Inclusion of Social Aspects in Life Cycle Assessment of Products

Development of a Methodology for Social Life Cycle Assessment

Dreyer, Louise Camilla

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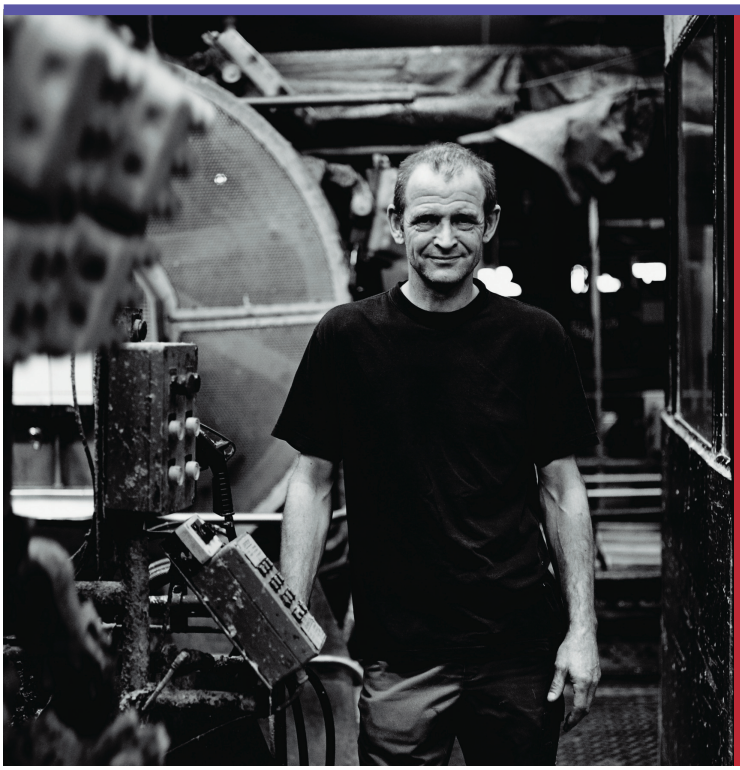

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Louise Camilla Dreyer
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Inclusion of Social Aspects in Life Cycle Assessment of Products

Development of a methodology for Social Life Cycle Assessment

Louise Camilla Dreyer

Thesis for the degree of Philosophiae Doctor

Industrial PhD Thesis, April 2009
Department of Management Engineering, Technical University of Denmark
Brødrene Hartmann A/S

Inclusion of Social Aspects in Life Cycle Assessment of Products - Development of a methodology for Social Life Cycle Assessment

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Author: Louise Camilla Dreyer

DTU Management Engineering
Produktionstorvet, building 424
DK-2800 Kgs. Lyngby

Phone:+45 4525 4800
E-mail: phd@man.dtu.dk

Tryk: Schultz Grafisk A/S

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what gets measured gets managed…

Preface

This is a dissertation presenting the results of the PhD project 'Inclusion of Social Aspects in Life Cycle Assessment of Products – Development of a Methodology for Social Life Cycle Assessment' conducted under the Industrial PhD Programme administered by the Danish Ministry of Science, Technology and Innovation. The goal of the project was to develop a Social life cycle assessment method aimed at company application.

The PhD project was carried out at Brødrene Hartmann A/S and Department of Management Engineering at the Technical University of Denmark in the period February 2003- February 2009.

Professor Michael Z. Hauschild from the Department of Management Engineering, Section for Quantitative Sustainability Assessment, at the Technical University of Denmark, was the university supervisor of the project. Director Claus Stig Pedersen, Brødrene Hartmann A/S (currently at Novozymes A/S), acted as company supervisor until November 2006, whereupon Corporate Manager, Tomas Schou Winther, Brødrene Hartmann A/S, took over the role until the finalisation of the project. Management Consultant Jens Schierbeck, acted as third part supervisor throughout the project.

The dissertation consists of a collection of four scientific articles with accompanying supporting information (Chapter 11) and a report (Chapter 1-10).

The report summarises, elaborates, discusses and concludes on the results presented in the articles and supporting information.

Kgs. Lyngby, April 24th 2009

Louise Camilla Dreyer

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Financial support for the PhD project from Brødrene Hartmann A/S and the Danish Ministry of Science, Technology and Innovation is gratefully acknowledged.

Finally, I would like to thank the people who have crossed my path during this project for their curiosity, scepticism, critique and many inspirational discussions, which all have contributed to the shaping of this project.

Summary

The goal of this Industrial PhD project is to develop a social life cycle assessment (LCA) method. The method aims to facilitate companies to conduct business in a socially responsible manner by enabling decisions on the basis of knowledge about their direct and indirect social impacts throughout the life cycle of their products.

The developed methodology of Social LCA consists of (1) a framework for Social LCA (2) a method to perform quantitative Social LCA (phases, steps and activities), and (3) methods and principles to develop underlying modelling of social impacts. Concrete models for inclusion of four impact categories representing fundamental labour rights violations were developed and tested in six case studies. The results of the case studies were used to evaluate the Social LCA method and the specific models for labour rights impacts. The ISO standards for Environmental LCA have been followed in the development to the extent that it has proved meaningful and practical when considering the different nature of social impacts.

A framework for social life cycle assessment
The Social LCA method is developed as a company decision-making tool aiming at an application in support of life cycle management. It operates with the area of protection "Human dignity and well-being" and applies a mid-point oriented impact assessment method. The focus is on the companies engaged in the product life cycle rather than on the processes (as is the case in Environmental LCA) due to the more obvious causal relation of social impacts to the conduct of the companies in which the processes take place rather than to the processes themselves. The Social LCA is thus based on a number of company assessments. A consequence of the company perspective is that neither process related impacts nor product use is considered by the method. Moreover, the lack of a natural quantifiable link between each of the companies included in the product system and the finished product creates the need for establishing a quantitative relationship between companies and product. Several different approaches are presented, each of them introducing a different bias in the assessment.

A method to perform quantitative social life cycle assessment (phases, steps and activities)
The Social LCA method proceeds through the same phases as Environmental LCA, but steps and activities of the inventory and impact assessment phases are quite different due to the chosen company perspective of the product system.

A managerial approach is chosen in the assessment of company conduct. This approach is suitable for modelling of impacts for which the probability of occurrence is related to, and therefore also reflected in, the existing management practice in a company, and for which specific managerial measures, which either promote or prevent that positive or negative impacts take place, can be determined. This approach entails that the impact assessment results (category indicator results) are expressed as probabilities that impacts take place rather than as impact potentials as in (mid-point oriented) Environmental LCA.

Company assessment, context assessment and product chain analysis are elements of the inventory analysis. The product chain analysis consists in mapping of the companies of the product chain and calculating product relation factors for these on the basis of the chosen product relation principle. Company assessment consists of a number of performance indicators (one representing each impact category) assessing the will and ability of a company in the life cycle to integrate managerial measures appropriate to prevent negative impacts. The indicator model, upon which performance indicators is based, accommodates a semi-quantitative assessment of the integration of preventive managerial measures. The assessment is performed in situ on the basis of interviews and documentation review. The context assessment for negative impacts consists in assessing the risk of impacts in the external environment of a company. Company contexts are ranked according to prevalence of risk based on a context 'risk' classification. The development of a performance indicator and a Context classification constitutes the inventory modelling of an impact category.

Characterisation consists in transforming the semi-quantitative assessment of management efforts to a quantitative scale, and translating this to a probability of impacts actually taking place. It is performed in four calculation steps, estimating company performance, company free rein, company risk, and (company related) product risk. Company performance is calculated applying a value attribution function to the scoring performed with the performance indicators. The company free rein reflects the degree to which circumstances are present in a company to allow negative impacts to take place and it is calculated by subtracting the company performance score from the maximum achievable score. Contextual adjustment of the company free rein score

makes up for the importance of management performance in a specific context relative to the importance it would have in the reference context for which indicators are defined. It is performed on the basis of the context classification results obtained in the inventory step and it results in a company risk score. A company's product risk score is obtained by relating the company risk score to the assessed product by multiplication with the relevant product relation factor

Case study results
The six case studies conducted in the project confirm the applicability and feasibility of the inventory and characterisation steps of the method. The case studies included one knowledge company and five small to medium-sized manufacturing companies located geographically widespread. On the basis of the case studies minor adjustments to the concrete inventory and characterisation models for labour rights violations have been recommended. The performance indicators applied in the inventory process were found to be most accurate when applied for companies that mainly employ blue-collar workers. On this basis a sector specific approach was recommended in the development of indicators. In conclusion the Social LCA method is thus applicable in the current form with four impact categories representing labour rights. The case studies also showed that company assessment was suitable as an internal social responsibility management tool, because of the managerial approach and concomitant level of detail of the company assessment.

Main findings
The range of possible applications of Social LCA based on the presented method is limited in comparison to traditional Environmental LCA due to the necessity of performing assessment in a rather site specific way. This complicates LCA applications that require assessment of products on a more conceptual or generic level.

The chosen extremely site specific assessment model is a pivotal methodological choice which on one hand ensures relevance of the LCA results for the intended application in life cycle management (LCM) but on the other hand poses a challenge to the data collection. In order to collect the site specific data required by the presented Social LCA method the company must have leverage in their product chain or be willing to work towards achieving it. In this sense the developed Social LCA method mainly aims at application in companies which are very serious about managing social responsibility for their product chain.

Four simplified indicator models relying on less information and/or information of more general character were tested for the four labour rights impact categories in the project. It was concluded that the usability of the results in terms of reliability of indication, information value, responsiveness to behavioural change of a company, and how easy it was to take actions on the basis of them, suffered significantly from simplification, which would complicate their application in support of LCM.

In support of LCM the Social LCA method aims at a stepwise and continuous execution of Social LCA. The Social LCA provides the company with an overview of the relations between the company's activities and the social impacts in the product life cycle through assessments of the life cycle companies' conduct. Product relation and possible aggregation of company impact profiles provides basis for identification of risks and opportunities in the product life cycle within the social scope.

Outlook
The main areas identified for further work comprise improvements to the modelling of labour rights, more research concerning the possibilities of combining Social and Environmental LCA; establishment of best practice regarding the application of product relation factors, specifically the possibility of using 'influence' as the main product relation principle for Social LCA applied for LCM; and more reflections concerning the inclusion of positive impacts in Social LCA.

Resumé

Formålet med dette ErhvervsPhD-projekt er at udvikle en social livscyklusvurderingsmetode (Social LCA). Metoden skal gøre det lettere for virksomheder at gøre forretning på en social ansvarlig måde ved at muliggøre at beslutninger kan tages på baggrund af viden om deres direkte og indirekte sociale påvirkninger i livscyklussen af deres produkter.

Den udviklede metodologi for Social LCA består af (1) et rammeværk for Social LCA (2) en metode til at udføre kvantitativ Social LCA (faser, trin og aktiviteter), og (3) metoder og principper til at udvikle den underliggende modellering af sociale påvirkninger. Konkrete modeller for inkludering af fire påvirkningskategorier der repræsenterer fundamentale arbejdstagers rettigheder blev udviklet og testet i seks case studier. Resultaterne af case studierne blev brugt til at evaluere Social LCA metoden og de specifikke påvirkningsmodeller for overtrædelse af arbejdstagers rettigheder. ISO standarderne for Miljø LCA er blevet fulgt i udviklingen i den udstrækning det viste sig at være meningsfuldt og praktisk, sociale påvirkningers meget anderledes natur taget i betragtning.

Rammeværk for social livscyklusvurdering
Social LCA metoden er udviklet som et beslutningsværktøj til virksomheder målrettet en anvendelse der understøtter livscyklusbaseret ledelse (LCM). Den tager udgangspunkt i beskyttelsesområdet "Menneskelig værdighed og velfærd" og anvender en midtpunktsorienteret metode til vurdering af påvirkninger. Fokus er på virksomhederne i livscyklussen hvori processerne sker, frem for på processerne i sig selv (som er tilfældet i Miljø LCA) på grund af den mere åbenlyse kausale forbindelse mellem sociale påvirkninger og virksomheders opførsel. Den sociale LCA er således baseret på en række af virksomhedsvurderinger. En konsekvens af virksomhedsperspektivet er at hverken påvirkninger relateret til udelukkende til processer eller produktanvendelse medtages i metoden. Manglen på en naturlig kvantitativ forbindelse mellem hver enkel virksomhed inkluderet i produktsystemet og det færdige produkt gør ydermere, at der skabes et behov for at etablere en 'kunstig' forbindelse. Forskellige tilgange er præsenteret, og hver af dem introducerer et forskelligt bias i vurderingen.

En metode til at udføre kvantitativ livscyklusvurdering (faser, trin og aktiviteter)
Social LCA metoden består af de samme faser som Miljø LCA, men trinnene og aktiviteterne i livscykluskortlægningen og vurderingen af påvirkninger er meget anderledes på grund af det valgte virksomhedsperspektiv på produktsystemet.

En ledelsesmæssig tilgang er taget til vurdering af virksomhedens opførsel. Denne tilgang er velegnet til modellering af påvirkninger for hvilke sandsynligheden for forekomst er relateret til, og dermed afspejlet i, en virksomheds ledelsespraksis, og når specifikke tiltag, som fremmer eller hindrer påvirkninger, kan defineres. Denne tilgang indebærer at resultaterne af vurderingen af påvirkninger (kategoriindikator resultater) udtrykkes i en sandsynlighed for at påvirkninger forekommer snarere end i påvirkninger som i Miljø LCA.

Virksomhedsvurdering, kontekstvurdering og produktkædeanalyse er elementer i kortlægningsfasen. Produktkædeanalysen består i at kortlægge virksomhederne i livscyklus og beregne produktrelationsfaktorer for disse på baggrund af det valgte produktrelationsprincip. Virksomhedsvurdering består af et antal præstationsindikatorer (en for hver påvirkningskategori) som vurderer en virksomheds vilje og evne til at integrere de ledelsesmæssige tiltag nødvendige for at forhindre negative påvirkninger i at opstå. Indikatormodellen som præstationsindikatorerne bygger på, muliggør semi-kvantitativ vurdering af integration af præventive ledelsesmæssige tiltag. Vurderingen udføres in situ på baggrund af interviews og gennemgang af dokumentation. Kontekstvurderingen for negative påvirkninger består i at vurdere risiko for påvirkninger i virksomhedens ydre miljø. Virksomhedskontekster rangeres på baggrund af en Kontekst 'risiko' klassifikation i overensstemmelse med udbredelsen af risiko. Udviklingen af en præstationsindikator og en Kontekst klassifikation udgør modelleringen af en påvirkningskategori i kortlægningsfasen.

Karakterisering består i at transformere den semi-kvantitative vurdering af ledelsesindsats til en kvantitativ skala, og oversætte denne til en sandsynlighed for at påvirkninger rent faktisk forekommer. Den udføres i fire beregningstrin: (1) estimering af virksomhedspræstation, (2) virksomhedsspillerum, (3) virksomhedsrisiko, og (4) (virksomhedsrelateret) produkt risiko. Virksomhedspræstation beregnes ved at anvende en værditildelingsmodel for scoringen foretaget med indikatorerne. Virksomhedsspillerum reflekter i hvor høj grad

der er omstændigheder til stede i virksomheden som muliggør at negative påvirkninger kan ske. Den beregnes ved at trække den aktuelle virksomhedspræstationsscore fra den højst opnåelige. Kontekstjustering af virksomhedsspillerumsscoren kompenserer for forskellen mellem vigtigheden af en ledelsesmæssig indsats i den specifikke kontekst sammenlignet med den kontekst for hvilken præstationsindikatorerne er defineret. Den udføres på baggrund af resultaterne af kontekstklassificeringen opnået under kortlægningsfasen og resulterer i en virksomhedsrisikoscore. En virksomhedsproduktrisikoscore opnås ved at gange virksomhedsrisikoscoren med den relevante produktrelationsfaktor.

Case studie resultater
De seks case studier udført i projektet bekræfter anvendeligheden og gennemførligheden af metodens kortlægnings- og karakteriseringstrin. Case studierne omfatter en vidensvirksomhed og fem små-til-mellemstore fremstillingsvirksomheder lokaliseret geografisk spredt. På baggrund af case studierne blev mindre justeringer foreslået til de konkrete kortlægnings- og karakteriseringsmodeller for overtrædelse af arbejdstagers rettigheder. Præstationsindikatorerne som blev anvendt i kortlægningsfasen viste sig at være mest nøjagtige når de blev anvendt for virksomheder som overvejende beskæftigede timelønnede. På denne baggrund blev en sektorspecifik tilgang anbefalet til videre udviklingen af indikatorer. Konklusionen er at Social LCA metoden er anvendelig i sin nuværende form med de fire påvirkningskategorier for overtrædelse af arbejdstagers rettigheder. Case studierne viste også at virksomhedsvurderingen var anvendelig som et internt ledelsesværktøj til social ansvarlighed grundet den ledelsesmæssige tilgang og den heraf følgende detaljeringsgrad af virksomhedsvurderingen.

Hovedresultater
I sammenligning med Miljø LCA er anvendelsesmulighederne for Social LCA baseret på den præsenterede metode noget begrænset på grund af nødvendigheden af at udføre virksomhedsspecifik vurdering. Dette komplicerer LCA anvendelser som kræver vurdering af produkter på et mere konceptuelt eller generisk niveau.

Den valgte ekstremt stedsspecifikke vurderingsmodel er et centralt metodisk valg, som på den en side sikrer relevansen af LCA resultater for den tilsigtede anvendelse i LCM, men som på den anden side udgør en udfordring for dataindsamlingen. For at kunne indsamle de stedsspecifikke data som den udviklede metode kræver, er virksomheden nødt til at have indflydelse i produktkæden eller være villig til at arbejde hen mod at få det. I den forstand retter Social LCA metoden sig primært mod en anvendelse i virksomheder som er meget seriøse omkring at arbejde med social ansvarlighed i deres livscyklus.

Fire simplificerede modeller som anvender mindre information eller information af en mere general karakter blev testet for de fire udvalgte påvirkningskategorier i projektet. Det blev konkluderet at anvendeligheden af resultaterne i form af pålidelighed, informationsværdi, modtagelighed for ændringer i opførsel, og hvor let det var at handle på baggrund af resultaterne, led meget under simplificeringen, hvilket vil begrænse deres anvendelighed i LCM.

I understøttelsen af LCM retter Social LCA metoden sig mod en trinvis og løbende udførsel af Social LCA. Den sociale LCA giver virksomheden et overblik over forbindelsen mellem virksomhedens aktiviteter og de sociale påvirkninger i produktlivscyklus via vurderingerne af livscyklusvirksomhedernes opførsel. Produktrelationen og den mulige sammenlægning af påvirkningsprofilerne for virksomhederne danner basis for identifikationen af risici og muligheder i produktlivscyklus indenfor det sociale område.

Perspektivering
Hovedområderne som der er identificeret for det videre arbejde omfatter: (1) forbedringer til modelleringen af arbejdstagers rettigheder, (2) mere forskning angående mulighederne for at kombinere Social og Miljø LCA, (3) etablering af ”best practice” angående anvendelsen af produktrelationsfaktorer, og specifikt muligheden for at anvende ”indflydelse” som det primære produktrelationsprincip i social LCA anvendt i LCM samt (4) reflektion angående inkluderingen af positive påvirkninger i Social LCA.

Glossary: Social LCA terminology

Below the terms frequently applied in the social life cycle assessment methodology presented in this dissertation are explained.

Aspect of violation	A characteristic of labour right violation to be addressed by managerial measures in a company to avoid violations of a specific labour right. For example 'exclusion from future employment' is an aspect of forced labour.
Company	In the characterisation 'company' refers to the specific entity in the product life cycle contributing to, the making of the product through raw materials extraction, manufacture of product components and semi-products etc., or actual handling of the finished product. I.e. the term cover a single production site and not the entire corporation.
Company assessment	The individual assessment of the conduct of a company in the product life cycle towards their main stakeholders. Social LCA is comprised by numerous company assessments. A company assessment consists of assessment with a number of performance indicators - one for each impact category included in the Social LCA.
Company free rein	The degree to which circumstances are present in a company that allows negative impacts to take place make up the free rein of that company.
Company performance	A quantitative representation of a company's efforts and ability to manage a particular issue.
Company risk	Expresses the risk of negative impacts taking place in a company (potential impact). It is based on assessment of a company's management performance with consideration for the context of that company.
Company risk classification	A general categorisation of company risk on the basis of company risk scores. The company risk classification is applied in interpretation of company risk scores and form basis for characterisation models.
Context	The external environment, which the company forms part of and by which the company conduct may be influenced, for example through legal, social, cultural, economic and political practices.
Context assessment	Assessment of probability of impacts in the external environment of a company.
Context classification	A general categorisation of contexts based on probability of impacts.
Contextual adjustment	Adjustment for the deviation in importance of management performance in a specific context in order to ensure low risk of negative impacts compared to the reference context, for which the assessment criteria of the multi-criteria indicator have been developed.
Contextual adjustment factor	A factor applied in adjustment for the deviation in importance of management performance in a specific context in order to ensure low risk of negative impacts compared to the reference context. Each contextual class of the Context classification is represented by a contextual adjustment factor.
Contextual class	A category of contexts characterised by a certain probability of impacts in the Context classification.

Integration efforts	Efforts made to integrate managerial measures effectively into daily company management practice with the purpose of preventing that impacts take place. Here integration efforts specifically refer to: (I) guidelines and practices (II) delegation of responsibility and communication about guidelines and practices, and (III) active control.
Managerial measures	Means to systematically manage an organisation's activities (business processes or work routines). Managerial measures are taken to avoid negative impacts on the area of protection.
Performance indicator	An indicator used to collect social life cycle inventory data for an impact category. Performance indicators comprised by multiple assessment parameters are also referred to as multi-criteria indicators.
Product relation factor	Expresses which weight the social impact profile of a specific life cycle company shall be given in the Social LCA of a product.
Product risk score	Expresses the proportion of a potential social impact of company, which can be ascribed to the product for which the LCA study is carried out.
Reference context	Represents the external conditions of the company for which the managerial measures of the multi-criteria indicators are defined as a desirable management effort to ensure a minimum risk of negative impacts. The reference context is characterised by very high risk in order to achieve best possible coverage of indicators.
Social aspect	A characteristic of a social issue of concern to be addressed through certain managerial measures by a company to avoid negative impacts on area of protection.

Acronyms

CRF	Company Free Rein
CRC	Contextual Risk Class
CAF	Contextual Adjustment Factor
CR	Company Risk
CP	Company Performance
CP_{max}	Maximum Company Performance
PRS	Product Risk Score
LCA	Life Cycle Assessment
LCI	Life Cycle Inventory
LCIA	Life Cycle Impact Assessment
ISO	International Organization for Standardization
ILO	International Labour Organisation
ITUC	International Trade Union Confederation
NGO	Non Governmental Organisation

Table of Contents

1 Introduction

All over the world, companies make business decisions every day which affect people and environment, directly through their own operations, or indirectly through the value chain of their business. Concurrently, with the globalization of product chains, the public's expectations to companies to assume a wider responsibility for the social impacts of their business, has increased. Companies are more frequently than ever confronted with questions regarding the conditions in their product chains by customers, consumer organisations and other NGO's. For example, approximately 60% of all Danish companies experience requirements to their social and environmental performance (CSR Kompasset, 2009). Requirements to social performance typically concerns issues like health and safety in the workplace, labour rights, anti-corruption and human rights compliance.

Many companies experience a need to respond to these growing expectations in the market by assessing, controlling, managing and improving their negative social impacts throughout their product chain. This has given rise to an increasing interest in participating in voluntary social responsibility or accountability guidelines for businesses, like the OECD Guidelines for Multinational Enterprises, the UN Norms, the ILO Tripartite Declaration of Principles, the UN Global Compact. As a result many companies have formulated ethical guidelines in the form of codes of conduct, defining their corporate social responsibility. Companies may however experience that it can be quite difficult to turn such declarations of intent into concrete actions. How does it obtain a sufficient overview of its social impacts, not only on own premises, but in the entire product chain, to take action? And how should it prioritise its efforts and document its progress?

Social LCA may serve as a tool in this process through its unique incorporation of the life cycle perspective, quantitative approach to assessment of impacts and ability to compact and transform a large amount of information into a simple and hence easily comprehensible result. When applied in life cycle management it may serve the purpose of prioritising efforts, setting goals and measures for a company's management of social responsibility in the product life cycle.

On the drawing board Social LCA holds a great deal of promise; however there are obstacles and challenges which must be faced and dealt with in the development of Social LCA methods in order to ensure feasibility on one hand and reliability and relevance of results for the application on the other hand. Current developments in Social LCA research reflect this.

Social LCA is a young research discipline, and the main body of research has been conducted within the past five years. However, in this short period of time several Social LCA approaches have been developed aiming at different applications like financial investment (Méthot 2005), design (Schmidt et al 2004, Gauthier 2005), labelling (Spillemaeckers et al 2004), industrial management (Cañeque 2002, Schmidt et al 2004, Dreyer et al 2006, Nazarkina and Le Bocq 2006) and public decision making (Hunkeler 2006). Also, a number of approaches have been created without a specified target group of users (Barthel et al 2005, Flysjö 2006, Manhart and Grießhammer 2006, Norris 2006, Weidema 2006)[1]. These approaches constitute a very diverse selection which reflects the lack of a common framework for Social LCA methodologies laying down the principles for selection of impact categories, approach to impact assessment, data collection and interpretation.

This Industrial PhD project aims to contribute to this research by proposing a methodology for Social life cycle assessment inspired by the International Organization for Standardization's (ISO) framework for Environmental LCA.

[1] Based on overview provided by Jørgensen et al (2008)

Project objectives
The goal of this Industrial PhD project is to develop a social life cycle assessment method. The method shall facilitate companies to conduct business in a socially responsible manner by enabling decisions on the basis of knowledge about their direct and indirect social impacts in the life cycle of their products.

More specifically put, this application requires that the social life cycle assessment result is able to:

- provide the company with an overview of the relations between the company's activities and the social impacts in the product life cycle;
- form basis for the identification of potential improvements of social impacts in the product life cycle; and
- provide the company with the possibility to use corporate social responsibility as a parameter in decision-making.

Moreover to enhance the eligibility of the method for this application, the social life cycle assessment must aim to:

- produce quantitative results;
- measure and assess performance and impacts in a way which is meaningful for a company;
- produce results which are responsive to change in a company's behaviour or conduct in a product chain perspective; and
- enable consideration for issues which are relevant for a companies to address as part of meeting general expectations of main stakeholders to corporate social responsibility.

2 Goal, framework and principles for the social life cycle assessment method development

The intended Social LCA goal and application, and main framework and principles, which has guided the Social LCA method development is presented in this chapter. The framework presentation aims to clarify some fundamental differences between Social LCA and Environmental LCA that originate from the different nature of social and environmental impacts. The methodological choices made in the development are presented in textboxes at the end of each section.[2]

2.1 Goal and application of developed Social LCA method

In accordance with the project objectives this Social LCA method is developed with an intended main application in business decision-making. This is with a primary goal of supporting life cycle management through:

> Continuous identification of social improvement potentials (hot spots) in the product chain with the objective of assessing business risks and opportunities within the social scope as basis for prioritising efforts and taking appropriate actions to minimise harmful impacts and maximise beneficial impacts on people's lives from the activities in the company's product chain.

Other applications supplementing the above:

(A) Comparison of alternative life cycle companies with the objective of assessing how choice of alternative suppliers or sub-contractors reflects in the social impact profile of the product with the aim of making a deliberate and knowledgeable selection when sourcing.

(B) Comparison of alternative solutions with the objective assessing how changes in product concept, components, materials and processes may influence product relation and choice of life cycle actors and hence reflect in the social impact profile of the product with the aim of making deliberate and knowledgeable choices in product improvements.

The intended commissioners and users of this Social LCA of products are product chain owners i.e. product manufacturers.

Methodological choices – Goal and application

- Social LCA as company decision-making tool

2.2 General framework and principles for LCA

The Social LCA methodology development has been inspired by the principles and framework for LCA described in the International Organization for Standardization's (ISO) standards for Environmental LCA, *viz*.: ISO 14040 (ISO, 1997), ISO 14041(ISO, 2000a) and ISO 14042 (ISO, 2000b). These standards have been followed in the development to extent that it has proved meaningful and practical when considering the different nature of social impacts. The main steps of LCA according to the ISO standards include definition of goal and scope, inventory analysis, impact assessment and interpretation of results, as illustrated in **Figure 1**. The developed Social LCA method is structured accordingly.

[2] The content of this chapter mainly refers to the scientific articles (Dreyer et al, 2005) (Hauschild et al, 2008).

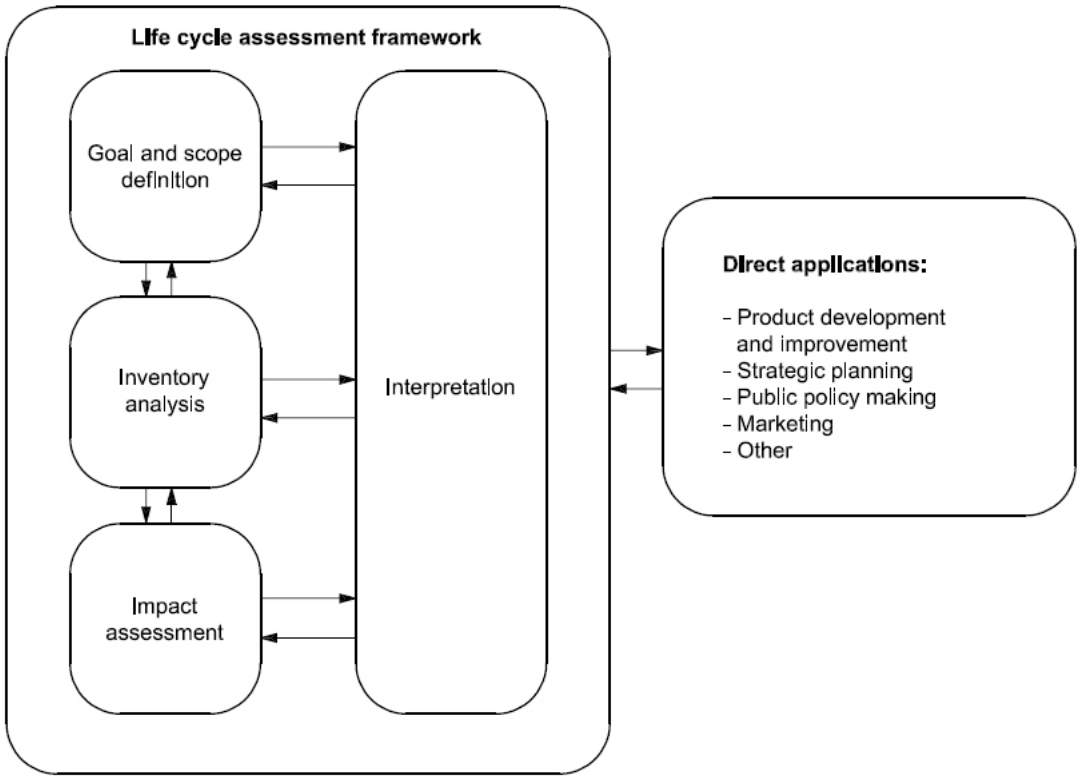


***Figure 1**: Steps in life cycle assessment according to ISO (ISO, 1997). The arrows between the steps indicate that life cycle assessment is conducted in an iterative process.*

The elements of the life cycle impact assessment (LCIA) according to ISO are illustrated in **Figure 2**. These have been sought implemented in the Social LCA method developed in this project. The content of each element is elaborated further in connection with the presentation of the Social LCA method in Chapter 3.

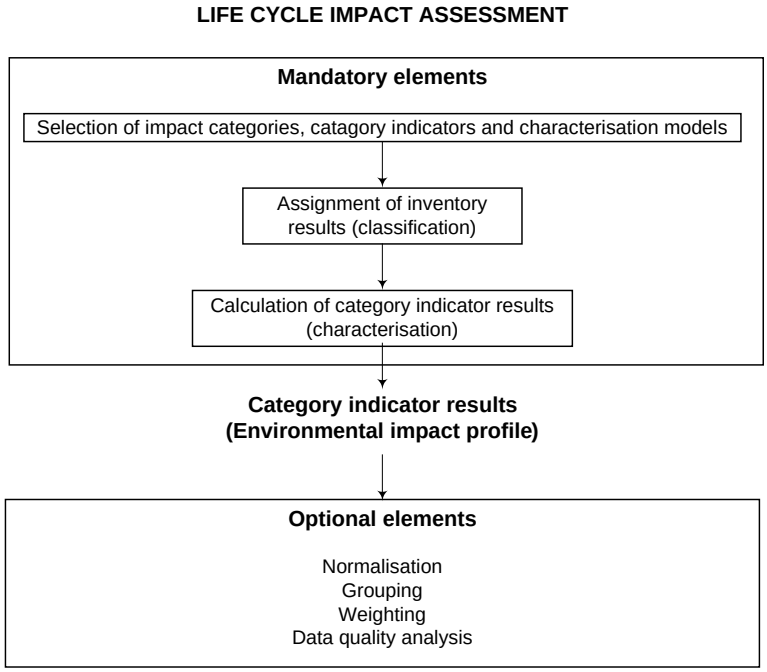


***Figure 2**: Elements of life cycle impact assessment phase in Environmental LCA according to ISO. (ISO, 2000b)*

2.3 Area of protection for Social LCA

In Environmental LCA areas of protection are defined to express what is of value to human society, and therefore must be protected by LCA through consideration of what causes damage to it. Contrary to Environmental LCA Social LCA may also include positive impacts, so the areas of protection of the Social LCA methodology must be defined to express what is of direct value to human society, and therefore must be protected and promoted by Social LCA through consideration of what causes damage and benefit to it. (Dreyer et al, 2005)

Social LCA is about people and impact on people, social impacts, whereas Environmental LCA is about impact on the biophysical environment. Environmental LCA methodology typically refers to four areas of protection, *Human Health*, *Natural Environment*, *Natural Resources* and *Man-made Environment* (Udo de Haes et al, 2002). *Human Health* is the only area of protection which concerns damage on people. *Human Health* is described as the intrinsic value of human life, and damage to this area of protection is defined as a mere question of human mortality and morbidity (Jolliet et al, 2003) as a consequence of impacts on the environment. Social LCA must protect and promote more than just human health in order to include all relevant social impacts on people thus a broader understanding of human life, encompassing the value of a good and decent life, must be embraced by the area(s) of protection of Social LCA. (Dreyer et al, 2005)

At least three important prerequisites for a good and decent life can be identified, 'human health', to live a healthy and naturally long life; 'human dignity', to live a decent life and enjoy respect and social membership; 'basic needs fulfilment', to have access to food, water, clothes, medical care etc. These prerequisites are interrelated, as human health, and in many cases human dignity, are promoted by, and even dependent on, fulfilment of basic needs. In keeping with this, a new area of protection is suggested for Social LCA, Human Dignity and Well-being. (Dreyer et al, 2005)

Methodological choices – Area of protection

- Social impacts on people may be both negative and positive
- Human Dignity and Well-being as the area of protection of Social LCA

2.4 Perception of the product system in Social LCA

In Environmental LCA the product system encompasses all the processes involved in the different stages of a product's life from the extraction of raw materials, through manufacture, use and maintenance to the final disposal of the product. Physical flows of intermediate products and products connect these processes and the life cycle stages of a product, and physical flows in and out of the individual processes exchanges with the surrounding environment. (ISO, 2000a)

Environmental LCA concern impacts on the environment from the product system, where there is a natural link between the physical input or output of a process in the product system and a subsequent change in quality of the surrounding environment. The performance of the processes is thus the main driver behind the product's environmental and resource impacts, and Environmental LCA therefore identifies all relevant processes in the life cycle of a product and analyse their exchanges with the environment. See the conceptual outline of the product system in **Figure 3**. (Dreyer et al, 2005)

Social LCA concern impacts on people from the product system. With a few exceptions (these are discussed in Chapter 5), impacts on people are generally not directly related to the physical flows in and out of the product system, but are independent of the physical conditions of the industrial processes taking place in the life cycle. It is indirectly via the activities of companies in which the processes of the life cycle takes place (process owners) that the impacts on people from the product system manifest in most stages, and not from the physical flows of the product system directly. In the use stage it is also via the activities of product users', i.e. the product use, that the impacts on people from the product system manifest. It therefore makes more sense in Social LCA to focus analysis on the process owners rather than the processes themselves. (Dreyer et al, 2005)

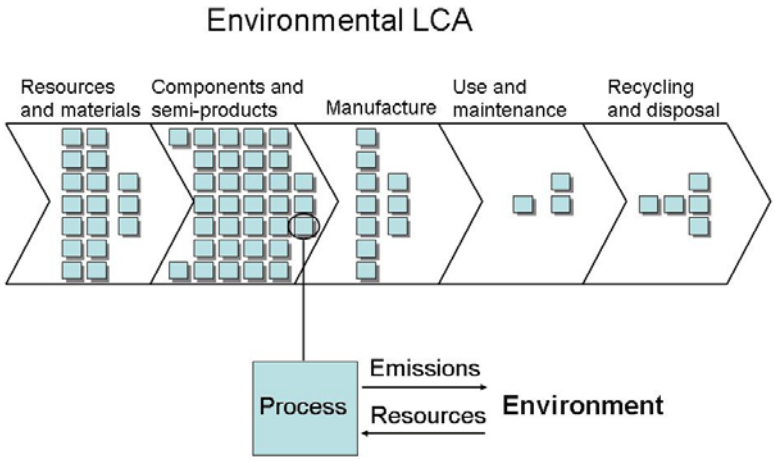


***Figure 3**: In Environmental LCA focus is on the individual processes and the physical flows which they exchange with the environment. (adapted from Dreyer et al (2005))*

When a company's fundamental right to conduct business and survive in the market (compete and gain profit) is accepted as main premise for the methodological development then social impacts related to the activities of the life cycle companies will concern the manner in which they conduct their business, not whether they do business or not. In line with this the social impacts related to the activities of the product user will concern the way the product is used (conduct of product user) and not the justification of the actual product. A methodological framework developed from a societal perspective rather than a company perspective might thus look different.

People affected directly or indirectly by a company's business activities may collectively be termed, the stakeholders of the company. How a company impact these through the way it conducts its business is the focus of this Social LCA method. **Figure 4** presents a simplistic stakeholder impact model for company, which considers the three main stakeholder groups, employees, and local community and society. When moving from the centre towards the periphery in the figure, the company's impact on people becomes more indirect. Impacts internally in the company (the inner sphere in **Figure 4**) can also give rise to impacts in the local community or the society, however more indirectly. The company may through its business conduct give rise to both positive and negative impacts on people. For example, use of forced labour will cause negative impacts on employees, whereas creation of well-paid jobs may give rise to positive impacts for the people getting a job and for the local community as a whole. (Dreyer et al, 2005)

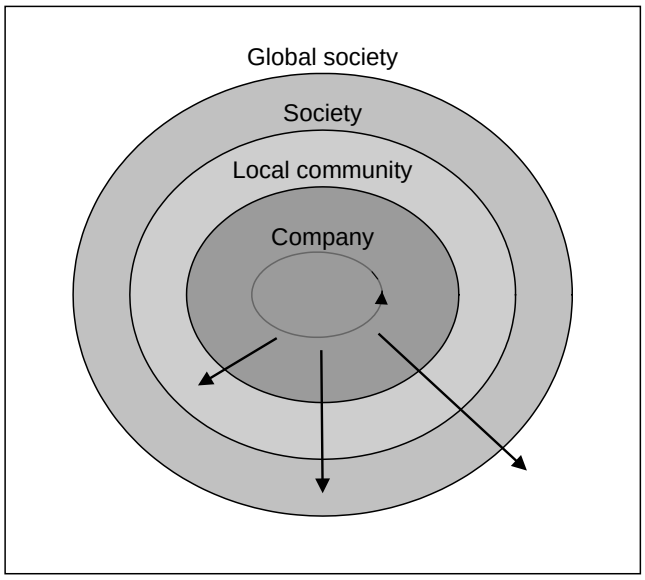


***Figure 4**: The impact from life cycle companies on key stakeholders. The approach is a simplified stakeholder impact model. The arrows illustrate the social impacts of the company on stakeholders internally or externally.(Dreyer et al, 2005)*

In the same manner we may perceive the impacts related to the product user's conduct. The product users affect their own lives directly when using a product, e.g. when taking medicine to cure an illness. This may also affect the lives of other in their immediate proximity with whom they interact e.g. through avoided transmission of disease as a result of taking medicine. In case of an extensive number of users a product use may also have an effect on society e.g. vaccines for a very contagious and deadly disease. The product use may not just result in positive impacts, for example, when medicine is not taken correctly it may result in other illnesses than the one it was meant to cure or when medicine is used to commit suicide or poison others. Depending on the conduct of the product user in the use situation, the product use may result in positive or negative impacts for the product user himself and the people affected by the product use directly or indirectly.

In this methodology development I chose to focus on the development of a methodology dealing with the social impacts related to the conduct of the companies engaged in the life cycle of a product. Hereby not implying that the impacts in the use stage of the product life cycle related to the conduct of the product user are insignificant, on the contrary, it is likely that there are significant direct or indirect social impacts on people, but these require a different methodological framework to consider in Social LCA. In a company application of Social LCA we will find that it is not relevant for the Social LCA to consider these impacts, since these typically will be addressed by other, perhaps more appropriate tools in the company. In other applications of Social LCA we might find the inclusion of impacts related to product user conduct more relevant, for example, when Social LCA is applied in support of decision-making concerning financial investments in specific companies.

Object of product system analysis in present Social LCA method is thus the conduct of the companies contributing to the making of the product through raw materials extraction, manufacture of product components and semi-products etc., or actual handling of the finished product. The smallest portion of the product system for which data are collected when performing life cycle assessment is thus the organisational independent enterprises directly engaged in the life cycle of the product. In this way Social LCA involves a number of individual company assessments which must be aggregated to produce the social life cycle profile of the product. This product system perception upon which this Social LCA method operates is illustrated in **Figure 5**.

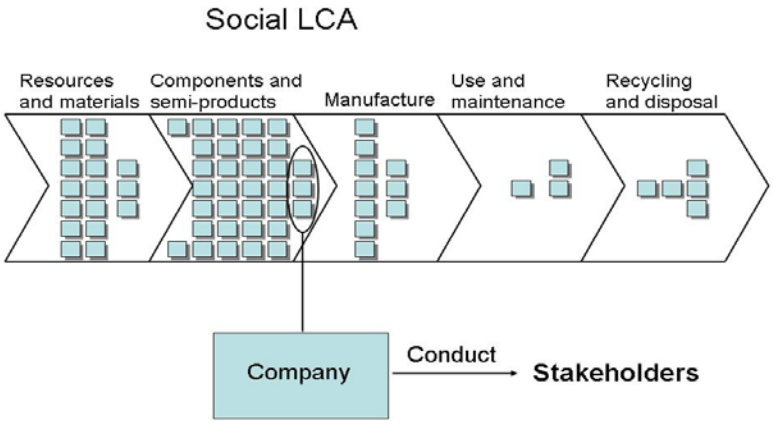


***Figure 5**: In the developed Social LCA method focus is on the companies engaged in the life cycle and the impact that their conduct has on the stakeholders who are affected by their actions (adapted from Dreyer et al (2005)).*

2.4.1 Product relation

A consequence of analysing the product system at company level instead of process level is that the relation of the impacts to the product and thereby the product service is no longer straightforward. Since the conduct of the life cycle companies is unrelated to the physical flows of intermediate products and products in the product system there is no natural and direct quantifiable link between the company conduct and the actual product as we see there this between process and product in Environmental LCA. The social impacts of the companies in the product life cycle must therefore, as part of the assessment, be related to the product in another meaningful manner. (Dreyer et al, 2005) (Hauschild et al, 2008)

Methodological choices – Perception of product system

- Modelling of non-process related impacts only
- Product system is perceived as consisting of the companies engaged in the product life cycle
- Modelling of impacts related to the conduct of life cycle companies towards main stakeholders, i.e. the Social LCA consists of a number of company assessments
- No inclusion of the product use
- A principle for establishing a quantitative relationship between each company included in the product system and the finished product must be determined during scope definition as a consequence of the lack of a natural quantifiable link between these.

2.5 General approach to life cycle impact assessment

In LCIA modelling the impact category indicator is the quantifiable representation of the impact category. According to the ISO 14042 Standard, the category indicator may be chosen anywhere between the environmental exchanges (environmental input and output of the product system) and the category endpoint(s) along the environmental mechanism of the impact category. The category indicator concept is illustrated in **Figure 6**. If the category indicator is defined near the environmental exchanges, the approach is defined as a midpoint approach contrary to the endpoint approach, where the category indicator is defined near the level of damage in the impact pathway, the (endpoint). Examples of category midpoints could be (increased) IR absorption capacity due to emission of greenhouse gases and (increased) UV-B radiation intensity at the surface of the earth due to stratospheric ozone depletion, while examples of category endpoints can be areas of direct societal concern e.g. human life span and valuable ecosystems. Classes of endpoints that have a recognised value for society are areas of protection. (ISO, 2000b) (Udo de Haes et al, 2002)

When modelling is performed all the way to endpoint, the uncertainty of the models and the data they apply are increased, as the models become more complex, but the results of the assessment become easier to interpret and relate to the everyday life. Contrary to this the midpoint modelling uses more accurate modelling, but the results do not have the same relevance for the individual as the results of the endpoint modelling. The quintessence of the problem in Environmental LCA when choosing LCIA approach is whether it is an acceptable trade-off to choose relevance of results over certain and complete modelling.

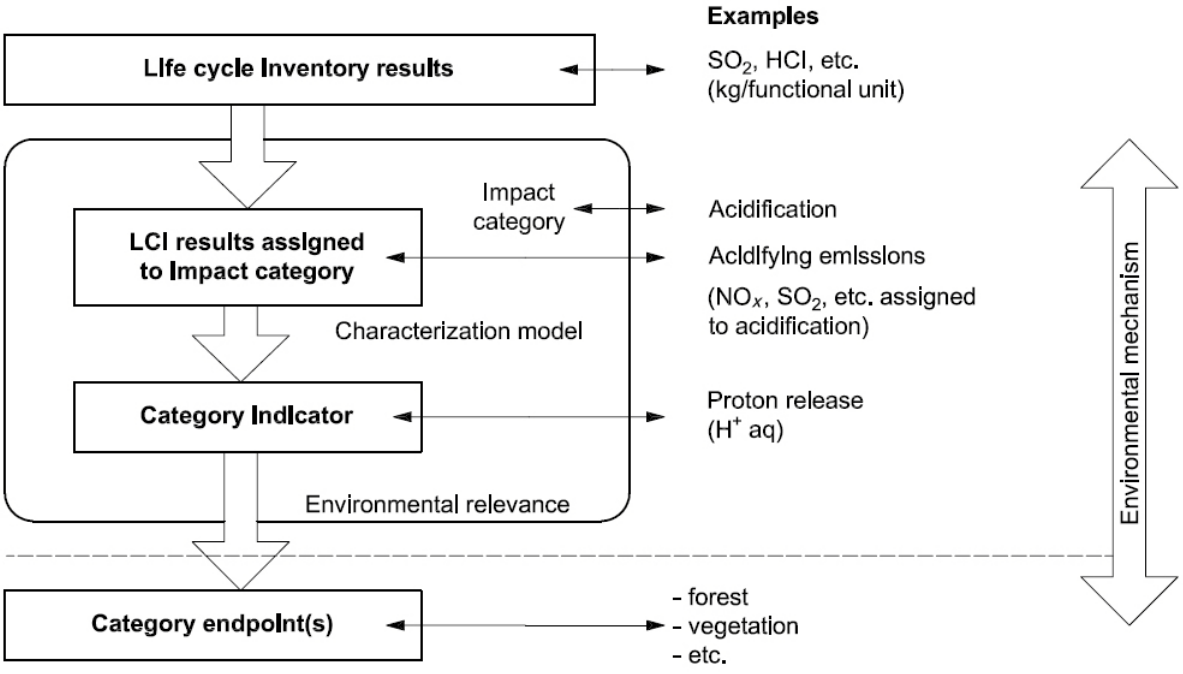


***Figure 6**: Category indicator concept according to ISO 14042. (ISO, 2000b)*

The discussion of where in the impact pathway the category indicator should be placed is equally relevant in Social LCA. The goal of this Social LCA method to support the company's management decisions naturally places the development of category indicators at a midpoint of the impact pathway. Due to the uncertainty of the causal relationships, damage modelling may cloud the understanding of the causal links between the conduct of the company and the damage upon the area of protection. In the application of Social LCA for life cycle management a clear understanding of cause and effect is essential in order for a company to make improvements. Furthermore, the expression of the product's social impacts in terms of damage, e.g. as disability or quality adjusted life years (DALY or QALY)[3] will be undesirable in the business context for many companies, implying that the company's product is dangerous compared to other products for which assessment is not performed. (Dreyer et al, 2009a)

Methodological choices – General approach to LCIA

- The Social LCA method is mid-point oriented

2.6 Impact categories

For the Social LCA to support the decision-making process in a company on one hand and attain legitimacy from a societal point of view on the other, it is recommended that Social LCIA operates with two classes of impact categories, an obligatory, normatively based, class of predetermined categories expressing minimum expectations to conducting responsible business, and an optional, self-determined class of categories expressing interests specific to the product manufacturer which are not already covered by the obligatory impact categories. See **Figure 7**. (Dreyer et al, 2005)

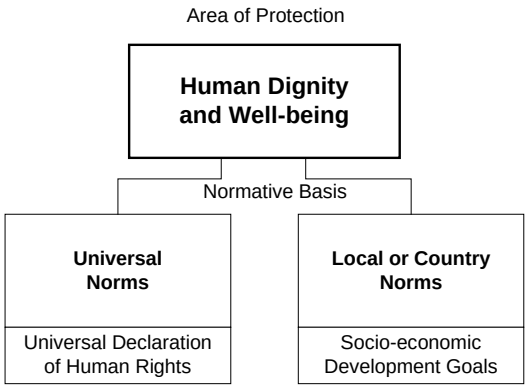
***Figure 7**: The two-layer structure of Social LCA designed to accommodate customisation of Social LCA while maintaining a general core. (Dreyer et al, 2005)*

Two-layer Social LCA	**Optional**	Self-determined context specific assessment parameters to customise Social LCA
	Obligatory	Consensus driven, "normative" assessment parameters expressing minimum requirements to business

2.6.1 Obligatory impact categories

The Universal Declaration of Human Rights may serve as normative basis for Social LCA together with local or country norms based on socio-economic development goals of individual countries, see **Figure 8**. In this way the Social LCIA take into account that the dignity and well-being of people is influenced by observance of fundamental human rights and the social, economical and political development stage of the society of which they are members. (Dreyer et al, 2005)

***Figure 8**: Proposed normative basis for the obligatory part of social life cycle impact assessment with Human Dignity and Well-being as area of protection. (Dreyer et al, 2005)*



[3] Disability Adjusted Life Years (DALY) is a metric developed by Murray and Lopez (1996) for the WHO and the World Bank. The original purpose was to have a tool to analyse the rationale of health budgets. DALY aggregates mortality and morbidity using weighting factors for the latter in the assessment of damage. Modelling of damage in life cycle impact assessment was introduced by Hofstetter (1998) and applied to the impact category Human Health in the Eco-indicator methodology (Goedkoop, Spriensma, 2000). The QALY metric, which is the inverse of the DALY metric, has later been suggested applied in Social LCA by Weidema (2006).

The International Labour Organisation's (ILO) Conventions (ILO, 2008) and the Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy (Tripartite Declaration) (ILO, 2001) constitutes universal norms which support development of an impact pathway top-down from the area of protection to the activities of companies.

The ILO Conventions are the interpretation of human rights in a labour market context and they therefore define the responsibility, as regards observance of human rights, which righteously can be placed with companies. The relationship between the management and the employees is central for the dignity and well-being of employees, not only as workers, but also as individuals and members of society. In this sense fundamental labour rights may be considered obligatory issues in a Social LCA aiming at company application. The ILO Conventions consider a broad scope of workers rights issues, whereof eight are considered fundamental, see **Table 1**.[4] (Dreyer et al, 2005)

A company may benefit human dignity and well-being by stimulating the socio-economic development, which increases welfare for people in the local community. This impact of the company on local community is thus more indirect than on the internal stakeholders (**Figure 4**). (Dreyer et al, 2005) The Tripartite Declaration emphasizes the role of companies in regard to promotion of economic and social welfare in developing countries through their activities (ILO, 2001, 2002). The issues considered by the Tripartite Declaration in guidance of companies operating in developing countries are described in **Table 2**.

Inventory and characterisation models for impact categories based on the ILO Conventions and the Tripartite Declaration must be guided by the content of relevant articles of these. An example is presented for the impact category 'Forced labour' in section 3.4.2.

***Table 1**: Eight ILO Conventions have been identified by the ILO's Governing Body as being fundamental to the rights of human beings at work (ILO, 1930, 1957, 1958, 1951, 1948, 1949, 1973, 1999).*

Issue	Convention
Freedom of association and collective bargaining	Freedom of Association and Protection of the Right to Organize Convention (No. 87) Right to Organize and Collective Bargaining Convention (No. 98)
The abolition of forced labour	Forced Labour Convention (No. 29) Abolition of Forced Labour Convention (No. 105)
Equality	Discrimination (Employment and Occupation) Convention (No. 111) Equal Remuneration Convention (No. 100)
The elimination of child labour	Minimum Age Convention (No. 138) Worst Forms of Child Labour Convention (No. 182)

***Table 2**: Excerpt of the principles of The Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy regarding companies operating in developing countries (ILO, 2001, 2002). Numbers in brackets in second column refers to article number of the Declaration. (From (Dreyer et al, 2005))*

Issue	Principle of conduct
Job creation	Increase employment opportunities and standards (16)
Local/national recruitment in developing countries	Use of national labour (18)
Generation of employment and technology development	Use technologies that generate employment and take part in development of new technology in host countries. (19)
Stimulation of economic growth in developing countries	Use of national suppliers (20)
Stability of employment	Ensure stability of employment through effective manpower planning (25)
Skill formation and development	Strive to raise education and skill level of employees in developing countries. (31)
Wages, benefits and conditions of work	Ensure best possible within the framework of government policies. (34)

[4] These have earlier been identified for inclusion in Social LCA or Sustainability LCA by several authors e.g. Mazijn (2004, 2005), Vanhoutte (2004), Barthel et al (2005), Schmidt et al (2004), Grießhammer et al (2006) and Manhart and, Grießhammer (2006)

To establish local or country norms it is recommended to start from National or Regional Human Development Reports published by the United Nations Development Programme (UNDP) or similar publications providing information about the socio-economic development of countries. Corruption and bribery, education, and health care are all examples of important issues of relevance for human dignity and well-being, which companies may influence. These and other similar topics may be considered under local or country relevant norms in obligatory Social LCA.

2.6.2 Optional impact categories

In order for a company to apply Social LCA in their decision-making process it must be able to include impacts related to the company's activities which are of special interest for the company to assess, e.g.: (Dreyer et al, 2005)

- Categories emerging from stakeholder dialogue
- Categories addressing specific company concerns
- Categories referring to specific company values and principles
- Categories addressing responsibility that may be associated with product (e.g. medicine, tobacco, organic foods etc.)

Methodological choices – Choice of impact categories

- The Social LCA method operates with obligatory and optional impact categories
- Fundamental labour rights violations are obligatory impact categories in the Social LCA method

3 Social life cycle assessment methodology

The steps and activities of the developed Social LCA method and its underlying models are presented and discussed in this chapter. Additionally, concrete inventory and characterisation models for fundamental labour rights violations (obligatory impact categories) illustrating application of the methodology are presented. The methodology presentation aims to accentuate the methodological choices of the developed Social LCA method and main differences between the Social LCA method and Environmental LCA.[5]

3.1 Assessment of company conduct – the basis of the Social LCA method

The focal point of this Social LCA method is how the life cycle companies through their conduct have a positive or negative impact on the dignity and well-being of the people affected by their activities. Assessment of company conduct with the aim of determining the social impacts related to this is thus central for the life cycle assessment. The choice of assessment approach shapes the specific purpose and content of the inventory and impact assessment steps and activities in the Social LCA method (**Table 3**, section 3.2).

3.1.1 Managerial approach to assessment of company conduct

Different approaches to assessing company conduct may be favourable depending on which aspects of company conduct one wishes to focus on. In this methodology development I choose a managerial approach by basing assessment of company conduct on the measures taken by the company preventive of negative impacts or promotive of positive impacts. On this basis the purpose of the impact assessment becomes to assess the potential impacts to stakeholders as a result of the company's conduct towards these. The step of characterisation will consist in, transforming the semi-quantitative assessment of management efforts performed in the inventory step on to a quantitative scale, and translating this company performance to a probability of impacts actually taking place (potential impacts), in a non-statistical sense. In the translation of company performance to probability of impacts consideration for the needs or risks characteristic for the context which the company forms part of is essential. The managerial approach entails that the impact assessment results (category indicator results) are expressed in probability that impacts take place rather than an expression of impacts per se as in (mid-point oriented) Environmental LCA. (Dreyer et al, 2009a)

3.1.2 Suitability of managerial approach

The managerial approach chosen here is suitable for modelling of impacts for which the probability of occurrence is related to, and therefore also reflected in, the existing management practice in a company, and for which specific managerial measures which either promote or prevent that positive or negative impacts take place can be determined. This typically applies to conduct directly affecting the employees of a company. However, 'corruption and bribery' is an example of conduct which may be managed, but which may also affect people outside the internal sphere of the company.

The managerial approach is particularly suitable for assessment of types of impacts which are difficult to directly determine occurrences of and quantify due to sensitivity of the topics. The most apparent example being labour rights violations. Violations of fundamental labour rights are in conflict with the law in most countries, which makes any kind of voluntary disclosure by the company about such unlikely, and since violations tend to happen inside a company, they are often invisible from the outside world. It is general for conduct which leads to negative impacts on people, in particular when the link between conduct and impact is direct (as the internal impact sphere of the company, **Figure 4**), that it is a very sensitive topic for a company to share information about - on the contrary the company will often have great interest in covering up. Furthermore, seldom does a company put the extent of their misconduct into quantitative terms, which may facilitate measurement of extent and severity of misconduct or negative impacts for the purpose of Social LCA, unless it is necessary for accounting purposes as it is for example with wage and overtime for some companies. So for example the number of incidents of harassment and work place accidents in a company becomes difficult to establish because they do not necessarily leave a trail in the company after they have taken place revealing their exact extent. It may be possible, for example through auditing, to uncover whether harassment takes place in a company, but an exact number of incidents will be impossible to obtain. Even through all employees were asked

[5] The content of this chapter mainly refers to the scientific article (Dreyer et al, 2009a) and the supporting information (Dreyer et al, 2009a1, 2009a2, 2009a3, 2009a4).

if they had ever been harassed in the workplace, the number of incidents uncovered this way would be highly uncertain, because of employees' fear of retribution, embarrassment or similar reactions which would affect their answers, even in an anonymous investigation.

To a large extent the managerial approach circumvent the problems related to sensitivity, because it addresses management practices and assess company performance, which is less sensitive to share information about, and which may still give indication as to whether impacts are likely to take place in the company. The managerial approach is therefore well suited for negative impacts, which are difficult to uncover with a direct approach, and for which it is difficult to establish the extent quantitatively in practice. Such assessment is however naturally qualitative and needs to be translated into quantitative terms in order to be applied in Social LCA.

Positive impacts on people are typically not sensitive for a company to disclose information about and therefore it is easier to measure these more directly. Often the conduct leading to positive impacts can be quantified in terms of company expenditure on promotive measures e.g. money spent on employee training, money spend on employee health insurance etc. In these cases the managerial approach is a less meaningful choice for assessment of company conduct. However, some of the same considerations apply to modelling of direct quantifiable positive social impacts. A product relation must still be established and consideration for the company context characteristics is still relevant for determining the magnitude that the actual positive impact that company conduct may result in.

Sometimes the combination of direct measuring and assessment of management effort may be valuable depending on the application of the LCA results. For example, a quantitative measure may provide information about how much money a company spends on education of employees, while an assessment of management practices may provide information about the quality of such an educational scheme and equality of access to it. A measure of 'Incidents in a year of employees working in excess of 48 hours in one work week' may indicate the most serious cases of excessive working hours. It does not consider that overtime in a smaller scale may also be problematic if it is not remunerated or poorly remunerated, if it is not voluntary, or if it poses a threat to the health and safety of the worker at the time and in the future (through effect on future work ability). An indicator of management practice may take these considerations into account.

Quantitative direct measures can sometimes be problematic because these depend on companies' ability to keep detailed records which allow that necessary LCA data can be gathered directly or deduced from these. This presupposes that the company registers, normal working hours, overtime, wages, deductions in wage, work place accidents, and similar things that may serve as indicators of working conditions, in a systematic and comprehensible manner. The managerial approach assesses the company conduct as it reflects in management practices and hence in working conditions at a certain time, i.e. in a snapshot, and does therefore not pose requirements to record keeping. The keeping of appropriate records may however be assessed as part of the company's management practice since existence of such may serve as evidence of practice. Even though the assessment of management efforts provides a snapshot of company conduct it may also include knowledge about past conduct, e.g. a court case regarding discrimination, if it serves as proof that existing management efforts in regards to a specific issue is inadequate. On the other hand, if for example working accidents in the past has lead to use of new safety equipment in the present; the practitioner may have the option to neglect that a certain kind of working accidents have happened in the past.

When basing assessment of potential impact on the assessment of company management effort it also becomes quite easy to identify the improvement potential of a company and give guidance as to how to improve, which supports the goal of Social LCA as stated for this method development.

Methodological choices – Assessment of company conduct

- Assessment of company conduct based on a managerial approach forms basis for impact assessment
- Impact category indicators express risk of impacts

3.2 Methodology presentation

The developed Social LCA method primarily aims to include some of the impacts in Social LCA, which generally are difficult to model in LCA due to their sensitive and complex nature. The main focus of the presented method is therefore inclusion of negative impacts concerning the people working in the product chain, i.e. the employees of the companies comprised by the product system. These comprise particular sensitive impacts because they often are results of a conduct which is morally questionable and in some cases synonymous with breaking the law. They constitute direct impacts on people and they take place inside the company and are therefore in that sense often hidden from the outside. The method may in principle accommodate positive impacts as well as negative impacts, however concrete inventory and characterisation models have only been tested for negative impacts, and therefore emphasis is also placed on presentation of the inclusion of negative impacts in Social LCA in this dissertation. It is however important to stress the importance of including positive impacts in Social LCA. A mere focus on negative impacts, such as labour rights violations, does not necessarily result in social responsible company behaviour when Social LCA results are applied for LCM. **Table 3** presents an overview of the developed Social LCA methodology. The elements of the methodology are presented in the following sections.

From **Table 3** we can see that goal and scope definition in a Social LCA study involves more or less the same activities as in an Environmental LCA study, whereas steps and activities of the inventory and impact assessment phases are quite different due to the chosen company perspective of the product system.

All steps and activities in the inventory and impact assessment phases in **Table 3** are performed for each company included by the product system for each impact category, except for 'calculating product relation factor (PRF)' which is performed once for each company and applied in the calculation of all impacts.

Social LCA is conducted in an iterative process as Environmental LCA (as illustrated in **Figure 1**). The goal and scope is defined initially in the LCA study, but may later on in the process require modifications due to unforeseen limitations, constraints or as a result of additional information appearing during the inventory or impact assessment phase. (ISO, 2000a)

***Table 3**: Overview of Social life cycle assessment methodology developed in this PhD project based on a company perspective of the product life cycle. The steps in social life cycle assessment, the main activities involved in these steps and the underlying methodological elements and their background.*

SOCIAL LIFE CYCLE ASSESSMENT METHODOLOGY				
Social life cycle assessment method			**Underlying methodological elements**	
Phase	**Step**	**Main activities**	**Modelling**	
Goal definition	Definition of application, motivation and audience of LCA study	Initially in each LCA study and modified in the iterative process of carrying out LCA	-	-
Scope definition	Identification and definition of the object of the assessment with a view to limit it to include that which is significant for the goal of the LCA	Defining: - the functional unit - the product system to be studied - the product system boundaries - product relation principles - allocation procedures - types of impact to be included - methodology of inventory and impact assessment - data requirements - …	Product system perception	
Inventory	Collection and processing of relevant information about the conduct of the companies identified during the scope definition, their product relation and contexts.		***Inventory model** for each impact category*	
I	Product chain analysis	Calculating product relation factor (PRF)		
II	Assessment of context	Classifying company context	Context classification	
III	Assessment of company management effort	Scoring with relevant performance indicators (AI, AII, AIII, BI, BII, BIII,…)	Performance indicator	Multi-criteria indicator model (criteria: AI, AII, AIII, BI, BII, BIII,…)
Impact assessment	**Characterisation**: Transformation of qualitative assessment of company management effort on to a quantitative scale, and translation of this company performance to a potential company impact.		***Characterisation model** for each type of impact categories*	
I	Calculation of company performance score (CP)	CP = (AI × AII × AIII) + (BI × BII × BIII) + (CI × CII × CIII)+ …	Value attribution to Multi-criteria indicator model (determination of value set)	Qualitative assessment of risk in performance scenarios Company risk classification
II	Calculation of company free rein score (CFR)	$CFR = (CP_{max}-CP)/CP_{max}$		
III	Calculation of company risk score (CR)	CR = CFR × CAF	Value attribution to Context classification (determination of contextual adjustment factors (CAF))	Qualitative assessment of risk in performance scenarios Company risk classification
IV	Calculation of product risk score (PRS) **Weighting:** weighting of potential company impact according to perceived seriousness of impact (optional)	PRS = PRF × CR		
V	Calculation of weighted product risk score (PRS_W)	PRS_W = PRS × WF	***Set of weighting factors** (one factor for each impact category)*	

3.3 Scope definition – general considerations

General methodological reflections on the scope of Social LCA in consideration of the intended application are put forward in the following sections.

3.3.1 Product system boundaries – initial delimitations

In light of the main application in decision-making related to life cycle management, it is natural to perceive the product chain from the product chain owner's, the product manufacturer's, perspective. Activities in the product chain which can be influenced by the product manufacturer's decisions directly or indirectly are also those which one might argue that the product manufacturer may be held responsible for, and therefore also those, which as a minimum should be included in a Social LCA study if significant (cut-off criteria based on relevance may be applied). These activities are also convergent with those which the product manufacturer in principle can collect specific data for. In practice, the product manufacturer's leverage varies with purchasing power, and in general the further upstream the smaller the influence and hence the access to data. Downstream the distribution stage the product chain often becomes diffuse due to the spread of products and, as we also experience in Environmental LCA, access to specific data about the use and fate of products is generally limited. In the following I discuss how the choices of the product manufacturer in principle can affect the composition of the product chain and how this in practice might contribute to setting of initial product system boundaries in scoping of an LCA study.

In the stages upstream the product manufacturing stage the product manufacturer as product chain owner may exert influence directly through his immediate choice of supplier and sub-contractors and indirectly through this choice, selection or de-selection of life cycle actors further upstream. Downstream the distribution stage the product manufacturer most often has no or very little direct or indirect influence over *the choice* of life cycle companies, i.e. the companies involved in maintenance, repair and disposal of the product. See illustration of influence in **Figure 9**.

It can be argued that in the product design stage the product manufacturer has indirect influence over these downstream life cycle stages through the choices made in product development affecting the need for maintenance and repair, and disposal possibilities, but, a part from a few exceptions perhaps, these choices will rarely concern which companies will be involved, and therefore it will be difficult to assess what the potential social impacts related to these choices will be. It may be possible for some products to make design choices, which reduce or avoid maintenance and repair (e.g. one use products), but because Social LCA considers both positive and negative impacts, it will be difficult to decide if such a decision is likely to have a positive outcome, that is, whether the avoided negative impact will make up for the potential positive social impact related to this decision. With respect to disposal, the product developer may design the product with a specific waste treatment in mind (e.g. biodegradable products for composting), but in the end, it will be the waste facilities available at the end-destination of the product that will determine the actual disposal scenario and hence the concrete waste management companies represented in the product chain.

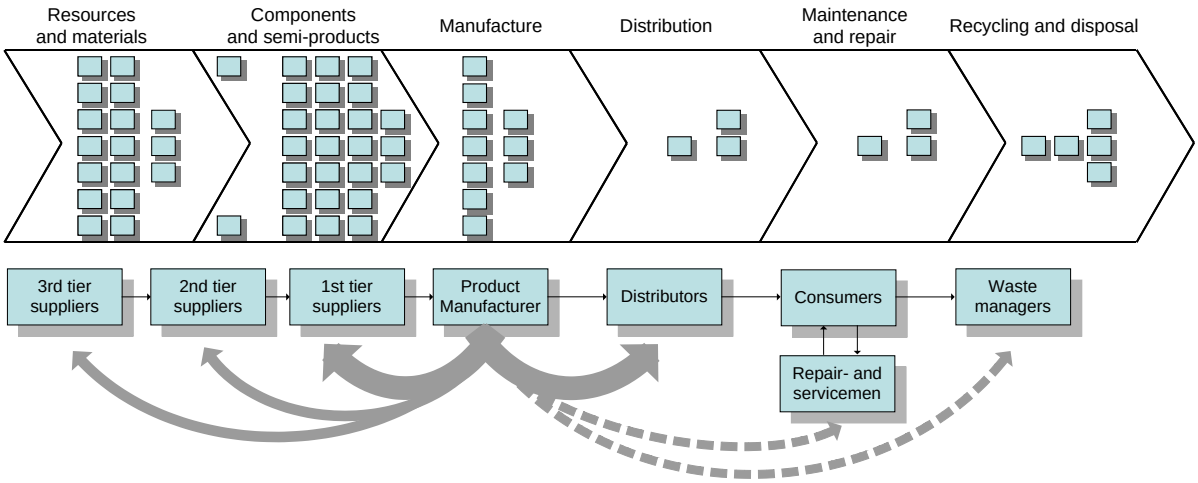


Figure 9: *A company exerts influence on the other companies in its product chain. Upstream the first tier of suppliers and sub-contractors the influence becomes more indirect. Downstream the distribution stage the company rarely has any influence over the companies involved in repair, maintenance and waste disposal (indicated by stippled lines).*[6]

Exceptions to this general rule about the product manufacturer's lack of influence in the downstream stages are when the product manufacturer has a take-back arrangement for used products, in which case the product manufacturer has influence on the choice of the waste management companies, or where the product manufacturer also is the end-user of the product (indicated by stippled lines in **Figure 9**). In a few cases of very specialised products, e.g. windmills produced for a local market, the product manufacturer may also be involved in repair and maintenance or have influence on the companies involved in these activities (indicated by stippled lines in **Figure 9**). The scope definition of an LCA study will identify these[7].

For a majority of product systems it will not be possible to state anything with certainty about the conduct of the companies of these stages, and the decisions of the product manufacturer will not affect the non-process related impacts of these. With respect for the intended application of the Social LCA one may find during the scoping of the LCA study that when applied for company decision-making, the product system may in practice often be delimited to encompass cradle-to-customer-gate thus including assessment of: Suppliers of services and commodities, Product Manufacturer, and Distributors. See **Figure 10**.

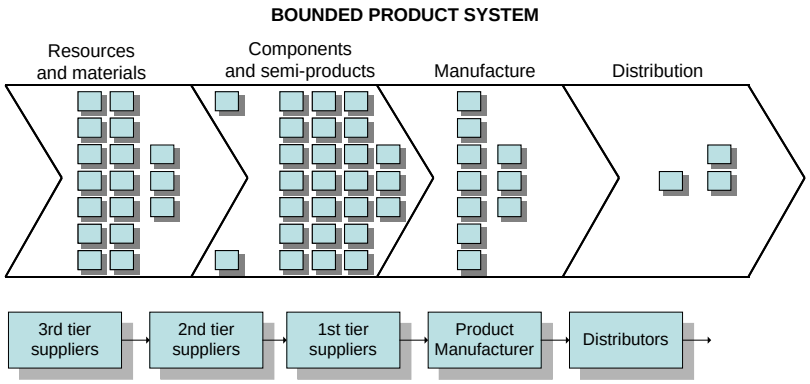


Figure 10*: Illustration of how the product system boundaries most often will look in practice, when non-process related impacts are modelled and the application of the LCA study is decision-making related to life cycle management.*

The product manufacturer's leverage will decrease upstream, as mentioned earlier, and therefore it might be difficult to collect data about the conduct of the upstream life cycle companies, but contrary to the use and disposal stage, the product manufacturer, in principle, has influence here through the choices he makes in

[6] Figure 3 in Dreyer et al (2005) depict the influence exerted by the product manufacture along the product chain. The illustration in the figure suggests that the influence the product manufacturer exerts upstream and downstream is proportional, which they are not as explained and in **Figure 9**.

[7] When considering product-service systems (PSS), where the 'product' is actually a system of products and services which are jointly capable of fulfilling specific customer demands, the product manufacturer has a natural ownership of the downstream stages as well as the upstream. (UNEP, 2002)

manufacturing and in some few cases also in product development, and therefore these should (in principle) always be included.[8]

Considering the number of processes, the related working hours, and the value creation in the companies along the product chain and of the use and disposal stage, it is fair to say that these stages comprise a rather small part of the product system and even if they are omitted it is still the larger part of the life cycle that is covered. Moreover, in a Social LCA study a product relation factor (see next section) based on either of the mentioned criteria will depreciate the significance of the social impacts related to the conduct of the companies engaged in the use and disposal stage in the Social LCA impact profile of the product.

3.3.2 Establishing product relation

Product relation principles
It forms part of the scoping of a Social LCA study to determine the principles upon which the relationship between the companies in the product chain and the finished product must be based. In general there is not one objectively correct way of determining a quantitative relationship between companies in the product chain and the finished product in Social LCA. Different approaches are possible but each of them introduces a different bias in the assessment and indirectly expresses a different view on the responsibility of the product chain owner in the chain. The product relation principles should be explicitly determined in support of the goal of the LCA study because of the influence that the introduced bias may have on the results of the study. When the goal of the study does not favour one approach to product relation several may be tried and the results discussed as part of the interpretation. The chosen product relation principle must always be transparently reported in public disclosure of Social LCA results.

Considerations of relevance when deciding on the principles upon which the product relations in the product chain include:

- principles must be meaningful in regards to social impacts e.g. the contribution of the company to the physical weight of the product is not relevant as basis;
- the consequences of introduced biases are known and these are compatible and acceptable in regards to the goal of the LCA study; and
- it must be possible obtain the data or information needed for establishing the quantitative relation for all companies included in the product system. (Dreyer et al, 2005) (Hauschild et al, 2008)

Some principles upon which the product relation of a company in the product chain may be determined (Dreyer et al, 2005) (Hauschild et al, 2008):

- Cost – the company's contribution to the cost of the product.
- Value creation – the company's contribution to the value of the product.
- Working hours – the time spent by the company's workers on the product.
- Influence - the importance of the product chain owning company to its supplier and hence the influence which it can exert (responsibility accompanies influence).

Product relation factor
The actual product relations for the companies in the life cycle are established in the inventory phase, and the social impacts may be related to the functional unit of the LCA study as a final step of characterisation if a functional unit has been determined. A company's product relation is expressed in a Product relation factor

[8] In Dreyer et al (2005) *Boundaries of the product system* I state: "The need for company-specific information and data has consequences for the scoping of the product system in Social LCA, i.e. which parts of the product system need to be included." This is an unfortunate formulation. In principle, the whole life cycle should indeed be included, but, given that the methodology has the goal to support management decisions, it is obvious to scope the product system in accordance with what the company can influence. The setting of product system boundaries are in principle independent of the data collector's ability to obtain data even though Dreyer et al (2005) suggest otherwise. (Weidema, 2005) (Dreyer, Hauschild, 2005)

(PRF)[9], which can be multiplied with the assessed company impact for the aggregation of all company impacts in the life cycle. (Dreyer et al, 2009a) The product relation concept is illustrated in **Figure 11**.

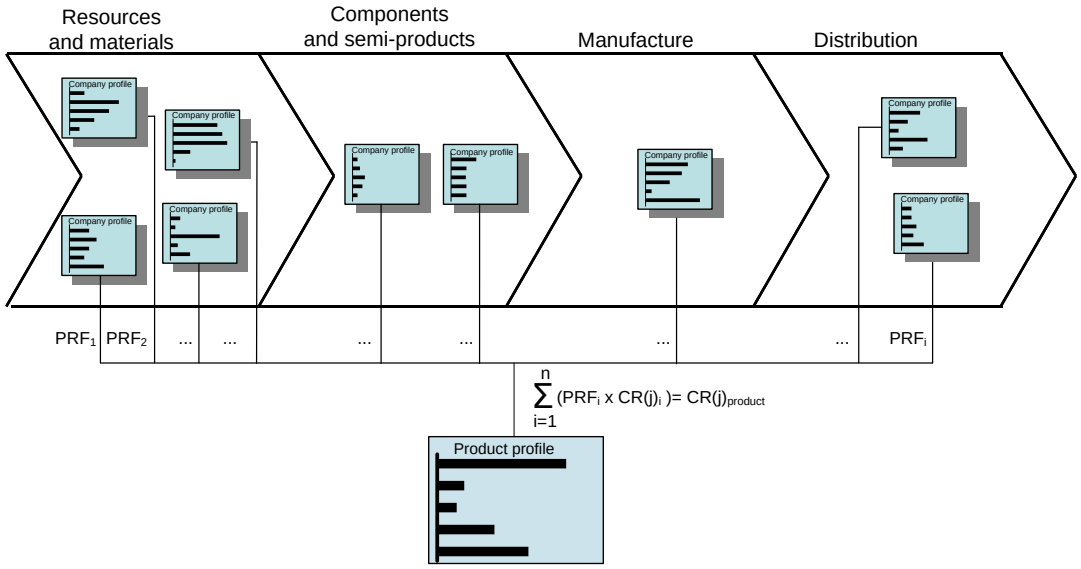


***Figure 11**: Illustration of the product relation concept. The social impact profile of each life cycle company is related to the product by means of a product relation factor (PRF). For example, the company risk (CR) for company (i) for impact category (j) is multiplied with the product relation factor (PRF_i)*

The Social LCA method has not been developed aiming at application of a specific product relation principle, but has been developed to accommodate the application of different principles. The requirements to the product relation factor are that it, regardless of principle, runs in the same interval as that of company impact (which is fixed between 0 and 1) and has a scope of variation (ratio between highest and lowest value) within the same order of magnitude as that of the company impact by which it is multiplied. These are precautions that ensure that total dominance of either is avoided for the determination of product related company impact.

For the first three of the product relation principles mentioned above, viz. 'cost', 'value creation' and 'working hours', the life cycle companies' product relations can be expressed as their individual share of the total in the life cycle (total costs, total value, total number of working hours). This means that the product relation factor naturally will assume values between 0 and 1, where 1 signifies that the product must carry the burden of the entire social impact profile of the company in question[10]. For example, if the total number of working hours involved in all life cycle stages of the product makes up two hours, and actual manufacture of the product takes thirty minutes, then the product manufacturer's social impact profile is related to the product with a factor of 0.25. However, depending on the chosen principle and the realistic range of variation of the associated product relation factor, it may be necessary to balance or control the variation of these.

For the product relation principle 'influence', the product relation factor values for the life cycle companies do not naturally add up to 1. This principle will therefore require some further method development in order to be applied.

3.3.3 Functional unit

The primary purpose of the functional unit in Environmental LCA is to provide a reference to which the physical inputs and outputs of the product system are related (ISO, 1997). In Social LCA where a product

[9] Product relation factors are referred to as share factors in Dreyer et al (2005).

[10] When the value creation principle is applied the waste managing companies will typically be assigned a product relation factor of zero since no value is created in the disposal stage unless the product is reused or recycled in some way. Consequently, using the principle 'value creation' the disposal stage is not included. This may not be particular problematic considering that the system boundaries in practice often will exclude this stage when the LCA study is applied in life cycle management (see **Figure 10**).

relation is established, because of lacking connection between the physical flows of the product system and the social impacts, the product itself may serve as the reference to which impacts are related.

In comparative LCA studies the functional unit serves the purpose of ensuring that the compared products provide a comparable service. In such Social LCA applications it is mandatory to define a functional unit for the product. The social impacts of the product system may be related to the functional unit based on the amount of the product required to fulfil the functional unit after they have been related to the product.

3.3.4 Allocation principle

In Environmental LCA environmental exchanges which occur as a result of shared processes are allocated between the products sharing the processes. (ISO, 1997)

The social impact profile of a company is shared by all products produced by the company. The Social LCA method assesses the management practices of the company as a whole reflecting the will and ability of the company to prevent negative impacts in general (see section 4.2). The social impacts of the company will be shared by the products according to the applied product relation principle. For example, if the product relation principle is working hours, a product in the company will be allocated a share of the company profile equivalent to the share that working hours spend on the product constitute of the total number of working hours in the company.

3.3.5 Data specificity and data quality requirements

Company management effort assessment
Social LCA based on company management effort assessment (company assessment) requires site specific data. In Environmental LCA the object of life cycle inventory analysis is the exchanges of the product system with the environment and the determinants of these are process and technology, for which general data often is available and can be applied with success depending on the goal and scope of the LCA study. In this Social LCA the object of inventory 'analysis' is the behaviour or conduct of companies represented in the life cycle of a product, and the determinants are the specific actions taken or efforts made by the individual companies, which requires company (site) specific data. (Dreyer et al, 2005) Other approaches to assess conduct of the life cycle companies may require less specificity, but have other disadvantages.

Data quality requirements concern the coverage and reliability of company assessments required by the specific LCA study's goal and scope. Site specific data can be obtained both in situ and ex situ, but the chosen data collection strategy will affect the data quality. In terms of reliability there is a natural tendency for a company to overstate their performance when assessed in regards to impacts related to their conduct. This is more likely to be pronounced in an ex situ data collection than an in situ data collection given the fewer validation possibilities ex situ. Company assessments may be carried out at different levels of detail, i.e. varying in assessment parameters' coverage of relevant aspects in the management situation, and with different possibilities for validation of data, also affecting the reliability of the LCA results and the type of decisions which the LCA study may support. The more detailed the assessment, the more precise the description of management effort, and hence the more difficult for a company to project a misleading image of their conduct – intentionally as well as unintentionally. However due to the required extent and depth it can be difficult to conduct detailed assessment ex situ.

When the intended application of the LCA is life cycle management the product manufacturer, as the LCA commissioner and user, must define at what level of social responsibility the company wishes to work with its product chain in order to decide on the data quality requirements. More specifically this involves clarification of what kind of actions the company wishes the LCA study to support. For example, a high level of detail is required if the product manufacturer wishes to facilitate positive change in his product chain by advising, educating or otherwise supporting suppliers and subcontractors in making social improvements. On the other hand if he wishes merely to weed out bad performing suppliers and subcontractors from this product chain, a lower level of detail may be adequate.

In Chapter 3.4 I present a comprehensive company assessment tool, which requires a high quality of site specific data, but aims to produce good indications of risks of impacts. Simpler assessment tools requiring a lower data quality may be developed based on this. In Chapter 6 I discuss the application of simpler models for assessing 'company conduct' in regards to labour rights.

Product chain analysis

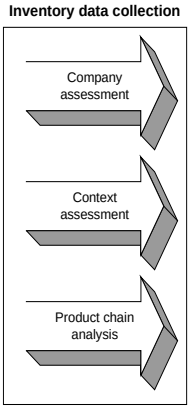
The specificity of data collected for the mapping of the product chain and the calculation of product relation factors for the life cycle companies is not given in the same way as for company assessment. For some product chains it is possible to estimate product relation factors on the basis of general information e.g. statistical information on working hours in production. Application of general data may however affect the reliability of the Social LCA significantly, because the product relation factor has an influence on the resulting company impact potential ascribed to the product which is comparable to that of the company's performance. Comparable specificity and quality of data for assessing and calculating company performance and product relation is hence desirable.

The data required for calculation of product relation factors is exact, so in principle it is more easily collected ex situ than data for company assessment, e.g. through questionnaires send by mail or email and telephone interviews.

Methodological choices – Scoping

- The product relation must be expressed by a factor assuming values in the same order of magnitude as the company impact and in the range between 0 and 1.
- It is only mandatory to define a functional unit for the product if a comparative LCA study is carried out.
- The social impacts related to a company's conduct are generally not allocated among the products produced by the company.
- Requirement of site specific data for company assessment, because actions and efforts are naturally specific.
- Company assessment tool developed in this project requires high data quality
- Data specificity and quality requirements to the product chain analysis should preferable be comparable to that of the company assessment.

3.4 Inventory

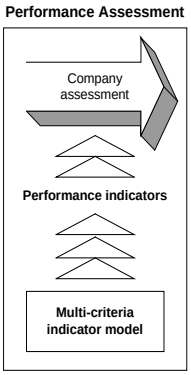


The objective of the life cycle inventory (LCI) phase in Social LCA is to gather relevant information about the conduct of the companies identified during the scope definition, their contexts and relations to the finished product. This involves company assessment, context assessment and product chain analysis. These three elements comprise the inventory.

3.4.1 Product chain analysis

The product chain is analysed with respect to determining the product relation factors which shall express the weight the social impact profile of each life cycle company in the Social LCA of the product. The product chain analysis performed on basis of the product relation principles determined in the scope definition of the LCA study.

3.4.2 Company assessment



In the Social LCI the conduct of each life cycle company is assessed on the basis of a number of performance indicators, one for each impact category considered by the LCA study. Together these constitute company assessment. The performance indicators developed in this project are comprised by multiple assessment parameters (multi-criteria indicators) assessing a company's efforts (will and ability) to integrate managerial measures appropriate to prevent a certain kind of impact.[11]

Multi-criteria indicator model

Each multi-criteria indicator is a matrix consisting of a number of subject dependent and independent assessment criteria.

The subject dependent assessment criteria of the multi-criteria indicator comprises a number of managerial measures which together describe the desirable management effort in an external environment where a company's management of the particular issue is of maximum relevance i.e. the context where negative impacts are most prevalent. For example, labour rights violations are common in the reference context for which labour rights indicators are developed. The actual contexts of companies assessed in an LCA study may differ from the reference context of the multi-criteria indicators and therefore some adjustment most be conducted so the companies' management efforts are judged on the basis of the need for performance in their particular context. This contextual adjustment is carried out as part of impact assessment, whereas context assessment necessary to determine the state of the context is performed as part of the inventory (see later). (Dreyer et al, 2009a)

The effectiveness of the integration of each of the managerial measures in the management of the company is assessed using the subject independent assessment criteria of the multi-criteria indicator, i.e. the predefined criteria. These are: (I) the establishing of *guidelines and practices* which support integration of the measure into daily work; (II) the *communication and delegation of responsibility* for the integration of the measure into daily work, and (III) the performance of *systematic active control* of the integration of the measure into daily work. The establishing of guidelines and practices (I) is an expression of conscious action based on the company's own ethical stance on the issue at hand. The criteria II and III must be considered in continuation of criterion I. If responsibility for compliance is not communicated and delegated, and compliance is not monitored, it is uncertain to what degree the measure is rooted in the daily management practice. Fulfilment of each of the three criteria is crucial for the effective integration of a measure. For each integration effort, a degree of implementation is scored, ranging from 1 to 3, in order to nuance the assessment of effort further. The scoring matrix, which constitutes the multi-criteria indicator model upon which performance indicators applied in

[11] In Dreyer et al (2005) I state: "In the proposed framework for Social LCA there is no traditional characterisation step. (…) In (the) Social LCA, the category indicators are developed to measure the social impacts directly at the company". This statement does not hold true in the concrete modelling developed in Dreyer et al (2009a) and presented here. The citation suggests that multi-criteria indicators are impact category indicators, but in fact these are performance indicators applied in the inventory for data collection. Impact category indicators will express risk not performance in this modelling. The misunderstanding arises from lack of distinction between inventory and characterisation steps at the time.

inventory are based, is presented in **Figure 12**. Managerial measures are placed in the first column of the matrix and the second, third and fourth column describes increasing integration effort. (Dreyer et al, 2009a)

MULTI-CRITERIA INDICATOR MODEL		EFFORTS IN INTEGRATION								
		I The company has established a practice or issued a guideline, which addresses the criterion stated in the left column			II The company has communicated and delegated responsibility for compliance with the practice/guideline to relevant managers and employees			III The company performs continuous active control to ensure that managers and employees comply with the established practice or guideline		
IMPLEMENTION DEGREE		1	2	3	1	2	3	1	2	3
MANAGERIAL MEASURES	A									
	B									
	C									
	…									

Figure 12: *Scoring matrix applied for semi-quantitative assessment of management effort in handling a relevant social issue. The managerial measures (A, B, C, …), which can help improve the social performance of the company for the impact category in question, are listed in the first column of the matrix. The second, third and fourth column of the matrix are used to score the company's efforts in integration of the measures into daily work in the company (I, II, III). Each of these three efforts is essential for effective management independent of the impact category. For each effort, the degree of implementation is scored (ranging from 1 to 3). (Dreyer et al, 2009a)*

Data collection

Company assessment is conducted in-situ by interviewing key persons, typically in middle management, on the basis of the performance indicators. Based on interviews, written documentation and on-site observations, the LCA practitioner assesses the integration efforts made by the company for each managerial measure of the indicators comprised by the company assessment, and scores the degree of implementation in the scoring matrix of the indicator with a tick[12]. The scoring may be further validated if deemed necessary by supplementing with interviews with employees, worker or union representatives or local NGO's.

In the process of scoring company performance, some personal judgement is necessary to determine management efforts and the degree of implementation. The LCI step of this Social LCA method thus involves elements of assessment contrary to Environmental LCA where this step aims to be more objective. (Dreyer et al, 2009a)

Developing performance indicators on the basis of the multi-criteria indicator model

Performance indicators are developed through the determination of the measures required for systematic management of the issue of concern represented by the impact category (e.g. forced labour). Managerial measures and their arrangement in the indicator matrix (**Figure 12**) are determined for each impact category in a three-step process (Dreyer et al, 2009a):

(1) Identification of central aspects of the issue i.e. identification of the main elements or characteristics that can be used to identify a situation of negative impact, which must be addressed by the indicator, based on qualitative links to the area of protection *Human dignity and well-being*. For the issue of labour rights negative impacts are synonymous with violations of these rights. Central aspects for forced labour are presented in **Box 1**.

(2) Identification of the activities in the company where impacts (identified in step 1) may occur and formulation the managerial measures necessary to ensure systematic and adequate management of each of these activities to minimise the risk that negative impacts actually can take place. In terms of labour

[12] Guidelines to ensure uniform scoring company management efforts are presented in Dreyer et al (2009a) (Appendix A).

rights violations it may be helpful to ask, where and when violations potentially could take place in a company; and how the occurrence of these violations may be effectively prevented through systematic management. See **Table 4** for the example of forced labour.

(3) Arrangement of the managerial measures in the scoring matrix, presenting the management approach to the issue in a logic and coherent manner. This arrangement is an optional step, which may be applied to facilitate the data collection. Often a simple arrangement according to the three stages of employee lifecycle, viz.: recruitment, employment, and end of employment; is beneficial, because it provides structure to the data collection. See the 'Abolition of forced labour' indicator in **Table 6**.

Box 1*: The main elements or characteristics that can be used to identify forced labour situations in practice. (Adapted from (ILO, 2005)). (Dreyer et al, 2009a2).*

FORCED LABOUR IN PRACTICE	
Lack of consent to (involuntary nature of) work **- the "route into forced labour**	**Menace of a penalty** **- the means of keeping someone in forced labour** **Actual presence or credible threat of**
▪ Birth/descent into "slave" or bonded status ▪ Physical abduction or kidnapping ▪ Sale of person into the ownership of another ▪ Physical confinement in the work location – in prison or in private detention ▪ Psychological compulsion, i.e. an order to work, backed up by a credible threat of a penalty for non-compliance ▪ Induced indebtedness (by falsification of accounts, inflated prices, reduced value of goods or services produced, excessive interest charges, etc.) ▪ Deception or false promises about types and terms of work ▪ Withholding and non-payment of wages ▪ Retention of identity documents or other valuable personal possessions	▪ Physical violence against worker or family or close associates ▪ Sexual violence ▪ (Threat of) supernatural retaliation ▪ Imprisonment or other physical confinement ▪ Financial penalties ▪ Denunciation to authorities (police, immigration, etc.) and deportation ▪ Dismissal from current employment ▪ Exclusion from future employment ▪ Exclusion from community and social life ▪ Removal of rights or privileges ▪ Deprivation of food, shelter or other necessities ▪ Shift to even worse working conditions ▪ Loss of social status

***Table 4**: Forced labour aspects and company activities where they may occur. Background for the determination of managerial measures to be considered by the 'Abolition of forced labour' indicator according to the forced labour aspects raised by the ILO in **Box 1**. The numbers in the last column refers to the managerial measures in the 'Abolition of forced labour' indicator in **Table 6**. (Dreyer et al, 2009a2).*

Forced labour aspect	Company activity	Managerial measure
Retention of identity documents or other valuable personal possessions	Keeping of personal documents	1
Induced indebtedness	Setting of wage and working hours	8, 9, 10, 12, 13
	Use of hiring fees and deposits	2, 3(1)
	Management of company provided goods and services(2)	20, 22, 23
	Management of loans and credit (3)	24, 25
Deception or false promises about types and terms of work	Issuing of employment contracts	4, 5, 6, 7
Birth/descent into "slave" or bonded status	Issuing of employment contracts	4, 5, 6, 7
Exclusion from future employment	Keeping of personal documents	1
	Issuing of employment contracts	4, 5, 6, 7
	Issuing of letter of resignation	18, 19
Indecent working conditions	Setting of wage and working hours	8, 9, 10, 12, 13
	Management of company provided goods and services (2)	20, 22, 23
Withholding and non-payment of wages	Regular and on timely payment of wages	11,13
Financial penalties	Use of wage deductions	13, 14
All aspects of forced labour	Examination of grievances	15, 16, 17
Physical confinement in work location	Management of accommodation with respect for freedom of movement (4)	20, 21

Notes:

(1) Relevant if the company uses recruitment agencies.

(2) Relevant if the company is situated remote from alternative accommodation and shopping possibilities.

(3) Relevant if loans, credit of similar schemes indebting the employee is provided by the company.

(4) Relevant if the company provides housing for employees.

In the Social LCA method presented here the distinction between the LCI phase and the LCIA phase is not so clear-cut as in Environmental LCA since the indicators applied for data collection in the processing of inventory are determined on the basis of characterisation of the topics represented by the equivalent impact category, so the type of impact dictates what data must be collected in order to assess the impact potential. In the Social LCA method it is most meaningful to score management efforts indicator by indicator i.e. impact category by impact, because the indicators of the company assessment predominately are comprised by different measures. Hereby an explicit classification step as in Environmental LCA, where the aggregated LCI results are assigned to the impact categories becomes irrelevant (see **Figure 2**). If company assessment were to include indicators with many overlapping managerial measures, i.e. when one managerial measure is essential for the management of more than one topic, then it could be considered to score management efforts for all managerial measures and then assign them to the relevant impact categories in a separate step. However, collecting data topic wise has the advantage that it is quite comprehensible for the respondents how management effort or lack of same may result in different impacts. The understanding of how systematic management works in prevention of impacts makes it possible for a company to take concrete actions for improvement immediately on the basis of the company assessment. In the application of Social LCA for life cycle management, the execution of company assessment itself thus can contribute to improvements by being a platform from which appropriate actions for improvement can be determined and progress can be assessed against.

Performance indicators on fundamental labour rights

In this project performance indicators have been developed for the four labour right-related impact categories based on the fundamental ILO conventions concerning: Forced labour; Discrimination; Freedom of association, right to organise and collective bargaining; and Child labour; see **Table 5**. The labour rights indicators are based on the multi-criteria indicator model in **Figure 12** and the above described three-step method has been applied

to determine the relevant managerial measures as illustrated by the example of forced labour in **Box 1** and **Table 4**. The resulting performance indicators are presented in **Table 6**, **Table 7**, **Table 8** and **Table 9**. (Dreyer et al, 2009a2)

Table 5*: Impact categories covering violations of fundamental labour rights and their corresponding performance indicator developed in this project. (Dreyer et al, 2009a2).*

Impact category	Corresponding performance indicator	Presentation
Forced labour	Abolition of forced labour	Table 6
Child labour	Minimum ages for employment	Table 7
Discrimination	Non-discrimination	Table 8
Restrictions of freedom of association, right to organise and collective bargaining	Freedom of association, right to organise and collective bargaining	Table 9

***Table 6**: Abolition of Forced Labour Indicator. (Dreyer et al, 2009a1, 2009a2)*

Managerial measures	**The company has established a practice or issued a guideline, which supports integration of the measure stated in the left column**			**The company has communicated and delegated responsibility for compliance with the practice/guideline to relevant managers and employees**			**The company performs continuous active control to ensure that managers and employees comply with the established practice or guideline**		
Recruitment	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
1. Birth certificate, passport, identity card, work permit or other original documents belonging to the employee are not under any circumstances retained or kept for safety reasons by the company neither upon hiring nor during employment									
2. No money deposit or hiring fee is received for a person to be considered for or to enter employment									
3. Applied recruitment agencies do not charge hiring fees from the company's future employees or are in any other way engaged in any form of forced labour									
4. Employment contracts that stipulate wage, working time, annual holidays and length of personal holiday, are issued									
5. Employment contracts that stipulate terms of resignation, which ensure employees voluntary leave of employment after due notice, are issued									
6. Employment contracts that are comprehensible to the employee as to terms, language and formulation are issued									
7. Employment contracts are kept on file									
During employment									
8. Overtime is voluntary for all employees paid by the hour									
9. Overtime is always remunerated at premium rate for employees paid by the hour									
10. Working hours for all employees are recorded									
11. Wages are paid on time with regular intervals									
12. Wages amount to at least living wage for the concerned region at all times or at least minimum wage if higher									
13. Wage including bonuses and other benefits additional to ordinary wage is recorded for all managers and employees									
14. Deductions in wage are only made with the consent of the employee and never for disciplinary purposes, and they are clearly stated in wage records and on employee wage slip									
15. All employees and other parties have the possibility to file complaints about labour practices, which conflicts with the principles of employment on a voluntary basis, in confidentiality and without negative consequences									
16. A system for handling complaints regarding labour practices, which conflicts with the principles of employment on a voluntary basis has been established to ensure response and a fair, uniform and confidential treatment of complaints									
17. All complaints and responses are recorded									
End of employment									
18. Letter of resignation is issued and handed over to the employee upon resignation									
19.Copies of letters of resignation are kept on file									
If the company provides housing for employees									
20. Use of accommodation provided by the company is voluntary and reasonable priced compared to earned wage									
21. House rules are defined and enforced with respect for the employees' freedom of movement									
If the company is situated remote from cities									
22. Food, accommodation and other necessities provided by the company are readily available and of a certain quality									
23. Food and other necessities provided by the company are reasonable priced compared to earned wage to ensure that employees are able to maintain a decent living standard while receiving a fair wage after deductions for these services.									
If loans, credit or similar schemes indebting the employee is provided by the company									
24. Loans, credit or similar schemes indebting the employee to the employer are subject to fair and transparent management									
25. Terms of loan, credit or similar schemes indebting the employee to the company is clearly documented in each case and kept on file									

***Table 7**: Minimum ages for employment Indicator. (Dreyer et al, 2009a1, 2009a2)*

Managerial measures	**The company has established a practice or issued a guideline, which supports integration of the measure stated in the left column**			**The company has communicated and delegated responsibility for compliance with the practice/guideline to relevant managers and employees**			**The company performs continuous active control to ensure that managers and employees comply with the established practice or guideline**		
Recruitment	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
1. Persons below the general minimum age are not hired to perform regular work									
2. Official documents, such as birth certificate, passport, identity card, or alternative method to establish age of applicants is used before hiring to ensure that no person below 13 years of age is hired									
3. Records on all employees stating names and ages or dates of birth are kept on file									
4. When hiring persons between 13 and 15 years of age for performing light work, parental consent is obtained and kept on file									
5. Employment contracts that stipulate wage, working time and work function, are issued for employees below 18 years of age									
6. Employment contracts are kept on file									
7. Apprenticeship programmes or similar educational programmes in the company are carried out in conjunction with a school, a training institution or are supervised by other competent authority									
8. Apprenticeship contracts that stipulates duration of programme, remuneration, areas of work, educational benefit and terms for awarding certificate of completed apprenticeship are issued									
9. Apprenticeship contracts are kept on file									
During employment									
10. Persons between 13 and 15 years of age only carry out light work, which is not harmful to their health, safety or development									
11. Working hours for employed persons between 13 and 15 years of age do not exceed 2 hours per day and are planned so working does not interfere with doing homework. Furthermore working hours are placed during the daytime (between 8 am and 8 pm) and not on Sundays or legal public holidays									
12. Persons less than 18 years of age do not carry out hazardous work, which is likely to jeopardize their health (physical or mental), safety or moral									
13. Working hours for employed persons between 15 and 18 years of age still attending school do not in any way interfere with doing homework or attending school									
14. Working hours for employed persons between 15 and 18 years of age does not exceed 42 hours a week and eight hours a day, and are placed during daytime (between 6 am and 10 pm)									
15. Working hours for all employees below 18 years of age are recorded									
16. All employees and other parties have the possibility to file complaints about labour practices concerning children in confidentiality and without negative consequences									
17. A system for handling complaints regarding labour practices concerning children has been established to ensure response and a fair, uniform and confidential treatment of complaints									
18. All complaints and responses are recorded									
If the company have employed home based workers									
19. Regular unannounced visits to home based workers are made to ensure that persons below minimum age do not take part in regular or hazardous work									

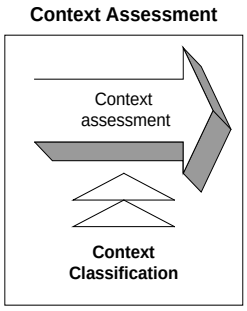
***Table 8**: Non-discrimination Indicator. (Dreyer et al, 2009a1, 2009a2)*

Managerial measures	**The company has established a practice or issued a guideline, which supports integration of the measure stated in the left column**			**The company has communicated and delegated responsibility for compliance with the practice/guideline to relevant managers and employees**			**The company performs continuous active control to ensure that managers and employees comply with the established practice or guideline**		
Recruitment	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
1. Announcement of open positions happen through national/regional newspapers, public job databases on the internet, employment services or other publicly available media ensuring a broad announcement									
2. Wording and formulation of job announcements do under no circumstances lead to beforehand exclusion of any qualified applicants									
3. Announcements are kept on file									
4. Selection of candidates for interviews is performed solely on the basis of a person's qualifications and ability relevant for performing the work in question									
5. Interviews of applicants is conducted solely with focus on a person's qualifications and ability to perform the work in question									
6. Conclusions made during job interviews are available on file for all candidates (selected and rejected) for as long as allowed by the law									
7. Employment of new employees is performed solely on the basis of a person's qualifications and ability relevant for performing the work in question									
8. The conditions for gaining access to welfare facilities and other non-payable benefits provided in connection with employment have clearly been defined to ensure that access to these are granted on equal terms for all managers and employees									
9. The conditions of work including number of working hours, rest periods, annual holidays with pay, term of notice, are determined on equal terms for all managers and employees									
During employment									
10. A system has been established to ensure that Individual remuneration is determined on equal terms for equal job functions									
11. The conditions for gaining access to bonuses and other payable benefits have clearly been defined to ensure that benefits are granted on equal terms for all managers and employees									
12. Applied recruitment agencies selects the company's future employees solely on the basis of a person's qualifications and ability relevant for performing the work in question									
13. Wage including bonuses and other benefits additional to ordinary wage is recorded for all managers and employees									
14. Detailed job descriptions for all positions are issued, updated and kept on file									
15. Promotion happens on equal terms for all employees in accordance with a person's individual qualifications, character, experience, ability and diligence									
16. All managers and employees are offered relevant training and other education programmes on equal terms									
17. Participants in training and other education programmes are recorded									
18. Working hours for all employees are recorded									
19. Access to relevant occupational health and safety equipment is on equal terms for all employees.									
20. All employees and other parties have the possibility to file complaints about unfair treatment during the company's recruitment or termination process or any conditions of employment in confidentiality and without negative consequences									
21. A system for handling complaints regarding recruitment, conditions of employment or termination has been established to ensure response and a fair, uniform and confidential treatment of complaints									
22. All complaints and responses are recorded									
End of employment									
23. Dismissal of individual employees on grounds other than reorganisation or retrenchment is carried out solely on the basis of an employee's performance in the work situation									
24. Dismissal of employees on grounds of reorganisation or retrenchment is carried out on equal terms for all managers and employees and in accordance with local standards or agreements including agreements with local unions									
25. Records on dismissed employees with explanatory comments on grounds of dismissal are kept on file									
If the no collective bargaining takes place in the company									
26. A system has been established to carry out employee appraisal									
27. Employee appraisal is clearly documented in each case and kept on file									

***Table 9**: Freedom of association, right organise and collective bargaining indicator. (Dreyer et al, 2009a1, 2009a2)*

Managerial measures	**The company has established a practice or issued a guideline, which supports integration of the measure stated in the left column**			**The company has communicated and delegated responsibility for compliance with the practice/guideline to relevant managers and employees**			**The company performs continuous active control to ensure that managers and employees comply with the established practice or guideline**		
Recruitment	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
1. Employment is not conditioned by joining a union or by relinquishment of trade union membership									
2. Employment is not conditioned by any restrictions on the right to collective bargaining									
3. Employee union members are provided employment under equal terms as non-union members									
During employment									
4. Facilities as may be necessary to assist the employee/union representatives in their work are made available									
5. Posting of union notices and other communication between the Union and its members at the company premises is allowed									
6. Employee/union representatives have reasonable time during paid working hours to exercise their functions									
7. Collective bargaining is used as a constructive forum for addressing working conditions and terms of employment and relations between employers and employees, or their respective organisations									
8. All union representatives and employees have access to information about collective bargaining agreements and other agreements between the company and the union									
9. Copies of collective bargaining negotiations and agreements are kept on file									
10. Employee/union representatives are invited to contribute to planning of larger changes in the company, which will affect the working conditions for the employees									
11. Minutes of meetings between employee/union representative and management are kept on file									
End of employment									
12. Dismissal of employees on grounds other than reorganisation or retrenchment happen solely on the basis of an employee's performance and is therefore always unrelated to the employee's membership of union or participation in union activities outside working hours or, with the consent of the employer, within working hours									
13. Dismissal of employees on grounds of reorganisation or retrenchment takes place with the involvement of employee representative and in accordance with local standards or agreements including agreements with local unions									
If freedom of association is limited by national legislation									
14. All employees and other parties have the possibility to file complaints and suggestions regarding the working conditions in the company in confidentiality and without negative consequences									
15. A system for handling complaints and suggestions has been established to ensure response and suggestions and a fair, uniform and confidential treatment of complaints									
16. All complaints, suggestions and responses are recorded									
17. Employees are represented by a number of elected employee representatives appropriate to the size of the company in all matters concerning their welfare and interests in the workplace									
18. A spokesperson for the employees is encouraged and supported by the company									
19. Establishment of work groups or councils has been encouraged and supported by the company to facilitate employee representation in all matters concerning their welfare and interests in the workplace									

3.4.3 Context assessment



With the performance indicators described above, the will and ability to manage certain activities preventive of negative impacts is assessed; however to what degree this management effort actually prevents impacts, is influenced by the degree to which the issue, against which performance is assessed, is of concern in the societal context of the company, i.e. the need for company performance. Societal context is here defined as the external setting, which the company forms part of and by which the company conduct may be influenced, for example through legal, social, cultural, economic and political practices. For example, in communities where corruption is very common, the need for a company to manage activities where bribery may take place is of outmost importance to ensure low risk of corruption in the company. (Dreyer et al, 2009a)

The managerial measures of the performance indicators have been defined as to comprise a desirable management effort to ensure a minimum risk of negative impacts in a context associated with very high risk (reference context). The actual contexts of companies assessed in an LCA study may differ from this reference context and the companies' performance results must be considered in this light. The purpose of the context assessment is to enable this consideration for risk in the external environment of the company in the impact assessment (section 3.5.1). Context risk assessment assesses the risk of negative impacts taking place in the context. A context assessment must be performed for all contexts for all issues addressed by the impact categories included in the LCA study. It is to be based on information which may be obtained from information search carried out from behind a desk[13]. (Dreyer et al, 2009a)

The context assessment can with advantage be carried out prior to company assessment since it provides information about the external circumstances which may influence a company's management practice, and therefore may enlighten the LCA practitioner on what to be particular aware of in the data collection.

Context classification

On the basis of the context assessment a context is classified in accordance with risk in the inventory phase. A classification (ranking) of contexts is developed on the basis of main characteristics of the issue, which makes it possible to distinguish between different contextual circumstances in terms of inherent risks

For labour rights violations the risk classification of context is based on analysis of prevalence and severity of labour rights violations in the country of operation, and to what degree these violations can be directly linked to a specific company, based on reported occurrences in the near location and same branch of industry, see **Table 10**. For the purpose of developing the context risk classification in **Table 10**, severity of labour rights violations have been divided into five levels according to country prevalence and severity. The typical violation pattern associated with each level is presented in **Table 11**. The violation pattern may vary for different regions and type of industries and therefore the context risk classification is also developed to take the prevalence of violations in proximity to the company into account if information about such is available. The contextual risk classification considers three levels of prevalence in proximity to the company: (Dreyer et al, 2009a4)

(1) Occurrences in both industry and near location of the company (region, state or, city); both near location and industry are mentioned in connection with violations.

(2) Occurrences in either industry or near location of the company; either near location or industry is mentioned in connection with violations.

(3) Occurrences in neither near location of the company nor industry are mentioned in connection with violations.

[13] In Dreyer et al (2009b1) it is demonstrated how assessment of contextual risk of fundamental labour rights violations is conducted in six case studies.

The prevalence of violations in proximity to the company reveals the topicality of the issue for precisely the company being assessed in the Social LCA, and hereby also the relevance of a strong management effort in that particular company. In the context risk classification knowledge about prevalence of violations in a country and prevalence in proximity to the company is combined, so prevalence of violations in the country governs the classification with the occurrence in proximity of the company as a magnifier. The classification only includes five classes because the typical information sources on labour rights violations do not accommodate a further distinction. (Dreyer et al, 2009a4)

Table 10: *Classification of risk context based on assessment of fundamental labour rights violations in the country and their proximity to the company. The contextual risk class expresses how probable it is that violations take place in the context of the company. Combinations of country prevalence (column 3) with proximity to company (column 4) together define risk situations which are descriptive to the context of a company belonging to the contextual risk class (column 1). (Dreyer et al, 2009a4)*

CONTEXT RISK CLASSIFICATION – FUNDAMENTAL LABOUR RIGHTS VIOLATIONS			
Contextual Risk Class (CRC)	**Probability of occurrence in context**	**Violations in the country**	**Violations in proximity to company**
1.	**Very likely**	Common	Unknown
		Widespread	Occurrences in both industry and near location
		Widespread	Occurrences in either industry or near location
		Several	Occurrences in both industry and near location
2.	**Likely**	Widespread	Unknown
		Several	Occurrences in either industry or near location
		Isolated	Occurrences in both industry and near location
3.	**Possible**	Several	Unknown
		Isolated	Occurrences in either industry or near location
4.	**Unlikely**	Isolated	Unknown
5.	**Very Unlikely**	Non-existent	-

Table 11: *Levels of prevalence of labour right violations in a country presented with common characteristics describing the violation pattern of a particular labour right in the country. One or several observations in each level may be descriptive for the prevalence of violations in the country. (Dreyer et al, 2009a4)*

Violations in the country (Level)	Characteristics of violation pattern
1. Common	▪ Violations are systematic. ▪ Violations take place in society on a common basis affecting most industries and locations. ▪ Violations are culturally conditioned and/or commonly accepted in the country. ▪ Organised violations of labour rights take place. ▪ The reported or estimated number of violations in the country is very high. ▪ A range of different aspects of this particular labour right are violated in the country. ▪ Several different information sources concurrently confirm that violations are common. ▪ Legislation protecting labour rights is absent or insufficient and/or very poorly enforced.
2. Widespread	▪ Violations take place in the country in many different industries and locations. ▪ The reported or estimated number of violations in country is high. ▪ Many different aspects of this particular labour right are violated in the country. ▪ Few aspects of this particular labour right are violated to a very large extent. ▪ There are strong indications of a problem with observing this particular labour right in the country. ▪ Several different information sources concurrently confirm that violations are widespread. ▪ Legislation protecting labour rights is insufficient and/or poorly enforced.
3. Several	▪ Violations take place in the country, however only to a small degree. ▪ The reported or estimated number of violations in country is limited, but occurrences exist. ▪ Few or a limited number of different aspects of this particular labour right are violated in the country. ▪ There are several indications of a problem with observing this particular labour right in the country. ▪ One or several different information sources confirm that violations take place. ▪ In general, legislation protecting labour rights exists and is enforced; however in regards to particular aspects it is insufficient and/or poorly enforced.
4. Isolated	▪ Few occurrences of violations have been reported. These are however sporadic, random and isolated cases. ▪ There is nothing that indicates that particular aspects of this labour right are violated. ▪ There is no indication of a particular problem with observing this labour right in the country. . ▪ No occurrences of violations have been reported, however there are some indications of violations taking place to a very limited extent. ▪ Legislation protecting labour rights exists and is enforced.
5. Non- existent	▪ Several sources of information confirm that there are no reports of violations in the country. ▪ Legislation protecting labour rights exists and is enforced. ▪ It is very unlikely that violations take place in the context.

Methodological choices – Inventory

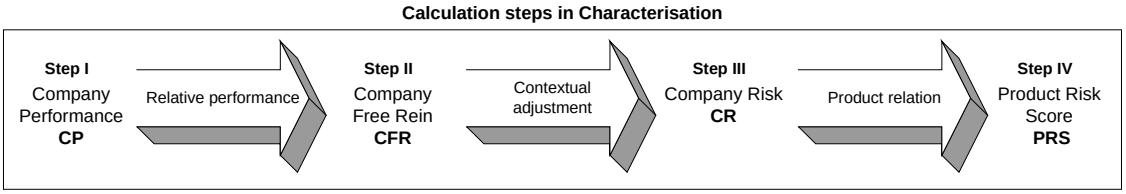
- Company assessment, context assessment and product chain analysis comprise the elements of inventory.
- Product chain analysis consists in mapping of the companies of the product chain and calculating of product relation factors for these on the basis of the chosen product relation principle
- Company assessment consists of a number of performance indicators (one representing each impact category) assessing the will and ability of a life cycle company to integrate managerial measures appropriate to prevent negative impacts.
- The indicator model, upon which performance indicators is based, is a scoring matrix consisting of two dimensions of assessment criteria (1) existence of relevant managerial measures (A, B, C, …) (subject dependent) (2) efforts in integration of measures into daily practice (I, II, III) (predefined). The indicator model accommodates semi-quantitative assessment of integration of managerial measures by scoring of implementation degree 1-3 for each integration effort I, II and III for each measure.
- The subject dependent assessment criteria of indicators are determined through identification of central aspects of the issue and formulation of managerial measures to address these in a business context.
- Company assessment is performed in situ on the basis of interviews and documentation review.
- Context assessment for negative impacts consists in assessing the risk of impacts in the external environment of a company. Company contexts are ranked according to prevalence of risk based on a context ‘risk’ classification
- The development of a performance indicator and a Context classification constitutes the inventory modelling of an impact category.

3.5 Obligatory impact assessment

Since there is no classification step in this Social LCA method (see section 3.4.2) characterisation constitutes the main element of obligatory impact assessment (see **Figure 2**).

3.5.1 Characterisation steps

The characterisation of impacts in the Social LCA method consists in four calculation steps in which company management performance is translated into potential company impact. The consideration for context in Social LCA, entail that calculation of the potential impacts must occur separately for each company before aggregation for the product system can take place. This is similarly to inclusion of site specific consideration in Environmental LCA (Hauschild, Wenzel, 1998,) (Potting, Hauschild, 1006). The characterisation of negative impacts is presented in the following.



The first step of the characterisation is to enable quantitative Social LCA by attributing value to the semi-qualitative assessments of company management effort obtained with the performance indicators in the inventory phase.

The value set attributed to the indicator scoring determines the importance of the individual integration efforts and implementation degrees of managerial measures for good company performance. A value set consisting of values for the three implementation degrees (1, 2, 3) within each integration effort (I, II, III) of the indicator (**Figure 12**) is determined for each type of impact as part of the characterisation model. The value attribution enable generation of a performance score for each company (CP) for each issue (impact category). There are three steps in the calculation of company performance:

(1) On the basis of the chosen value set determine the effort value (e.g. AI, AII, AIII) for each integration effort I, II and III for each of the scored managerial measures (A, B, C,…).
(2) Calculate the total measure score for each managerial measure (A_{tot}, B_{tot}, C_{tot},…) by multiplication of the three effort scores (**Equation 1**)
(3) Calculate the total performance score (CP) as the sum of all the measure scores. (**Equation 2**)

The act of multiplying the three effort values of the scoring matrix emphasizes that all three efforts must work together to ensure efficient management of an issue in a context of very high risk. The higher the total score, the better the management of the issue in question. Calculation of company performance score (CP) constitutes the first step of characterisation. (Dreyer et al, 2009a)

Equation 1: *Calculation of measure score for managerial measure A of a performance indicator by multiplication of the three belonging effort scores obtained through value attribution to company scoring.*

$$A_{tot} = AI \times AII \times AIII \qquad \text{Equation 1}$$

Equation 2: *Calculation of total Company performance score (CP) as the sum of the measures scores for all managerial measures of a performance indicator. A Company performance score is calculated for each company for each impact category.*

$$CP = A_{tot} + B_{tot} + C_{tot} + \ldots \qquad \text{Equation 2}$$

The Social LCA method operates on the assumption that negative impacts takes place as a result of lacking management, hence it is the lack of performance which is the focus of the characterisation of negative impacts. The difference between the measured company performance score (CP) and the ideal performance (CP_{max}) in a

context of very high risk makes up the free rein for negative impacts to take place; the greater the distance, the greater the free rein and hence the stronger the presence of circumstances allowing impacts to take place. Through indexation relative to the ideal company performance, the value of company free rein end up in the range between 0 and 1 regardless the variation in the number of possible management measures in the performance indicator and hence enabling comparison between scores of different impact categories. The indexation also provides a more comprehensible scale of the results, and the new scale facilitates later contextual adjustment. Calculation of the company free rein constitutes the second step of characterisation (**Equation 3**). (Dreyer et al, 2009a)

Equation 3: *Calculation of Company free rein (CFR) on the basis of Company performance (CP) and ideal Company performance (CP_{max}). A Company free rein score is calculated for each company for each impact category.*

$CFR = (CP_{max} - CP) / CP_{max}$	$CFR \in [0;1]$	**Equation 3**

How likely it is that lack of management effort, as expressed in the company free rein score, results in impacts depends on the degree to which the specific management effort dictated by the performance indicator is actually needed in the particular context in order to curb negative impacts. In the third step of characterisation, the company free rein scores are adjusted to make up for the fact that management performance has been assessed against a reference context associated with very high risk from which the actual context of the company may differ.

Context adjustment factors valuating the classes of the context risk classification are determined for each type of impacts as part of the characterisation model. The contextual adjustment factor express how probable it is that negative impacts take place in a given context of classification. The factor values are determined within the range 0 to 1, where 1 signifies the highest probability of negative impacts taking place. This means that the reference context has a contextual adjustment factor of 1.

A company risk score is calculated by multiplication of the company free rein score and the contextual adjustment factor belonging to the contextual risk class assigned the company context in the inventory phase (**Equation 4**).

Equation 4: *Calculation of Company risk (CR) on the basis of Company free rein (CFR) and Contextual risk adjustment factor (CAF). A Company risk score is calculated for each company for each impact category.*

$CR = CFR \times CAF$	$CR \in [0;1]$	**Equation 4**

In the fourth step of characterisation, the company risk scores are related to the product, for which the LCA is performed, using the product relation factors determined for the life cycle companies in the inventory phase. A product risk score is calculated by multiplication of the company risk score (CR) and the product relation factor (PRF) determined for the company (**Equation 5**). The step enables aggregation of the potential impacts of the life cycle companies for the formation of a social impact profile for the product.

Equation 5: *Calculation of product risk score (PRS) on the basis of company risk (CR) and product relation factor (PRF). A Company Performance score is calculated for each company for each impact category.*

$PRS = PRF \times CR$	$CR \in [0;1]$	$PRF \in [0;1]$	**Equation 5**

Cut-off criterion based on product relation factor and contextual adjustment factor

A cut-off criterion on the basis of the product of the contextual adjustment factor and product relation factor (CAF × PRF) can be determined in the scope definition in accordance with the goal of the study. Such a criterion can prove to be valuable for the scoping of the LCA study in the sense that it may reduce the number of companies for which company assessment needs to be carried out, and hereby reduce the time consumption for the execution of the LCA study. The product of CAF and PRF comprise a signification proportion of a

company's product risk score (PRS)[14], see **Equation 6**. If the product of CAF and PRF is very small it is therefore unlikely that the company will contribute significantly to the total impact potential for the category for which CAF has been determined. The contribution may therefore in principle be initially omitted by the LCA study; however it must be considered from the application perspective whether it makes sense to omit one category from the company assessment, or whether the cut-off criterion only should apply if the company's contribution to all impact categories generally is very low. Omissions must be subjected to later sensitivity analysis.

Equation 6: *Calculation of Product risk score (PRS) for a negative impact on the basis of Company free rein (CRF), Contextual risk adjustment factor (CAF) and Product relation factor (PRF). Based on* ***Equation 4*** *and* ***Equation 5****.*

PRS = CRF × CAF × PRF	**Equation 6**

3.5.2 Quantitative modelling – Value attribution

Value attribution to scoring of company management effort (**Figure 12**) and value attribution to Context classification (e.g. **Table 10**) are the two methodological steps allowing translation of the semi-quantitative scoring of the company management effort into a quantitative impact score. Both the determination of a value set for the performance indicator scoring and the determination of contextual adjustment factors rely on interpretation of company risk (Company risk classification **Table 12**), and qualitative assessment of risk in different performance scenarios (Scenarios in **Box 2**)

The classification in **Table 12** operates with five classes of perceived risk with specified intervals of company risk scores. As a result of indexation the company risk scores run in the interval 0 to 1, where 1 expresses very high company risk and 0 low company risk. The classification does not include a 'very low risk' class, because it would imply that the impact category indicators are complete in coverage of aspects, which is difficult to ensure given the qualitative approach to determining central aspects. The risk classification builds on the assumption that in a very high risk context (CAF=1)[15], an average performance score (CR = CFR × 1 = CFR = 0.5) is assumed more likely to result in 'high to medium' company risk rather than 'medium' company risk. (Dreyer et al, 2009a3)

The scoring patterns in the performance scenarios in **Box 2** are hypothetical; typically a company management effort will be more differentiated than suggested in the scenarios. Scenario 0 and 4 are respectively minimum and maximum scoring scenarios. The remaining scenarios are based on management situations where adequate guidelines and practices exist and either full or no communication and delegation of responsibility have taken place and either complete or no systematic active control takes place.

Table 12: *The Company risk classification defines five categories of company risk (CR). (Dreyer et al, 2009a3)*

COMPANY RISK CLASSIFICATION	
Company risk score	**Definition of company risk**
0.9 < CR ≤ 1.0	Very high risk
0.6 < CR ≤ 0.9	High risk
0.4 < CR ≤ 0.6	High to medium risk
0.2 < CR ≤ 0.4	Medium risk
0.0 ≤ CR ≤ 0.2	Low risk

[14] This presupposes that the requirement to product relation factors to assume values within the same order of magnitude as that the company risk score is fulfilled (see section 3.3.2). The significance of magnitudes of the product relation factor (PRF), contextual adjustment factor (CAF) and company risk score (CR) for the formation of the product risk score (PRS) is discussed further in Chapter 4.

[15] Minimum contextual adjustment is needed given the maximum need for high company performance.

***Box 2**: Five generic company performance scenarios based on scoring with multi-criteria indicators (see indicator model in **Figure 12**). I, II and III refers to the efforts in integration of a measure into daily work, i.e. (I) the establishing of guidelines and practices;(II) the communication and delegation of responsibility; and (III) the performance of systematic active control. 1, 2 and 3 refers to the degree of implementation of each effort. (Dreyer et al, 2009a3)*

Company performance scenarios: (based on indicator model in Figure 12)

(0) I_1, II_1 and III_1 are scored for each of the measures: No management performance in regards to the issue.

(1) I_3, II_1 and III_1 are scored for each of the measures: Guidelines and practices exist to enable management of the issue, but no efforts have been made to integrate the measures in the organisation through clear delegation of responsibility for compliance and communication about these, and active control of compliance is not carried out.

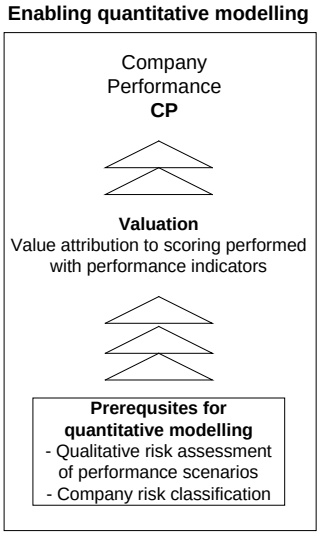
(2) I_3, II_3 and III_1 are scored for each of the measures: Guidelines and practices exist to enable management of the issue, and responsibility for compliance has clearly been delegated and the internal information level is very high. However, there is no active control of compliance.

(3) I_3 and II_3 are scored for each of the measures and III_1 is scored for one half of them and III_3 is scored for the other half: Guidelines and practices exist to enable management of the issue, and responsibility for compliance has clearly been delegated and the internal information level is very high. Active control of compliance exists for half of the measures.

(4) I_3, II_3 and III_3 are scored for each of all measures: Optimal management performance in regards to the issue.

Value attribution to scoring of company efforts

The effectiveness of management increases markedly in a company, when responsibility has been clearly communicated and delegated (II) for existing guidelines and practices (I), and this effort again becomes even more effective, and reliable, when it is combined with systematic active control (III) (see **Figure 12**). In the value attribution to company scoring this amplifying relationship between the three integration efforts of the multi-criteria indicator is expressed through multiplication of the effort scores for each managerial measure of the indicator in the formation of the company performance score (see **Equation 1**). (Dreyer et al, 2009a3)



The magnitudes of the values attributed to the implementation degrees 3 and 2 for efforts I, II and III determine how much emphasis is put on the integration efforts relative to each other in the assessment of performance due to the multiplication of effort scores. High values of implementation degrees 3 and 2 for II and III relative to I will favour a focused management effort, i.e. where few aspects are managed very well, while low values will favour a broad management effort, i.e. where many aspects are managed adequately. When considering the very high risk context of the performance indicators (the reference context), active control is important for ensuring low risk of impacts, however not at the expense of coverage of possible risk aspects. The value set must therefore balance the significance of a broad management effort with the need for active control. Some prerequisites for meaningful value attribution to company scoring are summarised in **Box 3**. (Dreyer et al, 2009a3)

Based on experience, it is determined to which categories of the risk classification in **Table 12**, and hereby associated risk score intervals, a company should belong in different performance scenarios in **Box 2** seen in relation to the reference context. On the basis of the prerequisites described in **Box 3** different value sets can be tested for their ability to distribute the performance scenarios in accordance with the desired risk placement. The performance scenarios in **Box 2** facilitate the determination of values for implementation degrees I_3, II_3, III_3. For the determination of implementation degrees I_2, II_2, III_2 additional scenarios can be applied. (Dreyer et al, 2009a3)

Interpretation of company risk in the five performance scenarios in regards to labour rights is presented **Table 13** for the determination of value attribution to labour rights indicators presented in section 3.4.2. There is no value set, which meets all prerequisites and at the same time is able to fulfil the desired risk placement of the performance scenarios. Two out of eight tested value sets come close. These differ in the sense that one the makes it a bit easier to score high having a bit smaller multiplicative effect than the other. It places the scenarios

1, 2 and 3 lower in the risk ranges than the other. Both value sets are acceptable choices for the indicators, however with consideration for the very high risk in the reference context, the value set placing most emphasis on active control is chosen here, i.e. the one with the stronger multiplicative effect, see **Table 14**. On the basis of performance scores obtained with the chosen value set in for the performance scenarios 0-4, the associated company risks are calculated with consideration for the reference context using the **Equation 3** and **Equation 4**, and presented in **Table 15**. (Dreyer et al, 2009a3)

***Box 3**: Short summary of prerequisites for value attribution. Terminology refers to multi-criteria indicator model in **Figure 12**. (Dreyer et al, 2009a3)*

Prerequisites for the value attribution

- The multiplicative effect must be curbed so it does not dismiss the effect of a broad effort, and the implementation degrees of the individual efforts must be correlated in such a way that management efforts I and II also count.
- The value attributed to I_2 must be relatively small compared to that of I_3, so the multiplicative effect does not diminish the much larger risk associated with an incomplete implementation (e.g. $I_2 \times II_3 \times III_3$) compared to complete implementation ($I_3 \times II_3 \times III_3$).
- If the company has not established a guideline or practice, i.e. they have implementation degree 1 in I (I_1), it is irrelevant to consider communication and delegation of responsibility (II) and active control (III). This is expressed in the value attribution by setting I_1=0.
- If guidelines or practices have been established, but communication and delegation of responsibility has not explicitly taken place and active control is not carried out, the action is still of some value seen from a risk minimisation point of view, however small
- If the efforts I_2 or I_3 (incomplete or full implementation) are not to be annulled in the valuation in the mentioned situation, where the efforts II and III are not integrated, it must apply in the value attribution that II_1>0 and III_1>0. The efforts II_1 and III_1 must however not add value to the measure score since no action is taken, hence it must apply II_1=1 and III_1=1 for this particular situation.
- The I_3 value must be relatively high compared to those of II_3 and III_3 (e.g. a factor 2) in order for the effort I_3 to count in the aggregated performance score, when efforts II and III are not integrated for a measure (i.e. II_1=1 and III_1=1). This means that the measure score of complete implementation $I_3 \times II_3 \times III_3$ must be within the same range as I_3 i.e. the multiplicative effect must not be too strong.

***Table 13**: Desired placement of different company performance scenarios in the Company risk classification considering the reference situation. (Dreyer et al, 2009a3)*

Company Risk score	Definition of company risk	Performance scenarios	Main argument for placement
0.9 < CR ≤ 1	Very high risk	Scenario 0: No integration effort I_1 for all measures	No actions have been taken to prevent violations from happening, which means that the internal environment is likely to resemble the external environment considering risk of violations. The company risk of violations is thus likely to be very high.
0.6 < CR ≤ 0.9	High risk	Scenario 1: I_3, II_1 and III_1 for all measures	A foundation for risk minimisation has been provided through establishment of guidelines and practices. This expression of will and good intentions does however not constitutes sufficient effort to ensure that violations do not take place in a high risk context.
0.4 < CR ≤ 0.6	High to medium risk	Scenario 2: I_3 , II_3 and III_1 for all measures	Integration of preventive guidelines and practices are ensured through explicit communication and delegation of responsibility for compliance, which is essential for behavioural change and thus crucial for creating an internal environment different from the external risk environment. However, the control of observance is necessary to ensure low risk of violations. The placement also balances focused and broad management effort.
0.2 < CR ≤ 0.4	Medium risk		
0.2 ≤ CR ≤ 0	Low risk	Scenario 3: I_3 , II_3 and III_1 for half of all measures and I_3 , II_3 and III_3 for other half of measures	Observance of guidelines and practices in the daily work is ensured through systematic active control for half of the measures making it difficult for violations to take place for the aspects affected.
		Scenario 4: Maximum integration effort. I_3 , II_3 and III_3 for all measures	A conscious and persevering management effort has been made through implementation of a series of preventive actions hampering violations.

Table 14: *Values for the implementation degrees of each of the three management efforts to be applied in the processing of management measure scores for all obligatory impact categories. (Dreyer et al, 2009a3).*

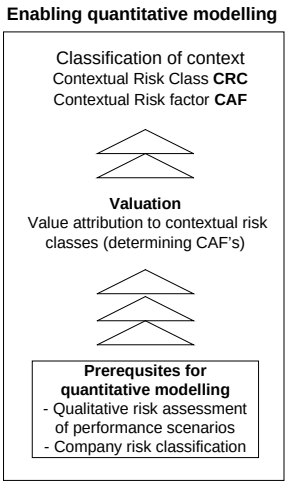
MULTI-CRITERIA INDICATOR MODEL	**EFFORTS IN INTEGRATION**								
	I			II			III		
	The company has established a practice or issued a guideline, which addresses the criterion stated in the left column			The company has communicated and delegated responsibility for compliance with the practice/guideline to relevant managers and employees			The company performs continuous active control to ensure that managers and employees comply with the established practice or guideline		
IMPLEMENTION DEGREE	I_1	I_2	I_3	II_1	II_2	II_3	III_1	III_2	I_1
MANAGERIAL MEASURES A, B, C, …	0	0,7	4	1	1,2	2	1	1,2	2

Table 15: *Company risk scores associated with company performance scenarios 0 to 4 when the value set in* ***Table 14*** *is assigned company scoring in the reference context. (Dreyer et al, 2009a3)*

Performance scenario	**Company risk class**	**Company risk score**
Scenario 0: No integration effort I_1 for all measures	Very high risk	1
Scenario 1: I_3, II_1 and III_1 for all measures	High risk	0.75
Scenario 2: I_3 , II_3 and III_1 for all measures	High to medium risk	0.50
Scenario 3: I_3 , II_3 and III_1 for half of all measures and I_3 , II_3 and III_3 for other half of measures	Medium risk	0.27
Scenario 4: Maximum integration effort. I_3 , II_3 and III_3 for all measures	Low risk	0

Contextual adjustment factors

The approach to determine value attribution to the Context classification for an impact category is the same as for value attribution to company scoring. An empirically based qualitative assessment of the potential risk of negative impacts for the company performance scenarios in **Box 2** in different contextual risk situations is used to determine the adjustment factors. The factors are determined with an aim to perform a modest adjustment of the company performance (Dreyer et al, 2009a4)



A factor range is defined on the basis of assessment of company risk associated with no performance (scenario 0) in contexts where negative impacts are very likely (CRC 1) and very unlikely (lowest risk class) to take place. No contextual adjustment of company free rein is necessary in the reference situation, where negative impacts are very likely to take place, because performance is of the outmost importance here. The contextual adjustment factor thus always assumes the value of 1 (CAF_1=1) for contextual risk class 1 (CRC 1). Interpretation of risk of labour rights violations in the different performance scenarios in the reference context is presented in **Table 13**. In regards to labour rights violations no performance in a low risk context is associated with 'medium' company risk. The lowest contextual adjustment factor in the Context classification (**Table 10**) is on this basis thus conservatively determined to be equivalent to the company risk value of the upper part of the 'medium' company risk class (**Table 12**), CAF_5=0.4. Interpretation of risk in the different performance scenarios in contexts assigned context risk class 5 (CRC 5) is presented in **Table 16**. (Dreyer et al, 2009a4)

***Table 16**: Risk of labour rights violations in performance scenarios 0-4 in the lowest risk contexts (CRC 5).Risk scores are obtained using **Equation 4** and a CAF_5=0.4. (Dreyer et al, 2009a4)*

Performance scenarios	Company Free Rein (CFR)	Company risk class	Company Risk score (CR)	Comments to Company risk
Scenario 0: No integration effort I_1 for all measures	1	Medium	0.40	No actions have been taken to prevent violations from happening, which means that the internal environment is likely to resemble the external environment considering risk of violations to a large extent. However the lack of a basic management effort, which would be expected considering the low risk in the context, means that risk of violations is still present, but only to a very small degree.
Scenario 1: I_3, II_1 and III_1 for all measures	0.75	Medium	0.30	Guidelines and practices have been established ensuring a foundation for good management practice. The lack of communication and delegation of responsibility for compliance makes the viability of these questionable in the daily practice. Considering the context the risk that violations are taking place is however remote.
Scenario 2: I_3 , II_3 and III_1 for all measures	0.50	Low	0.20	Integration of preventive guidelines and practices are ensured through explicit communication and delegation of responsibility for compliance. Despite the lack of active control violations are not very likely to occur. The company management efforts contribute to maintaining a low risk context.
	0.27	Low	0.11	Observance of guidelines and practices in the daily work is ensured through systematic active control for half of the measures making it difficult for violations to take place for the aspects affected even in a high risk context. The risk of violations is therefore faint and the company management effort promotes even lower risk of violations in the context.
Scenario 3: I_3 , II_3 and III_1 for half of all measures and I_3 , II_3 and III_3 for other half of measures	0	Low	0	A conscious and persevering management effort has been made through implementation of a series of preventive actions hampering violations. The management effort promotes even lower risk in the context and the company may be considered a role model for other companies.

When the upper and lower boundary of the contextual adjustment factor range has been determined, context adjustment factors for the intermediate risk classes of the Context classification must be determined within this range. The desired placement of performance scenarios according to perceived company risk in each context is used to determine the acceptable range for each contextual adjustment factor using the Company risk classification (**Table 12**), and on this basis a factor is suggested for each risk class. (Dreyer et al, 2009a4)

The contextual adjustment factors of the Context risk classification for labour rights violations are determined honouring the prerequisite that if a company scores maximum in integration effort I and II for all measures in a indicator (Scenario 2) it will end in the 'high to medium' risk category if the context is classified as CRC 1 or 2, in 'medium' for CRC 3 and 4 and in 'low' for CRC 5. In order for a company assigned CRC 1 or 2 to move into the 'medium' company risk category it must initiate active control of at least three measures in supplement to the broad management effort. The contextual adjustment factors assigned the Context risk Classification for labour rights violations is presented in **Table 17**. (Dreyer et al, 2009a4)

***Table 17**: Contextual adjustment factors to be applied together with labour rights indicators in Social LCA. Typical risk situations applying to the different classes may be identified using **Table 10** and **Table 11**. (Dreyer et al, 2009a4)*

CONTEXTUAL ADJUSTMENT FACTORS		
Contextual Risk Class (CRC)	**Contextual Adjustment Factor (CAF)**	**Probability of occurrence in context**
1.	1.0	Very likely
2.	0.9	Likely
3.	0.7	Possible
4.	0.5	Unlikely
5.	0.4	Very Unlikely

The classification and determination of adjustment factors may be more straightforward if a ranking of probability of a particular type impacts in different countries exists. For example, Transparency International's

Corruption Perceptions Index includes ranking of perception of corruption in 180 countries and territories (TI, 2008), which may be applied in the assessment of contextual risk in the characterisation model for the impact category Corruption. (Dreyer et al, 2009a4)

Methodological choices – Obligatory impact assessment

- Characterisation consists in transforming semi-quantitative assessment of management efforts on to a quantitative scale, and translating this company performance to a probability of impacts actually taking place. It is performed in four calculation steps, viz. company performance, company free rein, company risk, (company related) product risk.
- Company performance is calculated by value attribution to the scoring performed with the performance indicators.
- Company free rein is calculated by subtracting the company performance score from the maximum achievable. It reflects the degree to which circumstances are present in a company that allows negative impacts to take place.
- Contextual adjustment of the company free rein score on the basis of the context classification results in company risk. The adjustment make up for the deviation in importance of management performance in a specific context in compared to the reference context for which indicators are defined.
- Company risk is related to the assessed product by multiplication of company risk score and the relevant product relation factor. Hereby product risk is obtained.
- The determination of a value set for the performance indicator scoring and the determination of contextual adjustment factors constitutes the characterisation modelling of an impact category.

3.6 Optional impact assessment

The optional elements of LCIA according to ISO comprise normalisation, grouping and weighting of the category indicator results and data quality analysis (see **Figure 2**).

3.6.1 Normalisation

Normalisation is typically carried out in order to express all impact categories on a common scale to give an impression of the relative magnitudes of the impacts and prepare the results for weighting. In the method presented here normalisation is not necessary.

3.6.2 Grouping

Grouping may be performed in Social LCA in accordance with the goal and scope of the LCA study. Both sorting of impact categories on a nominal basis, e.g. by characteristics such as by main stakeholder affected, and by ranking in a given hierarchy, e.g. by high, medium and low priority, may be performed.

3.6.3 Data quality analysis

The purpose of data quality analysis is to better understand the significance, uncertainty and sensitivity of the LCIA results. The need for and choice of techniques depend on the accuracy and detail needed to fulfil the goal and scope of the LCA study. Techniques include: (ISO, 2000b)

- Gravity analysis - identifies data having the greatest contribution to the category indicator results
- Uncertainty analysis - describes statistical variability in data sets
- Sensitivity analysis - measures the extent to which changes, e.g. in inventory data, influences the category indicator results

A quantitative uncertainty analysis based on e.g. Monte Carlo simulation assuming knowledge of standard deviation for all central parts of the life cycle is hardly relevant today, but qualitative uncertainty considerations are. Sensitivity analysis is recommended as a minimum in Social LCA if cut-off criteria are applied in the study in order to establish whether significant contributions have been excluded in the first iteration of the LCA. Sensitivity analysis should also be performed if simplified performance indicators have been applied in the study in order establish the possible significance of unreliable prediction of impacts.

3.6.4 Weighting

Weighting of potential company impacts is optional in Social LCA as it is in Environmental LCA. It may be performed as the fifth calculation step of the proposed impact assessment, where the potential company impact (product risk score) is multiplied with a weighting factor (see **Equation 7**).Weighting can also be performed after the formation of the social impact profile for the product (aggregated product risk scores). One weighting factor must be determined for each impact category. The weighting factor must reflect the perceived seriousness of the effect caused by the impact and the possible consequences of this effect relative to other social impacts. The set of weighting factors is defined on the basis of value choices. In this Social LCA method intended for company application it is an obvious choice to base weighting factors on company priorities. The chosen weighting principle must always be presented together with the Social LCA results so value choices are transparent in interpretation.

Equation 7: *Calculation of Weighted product risk score (PRSw) on the basis of Product risk score (PRS) and a weighting factor (WF) for the relevant impact category.*

$PRS_W = PRS \times WF$	**Equation 7**

It is recommended that the four obligatory labour rights impact categories are weighted equally in Social LCA, because observance of the fundamental labour rights are by definition considered to be of equal importance.

Methodological choices – Optional impact assessment

- An explicit normalisation step is not deemed necessary in the Social LCA method.
- Grouping and weighting of category indicator results is optional and may thus be performed in accordance with goal and scope of the Social LCA study.
- Data quality analysis in some form is highly recommended when applying the Social LCA method.

3.7 Schematic overview of methodological elements

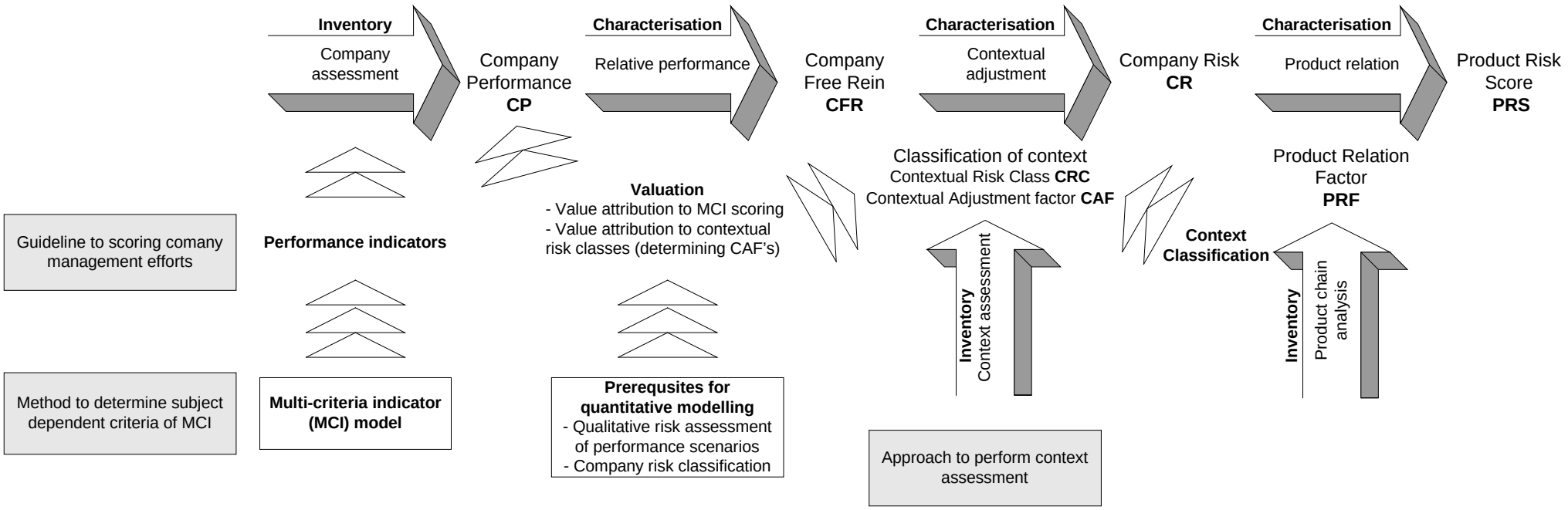


Figure 13: *Overview of the elements of the developed Social LCA methodology presented for negative social impacts. The large arrows describe the steps in the inventory and characterisation steps of the Social LCA method, which must be performed for each life cycle company for each impact category included in the Social LCA. The small triangular arrows signify the underlying modelling of the steps which must be developed for each type of impacts to be included in the Social LCA.*

4 Evaluation of the Social LCA method on the basis of case studies

The Social LCA method's inventory and characterisation modelling are evaluated in this chapter on the basis of experience from six case studies. The main focus of this case study presentation is thus on what the results tell us about the Social LCA method's feasibility and ability to produce reasonable results; for a more elaborate presentation of company performance and risk refer to (Dreyer et al, 2009b, 2009b2).[16]

4.1 Company case studies

Company assessment consisting of the four performance indicators on labour rights presented in Chapter 3 (**Table 6**-**Table 9**, section 3.4.2) was performed for six companies in the period 2004-2005, see **Table 18**. The companies were subsequently monitored for a period of time of half a year to two years, and assistance was provided in the improvement of performance regarding observance of labour rights during this time. Company assessments were performed on location and involved extensive interviews, documentation reviews and factory tours. In addition to the conditions of work exposed during the scoring and later monitoring, the presence of risk in company was also judged in a more intuitive manner on the basis of general observations regarding:

- Visual appearance of the facility,
- visual signs of violations,
- received awards connected to social or environmental performance,
- company certifications and transparency of management systems,
- reporting and other external communication,
- internal communication and openness in the company,
- appearance and attitude of employees and managers,
- employee satisfaction,
- participants' qualifications, seriousness and engagement,
- top management's commitment to social responsibility,
- company openness towards local community; and
- grievances and disputes involving the company. (Dreyer et al, 2009b)

***Table 18**: Presentation of company cases. (Dreyer et al, 2009b)*

Company	Location	Employees	Type of company
A	Malaysia	148	Manufacture
B	Brazil	105	Manufacture
C	Croatia	180	Manufacture
D	Hungary	388	Manufacture
E	Israel	48	Manufacture
F	Denmark	40	Knowledge

4.1.1 Case study results

Context assessments of labour rights violations were performed for the six company contexts on the basis of readily available information sources and contexts classified according to the Context risk classification in **Table 10** (section 3.4.3) (Dreyer et al, 2009b1). See the determined contextual risk classes and corresponding contextual adjustment factors in the six case studies in **Table 19**. Company performance, company free rein and company risk was calculated according to the characterisation steps 1 to 3 described in Chapter 3(section 3.5) on the basis of company assessment (scoring) and context risk classification. The calculated company free rein scores and company risk scores for the case companies are presented in **Table 20** and **Table 21** respectively. Since the case studies did not involve execution of a full LCA no product chain analysis was carried out and hence nor the product relation step of characterisation.

[16] The content of this chapter mainly refers to scientific article (Dreyer et al, 2009b) and the supporting information accompanying (Dreyer et al, 2009b1, 2009b2).

***Table 19**: Contextual risk classes (CRC), 1 to 5, determined for the six case study contexts for each of the four impact categories and corresponding contextual adjustment factors (CAF) (placed in brackets) on the basis of Context risk classification in **Table 10** (section 3.4.3) and contextual adjustment factors in **Table 17** (section 3.5.2) (Dreyer et al, 2009b). The context risk assessments are summarised in Dreyer et al (2009b1).*

Contextual Risk Class (CRC)	Company A Malaysia	Company B Brazil	Company C Croatia	Company D Hungary	Company E Israel	Company F Denmark
Child labour	**2 (0.9)**	**1 (1.0)**	**3 (0.7)**	**4 (0.5)**	**3 (0.7)**	**5 (0.4)**
Forced labour	**2 (0.9)**	**1 (1.0)**	**4 (0.5)**	**4 (0.5)**	**3 (0.7)**	**5 (0.4)**
Discrimination	**1 (1.0)**	**1 (1.0)**	**2 (0.9)**	**2 (0.9)**	**1 (1.0)**	**3 (0.7)**
Restrictions of freedom of association *(abbr.)*	**1 (1.0)**	**2 (0.9)**	**3 (0.7)**	**2 (0.9)**	**3 (0.7)**	**4 (0.5)**

***Table 20**: Company free rein (CFR) calculated for each of the six case companies on the basis of their indicator scorings. Company free rein is calculated using **Equation 3** (section 3.5.1). (Dreyer et al, 2009b)*

Company Free Rein (CFR)	Company A Malaysia	Company B Brazil	Company C Croatia	Company D Hungary	Company E Israel	Company F Denmark
Child labour	**0.67**	**0.54**	**0.74**	**0.54**	**0.67**	**0.55**
Forced labour	**0.46**	**0.46**	**0.37**	**0.28**	**0.49**	**0.41**
Discrimination	**0.56**	**0.14**	**0.63**	**0.38**	**0.50**	**0.68**
Restrictions of freedom of association *(abbr.)*	**0.84**	**0.45**	**0.46**	**0.88**	**0.57**	**0.84**

***Table 21**: Company risk (CR) calculated for each of the six case companies on the basis of their free rein (CFR) (**Table 20**) and Contextual adjustment factor (CAF) (**Table 19**). Company risk is calculated using **Equation 4** (section 3.5.1). (Dreyer et al, 2009b)*

Company Risk (CR)	Company A Malaysia	Company B Brazil	Company C Croatia	Company D Hungary	Company E Israel	Company F Denmark
Child labour	**0.60**	**0.54**	**0.52**	**0.27**	**0.47**	**0.22**
Forced labour	**0.42**	**0.46**	**0.19**	**0.14**	**0.34**	**0.16**
Discrimination	**0.56**	**0.14**	**0.57**	**0.34**	**0.50**	**0.48**
Restrictions of freedom of association *(abbr.)*	**0.84**	**0.41**	**0.32**	**0.79**	**0.40**	**0.42**

***Table 22**: Categorisation of company risks in the six companies (**Table 21**) according to the Company risk classification (**Table 12**, section 3.5.2). (Dreyer et al, 2009b)*

Company risk	Company A Malaysia	Company B Brazil	Company C Croatia	Company D Hungary	Company E Israel	Company F Denmark
Child labour	**High to medium**	**High to medium**	**High to medium**	**Medium**	**High to medium**	**Medium**
Forced labour	**High to medium**	**High to medium**	**Low**	**Low**	**Medium**	**Low**
Discrimination	**High to medium**	**Low**	**High to medium**	**Medium**	**High to medium**	**High to medium**
Restrictions of freedom of association *(abbr.)*	**High**	**High to medium**	**Medium**	**High**	**Medium**	**High to medium**

At a first glance some of the results in **Table 22** stand out merely on the basis of expectations related to the assessment of context risk. Some of these conspicuous results are justified in actual performance in the companies and confirmed by observations on-site, whereas others, when seen in light of the scoring process and on-site observations, reveal problems with the way that the performance indicators represent the labour rights issues. Some minor problems relating to indicators and characterisation are less conspicuous in the categorisation above, but are apparent when held together with observations on site. The most noteworthy case study results are presented below and elaborated in the following sections when relevant for the evaluation of the expedience of indicators (section 4.2) or characterisation (section 4.4).

- Company C has a surprisingly high risk of child labour according to the company assessment considering that the company is located in Croatia which is not commonly associated with child labour. Company C ends in the same risk category as company A and B, which are located in Brazil and Malaysia respectively, where child labour is more common. The relatively high risk score can be explained by a combination of mediocre management of apprentices and of employee grievances resulting in a high free rein, and a modest contextual risk adjustment, which is justified by the context risk assessment (see context assessment in Dreyer et al (2009b1)). Observations on site confirm that it is unlikely that traditional child labour takes place, but that there is a risk that apprentices, who usually are children of employees, carry out work, which is not adequate for their age. On this basis the assessed risk categorisation seems somewhat high for company C, despite the context risk. When comparing the scores and observations of the other companies it is noticed that the measured company risk scores for this impact category generally are slightly higher than observed risk in the companies justifies, which suggests that the 'Minimum ages for employment' indicator possibly underestimate performance. (Dreyer et al, 2009b, 2009b2)

- Company F has a quite high risk of violating employees' freedom of association, right to organise and collective bargaining according to the company assessment considering that it is located in Denmark, where trade unions traditionally are strong. The company risk is assessed to be equivalent to that of company B, which is located in Brazil, where the freedom of association, right to organise and collective bargaining is known to have difficult conditions. The high risk score of company F is more a reflection of the indicators' difficulties in assessing risk in the work situations of salaried professionals experienced in the scoring, rather than actual risk. The same problem was encountered in the performance scoring of 'abolition of forced labour' and 'minimum ages for employment' as well, but which does not display in these risk scores to the same degree. (Dreyer et al, 2009b, 2009b2)

- Company B has a low risk of discrimination according to the company assessment, which is surprising considering that discrimination is common in Brazil. The low company risk is however justified by an exceptional effort in management of employees ensuring equal terms in all aspects of the working place. (Dreyer et al, 2009b, 2009b2)

- Company D also has a quite low risk of discrimination (medium) according to the company assessment compared to company C and F (high to medium), where the context risk is in the same level. Based on observations the risk score should have been higher. Company D has not established a system ensuring equal remuneration and this, combined with the lack of collective bargaining in the company, gives grounds for concern, because neither employee appraisal, nor qualification levels or other similar objective criteria, are formally applied in the wage setting, which make discrimination possible. These circumstances ought to have affected the company risk score more significantly, but company D has a reasonably focused management effort in regards to non-discrimination and the company carries out quite a lot of active control of the implemented practices, which results in a quite high performance score despite the lack of management of equal remuneration. This suggests that the characterisation favours focused management as opposed to a broad management effort, i.e. very good management of a few aspects rather than adequate management of many. (Dreyer et al, 2009b). Moreover, a closer look at the discrimination indicator reveals that perhaps the aspect of equal remuneration does not have a strong enough representation in the 'Non-discrimination' indicator in the current formulation, which lower the significance of the aspect in the indicator score (Dreyer et al, 2009b2).

- Based on the context assessment the assessed low risk of forced labour in company C and D is not particular conspicuous, but the scoring revealed that the companies sometimes use financial penalties to discipline employees. This is a direct violation of employees' right to obtain adequate pay for services rendered, and the low risk scores of the companies are not defendable on this basis. The problem relates the 'Abolition of forced labour' indicator's inclusion of measures addressing observance of a specific labour right aspect directly. (Dreyer et al, 2009b2)

- The 'Freedom of association'[17] indicator is constructed in a way that emphasises the significance of high contextual risk in the company risk score, when no trade union is present in a company. This affected the risk scores in Company A and D, which are both assessed to have a high risk of violation of employees' freedom of association, right to organise and collective bargaining, which is debateable considering observed risk. (Dreyer et al, 2009b, 2009b2)

- A general observation in regards to the company risk categorisations presented in **Table 22** is that the majority of companies are in the high end of the risk categorisation (half of them in the 'high to medium' company risk category), despite no deliberate or serious violations were uncovered in any of them during the data collection and the following monitoring period. Several of the companies have to improve their management in order to entirely eliminate risk of violations, but still some, not all, of the risk scores seem unjustly high. This can be caused by choices made in the characterisation modelling regarding the valuation of scoring and magnitudes of contextual risk factors. (Dreyer et al, 2009b)

4.2 Evaluation of performance indicators for labour rights

The causes to lack of agreement between the assessed and observed company risk related to the construct of the labour rights indicators described in the previous section are discussed more elaborately in the following.

4.2.1 'Minimum ages for employment' indicator - extent of child labour violations

In accordance with the ILO convention No. 138 the 'Minimum ages for employment indicator' considers the working conditions for all children younger than 18 years of age (ILO, 1973) [18]. This means that high risk scores (and high free rein scores) in the child labour impact category are not necessarily synonymous with exploitation of children below general minimum age[19] which is most often associated with, and referred to as, child labour. (see (Dreyer et al, 2009a2)).

In the case studies the companies get high risk scores due to poor management of working conditions for apprentices (company C and D) and young workers (company A and E). Apparently the risk of child labour is quite high in the companies due to the lack of management practices concerning young workers and apprentices, but in reality the risk is much lower, because these are seldom hired and when they are, it is only for limited periods of time. Moreover, in the companies in question, apprentices and young workers are typically children of the employees. (Dreyer et al, 2009b)

The 'Minimum ages for employment' indicator reflects the management performance of the companies in regards to observance of the labour right satisfactory. The problem encountered in the case studies is that the indicator cannot take the extent to which apprentices or young workers are present in the company into account, only whether they are present or not[20]. The indicator operates from the view point that if children are present in the company they must be managed appropriately regardless of their number or it constitutes child labour, which is in accordance with the ILO Convention. However, for the purpose of Social LCA it is desirable to be able to distinguish those companies where the risk of child labour is substantial from those where they are more hypothetic or only present to a limited degree. The managerial approach preludes such distinction directly, but indirectly the problem could be solved by increasing the significance of the context risk via the contextual adjustment factors for this impact category. Consequently, the probability that child labourers will be present in a company will to a higher degree be determined by context risk and to a lesser degree by actual company management. Such a solution removes the incitement (score wise) for a company to appropriately manage working children if they only have a few, or if they are located in a low risk context (CRC 4 or 5), which is problematic in regards to the observance of the labour right. The question is whether or not it is better to accept

[17] 'Freedom of association, right to organise and collective bargaining' is in the following abbreviated to 'Freedom of association' when referring to the indicator.

[18] The indicator distinguishes between three types of working children: (1) children below general minimum age hired to carry out light work (2) children hired as apprentices, and (3) children between general minimum age and 18 years of age (young workers) hired to carry out non-hazardous work. (Dreyer et al, 2009a2)

[19] The general minimum age is 15 years or the age of completion of compulsory schooling if it is higher. In some developing countries the general minimum age is set to 14 years. (ILO, 1973)

[20] It is allowed to adjust the number of measures in the 'Minimum ages for employment' according to the presence of apprentices, children between 13 and 15 years old and young workers, in the company. (Dreyer et al, 2009a2)

the precautionary approach of the present indicator and, when deemed necessary, include estimations concerning the extent of the problems in the interpretation of the study results considering that such estimations are connected with uncertainty given the sensitivity of the issue.

4.2.2 Knowledge companies – coverage and relevance of indicators

The managerial measures of the labour rights indicators were determined on the basis of an interpretation of the relevant ILO Conventions into a business context in two steps, (1) the identification of central aspects of violation and (2) the identification of business processes relevant for addressing aspects of violation and formulation of measures necessary to manage these (See Chapter 3, section 3.4.2). Since many of the activities where labour rights violations may take place are the same in different companies, e.g. hiring and wage setting, the measures should be relevant for all companies, however the scoring of company F shows that this is not the case. The 'Abolition of forced labour', 'Minimum ages for employment' and 'Freedom of association' indicators did not work optimally in the scoring of company F. The problem mainly consisted in some measures requiring a very liberal interpretation in order to apply to the work situation of salaried professionals and some lacking measures served as an inadequate indication of presence of circumstances allowing labour rights violations to take place. (Dreyer et al, 2009b, 2009b2)

Since the indicators works fine in the other case studies, the problem suggests that it is not always the same circumstances that indicate risk of violations in knowledge companies (company F) and manufacturing companies (companies A-E), and therefore not the same measures that work to prevent violations of some labour rights. The cause is to be found in the differences in the typical employment conditions and type and organisation of work carried out in a knowledge company compared to a traditional manufacturing company. (Dreyer et al, 2009b, 2009b2)

The determination and formulation of managerial measures in the indicators should therefore be done in more deliberate accordance with the type and characteristics of the company in which the indicators are intended to be used, in order to capture the actual risk situations and avoid false indications where the violations are limited due to the type of work e.g. child labour in knowledge companies. Within the same industrial sector one may however find that companies share some main characteristics regarding company size, organisation of work, type of workers employed (skill and wage level), regional location of company (rural/urban) and even to some degree global location of company, which may enable a sector-specific formulation of the labour rights indicators. (Dreyer et al, 2009b)

In their current form the indicators 'Abolition of forced labour', 'Minimum ages for employment' and 'Freedom of association' are primarily applicable for assessment of traditional industries employing blue-collar workers such as companies A-E. In the scoring of companies A-E all measures were found to be relevant and adequate in their coverage of risk aspects. No additional risk aspects were encountered during the scoring (or later on), but this should of course be seen in light of the generally responsible conduct of these companies. More case studies including companies associated with higher risk might uncover additional risk aspects.

4.2.3 'Abolition of forced labour' indicator - weighting of measures

In the development of the labour rights indicators it was chosen not to deliberately weight individual measures of the indicators in order to avoid the evitable value judgment connected to this action. Violation aspects are therefore attributed importance equivalent to the extent of required management effort in the indicators, an approach which seems reasonable because the performance indicators measure will and ability. (Dreyer et al, 2009) However, the case studies show that perhaps some weighting will be advisable when it comes to measures addressing *direct* observance of a specific labour right aspect.

Measures addressing direct observance can be difficult to deal with in the company assessment, because the unsubtle character of such an approach will often result in an untrue answer. However, when the violations are commonly accepted in the countries where they take place, it is usually not a problem to consider observance of them directly in the indicator, as for example the retention of personal documents or use of financial penalties and hiring fees, which are aspects included by the 'Abolition of forced labour' indicator (see indicator in **Table 4**, section 3.4.2). The problem is that these important indications of actual violations may disappear in the

indicator result when addressed by just one or two measures giving them a weak representation in the indicator compared to other aspects.

This problem was encountered in assessment of risk of forced labour in company C and D, which are able to obtain a 'low' company risk categorisation despite that financial penalties sometimes are used for disciplinary purposes in the companies, because they manage all other aspects well. Based on observation it is considered unlikely that neither of the companies is engaging in traditional forced labour, which is reflected in the company risk categorisation, but the direct violation should have had an impact significant enough to place both companies in the 'medium' company risk category. (Dreyer et al, 2009b2) The problem does not affect the scores of the other companies for this impact category, because they manage the mentioned activities well.

A similar problem is encountered in the 'Non-discrimination' indicator regarding the aspect 'equal remuneration' but there the reason is partly due to a poor formulation of measures in the indicator.

4.2.4 'Non-discrimination' indicator – representation of the aspect 'equal remuneration'

The aspect 'equal remuneration' is represented in the 'Non-discrimination' indicator by one preventive measure concerning the establishment of a system (criterion 10 in **Table 8**, section 3.4.2), and three measures (criteria 11, 13 and 14)[21], which may support evaluation of equal remuneration for equal work and serve as documentation of such. Case study D revealed that a company may have implemented the measures supporting a system ensuring equal remuneration without actually having a system. The practices intended as supporting an equal remuneration system only do so if directly linked to the purpose of ensuring equal remuneration, which they are not in the formulation found in the present indicator. The result is that it is possible to score quite well even though equal remuneration is not ensured due to the little weight of the actual preventive measure in the score, which disappear in the indicator's twenty-seven other measures (in this case). The solution is to focus the supporting measures for the underlying purpose and perhaps additionally by attributing more weight to the actual preventive measure.

The problem is only present in regards to company D. In the companies B, C and E collective bargaining takes place ensuring equal remuneration, and in company A, they have established a wage setting system based on responsibilities, seniority, skills and qualifications. Company F lacks the same practices regarding equal remuneration as company D, but the perceived risk in company F was considerable lower because employees typically negotiated wage on the basis of wage statistics from their respective trade unions. Furthermore, the risk categorisation was sufficiently high to reflect the risk of discrimination in the company.

4.2.5 'Freedom of association' indicator – absence of trade union representation

The 'Freedom of association' indicator is constructed in such a way that whether or not the company deliberately keeps the trade union out, the absence of trade union representatives on site will impact negatively on the performance score (see indicator in **Table 9**, section 3.4.2). If the reason for the absence in the specific situation can be explained by circumstances relating directly to the context e.g. when freedom of association is limited by legislation, the company may take some additional measures (according to the indicator), which will enable higher performance scoring, but if the cause is of cultural or social nature, the company cannot take additional measures (facilitate parallel means to a union) in order to improve the performance, because this could also be a mean to obstruct employees' freedom of association. In this way a problem relating to the context can reflect in the company risk score both through the contextual risk adjustment and the performance scoring. (Dreyer et al, 2009b) In some contexts, it may thus be the situation that the a company's performance is partially measured against measures, which it is not possible for the company to take even though they may wish to, because the trade union is not represented at the company. Hence there is the risk that the company risk of violating employees rights is assessed to be higher than it actually is. However, it can be difficult to distinguish whether the absence of trade union(s) in a company is actually a result of cultural and social practices in the context or the company's attitude towards unionisation, or, which may often be the case, a combination of the two. In this situation the indicator should optimally indirectly uncover a company's true

[21] Carrying out employee appraisal is a necessary measure in ensuring equal remuneration for work of equal value if the company does not engage in collective bargaining. Employee appraisal is represented by two additional measures (no. 26 and 27 in **Table 8**, section 3.4.2), which may be included, when no collective bargaining takes place. (Dreyer et al, 2009a2)

willingness to accept unionisation and collective bargaining in the case that employees should wish to exercise these rights, but this is difficult to do with a managerial approach without posing requirements to involvement (via measures), which would compromise employees' right to organise without company interference. Directly asked it is considered unlikely that a company will openly confirm that it will not accept trade unions. Therefore it is considered acceptable that this indicator, in the situation where freedom of association, right to organise and collective bargaining is not limited by legislation, slightly emphasises the risk associated with the lack of trade union representation, resulting in a more precautionary assessment of company risk.

Alternatively, it could be allowed to take out the measures that presuppose trade union representation in the situation when no trade union is present in the company. Hereby the company free rein score will reflect the company's ability to manage the aspects which they can influence more righteously, but not their willingness to manage other should it become necessary. Given that this will be a weak indication of presence of actual risk the significance of the context risk must be increased at the same time.

In the case studies the situation occurs in the assessment of company A and D. There are no legal restrictions towards unionisation in neither Malaysia nor Hungary, but there is no trade union representation in neither of the companies, which partially is contributory to the relatively high free rein scores of the companies. The high context risk of violations (CRC 1 and 2) emphasises this in the company risk scores. Observations made in these companies support a high risk categorisation. Even though there were no evidence that the lack of trade union representation in the companies was due to restrictions of employees' freedom of association in neither, there were minor indications during the interviews in the companies that suggested an attitude which was not entirely open towards unionisation. It is debateable whether such indications actually justify a 'high' company risk categorisation, or whether 'high to medium' risk would have sufficed.

4.2.6 Conclusions regarding applicability and feasibility of labour rights indicators and indicator model

The problems with the labour right indicators identified in the case studies derive from the way the chosen measures collectively represent the labour right or specific aspects of the labour right. The accuracy of the 'Abolition of forced labour' and 'Non-discrimination' indicators may be adjusted by minor changes in formulation and indirect weighting of aspects and risk situations in the indicators.

The 'Minimum ages for employment' indicator and the 'Freedom of association' indication are a bit precautionary in their assessment for different reasons relating to the chosen managerial approach. The result is a risk that the indicators slightly overstate company risk is certain situations. In both cases there are weighty arguments for accepting this risk. The problem may be solved by increasing the influence of context risk in the assessment of company risk at the expense of actual management, but this might introduce other bias in the indication and it will not guarantee a more certain indication. It should also be taken into consideration that the relative placement of the companies included by the case study is quite good with the current indicators and contextual adjustment.

An important learning from the case studies is that performance indicators must be developed more specifically for the type of company intended assessed.

It can be concluded that none of the problems encountered with the indicators were irresolvable, but some adjustments is needed for the indicators to work optimal. All three pre-defined assessment criteria of the indicators showed to be relevant for assessing effectiveness of integration and risk minimising. In terms of coverage the indicators were judged to be good, especially considering that they maintained relevance in the broad geographical and cultural scope which the locations of the case study companies constituted. Since the case studies mainly included companies that performed rather well it is not unlikely that some additional problems may occur when more problematic cases are included. It is therefore recommended for further work that more cases studies are conducted to confirm this.

The company assessment was feasible, but time consuming. Judging from results achieved by the companies during the subsequent monitoring there were however many spin-off benefits of conducting the assessment (see Chapter 7).

4.3 Evaluation of Context risk classification for labour rights violations

All classes of the Context classification were applied in this study, see result in **Table 19**. A noteworthy result is that for the impact categories 'Discrimination' and 'Restrictions of freedom of association' the contextual risk classes are in the high end, which is likely to be a characteristic picture, because discrimination to some degree is present in most countries, and even in countries where the trade union movement is strong, violations sometimes occur. (Dreyer et al, 2009b)

The desk study of labour rights violations conducted in connection with the case studies was able to provide adequate information to determine context risk in accordance with the Classification. Information on violations in specific locations and industries was not consistently considered by the source material and violations in neither near location nor industries were identified in the case studies. The consideration for violations in the proximity of the company in the Classification is however still judged to be valuable for the assessment of context risk when such information is available. Considering the quality of the source material for available these case studies it would not have facilitated the risk assessment had the Classification contained more risk classes. (Dreyer et al, 2009b)

The contexts considered in this study are quite diverse in the sense that they are geographically widespread and embrace different economies, so when the Context classification is sufficiently differentiated to accommodate the risks encountered here it is very likely that it will adequate in other cases as well. (Dreyer et al, 2009b)

4.4 Evaluation of characterisation

The cause of the slight tendency to high risk scoring in some of the cases which could not be attributed to the construct of the indicators, can be found in the characterisation modelling as relating to either the company performance calculation (composition of value set) or the contextual adjustment (magnitudes of contextual adjustment factors). These possibilities are discussed more elaborately in the following.

Since the case studies did not involve execution of a full LCA it is not possible to evaluate the product relation step of characterisation on the basis of the case studies. Instead I reflect upon the possible and realistic range of magnitude of product risk scores for the labour rights impact categories.

4.4.1 Valuation of scoring and contextual adjustment

The contextual adjustment establishes the significance of the assessed company management performance for the risk of violations in the company by reflecting the importance of targeted management effort considering the prevalence of violations in the branch of industry, near location and country. The case studies show that the magnitudes of contextual adjustment factors generally were adequately determined to serve this purpose. The degree of management effort and improvements implicitly required of the companies, by the indicators, to obtain low risk of labour rights violations, was generally considered reasonable in light of their contexts, except for where increased active control constituted the main improvement potential. In these situations it could sometimes be debated whether the observed internal risk and the assessed context risk actually justified the strengthened active control which was needed in order for the company to be classified in a lower company risk category. This is a consequence of the valuation of scoring combined with the multiplication of integration effort scores, which influence the results in such a way that active control will be identified as the main area of improvement for companies in high risk contexts performing well and scoring broadly in the indicator (as the companies mainly did here). The value set applied in the company performance calculation determines the importance of the different integration efforts for risk minimisation. Too high company risk scores in mentioned situations can thus be explained by too much emphasis on active control by the chosen value set. The contextual adjustment merely sustains the need for active control in high risk contexts determined by the value set for indicator scoring in the characterisation. A contextual problem would have reflected in either too high or too low assessed company risk compared to observed risks in low risk contexts suggesting that the contextual adjustment was either not strong enough or too strong. (Dreyer et al, 2009b)

Another indication that the chosen value set put too much emphasis on active control is that company D receives a remarkable high performance score (considering the management effort) partly due to a focused management effort (the only case in the case studies), which suggests that the value set does not balance broad and focused management effort optimal.

The value attribution to the multi-criteria indicator results has been developed so establishment of guidelines or practices in the company's management (Integration effort I of the indicator) and communication and delegation of responsibility of these (Integration effort II) forms a strong basis for risk minimisation, but active control (Integration effort III) is necessary to achieve 'medium' and 'low' company risk. (Dreyer et al, 2009b) The case studies suggests that the chosen value set emphasises active control too much, which relates to the relative magnitudes of the values attributed to I_3 , II_3 and III_3 (see **Box 3**, section 3.5.2). High values of implementation degrees 3 and 2 for II and III relative to I will favour a focused management effort, while low values will favour a broad management effort (see section 3.5.2). It is possible to choose other value sets, which reduce the multiplicative amplification effect in the calculation of performance score and thus lessen the weight of active control in the assessment of performance, however tests show that not even moderate change of the present risk categorisation be obtained with another value set without compromising the desired placements of the different company performance scenarios in **Table 13** (section 3.5.2) with the current Company risk categorisation (**Table 12**, section 3.5.2).

The Company risk classification builds on the assumption that: "In a high risk context, an average performance score (CFR= CR = 0.5) is more likely to result in high to medium company risk rather than medium company risk" (Dreyer et al, 2009a3). Perhaps this assumption is related to a too conservative judgement of risk. More case studies, in particular case studies including companies with lower performance, will provide more grounds for such conclusions. (Dreyer et al, 2009b)

4.4.2 Formation of a company's product risk score

According to **Equation 6** (section 3.5.1) there are three things of significance for the magnitude of a company's product risk score (PRS):

- Magnitude of product relation factor (PRF)
- Magnitude of company free rein (CFR)
- Magnitude of contextual adjustment factor (CAF)

The aim of the product risk score is to expediently reflect the significance of the individual companies' potential impact for the assessed products total potential impact. Since the product relation is not natural, but must be created, it is necessary to be conscious of the influence it has on the product risk score. The developed Social LCA method aim for the product relation factors to be in the same range of magnitude as the company risk scores, i.e. that they in practice have the same significance for the magnitude of the product related impact potential of a company (see section 3.3.2). The method may however also accommodate another proportion between the two. This is a methodological choice which optimally should be determined on the basis of the chosen product relation principle in the intended application, because different applications may favour more or less emphasis on company risk in proportion to the product relation. In Chapter 7, I reflect upon how two different choices of product relation principles may contribute to different scoping of a company's social responsibility for its product chain, when the Social LCA is applied in life cycle management in a case where the product relation more or less as influential company risk.

If specific actions are not taken to deliberately curb the range of magnitude of the product relation factors, the applied product relation factor may in some situations completely dilute significance of the company risk. For example if the product relation principle is 'cost' and the smallest supplier contributes 0.01% to the product and the biggest 22%, the product relation factor will vary a factor 2200 between these two companies in the same product chain. The acceptable range of variation of the product relation factor depends on the realistic range of magnitude of the company risk score. The case studies provide us with some insight as to what this concerns in the following.

Contextual adjustment factor

The contextual risk adjustment has a modest effect on the respective company risk score due to the limited range of the adjustment factors (a factor 2.5 between the highest and lowest CAF). The contextual adjustment can in an extreme case move a company two risk classes in the Company risk classification. This is in accordance with

the general aim of the Social LCA to reflect the importance of preventive management approach as a means to distinguish the internal risk environment of the company from that of the context.

Company free rein and company risk
The company free rein score (CRF) can in theory vary up to a factor around 100, if the situation where maximum performance is achieved (CRF=0) is disregarded. In practice, in order to achieve the maximum score, it is judged that the company must have worked targeted with complying with the criteria of the indicator, which is a situation that is unlikely to occur in the first scoring, but possible in a second scoring. It is also likely that at least one or two measures will be judged not to be worthwhile the effort by the company in order to achieve a slightly higher performance score. Typically, companies in low risk contexts will not perform maximum, because the low risk location will not require so many active control provisions, which will reflect in relatively low performance scores and hence relatively high free rein score. Therefore will the lowest CRF (close to zero) in practice not occur in connection with the lowest CAF (0.4). The actual company free rein scores will on this basis probably not vary more than a factor 10 e.g. equivalent to CRF belonging to the range [0.1;1]. The actual range of variation of the company risk score will thus probably be much smaller than the possible. If CRF varies a factor 10 and CAF a factor 2.5, the CR score will vary a factor 25 in practice.

In the case studies, a variation of a factor 6 is observed between the lowest (0.15) and the highest (0.84) company risk scores (see **Table 21**). This result should be seen in light of the general decency observed in these companies and that none of them, except from company B, had worked consciously with labour right issues. Other cases may result in a larger span of CR scores.

4.4.3 Conclusions regarding suitability of the chosen characterisation model

If we disregard the disturbances to the general picture in **Table 22** related to the construct of the indicators, we find that the relative placement of companies according to magnitude of the resulting company risk scores generally is concurrent with expectations based on context risk and observations on site during the data collection and the following monitoring.

Overall the characterisation model worked as intended in the case studies. The effect of the contextual adjustment of the company free rein was modest as intended. It curbed the multiplicative amplification effect of the performance indicators in low risk contexts, so active control never became decisive for placement in lower company risk categories, and sustained a strong need for active control in high risk contexts, which was in accordance with observed management needs. The need for adjusting the value set attributed to scoring was by no means pronounced, so it is recommended to conduct more case studies before modifying the valuation, particularly considering that it will require reconsideration of the assessment of risk in the generic performance scenarios.

On the basis of the case studies it can be concluded that the range of magnitude of the company risk score is likely to be much smaller in practice than in principle.

5 Discussion of methodological delimitations and limitations

This chapter summarises the main features of the developed Social LCA method and compares it to Environmental LCA. Some of the implications that the methodological choices made during method development have for the application and feasibility of the method are furthermore discussed.

5.1 Comparison between Environmental LCA and the developed Social LCA method

Table 23 summarises some of the differences between Environmental LCA, as it is conceived by the ISO 14040-42 series (ISO, 1997, 2000a, 2000b), and the developed Social LCA method.

***Table 23**: Summarises the main differences between traditional Environmental LCA and the Social LCA method presented in this dissertation (Dreyer et al).*

	Environmental LCA	Social LCA (Dreyer et al)	Comments
Areas of protection (AOP) of the method	▪ Human Health ▪ Natural Environment ▪ Natural Resources ▪ Man-made Environment	▪ Human dignity and well-being	There are overlaps between the suggested Social LCA AOP and the existing 'Human Health' AOP of Environmental LCA. 'Human dignity and well-being' additionally encompass the value of living a healthy and naturally long life.
Product system description	Processes Raw materials extraction, manufacture of product components and semi-products, production of product, distribution, use, disposal.	Companies Suppliers of services and commodities (1st tier, 2nd tier,…), product manufacturer, distributors, repair and servicemen, waste managers.	The organisational approach is the main premise of the Social LCA methodology. It influences possible application of LCA results, data requirements, inventory models and characterisation models. Furthermore, it excludes consideration of process related impacts and impacts related to product use.
Object of inventory 'analysis'	Environmental exchanges - physical input and output of a process	A Company's conduct towards main stakeholders affected by actions - ▪ Company management effort ▪ Company contexts ▪ Company relation to product	In the Social LCA method the inventory consists of a compilation of company assessments.
The smallest unit of the product system for which data are collected	Process (unit process) For example: pulping of recycled newspapers (in the production of moulded-fibre packaging).	Company For example: Manufacturer of moulded-fibre packaging: Brødrene Hartmann A/S, Tønder, Denmark.	'Company' refers to a specific production site - not an entire corporation.
Quantitative relation to product and functional unit	Natural	Quantitative relationship must be established.	There is no natural quantifiable link between company conduct and the actual product, so a principle must be determined to establish such a relation. The choice of product relation principle has significant influence on the results of the Social LCA.
Data requirements	General and specific data	Site-specific (company specific) data	Social LCA requires site specific data, because the object of inventory 'analysis' is conduct of companies as in the specific actions taken or efforts made.
General approach to LCIA	Mid-point and end-point modelling	Mid-point modelling	The Social LCA method aims to model potential impacts on human dignity and well-being rather than damage, which makes it a mid-point LCA method. Damage modelling (end-point modelling) has been relinquished mainly due to the uncertainty of the causal relationships.
Mode of included impacts	Negative impacts	Positive and negative impacts	The characterisation model presented here is for negative impacts, but it is possible to model positive impacts in a similar manner when it is meaningful to take a managerial approach to assessment.
Category indicator results express	Occurrence of environmental impacts	Probability that social impacts occur	Due to the choice of managerial approach to assessment of company conduct in the LCIA only probability of impacts can be assess in the LCIA.
Characterisation	Calculation of potential environmental impact for emissions: - How much do the emissions contribute to the various types of environmental impacts?	Calculation of potential company impacts: - How much does company performance or lack of such contribute to company risk?	In Social LCA calculation of potential impacts occur separately for each company before aggregation for the product system can take place due to the site specificity of social impacts. In Environmental LCA aggregation typically takes place in the inventory.

The main difference between the developed Social LCA and Environmental LCA is the perception of the product system. The focus on companies rather than processes in the Social LCA is the main reason for the differences between Social LCA and Environmental LCA described in **Table 23**. Most noteworthy

consequences of this perception are that use and process related impacts are not included by the Social LCA method and a quantitative relation between company and product must be devised.

The main implications of the chosen managerial approach to assessment of company conduct in the method are that the impact category indicators express risk of impacts as opposed to expressing impacts directly, and that site specific data is required to carry out the assessment.

5.2 Exclusion of process related impacts

The perception of product system in the Social LCA method does not accommodate inclusion of process related impacts. This methodological choice is based on the more obvious causal relation of social impacts to the conduct of the companies in which the processes take place rather than to the processes themselves. Working environmental impacts are the most obvious exception to this rule. Working environmental impacts are naturally related to the physical processes involved in making or handling of the product, but some of these impacts are already covered by Environmental LCA and need not to be included in Social LCA. Environmental LCA may consider occupational health impacts on workers resulting from direct exposure and in principle also health impairment caused by environmental impacts, so these need not to be considered in Social LCA. Other working environmental impacts which are related to processes and physical product characteristics are for example, hearing impairments from exposure to noise, musculoskeletal injuries from monotonous repetitive work, and grievous bodily harm from accidents.[22]

Working environmental impacts may however also be addressed from an organisational (preventive) point of view and modelled in the presented Social LCA method. Appendix 1 presents a performance indicator for 'Workplace health and safety' based on a managerial approach. The indicator is developed on the basis of the ILO Occupational Safety and Health Convention (No.155) using the same method as for obligatory labour rights indicators presented earlier. The Convention sets minimum standards for occupational health and safety and the working environment, i.e. everything affecting physical or mental health that are directly related to safety and hygiene at work (ILO, 1981). The performance indicator focuses on employers' responsibility in regards to ensuring that the workplaces, machinery, equipment and processes under their control are safe and do not pose a hazard to health. In addition, it includes consideration for whether appropriate protection measures have been taken and adequate information and training in connection with work with hazardous substances or risky working processes is carried out.

The method presented here focuses on life cycle assessment of the company conduct related impacts, but process related social impacts, should such be identified, may also be included in a Social LCA study in addition, using other methods of assessment. It may then require further developments to bring the two types of impact indicators on a common scale for the purpose of direct comparison. One of the challenges consists in combining the precautionary 'measurement' of impacts by the indicator model with measured impacts in one assessment.

5.3 Limitations to applications

The range of applications of Social LCA based on the developed method is generally limited in comparison to traditional Environmental LCA due to the necessity of performing assessment on a specific product system complicating traditional LCA applications. Particularly applications in decision-making which require assessment of products on a more conceptual or generic level are affected by this methodological implication, for example:

- Product-oriented legislation and action plans for industries
- Setting of product standards, taxes, and subsidies
- Setting of sustainability labelling criteria
- Development of guidelines for public purchase
- Design choices in product development regarding concept, component, material, process (selection or hot spot analysis without specificity of product chain)

[22] The examples of working environmental impacts are from the EDIP method, which presents a method to include these in traditional process based LCA. (Alting et al, 1997).

Examples of specific decisions, which the Social LCA cannot support:
- Use of plastic or aluminium as structural material (comparison of generic materials)
- Distribution by truck or train (comparison of generic processes)

External applications of the Social LCA, i.e. applications by others than the product manufacturer, are hence very limited when this method is applied, because most of these require generic product assessments in one way or another.

The required specificity of Social LCA on one hand delimits the general number of applications, but on the other hand is the application of Social LCA for life cycle management particularly strengthened by the great specificity of assessment and results. The product manufacturer therefore also becomes the most obvious Social LCA user and commissioner when this method is applied.

5.3.1 Comparative studies and comparative assertions

Comparative Social LCA studies may be carried out for existing products on the basis of specific product chains.

The execution of comparative studies for competing products by different manufacturers is however likely to be limited in practice for several reasons. Firstly, the extent and costs of such a study must be accepted by two competing parties and the possible gain and loss related to the outcome of the study must counterbalance these. Secondly, the required detailed information for carrying out such a study will be of highly sensitive character both in regards to protecting possible competitive advantages and brand reputation for a company, which makes it doubtful that companies should wish to disclose such information for the purpose of comparison.

Comparison of products by same the product manufacturer or by different product manufacturers within the same corporation has a wider range of application. Results of such comparative studies may serve as decision-support in strategic business decisions in larger corporations by providing information about potential risks and benefits related to changes in the corporation of a structural character, for example:

- Whether to expand existing production capacity in one or another production site in the corporation with respect to achieving best possible social performance
- Consequences of increasing production in one site at the expense of another within a corporation (for example moving production from a site in developed country to a site in a developing country)
- Which production site in a corporation should produce what and how much in order to minimise the corporation's negative impact and maximise its positive impact.

Essentially the decisions above concern the choice of the most favourable of existing product chain(s) impact-wise when manufacturing a product. In principle all product chains can be optimised by changes in composition, but a company may location-wise be restrained by lack of attractive suppliers, which are favourable both in regards to their social impacts and product price, quality, delivery etc.

In comparative Social LCA studies, as well as in Environmental LCA studies, the limitations of LCI and LCIA are important because they may introduce biases in the comparison. When applying the presented Social LCA method, special attention must be paid to, equivalence of system boundaries in respect to cut-offs and data gaps, and choice of product relation principles, since discrepancies in these will make actual comparison very difficult and comparative assertions[23] problematic[24]. In case of comparative assertions disclosed to the public, the underlying LCA studies must be carried out by a third party due to the elements of assessment in data collection, which may compromise objectivity of internal LCA practitioner.

[23] Comparative assertion: 'claim regarding the superiority or equivalence of one product versus a competing product which performs the same function'. (ISO, 1997)

[24] As described under section 2.6.1 impact categories should be determined on basis of local and country norms, as well as universal. Comparability of two products therefore also entails completeness of assessment in terms of inclusion of impact categories relevant to the locations of the product chains. The assessment may thus include impact categories which are not relevant for assessment of both products.

5.3.2 Identification of trade-offs between social and environmental impacts

The presented Social LCA method does not accommodate direct comparison of environmental and social impacts since social impacts are not brought to a comparable scale. Possible trade-offs between social and environmental impacts resulting from changes in the product system may however still be established on a general level. Tradeoffs may be determined in a comparison of percentage-wise increase or decrease in social and environmental impacts resulting from a given change in product system.

It is important to notice that, due the organisational perspective of the product system in the Social LCA method, changes in the product system must have a structural effect on the product chain, e.g. on the composition of life cycle actors or their product relation, in order to influence the result of the Social LCA, whereas the Environmental LCA result only is sensitive to process changes and thus only to structural changes if they result in such. For example, changes in manufacturing technology may not at all affect the Social LCA result while it may be significant for the Environmental LCA result. The chosen principle for establishing product relation in Social LCA may however be decisive for whether process changes such as change of manufacturing equipment, also constitute a structural change reflecting in the Social LCA result. For example, if product relation is based on working hours spent on the product, change of manufacturing equipment may affect both the Social and Environmental LCA result, whereas if the product relation is based on the product manufacturer's influence, the same change will not affect the Social LCA result.

5.4 Data availability

In the presented Social LCA method data is required for product chain analysis, context and company assessments.

Execution of context assessments requires data which typically can be obtained from general sources of information. The availability and quality of data of course depends on the issue. The case studies showed that information about violations of fundamental labour rights was available from many different information sources, however it was of variable quality (Dreyer et al, 2009b1).

Company assessment comprised by performance indicators based on the multi-criteria indicator model is completely specific in its data requirements since it involves assessment of a company's specific management practice. Such an assessment is a time consuming task, which also requires permission to collect data on site. In general a company must have some incentive to volunteer information about their conduct, in particular when it comes to the more sensitive issues of Social LCA, and also considering the time consumption of involvement. The data required for company assessment is therefore not considered to be readily available.

Concrete mapping of the product chain and collection of data required for product relation calculations may be performed on the basis of data which in principle can be acquired from the life cycle companies through questionnaires or telephone interviews. Information about working hours, costs of production, relation to suppliers, exact suppliers, etc., however tends to have competitive value for a company, which may complicate this straightforward data collection significantly. It is possible to apply general data e.g. on production costs and working hours. Data availability of such general data is limited today, but it is not unlikely that demand may increase availability in the future.

Given the limited accessibility of the required data for the Social LCA, the data collector must have some leverage in the product chain in order to collect data. Ergo the product manufacturer has the greatest possibility to successfully collect data in the product chain, which emphasises the company application of this Social LCA method.

The influence that the product manufacturer is able to exert on the first tier of suppliers and subcontractors (including distributors) in the product chain is therefore of great importance for the possibility of carrying out Social LCA in accordance with the required data quality and specificity. Consequently, it can be difficult for a company to carry out Social LCA based on the developed method if it is of little consequence to its suppliers and subcontractors e.g. in terms of the revenue that it generates for these.

Data collection upstream the first tier will often require the co-operation and dedication of the first tier suppliers. The degree to which the product manufacturer is able to exert his influence on first tier of suppliers and subcontractors is therefore also of great importance for how much of the product chain it is possible to include in the Social LCA with specific data (as discussed in section 3.3.1).

5.5 Social LCA application in life cycle management

The strong requirements to specificity of the developed method puts limitations to its feasibility and application, and it is therefore important to view the Social LCA application in a broader perspective than just the typical LCA study. It is the specificity of the Social LCA method that makes it a reliable and therefore relevant tool for life cycle management.

The developed Social LCA method aims to support life cycle management by assessing risk and opportunities and forming basis for prioritising efforts and taking actions. The Social LCA should be seen as a dynamic tool in this process, where the assessment may be performed in a stepwise procedure and continuously updated to reflect changes in the product chain. The resources required for conducting this type of LCA will make applications requiring a one-off assessment, such as documentation towards customers and product declarations, secondary - a side-benefit to the primary application.

It is implicit that a life cycle management strategy includes the considerations of how a company may seek influence in its product chain in order to manage it. Examples include choice of collaborative suppliers and subcontractors, use of one-stop supplier concepts, entering partnerships with suppliers, choice of simpler product components, and becoming own supplier. All of these are decisions that may contribute to increasing the company's influence in the product chain in terms of leverage or reduced complexity (upstream tiers and absolute number of suppliers and subcontractors) in the long term. Increasing influence will facilitate the execution of Social LCA on life cycle companies and support improvements in the product chain on the basis of its results, but the Social LCA may also assist the company during the process of increasing influence in the product chain. Application of the individual 'assessment' tools in the developed Social LCA method, product chain analysis, context assessment and company assessment, may assist by focusing efforts. In this way the Social LCA is conducted in many steps rather than just one. A stepwise approach to conducting Social LCA is discussed further in Chapter 7.

Given the specificity requirement, this type of LCA is most relevant for companies with a wish to make improvements in the product chain and with the needed influence in their product chain and/or a wish to increase it.

Alternatively, the Social LCA must be conducted on the basis of data which is more readily available. The next chapter investigates this option further.

6 Application of simplified indicator models

In Social LCA it is not always possible to obtain specific information from companies or carry out an extensive data collection. It may therefore sometimes be necessary to supplement the detailed multi-criteria indicator method presented here by simplified indicator models for assessment of companies where access to data is limited in order to perform a full Social LCA study. Simplified indicator models are also desirable to apply in screening LCA's where the requirements to data collection must be limited.

Simplified indicator models could be reduced versions of the multi-criteria indicator model relying on less information and/or information of more general character, or entirely different types of models applying more accessible types of information and information sources. It is obvious that such simplified models will often be less reliable in their assessments of company conduct or impacts of conduct, which will affect the quality and comparability and of their results. When choosing to apply one simplified indicator model throughout the LCA study, as one typically would do in a screening, the inherent reliability of the model is the main consideration. It is crucial that the Social LCA based on the models do not acquit potentially problematic companies in a hot spot analysis. Additionally, the comparability and compatibility of results produced by models of different levels of sophistication is central in the choice of simplified models in an LCA study in order to achieve the necessary coverage. In this case, the LCA method must be able to handle the different uncertainties connected with the chosen indicators models in the aggregation in a way that renders these transparent for the interpretation of the LCA results.

Furthermore, when a Social LCA study is conducted with the intention of supporting life cycle management some consideration most also be given to the usability of its results in this application. The information value of the Social LCA results must be relatively high in order to form basis for decisions extending beyond mere selection and de-selection of suppliers and sub-contractors.

Four simplified indicator models for inclusion of labour rights issues in Social LCA are presented and compared to the multi-criteria indicator model in this chapter. The purpose of the comparison is to throw light on how the differences in influence information value, reliability, compatibility and comparability of the results obtained with indicators based on the different models.

6.1 Introduction to indicator models

Five generalised models for assessment of company conduct in regards to labour rights issues:

(A) **Multi-criteria model** assesses company conduct as in a company's will and ability to integrate managerial measures appropriate to prevent violations from taking place. See indicator example in **Table 24**.
(B) **Checklist model** assesses company conduct as in managerial measures taken to prevent violations from taking place. See indicator example in **Table 25**.

Key questions I model *assesses company conduct as in key managerial measures taken to prevent violations from taking place. See indicator example in*

(C) **Table 26**.
(D) **Key questions II model** assesses company conduct as in explicitly stated intentions and general management efforts made to prevent violations from taking place. See indicator example in **Table 27**.
(E) **Country and industry model** assesses prevalence of violations in country, near location and industry as a reflection of probability of prevalence in company. See indicator example in **Table 28**.

The complexity of the indicator models, as reflected in the number of assessment criteria they apply, decreases when moving from model A to E, and concomitantly the coverage of issues and level of detail of the data collected naturally also decrease. On the other hand, less company involvement is required when approaching the country and industry indicator model (E), where – in complete contrast to the multi-criteria model (A) - only general data is applied and the access to data therefore is unimpeded if available. The development of the presented models aims at different data collection strategies and validation possibilities.

***Table 24**: 'Abolition of forced labour' indicator scoring for Company G based on 'Multi-criteria' model (A).*

MULTI-CRITERIA (A)									
Managerial measures	**The company has established a practice or issued a guideline, which supports integration of the measure stated in the left column**			**The company has communicated and delegated responsibility for compliance with the practice/guideline to relevant managers and employees**			**The company performs continuous active control to ensure that managers and employees comply with the established practice or guideline**		
Recruitment	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
1. Birth certificate, passport, identity card, work permit or other original documents belonging to the employee are not under any circumstances retained or kept for safety reasons by the company neither upon hiring nor during employment			X			X	X		
2. No money deposit or hiring fee is received for a person to be considered for or to enter employment			X			X	X		
3. Applied recruitment agencies do not charge hiring fees from the company's future employees or are in any other way engaged in any form of forced labour	X								
4. Employment contracts that stipulate wage, working time, annual holidays and length of personal holiday, are issued		X			X		X		
5. Employment contracts that stipulate terms of resignation, which ensure employees voluntary leave of employment after due notice, are issued		X			X		X		
6. Employment contracts that are comprehensible to the employee as to terms, language and formulation are issued	X								
7. Employment contracts are kept on file		X				X	X		
During employment									
8. Overtime is voluntary for all employees paid by the hour			X			X	X		
9. Overtime is always remunerated at premium rate for employees paid by the hour			X			X			X
10. Working hours for all employees are recorded			X			X			X
11. Wages are paid on time with regular intervals			X			X			X
12. Wages amount to at least living wage for the concerned region at all times or at least minimum wage if higher			X			X	X		
13. Wage including bonuses and other benefits additional to ordinary wage is recorded for all managers and employees			X			X			X
14. Deductions in wage are only made with the consent of the employee and never for disciplinary purposes, and they are clearly stated in wage records and on employee wage slip			X			X			X
15. All employees and other parties have the possibility to file complaints about labour practices, which conflicts with the principles of employment on a voluntary basis, in confidentiality and without negative consequences		X		X			X		
16. A system for handling complaints regarding labour practices, which conflicts with the principles of employment on a voluntary basis has been established to ensure response and a fair, uniform and confidential treatment of complaints	X								
17. All complaints and responses are recorded	X								
End of employment									
18. Letter of resignation is issued and handed over to the employee upon resignation			X			X			X
19.Copies of letters of resignation are kept on file			X			X	X		

***Table 25**: 'Abolition of forced labour' indicator scoring for Company G based on 'Checklist' model (B).*

CHECKLIST (B)		
Managerial measures	**The company has established a practice or issued a guideline, which supports integration of the measure stated in the left column**	
Recruitment	**Yes**	**No**
1. Birth certificate, passport, identity card, work permit or other original documents belonging to the employee are not under any circumstances retained or kept for safety reasons by the company neither upon hiring nor during employment	X	
2. No money deposit or hiring fee is received for a person to be considered for or to enter employment	X	
3. Applied recruitment agencies do not charge hiring fees from the company's future employees or are in any other way engaged in any form of forced labour		X
4. Employment contracts that stipulate wage, working time, annual holidays and length of personal holiday, are issued	X	
5. Employment contracts that stipulate terms of resignation, which ensure employees voluntary leave of employment after due notice, are issued	X	
6. Employment contracts that are comprehensible to the employee as to terms, language and formulation are issued		X
7. Employment contracts are kept on file	X	
During employment		
8. Overtime is voluntary for all employees paid by the hour	X	
9. Overtime is always remunerated at premium rate for employees paid by the hour	X	
10. Working hours for all employees are recorded	X	
11. Wages are paid on time with regular intervals	X	
12. Wages amount to at least living wage for the concerned region at all times or at least minimum wage if higher	X	
13. Wage including bonuses and other benefits additional to ordinary wage is recorded for all managers and employees	X	
14. Deductions in wage are only made with the consent of the employee and never for disciplinary purposes, and they are clearly stated in wage records and on employee wage slip	X	
15. All employees and other parties have the possibility to file complaints about labour practices, which conflicts with the principles of employment on a voluntary basis, in confidentiality and without negative consequences	X	
16. A system for handling complaints regarding labour practices, which conflicts with the principles of employment on a voluntary basis has been established to ensure response and a fair, uniform and confidential treatment of complaints		X
17. All complaints and responses are recorded		X
End of employment		
18. Letter of resignation is issued and handed over to the employee upon resignation	X	
19.Copies of letters of resignation are kept on file	X	

***Table 26**: 'Abolition of forced labour' indicator scoring for Company G based on 'Key questions I' model (C).*

KEY QUESTIONS I (C)		
Managerial measures	**The company has established a practice or issued a guideline, which supports integration of the measure stated in the left column**	
	Yes	**No**
1. Birth certificate, passport, identity card, work permit or other original documents belonging to the employee are not under any circumstances retained or kept for safety reasons by the company neither upon hiring nor during employment	X	
2. No money deposit or hiring fee is received for a person to be considered for or to enter employment	X	
3. Employment contracts that stipulate wage, working time, annual holidays and length of personal holiay, are issued	X	
4. Employment contracts that stipulate terms of resignation, which ensure employees voluntary leave of employment after due notice, are issued	X	
5. Overtime is always remunerated at premium rate for employees paid by the hour	X	
6. Wages are paid on time with regular intervals	X	
7. Wages amount to at least living wage for the concerned region at all times or at least minimum wage if higher	X	
8. Deductions in wage are only made with the consent of the employee and never for disciplinary purposes, and they are clearly stated in wage records and on employee wage slip	X	
9. All employees and other parties have the possibility to file complaints about labour practices, which conflicts with the principles of employment on a voluntary basis, in confidentiality and without negative consequences	X	
10. Letter of resignation is issued and handed over to the employee upon resignation	X	

***Table 27**: 'Abolition of forced labour' indicator scoring for Company G based on based on 'Key questions II' model (D).*

KEY QUESTIONS II (D)		
General management	**Yes**	**No**
1. The company has formulated its position on prohibition of all kinds of forced labour* in writing as a policy, principle, guideline or similar	X	
2. The company position has been communicated efficiently to all managers and employees	X	
3 Responsibility for implementation of the position into management practices in the organisation have been delegated to relevant managers and employees	X	
4. Internal auditing, monitoring or other form of regular control on the subject is conducted on a regular basis		X

* Work or service, which is exacted from any person under the menace of any penalty and for which the said person has not offered himself voluntarily is considered forced labour, which is strictly prohibited. Slavery, debt labour, where debts are used to keep employees in a situation of bondage making it difficult to leave their position until their debts are paid off, or similar work carried out under direct or indirect compulsion is considered forced labour.

***Table 28**: 'Abolition of forced labour' indicator scoring for Company G based on 'Country and industry' model (E).*

COUNTRY AND INDUSTRY (E)				
Risk classification according to prevalence of forced labour				
Contextual risk class (CRC)	**Probability of forced labour in company**	**Violations in the country**	**Violations in industry and near location**	**Assessment**
1.	Very likely	Common	Unknown	
		Widespread	Occurrences in both industry and near location	
		Widespread	Occurrences in either industry or near location	
		Several	Occurrences in both industry and near location	
2.	Likely	Widespread	Unknown	
		Several	Occurrences in either industry or near location	
		Isolated	Occurrences in both industry and near location	
3.	Possible	Several	Unknown	X
		Isolated	Occurrences in either industry or near location	
4.	Unlikely	Isolated	Unknown	
5.	Very Unlikely	Non-existent	-	

6.2 Comparability and reliability of models A, B, C and D

The indicator models B, C and D all take a managerial approach to assessment of company conduct as the multi-criteria model (A) and therefore they all three also require site specific data. Based on this approach, the reliability of assessments obtained with models A, B, C and D, in terms of ability to provide correct indication of company performance (and ultimately presence of risk), is affected by several factors, in particular:

- Level of detail of model (coverage and sophistication)
- Assessor (partial/impartial) and location of assessor (in situ/ex situ)
- Validation possibilities

The reliability of assessment depends very much on the sophistication of the indicator model. It must be able to accommodate sufficient coverage of risk situations and reflect the optimal preventive company management effort in these situations adequately. The more specific and comprehensive the description of management effort, the more likely it is that the assessment is reliable.

Data reliability and data collection strategy are closely related when assessing issues of a particular sensitive character such as labour rights violations. It can have great influence on the reliability of the assessment, whether it has been conducted as self-assessment or impartial assessment, and in the case of impartial assessment, whether it has been conducted in situ or ex situ, due to the incentives of companies to cover up possible misconduct.

Validation of information means that the data collector validates the information obtained from one source by checking with another source and adjusting the assessment accordingly if necessary. When assessing negative impacts it can be difficult to uncover the true state of things; both in situ and ex situ data collection and validation by other sources than the main source can be an important step in ensuring reliability of the final assessment result. The internal validation possibilities are generally determined by the access granted the data collector, which typically depends on the influence that the assessment requirer may exert on the company undergoing assessment. The choice of data collection strategy typically aims at a specific validation level e.g. choice of application of questionnaires renders internal validation.

6.2.1 Indicator models' ability to adequately reflect the will and ability of a company to manage an issue

The assessment criteria of models B and C are based on the same identification of violation aspects as in model A (See **Box 1**, section 3.4.2). Model B includes all obligatory managerial measures determined on the basis of violation aspects, whereas model C only includes one managerial measure representing each violation aspect (see **Table 4**, section 3.4.2). All identified violation aspects are thus represented in the three models' assessment, but in model C the coverage is limited. Models B and C furthermore distinguish from model A by assessing performance solely on the basis of existence of established practices or issued guidelines. Model A additionally considers, the ability of a practice or guideline to fulfil the intent of the measure to minimise violations and its viability in the organisation (via scoring of implementation degree), and integration efforts in terms of delegation of responsibility and communication about guidelines and practices and monitoring of compliance. The integration efforts and the further distinction in implementation degrees considered by model A, serve the purpose of ensuring that practices and guidelines actually works as intended. Models B and C are therefore not as good as model A at indicating the ability of the company, they focus on the intentions (will) of the company, and thus constitutes less reliable, but also less time consuming assessments of company conduct, which are compatible with model A.

In the multi-criteria indicator model violation aspects are addressed by managerial measures to the extent considered necessary to ensure appropriate preventive management. The indication therefore becomes less reliable when some are taken out. When a reduced number are used to assess performance, such as in key questions I model (C), situations are likely to occur where a company is assessed to perform poorly, even though it in general manage the issue quite well, simply because the selected measures are not representative for their management effort. Naturally this problem may also exist with an opposite sign, when a company is assessed to perform very well.

The key questions II model (D) is more general in its assessment of management efforts than models A, B and C, and its assessment criteria builds on a similar principle as the integration efforts of the multi-criteria indicator model. It does not consider the specific violation aspects, but assesses existence of formulated intentions to observe labour rights and general efforts made to implement these intentions. The general character of criteria 2, 3 and 4 of model D (**Table 27**) does that the assessment mainly relies on the company's own perception of effort, unless it is SA8000 certified, which will indicate a certain effort. In general, when assessment criteria are very general in their formulation it becomes easier to circumvent the truth when assessed, because it is up to the company to interpret whether their efforts are adequate in serving the criteria. There is a tendency for general assessments of conduct (particular in regards to sensitive issues) always to come out positive.

The value of the indication of model D mainly lies with criterion 1 in the sense that if the company has taken the time and effort to formulate a policy or position on the issue, it serves as some indication that they have related to the issue in one way or the other, and compared to not taking action at all, this is a positive measure. One may also keep in mind that if a company violates rights, while clearly having stated not to do so, the violations, at least from the outside point of view, become premeditated, which may have a impact on the company's 'license to operate', and may therefore be a strong motivator for acting accordingly. However, whereas the existence of a policy or position may indicate the presence of will, it does not indicate ability. It does not uncover to what extent the company understands the implications of enforcing observance of it, nor does it provide information about the company's ability to manage the issue. The model is hence very unreliable in its assessment of the ability of a company even though it holds some information value as regards the intentions of the company. On

the other hand, the company involvement is very low since the assessment can be completed in a manner of minutes.

In general, the results of model D are not considered particularly comparable to those of models A, B and C because it assesses whether measures has been taken as opposed to what measures has been taken

6.2.2 Scoring example

*The different indicator scorings for Company G presented in **Table 24** (model A), **Table 25** (model B),* **Table 26** (model C) and **Table 27** (model D) demonstrate how significant coverage of aspects and the consideration for integration efforts are for the results of the assessments.

The multi-criteria indicator scoring presented in **Table 24** was performed for a small manufacturing company, G, which employs blue collar workers and is located in a medium risk context (Contextual risk class 3 for forced labour violations). The checklist indicator (B, Table 25) scoring is obtained from the multi-criteria indicator by scoring yes when practices or guidelines addressing a measure exist, i.e. when implementation degrees 2 and 3 have been scored in the multi-criteria indicator, and no for the remaining. By reducing the included number of measures (one for representing each violation aspect), the scoring for the key questions I indicator (C, Table26) is obtained. The key questions II indicator (D) scoring presented in **Table 27** was conducted in situ as a pre-assessment to the multi-criteria assessment.

When value is attributed to the indicator scorings the differences in results become more tangible. Value attribution to model A is presented in Chapter 3 (section 3.5.2). A similar value attribution to models B, C and D can be made quite straightforward by awarding yes answers with a score of 1 and no answers with a score of 0 since weighting of measures is not recommended[25]. The calculated company performance and risk scores[26] are presented in **Table 29**.

***Table 29**: Calculation of company performance and company risk for scoring with multi-criteria indicator (**Table 24**), checklist indicator (**Table 25**), key questions I indicator (*

***Table 26**) and key questions II indicator (**Table 27**). The company context is assessed to be contextual risk class CRC 3 and is ascribed contextual adjustment factor CAF= 0.7 accordingly.*

Assessment type	Multi-criteria (A)	Check list (B)	Key questions I (C)	Key questions II (D)
Measures	19	19	10	4
Company performance (CP)	139	14,3	9,3	3
Max company performance (CP_{max})	304	17	9,3	4
Company free rein (CFR)	0.49	0.16	0	0.25
Company risk (CR)	0.34 Medium risk	0.11 Low risk	0 Low risk	0.18 Low risk

According to the multi-criteria indicator scoring the improvement potential for Company G in regard to preventive management of the issue is significant. The main area which Company G needs to improve is practices regarding employment contracts (criteria 4, 5, 6, 7), in particular what concerns comprehensibility for the employee, because the majority of employees are immigrants. Moreover, Company G does not have any practices ensuring that the applied recruitment agency does not charge hiring fees or ask for money deposits from employees (criterion 3), and the company only has informal complaint procedures (criteria 15, 16, 17). In general delegation of responsibility and communication about practices is high, but the company only carries out active control in regard to measures concerning wage and working hours.

The checklist indicator scoring only includes consideration for the lack of practices, which reflects in the ‘low’ company risk assessed with model B as opposed to the ‘medium’ company risk assessed with model A after

[25] Weighting of measures are not performed as a general rule, but the three measures covering ‘Examination of employee grievances’ is an exception. These are weighted with one-third each in the performance indicators where this company activity is included, so the activity is weighted as if addressed by one measure. (Dreyer et al, 2009a1)

[26] All company performance assessments based on a managerial approach must undergo contextual adjustment in order to take the actual need for targeted management effort into account.

contextual adjustment. Had Company G lacked active control for just three more measures, the resulting company risk would have been assessed to be 'high to medium' instead with the multi-criteria indicator, which shows that the span between the results of the two results is quite significant.

None of the practices missing in the management effort of Company G according to models A and B are covered by the key questions I model (C), which therefore concludes that there is no company risk. The scoring example illustrates that even though the models A, B and C have the same basis and are therefore somewhat compatible, the comparability of results is somewhat debatable.

Company G obtains a company risk score of 0.18 with the scoring performed with the key questions II model (D), which results in a placement in the 'low' company risk category. Compared to the models A, B and C, the result of model D comes closest to that of models B and C, however considering the result's dependency on the existence of a policy and the observations at company G, this is, at least in this case, considered to be coincidental.

Many companies have not formulated their position on fundamental labour rights in writing. It does not mean that they necessarily violate these rights. Company G is a very small company located in a context where it is not uncommon that companies violate fundamental labour rights. Based on the interviews conducted during the visit in the company it is concluded that this company probably would not have been so concrete about their position on forced labour had it not been bought by a large corporation a few years earlier, where corporate social responsibility was an important issue. The preventive measures that the company has taken are not considered to be a result of the policy, but rather a result of the general management style which existed prior to the shift of ownership of the company. If the company had not had the policy, they would have obtained a company risk score of 1 'very high' company risk instead of 'low', i.e. quite the opposite result. Neither the 'very high' nor 'low' company risk category seems to be adequate descriptions compared to the observed risk in the company.

Observed and assessed risk in scoring example
It is considered unlikely that what is perceived as traditional forced labour takes place in Company G based on the observations made during the scoring and the subsequent monitoring period. However, risk is present in Company G in regards to violation of the rights of migrant workers due to language barriers and lack of employment contracts. This group is in general subjected to forced labour conditions in the country due to their lack of status, also in regards to the trade union membership, which may also be affecting their status and working conditions in the company. Based on these observations 'medium' company risk seems to be an adequate description for the risk situation in Company G. The scoring example illustrates how the simpler models tend to overstate company performance.

6.2.3 Data collection strategy and reliability of assessment

This tendency to overstate performance is likely to be enhanced for models B and C when data is collected ex situ, because the natural validation possibilities of the data collector are more restricted ex situ. On site the data collector has possibility to elaborate more on questions and receive more elaborate answers as opposed to when located ex situ, and even though internal validation possibilities are limited, personal observations may be valuable sources of validation. It is however important to note that the applied indicator models' may not always be able to accommodate the risk situations which may be uncovered through these personal observations due to their lack of sophistication.

The reliability of results obtained with the key questions II model (D) is not considered to be particularly sensitive to the location of the data collector, because the data collector has no actual assessor role due to the chosen type of assessment criteria. If a company fabricates a policy solely for the purpose of answering a questionnaire, external validation, in the form of general information search about the company, will expose this. Regardless, the written commitment made via the questionnaire will be somewhat binding and in that sense it may result in changes accordingly as discussed earlier.

The case studies showed that the complexity of assessment based on model A required a skilled assessor to carry out the scoring process, and that the comprehensiveness of the assessment furthermore excluded the

possibility of conducting it as a telephone interview (Dreyer et al, 2009b). Ex situ data collection is hence not an option for when conducting assessment with model A.

Self-assessment – application of questionnaires
Self-assessment through use of questionnaires is an attractive method to collect information from companies upstream and downstream the product chain because it requires less involvement than in situ assessments such as model A or perhaps model B entail. Of the presented indicator models B, C and D are the best suited for self-assessment due to their balance between coverage, comprehensiveness and complexity. Questionnaires have to be simple and self-explanatory to a large degree in order to be answered correctly. If they are too comprehensive and demanding, respondents are likely to give up beforehand unless the consequences of not answering are severe, and if the complexity is high, as if based on model A, the risk of misinterpretations, and hence erroneous answers, will be high. The reliability of self-assessment is in general very low, because the data provider may often be dependent on the inquirer as a customer (supplier and subcontractors), which makes it more attractive for them to answer what they think the inquirer wants to hear rather than the truth. This is likely to become more pronounced, the more dependent the company is, but on the other hand the possibility of conducting more detailed in situ assessment will also increase with the leverage this dependency provides. The more detailed (specific) the assessment, the harder it becomes to lie, manipulate or circumvent the truth, however also the less likely it becomes that companies, who are less dependent of inquirer, will answer due to the time consumption. It is a challenge of questionnaires to strike the correct balance between comprehensiveness and acceptable indication of performance on one hand with level of difficulty and time consumption of answering on the other hand. There is also the risk that when questions are detailed and few they may not be able to embrace the management effort of the company sufficiently, which might make the company reluctant to answer or answer correctly, because they feel that their efforts are not valued in the assessment. This risk is present when applying model C.

Telephone interviews
Telephone interviews are generally not particularly binding for the respondent and in that sense therefore not very reliable. On the other hand it may be easier for the data collector to assess whether measures actually exists in this way rather than on the basis of questionnaires given the possibility to ask more elaborately as in the onsite data collection. Telephone interview is only a possible data collection strategy when the applied assessment model is simple and when the company assessment is limited in size i.e. that it only includes few topics. Of the models presented here, model C is thus the most likely candidate for such a data collection strategy.

Case studies showed that even with the best intentions respondents' perception of things did not always agree with how they really were when investigated further, which accentuates the importance of the assessor role of the data collector, and this is relinquished when self-assessment is conducted.

Internal validation possibilities and reliability of assessments
It has decisive influence on the reliability of the assessment (within the boundaries of the applied model) to what degree, and on the basis of what sources, a company assessment is validated. A natural level of validation accommodates each of the presented models based on their design and the degree of involvement of the company which they aim for. In addition to this comes the possible internal validation level, which largely is determined by the access (goodwill or influence) which is present for the data collector. The less internal validation, the more weight must be given to the reliability of the individual sources of information, which in some cases may be problematic. For example, in a typical in situ data collection in a medium-sized company the chosen respondents are often representatives of middle management or management. Management may not necessarily be completely aware of what actually goes on in the company (at least not on a detailed level) and the scoring is more likely to reflect how management thinks that daily management is rather than how it actually is. Middle management may be more in touch with reality, but may also have strong incentives to hide the true state of things if the company is likely to reflect poorly in the assessment due to the fear of personal repercussions. Furthermore, both management and middle management may also have strong incentives to cover up things if they suspect that it might affect the relationship with assessment requirer if this is a customer or if practices are in conflict with the law. Document review and/or interviews with workers or workers representatives can therefore be very important means to achieve reliable in situ assessment. Though the results

of these without internal validation may be more certain than those obtained ex situ, the reliability may still be debatable – especially if the chosen indicator model is already weak when it comes to assessment of the company's ability, i.e. when it focuses on the intentions of the company such as models B and C.

6.3 Comparability and reliability of model E in comparison to models A-D

Models A, B, C and D all require site specific information from the company undergoing assessment, however the extent of involvement of the company descends approaching model D. Model E builds on the context classification method presented in Chapter 3 (section 3.4.3), and relies entirely on information, which can be obtained general sources as confirmed by the context assessments performed in the case studies presented earlier. Model E is remarkably different from models A-D because it assesses company conduct on the basis of the conduct of other companies in the same country, near location or branch of industry, as opposed to assessment on the basis of the specific actions of the company. Model E assesses risk of violations directly, whereas models A-D assess performance in prevention. The determination of managerial measures in models A, B and C and general management efforts in model D necessitates that obtained indicator scores are contextual risk adjusted, i.e. that models A, B, C and D are combined with model E in order to take the contextual need for performance into account. Model E's ability to pronounce on company risk when applied alone is however debatable. It is a question of whether it is acceptable to make generalisations about company conduct. Moreover, the results obtained with model E are of course unable to differentiate between companies in the same region and therefore of little value if dealing with a product chain mainly located in the same country.

Even though a company is operating in a country where labour rights are violated extensively, it does necessarily mean that the company violates the rights of its employees, it just means that if they do not consciously address labour rights in their management practices, violations are likely to occur. Differences in the companies' management practices may thus result in entirely different conduct towards employees. The assessment with model E may hence in the worst case present a result, which is in complete disagreement with reality. Case study company B is a good example of this problem. Company B is located in a context where discrimination is considered common, but the company has made an exceptional effort in management of employees ensuring equal terms in all aspects of the working place, thus lowering the actual risk of discrimination in the company significantly (Dreyer et al, 2009b2). According to results obtained with model E there is a very high risk of violations in this company, whereas according to model A there is low risk, which was backed by the observations made during the scoring and in the subsequent monitoring period. As the example demonstrates, it is problematic to conclude that many violations on a country basis will make it likely that violations take place in the company. It is possible for the company to distinguish itself from its context through conscious management effort, and this will often be a requirement if the company is to do business with companies that employ social responsibility principles. It will however be more acceptable to conclude that no or few violations in the country will make it unlikely that violations take place in the company, because few violations on a country basis will be an expression that the conditions which enable violations are not present in the country i.e. that it is difficult to violate labour rights in the country. This is supported by the case studies. Results from the case studies show that violations are of limited or of small consequence in the companies in low to medium risk contexts (CRC 4 and 5) (see **Table 19** and **Table 22**, section 4.1.1).

Being highly unreliable in its prediction of impacts, the country and industry model (E) is problematic to include in Social LCA alongside more reliable assessments of conduct. In general, its application should be weighted against whether in the concrete situation it is judged better to include information which may be misleading as opposed to not including information at all. On the other hand model E may be applied for scoping purposes, where companies belonging to high to medium risk contexts (CRC 1, 2 and 3) are sought out for more detailed assessment. (Dreyer et al, 2009b)

The comparability of results obtained with models E and A-D is low and when mixing these in the LCA, there is a risk that general (and very uncertain) data may overshadow data of more specific (and certain) character unless steps are taken to express results obtained with the different assessment models in light of their related uncertainties. Compatibility of results obtained with indicators based on model E with results obtained with model A-D is furthermore challenged by the different approaches to scoring. Due to the managerial approach to assessment of the models A-D, indicators based on these models produce results which may be considered

compatible, whereas model E must apply a value attribution system very different from these, making the results of this model much less compatible with those of the other models.

Table 30 summarises the characteristics of the simplified indicator models in addition to the multi-criteria model.

6.4 Usability of results

The choice of which type(s) of indicator models to apply in an LCA study must be in accordance with what kind of actions the study commissioner wishes the LCA study to support.

The goal and application of the LCA study poses requirements to the information value of the company assessments as well as the reliability. It is essential in the life cycle management application that the results of the company assessment are action oriented and responsive to behavioural change. From the LCA results it must be possible to deduce the information required for the product chain owner to manage product chain risk and opportunities adequately. The product chain owner must be able to understand, on the basis on the LCA results, what changes he can facilitate with his actions in order to achieve improvements in the life cycle companies. For all applications, the assessments must hold sufficient information to be able to distinct company performances from each other. If for example ninety-five percent of the companies score maximum, the assessment will not be particular applicable. Additionally, what differentiates companies from each other must of course be a reliable indication of difference in actual risk.

The different indicator models provide results which are more or less responsive to change and action oriented, which therefore makes them more or less applicable in a Social LCA application in support of life cycle management.

If the Social LCA is primarily based on application of indicator model E more sophisticated models will have to be introduced at a later stage if the results are to form basis for life cycle management. Model E assesses company conduct on the basis of conditions, which the company cannot change through change of behaviour. A Social LCA based on country and industry assessments can therefore not support decisions aiming at improvements in life cycle companies, since these will not display in the LCA result. The LCA application will thus be limited to support selection and de-selection of life cycle companies based on geographical location.

Model D holds little information value and in reality, it is only responsive to change in regards to formulation of intentions and is therefore not particular responsive to actual changes in behaviour. As an indirect indicator of risk, which is its purpose as an inventory model in the Social LCA, it is not particular good, because lack of e.g. a policy does not indicate risk and existence of a policy does not ensure low risk. For the product chain owner to know about which companies in the product chain that have policies is however interesting because it indicates the willingness of these to work with the issues and hereby the product chain owner's possibility to facilitate change, so in that sense the results of model D holds information that is of value in a life cycle management application.

Models B and C hold more information and provides the product chain owner the possibility to facilitate positive change e.g. by posing specific requirements to improvement, giving advise on improvements, educating or otherwise supporting suppliers and subcontractors in making social improvements.

Reliability separates model A from models B and C, and model A also gives the product chain owner the possibility to give consideration to the companies' use of self-regulation and third-party control.

***Table 30**: Five different indicator models for Social LCA inventory modelling of labour rights impact categories.*

Model	(A) Multi-criteria	(B) Checklist	(C) Key questions I	(D) Key questions II	(E) Country and industry
Indicator example	**Table 24**	**Table 25**	**Table 26**	**Table 27**	**Table 28**
Object of assessment	Company conduct as in a company's will and ability to integrate managerial measures appropriate to prevent violations from taking place.	Company conduct as in managerial measures taken to prevent violations from taking place.	Company conduct as in key managerial measures taken to prevent violations from taking place.	Company conduct as in explicitly stated intentions and general management efforts made to prevent violations from taking place.	Prevalence of violations in country, near location and industry as a reflection of probability of prevalence in company.
Required specificity of data	Company specific	Company specific	Company specific	Company specific	Company context specific
Assessment parameters	Two-dimensional: (1) managerial measures taken (A, B, C, …) (2) efforts in integration of measures into daily practice (I, II, III)	One-dimensional: - managerial measures taken (A, B, C, …)	One-dimensional: - managerial measures taken	One-dimensional: - existence of formulated intentions and general management efforts made.	One-dimensional: - occurrence of violations in external environment
Assessment technique	Semi-quantitative assessment: Scoring of implementation degree 1-3 for each integration effort I, II and III	Qualitative assessment: Scoring yes or no	Qualitative assessment: Scoring yes or no	Qualitative assessment: Scoring yes or no	Qualitative assessment: Rating probability of violations: very likely, likely, possible, unlikely, very unlikely.
Value attribution	Calibrated value attribution to indicator model based on performance scenarios as part of the characterisation model for labour rights violations (see section 3.5.2)	Value attribution: yes=1 and no=0	Value attribution: yes=1 and no=0	Value attribution: yes=1 and no=0	Value attribution to probability levels
Coverage of issue	Specific (aspect oriented): All identified central violations aspects (see **Table 4**)	Specific (aspect oriented): All identified central violations aspects (see **Table 4**)	Specific (aspect oriented): All identified central violations aspects are represented (see **Table 4**), however coverage of each limited.	General (issue oriented): No coverage of specific aspects	General (issue oriented)
Typical data sources	- Interview: workers, management, union and workers representative(s), local NGO's - Review of documentation - Personal observations - Public media search about the company (news media, internet, company homepage, financial reports, sustainability reports, NGO's homepages etc) - Awards - Investigative reports in connection with award granting - Audit reports in connection with certifications, e.g. SA8000[(1)]	- Questionnaire or interview: management - Interview: local NGO's - Personal observations (if in situ) - Public media search about the company (news media, internet, company homepage, financial reports, sustainability reports, NGO's homepages etc) - Awards - Investigative reports in connection with award granting	- Questionnaire or interview: management - Interview: local NGO's - Personal observations (if in situ) - Public media search about the company (news media, internet, company homepage, financial reports, sustainability reports, NGO's homepages etc) - Awards - Investigative reports in connection with award granting	- Questionnaire: management - Interview: local NGO's - Public media search about the company (news media, internet, company homepage, financial reports, sustainability reports, NGO's homepages etc) - Rewards and certifications: e.g. SA8000 certification[1)]	- Country reports on labour rights violations - NGO's homepages - News media
Typical data collection strategy	In situ: formal site visits or auditing	In situ: informal site visits or Ex situ: questionnaire or telephone interview	In situ: informal site visits or Ex situ: questionnaire or telephone interview	Ex situ questionnaire	Desk study of literature and electronic materials.
Possibility of internal validation	Several sources of internal validation (see data sources)	No or limited sources of internal validation (see data sources)	No internal validation	No internal validation	N/A

(1) The SA8000 standard is a voluntary global auditable code on labour standards that can be employed for all sectors. It was developed in 1996 by Social Accountability International (SAI) through an international multi-stakeholder process and became fully operational in 1998. (SAI, 2001)

6.5 Choice of indicator models

Choice of which indicator model(s) to apply in a Social LCA study must be in accordance with the goal of the study. The choice must be based the models' ability to produce sufficiently reliable and adequate results to serve the intended application of the study.

6.5.1 Conducting full Social LCA

When difficulties are met in collection of detailed specific data as for the assessment with multi-criteria indicators, it may be necessary to apply simpler models if a full Social LCA is to be performed. This may entail an adjustment of the goal and scope of the study accordingly. The indicator models presented in **Table 30** relate to different means available to the product manufacturer to retrieve the necessary information upstream and downstream the product chain (typical data collection strategies), e.g. questionnaires, informal or formal visits, and they can be applied depending on the relative influence that of the product manufacturer exerts over the companies (Dreyer et al, 2009a). Based on the typical pattern of the product manufacturer's influence and access to data in the product chain presented in **Figure 10** (section 3.3.1), the natural choice of indicator model in the Social LCA study is shown in **Figure 14**.

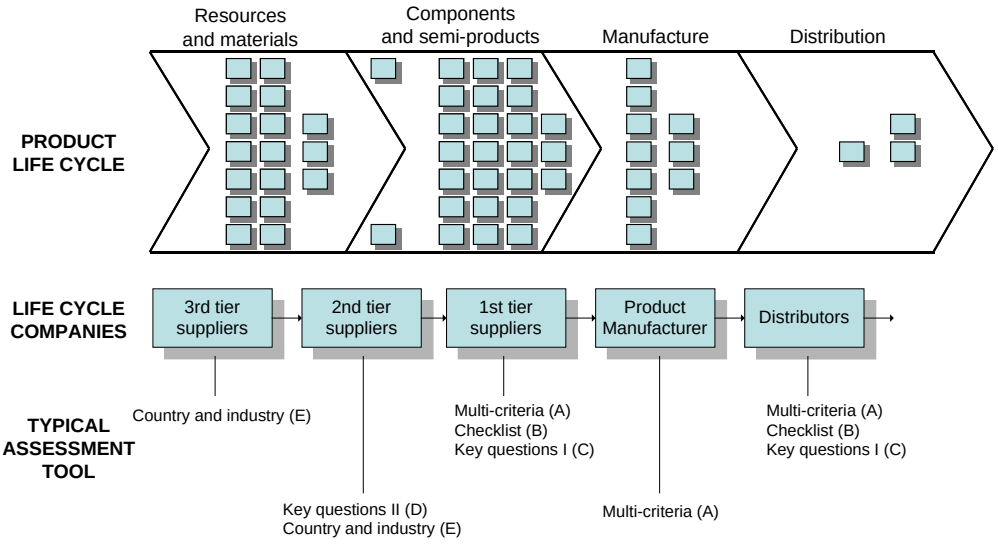


Figure 14 *Typical uses of the different types of indicator models in Social LCA dependent on the typical access to information in the product chain. Based on the bounded product system presented in* ***Figure 10*** *(section 3.3.1).*

The indicator models A-D all require some kind of involvement with the life cycle company. The indicator models may be applied in accordance with overall goals (acceptable level of social responsibility in the chain) and scope (time constraints, resources allocated to the investigation, etc.), which both are dependent of the possible influence which the product manufacturer can hope to exert over the life cycle companies. Typically models B, C and D will be used where there are restrictions on resources or association. For example a visit to a contractor in connection with other business may provide the opportunity to carry out assessment with models B, C or D, engagement of a new contractor may involve assessment with model B as a first step and model A at a later stage. For internal assessment model A will be an obvious choice.

Where the product manufacturer exerts little or no influence and access to data is limited, the only option is model E, when choosing between the indicator models in **Table 30**.

Given the relatively low reliability of simplified models it is very important to use them in a deliberate manner and conduct sensitivity analysis when combined with more reliable models in an LCA study. The LCA practitioner must give consideration as to whether it will be better to conduct a smaller study than a full, but a very uncertain, study.

It is recommended to accompany each company assessment with a reliability factor if a mix of indicator models is used in the same Social LCA. A set of reliability factors may be determined for the chosen indicator models in the scope definition of the LCA study. The reliability factor is product related and aggregated in parallel to

the company's impact profile, so a total reliability score can be obtained for the LCA study. In this way the reliability of the final Social LCA is transparent for interpretation of results and it will be possible to keep track of the reliability of the individual assessed company impact profiles.

6.5.2 Screening LCA

The main weakness of the simplified site specific models B, C and D is that they indicate intentions rather than ability of a company to manage, which means that they will have a tendency to give a more positive impression of the company management than it might actually qualify for. The models' tendency to overstate performance will lead to identification of few hot spots, i.e. there is a risk of false positives, when applied in hot spot analysis.

The models B and C moreover suffer a reliability loss when data is collected ex situ due the sensitivity of labour rights issues, which in addition to their inherent weaknesses, makes them questionable for screening LCA, where ex situ data collection is preferred and a low risk of dismissing potentially problematic companies is required.

In general model D provides a very unreliable indication of preventive management due its reliance on existence of statement of intent (see earlier scoring example). The risk of both overstating and understating performance is present (i.e. risk of false positives and false negatives) and therefore it is not a particular good indicator model to apply in screening.

Model E is not reliable in distinguishing between companies in medium to high risk contexts (CRC 3, 4 and 5)(i.e. risk of false negatives and positives) and therefore it is not really adequate for screening purposes. It is however able to distinguish between probable low company risk on one hand and probable medium to very high company risk on the other hand, which makes it a suitable for scoping.

In summary, none of the discussed approaches to simplification of the multi-criteria indicator model provides data that give the desired compatibility and comparability with the results from the detailed model.

7 Managing corporate social responsibility with Social LCA tools

Working with Social LCA as a management tool is a way to work consciously with product chain responsibility. The company conducting the LCA has to decide in what way they perceive and take on responsibility for the activities in the product chain. This chapter explores some of the implications and possibilities of the developed Social LCA method in a life cycle management application.

7.1 Scoping corporate social responsibility in the Social LCA study

The choice of impact categories and product relation principle in the Social LCA constitutes an important scoping of the Social LCA study. In the life cycle management application, these choices will reflect the product chain responsibility assumed by the company.

7.1.1 Defining corporate social responsibility

When a company conducts Social LCA with the aim of supporting life cycle management, the choice of impact categories indirectly scopes the social responsibility by defining the topics which the company intends to work within its product chain. Of course it does not eliminate the possibility of supplementing the life cycle management strategy with other tools, but it defines a minimum.

7.1.2 Scoping the extent of corporate social responsibility along the product chain

Serving the function of deciding the degree to which the product must carry the social impact profiles of the life cycle companies, the product relation factor is of central importance in the Social LCA method (See section 3.3.2). The application of the product relation factors indirectly scopes the extent of the product owner's social responsibility for his product chain when the Social LCA is applied as basis for life cycle management, because the LCA results are used to determine and focus the company's actions for improvement, and the concrete actions express the extent of the social responsibility actually assumed by the company. In other words, product chain analysis carried out in the inventory phase on the basis of the chosen product relation principle defines who is embraced by the product chain owner's responsibility and to what degree. The product relation principles place emphasis differently in the product chain. For example, the use of 'number of working hours' as basis places the strongest emphasis on companies where a high degree of manual labour is involved, and hence a lot of people employed per product unit. In contrast, the use of 'influence' as basis places the emphasis on the companies where the product chain owner directly or indirectly has the possibility to exert the most influence. In the latter case, the product relation factor reflects the degree to which the product chain owner enables the actions of the product chain companies with the revenue that his business generates for them either directly (e.g. for an immediate supplier) or indirectly (e.g. for a supplier's supplier). This also entails that the product chain owner, in terms of the Social LCA, carries full responsibility for his own production or for subsidiaries where he has controlling interest, which is expressed in a product relation factor of 1. When 'working hours' is applied as the product relation principle, the same only applies when the product manufacturer also is the company in the product chain which requires most manpower per product unit. On the other hand the 'working hours' emphasizes responsibility for the life cycle companies where the largest number of people directly affected by *a* company's conduct is present, i.e. employees (the internal impacts sphere of life cycle companies), see **Figure 4** (section 2.4). When responsibility follows the largest number of people affected by the activities in the life cycle, it is in full accordance with the chosen area of protection of the method 'human dignity and wellbeing'. In a life cycle management perspective on the Social LCA, it however makes good sense that responsibility accompanies influence[27], because it makes it more likely that the product chain owner actually can take actions to make improvements in the product life cycle on the basis of the Social LCA. The product chain owner is more likely to be able to obtain adequate information and have the necessary influence to put pressure on the most important contributors to social impacts according to the Social LCA. On the other hand it is more likely to make a larger difference in terms of the number of people who's social conditions will be affected, if the product chain owner is successful in making just a few improvements despite a perhaps small monetary

[27] In Jungk (2006) the Danish Institute for Human Rights (DIHR) defines three basic principles to be applied in a business context for identifying one actor's responsibility for the actions of another in regards to human rights violations. According to the enabling principle responsibility follows influence in the sense that if one business enables or empowers another to do anything which violates human rights, the original business has some degree of responsibility for the violations. The enabling principle is based on the extent to which the first financially supports the second.

influence, if the 'working hours' principle is applied. From a product declaration perspective on the Social LCA, the latter product relation principle may be a better choice since it reflects how great a part a company plays in the life cycle rather than how great a part it plays in relation to the product chain owner.

The example demonstrates that the type of responsibility indirectly placed with the product chain owner through the choice among the two product relation principles is quite different. It is therefore important that the LCA practitioner makes a deliberate choice about product relation principles in accordance with the wishes of the LCA commissioner and the goal of the LCA in order to obtain the best possible application of the LCA study results. The example also emphasises the importance of making the chosen product relation principle transparent in the presentation of the Social LCA results.

Alternatively, different product relation principles may be applied in the interpretation of the Social LCA results providing different views on the impacts of the product chain, however when decisions are to be made, one must be chosen.

7.2 Focusing with product chain analysis and context assessment

Because of the requirements to the specificity of the inventory data, it can be a protracted affair to conduct company assessments for all the companies in the product chain, and therefore it is a good idea to do it in a stepwise process giving priority to the companies which have the strongest relation to the product and where there the potentially largest risk is present as revealed by the context assessment. The product of the contextual adjustment factor and the product relation factor plays a decisive role in the calculation of the product related company risk score (see section 3.3.2 and section 4.4.2), and the companies in the product chain can therefore be sorted into priority groups using these criteria.

The company conducting the Social LCA study can make a deliberate prioritisation of efforts by defining a minimum scope of responsibility of the product chain based on the magnitude of the product relation factor, so companies with a product relation factors below a specific value, X, are not included in the first iteration of the Social LCA.

The first iteration of Social LCA is conducted in three steps:

(1) Mapping the product chain and determining product relation factor
(2) Identifying and classifying contexts
(3) Assessing selected companies' impact

Mapping the product chain and determining product relation factor– Product chain analysis
The first tier of suppliers and subcontractors upstream and downstream is determined and product relations established. Depending on the choice of product relation principle (see Chapter 3, section 3.3.2) this will be a more or less troublesome task. Product relation principles based on contribution to the cost or value of the product will make the task easier than if based on working hours spent on the product or based on influence, since the latter requires information from the supplier or subcontractor, whereas the former requires information which may be generated within own company.

Because the product relation of a second tier company will rely on the product relation of the first tier company these will be of smaller value than for the first layer due to the multiplication involved. Therefore, if the product relation factor for a company is smaller than X (PRF<X) there is no reason to trace the branch of the product chain further upstream in the first iteration. Those companies with product relation factors greater than X (PRF>X) must be contacted with a respect to gathering the information necessary to map their product chain. Sometimes it may be more practical to wait contacting the companies until it is known whether it is also necessary to conduct a company assessment.

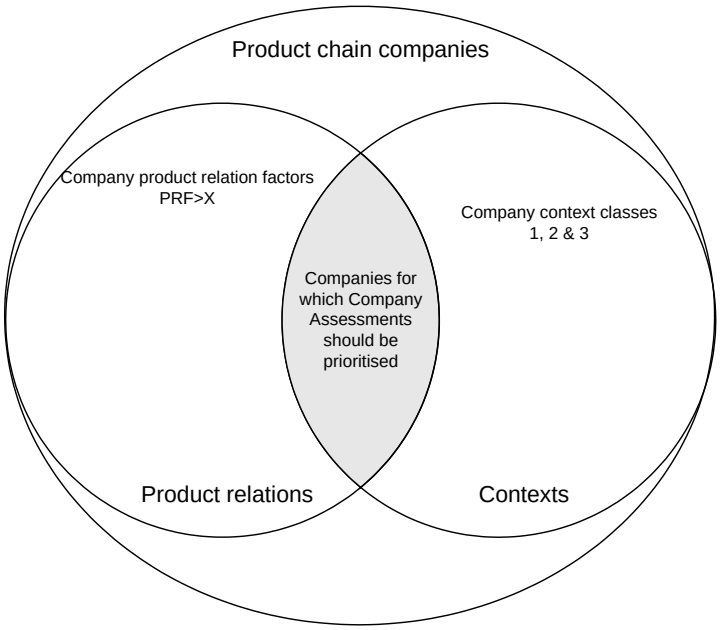
Identifying and classifying contexts - Context assessment
If the information is not already available at this stage (depending on the product relation principle), it is necessary to gather information about the location of the companies that were selected on the basis on their product relation factor (PRF>X). Sometimes it can be a challenge to identify the specific production site when

products are bought from large corporations or wholesalers. If it is difficult to identify the original production site in a corporation at this stage, the analysis may operate with different possible sites. If company assessment is deemed necessary for either of the sites in this analysis, all should in principle be included in the study and perhaps represented by weighted average in a final Social LCA study.

Assessments of context risk are performed for the selected companies for all impact categories and the companies are ascribed the relevant contextual risk class. The Context risk classification for fundamental labour rights violations presented earlier leads to a division of companies into five classes (see **Table 10** , section 3.4.3). There are no labour rights violations or a limited number of violations in contexts belonging to contextual risk classes 4 and 5, and therefore when low priority is given to companies belonging to these classes in the first iteration, the probability that a potentially problematic company is excluded is relatively low.

Assessing selected companies' impacts – Company assessment
Company assessment is performed for the companies with a product relation factor higher than X, which have company contexts belonging to the high to medium risk classes (CRC 1, 2 and 3). In this way company assessment is only performed for a limited number of companies in the first iteration of Social LCA. **Figure 15** illustrates the applied prioritisation principle.

***Figure 15**: Illustration of the prioritisation principles applied in the first iteration of stepwise Social LCA including impact categories covering labour rights indicators.*



The introduction of a cut-off criterion on the product relation factor as first selection criterion in the screening is deemed safe since the potential range of variation of the context assessment and the later company performance scores is so that even the worst companies in the worst contexts will not contribute significantly to the total score for the product system if the product relation factor is below the cut-off criterion.

7.3 Managing social responsibility internally with Company assessment

The Company assessment may serve as a good platform for systematic management of social responsibility when used internally in a company. With its normative outset and focus on concrete implementation, the Company assessment forms good basis for a company to turn its intentions of social responsibility into practice. The social issues considered by the Company assessment define the scope of the company's social responsibility, e.g. fundamental labour rights, workplace health and safety and anti-corruption. Most companies that have ethical guidelines in the form of code of conduct, defining their corporate social responsibility, address these issues.

The performance indicators of the Company assessment define the efforts required by a company to manage these different social issues and in this sense they provide some general guidance as to how a company may

embrace its social responsibility and live up to its code of conduct. On the basis of the assessment it is possible for the company to evaluate its status and progress in regards to adhering to its commitments, and identify possible areas of improvement. When the assessment is conducted not only with respect to assessing company performance, but also with an ultimate goal of improving it, it becomes possible to go more in-depth, which supports more specific recommendations to improvement to be given on the basis of it. The process of conducting the assessment in itself may also facilitate the following improvement process, because when conducted in this way it enables the participants to gain deeper insight to the issues and a greater understanding of their role in daily management.

The case studies presented earlier were conducted also with the aim of giving the participating companies recommendations on how to improve their performance in managing labour rights issues. The last session of the company visits included a presentation to the management of the outcome of the data collection, accompanied by recommendations to improvements as an acknowledgement of the time and effort invested by the company in the data collection. Based on the scoring process in these companies and the subsequent monitoring period, the following experiences were gained on how the act of conducting a company assessment may facilitate systematic management of social responsibility:

Company Assessment…

- starts the discussion of sensitive topics;
- provides overview of practices;
- reveals pro forma management systems;
- identifies inconsistencies in systems i.e. disagreement between written guidelines and actual practices, and between what a company says it does and what it actually does;
- identifies actual violations of workers rights;
- serves as a motivator for improving performance (a score motivates);
- serves as practical guidance for improving performance (gives an idea of how to get there);
- gives feedback and input to people working with the area (primarily Human Resources – which sometimes is just one person);
- identifies possibilities for streamlining management processes;
- serves as platform for sharing experience between production sites in a Corporation (through practitioners);
- provides overview to determine gaps with e.g. SA8000 certification;
- serves as a basis for defining performance goals for the company or corporation.

In Appendix 2 Case study B is presented as a concrete example of how recommendations for improvement can be based on company assessment and serves as a platform for systematic management of social responsibility in a company.

8 Conclusion

The methodology of social life cycle assessment developed in the PhD-project consists of (1) a framework for social life cycle assessment (2) a method to perform quantitative social life cycle assessment (phases, steps and activities), and (3) methods and principles to develop underlying modelling of social impacts. Concrete models for inclusion of four impact categories representing fundamental labour rights violations were developed and tested in six case studies. The results of the case studies were used to evaluate the Social LCA method and the specific models for labour rights impacts.

Social LCA conducted with the developed method provides the company with an overview of the relations between the company's activities and the social impacts in the product life cycle through assessments of the life cycle companies' conduct. Product relation and possible aggregation of company impact profiles provides basis for identification of risks and opportunities in the product life cycle within the social scope.

The methods and principles underlying inventory and characterisation modelling of social impacts have been elaborately presented to enable development of inventory and characterisation models for inclusion of other impacts.

The managerial approach chosen for assessment of company conduct is suitable for modelling of impacts for which the probability of occurrence is related to, and therefore also reflected in, the existing management practice in a company, and when specific managerial measures which either promote or prevent that positive or negative impacts take place can be determined. This typically applies to activities in the internal sphere of a company and hence employees constitute a main stakeholder for whom impacts at least can be included by the Social LCA method. This is also demonstrated by the modelling of the obligatory labour rights impact categories. Impacts to other stakeholders may be included as well inasmuch as impacts to these can meaningfully be addressed within this managerial perspective.

The Social LCA method enables inclusion of positive impacts as well as negative impacts. These may in principle be modelled in a similar manner as the negative impacts, but in practice we may find that some positive impacts are of such nature that they are more suitable for direct quantification. However, some of the same considerations also apply to modelling of direct quantifiable positive social impacts. A product relation must still be established and consideration for the company context characteristics is still relevant for determining the magnitude that the actual positive impact that company conduct may result in.

The obligatory impact categories of the Social LCA method are defined on a normative basis. Additionally, the Social LCA method operates with the option of including impact categories addressing topics of specific interest to the company in order to ensure maximum relevance of the LCA results in regards to the company's social responsibility strategy and general decision-making process.

The case studies conducted confirm the applicability and feasibility of the inventory and characterisation steps of the method. On the basis of the case studies minor adjustments to the concrete inventory and characterisation models for labour rights violations have been recommended. The performance indicators applied in the inventory process were found to be most accurate when applied for companies that mainly employ blue-collar workers. On this basis a sector specific approach was recommended in the development of indicators. In conclusion the Social LCA method is thus applicable in current form with four impact categories representing labour rights.

The level of detail of company assessment ensures that it is possible to identify the improvement potential(s) of the individual company, while the quantification and aggregation of company management efforts ensure that the improvement potentials in the product life cycle can be identified. A positive side-benefit to the managerial approach and concomitant level of detail discovered in the case studies was that the company assessment was suitable as an internal social responsibility management tool as well.

The developed Social LCA method was not tested on a whole product life cycle, but on the basis of its construct it is possible to draw some conclusions regarding its general applicability and feasibility. In support of life cycle

management the Social LCA method aims at a stepwise and continuous execution of Social LCA. The chosen extremely site specific assessment model is a pivotal methodological choice which on one hand ensures relevance of the LCA results for the intended application in life cycle management but on the other hand poses a challenge to the data collection.

It is a question whether it will be possible to contrive a more general assessment models that is able to deliver meaningful and relevant results for the intended application with a considerably lower requirement of site specificity and hence effort from the LCA practitioner. For the labour rights issues, tests of simplified site specific and general assessment models have shown that the usability of the results in terms of reliability of indication, information value, responsiveness to behavioural change of a company, and how easy it was to take actions on the basis of them, suffered significantly from simplification, which would complicate their application for life cycle management. It can be concluded on the basis of the tests that to balance delivering meaningful results and being able to actual collect required data poses a major challenge to Social LCA.

In order to collect the data required by the presented Social LCA method the company must have leverage in their product chain or be willing to work towards achieving it. In this sense the Social LCA method mainly aims at application in companies which are very serious about managing social responsibility for their product chain.

9 Outlook

Social LCA is a very young discipline and there is still much scientific work that needs to be conducted before it reaches a status comparable to that of Environmental LCA today. The Task Force 'Integration of social aspects into LCA' under the UNEP-SETAC Life Cycle Initiative has played an important role in this process in the recent years by providing a forum for the discussions and exchanges of ideas, which is essential in the early stages of a new research discipline, and with the work towards a code of practice of Social LCA. Hopefully, the Task Force will continue to be a forum where future Social LCA developments can take place and where some of the many challenges that quantitative Social LCA faces, which present project broaches, can be addressed.

In the following I reflect upon selected areas in Social LCA that requires further work in general and specifically in regards to improving the Social LCA method developed in this PhD-project.

Product relation principles – best practice
The company perspective of the product system applied in the presented method is deemed central for Social LCA given the nature of social impacts. One of the important tasks in maturing Social LCA as a discipline therefore involves further development of the product relation concept.

As discussed earlier, the choice of product relation principle will inevitably introduce a bias to the LCA study in regards as to how it places emphasis in the life cycle and how much it affects the importance of the actual company impact in the aggregation of a product impact profile.

The development of a best practice recommendation on which principles to adopt in different applications of Social LCA, and how product relation factors should be determined accordingly in order to ensure that the introduced bias is in accordance with the goal and intended application of the LCA results, would be a valuable contribution to the general applicability of Social LCA. In this way the introduced biases would be known and kept under control in different applications, and it would be avoided that the choices regarding product relation in Social LCA were made unconsciously or with ulterior motives.

Product relation in the life cycle management application
The Social LCA method presented here does not prescribe a method to carry out product relation despite the importance of this for the result of an LCA study. In the application of Social LCA for life cycle management it is particularly interesting to investigate the possibility of using 'influence' as the main product relation principle. It enables scoping of social responsibility of the product chain in accordance with influence, which one may find both acceptable and practical in consideration of the goal and motivation of life cycle management. It is however a somewhat controversial suggestion in LCA to emphasise the relations of the product manufacturer to the suppliers and subcontractors rather than the relations of these to the product, but given that these are not unambiguous as it is, such an option may after all also be acceptable. When applying such a principle, the product relation factor values will not naturally add up to 1, when aggregated for the product life cycle, which complicates the use. It will therefore require further development in order to be applied.

Sustainability life cycle assessment
The method developed in this project does not accommodate direct comparison with results of Environmental LCA in the present form. It will generally be a challenge to bring social and environmental impact on to the same scale given their very different nature and also due to the lack of natural product relation of social impacts. The application prospects of sustainability life cycle assessment are however great, so it is an important future research area.

Inclusion of positive impacts
Positive impacts distinguish themselves from negative impacts on many accounts and as discussed earlier this may often enable a more direct inclusion in Social LCA. Positive impacts are included in Social LCA in the recognition that companies may have a positive impact on their stakeholders as well as a negative. The inclusion of positive impacts however raises an important discussion in the sense that the identification of impact categories in Social LCA contributes to defining the social responsibility expected by companies. It is important to be aware of the indirect responsibility which is placed with companies, when including a topic against which a company's performance is assessed. The role of companies in regards to 'promotion' of positive impacts is

much less clear than in the ‘prevention’ of negative impacts, particularly when considering the performance of what could be seen as societal tasks. Take for example, positive impacts on employees in the form of the company’s provision of educational programmes, health care, childcare facilities, economic micro loans etc.; there is no doubt that companies can and in some countries do and perhaps also must, play an important role in performing these tasks, but the inclusion in Social LCA calls for more reflection of the consequences of indirectly imposing societal tasks on companies.

Further work on the developed method

A full Social LCA would have completed this project in many senses; however given that the developed method aims at a stepwise execution of Social LCA, that was beyond the temporal scope of this project. Case studies including the life cycle perspective are required to conclude on the feasibility of the entire method for conducting Social LCA. The labour rights indicators and concomitant characterisation model is tested in a modest number of companies in this project. More case studies are also required to support the conclusions regarding concrete models and enable adequate adjustment and calibration. Moreover, this will also give opportunity to investigate the possibility of a sector-specific development of the labour rights indicators further.

The application of simplified models would increase the feasibility of Social LCA significantly, so it is recommended that further work is conducted in this area. The possibility of accompanying each company assessment with a reliability factor when a mix of indicator models is used in the same Social LCA should be explored further.

Finally, it is recommended that more impact categories are identified and tried modelled using the methods and principles presented in this dissertation to expand the scope of the method. The inclusion of more impacts will naturally increase the value of the developed Social LCA method for its application. For instance, the developed method is very suitable for including a topic such as corruption and bribery, because occurrences are related to the management practice in a company and can be prevented through managerial measures. By including anti-corruption in addition to labour standards, the presented Social LCA method will be covering five of the ten principles of the UN Global Compact[28], which will make the method attractive for companies participating in this initiative. Particular since Environmental LCA applied in life cycle management may address the three principles concerning the environment.

[28] The UN Global Compact's ten principles address the areas of human rights (Principle 1 and 2), labour standards (Principles 3, 4, 5 and 6), the environment (Principles 7, 8 and 9) and anti-corruption (Principles 10). (UN Global Compact, 2000)

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11 Article collection

This chapter presents the scientific papers written during the PhD project together with supplementary information. Supplementary information is presented in immediate continuation of the relevant paper. Supplementary information has separate lists of references.

Article 1 Dreyer LC, Hauschild MZ, Schierbeck J (2005) **A framework for social life cycle impact assessment**. A framework for social life cycle impact assessment. International Journal of LCA vol. 11 (2) p. 88-97, DOI: 10.1065/lca2005.08.223

Article 2 Hauschild MZ, Dreyer LC, Jørgensen A (2008) **Assessing social impacts in a life cycle perspective—Lessons learned**. CIRP Annals - Manufacturing Technology 57 (2008) 21–24

Article 3 Dreyer LC, Hauschild MZ, Schierbeck J (2009): **Characterisation of social impacts in LCA - development of indicators for labour rights.** International Journal of LCA vol. 15 (3) p. 247-259, DOI: 10.1007/s11367-009-0148-7

Supplementary information:
1. Labour rights indicators
2. Development of indicators for four obligatory impact categories in Social LCA
3. Development of value attribution to labour rights indicators
4. Development of contextual risk classification for labour rights violations

Article 4 Dreyer LC, Hauschild MZ, Schierbeck J (2009): **Characterisation of social impacts in LCA - Implementation in six company case studies.** International Journal of LCA vol. 15 (4) p. 385-402, DOI: 10.1007/s11367-010-0159-4

Supplementary information:
1. Assessment of contextual risk of fundamental labour rights violations in six case studies
2. Elaborate presentation and discussion of case study results

Letter to the editor

Dreyer LC, Hauschild MZ (2006) **Scoping must be done in accordance with the goal definition, also in Social LCA**. International Journal of LCA vol. 11 (2) p.87, DOI: 10.1065/lca2006.02.004

11.1 Article 1: A framework for social life cycle impact assessment

Dreyer LC, Hauschild MZ, Schierbeck J (2005) A framework for social life cycle impact assessment. A framework for social life cycle impact assessment. International Journal of LCA vol. 11 (2) p. 88-97.

Societal Assessment (Subject Editor: David Hunkeler)

A Framework for Social Life Cycle Impact Assessment

Louise Camilla Dreyer[1 2]*, Michael Z. Hauschild[1] and Jens Schierbeck[3]

[1] Technical University of Denmark (DTU), Department of Manufacturing Engineering and Management (IPL), Section for Innovation and Sustainability, Produktionstorvet Bygning 424, 2800 Lyngby, Denmark
[2] Brødrene Hartmann A/S, Corporate Sustainable Development, Klampenborgvej 203, 2800 Lyngby, Denmark
[3] JPS management, Øverødvej 48, 2840 Holte, Denmark

* **Corresponding author** (lcd@hartmann.dk)

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Abstract

Goal, Scope and Background. To enhance the use of life cycle assessment (LCA) as a tool in business decision-making, a methodology for Social life cycle impact assessment (LCIA) is being developed. Social LCA aims at facilitating companies to conduct business in a socially responsible manner by providing information about the potential social impacts on people caused by the activities in the life cycle of their product. The development of the methodology has been guided by a business perspective accepting that companies, on the one hand, have responsibility for the people affected by their business activities, but, on the other hand, must also be able to compete and make profit in order to survive in the marketplace.

Methods. A combined, bottom-up and top-down approach has been taken in the development of the Social LCIA. Universal consensus documents regarding social issues as well as consideration for the specific business context of companies has guided the determination of damage categories, impact categories and category indicators.

Results, Discussion, and Conclusion. The main results are the following: (1) Impacts on people are naturally related to the conduct of the companies engaged in the life cycle rather than to the individual industrial processes, as is the case in Environmental LCA. Inventory analysis is therefore focused on the conduct of the companies engaged in the life cycle. A consequence of this view is that a key must be determined for relating the social profiles of the companies along the life cycle to the product. This need is not present in Environmental LCA, where we base the connection on the physical link which exists between process and product. (2) Boundaries of the product system are determined with respect to the influence that the product manufacturer exerts over the activities in the product chain. (3) A two-layer Social LCA method with an optional and an obligatory set of impact categories is suggested to ensure both societal and company relevance of the method. The obligatory set of impact categories encompasses the minimum expectations to a company conducting responsible business. (4) A new area of protection, *Human dignity and Well-being*, is defined and used to guide the modelling of impact chains. (5) The Universal Declaration of Human Rights serves as normative basis for Social LCA, together with local or country norms based on socio-economic development goals of individual countries. The International Labour Organisation's Conventions and Recommendations, and the Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy, support development of the impact pathway top-down, starting from the normative basis. (6) The obligatory part of Social LCA addresses the main stakeholder groups, employees, local community and society.

Recommendations and Outlook. Social LCA is still in its infancy and a number of further research tasks within this new area are identified.

Keywords: Framework, social LCIA; human rights; international labour organisation (ILO); social LCA; social LCIA; social responsibility

Introduction

All over the world, companies make business decisions every day which affect people and environment, directly through their own operations, or indirectly through the value chain of their business. Increasingly, these companies are confronted with questions, e.g. from customers, consumer organisations and other NGOs, regarding their social performance. In several cases, which have reached the media, large multinational corporations have been held responsible for poor working conditions, not only in their own facilities, but also at their suppliers. Society's expectations to companies to assume a wider responsibility for the social impacts of their business activities is a challenge that has been accepted by companies that wish to conduct business in a more responsible way. Many companies, thus, see themselves in need of a tool which can help them make informed decisions about their social impacts throughout the life cycle of their products.

Life cycle assessment (LCA) has obtained a widespread use for decision support, but LCA traditionally only considers environmental impacts [1–3] and to some extent working environment impacts [4–6]. Therefore, recommendations based on LCA fail to address possible trade-offs between environmental protection and both social and economic concerns in the product life cycle. This raises questions about LCA's ability to support actual decision-making in companies, which aim for sustainability, and it creates an incentive for developing LCA methodology to include these other dimensions of sustainability. Life Cycle Costing (LCC) considers economic implications in a life cycle perspective and, after a relatively long history outside the scientific LCA community, it is attempted to be integrated into life cycle management (e.g. [7,8]); however, research carried out on Social LCA is still at an early stage and publications on the subject are quite limited. To mention a few of these is, one might consider the early SELCA [9], Casado Cañeque's work on development of social company performance indicators for

use in LCA [10], Life Cycle Working Time [11] and research conducted on an integrated approach for product assessment in connection with the Label 'Sustainable Development' [12]. More recent research includes SEEbalance by BASF [13] and PROSA by the German Öko-Institut [14].

It is the aim of the authors to contribute to this research by suggesting a framework for a Social life cycle impact assessment (LCIA) methodology. The article presents a method to define the issues for obligatory impact categories of Social LCA, whereas the indicators working within this framework will be presented in a later paper. The framework and the tools that follow it are intended to support informed business decisions in a company which aims at minimising harmful impacts on peoples' lives from the activities in the company's product chains. Focus is thus on those types of impacts that the company has a possibility to influence, and a premise for the developmental work is that the method does not question a company's fundamental right to conduct business and survive in the market (compete and gain profit), but focuses on the manner in which it conducts its business. The Social LCA is hence developed to facilitate companies to conduct business in a socially responsible manner. A framework developed from a societal perspective rather than a company perspective might thus look different.

In order to increase comparability and ultimately compatibility between Social and Environmental LCA, the framework known from the ISO standards for Environmental LCIA [15] has been used as inspiration and followed to the extent that it has proved to be meaningful and practical.

1 Product System Definition in Social LCA

The focus on social impacts rather than the environmental and resource impacts necessitate some deliberation of the way the product system is traditionally conceived and modelled, and how the impacts of the activities of the product life cycle are related to the functional unit of an LCA study.

1.1 Conceptual understanding of the product system

The product system encompasses all the processes involved in the different stages of the product's life from the extraction of raw materials, through manufacture, use and maintenance, to the final disposal of the product. When the focus is on environmental impacts, there is a natural link between the physical input or output of a process and a change in quality of the surrounding environment. The performance of the processes is thus the main driver behind the product's environmental impacts, and Environmental LCA therefore identifies all relevant processes in the life cycle of a product and analyses their exchanges with the environment. See the conceptual outline of the product system in **Fig. 1**.

Social LCA is about impacts on people and, therefore, the focus must be on those activities in the life cycle which affect people. Here, it makes little sense to perform the analysis on a process level, since most impacts on people will be independent of the physical conditions of an industrial process, with the exception of some direct occupational health impacts on workers[1]. Social impacts on people in the life cycle of a product have a more clear relation to the conduct of the companies involved in the product chain – and to the way the companies organise and manage their business. People affected directly or indirectly by the company's business activities may collectively be termed the stakeholders of the company. In the inventory step, the conduct of the company towards stakeholders is analysed, while the impact assessment addresses the impacts to these stakeholders as a result of the company's conduct. This perception of the product system is illustrated in **Fig. 2**. In this way, Social LCA involves a number of individual company assess-

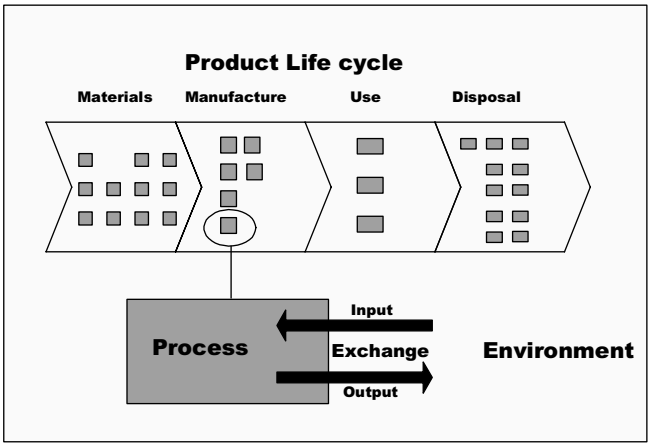

Fig. 1: The product system as perceived and modelled in Environmental LCA. The product life cycle consists of processes (depicted as small blocks), which are each analysed individually and aggregated in the inventory

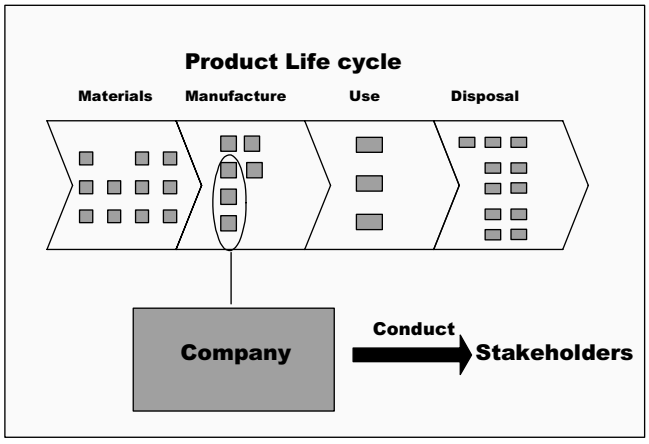

Fig. 2: The product system as perceived and modelled in Social LCA. The product life cycle is perceived as comprising a number of companies where industrial processes (depicted as small blocks) take place. The conduct of each company towards its stakeholders is analysed and aggregated in the inventory

[1] Environmental LCA considers occupational health impacts from direct exposure and, therefore, these need not be considered in Social LCA. Other occupational health impacts (e.g. psychological) are more dependent on organisational aspects and may thus also be analysed from an organisational point of view. Furthermore, when Social LCA has the purpose of improving social performance of a product and hence a company (following the line of thought presented here), it can also prove valuable to view occupational health from an organisational point of view, because it may indirectly give guidance to improvement.

ments which must be aggregated to produce the social life cycle profile of the product.

In the organizational perception of the product system in Social LCA, the use stage naturally falls out of place. Unlike in the other life cycle stages: the impacts on people cannot meaningfully be related to the conduct of one or several companies, but are related directly to the product use.

The direct and indirect social impacts derived from use of a product are often positive. If the social LCA is used for a social product profile, they should be included, but their inclusion gives rise to discussions about product justification and product benefits. A further elaboration of the characteristics of the use stage is presented in **Box 1**. Later in this article, we will suggest a basis for determining social company assessment parameters for all life cycle stages except the use stage, in recognition of the fundamental difference between this stage and the others.

Box 1: A characterisation of the use stage in Social LCA

The social impacts in the use stage occur when the product provides its service to the user, as specified in the functional unit of the LCA. When the LCA is used to compare different products fulfilling the same function, the social impacts in the use stage are often very similar (e.g. comparison of two types of washing powders for washing clothes), but when the comparison covers different product service systems with the same function (e.g. comparison of washing clothes by hand and in a machine), they may differ considerably and are therefore important to include. The types of social impacts are strongly dependent on the nature of the product. For example, the social impacts related to use of heart medicine are very different from those related to use of washing powder. Hence, it is suggested that assessment of the product's direct social impacts be carried out on a product category basis.

1.2 Relating company impacts to the product and the functional unit

A consequence of analysing impacts at a company level instead of process level is that the relation of the impacts to the product and thereby the product service is no longer straightforward. The link between a company's conduct in the product life cycle and the actual product is not direct and naturally quantifiable as the physical link between process and product which are the basis of Environmental LCA. Hence, to apply the organisational approach, it is necessary to develop a method to relate the social profiles of the suppliers, manufacturer and the waste management companies to the product in a meaningful manner.

A share factor is used to represent the weight that is given to a company's social profile in the aggregation of social impacts along the product chain, reflecting that company's importance in the overall life cycle. Importance can be determined in several ways, and there is not one obvious choice among them. To put emphasis on the activities in the life cycle, which involve most people, the number of working hours spent at the company per functional unit of the product could be used as a basis for determining the company's share factor. Alternatively, a focus on value creation along the product chain would require, for instance, that monetary input and output for each company or each life cycle stage be used as a basis. If a manageability approach is taken, focus could be directed at those parts of the life cycle where the manufacturer has the largest influence, and the share factor could then be based on the material costs and product price for the company in the product chain. Other ways to calculate the share factor could be contrived, and the choice depends on two main criteria. Firstly, since the share factor inevitably introduces a bias in the assessment (as we know from the choice of allocation principle in Environmental LCA), it is important that this bias is known and accepted. Secondly, it is of utmost importance that the data or information needed for calculation of the share factor is available for all companies in the product chain, since the share factor is crucial for relating the individual company profiles to the product and hence for aggregating over the life cycle. Investigations of the different principles and their consequences for the results of the Social LCA are ongoing, and no choice has yet been made.

The social profile of the company can be more or less comprehensive depending on the choice of assessment parameters and the complexity of modelling. The framework operates with a number of different social impact categories which together give a covering impression of the company's social conduct. As suggested by Udo de Haes [16], a very simple social profile could be based on whether a company has obtained certification within the social area or not, but this approach is insufficient for the management decision support needed in our case.

1.3 The boundaries of the product system

A product life cycle can easily be described in general terms based on immediate knowledge about the product, e.g. activities in the life cycle of a cotton t-shirt involve the growing of cotton, processing of cotton, spinning, weaving, etc. In Environmental LCA, this information together with use of general process data can be used to make an LCA of the product. General information, as such, does not provide us with any useful information for carrying out Social LCA, because aspects of company conduct and related stakeholder impacts are, in principle, always specific. To assess the conduct of companies in the life cycle of the product, more specific information is needed. On the basis of information of geographical location and branch of industry, we may find information about what is commonly encountered company conduct in a certain area and in a certain branch, and on this basis make it probable, what is the conduct of the investigated company. However, the case may be that two companies producing the same product and located in the same region of a country have totally different social impacts, because of different management and therefore different conduct, for example towards employees, the local community and other stakeholders. While country or region-specific information about the product chain may enable a crude assessment, a conclusive assessment must be based on company-specific information for the most important companies in the product chain. In contrast to Environmental LCA, the Social LCA is highly site-specific in its data requirements, and the value of conducting Social LCA on the basis of generic product chains is normally limited. A similar conclusion has been presented by Vanhoutte et al. [12].

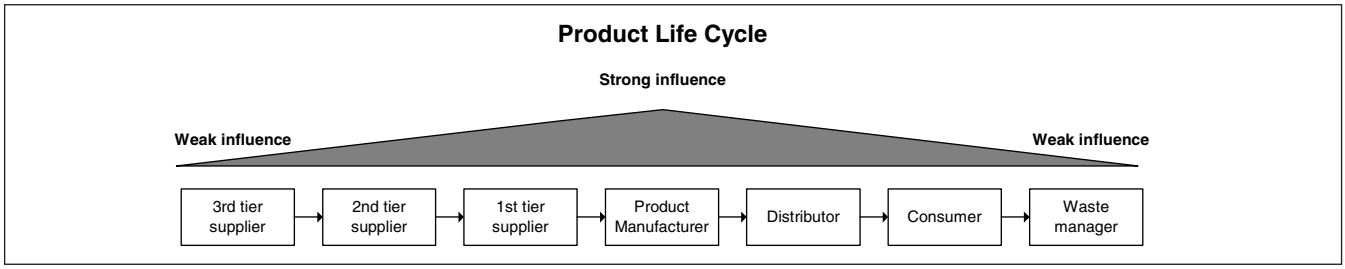

Fig. 3: The influence exerted by the product manufacturer varies along the product chain

The need for company specific information and data has consequences for the scoping of the product system in Social LCA, i.e. which parts of the product system need to be included. In order to obtain specific information from a company, it is crucial that the data collector has some influence to exert on it. Since the focus is on the application of Social LCA in business decision-making, the data collector is typically the manufacturer of the product. The further upstream or downstream the activities are located, the weaker the influence of the manufacturer will be as illustrated in **Fig. 3**. This decision support-perspective, thus, tends to narrow down the focus on the material stage and makes the relevance of the disposal stage debatable. The product system boundaries in Social LCA must be determined on a case-to-case basis, but some general thoughts are presented in the following.

Material stage – Suppliers of commodities and services. The product manufacturer exerts influence on the material stage of the life cycle, through choice of materials and services, and through selection of suppliers. The product manufacturer has influence on the conduct of the suppliers as a customer, but the further upstream, the more indirect and weak this influence becomes. In the material stage, the Social LCA has the strongest focus on the direct suppliers (first tier), but in some situations, important impacts lie further upstream and, here, the product manufacturer has to exert a more indirect influence through partnerships or through pressure on his own supplier. All relevant social impacts in the material stage are included in the Social LCA, and consideration of the first tier of suppliers is regarded as minimum.

Manufacturing stage – Product manufacturer. The product manufacturer of course exerts maximum influence in the manufacturing stage and has the benefit of unimpeded access to information about the interaction with stakeholders. Therefore, all relevant social impacts on stakeholders of the company are included in the Social LCA.

Distribution – Product manufacturer or distributor. The product manufacturer exerts direct influence in the distribution stage whether performed in house or outsourced. The social impacts of the distribution stage are included in the Social LCA at all times.

Use stage – Consumers. Social impacts of product use should be considered in Social LCA, typically on a product category level.

Disposal stage – Waste management companies. The social impacts of the disposal stage will depend on the local or regional community's choice of waste management companies and technologies, and the way in which these companies interact with their employees, the local community and other relevant stakeholders. The influence of the product manufacturer will usually be limited here. In addition, obtaining the needed information will require that product manufacturers track their products to specific waste management companies. While this may be feasible for a manufacturer who primarily produces for a local market, this level of information will be difficult to obtain for a manufacturer on a global market. An exception is the case where the manufacturer has a take back arrangement for used products, i.e. where he has influence on the choice of waste management companies, or where the manufacturer is also the end-user of the product. There are occupational health and safety impacts during waste handling which the manufacturer may help minimise through the design of the product. To the extent that these impacts are of a chemical nature, they may be included in Environmental LCA. In summary, the social impacts in the disposal stage are included in the Social LCA to the extent possible, but the product manufacturer generally has little influence on activities in this stage. Considering the number of processes, the related working hours and the value creation of the entire life cycle and of the disposal stage, it is fair to say that this stage comprises a rather small part of the product system and, even if the disposal stage is omitted, it is still the larger part of the life cycle that is covered.

Transportation between stages. Transport other than that associated with the distribution of the product must also be considered in Social LCA to the degree possible. The product manufacturer may exert influence on the transportation of materials from suppliers, which is why it must be included at all times. Transport between suppliers upstream to the 1st tier and transport to disposal locations downstream, however, is virtually out of the influence sphere of the product manufacturer and will be difficult to include.

2 Social Life Cycle Impact Assessment: From the Top or the Bottom?

A company defines its social responsibility through its actions or lack of action, whether these are intentional, unintentional or even unconscious. For Social LCA to support actual decision-making in companies leading to actions for improvement of social impact, it is essential that all relevant impacts are included, and that the link between a company's actions and the impact or damage they cause on people is clear and relatively certain. A Social LCA method will inevitably place a certain responsibility with a company through its choice of assessment parameters, i.e. category indicators, impact categories, and damage categories. This

means that this choice must be transparent, and fair in terms of the influence which it is possible for a company to exert. In a bottom-up approach, the definition of assessment parameters will start with an identification of social issues in the business context of the product manufacturer[2]. The company should not be held accountable for more than it possibly can influence and all impacts, which are relevant from the company's point of view, should be considered. This can be achieved by a bottom-up approach. In a top-down approach, the definition of assessment parameters starts with an identification of what is valuable to society. This ensures an inclusion of those impacts which are relevant from a societal point of view[3], but the relevance to the company's decision-making is not always straightforward, and sometimes it is completely absent.

Our choice to focus on the application of Social LCA in a company's decision-making process favours a bottom-up approach starting from the business context of the product manufacturer. Such an approach implicitly demands great flexibility of the method to ensure that relevant impacts from the company's point of view are included. On the other hand, we would like to avoid that the choice of assessment parameters becomes a random and inconsistent selection based on availability of data and on what companies wish to be held accountable for, rather than on what is most essential for the objective of reducing harmful and promoting beneficial impacts on people. It is crucial for the legitimacy of the Social LCA that it is normative and therefore consensus-seeking in its approach, making value-judgements transparent and accepted in the definition of category indicators, impact and damage categories. In order to ensure both societal and company relevance of the method, a two-layer LCA method is suggested.

2.1 Two-layer social LCA

For Social LCA to support the decision-making process in a company, it must adapt to the specific context of this company's operation, for example by considering impacts which are specific to the product or sector of industry and to the company itself. The company may thus wish to determine social assessment parameters based on dialogue with stakeholders, based on specific concerns, on corporate values and/or on principles for conducting business, on responsibility that may inherently be associated with the product (e.g. medicine, tobacco, organic foods), etc. From a legitimacy point of view, the methodology should include social assessment parameters that express some minimum expectations to conduct responsible business.

Two-layer Social LCA	Optional	Self-determined, context-specific assessment parameters to customise Social LCA
	Obligatory	Consensus-driven, 'normative' assessment parameters expressing minimum requirements to business

Fig. 4: The two-layer structure of Social LCA designed to accommodate customisation of Social LCA while maintaining a general core

The Social LCA thus consists of two layers of impact categories, an obligatory, normative, predetermined set of categories expressing minimum expectations to conducting responsible business, and an optional, self-determined set of categories expressing interests specific to the product manufacturer to the extent that these are not already covered by the predetermined impact categories (**Fig. 4**). In this way, Social LCA will consist of a normative core, but with an option to customise it to serve internal company purposes.

2.2 Combined top-down bottom-up approach

In the development of the obligatory part of the framework, it was experienced, when it came to modelling the impacts, that the top-down approach had to be combined with a bottom-up approach due to the difficulties in creating a quantitative relationship between the 'damage level' and the company's activities in the product system. The top-down approach was applied to define the relevant issues for the definition of impact categories (see Section 4), i.e. to identify what we wish to protect and promote with our social LCA method and which social values lie behind this choice – to define what 'social' means in the context of a life cycle assessment. This has resulted in definition of an area of protection (see Section 3). At the same time, the impact chain from the level of the product system activities (common business processes) towards the defined impact categories was traced in the bottom-up approach (see Section 5). The combination of the two approaches ensures both the connection to the inventory level and the relevance on the societal level. The development of the obligatory part of the Social LCIA framework is presented in the following sections.

3 Areas of Protection

In Environmental LCA, the assessment addresses impacts on and damages to the quality of the surrounding environment. Hence the term 'Area of protection', is used to express what is of value to human society, and must therefore be protected by LCA through the consideration of what causes damage to it. In Social LCA, a company's activities may result in positive impacts (injection of capital in a local community in a developing country, job creation, etc.) on the stakeholders as well as negative impacts (indecent working conditions, exploitation of local natural resources, etc.). In social LCIA, areas of protection are thus used to express what is of direct value to human society, and therefore must be protected *and promoted* by LCA through consideration of what causes damage *and benefit* to these areas.

[2] In traditional LCA, the bottom-up or midpoint approach (sometimes referred to as 'environmental theme approach') is based on known and acknowledged environmental problems as categories of impact. The approach starts from the environmental exchanges between the product system and the surroundings, and these are taken as input to models of the environmental impact chain which underly the environmental problem. Given the acceptance of such categories in decision-making, the results, expressed in terms of midpoint variables, can be regarded as relevant for decision-making [3]. Environmental LCIA frameworks based on the traditional bottom-up approach are, for example, EDIP97 [4] and CML2001 [1].

[3] Examples of Environmental LCIA frameworks based on a top-down approach (sometimes referred to as 'damage approach') are Eco-Indicator 99 [2] and EPS [17].

3.1 Existing areas of protection

Areas of protection have already been defined in Environmental LCA, but their relevance and sufficiency to Social LCA is questionable, given that they have been defined in an environmental context. Most LCA methodology publications refer to four areas of protection, *Human Health*, *Natural Environment* and *Natural Resources*, which are also applied by ISO [15], and *Man-made Environment,* which was recommended as best practice in 1999 [18] (**Table 1**)[4].

Table 1: Areas of protection and underlying societal values in Environmental LCA [18]

Areas of protection	Societal values
Human health	Intrinsic value of human life, economic value
Natural environment	Intrinsic value of nature (ecosystems, species), economic value of life support functions
Natural resources	Economic and intrinsic values
Man-made environment	Cultural, economic, and intrinsic values

The identification of these four areas of protection does not originate from a discussion of societal values, as one might expect from the description, but may be seen as a corollary to a bottom-up approach, which has been guided by the conceived damage of environmental impacts such as acidification, global warming, etc.[5] [21,22]. As a natural consequence, social impacts and related damages are not considered. Even though there may be an overlap between what should be protected in Social and Environmental LCA, because environmental impacts may lead to damage on some of the same areas of protection as social impacts, new areas of protection or a redefinition of the existing must also be considered in the Social LCIA to fully include the Social Dimension.

3.2 Areas of protection in social LCA

What do we wish to protect and promote with our Social LCA method? Social LCA is about people and impact on people, social impacts, whereas Environmental LCA is about impact on the biophysical environment. As discussed in the previous section, Environmental LCA only considers damage on people, which occurs as a consequence of impacts on the environment. The area of protection, *Human Health*, is described as the intrinsic value of human life, and damage to this area of protection is defined as a mere question of mortality and morbidity [19]. Social LCA should embrace a broader understanding of human life, encompassing the value of a good and decent life, to be able to truly consider social impacts and damage to people. At least three important prerequisites for a good and decent life can be identified, 'human health', to live a healthy and naturally long life; 'human dignity', to live a decent life and enjoy respect and social membership; 'basic needs fulfilment', to have access to food, water, clothes, medical care, etc. These prerequisites are interrelated as human health and, in many cases, human dignity, are promoted by, and even dependent on, fulfilment of basic needs. In keeping with this, a new area of protection is suggested, *Human Dignity and Well-being*.

With the interrelationship between human dignity, human health and basic need fulfilment in mind, *Human Dignity and Well-being* should be regarded as complementary to the existing areas of protection. Overlaps may occur between the *Human Health* area of protection in Environmental LCA and *Human Dignity and Well-being*. The proposed new area of protection may not be the only relevant area of protection in Social LCA, but it is proposed because of its obvious connection to impacts on people. In the future development, it is relevant to consider whether the area's protection for Social and Environmental LCA should be integrated. Considering the overlaps between the suggested *Human Dignity and Well-being* and the existing *Human Health*, this seems a natural next step.

4 From the Top and Down: Development of the Obligatory Part of the Social LCA Framework

In order to apply the area of protection in a further development of the Social LCIA framework, a more explicit definition of the meaning of 'protection and promotion of human dignity and well-being' is needed. For a broader acceptance of the Social LCA methodology, it is chosen, to the extent possible, to draw upon international agreements that reflect a broader understanding, representative for our global community. This is also in accordance with the recommendation given by ISO for Environmental LCIA methods that 'the impact categories, category indicators and characterization models should be internationally accepted, i.e. based on an international agreement or approved by a competent international body' [23].

4.1 Universal Norms

The Universal Declaration of Human Rights (UDHR) [24] was the first document in history, considered to have universal validity, to be adopted by an international organisation such as the United Nations[6] [26]. The UDHR expresses the fundamental human rights as a way to protect and promote human dignity and well-being. It was elaborated in recognition that the 'inherent dignity of all members of the human family is the foundation of freedom, justice and peace in the world', and in the preamble to the UDHR, the fundamental human rights are motivated by: "Whereas the peoples of the United Nations have in the Charter reaffirmed their faith in fundamental human rights, in the dignity and worth of the human person and in the equal rights of men and women and have determined to promote social progress and better standards of life in larger freedom,…"

[4] Definitions of these areas of protection and an additional one, *Life Support Function*, have been subject to discussions over the years in the international LCA community, and a consensus has not yet been established [3,19].

[5] In later discussions about the inclusion of *Man-made environment*, the argument about its policy-relevance, however, has also been brought forward [20].

[6] The United Nations was formed by 58 member states at that time of the adoption. Today, the organisation has 191 members, which have signed the Universal Declaration of Human Rights. [25,26]

Furthermore, the UDHR fulfils two important criteria to serve as a normative basis for Social LCIA. It is the result of an international consensus process, and its fundamental validity has been established in practice through inspiring the creation of legally binding human rights treaties[7]. A similar approach to use international conventions, treaties and laws as basis for value judgements in LCA has been suggested by Volkwein & Klöpffer (1996) [27] in relation to the valuation step in LCA.

4.2 Local or country relevant norms

What is conceived as damaging or beneficial for the human dignity and well-being in a society is also influenced by its culture, and political and socio-economic stage of development. In addition to the fundamental human rights, there are thus also society specific conditions, which are relevant for the perception of what is damaging and beneficial for the protection and promotion of the human dignity and well-being. Consequently, it is not sufficient only to rest on the universal norms in Social LCIA. In addition, local or national norms must be considered.

Human dignity and well-being is threatened if a minimum of material welfare is not present. Protection and promotion of human dignity and well-being is therefore also closely related to the positive or negative influence on the economic, social and political development of the country or society. Social LCIA must be able to take into account that many developing countries are at another level of development than industrialised countries, a level where stimulation of economic growth and social progress is essential for achieving better conditions of life and thereby human dignity and well-being, as well as observance of human rights. Consequently, it is necessary to consider the socio-economic and political problems on a country or regional basis to determine some of the relevant issues for Social LCA, the local or country relevant norms (**Fig. 5**).

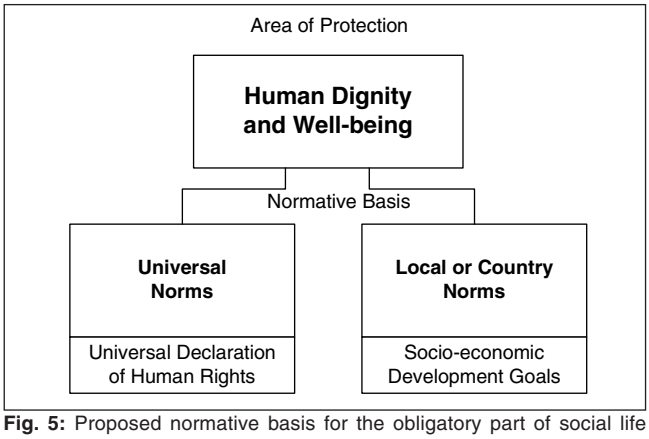

Fig. 5: Proposed normative basis for the obligatory part of social life cycle impact assessment with Human Dignity and well-being as an area of protection

[7] UDHR is not a legally binding document, but it has inspired more than 60 human rights instruments which together constitute an international standard of human rights. For example, the International Covenant on Economic, Social and Cultural Rights and the International Covenant on Civil and Political Rights, both of which are legally binding [25].

5 Establishing Impact Pathways in the Obligatory Part of the Social LCA Framework

After establishing the normative basis of Social LCA, the impact pathways from the area of protection to the midpoint level must be established. For this purpose, the Conventions and Recommendations of the International Labour Organisation and the Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy are used as universal norms. The local or country norms must be determined based on an analysis of the cultural and socio-economic issues of the relevant country, region, or local community.

5.1 Universal norms

ILO Conventions. The International Labour Organisation (ILO) is a UN organisation. The ILO formulates international labour standards in the form of Conventions and Recommendations setting minimum standards of basic labour rights in a tripartite process with representation of government, employers and workers [28]. The ILO has both inspired, and been inspired by, the UDHR. The ILO Conventions and Recommendations are the interpretation of human rights in a labour market context and they therefore define the responsibility, as regards observance of human rights, which righteously can be placed with companies. The relationship between the management and the employees is central for the dignity and well-being of employees, not only as workers, but also as individuals and members of society. Fundamental worker's rights offer clear guidelines on how employees should be treated irrespective of the country of operation.

The ILO Conventions and Recommendations consider a broad scope of worker's rights issues, whereof eight are considered fundamental (**Table 2**). There are some Conventions and Recommendations, which are directed at specific occupations, e.g. working at sea, in plantations, with machines, and these should of course be considered when dealing with these specific types of businesses. Other more general Conventions and Recommendations consider subjects like minimum wage, limitation of working hours, and health and safety of employees.

Table 2: Eight ILO Conventions have been identified by the ILO's Governing Body as being fundamental to the rights of human beings at work [28]

Issue	Convention
Freedom of association and collective bargaining	Freedom of Association and Protection of the Right to Organize Convention (No. 87) Right to Organize and Collective Bargaining Convention (No. 98)
The abolition of forced labour	Forced Labour Convention (No. 29) Abolition of Forced Labour Convention (No. 105)
Equality	Discrimination (Employment and Occupation) Convention (No. 111) Equal Remuneration Convention (No. 100)
The elimination of child labour	Minimum Age Convention (No. 138) Worst Forms of Child Labour Convention (No. 182)

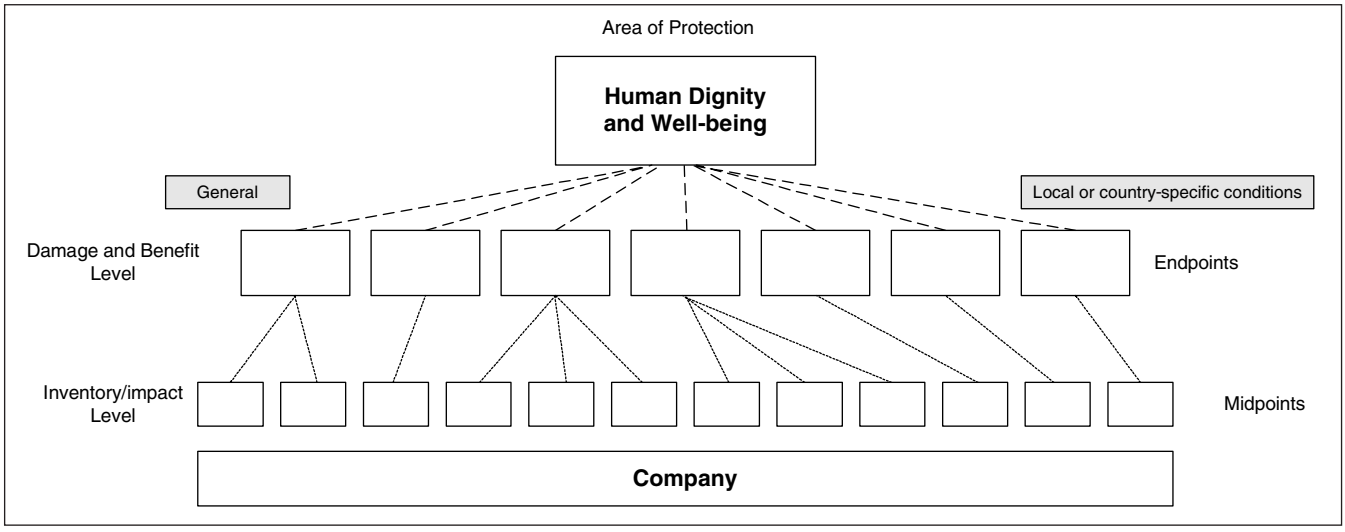

Fig. 6: The impact model of the Social LCIA framework

In the development of the Social LCIA framework, the ILO Conventions and Recommendations have been used to create a qualitative pathway top-down from the area of protection towards the midpoint, companies' impacts on employees. They have thus been used to define impact categories and category indicators by guiding what the indicators shall represent and how they shall do it (moving top-down in **Fig. 6**).

The ILO Conventions are aimed at implementation at state level and hence not formulated to address the business activities of companies. Therefore, indicators addressing the concerns of the ILO Conventions and Recommendations have been developed (in what may be perceived as a bottom-up approach), starting from the general business processes which take place in companies, e.g. the hiring of new workers.

An overview of the impact pathway model applied in the Social LCIA is presented in Fig. 6.

Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy. A company may benefit human dignity and well-being by stimulating the socio-economic development, which increases welfare for people in the local community. This impact of the company on local community is thus more indirect than on the internal stakeholders. On a national level, the company may also impact on the area of protection indirectly through its stimulation of economic and social development in society.

Besides giving guidance based on the ILO Conventions and Recommendations, the Tripartite Declaration emphasizes the role of companies in regard to promotion of economic and social welfare in developing countries. Their activities should be in harmony with the development priorities and the social aims and structure of the country in which they operate [29,30].

The issues considered by the Tripartite Declaration in guidance of companies operating in developing countries are described in **Table 3**. Similar to the indicators based on the ILO Conventions and Recommendations, the relevant articles of the Tripartite Declaration have been used to guide the content and positive direction of indicators in the Social LCIA.

5.2 Local or country relevant norms

To establish local or country norms, it is recommended to start from National or Regional Human Development Reports published by the United Nations Development Programme (UNDP) or similar publications providing information about the socio-economic development of countries.

Table 3: Excerpt of the principles of The Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy regarding companies operating in developing countries [29,30]. Numbers in brackets in second column refers to article number of the Declaration

Issue	Principle of conduct
Job creation	Increase employment opportunities and standards (16)
Local/national recruitment in developing countries	Use of national labour (18)
Generation of employment and technology development	Use technologies that generate employment and take part in development of new technology in host countries (19)
Stimulation of economic growth in developing countries	Use of national suppliers (20)
Stability of employment	Ensure stability of employment through effective manpower planning (25)
Skill formation and development	Strive to raise education and skill level of employees in developing countries (31)
Wages, benefits and conditions of work	Ensure best possible within the framework of government policies (34)

Corruption and bribery, payment of income tax, prevention of illiteracy and contribution to health care, e.g. in areas where HIV/AIDS causes big societal problems, are all examples of important topics which cannot be ignored when doing business certain places in the world. These and other similar topics may be considered under local or country-relevant norms in obligatory Social LCA.

5.3 Implications of the suggested framework

Impacts on stakeholders. The stakeholder relations of a company are very specific and can be quite complex, which makes it difficult to make a general people impact model based on them. The normative approach in the Social LCIA results in a simplified stakeholder impact model for companies, considering only three main stakeholder groups, employees, and local community and society. The people impact spheres of a company engaged in the life cycle of a product, as conceived in the obligatory part of the Social LCA, are illustrated in **Fig. 7**. When moving from the centre towards the periphery in the figure, the company's impact on people becomes more indirect. Impacts internally in the company (the inner sphere in Fig. 7) can also give rise to impacts in the local community or the society, although more indirectly. The possibility to customise Social LCA (optional part) enables inclusion of impacts on other relevant stakeholders.

New perception of LCIA elements and challenges. In the proposed framework for Social LCA there is no traditional characterisation step. The characterisation model in Environmental LCA serves the purpose of quantitatively translating the life cycle inventory results into environmental impacts as represented by the category indicator scores. In Social LCA, the category indicators are developed to measure the social impacts directly at the company. The process of developing the indicators on the basis of the ILO Conventions and Recommendations and the Tripartite Declaration, which also include elements of assessment, can be regarded as equivalent to the modelling of impact indicators in the characterisation modelling of Environmental LCA. The impacts in Social LCA are very site-specific. This means that the indicator score is determined not only by the behaviour of the company, but also of the locally-determined risk that the behaviour of the company will lead to actual damage to the area of protection.

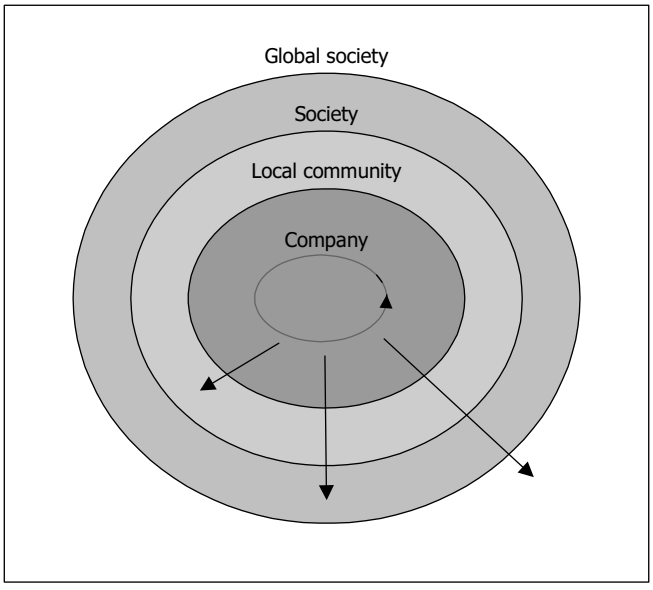

Fig. 7: The impact from life cycle companies on key stakeholders as conceived in the obligatory part of the Social LCA. The approach is a simplified stakeholder impact model. The arrows illustrate the social impacts of the company on stakeholders internally or externally

Social LCA is also distinguished from Environmental LCA by including elements of assessment in the inventory through the use of qualitative indicators. This fact poses larger requirements to LCA practitioners and practitioner manuals to give specific guidance on the use of indicators to ensure uniform assessment.

6 Conclusions

This article has presented a framework for Social LCA with a focus on legitimacy (through its foundation in universal norms) and company relevance. The framework covers the entire life cycle of a product with emphasis on the stages where the company has the largest influence, the materials and product manufacturing stages.

To accommodate the extended perspective compared to Environmental LCA, a new area of protection, *Human Dignity and Well-being*, has been proposed, and social impacts have been defined as impacts that ultimately will result in damage or benefit for this area of protection.

Contrary to the process-approach taken in Environmental LCIA, an organisational approach is taken when defining the product system, because social impacts are generally determined by the conduct of the companies which are engaged in the life cycle. The organisational approach requires a method to relate the social profiles of the companies involved in the life cycle to the product, and research is needed to analyse and test alternative methods.

The Social LCA framework consists of two layers of impact categories, an obligatory and an optional. The two-layer framework is suggested in recognition of the observation that many important social impacts of companies will be dependent on the specific business context, in terms of who are affected by the business activities and how they are affected. Hence, for Social LCA to be valuable as a decision support tool, the framework must enable inclusion of special concerns. On the other hand, there are some social impacts which are relevant to address for all companies and which must be considered by Social LCA in order to ultimately serve the objective of reducing harmful impacts and promoting beneficial impacts on people.

The framework is still under development, and even though some impact categories and indicators have been developed and tested on industry cases with success, full operationalisation with normalisation, weighting and aggregation has not yet been accomplished. The often more qualitative approach, necessary to assess violations of workers rights, for example, challenges the very essential elements of traditional LCA, normalisation and aggregation across impact categories. Further research in this area is necessary to succeed with the presented framework. It has not yet been attempted to establish a

quantitative link between impact and damage, i.e. to model actual damages caused by the companies' conduct. Where possible, this will support weighting of the impact categories and provide information of obvious relevance for society.

Further work with the establishment of local and country norms is necessary for Social LCA to give a covering image of the social impacts through use in business decision-making and to help it to reflect impacts which raise living standard in some parts of the world and thereby promote human dignity and well-being.

Social LCA holds the potential of promoting economic and social welfare in developing countries and improving working conditions around the world by providing responsible companies with a tool to assess the social impacts in the product chain of their business activities. In addition, it may also make LCA a more interesting and relevant tool for companies in developing economies by supporting inclusion of the beneficial sides of economic development, where Environmental LCA focuses on the damages which the development typically causes to the environment.

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11.2 Article 2: Assessing social impacts in a life cycle perspective—Lessons learned

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Assessing social impacts in a life cycle perspective—Lessons learned

M.Z. Hauschild (2)[a,*], L.C. Dreyer [a,b], A. Jørgensen [a]

[a] *Department of Management Engineering, Technical University of Denmark, Lyngby, Denmark*
[b] *Brødrene Hartmann A/S, Lyngby, Denmark*

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ABSTRACT

In our globalised economy, important stakeholder groups nowadays hold companies responsible for the social impacts they cause in their product chain through activities like child labour, corruption or discrimination of employees. Many companies thus see themselves in need of a tool which can help them make informed decisions about their social impacts throughout the life cycle of their products. The paper presents lessons learned from four years of work with industry on development of a methodology for Social Life Cycle Assessment and implementation in the industrial product chain. The Social LCA methodology supplements the traditional environment-oriented LCA and the life cycle costing tools in support of sustainability management addressing all three pillars of sustainability: people, planet and profit.

1. Introduction

A company has the possibility to influence the actions of the different actors along its product chains, back in the supply chain to its suppliers and their suppliers, and forth to the customer and user, and to the disposal or recycling of its products (Fig. 1). This possibility entails responsibility for a sustainable company, and Life Cycle Assessment (LCA) is thus a relevant analytical tool for sustainable engineering and management introducing the necessary life cycle perspective [1].

In our globalised economy, important stakeholder groups nowadays hold companies responsible for the social impacts they cause in their product chain through activities which may involve child labour, corruption, discrimination and deprivation of employees of their right to organize and demand fair working conditions. Often, these impacts occur far from the company headquarters, typically upstream in the product chain, but examples exist where globalised corporations have been held responsible by media and Non-Governmental Organisations for poor working conditions, not only in their own facilities, but also at their suppliers. The damage to their brand can be substantial, and for companies who claim to be sustainable, sometimes irreparable. This inspires companies to broaden their traditional focus on shareholders to include a wider range of stakeholders through adherence to voluntary sustainability principles like the Organisation on Economic Co-operation and Development, OECD's Guidelines for Multinational Enterprises [2], the United Nation's Norms on the Responsibilities of Transnational Corporations with Regard to Human Rights [3], the International Labour Organisation (ILO) Tripartite Declaration of Principles Concerning Multinational Enterprises and Social Policy [4] or the United Nation's Global Compact [5]; trough participation in Social Reporting Initiatives such as Global Reporting Initiative [6], or through application of Managements systems, such as SA8000 [7].[1] Issues like discrimination, child labour, corruption and fair working conditions all reflect the company ethics, and there is a need for a tool which can help companies prioritise their efforts in minimising social impacts throughout the life cycle of their products.

LCA methodology has been developed over the last decades to focus on the environmental impacts [1], and the basic principles of Environmental LCA have been set in international standards [8,9]. Sustainability is, however, commonly recognized as having three dimensions [10]:

- Environmental sustainability.
- Economic sustainability.
- Social sustainability.

Tools also exist for addressing the economic dimension of sustainability along the product chain, e.g. in Life Cycle Costing [11,12], but work on assessments of the social impacts in a life cycle perspective is rather recent and has gained momentum only over the last years [13–15].

The authors have been involved in the work with Social LCA ([15–17]), and here report on some of the central lessons learned so far.

2. Lessons learned

Experience from Environmental LCA has inspired the development of the Social LCA methodology. The focus is still on the product, and for many applications, the methodology should allow

* Corresponding author.

[1] Additionally, ISO is currently working on a standard on social responsibility (ISO 26000).

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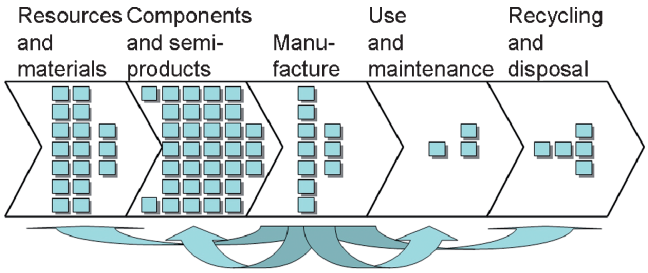

Fig. 1. A company has the possibility to exert influence on the other actors in its value chain.

aggregation of impacts over the whole life cycle. Sometimes there are trade-offs between social and environmental impacts, an activity which improves the social impacts may worsen the environmental impacts and vice versa. When this is the case, it is helpful if the analytical methodologies for social and environmental impacts are consistent and compatible so the social and environmental impacts may be brought on a comparable scale.

2.1. Different uses require different tools

Like the Environmental LCA, Social LCA has been mentioned and used in a number of different application types:

- Sustainability labelling of products or services.
- Sustainability management in a life cycle perspective [16,18].
- Sustainability assessment of technology choices [19].

The different scopes pose different requirements to the methodology and even within one application type there may be a diversity of needs. The company working with management of the social impacts in its product chains may thus need tools ranging from simplified tools of little data requirement for screening of potential suppliers or of the whole product chain in order to detect potential hot spots, to more comprehensive and data-requiring tools for detailed assessments and documentation of the improvements made in the life cycle of the products. Rather than one tool, the company needs a toolbox with tools addressing a variety of needs in the management practice. It is essential that these tools be calibrated against each other so they all indicate the same direction for social sustainability.

2.2. Importance of local specificity

From Environmental LCA the difficulty of addressing very locally dependent impacts is well-known. The local dependence means that the assessment requires site specific information about the local environment or the conditions under which a process is operated. Considering the number of sites potentially involved in the life cycle, the environmental life cycle impact assessment is normally done in a site-generic way, ignoring local or regional differences in environmental conditions and susceptibilities [20]. Inventory information is largely based on generalised unit process data, and specific data is only collected for the most dominating processes in the product chain [21]. The most local impacts of all, the human health impacts from exposure of the workers which operate the production equipment, with a strong dependence on the actual conditions of the process, are typically not included.

Social impacts are also strongly influenced by local conditions, in particular by the company's actual behaviour, and it is therefore necessary to collect specific data for the companies in the product chain. This is a cumbersome task, particularly for the companies far back in the product chain, (the suppliers of the suppliers, etc.) where one will typically have to resort to generalised data, e.g. based on location of the company and line of industry. This is also why simplified screening tools are needed in the Social LCA toolbox to identify the hot spots of the product chain and focus the effort in data collection on these parts of the product chain, where social impact can be severe and where more detail is needed in the analysis.

2.3. Which impacts and how to quantify them?

In Environmental LCA, the impact assessment addresses the impacts which the product system's emissions and resource extractions have on a number of Areas of Protection, which in Environmental LCA are [22]:

- Human health.
- Natural environment.
- Natural resources.
- Man-made environment.

While some of these are also relevant as Areas of Protection for the impact assessment in Social LCA (notably human health, which may be strongly influenced by the social impacts of a company), it is clear, that they do not fully cover what we want our Social LCA to address. An additional Area of Protection is needed covering Human Dignity and Well-being, representing the value of a good and decent life enjoying respect and social membership and with fulfilment of the basic needs (access to food, water, clothes, medical care, ...) [16,23].

These Areas of Protection help us identify the types of impacts which are relevant to consider in a Social LCA. Considering the local nature of social impacts, the relevant impacts may differ from company to company in the product chain. To ensure the relevance of the Social LCA as a decision support tool, it must adapt to the actual context by considering impacts which are specific to the product or sector of industry, and to the company itself. Grießhammer et al. [14] see the participation of stakeholders in the definition of indicators to address as preferable. On the other hand, the methodology must also include social assessment parameters that express some minimum expectations to a responsible conduct of business. The Social LCA therefore has to address two types of impact categories, an obligatory and predetermined set of categories which represents minimum requirements to conducting responsible business, and an optional, self-determined set which expresses interests specific to the product manufacturer [16].

In order to facilitate international consensus on the obligatory impact categories, they are typically based on the Universal Declaration of Human Rights [24] as it has been translated into global workers rights by the International Labour Organisation in its conventions [25] and in the Tripartite Declaration of Principles Concerning Multinational Enterprises and Social Policy [4]. Examples of obligatory impact categories are [16]:

- Discrimination.
- Child labour.
- Forced labour.
- Freedom of association.

Whereas the obligatory impact categories are seen as truly universal, the optional impact categories are much more dependent on the context of the company in terms of geographical and cultural settings, and they also may vary from trade to trade. Examples of optional impact categories are [15,16]:

- Physical working conditions.
- Working hours.
- Minimum wage and benefits.
- Training and education of employees.
- Development support towards local society.

From Environmental LCA we are used to measure only negative impacts on the environment. The product itself may be beneficial to the environment, but the emissions and resource uses that it causes throughout its life cycle only have negative impacts. This is

different for Social LCA. Manufacturing can be an important social activity accompanied by creation of wealth in the local community through payment of workers and purchase from local suppliers, training of workers, improvement of health among workers and their families, etc. If performed in an unethical manner it may also have strongly negative social impacts, through infringement on the workers' rights, employment of child labour, distortion of local communities, use of bribery to create corruption, etc. The Social LCA must be able to address as well the positive as the negative impacts.

In Social LCA, the impacts may be quantified using indicators which allow aggregation across the entire life cycle in accordance with the ISO requirements known from Environmental LCA [8,9]. Different approaches are used for quantification of the different social impacts. Some of the positive impacts may be directly quantified but for the negative impacts, and in particular in the obligatory categories, a direct quantification is often not meaningful. Violations of labour rights can be difficult to prove, and the absence of reported infringements or complaints may tell more about inefficient book-keeping than of the quality of the work environment. Instead, the risk that negative impacts occur may be gauged from the way that the company manages the relevant activities as proposed by [16].

2.4. Relating social impacts to the product

In Environmental LCA the focus is on the environmental impacts from the product system. These are caused by physical flows, and the Life Cycle Inventory collects and aggregates information about physical flows to and from all the processes in the life cycle. Resources, materials and (semi)products enter, and emissions and (semi)products leave the system. The fundamental unit of the product system in Environmental LCA is the process, since this is where the actual physical flows are determined.

Social LCA addresses social impacts, and these are not determined by physical flows but by the way, a company treats the people, it interacts with—its stakeholders. In Social LCA, it is therefore the company rather than the process which is the fundamental unit, and the inventory analysis is focused on the conduct of the company towards its stakeholders (see Fig. 2).

Once evaluated, the social impacts of the different companies in the product chain must be allocated to the product. In Environmental LCA the relationship between the process and the product is of a physical nature: How large emissions and resource consumption are caused by the processing of the product? The aggregation of the contributions from the individual processes to a total for the life cycle thus follows simple physical rules in Environmental LCA.

In Social LCA it is less straightforward to link the behaviour of the individual companies in the product chain to the product in a quantitative way. Nevertheless, it is indispensable to decide the weights given to each supplier in order to aggregate the social impacts over the life cycle. It is clear that the performance of companies, which play a large role in the life cycle, should influence the product's total impact more than companies which only contribute little to the product, but how to measure the contribution? There is not one objective answer to this question, but a number of possibilities can be listed:

- Physical weight—the contribution to the physical weight of the product.
- Cost—the contribution to the cost of the product.
- Value creation—contribution to the product's value.
- Working hours—the time spent on the product.

The parameter on which to base the weight given to each individual company must meet two criteria. First it must be possible to get the information needed to determine the parameter for all companies in the product chain. Second, and most important, the parameter must be relevant in a calculation of the social impacts of the product.

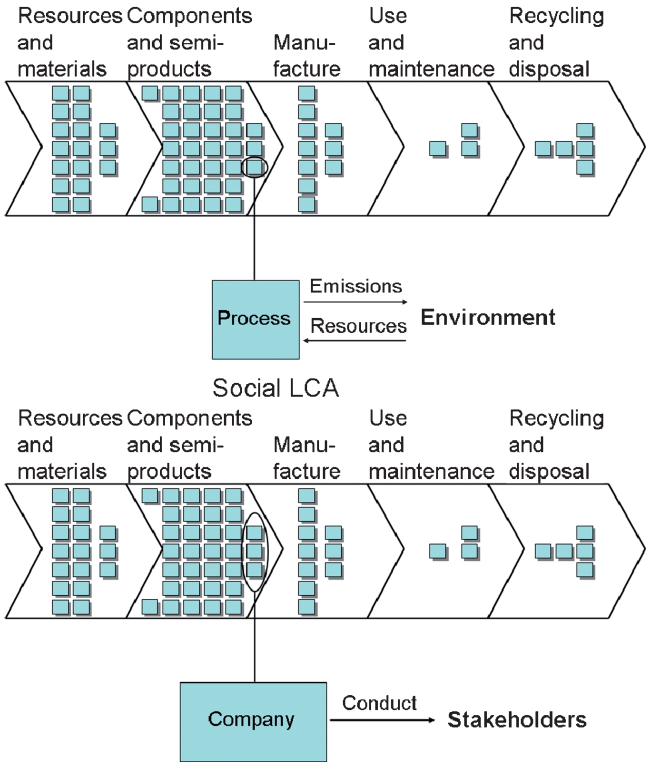

Fig. 2. In Environmental LCA focus is on the individual processes and the physical flows which they exchange with the environment. In Social LCA focus is on the company and the impact that its conduct has on the stakeholders (adapted from [16]).

The first proposal, the physical weight, clearly meets the first criterion and just as clearly fails the second. The weight of the different parts of the product cannot be justified as a relevant allocation criterion in a Social LCA.

Both the second and third proposal can be seen as relevant allocation parameters in a Social LCA. It seems fair that the companies which contribute most to the value creation or to the accumulation of costs along the product chain are also the companies which should influence the social profile of the product the most. As regards the information needed for these parameters, cost information can be sensitive for a company to pass on to its customers, and the value creation can be difficult to assess in a consistent way for each link in the product chain.

3. Conclusion

With the globalisation of production, even simple products often involve companies which operate in parts of the world where the social impacts of their activities can be serious. Particularly producers of consumer goods, who wish to protect their brand in a very sensitive market, develop a natural focus on corporate social responsibility, CSR, and broaden the focus to sustainability rather than just environment.

Furthermore, there are often conflicts between environmental improvements and social impacts. Outsourcing of parts of the production to developing economies will thus normally lead to worse environmental impacts since environmental regulation and infrastructure will be weaker or completely absent in the developing economies. On the other hand, the outsourcing creates jobs and trains local workers, and employment leads to increased welfare in the local economy. These are the two sides of economic growth, and if we only look at the environmental impacts, we miss the full picture. The economic growth caused by outsourcing of production to a developing economy may be positive even from a narrow environmental perspective, if the

outsourcing is done in a responsible way. The increase in welfare and material security will allow the local citizens to act in a more sensible way rather than erode their local environment in an attempt to meet their immediate needs. Nonetheless, very little work has so far been performed on the development or application of Social LCA, which is crucial to allow companies to fully consider sustainability. Several projects are, however, ongoing (see [15] for a review) and finalised methodologies are still to be presented. Under the joint Life Cycle Initiative of the United Environment Program, UNEP and the Society of Environmental Toxicology and Chemistry, SETAC to 'develop and disseminate practical tools for evaluating the opportunities, risks, and trade-offs associated with products and services over their whole life cycle' [26], a task force has been dedicated to the discussion of and establishment of consensus on the methodology for Social LCA [14].

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11.3 Article 3: Characterisation of social impacts in LCA - development of indicators for labour rights

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Supplementary information:

1. Labour rights indicators
2. Development of indicators for four obligatory impact categories in Social LCA
3. Development of value attribution to labour rights indicators
4. Development of contextual risk classification for labour rights violations

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SOCIETAL LIFE CYCLE ASSESSMENT

Characterisation of social impacts in LCA

Part 1: Development of indicators for labour rights

Louise Camilla Dreyer · Michael Z. Hauschild · Jens Schierbeck

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Abstract
Background, aim, and scope The authors have suggested earlier a framework for life cycle impact assessment to form the modelling basis of social LCA. In this framework, the fundamental labour rights were pointed out as obligatory issues to be addressed, and protection and promotion of human dignity and well-being as the ultimate goal and area of protection of social LCA. The intended main application of this framework for social LCA was to support management decisions in companies who wish to conduct business in a socially responsible manner, by providing information about the potential social impacts on people caused by the activities in the life cycle of a product. Environmental LCA normally uses quantitative and comparable indicators to provide a simple representation of the environmental impacts from the product lifecycle. This poses a challenge to the social LCA framework because due to their complexity, many social impacts are difficult to capture in a meaningful way using traditional quantitative single-criterion indicators. A salient example is the violation of fundamental labour rights (child labour, discrimination, freedom of association, and right to organise and collective bargaining, forced labour). Furthermore, actual violations of these rights somewhere in the product chain are very difficult to substantiate and hence difficult to measure directly.
Materials and methods Based on a scorecard, a multi-criteria indicator model has been developed for assessment of a number of social impact categories. The multi-criteria indicator assesses the effort (will and ability) of a company to manage the individual issues, and it calculates a score reflecting the company's performance in a form which allows aggregation over the life cycle of the product. The multi-criteria indicator model is presented with labour rights as an example, but the underlying principles make it suitable for modelling of other social issues with similar complexity and susceptibility to a management approach.
Results The outcome of the scorecard is translated for each impact category through a number of steps into a company performance score, which is translated into a risk of social impacts actually occurring. This translation of the scorecard results into a company risk score that constitutes the characterisation of the developed social LCA methodology. The translation from performance score to risk involves assessment of the context of the company in terms of geographical location and industry and of the typical level of social impacts that these entail, and interpretation of the company's management effort in the light of this context.

Preamble: The present paper is the first in a series of two. The paper presents a characterisation model based on multi-criteria indicators representing fundamental labour rights, which is implemented in six company case studies and evaluated on this basis in the second paper (Part 2: Implementation in six company case studies).

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L. C. Dreyer · M. Z. Hauschild (✉)
Department of Management Engineering,
Section for Quantitative Sustainability Assessment,
Technical University of Denmark (DTU),
Produktionstorvet Bygning 426,
2800 Lyngby, Denmark
e-mail: mic@man.dtu.dk

L. C. Dreyer
e-mail: lcd@man.dtu.dk

J. Schierbeck
Saxo Bank A/S,
Smakkedalen 2,
2820 Gentofte, Denmark
e-mail: jsc@saxobank.com

Discussion The developed indicators in social LCA are discussed in terms of their ability to reflect impacts within the four obligatory impact categories representing the labour rights according to the conventions of the International Labour Organisation (ILO) covering forced labour, discrimination, restrictions of freedom of association and collective bargaining, and child labour. Also their feasibility and the availability of the required data are discussed.
Conclusions It is concluded that it is feasible to develop indicators and characterisation methods addressing impacts related to the four obligatory impact categories representing the labour rights. The developed indicators are judged to be both feasible and relevant, but this remains to be further investigated in a separate paper in which they are implemented and tested in six separate industrial case studies.
Recommendations and perspectives The suitability of multi-criteria assessment methods to cover other social impacts than the obligatory ILO-based impacts is discussed, and it is argued that the combination of indirect indicators measuring a risk of impacts and direct indicators giving a direct measure of the impacts requires an explicit weighting before interpretation and possible aggregation.

Keywords Corporate social responsibility (CSR) · Human rights · International labour organisation (ILO) · Labour rights · Multi-criteria indicator · Site specificity · Social LCIA

1 Introduction

Social life cycle assessment addresses the impacts that a product has on people who interact with the life cycle of the product. In an earlier paper (Dreyer et al. 2005), we presented a framework for social life cycle impact assessment (LCIA). We made the point that in contrast to environmental impacts, which are related to the physical input and output of the processes in the life cycle of the product, impacts on people are related to the conduct of the companies engaged in the product chain. While environmental LCA is focused on the processes as the fundamental elements of the product system, social LCA must be focused at a higher hierarchical level—on the companies in which the processes occur, as illustrated in Fig. 1. Impact categories and indicators in social LCA must thus reflect the conduct of the companies engaged in the life cycle, towards the main stakeholders who are affected by their actions.

The intended application of our social LCA methodology is to support informed business decisions in a company (the manufacturer of the product) which has the aim to minimise harmful impacts on peoples' lives from the activities in the company's product chains. For this application, the focus of the methodology must be on those types of impacts that the company has a possibility to influence, and our social LCA is developed to facilitate companies to conduct business in a socially responsible manner. A methodology developed from a societal perspective rather than a company perspective might thus look different.

The social LCA result will reflect the risk that a company conducts its business in an unacceptable manner concerning the stakeholders, which are directly affected by its activities. It will also tell whether the company acts in a way that may displease the stakeholders who are not directly affected, but have taken interest in the company on behalf of affected stakeholders, e.g. NGOs, and hereby the result will also reflect the risk that these will try to influence the conditions under which the company conducts its business.

Negative as well as positive impacts are included in social LCA and may concern activities like violation of fundamental labour rights (e.g. working time, disciplinary actions and wage payment and health and safety of employees), corruption and bribery, company programmes

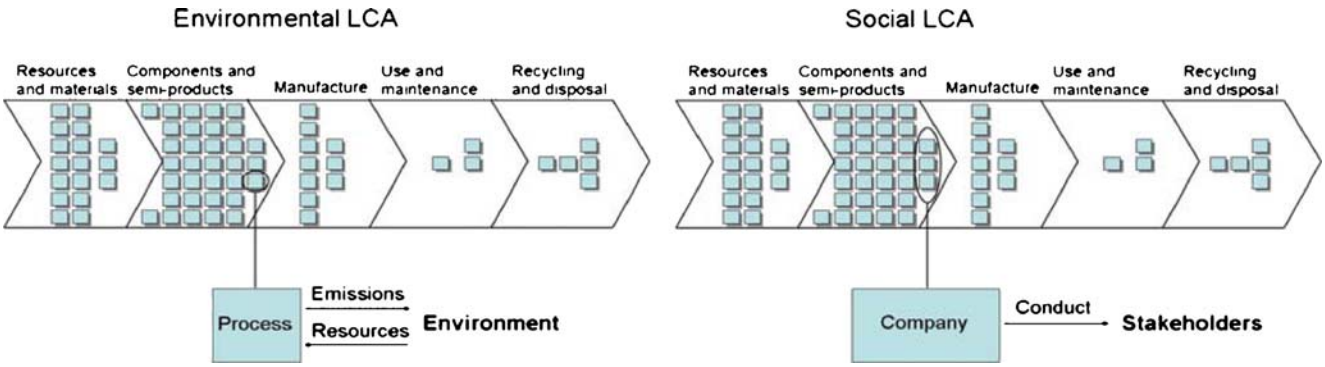

Fig. 1 In environmental LCA, focus is on the individual processes and the physical flows which they exchange with the environment. In social LCA, focus is on the companies engaged in the life cycle and the impact that their conduct has on the stakeholders who are affected by their actions (adapted from Dreyer et al. 2005)

for training and education or for health of employees, job creation and stimulation of economic development.

In an earlier paper (Dreyer et al. 2005), we suggested that social LCIA has two classes of impact categories, an *obligatory*, normatively based, class of predetermined categories expressing minimum expectations to conducting responsible business, and an *optional*, self-determined class of categories expressing interests specific to the product manufacturer, which are not already covered by the obligatory impact categories. We also argued that the obligatory impact categories should be based on the four issues of concern pointed out as fundamental by the International Labour Organisation (ILO), viz forced labour, discrimination, freedom of association and right to organise and collective bargaining and child labour (ILO 1930, 1948, 1949, 1951, 1957, 1958, 1973, 1999). These have earlier been identified for inclusion in social LCA or sustainability LCA by several authors, e.g. Mazijn (2004, 2005), Vanhoutte et al. (2004), Barthel et al. (2005), Schmidt et al. (2004), Griesshammer et al. (2006) and Manhart and Griesshammer (2006), and they are impacts that a company has a strong possibility to influence.

This paper presents a methodology for characterisation of social impacts belonging to the obligatory class of labour rights as defined by ILO. In Section 2, it is argued that violations of labour rights are complex and therefore difficult to measure using traditional quantitative single-criterion indicators, and in Section 3, we present a new methodology to create indicators suitable for modelling labour rights violations and other similar social issues in social LCA. In Section 4, we reflect on the significance of including considerations of the company's social context in the modelling of its social impacts, and in Section 5, we present a characterisation method for the labour rights impact categories. Finally, in Section 6, we discuss requirements to a category indicator, scope of assessment, data availability, weighting and other indicators in relation to the presented methodology.

2 Indicators for labour rights in social LCIA

Violations of labour rights may occur in many different ways, and they are complex to measure. Discrimination, for example, may occur through dismissal of female employees for getting pregnant, avoiding the hiring of persons with a different cultural background or assignment of the dirtiest jobs in the company to employees who belong to national minorities. Such aspects of discrimination must be included in the quantification of this type of labour right violation. Violations of labour rights are often difficult to substantiate: They may occur in a small and closed forum, e.g. when a manager punishes an employee, they are not necessarily the result of conscious acts, e.g. discrimination, the lines marking violations can be subtle, e.g. when overtime is considered voluntary, and the severity of some violations makes them too sensitive to disclose, e.g. when a company employs children in the workforce. This complexity and sensitivity make it difficult to quantify both the extent and severity of labour rights violations. Hence traditional quantitative indicators for LCA, which are typical one-dimensional in their representation of an issue and focused on direct measurement of the impact itself, have difficulty in producing meaningful results for some social issues. For example, the most simple, and often used, indicator for child labour 'number of employees below 15 years of age'[1] fails to consider the complexity of the child labour issue on several accounts[2]. Provided that information about the number of children working in the company below the minimum age is attainable from a company, it may be taken as an indication of exploitation of children. On the other hand, it may also be an act of social responsibility that a company introduces children to working life by letting them take on work that is appropriate to their age and maturity giving them the opportunity to gain skills and add to the well-being of their families. The ILO convention concerning child labour supports such initiatives by allowing children below the general minimum age to carry out light work (ILO 1973). This complexity of the issue can be dealt with by introducing more assessment criteria in the indicator model or by performing a qualitative assessment. The example also illustrates the necessity of such indicator results to be interpreted in the management context to be meaningful.

Another example illustrating shortcomings of traditional indicators concerns the measurement of work environmental impacts. Most companies register accidents at the workplace, but the registered number of working accidents may be a poor indicator of the quality or safety of the work environment. A company which has no active management of the work environment may have a low number of registered working accidents, simply because it has no systematic registration of them. Detached from its context of management effort, the number of reported working accidents will therefore not give an unambiguous assessment of the company's performance. Nevertheless, this type of *direct indicator* is frequently used in LCA as an indicator

[1] This type of indicator is used for assessment in LCA by Barthel et al. (2005) for modelling of labour rights issues by indicators concerning the humanity of working conditions measured, e.g. in 'seconds of actual child labour or forced labour' (Barthel et al. 2005). This measurement requires information about number of child labourers and persons working involuntarily.

[2] This example was also presented in a feasibility study about integration of social aspects into LCA (Griesshammer et al. 2006), where the authors briefly reflect on the complexity behind social indicators and the need of clear definitions.

of the work environment quality—in number of accidents per functional unit (Hauschild and Wenzel 1998), distinguished in lethal accidents and non-lethal accidents (Barthel et al. 2005) or further differentiated (Schmidt et al. 2004).

Instead, information about the measures taken to secure a safe and healthy work environment may serve as an *indirect indicator* of the quality of work environment, which can be expected. Examples of managerial measures that support a safe and healthy work environment in the company could be measures ensuring that the employees receive regular health and safety training, that safety instructions are placed on all machines in a language understood by the employees, that all employees have access to safety equipment and are instructed in the use of the equipment, that regular safety inspection rounds are conducted to ensure that safety instructions are followed and safety equipment is used and that all groups of employees are represented in a health and safety committee that meets frequently to discuss possible improvements in the working environment. All these measures help in reducing the risk that negative work environmental impacts occur—*provided that the implementation is effective*. The effectiveness of the implementation is crucial for the resulting work environment in the company, and the indicators for social impacts in LCIA are built upon this observation.

3 Development of a multi-criteria indicator model assessing company performance

With their ability to reflect multiple aspects of an issue in one indicator, multi-criteria indicators can handle the complexity of labour rights issues. Instead of aiming at quantitative direct indication of the extent and severity of labour rights violations in a company in the social LCA, we suggest the use of a multi-criteria indicator, assessing a company's efforts (will and ability) to integrate managerial measures appropriate to the issue, to evaluate preventive actions and provide an indirect indication of risk of violation. This is based on the presumption that lack of a systematic management approach with dedicated preventive actions gives free rein to violate rights, which enhances the risk that violations actually occur. The main premise is thus that systematic management is preventive and that there is coherence between systematic management and responsible conduct.

3.1 Multi-criteria indicator model

For each impact category, the relevant managerial measures are identified. Next, the effectiveness of the integration of these measures in the management of the company is assessed based on three predefined assessment criteria: (1) the establishing of *guidelines and practices*, which support integration of the measure into daily work; (2) the *communication and delegation of responsibility* for the integration of the measure into daily work; and (3) the performance of *systematic active control* of the integration of the measure into daily work. The establishing of guidelines and practices (1) is an expression of conscious action based on the company's own ethical stance on the issue at hand, i.e. not the use of predefined or specific guidelines and practices. The criteria 2 and 3 must be considered in continuation of criterion 1. Simultaneous fulfilment of each of the three criteria is crucial for the effective implementation of a measure, and therefore they are assessed separately, and the results are combined into an aggregated score for a measure. The assessment is performed in a scoring matrix or scorecard as shown in Fig. 2. The elements of the assessment are described in the following sections, and Appendix A in the Electronic supplementary materials provides an excerpt of the scoring of a company's management effort for the impact category *Working Environment* and presents the basic rules for scoring the implementation degrees 1 to 3 for each of the management efforts 1, 2 and 3.

The data collection and inventory processing process of traditional environmental LCA is paralleled here by filling in the matrix for each of the companies engaged in the life cycle. The company assessment using multi-criteria indicators may be considered equivalent to the inventory processing for a unit process in environmental LCA.

3.1.1 Managerial measures

The managerial measures are listed in the first column of the matrix in Fig. 2 (A, B, C...). Within each impact category (e.g. work environment, forced labour or child labour) activities which can cause impacts are identified together with the measures that the company can take to manage these particular activities. The managerial measures may be interconnected and partly overlapping in coverage of the activities in order to provide an adequate description of a company's management efforts.

Managerial measures and their arrangement in the matrix are defined for each impact category in a three-step process (schematic overview is provided in Fig. 3):

1. Identify central aspects of the issue, i.e. identify the main elements or characteristics that can be used to identify a situation of negative or positive impact, which must be addressed by the indicator, based on qualitative links to the area of protection *human dignity and well-being*. For labour rights, negative impacts are synonymous with violations of these rights. Examples of central aspects for, e.g. forced labour, are exclusion

MULTI-CRITERIA INDICATOR MODEL		EFFORTS IN INTEGRATION								
		I The company has established a practice or issued a guideline, which addresses the criterion stated in the left column			II The company has communicated and delegated responsibility for compliance with the practice/guideline to relevant managers and employees			III The company performs continuous active control to ensure that managers and employees comply with the established practice or guideline		
IMPLEMENTION DEGREE		1	2	3	1	2	3	1	2	3
MANAGERIAL MEASURES	A									
	B									
	C									
	…									

Fig. 2 Scoring matrix applied for semi-quantitative assessment of management effort in handling a relevant social issue. The managerial measures (*A*, *B*, *C*,...), which can help improve the social performance of the company for the impact category in question, are listed in the in the first column of the matrix. The second, third and fourth columns of the matrix are used to score the company's efforts in integration of the measures into daily work in the company (*I*, *II* and *III*). Each of these three efforts is essential for effective management independent of the impact category. For each effort, the degree of implementation is scored (ranging from 1 to 3)

from future employment, withholding of wages and induced indebtedness.

2. Identify the activities in the company where impacts (identified in step 1) may occur and formulate the managerial measures necessary to ensure systematic and adequate management of each of these activities to minimise the risk that negative impacts actually can take place or promote the actualisation of positive impacts. In regard to, e.g. forced labour, handling of personal documents is a common activity during the hiring stage where the employer has the possibility, if permitted by circumstances, to retain identity documents or other valuable possessions belonging to the employee, which during the employment may be used as a mean to restrict the freedom of the employee to seek other employment. A managerial measure could be formulated like this: 'Birth certificate, passport, identity card, work permit or other original documents belonging to the employee are not under any circumstances retained or kept for safety reasons by the company neither upon hiring nor during employment'. In terms of labour rights violations it may be helpful to ask, where and when violations potentially could take place in a company and how the occurrence of these violations may be effectively prevented through systematic management.
3. Arrange the managerial measures in the matrix (see Fig. 2), presenting the management approach to the issue in a logic and coherent manner. This arrangement is an optional step, which may be applied to facilitate the data collection. Often a simple arrangement according to the three stages of employee lifecycle, viz recruitment, employment and end of employment, is beneficial, because it provides structure to the data collection.

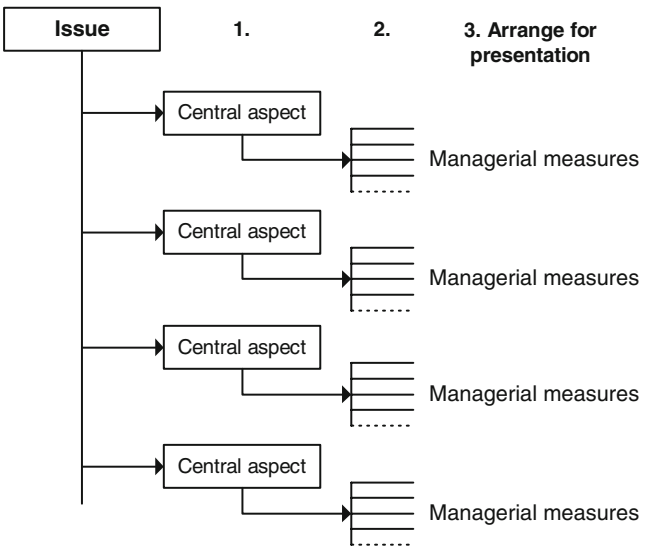

Fig. 3 The three steps to determine the subject dependent assessment parameters for an impact category indicator in social LCA

The indicator for the impact category *forced labour* is presented in Appendix B in the Electronic supplementary materials. Indicators for the other obligatory impact categories concerning labour rights in social LCA and the background for their development are presented in the Electronic supplementary materials, Appendices 1 and 2, respectively.

3.1.2 Efforts in integration

For each managerial measure taken by the company, guidelines and practices (I); delegation of responsibility and communication about guidelines and practices (II); and monitoring (III), which supports integration of the measure into daily work, are surveyed (second, third and fourth column of the matrix in Fig. 2). The three efforts are elaborated further in the following sections, and the basic principles for scoring of them are described in Appendix A in the Electronic supplementary materials.

Practice established or guideline issued A *guideline* provides the user with written step-by-step guidance to carry out a certain task, e.g. recruitment, whereas a *practice* is a general way of carrying out a task, which is not written down. For example, an employee may describe the practice of announcing open positions in the company like this 'when we have an open position, I always draft an announcement for the newspaper, which I send to the manager of hiring, for approval'.

Management style may vary significantly from company to company, so the quality of the individual practice or guideline must be assessed with respect to (1) its ability to fulfil the intent of the measure to minimise the risk of negative impacts or promote positive impacts and (2) its viability in the organisation.

For example, behind a measure about broad announcement of open positions lies the intent of ensuring applicants equal access to employment, which is a central aspect of non-discrimination. If the company's practice regarding announcement of open positions excludes a group of applicants, e.g. advertisement in youth magazine excludes elder applicants, it does not fulfil the intent of the measure.

Communicated and delegated responsibility A guideline may be developed for carrying out a certain task, but if the people involved in the task do not know that the guideline exists, do not know how to use the guideline or disagree with the guideline, it is unlikely that it will be followed in daily work. Therefore, for a practice or guideline to work effectively in an organisation, it is important that all concerned employees and managers have been informed about the practice/guideline in such a way that they can act accordingly and that responsibility for compliance has been explicitly delegated. It is not enough that written guidance has been sent out to the relevant employees and managers; it must also be ensured that they actually have acquainted themselves with the content and accepted its implications including the delegated responsibility for compliance.

The relevant employees and managers must be identified for each measure by asking, firstly, who is responsible for ensuring daily integration; secondly, whose behaviour is affected by the measure taken; and thirdly, who has interest in being informed in general.

Active control to ensure compliance Without control, it is not possible for the management to ensure the actual use of a guideline or practice in the daily work. *Active control* means that the company has established a system to monitor and survey that concerned employees and managers comply with the issued guidelines and practices. This involves systematic control on a regular basis by a superior or other qualified person in the company, who is impartial to the outcome of the control, or by a third party independent of the company. In order for the indicator to reflect both will and ability of the company to manage an issue, control should be company initiated, e.g. annual internal audit, internal anonymous employee survey. Yearly labour inspection by the national Labour Department does hence not constitute active control. In some organisations and for some measures, third party control may be the only type of effective active control. Active control can involve random check (sampling) with documented outcome for some measures.

An example of active control, which will be very efficient for most measures concerning the working environment, is regular safety rounds in the factory.

4 Contextual adjustment of indicator scores

Assessment with the multi-criteria indicators does not allow us to say whether impacts take place or not, only whether the circumstances in the company may permit or facilitate them to do so. The multi-criteria indicators measure the management effort of a company in regard to a particular issue. The importance of a strong management effort to avoid negative impacts or promote positive impacts taking place depends on the issue's topicality in the given context of the company compared to that of the reference context. The reference context represents the external conditions of the company for which the managerial measures of the indicator have been defined as a desirable management effort to ensure a minimum risk of negative impacts or a maximum possibility of positive impacts. In order to interpret the results of the multi-criteria indicators into a probability that social impacts actually take place, we therefore introduce a contextual adjustment as a part of impact assessment, assessing the need for good performance in light of the given context of the company. The contextual adjustment is valid for both positive and negative impacts, but for simplification of the discussion, the focus is in the following on negative impacts exemplified by labour rights violations.

By context, we mean the external environment characterising the risk of negative impacts. For labour rights issues, the external risk environment is typically influenced both by the geographical location of the company and the industry it belongs to. The external risk environment is the background on which the management of the company must be judged. If the company does not take specific measures to manage a particular issue, the internal risk environment of the company must be expected to resemble this background situation, whereas a dedicated effort may reduce the risk of social impacts compared to the level of the company's context. Depending on nature of the social issue and the scope of the LCA, the location may be specified as region (e.g. South America), country (e.g. Brazil), national macro-region (e.g. southeast of Brazil), state (e.g. Sao Paulo state) or even city (e.g. Sao Paulo).

The assessment of the context depends on the social issue and may be based on (1) existence and enforcement of national legislation concerning the issue, and social, cultural, economic and political practices at the location, and (2) the practices of members of the industry. The frequency and severity of violations reveal the topicality of the issue in the actual context, since they are the product of norms and customs in the concerned environment. Frequency and severity of violations at a particular location and in a specific industry may thus serve as an indicator of the context risk. If the context risk is high, i.e. violations are widespread or common, the company needs to make a very strong management effort in order to ensure/demonstrate low internal risk of violations, and vice versa. For example, the demands to a management system to ensure that children below minimum age are not hired are higher in a country where child labour is culturally accepted and therefore widespread, than in a country where this is not the situation. A company in Brazil must thus work harder to ensure a minimum age restriction for hiring than a company in Germany.

The managerial measures (introduced in Section 3.1.1) are defined in a way so they together describe a desirable company performance in a context where the issue is of maximum topicality. In regard to labour rights, this translates to desirable company performance in a very high risk context, i.e. where violations are common or systematic at a regional level and in the concerned industry. In order to assess the likeliness of negative impacts actually taking place in a company, the company's indicator result must be adjusted for the deviation of the context of the company from the reference context for which the indicator assessment criteria were developed. A parallel from environmental LCA is the inclusion of site dependent considerations (e.g. Potting and Hauschild 2006), but in social LCA, the need is more extreme. The social impacts of a company are determined by the way it behaves towards its stakeholders, and this may vary between two otherwise very similar companies applying the same technologies and operating in the same region. This means that it is difficult to apply general default data for social LCA with the purpose of supporting a company's management of its product chains (see Weidema 2005; Dreyer and Hauschild 2005), and as also the case for the implementation of spatial differentiation in environmental LCA, data availability may be a limiting factor.

5 Characterisation for obligatory impact categories

For the obligatory impact categories on labour rights, a characterisation model is described to calculate category indicator results based on the scoring of company management efforts in the scorecard shown in Fig. 2.

The characterisation operates on the scored company management effort from the inventory, and interprets it in a company risk perspective to generate a score which can be interpreted as the potential impact within the social impact category. Similar to inclusion of site specific consideration in environmental LCA, the consideration for context in social LCA entails that calculation of the potential impacts must occur separately for each process (company) before aggregation for the product system can take place (Potting and Hauschild 2006). The steps in characterisation are summarised in Fig. 4 and further elaborated in the following: The company assessment using multi-criteria indicators may be considered equivalent to the inventory processing for a unit process in environmental LCA.

Step I: Company performance (CP) The company performance is here defined as a score representing a company's efforts and ability to manage a particular issue through integration of appropriate managerial measures. The company performance score for an impact category is calculated using the filled in scorecard (see Fig. 2), attributing values to the three implementation degrees (1, 2 and 3) within each effort (I, II and III), multiplying the implementation degree values per management measure and summing them across management measures to arrive at one score for the impact category. The attribution of values determines the relative weight which is assigned to each of the individual efforts and implementation degrees in the scoring matrix, i.e. how the three efforts must act together for an efficient management of the issue in a very high risk context. The effectiveness of management increases markedly in a company, when responsibility has been clearly communicated and delegated (II) for existing guidelines and practices (I), and this effort again becomes even more effective, and reliable, when it is combined with systematic active control (III). In the value attribution to company

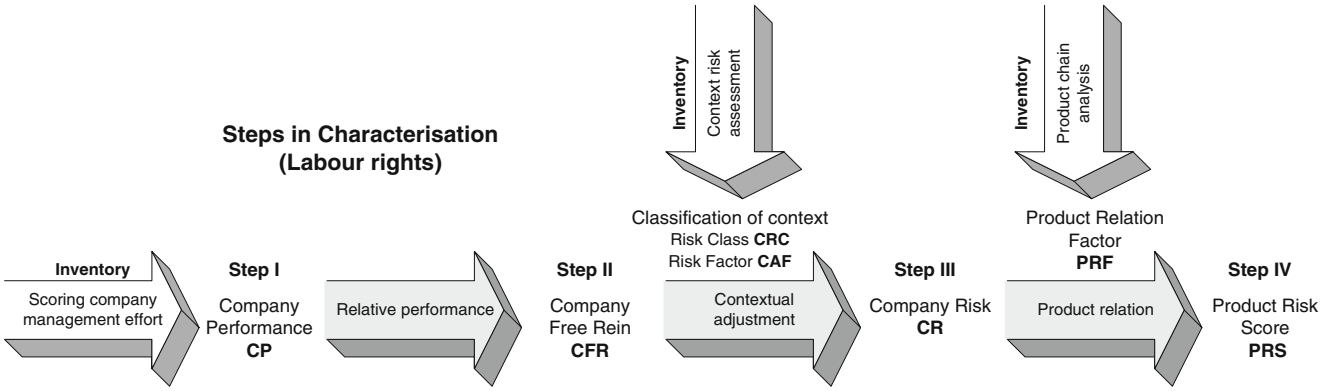

Fig. 4 Four steps of characterisation in social life cycle impact assessment for obligatory impact categories. The illustration is for one company and one impact category. *White arrows* signify inventory process, and *grey arrows* signify characterisation process

scoring, this amplifying relationship between the three integration efforts of the multi-criteria indicator is expressed through multiplication of the effort scores for each managerial measure of the indicator in the formation of the company performance score. The higher the total score, the better the management of the issue in question. The value attribution is elaborated further in Appendix 3 in the Electronic supplementary materials, where the values shown in Table 1 are developed to ensure the necessary differentiation between different performance levels.

Steps in calculating company management performance score (refer to Table 1 and Fig. 2 for terminology):

- Determine scores for each effort (AI, AII, AIII, BI, BII, BIII,...) by attributing values from Table 1 to implementation degrees 1, 2 and 3.
- Calculate scores for each managerial measure (A_{tot}, B_{tot}, C_{tot},...) by multiplication of the three effort scores (Eq. 1):

$$A_{tot} = \mathrm{AI} \times \mathrm{AII} \times \mathrm{AIII} \quad (1)$$

- Calculate total company performance score (CP) as the sum of the scores for all managerial measures (Eq. 2):

$$\mathrm{CP} = A_{tot} + B_{tot} + C_{tot} + \ldots \quad (2)$$

Step II: Company free rein (CFR) The difference between the measured company performance score (CP) and the ideal performance (CP_{max}) in a context of very high risk makes up the free rein to violate labour rights; the greater the distance, the greater the free rein and hence the stronger the presence of circumstances allowing violations to take place. Through indexation relative to the ideal company performance, the value of company free rein ends up in the interval between 0 and 1 regardless of the variation in the number of possible management measures in the impact category enabling comparison between scores of different impact categories (which have different numbers of management measures). The indexation also provides a

Table 1 Values for the implementation degrees of each of the three management efforts to be applied in the processing of management measure scores for all obligatory impact categories

Multi-criteria indicator model	Efforts in integration								
	I			II			III		
	The company has established a practice or issued a guideline, which addresses the criterion stated in the left column			The company has communicated and delegated responsibility for compliance with the practice/ guideline to relevant managers and employees			The company performs continuous active control to ensure that managers and employees comply with the established practice or guideline		
Implementation degree	I_1	I_2	I_3	II_1	II_2	II_3	III_1	III_2	III_3
Managerial measures A, B, C,...	0	0.7	4	1	1.2	2	1	1.2	2

Value attribution is developed in Appendix 3 in the Electronic supplementary materials

more comprehensible scale of the results, and the new scale facilitates contextual adjustment (Eq. 3):

$$CFR = (CP_{max} - CP)/CP_{max} \qquad CFR \in [0;1] \tag{3}$$

Step III: Company risk (CR) The indexed company free rein is adjusted by a contextual adjustment factor (CAF), which represents the relevance or importance of performance when considering the context of the company. The contextual adjustment enables comparison between scores of same impact category for different companies by compensating for differences in the context within which they operate. The adjustment is performed downwards to compensate for lower relevance/importance of performance than in the chosen reference context (Eq. 4):

$$CR = CFR \times CAF \qquad CR \in [0;1] \qquad CAF \in [0.4;1] \tag{4}$$

Contextual adjustment factor A context risk classification has been developed for labour rights violations on the basis of reported frequency and severity of labour rights violations in different geographic locations and industries. The classification considers five generic risk classes each of which is assigned a contextual adjustment factor with a value between 0.4 and 1, where a factor value of 1 signifies very high risk in present context. Based on a desk study of violations for the relevant geographic location and industry, the context of the assessed company is placed in a risk category and assigned the corresponding contextual adjustment factor. The context risk classification is described in Appendix 4 in the Electronic supplementary materials. The meaning of the different contextual adjustment factors is given in Table 2, and the meaning of the resulting CR scores is explained in Table 3.

Step IV: Product risk score (PRS) The company risk scores for the companies in the product chain must be related in a quantitative way to the product for which the LCA is performed in order to arrive at an impact score for the product. Each company risk score is related to the product chain by multiplication with a product relation factor PRF (Eq. 5):

$$PRS = PRF \times CR \qquad CR \in [0;1] \qquad PRF \in [0;1] \tag{5}$$

PRF[3] The product relation factor expresses which weight the social risk profile (consisting of one company risk score for each impact category) of a company in the life cycle shall be given in the social LCA of the product. The product relation factor has a value between 0 and 1, where 1 signifies that the product must carry the entire risk profile of the company in question. There is not one objectively correct way of calculating the product relation factor, but different approaches are possible (Dreyer et al. 2005). The choice of product relation principle will inevitably introduce a bias to the LCA study as regard to how it places emphasis in the life cycle, and it will influence the importance of the individual company impact in the overall impact profile for the product. The range of variation of the product relation factor (in particular the ratio between highest and lowest value it can take) in comparison to the possible range of the company risks is of importance. The product relation step therefore constitutes a value choice in the characterization method (Dreyer 2009).

Since this step is not necessary in traditional LCA, where the product relation is implicit, and hence not considered by ISO terminology (ISO 1997), it can be debated as to whether this should form part of characterisation or be

[3] Product relation factors is the same as what is referred to as share factors in Dreyer et al. (2005).

Table 2 Contextual adjustment factors to be applied in characterisation of labour rights indicators in social LCA

Contextual adjustment factors		
Contextual risk class (CRC)	Contextual adjustment factor (CAF)	Probability of occurrence in context
1	1.0	Very likely
2	0.9	Likely
3	0.7	Possible
4	0.5	Unlikely
5	0.4	Very Unlikely

Contextual risk classes are described in Appendix 4 in the Electronic supplementary materials. Typical risk situations applying to the different classes may be identified using Table 4.1 and Table 4.2 in Appendix 4 in the Electronic supplementary materials

Table 3 Interpretation of company risk

Company risk classification	
Company risk score	Definition of company risk
$0.9<CR\leq1.0$	Very high risk
$0.6<CR\leq0.9$	High risk
$0.4<CR\leq0.6$	High to medium risk
$0.2<CR\leq0.4$	Medium risk
$0.0\leq CR\leq0.2$	Low risk

The company risk classification defines five classes of company risk (CR). The classification is described further in Appendix 3 in the Electronic supplementary materials

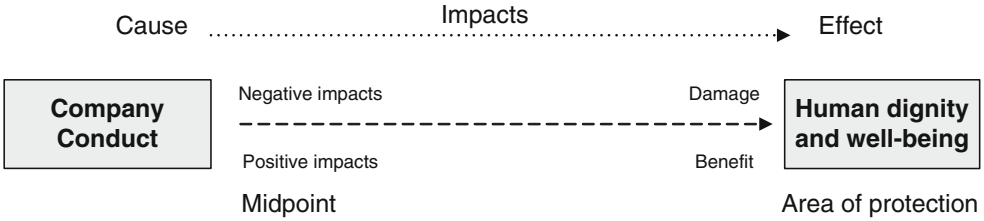

Fig. 5 Impact pathway model of the social LCIA framework. The goal of social LCA to support the company's management decisions naturally places the development of category indicators at midpoint of the impact pathway

viewed as a separate step similar to normalisation and weighting.

6 Discussion and outlook

6.1 Requirements to the impact category indicator

In environmental LCA, the inputs and outputs of a process in the inventory are quantified, and on the basis of assessment by environmental models (characterisation), the resulting (negative) impact on the environment is expressed by a score of the impact category indicators. As an alternative to assessing the social impacts of a company's operation directly in social LCA, it is here proposed to operate with impact category indicators, which express the probability that impacts occur as a result of a company's operation, through assessment[4] of the company's will and ability to manage its activities (multi-criteria indicators) considering the context which the company forms part of (contextual risk adjustment factors).

The requirement of an impact category indicator (category indicator) in the ISO standard for LCA (ISO 1997) is that it must be a quantifiable representation of an impact category, which is achieved in the suggested characterisation method.

The discussion of where in the impact pathway the category indicator should be located is well known from environmental LCA, and it is equally relevant in social LCA. The choice should respect the goal of the LCA. The goal of supporting the company's management decisions thus requires that the methodology addresses the expectations and demands from the main stakeholders of the company. The results of the social LCIA must be meaningful to the company, it must be easy to trace them back to tangible managerial measures, and they must be sufficiently sensitive to reflect changes in the management practice. Due to the uncertainty of the causal relationships, damage modelling may cloud the understanding of the causal links between the conduct of the company and the damage upon the area of protection. Furthermore, the expression of the product's social impacts in terms of damage, e.g. as disability or quality adjusted life years (DALY or QALY),[5] will be undesirable in the business context for many companies, implying that the company's product is dangerous compared to other products, which do not communicate their social impacts in this way. The use of the social LCA methodology for management decision support in companies thus point to the use of category indicators defined at the midpoint level. See overview of the impact pathway model of the social LCIA in Fig. 5.

6.2 The scope and aim of the assessment: labour rights violations

The proposed indicator model is focused on the will and ability of a company to manage an issue of concern (here developed for labour rights), rather than on direct impact, and this has consequences for the type of conclusions which can be drawn and therefore also the type of violators and violations it is likely to detect.

In principle, the method is developed to detect the risk of company violations of any severity. However, in reality, it will predominately detect violations of the more moderate character, which you can expect to get information about when conducting interviews in a company. In the situations where violations may be of a more serious character, the access to information will normally be limited. The type of violations indicated through the method may consist of many smaller violations or isolated cases of severe violations, such as:

- Unintentional as well as intentional discrimination of employees during recruitment, employment or termination of employment.

[4] In the process of scoring company performance, some personal judgement may be necessary to determine management efforts and the degree of implementation, and therefore the scoring step may include elements of assessment.

[5] Disability adjusted life years (DALY) is a metric developed by Murray and Lopez (1996) for the WHO and the World Bank. The original purpose was to have a tool to analyse the rationale of health budgets. DALY aggregates mortality and morbidity using weighting factors for the latter in the assessment of damage. Modelling of damage in life cycle impact assessment was introduced by Hofstetter (1998) and applied to the impact category Human Health in the Eco-indicator methodology (Goedkoop and Spriensma 2000). The QALY metric, which is the inverse of the DALY metric, has later been suggested applied in social LCA by Weidema (2006).

- Unintentional hiring of children; hiring of children under false pretence (e.g. as apprentices); work of children inconsistent with their physical and mental development.
- Work on involuntary basis and under menace of penalty.
- Suppression, restriction or obstruction of employees' right to freedom of association, right to organise and collective bargaining.

In this group of violators, we will find the companies that violate rights, because they lack systematic management, are ignorant of labour rights, have opportunity to take advantage of employees' less fortunate situation and may gain economically (in a small scale) by doing so, have individual persons hired showing poor judgement, etc. The method will primarily expose companies operating in the grey zone in regard to observance of labour rights. Hence disclosure of severe violations, such as physical confinement and physical punishment of employees, children in prostitution, disappearance and liquidation of union representatives, etc., is not directly considered by this approach. Even so, these labour rights aspects are indirectly considered by the social LCA through the context risk assessment, which considers labour rights violations of any severity. The presence of severe violations in the environment of the company is reflected through the adjustment of company free rein, as a demand of extra management effort from the company in order to minimise the risk of violations of less severe character, i.e. the need for management effort to prevent smaller violations from occurring is enhanced. When the extent of the management effort rises beyond a certain level, it also becomes preventive in regard to more severe violations, simply because these cannot coexist with the high awareness level accompanying the management effort. Social auditing often finds that behaviour leading to severe violations like physical abuse of employees is very unlikely to occur in a company which has employment contracts and training programmes for its employees. So the company risk scores obtained in characterisation may indirectly also express the risk of more severe violations.

The multiple assessment parameters of the labour rights indicators are developed to ensure that it can be said with reasonable certainty that violations do not take place if the company performs maximum regardless of the context. The contextual adjustment is thus carried out in the characterisation in such a way that it leaves a good performer unaffected, whereas a bad performer is affected by the adjustment to the degree that labour rights violations in the surroundings of the company give rise to concern and pose requirements to conscious management effort to ensure a low risk of violations in the company. Implicitly it is thus our perception of company risk that the influence of the external risk environment is less important than a conscious company management, meaning that a company's conduct does not necessarily have to be a product of its surrounding environment, but may be a result of a conscious management effort.[6] Hereby we emphasise that even a strong prevalence of violations in the settings of the company (country, industry) does not necessarily result in violations in the company. This preventive management paradigm is the backbone of the social LCA method presented with its focus on spotting the improvement potential(s) of the individual company in the small perspective (unit process level) and the improvement potentials in product chain in the larger perspective (life cycle level).

6.3 Data availability

The multi-criteria assessment method demands a site-specific data collection, which will often also require a high level of validation. It is not always possible to obtain specific information and may therefore sometimes be necessary to supplement by more simplified indicator models for companies with reduced access to data. Simplified indicator models could be reduced versions of the multi-criteria indicator, applying more accessible types of information and information sources, or models relying on information of more general character. In general, when simplified indicator models are used, it is very important to consider the consequences that this has for the reliability of the LCA. For example, assessment relying on use of generic data, such as assessment of country risk to represent internal risk environment of a company when considering negative impacts, can result in erroneous assessments and in the worst case a misleading conclusion of the LCA, e.g. identifying the wrong hot spots. Furthermore, in order to apply indicator models of different sophistication in the same LCA, they must be able to produce results that are compatible with the results produced with those of the multi-criteria indicator model. This also implies that the LCA method must be able to handle the different uncertainties connected with the chosen models in the aggregation in a way that enables comparability of the results ultimately in the interpretation of the LCA.

In social LCA, the issues which are addressed are of a particularly sensitive character. The structure of the multi-criteria indicators makes it difficult for a company—intentionally as well as unintentionally—to give a misleading image of their conduct and hence the risk of violations. This

[6] This is also reflected in the relative importance of the CAF, which in the extreme can move a company no more than two risk classes (see Table 3).

is one of the major strengths of the model as opposed to more simplified models.

6.4 Weighting of obligatory impacts

The contextual adjustment carried out in the characterisation is not to be confused with the weighting step of traditional LCA. The context risk is important for how large a management effort is needed to ensure that violations do not take place. The contextual adjustment does thus not evaluate whether observance of a given labour right is of more or less importance in the context, only the relevance of performing the determined managerial measures of the multi-criteria indicator. Regarding weighting between the different impact categories that represent the labour rights, in our work, we consider observance of the eight fundamental labour rights (four issues) to be by definition of equal importance, and therefore do not suggest any explicit weighting of the obligatory impact categories in case of comparison across the impact categories.

6.5 Derived indicators

Social LCA is a new discipline, and there are many different topics to work with at this stage of methodology development.

Fundamental labour rights are social aspects that have caught our particular interest, because even though it is widely accepted that these constitute minimum standards to which companies must apply, they are also aspects which are difficult to make tangible and actionable for companies. In terms of LCA, they are also social aspects, which are particularly difficult to quantify. The labour rights indicators presented in this paper (Appendices B and 1 in the Electronic supplementary materials) are therefore quite comprehensive involving many aspects in order to meet these challenges. Other social aspects may be represented by more simple multi-criteria indicators that constituted of few managerial measures; see the example of measures for indicator on working hours in Table 4. For social aspects related to the employer–employee relation, several simpler indicators may be derived from the labour rights indicators presented in this paper, because they, in their attempt to encompass central aspects of labour rights violations, touch upon many different aspects of working conditions. Derived indicators may for example include overtime, wage (remuneration in general), equal remuneration, grievances, employment contracts, training and education. Examples are given in Table 6 in Appendix C in the Electronic supplementary materials. Indicators along this line on labour practices and decent work conditions have been suggested by several authors; see overview presented by Jørgensen et al. (2008). Some of these derived indicator scores can also be submitted to a contextual risk adjustment, which may then be more specific when data on conditions relating to the issues are available. Data on occurrence of overtime, and on wages and equal remuneration, are thus sometimes available from common sources on labour rights violations. What concerns examination of grievances, contextual adjustment on the basis of risk of labour rights violations in general, is very relevant, because the need for grievances systems is highly dependent on the topicality of labour rights violations in the context. Equal remuneration may be adjusted by contextual risk of discrimination in the lack of specific data.

Table 4 Example of managerial measures for working hours indicator based on ILO convention 1 (ILO 1919)

Managerial measures	
	Working hours
1	Employees are never required to work more than 48 h per week
2	Employees have at least 1 day off in every 7-day period on average
3	Regular working hours do not exceed 8 h a day
4	Overtime does not exceed 12 h per week
5	Overtime is only used under exceptional business circumstances
6	Overtime is always compensated by time off or at a premium rate
7	Work is organised to accommodate paid rest breaks
8	Working hours for all employees are recorded

The ILO has published a series of conventions addressing working hours for specific industrial undertakings and workplaces. The indicator is based on the general rule for working hours, as stated by ILO convention 1. There are exceptions to this rule, which the managerial measures may be slightly adjusted to take into consideration, when the indicator is applied in these situations

6.6 Other social impacts

This paper has mainly focused on the modelling of labour rights issues in social LCA (obligatory impacts), but the multi-criteria indicator model presented earlier will also be suitable for modelling other social issues in social LCA when these comprise multiple aspects, which can be handled through systematic management and when systematic management of the issue will be preventive for negative impacts or conducive for positive impacts. *Corruption and bribery* and *stimulation of local economic growth* are examples of social issues with a direct relation to the company's conduct towards internal as well as external stakeholders, which successfully can be subjected to systematic management and for which a multi-criteria indicator model would also be suitable.

Other social impacts may be covered by single-criterion indicators and measurement of direct impacts, e.g. *money spent on education programmes for employees*. If indicators

directly measuring impacts are combined with the multi-criteria indicators measuring risk, it is necessary to consider this different in the measurement approach in an explicit weighting.

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Characterisation of social impacts in LCA
Part 1: Development of indicators for labour rights

Appendix A, B, C

Louise Camilla Dreyer • Michael Z. Hauschild • Jens Schierbeck

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L. C. Dreyer
Technical University of Denmark (DTU), Department of Management Engineering, Section for Quantitative Sustainability Assessment, Produktionstorvet Bygning 426, 2800 Lyngby, Denmark
e-mail:lcd@man.dtu.dk

M. Z. Hauschild (*)
Technical University of Denmark (DTU), Department of Management Engineering, Section for Quantitative Sustainability Assessment, Produktionstorvet Bygning 426, 2800 Lyngby, Denmark
e-mail: mic@man.dtu.dk

J. Schierbeck
Saxo Bank A/S, Smakkedalen 2, 2820 Gentofte, Denmark
e-mail: jsc@saxobank.com

Appendix A: Scoring management effort

Fig. 6 presents an illustrative example of the category indicator for the impact category Working Environment. The key managerial measures, which can be taken to ensure a safe and healthy working environment, are listed in the in the first column of the matrix (here an excerpt – there may well be more than 15 measures). The second, third and fourth column of the matrix describe efforts in integration of measures into daily work in the company. For each effort, the degree of implementation is scored (increasing from 1 to 3).

Fig. 6 Illustrative example of the category indicator for the impact category Working Environment with the scoring of a company's efforts in integrating preventive managerial measures (excerpt – there may well be more than 15) into daily work is shown.

WORKING ENVIRONMENT		**EFFORTS IN INTEGRATION**								
		I The company has established a practice or issued a guideline, which addresses the criterion stated in the left column			**II** The company has communicated and delegated responsibility for compliance with the practice/guideline to relevant managers and employees			**III** The company performs continuous active control to ensure that managers and employees comply with the established practice or guideline		
IMPLEMENTION DEGREE		1	2	3	1	2	3	1	2	3
MANAGERIAL MEASURES	All new managers, employees, contract workers and other persons going to carry out work on the premises go through an introductory health and safety training course in a language understood by the participants			X			X			X
	Safety instructions are issued and updated for each job function in a language understood by all employees			X			X	X		
	All employees receive guidance in proper use of personal protective clothing and equipment with consideration for motivational factors for usage, in a language understood by employees			X			X	X		
	…									

Scoring the company's efforts in integration of managerial measures into daily work is done according to the following interpretation of implementation degrees for each effort:

Effort I: Practice established or guideline issued

The degree to which the practice or guideline is implemented follows this scoring:

(1) The company has no written guidelines nor established a practice supporting integration of the measure.
(2) The company has written guidelines or an established practice addressing the subject of the measure, but these cannot support a complete integration of the measure.
(3) The company has written guidelines or an established practice, which supports full integration of the measure.

Effort II: Communicated and delegated responsibility.

Implementation of the communication and delegation of responsibility may follow this scoring:

(1) The company has not explicitly delegated responsibility for the written guidelines or the established practice, and the company has not communicated the content of the guidelines or practice to the concerned employees and managers.
(2) The company has informed some managers or employees about the written guidelines or practice, but not all relevant managers and employees have been informed in a systematic way. Responsibility for compliance has not clearly been delegated to all relevant managers or employees. Communication and delegation of responsibility for compliance is incomplete.

(3) The company has explicitly delegated responsibility for the written guidelines or established practice and communicated the content of the guidelines or practice to all the concerned employees and managers.

Effort III: Active control to ensure compliance.
Implementation of active control may be scored as follows:

(1) The company does not carry out any systematic control that ensures the effectiveness of the established practice or guideline.
(2) The company carries out control that ensures the effectiveness of the established practice or guideline, but not on a regular basis.
(3) The company controls conformity with the established practice or guideline systematically and on a regular basis.

A company scoring as illustrated in Fig. 6 could be a company which: "has an introduction programme which all employees and contract workers go through before commencing work. This programme includes mandatory health and safety training specific for each job position including guidance on use of ear protectors and protective gloves (the relevant health and safety equipment needed in the production). A Health and Safety Supervisor in the company is responsible for carrying out training. Other persons who are going to carry out work at the company premises are directed to the Health and Safety Supervisor who explains necessary safety precautions before they start working. The Health and Safety Supervisor keeps training records, which are controlled by the Human Resource Manager monthly before salary payment. The Health and Safety Supervisor is also responsible for issuing and updating safety instructions, and communicating them to the employees, which he does during the introductory training. However, nobody in the company controls whether safety instructions are actually followed or protective equipment is actually used on a regular basis."

Appendix B: Table 5 Abolition of Forced Labour Indicator

***Abolition of Forced Labour* indicator** **Managerial measures**	The company has established a practice or issued a guideline, which supports integration of the measure stated in the left column			The company has communicated and delegated responsibility for compliance with the practice/guideline to relevant managers and employees			The company performs continuous active control to ensure that managers and employees comply with the established practice or guideline		
Recruitment	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
1. Birth certificate, passport, identity card, work permit or other original documents belonging to the employee are not under any circumstances retained or kept for safety reasons by the company neither upon hiring nor during employment									
2. No money deposit or hiring fee is received for a person to be considered for or to enter employment									
3. Applied recruitment agencies do not charge hiring fees from the *company's* future employees or are in any other way engaged in any form of forced labour									
4. Employment contracts that stipulate wage, working time, annual holidays and length of personal holiday, are issued									
5. Employment contracts that stipulate terms of resignation, which ensure employees voluntary leave of employment after due notice, are issued									
6. Employment contracts that are comprehensible to the employee as to terms, language and formulation are issued									
7. Employment contracts are kept on file									
During employment									
8. Overtime is voluntary for all employees paid by the hour									
9. Overtime is always remunerated at premium rate for employees paid by the hour									
10. Working hours for all employees are recorded									
11. Wages are paid on time with regular intervals									
12. Wages amount to at least living wage for the concerned region at all times or at least minimum wage if higher									
13. Wage including bonuses and other benefits additional to ordinary wage is recorded for all managers and employees									
14. Deductions in wage are only made with the consent of the employee and never for disciplinary purposes, and they are clearly stated in wage records and on employee wage slip									
15. All employees and other parties have the possibility to file complaints about labour practices, which conflicts with the principles of employment on a voluntary basis, in confidentiality and without negative consequences									

***Abolition of Forced Labour* indicator (contd.)** **Managerial measures**	The company has established a practice or issued a guideline, which supports integration of the measure stated in the left column			The company has communicated and delegated responsibility for compliance with the practice/guideline to relevant managers and employees			The company performs continuous active control to ensure that managers and employees comply with the established practice or guideline		
During employment (contd.)	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
16. A system for handling complaints regarding labour practices, which conflicts with the principles of employment on a voluntary basis has been established to ensure response and a fair, uniform and confidential treatment of complaints									
17. All complaints and responses are recorded									
End of employment									
18. Letter of resignation is issued and handed over to the employee upon resignation									
19.Copies of letters of resignation are kept on file									
If the company provides housing for employees									
20. Use of accommodation provided by the company is voluntary and reasonable priced compared to earned wage									
21. House rules are defined and enforced with respect for the employees' freedom of movement									
If the company is situated remote from cities									
22. Food, accommodation and other necessities provided by the company are readily available and of a certain quality									
23. Food and other necessities provided by the company are reasonable priced compared to earned wage to ensure that employees are able to maintain a decent living standard while receiving a fair wage after deductions for these services.									
If loans, credit or similar schemes indebting the employee is provided by the company									
24. Loans, credit or similar schemes indebting the employee to the employer are subject to fair and transparent management									
25. Terms of loan, credit or similar schemes indebting the employee to the company is clearly documented in each case and kept on file									

Appendix C: Managerial measures derived from obligatory labour rights indicators which may constitute basis for separate indicators.

	Managerial measures
	Overtime
1	Overtime is voluntary for all employees paid by the hour
2	Overtime is always remunerated at premium rate for employees paid by the hour
3	Working hours for all employees are recorded
	Wage
1	Wages are paid on time with regular intervals
2	Wages amount to at least living wage for the concerned region at all times or at least minimum wage if higher
3	Wage including bonuses and other benefits additional to ordinary wage is recorded for all managers and employees
4	Deductions in wage are only made with the consent of the employee and never for disciplinary purposes, and they are clearly stated in wage records and on employee wage slip
	Employment contracts
1	Employment contracts that stipulate wage, working time, annual holidays and length of personal holiday, are issued
2	Employment contracts that stipulate terms of resignation, which ensure employees voluntary leave of employment after due notice, are issued
3	Employment contracts that are comprehensible to the employee as to terms, language and formulation are issued
4	Employment contracts are kept on file
	Equal remuneration
1	A system has been established to ensure that Individual remuneration is determined on equal terms for equal job functions
2	The conditions for gaining access to bonuses have clearly been defined to ensure that these are granted on equal terms for all managers and employees
3	Wage including bonuses and other benefits additional to ordinary wage is recorded for all managers and employees
4	Detailed job descriptions for all positions are issued, updated and kept on file
	Examination of grievances
1	All employees and other parties have the possibility to file complaints about labour practices in confidentiality and without negative consequences
2	A system for handling complaints regarding labour practices has been established to ensure response and a *fair*, uniform and confidential treatment of complaints
3	All complaints and responses are recorded

Table 6 Managerial measures constituting subject dependent assessment criteria of indicators derived from obligatory multi-criteria indicators for labour rights. Measures of indicators for *Overtime*, *Wage* and *Employment contracts* are derived from *Abolition of forced labour* indicator (Appendix B). *Equal remuneration* indicator measures derived from *Non-discrimination* indicator (Appendix 1 in the Electronic Supplementary Material). *Grievances* indicator measures are general for all labour rights indicators.

SOCIETAL LIFE CYCLE ASSESSMENT

Characterisation of social impacts in LCA
Part 1: Development of indicators for labour rights

Supplementary material 1-4

Louise Camilla Dreyer • Michael Z. Hauschild • Jens Schierbeck

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L. C. Dreyer
Technical University of Denmark (DTU), Department of Management Engineering, Section for Quantitative Sustainability Assessment, Produktionstorvet Bygning 426, 2800 Lyngby, Denmark
e-mail:lcd@man.dtu.dk

M. Z. Hauschild (*)
Technical University of Denmark (DTU), Department of Management Engineering, Section for Quantitative Sustainability Assessment, Produktionstorvet Bygning 426, 2800 Lyngby, Denmark
e-mail: mic@man.dtu.dk

J. Schierbeck
Saxo Bank A/S, Smakkedalen 2, 2820 Gentofte, Denmark
e-mail: jsc@saxobank.com

Supporting information 1: Labour rights indicators

Tables 1.1 to 1.4 presents four labour rights indicators based on the multi-criteria indicator model presented in (Dreyer et al, 2010a). The background and development of the labour rights indicators is presented (Dreyer et al, 2010b).

References

Dreyer LC, Hauschild MZ, Schierbeck J (2010a) Characterisation of social impacts in LCA - development of indicators for labour rights. Int J Life Cycle Assess 15 (3):247-259

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Table 1.1 *Minimum ages for employment* Indicator

Managerial measures	The company has established a practice or issued a guideline, which supports integration of the measure stated in the left column			The company has communicated and delegated responsibility for compliance with the practice/guideline to relevant managers and employees			The company performs continuous active control to ensure that managers and employees comply with the established practice or guideline		
Recruitment	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
1. Persons below the general minimum age are not hired to perform regular work									
2. Official documents, such as birth certificate, passport, identity card, or alternative method to establish age of applicants is used before hiring to ensure that no person below 13 years of age is hired									
3. Records on all employees stating names and ages or dates of birth are kept on file									
4. When hiring persons between 13 and 15 years of age for performing light *work*, parental consent is obtained and kept on file									
5. Employment contracts that stipulate wage, working time and work function, are issued for employees below 18 years of age									
6. Employment contracts are kept on file									
7. Apprenticeship programmes or similar educational programmes in the company are carried out in conjunction with a school, a training institution or are supervised by other competent authority									
8. Apprenticeship contracts that stipulates duration of programme, remuneration, areas of work, educational benefit and terms for awarding certificate of completed apprenticeship are issued									
9. Apprenticeship contracts are kept on file									
During employment									
10. Persons between 13 and 15 years of age only carry out light work, which is not harmful to their health, safety or development									
11. Working hours for employed persons between 13 and 15 years of age do not exceed 2 hours per day and are planned so working does not interfere with doing homework. Furthermore working hours are placed during the daytime (between 8 am and 8 pm) and not on Sundays or legal public holidays									
12. Persons less than 18 years of age do not carry out hazardous work, which is likely to jeopardize their health (physical or mental), safety or moral									
13. Working hours for employed persons between 15 and 18 years of age still attending school do not in any way interfere with doing homework or attending school									
14. Working hours for employed persons between 15 and 18 years of age does not exceed 42 hours a week and eight hours a day, and are placed during daytime (between 6 am and 10 pm)									

Table 1.1(contd.) *Minimum ages for employment* Indicator

Managerial measures	The company has established a practice or issued a guideline, which supports integration of the measure stated in the left column			The company has communicated and delegated responsibility for compliance with the practice/guideline to relevant managers and employees			The company performs continuous active control to ensure that managers and employees comply with the established practice or guideline		
During employment (contd.)	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
15. Working hours for all employees below 18 years of age are recorded									
16. All employees and other parties have the possibility to file complaints about labour practices concerning children in confidentiality and without negative *consequences*									
17. A system for handling complaints regarding labour practices concerning children has been established to ensure response and a *fair*, uniform and confidential treatment of complaints									
18. All complaints and responses are recorded									
If the company have employed home based workers									
19. Regular unannounced visits to home based workers are made to ensure that persons below minimum age do not take part in regular or hazardous work									

Table 1.2 *Abolition of Forced Labour* Indicator

Managerial measures	The company has established a practice or issued a guideline, which supports integration of the measure stated in the left column			The company has communicated and delegated responsibility for compliance with the practice/guideline to relevant managers and employees			The company performs continuous active control to ensure that managers and employees comply with the established practice or guideline		
Recruitment	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
1. Birth certificate, passport, identity card, work permit or other original documents belonging to the employee are not under any circumstances retained or kept for safety reasons by the company neither upon hiring nor during employment									
2. No money deposit or hiring fee is received for a person to be considered for or to enter employment									
3. Applied recruitment agencies do not charge hiring fees from the *company's* future employees or are in any other way engaged in any form of forced labour									
4. Employment contracts that stipulate wage, working time, annual holidays and length of personal holiday, are issued									
5. Employment contracts that stipulate terms of resignation, which ensure employees voluntary leave of employment after due notice, are issued									
6. Employment contracts that are comprehensible to the employee as to terms, language and formulation are issued									
7. Employment contracts are kept on file									
During employment									
8. Overtime is voluntary for all employees paid by the hour									
9. Overtime is always remunerated at premium rate for employees paid by the hour									
10. Working hours for all employees are recorded									
11. Wages are paid on time with regular intervals									
12. Wages amount to at least living wage for the concerned region at all times or at least minimum wage if higher									
13. Wage including bonuses and other benefits additional to ordinary wage is recorded for all managers and employees									
14. Deductions in wage are only made with the consent of the employee and never for disciplinary purposes, and they are clearly stated in wage records and on employee wage slip									
15. All employees and other parties have the possibility to file complaints about labour practices, which conflicts with the principles of employment on a voluntary basis, in confidentiality and without negative consequences									

Table 1.2 (contd.) *Abolition of Forced Labour* Indicator

Managerial measures	The company has established a practice or issued a guideline, which supports integration of the measure stated in the left column			The company has communicated and delegated responsibility for compliance with the practice/guideline to relevant managers and employees			The company performs continuous active control to ensure that managers and employees comply with the established practice or guideline		
During employment (contd.)	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
16. A system for handling complaints regarding labour practices, which conflicts with the principles of employment on a voluntary basis has been established to ensure response and a fair, uniform and confidential treatment of complaints									
17. All complaints and responses are recorded									
End of employment									
18. Letter of resignation is issued and handed over to the employee upon resignation									
19.Copies of letters of resignation are kept on file									
If the company provides housing for employees									
20. Use of accommodation provided by the company is voluntary and reasonable priced compared to earned wage									
21. House rules are defined and enforced with respect for the employees' freedom of movement									
If the company is situated remote from cities									
22. Food, accommodation and other necessities provided by the company are readily available and of a certain quality									
23. Food and other necessities provided by the company are reasonable priced compared to earned wage to ensure that employees are able to maintain a decent living standard while receiving a fair wage after deductions for these services.									
If loans, credit or similar schemes indebting the employee is provided by the company									
24. Loans, credit or similar schemes indebting the employee to the employer are subject to fair and transparent management									
25. Terms of loan, credit or similar schemes indebting the employee to the company is clearly documented in each case and kept on file									

Table 1.3 *Non-discrimination* Indicator

Managerial measures	The company has established a practice or issued a guideline, which supports integration of the measure stated in the left column			The company has communicated and delegated responsibility for compliance with the practice/guideline to relevant managers and employees			The company performs continuous active control to ensure that managers and employees comply with the established practice or guideline		
Recruitment	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
1. Announcement of open positions happen through national/regional newspapers, public job databases on the internet, employment services or other publicly available media ensuring a broad announcement									
2. Wording and formulation of job announcements do under no circumstances lead to beforehand exclusion of any qualified applicants									
3. Announcements are kept on file									
4. Selection of candidates for interviews is performed solely on the basis of a person's qualifications and ability relevant for performing the work in question									
5. Interviews of applicants is conducted solely with focus on a person's qualifications and ability to perform the work in question									
6. Conclusions made during job interviews are available on file for all candidates (selected and rejected) for as long as allowed by the law									
7. Employment of new employees is performed solely on the basis of a person's qualifications and ability relevant for performing the work in question									
8. The conditions for gaining access to welfare facilities and other non-payable benefits provided in connection with employment have clearly been defined to ensure that access to these are granted on equal terms for all managers and employees									
9. The conditions of work including number of working hours, rest periods, annual holidays with pay, term of notice, are determined on equal terms for all managers and employees									
During employment									
10. A system has been established to ensure that Individual remuneration is determined on equal terms for equal job functions									
11. The conditions for gaining access to bonuses and other payable benefits have clearly been defined to ensure that benefits are granted on equal terms for all managers and employees									
12. Applied recruitment agencies selects the company's future employees solely on the basis of a person's qualifications and ability relevant for performing the work in question									
13. Wage including bonuses and other benefits additional to ordinary wage is recorded for all managers and employees									
14. Detailed job descriptions for all positions are issued, updated and kept on file									

Table 1.3 (contd.) *Non-discrimination* Indicator

Managerial measures	The company has established a practice or issued a guideline, which supports integration of the measure stated in the left column			The company has communicated and delegated responsibility for compliance with the practice/guideline to relevant managers and employees			The company performs continuous active control to ensure that managers and employees comply with the established practice or guideline		
During employment (contd.)	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
15. Promotion happens on equal terms for all employees in accordance with a person's individual qualifications, character, experience, ability and diligence									
16. All managers and employees are offered relevant training and other education programmes on equal terms									
17. Participants in training and other education programmes are recorded									
18. Working hours for all employees are recorded									
19. Access to relevant occupational health and safety equipment is on equal terms for all employees.									
20. All employees and other parties have the possibility to file complaints about unfair treatment during the company's recruitment or termination process or any conditions of employment in confidentiality and without negative consequences									
21. A system for handling complaints regarding recruitment, conditions of employment or termination has been established to ensure response and a *fair*, uniform and confidential treatment of complaints									
22. All complaints and responses are recorded									
End of employment									
23. Dismissal of individual employees on grounds other than reorganisation or retrenchment is carried out solely on the basis of an employee's performance in the work situation									
24. Dismissal of employees on grounds of reorganisation or retrenchment is carried out on equal terms for all managers and employees and in accordance with local standards or agreements including agreements with local unions									
25. Records on dismissed employees with explanatory comments on grounds of dismissal are kept on file									
If the no collective bargaining takes place in the company									
26. A system has been established to carry out employee appraisal									
27. Employee appraisal is clearly documented in each case and kept on file									

Table 1.4 *Freedom of association, right organise and collective bargaining* indicator

Managerial measures	The company has established a practice or issued a guideline, which supports integration of the measure stated in the left column			The company has communicated and delegated responsibility for compliance with the practice/guideline to relevant managers and employees			The company performs continuous active control to ensure that managers and employees comply with the established practice or guideline		
Recruitment	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
1. Employment is not conditioned by joining a union or by relinquishment of trade union membership									
2. Employment is not conditioned by any restrictions on the right to collective bargaining									
3. Employee union members are provided employment under equal terms as non-union members									
During employment									
4. Facilities as may be necessary to assist the employee/union representatives in their work are made available									
5. Posting of union notices and other communication between the Union and its members at the company premises is allowed									
6. Employee/union representatives have reasonable time during paid working hours to exercise their functions									
7. Collective bargaining is used as a constructive forum for addressing working conditions and terms of employment and relations between employers and employees, or their respective organisations									
8. All union representatives and employees have access to information about collective bargaining agreements and other agreements between the company and the union									
9. Copies of collective bargaining negotiations and agreements are kept on file									
10. Employee/union representatives are invited to contribute to planning of larger changes in the company, which will affect the working conditions for the employees									
11. Minutes of meetings between employee/union representative and management are kept on file									
End of employment									
12. Dismissal of employees on grounds other than reorganisation or retrenchment happen solely on the basis of an employee's performance and is therefore always unrelated to the employee's membership of union or participation in union activities outside working hours or, with the consent of the employer, within working hours									

Table 1.4 (contd.) *Freedom of association, right organise and collective bargaining* indicator

Managerial measures	The company has established a practice or issued a guideline, which supports integration of the measure stated in the left column			The company has communicated and delegated responsibility for compliance with the practice/guideline to relevant managers and employees			The company performs continuous active control to ensure that managers and employees comply with the established practice or guideline		
End of employment (contd.)	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
13. Dismissal of employees on grounds of reorganisation or retrenchment takes place with the involvement of employee representative and in accordance with local standards or agreements including agreements with local unions									
If freedom of association is limited by national legislation									
14. All employees and other parties have the possibility to file complaints and suggestions regarding the working conditions in the company in confidentiality and without negative consequences									
15. A system for handling complaints and suggestions has been established to ensure response and suggestions and a fair, uniform and confidential treatment of complaints									
16. All complaints, suggestions and responses are recorded									
17. Employees are represented by a number of elected employee representatives appropriate to the size of the company in all matters concerning their welfare and interests in the workplace									
18. A spokesperson for the employees is encouraged and supported by the company									
19. Establishment of work groups or councils has been encouraged and supported by the company to facilitate employee representation in all matters concerning their welfare and interests in the workplace									

Supporting information 2: Development of indicators for four obligatory impact categories in Social LCA

In (Dreyer et al, 2005) it was argued that the obligatory part of the impact assessment in Social LCA should include indicators and characterisation model for the four labour right-related impact categories based on the fundamental International Labour Organisation (ILO) conventions, *viz.*: Forced labour, Discrimination, Freedom of association, right to organise and collective bargaining, and Child labour. This Appendix presents the background and development of performance indicators representing these obligatory impact categories on labour rights. The multi-criteria indicator model upon which the indicators are based and the method applied to determine assessment criteria for this model are described in (Dreyer et al, 2010). The method to determine subject dependent assessment criteria of the indicators consists of two obligatory steps: (1) identification of central aspects of violation (2) identification of business processes relevant for addressing central aspects of violation and formulation of managerial measures to address these (Dreyer et al, 2010).

The labour rights indicators assess management efforts (performance indicators) as opposed to impacts (impact category indicators) and their names denote this positive direction of indication: *Minimum ages of employment, Abolition of forced labour, Non-discrimination* and *Freedom of association, right to organise and collective bargaining*[1]. The indicator results are later during the characterisation transformed into risk of violations of labour rights (category indicator scores), which signifies the indicators' association with the respective impact categories (see Chapter 5 *Characterisation for obligatory impact categories* in (Dreyer et al, 2010)). The indicators presented have been developed, tested and revised over a three-year period until they reached the form in which they are presented here.

1 Introduction to development of labour rights indicators

1.1 Determination of managerial measures in labour rights indicators

The identification of central aspects of violation is primarily based on the relevant ILO core conventions, accompanying recommendations and the characterisations of labour rights violations provided by the ILO in their follow-up reports on The ILO Declaration on Fundamental Principles and Rights at Work. With outset in these, some typical activities in a company where violations may take place are identified and measures necessary ensure systematic and adequate management of each of these activities formulated. The ILO Conventions are state instruments, which mean that they often are very general in their formulation of requirements, leaving interpretation into national context to happen through national legislation. To formulate the individual managerial measures some requirements of the conventions must thus be specified more clearly or interpreted. For this purpose, references to other related ILO Conventions and other work carried out by organisations under the ILO are used.

The managerial measures in the indicators aim to address four general aspects with relevance for labour rights management in a company:

- Direct observance
- Indirect observance
- Documentation
- Handling of employee grievances

Some of the measures in the indicators address the provisions of a specific ILO Convention directly and thereby a company's direct observance of the ILO Convention e.g. measures concerning minimum ages for work.

Other measures address the provisions of a specific ILO Convention indirectly through focus on specific aspects of violation. These measures concern actions that support or demonstrate observance of the Convention. An example of a measure based on indirect observance is the availability of employment contracts with the purpose of avoiding deception or false promise about types and terms of work, which is an aspect of forced labour.

[1] In the literature, the term *freedom of association* is often used as a collective term for all three elements of the ILO Conventions no.97 and no.98: freedom of association, right to organize and right to collective bargaining. For reasons of simplicity, we here chose abbreviate the indicator, in accordance with this practice, to *Freedom of association,* even though these have a much broader scope than the abbreviated names suggests.

Documentation, as demonstrated e.g. through availability of records, is addressed by measures primarily for two reasons. Firstly, record keeping indicates a systematic and orderly management style. Secondly, records may be used to control integration of specific measures both during assessment and during company initiated control. The mere availability of records may also indicate that the company has nothing to hide.

Employee grievances are addressed by measures in indicators for all labour rights, because a formalised possibility for employees to complain or raise concerns about specific practices in the company is a very important tool for combating the more subtle violations such as discrimination or aspects of forced labour such as punishment for misconduct.

The managerial measures have been determined under the assumption, that the more formalized the employee-employer relationship is and the more transparent, systematic and well-documented the management of employees is, the more likely it is that the company does not violate labour rights. Hence, the larger, the degree of integration of managerial measures in daily work, the lower, the risk that violations of this type take place in the company.

1.2 Obligatory and additional measures

All indicators consist of obligatory and additional managerial measures. The indicators are developed aiming at general applicability, so as a general rule, obligatory measures are valid for all companies. There is however some exceptions to this rule, particular for the *Minimum ages for employment* indicator, and these are described in the background for each of the indicators in the following chapters. Additional measures primarily cover special aspects which are not generally relevant for all companies, but may be applicable in special situations e.g. when the company is located in remote areas, employ home workers etc. Additional measures may be excluded from assessment, when irrelevant, without affecting the completeness of the assessment.

1.3 Weighting of measures in the indicators

In the multi-criteria indicators labour rights aspects are addressed by managerial measures to the extent considered necessary to ensure appropriate management. The number of managerial measures addressing different aspects in the indicator therefore differs and hence representing aspects with different weight in the indicator result. It is possible to perform a weighting of the measures in the indicators ensuring equal emphasis on aspects in the indicator scores, however in general this is not done (see Step I in *Characterisation for obligatory impacts* in (Dreyer et al, 2010)), because it raises the discussion of whether the risk aspects represented in the indicators actual are of equal importance. As it is, risk aspects are attributed importance equivalent to the extent of required management effort, and considering that the multi-criteria indicators measure will and ability, this seems a sensible approach; however it being at the expense of some risk aspects may receive little attention.

One exception is however made in the labour rights indicators in regards to *Examination of employee grievances*[2], which is not linked to one or several aspects of violation (as other company activities addressed by measures are), but is a general provision in support of preventive actions concerning all aspects of labour rights violations. The three measures covering *Examination of employee grievances* are weighted with one-third each in the indicators where this company activity is included, so the activity is weighted as if addressed by one measure. This is primarily done in order to avoid that they dilute the significance of measures directly linked to specific aspects of violations in the assessment. Furthermore, when considering company assessment consisting of the four obligatory indicators, the activity would receive quite significant weight in comparison to other activities (even though there are other overlapping measures between the indicators).

2 Development of Minimum ages for employment indicator

2.1 Aspects of child labour

ILO sets boundaries to child labour for abolition, thus the term *child labour* does not encompass all work carried out by children[3]. Abolition of child labour aims to ensure children's future contribution to economic growth and social development by keeping them in school and thereby providing them with the opportunity to acquire the necessary skills to work and develop themselves mentally as well as physically. Child labour does thus not include work carried out by

[2] *Examination of grievances* is considered by the following indicators: *Minimum ages for employment*, *Abolition of forced labour*, *Non-discrimination*. See background Tables 2.2, 2.4 and 2.6.

[3] A child is defined as "every human being below the age of eighteen years" in the United Nations Convention on the Rights of the Child, 1989. (UN, 1989)

children, which is consistent with their education and full physical and mental development. Hence activities such as, helping out at home after completion of school and homework, and participation in vocational training or other technical programmes, do not constitute child labour. Work that is appropriate to their age and maturity, may even be beneficial, because by taking on work, they learn to take responsibility, they gain skills and add to the well-being of their families. Child labour that should be abolished according to ILO Conventions No. 138 (ILO, 1973a) and No. 182 (ILO, 1999a) falls into three categories:

(1) Labour that is performed by a child who is under the minimum age specified for that kind of work (as defined by national legislation, in accordance with accepted international standards), and that is thus likely to impede the child's education and full development.

(2) Labour that jeopardizes the physical, mental or moral well-being of a child, either because of its nature or because of the conditions under which it is carried out, known as hazardous work.

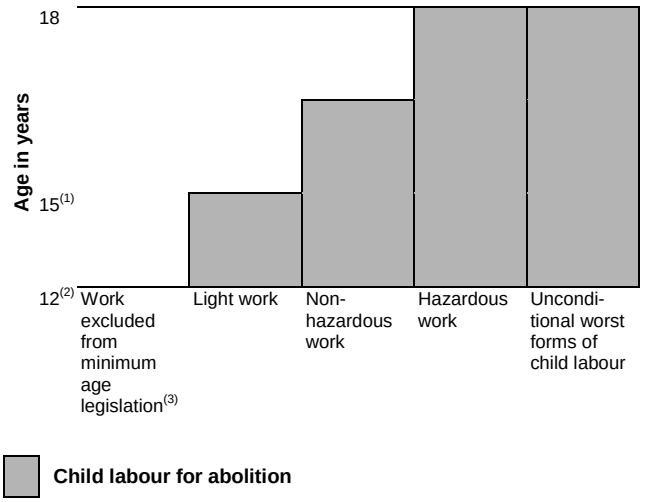
(3) The unconditional worst forms of child labour, which are internationally defined as slavery, trafficking, debt bondage and other forms of forced labour, forced recruitment of children for use in armed conflict, prostitution and pornography, and illicit activities.

The boundaries for child labour for abolition is defined by the interaction between the type of work and the age of the child involved. Thus the ILO Convention No.138 fixes a general minimum age to employment (hereafter referred to as minimum age for non-hazardous work), but it also provides two exceptions to this general minimum age for children carrying out light work and hazardous work. These three types of work are described in the following. Fig. 2.1 summarises the boundaries of child labour for abolition.

Non-hazardous work. According to the ILO Convention No.138 the minimum age for performing non-hazardous work is 15 years or the age of completion of compulsory schooling if it is higher (Article 2 (3)) (ILO, 1973a). However, national legislation in a number of countries defines 16 years as minimum age for non-hazardous work (APPLIS ILO, 2005). In developing countries where the economy and educational facilities are insufficiently developed the ILO may have allowed for the minimum age for non-hazardous work to be set at 14 years for an initial period after ratification (Article 2 (4)) (ILO, 1973a).

Light work. The ILO Convention No.138 provides a minimum age for admission to employment that is lower than the minimum age for carrying out non-hazardous work for the purpose of carrying out light work (Article7 (1)) (ILO, 1973a). If the minimum age for carrying out non-hazardous work is 15 years or above, persons in the range 13 to 15 years of age may carry out light work. If the minimum age for carrying out non-hazardous work is 14 years, persons in the range 12 to 14 years of age may carry out light work. National legislation may specify a minimum age for light work and may, or may not, subject it to the conditions set forth in the Convention. The national legislation may thus be weaker or stricter e.g. not allowing light work at all or setting differentiated age limits for occupations and/or apply specific definitions of light work.

Hazardous work. Another exception to general minimum age in the ILO Convention No.138 is in regards to hazardous work (Article 3) (ILO, 1973a). The minimum age for carrying out hazardous work is fixed at 18 years of age. Under strict conditions the minimum age may however be set to 16 years of age.



1) The minimum age for admission to employment can be set at 14, 15 or 16 years.
(2) The minimum age for light work can be set at 12 or 13 years
(3) For example, house chores and work in family business.

Fig. 2.1 Basic distinctions of child labour for abolition in ILO child labour standards. (Adapted from (ILO, 2002))

2.2 Measures for management of minimum ages for employment

The measures for managing minimum ages for employment have been formulated on the basis of the ILO Conventions No.138 and No.182. Many of the requirements of the two ILO Conventions concerning minimum age for employment and conditions of work for working children can directly be translated into a company management context, whereas the requirements concerning worst forms of child labour are more difficult to include. Worst forms of child labour such as prostitution, pornographic performances, production of drugs etc. are aspects unsuited for inclusion in a method relying on a preventive management paradigm addressing companies. These aspects are therefore not covered directly by the managerial measures in the indicator. Worst forms of child labour will however be covered indirectly, as integration of other measures regarding minimum age and working conditions, will indicate whether they are likely to take place.(Read more about the scope of the Social LCA method based on multi-criteria indicators in *Discussion and outlook* in (Dreyer et al, 2010))

The main concern, which the managerial measures must consider, is that the company bases its workforce on children. In the employee life cycle three main aspects of management of working children can be identified to address this concern considering the requirements of the two ILO Conventions:

(1) In the recruitment stage, the company must ensure that children are not hired to perform work that they are not allowed to perform according to the requirements of the conventions. To ensure this, the company must actively ensure that the applicant's age is always known before hiring, and that the age of a new employee is acceptable considering the job content of the open position.
(2) In the recruitment stage, the company must ensure that children are not hired under false pretence. To ensure this, terms of work must be clearly stipulated in all cases of hiring children.
(3) During the employment, the company must ensure that the children they have hired, at all times carry out work, which they are allowed to. This means that all relevant persons in the company must be informed about the specific requirements to working conditions for the specific age groups.

The relevant aspects of child labour and the company activities in which they may be addressed to minimise the risk that child labour takes place are presented in Table 2.1 The specific inclusion in the indicator is specified with reference to the origin (ILO reference) accordingly. On the basis of Table 2.1 specific measures for management of minimum ages for employment have been formulated. These are presented and elaborated in Table 2.2. Where it has been deemed necessary to apply other sources of information for interpretation of the requirements of the ILO Conventions No.138 and 182 these are discussed.

Table 2.1 Background for the determination of managerial measures to be considered by the *Minimum ages for employment* indicator according to the child labour aspects raised by the ILO. The ILO references indicate the origin of the managerial measure. Appropriate references are: Convention No. 138 (ILO, 1973a), Convention No. 182 (ILO, 1999a) Convention No. 90 (ILO, 1948a), Recommendation No. 41(ILO, 1932a) and Recommendation No. 190 (ILO, 1999b).

Child labour aspect	Company activity	ILO Reference	Managerial measure
Hiring children	Introduction of a general minimum age rule	C138	1
	Checking age of new employees	C138 Article 2, 3, 7	2
	Registration of new employees	C138 Article 9 (3)	3
	Obtaining parental consent	R41 Article 3	4
		Indirectly C182 Article 3(a)	do.
Use of child labour under false pretence	Issuing of employment contracts	Indirectly C138, C182	5, 6
	Hiring of apprentices(1)	C138 Article 6	7, 8, 9
Exploiting children 13 to15 years of age(2)	Handling working conditions for children 13 to 15 years old	C138 Article 7 (1)	10, 11, 15
		R41 Article 2	do.
		C33 Article 3	do.
	Obtaining parental consent	R41 Article 3	4
Exploiting children 15 to18 years of age(3)	Handling working conditions for children 15 to 18 years old (hazardous work)	C138 Article 3 (2)	12
		C182 Article 3 (d)	do.
		R190 Article 3	Do.
	Handling working conditions for children 15 to 18 years old (working hours)	C138 Article 3 (2)	13, 14, 15
		C182 Article 3 (d)	do.
		C90 Article 2	do.
		R190 Article 3 (e)	do.
All aspects of child labour	Examination of grievances	Indirectly C138, C182	16, 17, 18
Hidden child labour(4)	Inspection of home based workers	Indirectly C138, C182	19

Notes:

(1) Relevant if the company uses the labour of apprentices

(2) Relevant if the company employs children 13 to 15 years old

(3) Relevant if the company employs children 15 to 18 years old (young workers)

(4) Relevant if the company employs home based workers

The *Minimum ages for employment* indicator consist of 18 obligatory measures and 1 additional measure. The additional measure concerns the situation where the company employs home-based workers (measure no.19 in Table 2.2). When the company employs home-based workers the obligatory measures concern these as well as workers located in situ.

When obligatory measures are taken out of the indicator it must be clearly documented as a prerequisite for the scoring in connection with interpretation of results. Following situations allow exclusion of measures from the *Minimum ages for employment* indicator:

- If the company has a practice not to employ apprentices and is not planning to do so in the future, it is allowed to take out measures concerning the hiring apprentices of the indicator (measures no. 7, 8, 9 in Table 2.2).
- If the company has a stated policy not to hire children under the age of 15 years of age, i.e. scores above zero in measure no.1 in Table 2.2, it is allowed to take out measures concerning working children (measures no. 4, 10, 11 in Table 2.2).

- If the company does not employ young workers, it is allowed to take out measures concerning working conditions for these (measures no.5, 6, 12, 13, 14, 15 in Table 2.2).

Table 2.2 Formulation and explanation of key managerial measures applied for the *Minimum ages for employment* indicator in Social LCA.

Measures	Explanation
Introduction of a general minimum age rule	
1 Persons below the general minimum age are not hired to perform regular work	The first step to abolish child labour is when a company take an ethical stance in regards to child labour by explicitly stating that persons below the general minimum age are not to form part of the regular workforce. The enforcement of this rule will be covered by the following measures. A prerequisite for taking out measures concerning working children below minimum age (no. 4, 10 and 11) in the assessment of a company claiming not to employ such is that the company explicitly has stated this intention in accordance with this measure. This structure is made in the indicator in order to apply a precautionary principle compensating for the limited insight of the LCA practitioner during data collection. If the measures are scored and the company indeed are not employing children, the contextual risk adjustment will consider the significance of this in regards to company risk (See Characterisation for obligatory impact categories in (Dreyer et al, 2010)).
Checking age of new employees & Registration of new employees	
2 Official documents, such as birth certificate, passport, identity card, or alternative method to establish age of applicants is used before hiring to ensure that no person below 13 years of age is hired	To effectively abolish child labour in the long run it is necessary to enforce the minimum age(s) for employment. To ensure that no one below the minimum age is hired to perform a certain job in the company, the hiring manager must always ensure that the age of an applicant is acceptable when considering the expected working conditions of the open position. In this way the company will never be ignorant of child labour taking place on their premises.
3 Records on all employees stating names and ages or dates of birth are kept on file	The existence of transparent and complete employee records will confirm how many children are working in the company. The degree to which the company bases it workforce on working children may give an indication of whether the company engages in child labour.
Obtaining parental consent	
4 When hiring persons between 13 and 15 years of age for performing light work, parental consent is obtained and kept on file	Very young children may easily be exploited when entering employment, because of their lack of experience with the labour market and its mechanisms. The consent of a parent will ensure that someone represents the interests of the child both while entering the employment as well as during the employment. The consent will not be a guarantee that child labour does not occur, but it will indicate that the employment is voluntary.
Issuing of employment contracts	
5 Employment contracts that stipulate wage, working time and work function, are issued for employees below 18 years of age	Employment contracts or other written agreements between employer and the employee are essential for avoiding that deception or false promises about types and terms of work forms grounds for a person entering employment. When the employee is a child, there are very specific conditions of work, as to what work tasks may be carried out, duration and time of work, which must be respected. The parents of the child will sign the contract on behalf of the child.
6 Employment contracts are kept on file	Filing of employment contracts demonstrates systematic management and provides transparency in the conditions of employment for employees less than 18 years of age. When employment contracts are kept on file they can serve as objective evidence that the working conditions for employees of specific age groups are respected. The presence of contracts also supports the notion that the company does not engage in child labour.
Hiring of apprentices	
7 Apprenticeship programmes or similar educational programmes in the company are carried out in conjunction with a school, a training institution or are supervised by other competent authority	Participation in apprenticeship programmes is a way for children to experience the labour market at their own terms, while at the same time developing their skills and teaching them to take responsibility, which in all may prepare them for the adult labour market. Apprenticeship programmes may however also be a cover for exploitation of children's cheap labour if the educational purposes and regular monitoring is not ensured.
8 Apprenticeship contracts that stipulates duration of programme, remuneration, areas of work, educational benefit and terms for awarding certificate of completed apprenticeship are issued	Apprentice contracts stipulating duration of the programme; remuneration; areas of work; educational benefits; and terms for awarding certificate of completion, are essential for ensuring that apprenticeships do not become a cover for underpaying employees or to avoid legal obligations required for regular employees.
9 Apprenticeship contracts are kept on file	Filing of apprentice contracts demonstrates systematic management and provides transparency in the conditions of the apprenticeship. When these contracts are kept on file they can serve as objective evidence that the work of children is not exploited under the pretence of apprenticeship. The presence of such contracts also supports the notion that the company does not engage in child labour.

Table 2.2 (contd.) Formulation and explanation of key managerial measures applied for the *Minimum ages for employment* indicator in Social LCA.

Measures	Explanation
Handling working conditions for children 13 to 15 years old	
10 Persons between 13 and 15 years of age only carry out light work, which is not harmful to their health, safety or development.	If a company has working children it does not necessarily mean that the company exploits these children. The distinction between child work and child labour rests on the work tasks carried out; work duration; time of work; and the possibility of attending school parallel to working. (ILO, 2002)
11 Working hours for employed persons between 13 and 15 years of age do not exceed 2 hours per day and are planned so working does not interfere with doing homework. Furthermore working hours are placed during the daytime (between 8 am and 8 pm) and not on Sundays or legal public holidays	ILO Convention No.138 stipulates that children in the age group 13-15 years of age are only allowed to carry out light work[(1)]: "(a) which is not likely to be harmful to the health or development of children and; (b) which is not such as to prejudice their attendance at school or their capacity to benefit from the instruction received" (Article 7 (1)) (ILO, 1973a). The Convention does not provide further guidance on as to what is considered light work. Examples of light work are however provided by the Minimum Age (Non-industrial Employment) Recommendation No. 41 "running errands, distribution of newspapers, odd jobs in connection with the practice of sport or the playing of games, and picking and selling flowers or fruits might be taken into consideration" (Article 2) (ILO, 1932a)[(2)].
15 Working hours for all employees below 18 years of age are recorded	Requirements regarding the duration and time of work are essential for ensuring working children's possibility of attending school and their general well-being in the job situation. Convention No.138 is very general in its formulation leaving the setting of requirements to up to the member states. Here, in need of more specific requirements for the purpose of formulating a measure to address this aspect, we refer to requirements of other ILO Conventions or publications. The Minimum Age (Non-industrial Employment) Convention No. 33 provides that "the duration of light work should not exceed two hours per day on either school days or holidays, the total number of hours spent at school and on light work must in no case exceed seven per day" (Article 3) (ILO, 1932b)[(3)]. Furthermore night work (between 8 pm and 8 am) and work on Sundays and legal public holidays is prohibited. Records of working hours demonstrate that management of working children in the company is somewhat systematic. The existence of complete and transparent records of working hours indicates that the company does not engage in child labour, because such records can be used to determine if children are working excessive of the allowed number of hours and outside the normal hours.
Handling working conditions for children 15 to 18 years old (hazardous work[(4)])	
12 Persons less than 18 years of age do not carry out hazardous work, which is likely to jeopardize their health (physical or mental), safety or moral	In continuation of the requirements above, working children should not under any circumstances be allowed to carry out hazardous work. Both ILO Convention No. 138 and 182 define hazardous work in very general terms as work "likely to jeopardize/harm the health, safety or morals of children" leaving it up to State members to formulate a list over hazardous work (No.138, Article 3 (2) & No.182 Article 4 (1)) (ILO, 1973a). The Worst Forms of Child Labour Recommendation (No.190) accompanying Convention No.182 however provides guidance on this:" In determining the types of work referred to under Article 3(d) of the Convention (No.182 ed.), and in identifying where they exist, consideration should be given, inter alia, to: (a) work which exposes children to physical, psychological or sexual abuse; (b) work underground, under water, at dangerous heights or in confined spaces; (c) work with dangerous machinery, equipment and tools, or which involves the manual handling or transport of heavy loads; (d) work in an unhealthy environment which may, for example, expose children to hazardous substances, agents or processes, or to temperatures, noise levels, or vibrations damaging to their health; (e) work under particularly difficult conditions such as work for long hours or during the night or work where the child is unreasonably confined to the premises of the employer." (Article 3) (ILO, 1999b) It must be expected that national legislation will define hazardous work more concretely than Recommendation No.190 if ILO Convention No.138 has been ratified.
Handling working conditions for children 15 to 18 years old (working hours)	
13 Working hours for employed persons between 15 and 18 years of age still attending school do not in any way interfere with doing homework or attending school	As children in the age group 13-15 years of age are only allowed to carry out light work as specified above, the requirements concerning hazardous work are here directed at children in the age group 15-18 years of age.

Continues

Table 2.2 (contd.) Formulation and explanation of key managerial measures applied for the *Minimum ages for employment* indicator in Social LCA.

Measures	Explanation
Acceptable working conditions for children 15-18 years old (working hours)(contd.)	
14 Working hours for employed persons between 15 and 18 years of age does not exceed 42 hours a week and eight hours a day, and are placed during daytime (between 6 am and 10 pm) **15** Working hours for all employees below 18 years of age are recorded	Requirements regarding the duration and time of work are only touched upon in general terms in the Worst Forms of Child Labour Recommendation (No.190) in connection with the definition of hazardous work (Article 3 (e)) (ILO, 1999b) (see above). Therefore, in need of more specific requirements for the purpose of formulating a measure to address this aspect, we refer to requirements of other ILO Conventions and publications. For estimation of the number of children in hazardous work, the Statistical Information and Monitoring Programme on Child Labour defines work exceeding 42 hours(5) per week as hazardous on the basis of national classifications of hazardous child work (IPEC SIMPOC, 2002). This is also considered by the managerial measure. It should be noted that national legislation thus might be stricter in this area. Recommendation No.190 does not define 'work during the night' further in connection with hazardous work, so the Conventions regarding night work are examined. Night work of young persons (Industry) Convention No.90 define night as, (1) the period 22.00-06.00 (12 hours of rest required within this period) for young persons between 15 and 16 years of age and (2) the period 22.00-07.00 (7 hours of rest required within this period) for persons between 16 and 18 years of age (ILO, 1948a). In its conditions of employment for children, the Minimum Age Recommendation No. 146 stipulates a minimum of 12 hours of night rest (ILO, 1973b), so here we chose to apply the period 22.00-06.00, which respect 12 hours of night rest.
Examination of grievances	
16 All employees and other parties have the possibility to file complaints about labour practices concerning children in confidentiality and without negative consequences **17** A system for handling complaints regarding labour practices concerning children has been established to ensure response and a fair, uniform and confidential treatment of complaints **18** All complaints and responses are recorded	The existence of a used complaint system will support the notion that there is no child labour taking place. A company may have a complaint system, but if employees are not informed about its existence or if there is doubt as to how complaints are handled, the system will not work. Furthermore, if the company management does not respond to complaints or does not treat the complaint with respect, the confidence in the system will slowly disappear and the system will be useless. It is important that employees feel free to lodge complaints and that the means to do so in confidentiality is present. For example, a complaint box placed outside the director's office or far away from the production area is likely not to be used. Employees may lodge complaints about the content, duration and time of children's work or other conditions concerning the well-being of working children. The complaint system may, if effective, ensure that insufficient supervision of working children is improved. The recording of complaints is important as the number and severity of complaints may serve as an indication of whether the system works or not.
Inspection of home-based workers (additional measure)	
19 Regular unannounced visits to home based workers are made to ensure that persons below minimum age do not take part in regular or hazardous work	A company may indirectly engage in child labour if it employs home-based workers. When employees work from their own homes it is not possible to be sure who actually carries out the work. Children may thus be participating in regular or hazardous work without supervision. To avoid that the company unknowingly participates in child labour practices it must actively control that home based child labour does not take place through regular inspections of home-based workers.

Notes:

(1) In some countries the ILO have allowed a lower general minimum age of 14 years and an equivalent 12 years for carrying out light. However, this being meant as an interim arrangement (in a transitional period after ratification), the criteria concerning light work applies the minimum age of 13 years.

(2) Recommendation No.41 is aimed at non-industrial employment, but is cited several places in connection with general interpretation of Convention No.138 (IPEC SIMPOC, 2002) (ILO, 2000a).

(3) Convention No. 33 is aimed at non-industrial employment, but is cited several places in connection with general interpretation of Convention No.138 (IPEC SIMPOC, 2002) (ILO, 2000a) (SAI, 2005).

(4) The ILO allows for children more than 16 years of age to carry out hazardous work under strict conditions, however this being an exception to the rule, the criteria concerning hazardous work are concerned with the minimum age of 18 years of age.

(5) 43 hours is longer than most normal hours of work per week for adults. Normal workweek ranges from 35 hours to 46 hours, but most of them are in the range 40 to 44 hours (IPEC SIMPOC, 2002).

3 Development of Abolition of forced labour indicator

3.1 Aspects of forced labour

There are two ILO Conventions concerning forced labour. The Forced labour Convention (No.29) requires suppression of forced or compulsory labour in all its forms. Forced or compulsory labour is defined as "all work or service which is exacted from any person under the menace of any penalty and for which the said person has not offered himself voluntarily" in the Convention (Article 2 (1)) (ILO, 1930)[4]. The Abolition of Forced Labour Convention (No.105) is the second ILO instrument concerning forced labour. This Convention clarifies certain purposes for which forced labour can never be imposed. It specifies that forced labour can never be used for the purpose of economic development or as a means of political education, discrimination, labour discipline, or punishment for having participated in strikes (Article 1) (ILO, 1957).

The definition of forced labour in the Forced Labour Convention comprises two basic elements: the work or service is exacted under the menace of a penalty and it is undertaken involuntarily. Penalty may be in the form of penal sanctions or loss of rights or privileges. The menace of penalty can take multiple different forms, from the extreme form, involving threat of physical violence, to the more subtle forms of a psychological nature. Examples of penalties are threats to report illegal workers to the police; late or non-payment of wages; threats of dismissal if employees refuse to work excessive hours; detainment of identity papers, work permit etc. The ILO supervisory bodies have also reflected on the form and subject matter of consent; the role of external constraints and indirect coercion; and the possibility of revoking freely given consent. Many may enter employment voluntarily and later on discover that they are not free to withdraw their offered labour e.g. if bonded by debt, and in this situation the initial consent is considered irrelevant. ILO presents the main elements or characteristics that can be used to identify a forced labour situation in practice to explain the concept of forced labour in more detail, see Box 2.1. (ILO, 2005a)

Box 2.1 The main elements or characteristics that can be used to identify forced labour situations in practice. (Adapted from (ILO, 2005a))

Forced Labour in practice

Lack of consent to (involuntary nature of) work -the route into forced labour	**Menace of a penalty - the means of keeping someone in forced labour**
	Actual presence or credible threat of:
▪ Birth/descent into 'slave' or bonded status	▪ Physical violence against worker or family or close associates
▪ Physical abduction or kidnapping	▪ Sexual violence
▪ Sale of person into the ownership of another	▪ (Threat of) supernatural retaliation
▪ Physical confinement in the work location – in prison or in private detention	▪ Imprisonment or other physical confinement
▪ Psychological compulsion, i.e. an order to work, backed up by a credible threat of a penalty for non-compliance	▪ Financial penalties
▪ Induced indebtedness (by falsification of accounts, inflated prices, reduced value of goods or services produced, excessive interest charges, etc.)	▪ Denunciation to authorities (police, immigration, etc.) and deportation
▪ Deception or false promises about types and terms of work	▪ Dismissal from current employment
▪ Withholding and non-payment of wages	▪ Exclusion from future employment
▪ Retention of identity documents or other valuable personal possessions	▪ Exclusion from community and social life
	▪ Removal of rights or privileges
	▪ Deprivation of food, shelter or other necessities
	▪ Shift to even worse working conditions
	▪ Loss of social status

[4] The Convention provides for certain exceptions, in particular in regard to obligations as military service; work or service which is part pf normal civic obligations; work or service exacted as a consequence of conviction in a court of law, under certain conditions; work exacted in cases of emergencies such as wars, fires, earthquakes, etc; and minor communal services as defined (Article 2 (2))

3.2 Measures for management of abolition of forced labour

The measures to manage abolition of forced labour have been formulated on the basis of the characterisation presented in Box 2.1. Management practices that may indicate that work is carried out on a voluntary basis and without menace of penalty, have been identified in the situations, where the employer has the possibility of routing people into or keeping employees in forced labour. However, as was the case with worst forms of child labour, some aspects of forced labour are quite difficult to include directly in managerial measures due to the general approach of the multi-criteria indicator. Management of these aspects tends to be invisible in the management system and direct confrontation with unethical behaviour usually will not result in a true answer. Especially menace of penalty is very difficult to detect and to address directly. Some companies may have records of disciplinary actions, but it is not possible to have a management practice that ensures directly e.g. that employees are not threaten. It will be difficult for this kind of indicator to directly detect if employees are working under the menace of threat. However, integration of other measures will indicate whether it is likely to take place or not. One argument is that it is unlikely that a company that has a employee complaint system, employee contracts, working hours registration and pays minimum wage, would resort to means necessary to keep employees in forced labour (read more about the scope of the Social LCA method based on multi-criteria indicators in *Discussion and outlook* in (Dreyer et al, 2010)). Consequently, it is not all aspects of forced labour as defined by the ILO in Box 2.1 that directly have been covered by a the managerial measures, but these are considered covered indirectly by the general indication of all measures. Furthermore, some general measures addressing the decency of working conditions have been included additionally.

The relevant aspects of forced labour and the company activities in which they may be addressed to minimise the risk that forced labour takes place are presented in Table 2.3. On the basis of Table 2.3 specific measures for management of abolition of forced labour have been formulated. These are presented and elaborated in Table 2.4.

Table 2.3 Background for the determination of managerial measures to be considered by the *Abolition of forced labour* indicator according to the forced labour aspects raised by the ILO in Box 2.1.

Forced labour aspect	Company activity	Managerial measure
Retention of identity documents or other valuable personal possessions	Keeping of personal documents	1
Induced indebtedness	Setting of wage and working hours	8, 9, 10, 12, 13
	Use of hiring fees and deposits	2, 3[(1)]
	Management of company provided goods and services[(2)]	20, 22, 23
	Management of loans and credit [(3)]	24, 25
Deception or false promises about types and terms of work	Issuing of employment contracts	4, 5, 6, 7
Birth/descent into 'slave' or bonded status	Issuing of employment contracts	4, 5, 6, 7
Exclusion from future employment	Keeping of personal documents	1
	Issuing of employment contracts	4, 5, 6, 7
	Issuing of letter of resignation	18, 19
Indecent working conditions	Setting of wage and working hours	8, 9, 10, 12, 13
	Management of company provided goods and services [(2)]	20, 22, 23
Withholding and non-payment of wages	Regular and on timely payment of wages	11,13
Financial penalties	Use of wage deductions	13, 14
All aspects of forced labour	Examination of grievances	15, 16, 17
Physical confinement in work location	Management of accommodation with respect for freedom of movement [(4)]	20, 21

Notes:

(1) Relevant if the company uses recruitment agencies.

(2) Relevant if the company is situated remote from alternative accommodation and shopping possibilities.

(3) Relevant if loans, credit of similar schemes indebting the employee is provided by the company.

(4) Relevant if the company provides housing for employees.

The *Abolition of forced labour* indicator consists of 19 obligatory measures and 6 additional measures. The additional measures concern the situations where the company provide housing (measures no. 20 and 21 in Table 2.4), basic necessities (measures no. 20, 22 and 23 in Table 2.4) and loans (measures no. 24 and 25 in Table 2.4) to employees.

When the company does not use a recruitment agency and is not planning to do so in the future, it is allowed to take out the measure concerning use of recruitment agency (measure no. 3 in Table 2.4). If this measure is taken out of the indicator it must be clearly documented as a prerequisite for the scoring in connection with interpretation of results.
If a company has outsourced its recruitment process to a recruitment agency and/or employees are actually employed and paid by third part and rented to the company, the scoring must be considered for this party rather than the company for measures addressing activities no longer placed in the company. The outsourcing of functions sensitive to violations does thus permit reducing the extent of the indicator due to lack of relevance of measures.

Table 2.4 Formulation and explanation of key managerial measures applied for the *Abolition of forced labour* indicator in Social LCA.

Measures	Explanation
Keeping of personal documents	
1 Birth certificate, passport, identity card, work permit or other original documents belonging to the employee are not under any circumstances retained or kept for safety reasons by the company neither upon hiring nor during employment	If an employer retains birth certificate, passport, identity card, work permit or other original documents belonging to an employee there is possibility for keeping the employee in forced labour. By retaining important personal documents the employer may restrict the freedom of the employee to withdraw offered labour. By retaining personal documents the employee may also be prevented from seeking other employment on account of lacking documentation of identity or ability to present work permit. Withholding of passport will also make it impossible to seek employment abroad. Typical violations of this kind occur in the recruitment stage or during the employment. Withholding personal documents may occur upon hiring as a requirement to take on work, under pretence that it is for safeguarding or for registration of the new employee. During employment withholding personal documents may also take place under pretence that it is for safeguarding, or under constraint or as a result of disciplinary action.
Use of hiring fees and deposits	
2 No money deposit or hiring fee is received for a person to be considered for or to enter employment **3** Applied recruitment agencies do not charge hiring fees from the company's future employees or are in any other way engaged in any form of forced labour	Charging employees hiring fees may be a way for a company to route employees into forced labour, because by indebting them to the company, the freedom of the employees may become restricted until the debt is paid off. In serious cases of debt labour the victim's debt becomes subjected to high interest rates making it impossible to pay back his debt keeping him in forced labour. Another way of keeping employees in forced labour is by charging deposits. Upon hiring the employee pays a very large deposit, which is lost if employee chooses to leave the employment before the termination of the contract. The employer can exploit this dependency to force the employee to accept indecent working conditions e.g. excessive overtime, unsafe working tasks. Induced indebtedness by hiring fees traps people with limited working possibilities e.g. in regions with high unemployment, migrant workers or other vulnerable groups. The company may indirectly participate in forced labour practices if they use a recruitment agency that charges hiring fees. It is a very common form of forced labour that employees have become indebted to the recruitment agency arranging their employment, because they have been charged with very high fees, which they need to work to pay off.
Issuing of employment contracts	
4 Employment contracts that stipulate wage, working time, annual holidays and length of personal holiday, are issued **5** Employment contracts that stipulate terms of resignation, which ensure employees voluntary leave of employment after due notice, are issued **6** Employment contracts that are comprehensible to the employee as to terms, language and formulation are issued **7** Employment contracts are kept on file	Employment contracts between employer and the employee are essential for avoiding that deception or false promises about types and terms of work forms grounds for a person entering employment. Employment contracts must clearly stipulate regular working hours, remuneration, terms of overtime including payment of such, public/religious holidays, vacation etc., either directly or with reference to collective bargaining agreements or national legislation. For the contract to work as intended, it is crucial that the employee is able to understand the content and meaning of the contract. It is thus important that the language used in the contract is read and understood by the employee. The terms of resignation in the contract are important in regards to the subject of forced labour because they serve as assurance that the employment is entirely voluntary and that the employee is free to leave the employment at any given time after due notice. Filing of employment contracts demonstrate systematic management and provide transparency in the conditions of employment. When employment contracts are kept on file they can serve as objective evidence that the rights of the employees are respected. The presence of contracts for all employees supports the notion that no employee have been born or descended into slave or bonded status.
Setting of wage and working hours	
8 Overtime is voluntary for all employees paid by the hour	Wage and working hours are important aspects to consider in regards to forced labour. There are several forms of forced labour related to these, which also emphasises the importance of employment contracts (see above). ***Continues***

Table 2.4 (contd.) Formulation and explanation of key managerial measures applied for the *Abolition of forced labour* indicator in Social LCA.

Measures	Explanation
Setting of wage and working hours (contd.)	
9 Overtime is always remunerated at premium rate for employees paid by the hour **10** Working hours for all employees are recorded **12** Wages amount to at least living wage for the concerned region at all times or at least minimum wage if higher **13** Wage including bonuses and other benefits additional to ordinary wage is recorded for all managers and employees	A company can force employees to work overtime by paying them a low hourly wage or low piece-rate price making it impossible for them to earn a living wage without working overtime. Employees may give their consent to work overtime in this situation, but the consent is given under indirect coercion, which constitutes forced labour. Overtime must be voluntary for all employees at all time. If the company fails to pay a living wage it can also force employees to indebt themselves to the company through loans or wage advancements, thereby eliminating the possibility of withdrawing their offered labour. The existence of wage records for all employees confirms that wage is actually paid, which indicates that employees are not kept as slaves. Transparency in wage records is very important to uncover unfair remuneration. Overpricing of company provided services and goods and other deductions in wage may be indirect methods to keep the actually paid wage below an acceptable level. Wage records may serve as objective evidence that fair wage is paid. When overtime is remunerated less than premium rate it is an indication that it is not voluntarily carried out. Records of working hours demonstrate that management of employees is somewhat systematic. Also as was the case with wage records, the existence of records of working hours indicates that employees are not kept as slaves. Records of working hours can be used to determine if employees are working overtime on a regular basis and excessively. The degree of overtime may indicate the degree of voluntariness. The combination of records on wage and working hours may serve as control if employees must work excessive hours to be in receipt of a fair wage e.g. if the hourly wage or rate per piece is low. Furthermore, the records can confirm if employees are paid premium rate for overtime.
Use of wage deductions	
13 Wage including bonuses and other benefits additional to ordinary wage is recorded for all managers and employees **14** Deductions in wage are only made with the consent of the employee and never for disciplinary purposes, and they are clearly stated in wage records and on employee wage slip	Fines and deductions in wage may be used as a way to pay the employee less than agreed upon in the contract. Deductions in wage can lower the paid wage below minimum wage or living wage, which may result in employees being forced to indebt themselves (see above). The use of fines and deductions is a commonly used method to discipline the workforce. Employers may use these to deter or punish lateness, absenteeism, failure to meet quota, mistakes during operation, damaging of operational equipment, bathroom breaks longer than allowed etc. Wage records may, if transparent and complete, confirm that deductions are not used for disciplinary actions and does not lower the employee salary below minimum or living wage.
Regular and timely payment of wages	
11 Wages are paid on time with regular intervals **13** Wage including bonuses and other benefits additional to ordinary wage is recorded for all managers and employees	Stalling payment of wages can easily be used as a mean of exerting pressure on employees to, for example, work excessive hours or similar. Payments of wages may also be arranged in such a way that it deprives the employees their rights to terminate employment. Wage records will be able to confirm whether payment of wages is regular and timely.
Examination of grievances	
15 All employees and other parties have the possibility to file complaints about labour practices, which conflicts with the principles of employment on a voluntary basis, in confidentiality and without negative consequences	

Table 2.4 (contd.) Formulation and explanation of key managerial measures applied for the *Abolition of forced labour* indicator in Social LCA.

Measures	Explanation
Examination of grievances (contd.)	
16 A system for handling complaints regarding labour practices, which conflicts with the principles of employment on a voluntary basis has been established to ensure response and a fair, uniform and confidential treatment of complaints	Refer to earlier general argumentation for *Examination of grievances* in Table 2.2. In regards to the particular subject of forced labour, employees may use this possibility to l lodge complaints about disciplinary practices, deductions, restriction of movements and involuntary overtime. Companies managing their business in good faith may be surprised to get knowledge about practices, which can be associated with forced labour, e.g. disciplinary practices performed by foreman.
17 All complaints and responses are recorded	
Issuing of letter of resignation	
18 Letter of resignation is issued and handed over to the employee upon resignation	In some countries it is necessary for the company to issue a letter of resignation or sign a workbook to release the employee from the employment. If the employee does not have evidence of the cessation of the employment he will not be able to seek employment elsewhere. The result is that the employee is kept in a situation where he cannot leave the current employment even though he wishes to.
19 Copies of letters of resignation are kept on file	Filing of letters of resignation demonstrates systematic management and provides transparency in the conditions of employment. When letters of resignation are kept on file they can serve as objective evidence that the practice is actually implemented, and that company does not compel employees to stay employed in this way.
Management of accommodation with respect for freedom of movement (additional measures)	
20 Use of accommodation provided by the company is voluntary and reasonable priced compared to earned wage	Physical confinement in work location is a traditional form of forced labour where employees are restricted, coerced or intimidated to remain at the worksite or in company provided accommodation. Use of company provided accommodation must be voluntary, which may constitute a problem when the company is placed in an area with no alternative accommodation possibilities. The use of company provided accommodation may thus be more or less voluntary.
21 House rules are defined and enforced with respect for the employees' freedom of movement	House rules may be formulated in such a way that employees are not allowed to leave the company premises after end of their shift. Security guards may be employed to make sure that this is enforced. Employees are thus restricted in their freedom of movement, which constitutes forced labour.
Management of company provided goods and services (additional measures)	
20 Use of accommodation provided by the company is voluntary and reasonable priced compared to earned wage	The availability, pricing and quality of company provided goods and services become of particular importance, when the company is situated remote from alternative accommodation and shopping possibilities, e.g. mining and forest logging companies. The lack of alternatives may give the company the possibility of setting prices as it pleases. Employees may then not be able to receive a decent wage due to the company overcharging for basic goods and services. Furthermore, this practice may result in indebting the employee and thereby bonding the employee to the employer.
22 Food, accommodation and other necessities provided by the company are readily available and of a certain quality	
23 Food and other necessities provided by the company are reasonable priced compared to earned wage to ensure that employees are able to maintain a decent living standard while receiving a fair wage after deductions for these services.	
Management of loans and credit (additional measures)	
24 Loans, credit or similar schemes indebting the employee to the employer are subject to fair and transparent management	The moment that an employee is indebted to his employer there is risk of bonded labour as the character of the employment may easily become involuntary. Therefore great caution is necessary in case such arrangements take place. It is thus essential that loans, credit or similar schemes indebting the employee are subject to fair and transparent management. It is important to emphasize that such schemes do not necessarily lead to bonded labour. They may work perfectly well in some companies.
25 Terms of loan, credit or similar schemes indebting the employee to the company is clearly documented in each case and kept on file	Terms of loans, credit or similar schemes must be documented, so it is possible to determine if conditions are fair and not used as a means to bond employees.

4 Development of *Non-discrimination* indicator

4.1 Aspects of discrimination

The two ILO Conventions on equality at work are among the most widely ratified ILO Conventions.(ILO, 2000b) The Discrimination (Employment and Occupation) Convention, 1958 (No.111) aims to eliminate discrimination in access to employment, training and working conditions and to promote equality of opportunity and treatment through formulation of national policy (ILO, 1958a). Discrimination is defined as any distinction, exclusion or preference based on distinction, exclusion or preference based on race, colour, sex, religion, political opinion, national extraction or social origin which has the effect of nullifying or impairing equality of opportunity or treatment in employment or occupation (Article 1(1)) (ILO, 2000b). This means that that the presence of intent is not necessary to identify a situation of discrimination, what matters is the effect of deprivation or limitation of equal opportunity and treatment arising from a difference in treatment (ILO, 2003). Differential treatment on basis of the inherent requirements of a particular job or as a result of special measures of protection e.g. to address the specific health needs of women or men, do not constitute discrimination.

The formulation of a national policy for the prevention of discrimination in employment and occupation required by Convention No.111 should according to the Recommendation (No.111) have the scope of application stipulated in Box 2.2 (ILO, 1958b).

Box 2.2 Presents the scope of application of the ILO Discrimination Convention as defined by the accompanying ILO Recommendation, No.111 (ILO, 2003).

Scope of application

The Convention no.111 protects all workers against discrimination. This protection applies to all sectors of employment and occupation, both public and private, and extends to:

- Access to education, vocational guidance and training
- Access to employment and occupation (i.e. to work, whether self-employment, wage employment or in the public service)
- Access to placement services
- Access to workers' and employers' organizations
- Career advancement
- Security of job tenure
- Collective bargaining
- Equal remuneration for work of equal value
- Access to social security, welfare facilities and benefits

The second ILO instrument concerning equality at work, the Equal remuneration Convention (No.100), concerns equal pay for men and women for work of equal value (ILO, 1951). The term remuneration includes the ordinary, basic or minimum wage or salary and any additional emoluments whatsoever payable directly or indirectly, whether in cash or in kind, by the employer to the worker and arising out of the worker's employment (Article 1 (a)) (ILO, 1951). One of the means specified for assisting in giving effect to the Convention to establish or encourage the establishment of methods for objective appraisal of the work to be performed, whether by job analysis or by other procedures, with a view to providing a objective classification of jobs. (ILO, 2003) The issue of equal remuneration for work of equal value is also covered by ILO Recommendation No. 111, see Box 2.2.

4.2 Measures for management of non-discrimination

The measures to manage Non-discrimination and equal remuneration have been formulated on the basis of the ILO Conventions No.100 and No.111. Management practices that may support and thereby indicate equality of opportunity and treatment in employment have been identified in the situations in the company where discrimination may take place consiously as well as subconsiously. The definition of discrimination in Convention No. 111 and the scope of application presented in Box 2.2 have been the immediate offset for the indentifying relevant aspects of discrimination. Equal access to employment, training and working conditions are discrimination aspects of Convention No. 111 that are particularly suitable to address in a company management context. Access to vocational guidance and placement services is an aspect, which is not considered here, because it lies outside the company management context. Moreover, a *Freedom of association and collective bargaining* indicator may cover general access to workers' organisations and collective bargaining on a company level.

The relevant aspects of discrimination and the company activities in which they may be addressed to minimise the risk that discrimination takes place are presented in Table 2.5. On the basis of Table 2.5 specific measures for management of non-discrimination and equal remuneration have been formulated. These are presented and elaborated in Table 2.6.

Table 2.5 Background for the determination of managerial measures to be considered by the *Non-discrimination* indicator according to the discrimination aspects raised by the ILO in Box 2.2. The ILO references indicate the origin of the managerial measure. Appropriate references are: Recommendation No. 111 (ILO, 1958b), Convention No.111 (ILO, 1958a) and Convention No.100 (ILO, 1951).

Discrimination aspect	Company activity	ILO Reference	Managerial measure
Access to employment	Announcement of open positions	R111 Article 2b (ii)	1, 2, 3
	Selection and treatment of job applicants	R111 Article 2b (ii)	4, 5, 6, 7
	Use of recruitment agencies(1)	R111 Article 2b (ii)	12
	Dismissal of employees	R111 Article 2b (ii)	23, 24, 25
Access to welfare facilities and benefits related to employment	Determining conditions of work and access to welfare facilities and benefits	R111 Article 2b (vi)	8, 9, 14, 18
Other conditions of work including occupational safety and health, hours of work, rest periods, holidays	Determining conditions of work and access to welfare facilities and benefits	R111 Article 2b (vi)	8, 9, 14, 18
	Management of H&S equipment	R111 Article 2b (vi)	14, 19
Security of job tenure	Determining conditions of work and access to welfare facilities and benefits	R111 Article 2b (iv)	9
Equal remuneration for work of equal value	Remuneration	R111 Article 2b (v)	10, 11, 13, 14
	Employee appraisal(2)	R111 Article 2b (v)	26, 27
Career advancement	Handling career advancement	R111 Article 2b (iii)	15
Access to education and training	Training and educating	R111 Article 2b (ii)	16, 17
All aspects of non-discrimination	Examination of grievances	Indirectly C111 C100	20, 21, 22

Notes:

(1) Relevant if the company uses recruitment agencies.

(2) Relevant if the company does not engage in collective bargaining.

The *Non-discrimination* indicator consists of 25 obligatory measures and 2 additional measures. The additional measures concern the situations where the company does not engage in collective bargaining and address the need for employee appraisal in connection with negotiation of working conditions (measures no. 26 and 27 in Table 2.6).

When the company does not use a recruitment agency and is not planning to do so in the future, it is allowed to take out the measure concerning use of recruitment agency (measure no. 12 in Table 2.6). If this measure is taken out of the indicator it must be clearly documented as a prerequisite for the scoring in connection with interpretation of results.

If a company has outsourced its entire recruitment process to a recruitment agency and/or employees are actually employed and paid by third part and rented to the company, the scoring must be considered for this party rather than the company for measures addressing activities no longer placed in the company. The outsourcing of functions sensitive to violations does thus permit reducing the extent of the indicator due to lack of relevance of measures.

Table 2.6 Formulation and explanation of key managerial measures applied for the *Non-discrimination* indicator in Social LCA.

Measures	Explanation
Announcement of open positions	
1 Announcement of open positions happen through national/regional newspapers, public job databases on the internet, employment services or other publicly available media ensuring a broad announcement	Open positions must always be publicly announced to ensure equal access to employment. The announcement must be conducted in a manner that ensures reach of a broad group of applicants, so the choice of media should be considered with respect to this. For example it would be unacceptable if a company only announce available jobs in the local church society newsletter. The requirement of broad announcement does not conflict with the wish to consider specific persons or uninvited applications in the hiring process as these may be considered on the same terms as new applicants and applications.
2 Wording and formulation of job announcements do under no circumstances lead to beforehand exclusion of any qualified applicants	The choice of words and formulation in the text of a job announcement must not lead to beforehand exclusion of qualified applicants on the basis of characteristics not relevant for the ability to perform the work or work function in question. For example the text should be formulated in a way that is neutral in regards to gender and age. When announcements are kept on file it is possible to verify the implementation of the practice.
3 Announcements are kept on file	
Selection and treatment of job applicants	
4 Selection of candidates for interviews is performed solely on the basis of a person's qualifications and ability relevant for performing the work in question	Situations of discrimination may occur during recruitment of new employees, when a hiring manager's personal preferences or bias become decisive rather than an evaluation of the qualifications and ability of the applicant. Discrimination may happen consciously as well as subconsciously, which makes it difficult to address, and furthermore it can be difficult to detect during the recruitment process, because usually, only few persons are involved in the process, and after the process (during monitoring) because it is not possible to ask rejected applicants if they discriminated.
5 Interviews of applicants is conducted solely with focus on a person's qualifications and ability to perform the work in question	To prevent discrimination in the recruitment process it is essential that the company have a formal process for handling the different steps in the process thus leaving less room personal judgement based on non-work related information about the applicant. Use of management tools that guides and structure the process from start to end may support this, e.g. an interview guideline describing how the interview should be carried out, what the relevant information needed from the applicant is, and what questions are not allowed to ask etc. Structuring and framing the recruitment process aims at giving the applicants uniform treatment. Communication of non-discriminatory practices and use of double check, where superior or independent person approve the selection process, are important elements in consolidating a practice ensuring equal opportunity in the recruitment. Conclusions made during interviews can support double check or potentially serve as documentation of a fair and transparent recruitment process.
6 Conclusions made during job interviews are available on file for all candidates (selected and rejected) for as long as allowed by the law	
7 Employment of new employees is performed solely on the basis of a person's qualifications and ability relevant for performing the work in question	
Determining conditions of work and access to welfare facilities and benefits	
8 The conditions for gaining access to welfare facilities and other non-payable benefits provided in connection with employment have clearly been defined to ensure that access to these are granted on equal terms for all managers and employees	The term 'welfare facilities and non-payable benefits' covers numerous company provided facilities and benefits for employees such as free transportation, company car, meals, dental care, sporting facilities. A traditional form of discrimination is differential treatment of employees in regards to conditions of work or access to welfare facilities and benefits. Discrimination take place when one or several employees have advantages in terms of working conditions or access to welfare facilities and benefits, which cannot be ascribed their particular rank, seniority, job description or other objective and impersonal basis for allotment. Conditions of work and conditions for gaining access to particular welfare facilities and benefits must therefore be determined on equal terms for all employees and managers, which means without distinction, exclusion or preference based on any characteristics not relevant for performing the work or work function in question. A clear definition of required skill level, seniority or other objective criterion for achieving a particular benefit or favourable working condition, is necessary to ensure non-discrimination. An example of an objective criterion is 'for every 5 years of seniority an extra yearly vacation day is released'. In companies with collective bargaining, conditions for gaining access to particular welfare facilities and benefits are often described in the collective bargaining agreement in this way. Records of working hours may together with job descriptions[(1)] be used to confirm that working conditions are determined on equal terms for all employees and managers.
9 The conditions of work including number of working hours, rest periods, annual holidays with pay, term of notice, are determined on equal terms for all managers and employees	
14 Detailed job descriptions for all positions are issued, updated and kept on file	
18 Working hours for all employees are recorded	

Table 2.6 (contd.) Formulation and explanation of key managerial measures applied for the *Non-discrimination* indicator in Social LCA.

Measures	Explanation
Management of health and safety equipment	
14 Detailed job descriptions for all positions are issued, updated and kept on file **19** Access to relevant occupational health and safety equipment is on equal terms for all employees.	To avoid personal case-by-case judgment and thereby the possibility of discrimination, access to health and safety equipment must objectively be determined on the basis of need with consideration of specific work function. Predefined need for health and safety equipment could be included in job descriptions if available in the company.
Remuneration	
10 A system has been established to ensure that Individual remuneration is determined on equal terms for equal job functions **11** The conditions for gaining access to bonuses have clearly been defined to ensure that these are granted on equal terms for all managers and employees **13** Wage including bonuses and other benefits additional to ordinary wage is recorded for all managers and employees **14** Detailed job descriptions for all positions are issued, updated and kept on file	Discrimination takes place when employees in the same or similar job functions do not earn the same wage. Differentiation between women and men's wage constitute a particular common form of discrimination in most countries (ILO, 2005b). To ensure equal remuneration, wage and bonuses and other payable benefits must be determined on the basis of a classification of jobs, competence, skill level, seniority or other objective criterion. Wage and bonuses granted on the basis of an evaluation of individual work performance of employees are not necessarily in conflict with determining remuneration on equal terms for equal job functions. As long the criteria for achieving a particular wage level or bonus are clearly defined; the process of employee appraisal is formalised and transparent; and access to the wage and bonus system is equal for all employees with the same or similar job function. Job descriptions may play an important role in ensuring equal remuneration for work of equal value, because a description of job content, responsibilities and remuneration options for each position will secure background information necessary for evaluating equal remuneration for equal work. In companies with collective bargaining, access to different wage levels and bonuses are often described in the collective bargaining agreement in this way. Records of wage and benefits may together with job descriptions be used to confirm that working conditions are determined on equal terms for all employees and managers.
Use of recruitment agencies	
12 Applied recruitment agencies selects the company's future employees solely on the basis of a person's qualifications and ability relevant for performing the work in question	A company may indirectly participate in discriminatory practices if they use a recruitment agency that discriminates in their selection of candidates. To make sure that the company is not complicit in discrimination it must take actions to ensure that the practices of the applied recruitment agency are non-discriminatory. The recruitment of new employees is a process that naturally lies within the internal boundaries of the company management sphere, so if the company has outsourced its entire recruitment process to an agency, the measures no. 1-11 are still valid, but must be considered for the recruitment agency instead. Measure no. 12 addresses the situation, where a recruitment agency is used in addition to the company's own recruitment process.
Handling career advancement	
15 Promotion happens on equal terms for all employees in accordance with a person's individual qualifications, character, experience, ability and diligence	Discrimination may happen in the process of promotion. Promotion may happen for many different reasons. It may be a result of the opening of a new position due to reorganisation or business changes, or an employee leaving the company. In may also be used as a mean to reward a particular employee for his or her performance or as a mean to hold on to a particularly skilled employee. In either situation a formal evaluation of employee performance must form basis for choosing an employee for promotion to avoid that managers' personal preferences or bias becomes decisive. When meaningful, a company should announce open positions internally so all employees have the opportunity to change job position.
Training and educating	
16 All managers and employees are offered relevant training and other education programmes on equal terms **17** Participants in training and other education programmes are recorded	Access to training or other educational programmes must objectively be determined on the basis of need with consideration of specific work function to avoid personal case-by-case judgment and thereby the possibility of discrimination. Predefined needs for training and education could be included in job descriptions if available in the company. If training or education beyond the level required by the work function is offered to employees, it must be managed as a non-payable benefit (see managerial measure no. 8). Recording of all training and education enables transparency in access, which may serve as supporting evidence of actual practice.

Table 2.6 (contd.) Formulation and explanation of key managerial measures applied for the *Non-discrimination* indicator in Social LCA.

Measures	Explanation
Examination of grievances	
20 All employees and other parties have the possibility to file complaints about unfair treatment during the company's recruitment or termination process or any conditions of employment in confidentiality and without negative consequences	Refer to earlier general argumentation for *Examination of grievances* in Table 2.2. In regards to the particular subject of discrimination, employees may use this possibility to lodge complaints about harassment or discrimination by colleagues or managers experienced by themselves or by colleagues.
21 A system for handling complaints regarding recruitment, conditions of employment or termination has been established to ensure response and a fair, uniform and confidential treatment of complaints	
22 All complaints and responses are recorded	
Dismissal of employees	
23 Dismissal of individual employees on grounds other than reorganisation or retrenchment is carried out solely on the basis of an employee's performance in the work situation	Discrimination may occur in the process of dismissing employees. To avoid discrimination it is important to ensure that employees cannot be dismissed without proper argumentation that concerns his or her performance in the job situation. Similar to the recruitment, it is essential that the company have a formal process thus leaving less room personal judgement based on non-work related information. Use of management tools that guides and structure the process from start to end may support this. Communication of non-discriminatory practices and use of double check, where superior or management group approve the dismissal, are important elements in consolidating a practice ensuring non-discrimination in the dismissal process. Records on dismissed employees with explanatory comments on grounds of dismissal can support double check and serve as supporting evidence of actual practice. This may be in the form of letters of resignation if these state grounds for dismissal.
24 Dismissal of employees on grounds of reorganisation or retrenchment is carried out on equal terms for all managers and employees and in accordance with local standards or agreements including agreements with local unions	
25 Records on dismissed employees with explanatory comments on grounds of dismissal are kept on file	
Employee appraisal (additional measures)	
26 A system has been established to carry out employee appraisal	In companies where collective bargaining takes place it more or less provides a formal frame for determining remuneration, number of working hours, annual holidays, rest periods etc. So, when individual negotiation takes place instead of collective bargaining, the risk of discrimination is high, unless steps have been taken to formalise the process in an alternative manner. Systematic employee appraisal is an important element in adding transparency to result of individual negotiation. It is important that the reasons for granting one employee a higher wage or special benefits compared to another employee in the same job function are transparent and documented. It is difficult to document that discrimination does not occur, unless the process of evaluating employee performance is formal i.e. standardized and documented. These measures should be seen in continuation of previous measures no. 8, 9, 10 and 11.
27 Employee appraisal is clearly documented in each case and kept on file	

Notes:

(1) Here a job description is defined as ‘a description of job content, responsibilities and remuneration options’

5 Development of Freedom of association, right to organise and collective bargaining indicator

5.1 Aspects of freedom of association, right to organise and collective bargaining

There are two ILO conventions concerning freedom of association, the Freedom of association and protection of the right to organise Convention (No.87) and the Right to organise and collective bargaining Convention (No.98). Convention No. 87, the main document on freedom of association, establishes the right of all workers and employers to form and join organisations of their own choosing without prior authorisation, and lays down a series of guarantees for the free functioning of organisations without interference by the public authorities including rights to draw up constitutions and rules, to elect their representatives, to organise their administration and activities, and to formulate their programmes. Convention No.98 provides for the protection against anti-union discrimination, for protection of workers' and employer' organisations against acts of interference by each other, and for measures to promote and encourage collective bargaining. (ILO, 2000c)

The conventions comprise three areas which must be protected and promoted:

Freedom of association: The right of all workers and all employers to freely establish and join organisations. In other words, the right of individuals to unite as group or union in order to facilitate the joint promotion of their welfare and interests.

Right to organise: The right of all workers and all employers to further and defend the interests of workers or of employers.

Collective bargaining: The term collective bargaining encompasses all negotiations between an employer, a group of employers or group of employers' organisations and one or more workers' organisations. Negotiations usually concern wage, working conditions, terms of employment, regulation of relations between employers and workers.

5.2 Measures for management of freedom of association, right to organise and collective bargaining

In general the role of a company in regards to ensuring employees' freedom of association, right to organise and collective bargaining and is through acceptance of these rights rather than through management. Practices must therefore be of such a character that the company does not interfere with union activities and compromise the pertinent rights e.g. with the process of establishment of trade unions, which may affect the independence of these. The definitions of freedom of association, right to organise and collective bargaining derived from Conventions no.87 and 98 have been the offset for identifying the relevant aspects. The managerial measures in the indicator therefore primarily aim to ensure that structures are present in the company which allow and facilitate the work of and with trade unions. Basic structures concern the assurance of free choice of organisation, non-discrimination of union members and union representatives and provision of appropriate facilities for trade unions to conduct their work. Furthermore measures address the presence of structures necessary for trade unions to defend and further interests of employees through constructive dialogue, consultation and negotiation in matters concerning the interests of the employees.

The central aspects of employees' freedom of association, right to organise and collective bargaining and the company activities which may be addressed to minimise the risk that these rights be compromised or restricted are presented in Table 2.7. On the basis of Table 2.7 specific measures for management of have been formulated. These are presented and elaborated in Table 2.8.

Table 2.7 Background for the determination of managerial measures to be considered by the *Freedom of association* indicator according to the aspects raised by the ILO. The ILO references indicate the origin of the managerial measure. Appropriate references are: Convention No. 87 (ILO, 1948b) and Convention No.98 (ILO, 1949).

Aspect	Company activity	ILO Reference	Managerial measure
Free choice of organisation	Hiring of new employees	C87 Article 2	1, 2
Anti-union discrimination	Hiring of new employees	C98 Article 1	1, 2, 3
	Dismissal of employees	C98 Article 1	12
Collective bargaining and right to organise	Ensuring appropriate facilities for trade union activities	Indirectly C87, C98	4, 5,6
	Engaging in collective bargaining	Indirectly C87, C98	7, 8, 9
	Consultation	Indirectly C87, C98	10, 11, 13
Parallel means of organising(1)	Examination of grievances and suggestions	Indirectly C87, C98	14, 15, 16
	Facilitating election and work of employee representatives	Indirectly C87, C98	17, 18(2), 19

Notes:

(1) Relevant if freedom of association is limited by national legislation.

(2) Relevant if free elections of employee representatives are restricted by national legislation.

The *Freedom of association, right to organise and collective bargaining* indicator consist of 13 obligatory measures and 6 additional measures. When freedom of association is limited by national legislation, it is allowed to take out measures concerning the activities of a trade union on the company premises (measures no. 7, 8, 9 regarding collective bargaining and measure no.13 regarding consultation with trade union in case of rounds of lay offs in Table 2.8). These obligatory measures are replaced by additional measures concerning the situation where workers cannot freely join trade unions. When these obligatory measures are taken out of the indicator it must be clearly documented as a prerequisite for the scoring in connection with interpretation of results.

The additional measures (measures no. 14, 15, 16, 17, 18, 19 in Table 2.8) concern the situation where freedom of association and collective bargaining is limited by national legislation. In this situation, and only then, the company must seek to establish parallel means for employees to further and defend their interests in the absence of a trade union, through establishment of:

- a system ensuring that employees can address the management with grievances, suggestions or other matters concerning the workplace welfare anonymously
- a structure for employee representation and consultation

These parallel means to organising constitute an act of interference by company management concerning employee rights if freedom of association is not restricted by law[5]. In the situation where cultural and social circumstances hinder formation of association, e.g. if there is no tradition for joining trade union or workers lack confidence to join unions or to organise themselves due to historic reasons, and no trade unions are present in the company due to this, it is not allowed to take out measures of the indicator concerning the activities of unions. The measures must be scored zero in accordance with lacking support of initiative. This way the company keeps incitement (reflected by score) to be open for the establishment of trade unions. The company may facilitate that trade unions provide training and information to workers about their rights to join trade union and trade union activities via other trade unions. The company should however never provide this training and information by themselves.

[5] ILO Convention No. 98 (Article 2):"The employer shall not promote competing workers' organisations or seek to control the activities of workers' organisations."

Additional measures no. 17 and 18 replace one another. In the situation where free elections of employee representatives (no.17) are restricted by national legislation, the company must support that a spokesperson take on the role of an employee representative (no.18) informally.

Table 2.8 Formulation and explanation of key managerial measures applied for the *Freedom of association, right organise and collective bargaining* indicator in Social LCA.

Measures		Explanation
Hiring and dismissing employees		
1	Employment is not conditioned by joining a union or by relinquishment of trade union membership	The company must apply practices and guidelines in the hiring process which ensure that trade union affiliation is not an issue discussed during recruitment and hiring to ensure non-discrimination on the basis of trade union membership and free choice of trade union.
2	Employment is not conditioned by any restrictions on the right to collective bargaining	Furthermore, the company must apply union neutral practices and guidelines during employment in such areas as job assignment, record keeping, and decisions on advancement, dismissal, transfer, etc.
3	Employee union members are provided employment under equal terms as non-union members	Employment conditions stated in contracts must not restrict the right to collective bargaining.
12	Dismissal of employees on grounds other than reorganisation or retrenchment happen solely on the basis of an employee's performance and is therefore always unrelated to the employee's membership of union or participation in union activities outside working hours or, with the consent of the employer, within working hours	
Ensuring appropriate facilities for trade union activities		
4	Facilities as may be necessary to assist the employee/union representatives in their work are made available	The company must provide facilities which may help employee representatives fulfil their functions. Facilities may include, but are not limited to, meeting rooms, notice boards, telephone, computer, internet access (if generally available) and similar. The facilities must be appropriate to the size and organisation of the company.
5	Posting of union notices and other communication between the Union and its members at the company premises is allowed	Furthermore, the ability to collect union dues on company premises, distribution of union related documents and other communication between the union and its members, must be allowed.
6	Employee/union representatives have reasonable time during paid working hours to exercise their functions	
Collective bargaining		
7	Collective bargaining is used as a constructive forum for addressing working conditions and terms of employment and relations between employers and employees, or their respective organisations	The company must recognise employee organisations for the purpose of collective bargaining. In order for the negotiations to be constructive the company must enter the bargaining with good faith and topics open for negotiation must be of significance to employees.
8	All union representatives and employees have access to information about collective bargaining agreements and other agreements between the company and the union	The negotiations usually concern wage, grievances, disciplinary rules, terms of employment and similar. Representatives must be given reasonable notice and have access to all documents necessary to engage constructively in the negotiation.
9	Copies of collective bargaining negotiations and agreements are kept on file	All employees must have access to information about agreements made on their behalf either directly or via employee representatives in order to reflect and respond to agreements.
		Copies of agreements confirm that collective bargaining actually takes place in the company and the content of agreements will reveal if the collective bargaining is real as opposed to just a formality.

Table 2.8 (contd.) Formulation and explanation of key managerial measures applied for the *Freedom of association, right organise and collective bargaining* indicator in Social LCA.

Measures	Explanation
Consultation	
10 Employee/union representatives are invited to contribute to planning of larger changes in the company, which will affect the working conditions for the employees	Employee/union representatives must be consulted in larger changes in the company in order for the trade union to defend and further the interests of the employees in the best possible way. In order for employee/union representatives to carry out their duties effectively these must also be given reasonable notice be for larger changes in the company.
13 Dismissal of employees on grounds of reorganisation or retrenchment takes place with the involvement of employee representative and in accordance with local standards or agreements including agreements with local unions	Consultation may also be a way for a company to gain the support of employees in implementation of new projects, reorganisations or other major changes, which otherwise may affect the motivation of employees negatively. During rounds of layoff, the representatives may, besides ensuring the rights of employees to a fair treatment, also have an important role in keeping the motivation of remaining employees.
11 Minutes of meetings between employee/union representative and management are kept on file	Minutes of meetings serve as documentation that the trade union / employees actually are consulted in major decisions concerning employees.
Examination of grievances and suggestions (additional measures)	
14 All employees and other parties have the possibility to file complaints and suggestions regarding the working conditions in the company in confidentiality and without negative consequences	The existence of a complaint system has another function in the *Freedom of association, right to organise and collective bargaining* indicator than in the previously described labour rights indicators. It makes little sense to have a system for employees to complain about restrictions of these rights to the management, which also always will be the origin of such restrictions.
15 A system for handling complaints and suggestions has been established to ensure response and suggestions and a fair, uniform and confidential treatment of complaints	The trade union representatives fulfil the role as communication channel between employees and employer, so in the absence of a union it is important to ensure alternative means to make management aware of concerns of the employees. An anonymous formalised system to collect and handle complaints and suggestions of employees gives employees the possibility to address management without negative repercussions. It also gives the company possibility to respond to problems, concerns and suggestions of employees and improve working conditions.
16 All complaints, suggestions and responses are recorded	If the company management does not respond to complaints or does not treat the complaint with respect, the confidence in the system will slowly disappear and the system will be useless. It is important that employees feel free to lodge complaints and that the means to do so in confidentiality is present. For example, a complaint box placed outside the director's office or far away from the production area is likely not to be used. The recording of complaints is important as the number and severity of complaints may serve as an indication of whether the system works or not. The three measures are scored with full weight in the indicator due to their importance in establishing parallel means of organising.
Facilitating election and work of employee representatives (additional measures)	
17 Employees are represented by a number of elected employee representatives appropriate to the size of the company in all matters concerning their welfare and interests in the workplace	In the situations where the right to free association and collective bargaining is restricted e.g. China, Myanmar and Vietnam, the company will need to facilitate employees' election of representatives in order to enable employees' representation in matters concerning their welfare and interests in the work place. This is a parallel mean to organising, which must never replace the independent association of employees.
18 A spokesperson for the employees is encouraged and supported by the company	In the situation, where free elections off employee representatives are not allowed, the company must facilitate and support that an informal spokesperson take on the task of being mediator between employees and employer. (no.18 replaces no.17 when used)
19 Establishment of work groups or councils has been encouraged and supported by the company to facilitate employee representation in all matters concerning their welfare and interests in the workplace	The company must encourage the establishment of work groups or committees, where employees actively can engage in discussions in matters concerning e.g. health and safety, complaints and suggestions, wage negotiation etc, and support these by recognising their authority by entering in constructive dialogue, consultation and negotiation with these.

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Supporting information 3: Development of value attribution to labour rights indicators

The value attribution determines how the individual integration efforts I, II, III and implementation degrees 1, 2, 3 in the multi-criteria indicator model should be valued in the aggregation into one company performance score. Terminology used in the following refers to Fig. 3.1 below and Chapter 5 *Characterisation for obligatory impact categories* in (Dreyer et al, 2010a).

MULTI-CRITERIA INDICATOR MODEL		EFFORTS IN INTEGRATION								
		I			II			III		
		The company has established a practice or issued a guideline, which addresses the criterion stated in the left column			The company has communicated and delegated responsibility for compliance with the practice/guideline to relevant managers and employees			The company performs continuous active control to ensure that managers and employees comply with the established practice or guideline		
IMPLEMENTION DEGREE		I_1	I_2	I_3	II_1	II_2	II_3	III_1	III_2	III_3
MANAGERIAL MEASURE	A									
	B									
	…									

Fig. 3.1 Scoring matrix applied for semi-quantitative assessment of managerial effort in handling a relevant social issue.

1 Prerequisites for the value attribution

1.1 Multiplication of effort scores

The effectiveness of management increases markedly in a company, when responsibility has been clearly communicated and delegated (II) for existing guidelines and practices (I), and this effort again becomes even more effective, and reliable, when it is combined with systematic active control (III). In the valuation this amplifying relationship between the three efforts is expressed through *multiplication* of the effort scores for each managerial measure (A, B,…), e.g. A_{tot} = AI × AII × AIII. Integration of effort II and III becomes very important in addition to effort I in the risk minimisation of negative impacts in the reference context, which is associated with very high risk. The multiplicative effect will emphasize this significance.

The magnitude of the values attributed the implementation degrees 3 and 2 in I, II and III, is decisive for the strength of the multiplicative effect and for how much each of the three efforts weigh in the total score, i.e. how much emphasis is to put on e.g. active control relative to delegation and communication of responsibility in the assessment of performance. The multiplicative effect is increased with increasing magnitude of values attributed the implementation degrees 2 and 3 in II and III. The stronger the multiplicative effect, the more emphasis on selective or focused management rather than broad management in the quantitative assessment of performance. A strong multiplicative effect implies that it is better to be very good at managing a few aspects rather than being okay at managing a lot of aspects. When considering operation in a high risk context, active control is important, however not at the expense of coverage of the risk area. Establishment of guidelines or practices (I) and communication and delegation of responsibility of these (II) forms a strong basis for risk minimisation despite the uncertainty of effectiveness resulting from lack of active control, and this should be awarded in the performance score. The strength of the multiplicative effect must be balanced so it does not dismiss the effect of a broad effort, and the implementation degrees of the individual efforts must be correlated in such a way that management efforts I and II also count.

1.2 Distinction between fully and partly implemented efforts

The difference between implementation degrees 2 and 3 is the difference between having partly implemented and fully implemented the preventive action. When implementation degree 2 is scored in effort I (I_2) it means that guidelines or practices cannot support a complete integration of the measure either because of lacking ability of these to minimise risk or due to questionable viability of these in the organisation. The subsequent scoring of efforts II and III is done in relation to this situation of incomplete guidelines or practices, which makes it possible to score all three implementation degrees for

these efforts. Therefore, it is important that the value attributed to I_2 is relatively low compared to that of I_3, so the multiplicative effect does not diminish the much larger risk associated with an incomplete implementation (e.g. $I_2 \times II_3 \times III_3$) compared to complete implementation ($I_3 \times II_3 \times III_3$). The magnitudes of the values for the implementation degrees II_2 and III_2 will therefore also dependent very much on the respective implementation degrees II_3 and III_3.

1.3 Lower boundary conditions

The establishment of guidelines or practices (I) is the point of entry in the indicator model. If the company has not established a guideline or practice, i.e. they have implementation degree 1 in I (I_1), it is irrelevant to consider communication and delegation of responsibility (II) and active control (III). This is expressed in the value attribution by setting I_1=0. Hence, if there are no guidelines or practices, the subsequent multiplication with zero will result in a total score of zero for the managerial measure. The lowest attainable company performance score (CP_{min}) is thus zero, which is scored if the company does not have any guidelines and practices established concerning any of the relevant measures in the indicator. If guidelines or practices have been established, but communication and delegation of responsibility has not explicitly taken place and active control is not carried out, the action is still of some value seen from a risk minimisation point of view, because good intentions and will is demonstrated. If the efforts I_2 or I_3 (incomplete or full implementation) are not to be annulled in the valuation in the mentioned situation, where the efforts II and III are not integrated, it must apply in the value attribution that II_1>0 and III_1>0. The efforts II_1 and III_1 must however not add value to the measure score since no action is taken, hence it must apply II_1=1 and III_1=1. In conclusion the values (0, 1, 1) must be assigned to the effort levels (I_1, II_1, III_1) respectively. Furthermore, the I_3 value must be relatively high compared to those of II_3 and III_3 (e.g. a factor 2) in order for the effort I_3 to count in the aggregated performance score, when efforts II and III are not integrated for a measure (II_1=1 and III_1=1). This means that the measure score of complete implementation $I_3 \times II_3 \times III_3$ must be within the same range as I_3 i.e. the multiplicative effect must not be too strong.

1.4 Upper boundary conditions

The highest attainable company performance score (CP_{max}) depends on the number of managerial measures in the impact category indicator, as well as the actual valuation of the individual integration efforts. It will therefore naturally vary across impact categories with the complexity of the issues represented by the indicators and within impact categories depending on the inclusion of obligatory and additional measures (see (Dreyer et al, 2010b)). In order to enable comparison between scores of different impact categories it is chosen during the impact assessment to perform a sort of indexation or normalisation which levels out this variation in highest attainable performance score. The actual magnitude of CP_{max} in itself is therefore not really interesting for determining the value attribution.

2 Determination of a complete value set

The impact category indicators have been developed to assess company performance in a reference context, where the issues represented by the indicators are of maximum importance (i.e. where violations are very likely to occur). Hence maximum company performance scores express optimal performance in a context associated with very high risk. The scoring (efforts and associated implementation degrees) must thus be attributed values according to risk minimisation potential in this particular context. When operating in a very high risk context, the contextual adjustment factor (CAF) is 1 and the entire free rein for violations in the company is likely to be utilised for violations, i.e. company free rein (CFR) equals company risk (CR):

$$CFR = (CP_{max} - CP) / CP_{max} \quad \textbf{Equation (1)}$$

$$CR = CFR \times CAF \quad \textbf{Equation (2)}$$

When CAF= 1,

$$CR = CFR \times 1 = (CP_{max} - CP) / CP_{max}$$

The outcome of the impact assessment is a range of company risk scores (CR) calculated on the basis of the impact category indicator scores (CP). As a result of indexation the company risk scores run in the interval 0 to 1, where 1 expresses very high company risk and 0 low company risk. In Table 3.1 we have defined a Company risk classification to support interpretation of company risk and facilitate the determination of a suitable set of values to attribute the scoring of management efforts.

The classification operates with five classes of perceived risk with specified intervals of company risk scores. The classification is performed for reference context, where violations are very likely to occur, meaning that CAF is 1 and hence that the company free rein (CFR) equals company risk (CR). In a very high risk context, an average performance score (CFR= CR = 0.5) is more likely to result in *high to medium* company risk rather than *medium* company risk. The classification does not include a *very low risk* class, because it would imply that the impact category indicators are complete in coverage of aspects, which is not possible due to the preventive management paradigm the method relies on (see *Discussion and outlook* in (Dreyer et al, 2010a)).

Table 3.1 The Company risk classification defines five categories of company risk (CR).

COMPANY RISK CLASSIFICATION	
Company risk score	**Definition of company risk**
$0.9 < CR \leq 1.0$	Very high risk
$0.6 < CR \leq 0.9$	High risk
$0.4 < CR \leq 0.6$	High to medium risk
$0.2 < CR \leq 0.4$	Medium risk
$0.0 \leq CR \leq 0.2$	Low risk

Based on experience with application in a number of different companies around the world, it is determined to which risk categories and hereby associated risk score intervals, a company should belong in different performance scenarios seen in relation to the reference context. On this basis it is possible to determine which set of values that come the closest to achieve the desired placement when assigned to the different effort levels (I_2, I_3, II_2, II_3, III_2, III_3). The values for implementation degrees I_3, II_3, III_3 are determined first using this approach.

2.1 Determining values for implementation degree 3

The following five generic company performance scenarios are used in the determination of values for I_3, II_3, and III_3:

0. I_1, II_1 and III_1 are scored for each of the measures: No management performance in regards to the issue.
1. I_3, II_1 and III_1 are scored for each of the measures: Guidelines and practices exist to enable management of the issue, but no efforts have been made to integrate the measures in the organisation through clear delegation of responsibility for compliance and communication about these, and active control of compliance is not carried out.
2. I_3, II_3 and III_1 are scored for each of the measures: Guidelines and practices exist to enable management of the issue, and responsibility for compliance has clearly been delegated and the internal information level is very high. However, there is no active control of compliance.
3. I_3 and II_3 are scored for each of the measures and III_1 is scored for one half of them and III_3 is scored for the other half: Guidelines and practices exist to enable management of the issue, and responsibility for compliance has clearly been delegated and the internal information level is very high. Active control of compliance exists for half of the measures.
4. I_3, II_3 and III_3 are scored for each of all measures: Optimal management performance in regards to the issue.

What company risks are associated with the five performance scenarios must be seen in relation to the reference context. See interpretation of risk in the different scenarios in Table 3.2.

The scenarios are hypothetical; typically a company management effort will be more differentiated than suggested in the scenarios. Scenarios 0 and 4 illustrates the borderline cases i.e. best achievable performance in scenario 4, which is associated with low risk of violations, and no performance in scenario 0, which is associated with very high risk of violations. When scenario 2 is placed in the risk interval]0.4;0.6], it means that achieving maximum score in effort I and II for all measures (i.e. scoring I_3, II_3, III_1) results in a company risk score around 0.5 (CR=0.5). This placement of scenario 2 balances the multiplicative effect so both breadth and depth of the management effort is valued, because achieving maximum score in effort I, II and III for half of all measures (i.e. scoring I_3, II_3, III_3), is equal to half the maximum achievable company performance score ($CP = 0.5 \times CP_{max}$), and in the reference context (CAF=1) this results in a company risk score of 0.5 (CR=0.5). In other words, when the company risk equals 0.5 in scenario 2: being excellent at implementing half of all measures is valued equal as to being good at implementing all measures. Furthermore, significance of active

control is decreased by placement of scenario 2 in the lower part of the interval (CR<0.5) and increased by placement in the upper part of the interval (CR<0.5).

Table 3.2 Desired placement of different company performance scenarios in the Company risk classification considering the reference situation where the contextual adjustment factor (CAF) is 1.

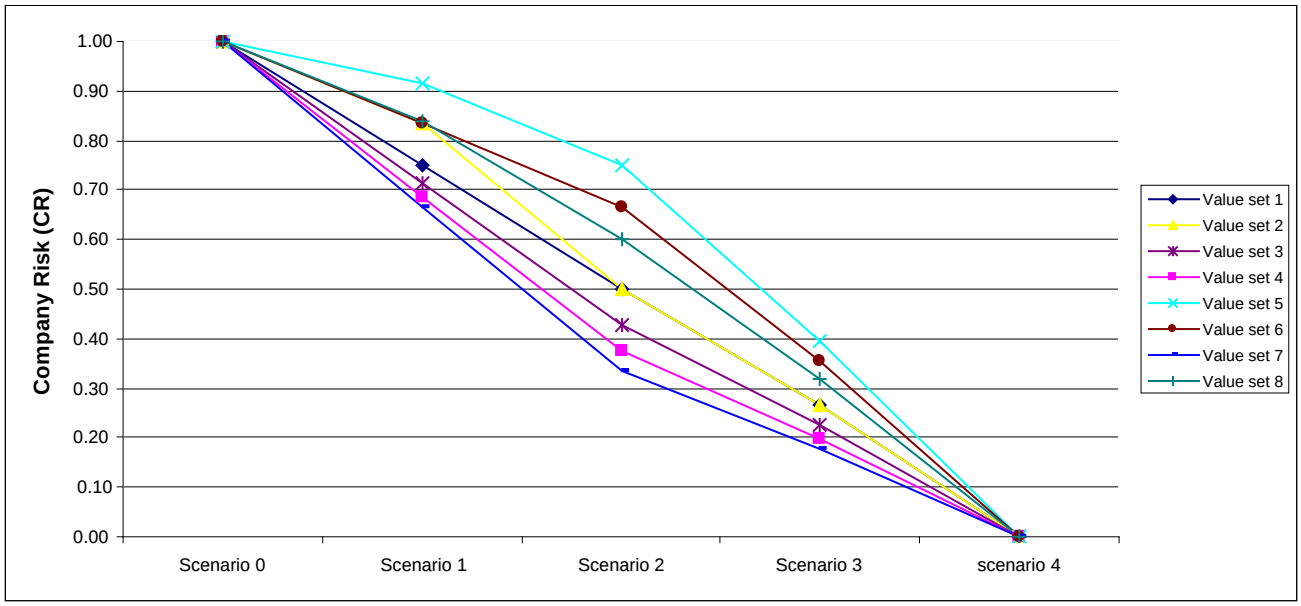
Company Risk score	Definition of company risk	Performance scenarios	Main argument for placement
$0.9 < CR \leq 1$	Very high risk	Scenario 0: No integration effort I_1 for all measures	No actions have been taken to prevent violations from happening, which means that the internal environment is likely to resemble the external environment considering risk of violations thus the company risk for violations is likely to be very high.
$0.6 < CR \leq 0.9$	High risk	Scenario 1: I_3, II_1 and III_1 for all measures	A foundation for risk minimisation has been provided through establishment of guidelines and practices. This expression of will and good intentions does however not constitutes sufficient effort to ensure that violations do not take place in a high risk context.
$0.4 < CR \leq 0.6$	High to medium risk	Scenario 2: I_3 , II_3 and III_1 for all measures	Integration of preventive guidelines and practices are ensured through explicit communication and delegation of responsibility for compliance, which is essential for behavioral change and thus crucial for creating an internal environment different from the external risk environment. However the control of observance is necessary to ensure low risk of violations. The placement also balances selective and broad management effort.
$0.2 < CR \leq 0.4$	Medium risk		
$0.2 \leq CR \leq 0$	Low risk	Scenario 3: I_3 , II_3 and III_1 for half of all measures and I_3 , II_3 and III_3 for other half of measures	Observance of guidelines and practices in the daily work is ensured through systematic active control for half of the measures making it difficult for violations to take place for the aspects affected.
		Scenario 4: Maximum integration effort. I_3 , II_3 and III_3 for all measures	A conscious and persevering management effort has been made through implementation of a series of preventive actions hampering violations.

On the basis of the prerequisites described in Chapter 1 eight alternative value sets for valuation of implementation degree 3 for the efforts I, II and III are defined in Table 3.3 and tested for their ability to distribute the performance scenarios as desired in Table 3.2. The resulting performance for the eight value sets is shown in Fig. 3.2.

Table 3.3 Value attribution respecting the prerequisites described in Chapter 1, which are to be tested for the five performance scenarios in order to determine the most suitable values for the implementation degrees I_3, II_3, III_3.

IMPLEMENTION DEGREE	I_1	I_2	I_3	II_1	II_2	II_3	III_1	III_2	III_3
Value set 1	0	-	4	1	-	2	1	-	2
Value set 2	0	-	4	1	-	3	1	-	2
Value set 3	0	-	4	1	-	2	1	-	1.75
Value set 4	0	-	4	1	-	2	1	-	1.6
Value set 5	0	-	4	1	-	3	1	-	4
Value set 6	0	-	4	1	-	2	1	-	3
Value set 7	0	-	4	1	-	2	1	-	1.5
Value set 8	0	-	4	1	-	2.5	1	-	2.5

Fig. 3.2 The company risks associated with the five performance scenarios (described in Table 3.2) when applying the eight different value sets for implementation degrees I_1, I_3, II_1, II_3, III_1, III_3 (described in Table 3.3).



Value sets 1, 3, 4 and 7 place scenario 1 in the lower half of the *high risk* class. Value sets 1, 2, 3 place scenario 2 in the *high to medium risk* class (all in the lower half). Only value sets 4 and 7 place scenario 3 in *low risk*. Value sets 1, 2, 3 however place scenario 3 in lower half of *medium risk* i.e. close to the *low risk* class. Value sets 5, 6 and 8 are the value sets with the strongest multiplicative effect, value sets 3, 4 and 7 have the weakest multiplicative effect. Value sets 1 and 2 have medium multiplicative effect. This means that value sets 3, 4 and 7 put more emphasis on broad management rather than focused management, whereas value sets 5, 6 and 8 put emphasis on focused management rather than on broad management. Thus active control plays a larger role in value sets 5, 6 and 8 compared to the other value sets. In value sets 1 and 2 breadth and depth of management approach is balanced so that scoring maximum in all efforts ($I_3 \times II_3 \times III_3$) for half of all measures in an indicator results in the same performance score as scoring maximum in effort I and II for all measures in an indicator, i.e. the company risk equals 0.5 in scenario 2.

Based on their placement of the scenarios, primarily three value sets stand out as optimal to obtain the desired placement (Table 3.2): scenario1, 2 and 3. Value sets 1 and 2 differ only in regard to the placement of scenario 1 in the *high risk* class. Where value set 2 places scenario 1 in the upper half of the risk interval, value set 1 places it in the middle/lower part, which seems more appropriate (see section 1.3). Value sets 1 and 3 only differ marginally as value set 3 generally places the scenarios 1, 2 and 3 lower in the risk intervals than value set 1 due to the lower multiplicative effect of the value set, i.e. smaller emphasis on active control. With value set 3 it therefore becomes slightly easier to score high compared to with value set 1, and scenario 3, which signifies good management performance, is moved very close to the *low risk* class. In the multi-criteria indicator model active control serves as the ultimate assurance of effectiveness of the other two efforts. In practice sufficient active control can however be resource demanding, particularly if it involves a third part. This makes many companies choose to do without. Insufficient or lack of active control does not mean that the measures taken by the company do not work – it means that we cannot be sure that they do, but this is particularly important when operating in a high risk context. Value attribution with both set 1 and 3 seem to be acceptable choices for the multi-criteria indicator considering the qualitative assessment of risk associated with the different scenarios in the reference context. More extensive empirical studies may further validate the final choice of value set. With particular consideration for the reference context of the indicator model we here chose to apply value set 1.

On the basis of performance scores obtained with value set 1for the performance scenarios 0-4, the associated company risks are calculated with consideration for the reference context using the Eq.1 and Eq.2, and presented in Table 3.4

Table 3.4 Company risk scores associated with company performance scenarios 0 to 4 when value set 1 (Table 3.3) is assigned the scoring and the contextual adjustment factor (CAF) is 1 (reference situation).

Performance scenarios	**Company risk class with value set 1**	**Company risk score**
Scenario 0: No integration effort I_1 for all measures	Very high risk	1
Scenario 1: I_3, II_1 and III_1 for all measures	High risk	0.75
Scenario 2: I_3 , II_3 and III_1 for all measures	High to medium risk	0.50
Scenario 3: I_3 , II_3 and III_1 for half of all measures and I_3 , II_3 and III_3 for other half of measures	Medium risk	0.27
Scenario 4: Maximum integration effort. I_3 , II_3 and III_3 for all measures	Low risk	0

2.2 Determining values for implementation degree 2

With the values of the implementation degrees I_3 II_3 and III_3 determined, it is easier to determine the relevant values for I_2, II_2 and III_2. The following three scenarios may facilitate the determination of values for I_2 and, II_2 and III_2 respectively

5. I_2, II_3 and III_3 are scored for each of the measures: Guidelines or practices cannot support a complete integration of the measure. Responsibility for compliance has however clearly been delegated and communicated and active control is carried out for the insufficient guidelines and practices.
6. I_3, II_2 and III_2 are scored for each of the measures: Guidelines and practices exist to enable management of the issue, but efforts to integrate the measures in the organisation, through clear delegation of responsibility for compliance and communication about these and active control of compliance, are insufficient.
7. I_3, II_2 and III_1 are scored for each of all measures: Guidelines and practices exist to enable management of the issue, but efforts to integrate the measures in the organisation, through clear delegation of responsibility for compliance and communication about these are insufficient, and no active control is carried out.

In regards to placement of the performance scenario 5 in the Company risk classification, we would expect that risk associated with this scenario is higher than that associated with scenario 1, however performance in scenario 5 does not lead to *very high risk* in the reference context. The measures taken are not optimal in regards to risk minimisation, but will and

intent is demonstrated to a certain degree. The difference in values for I_2 and I_3 should be balanced so scenario 5 is placed in the upper part of the *high risk* class i.e. in the interval [0.750 ; 0.900[. When I_2 has the value of 0.7 it places scenario 5 in the middle of the upper half of the *high risk* class (CR=0.825).

The risk of violations associated with performance scenario 6 is lower than in scenario 1 (CR=0.750), but higher than in scenario 2 (CR=0.500) i.e. the values of II_2 and III_2 should be determined so scenario 6 is placed in the risk interval]0.5;0.75[(see Table 3.4). Scenario 1 is placed in the *high risk* interval and scenario 2 is placed in the *high to medium risk* interval. Considering the risk minimisation potential of the performance demonstrated in scenario 6 this scenario should more precisely be placed in the lower part of the *high risk* class i.e. in the upper half of the mentioned risk interval. Risk of violations associated with scenario 7 is higher than scenario 6, but lower than scenario 1. When II_2 and III_2 are attributed the values 1.2 and 1.2, in addition to the values already determined for the other implementation degrees, this is criterion is met. Company risk in scenario 6 and 7 will with these values be 0.64 and 0.7 respectively.

On the basis of performance scores for the performance scenarios 0-7obtained with the value attribution determined in the section above and the previous sections, the associated company risks are calculated with consideration for the reference context using the Eq. 1 and Eq. 2. The result is presented in Table 3.5 and Fig. 3.3.

Fig. 3.3 The company risks associated with seven performance scenarios (described in Table 3.2 and above in section 2.2) when applying the complete value set for the implementation degrees.

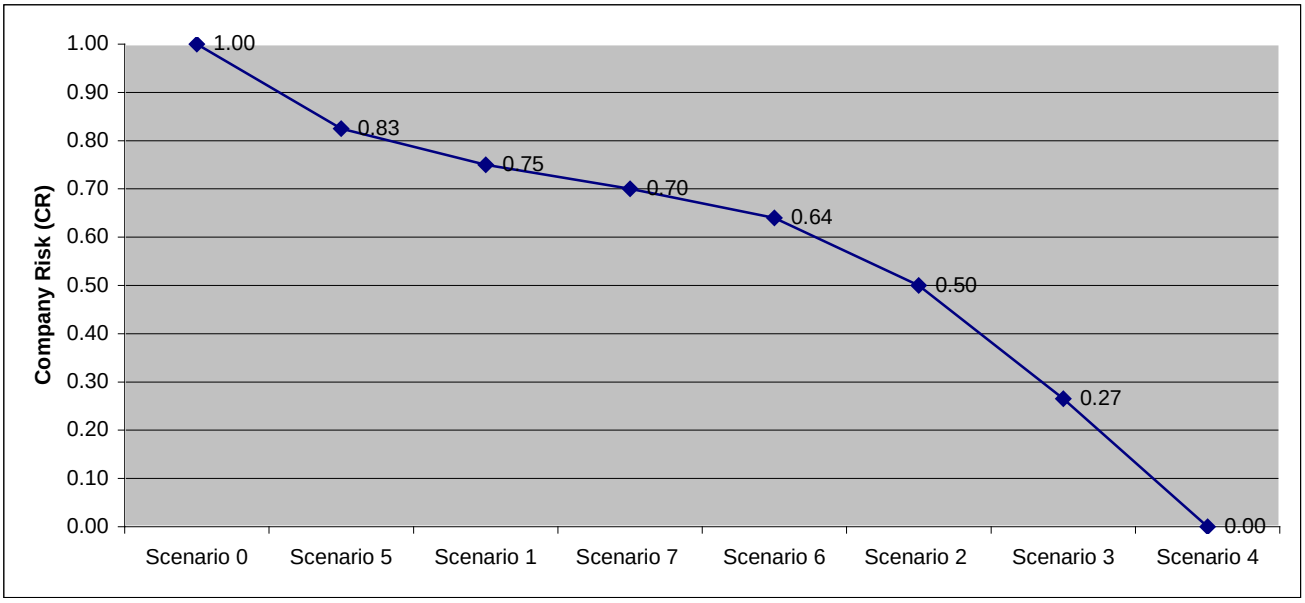


Table 3.5 Company risk scores associated with company performance scenarios 0 to 7 when value attribution determined above is assigned the scoring and the contextual adjustment factor (CAF) is 1 (reference situation).

Performance scenarios	Company risk class	Company risk score
Scenario 0: No integration effort I_1 for all measures	Very high risk	1
Scenario 5: I_2, II_3 and III_3 for all measures	High risk	0.83
Scenario 1: I_3, II_1 and III_1 for all measures	High risk	0.75
Scenario 7: I_3, II_2 and III_1 for all measures	High risk	0.70
Scenario 6: I_3, II_2 and III_2 for all measures	High risk	0.64
Scenario 2: I_3 , II_3 and III_1 for all measures	High to medium risk	0.50
Scenario 3: I_3 , II_3 and III_1 for half of all measures and I_3 , II_3 and III_3 for other half of measures	Medium risk	0.27
Scenario 4: I_3 , II_3 and III_3 for all measures	Low risk	0

3 Summary and reflections

A complete value set for the implementation degrees of the multi-criteria indicator model for the valuation of scored management effort is presented in Table 3.6, valid for obligatory impact categories. The valuation of the scored management effort enables aggregation into one company performance score (CP) for each impact category, which is the first step of characterisation in social life cycle assessment (see characterisation for obligatory impacts in (Dreyer et al, 2010a)). The value attribution may look different for other impact categories than those covering labour right violations. The multi-criteria indicators for labour right issues are developed in a context of very high risk, which is reflected in the valuation as strong emphasis is put on the need for active control to ensure low risk in the assessment of performance. Hence, when applying the valuation of effort presented in Table 3.6 contextual adjustment must be carried out if the context of the assessed company differs from the reference context (see characterisation for obligatory impacts in (Dreyer et al, 2010a)).

Table 3.6 Complete value set for the implementation degrees of the multi-criteria indicator model for the valuation of scored management effort valid for obligatory impact categories.

IMPLEMENTION DEGREE	**I_1**	**I_2**	**I_3**	**II_1**	**II_2**	**II_3**	**III_1**	**III_2**	**III_3**
Value attribution	0	0.7	4	1	1.2	2	1	1.2	2

References

Dreyer LC, Hauschild MZ, Schierbeck J (2010a) Characterisation of social impacts in LCA - development of indicators for labour rights. Int J Life Cycle Assess 15 (3):247-259

Dreyer LC, Hauschild MZ, Schierbeck J (2010b) Development of indicators for four obligatory impact categories in Social LCA. Supporting information 2 to 'Characterisation of social impacts in LCA—development of indicators for labour rights'. Int J Life Cycle Assess, doi:10.1007/s11367-009-0148-7

Supporting information 4: Development of contextual risk classification of labour rights violations

In the following, a risk classification of company context is developed and accompanying adjustment factors are determined. The contextual adjustment factors are to be applied in the characterisation modelling for downward adjustment of company free rein in contexts differing from the chosen reference of labour rights indicators. The contextual adjustment is carried out to take into account that the degree of management effort needed to ensure low risk of violations is influenced by the norms and customs of the external environment of the company (the context). In the characterisation, the contextual risk adjustment thus facilitates comparison of impact scores of similar topics across countries and comparison of impact scores across topics, which is needed in LCA[1].

The classification of context risk in the Social LCA is developed to rely on desk studies. The development of the classification therefore takes the general availability and quality of information sources regarding labour rights violations into account. At present, data collected on labour rights violations is limited and often incomplete when available. Data collection in this area often lacks a systematic approach and hence information presented by sources may be somewhat random and not necessarily reflecting relevance. With consideration for these limitations, the classification presented here aims at a simple and feasible approach ensuring that the available data can be applied in a way enabling uniform and comparable contextual adjustment of the company free rein (CFR) scores of the Social LCA. The classification of context may be extended to include more features at a later stage should additional relevant information become more readily available or should data collection conducted in the area become more systematic and extensive than presently.

1 Contextual risk of labour rights violations

The risk classification of company context is based on analysis of prevalence and severity of labour rights violations in the country of operation and to what degree these violations can be directly linked to a specific company based on reported occurrences in the near location and same branch of industry.

1.1 Assessment of prevalence and severity of labour right violations

Prevalence and severity of labour rights violations in a country reflects the social, cultural, economic and political practices in that country, but is also a result of presence and enforcement of national legislation addressing labour rights. Without proper enforcement in the form of an efficient judicial system and a sufficient level of inspection, violations are likely to occur to the degree the general circumstances allow them to. Prevalence of labour rights violations can with advantage be divided into 5 levels. The scale spans from *no violations* (Level1) over *random*, *sporadic* and *isolated violations* (Level 2) and further to *planned*, *systematic*, *continuous violations* (Level 5)[2]:

Level	Prevalence of violations in country
1.	Common
2.	Widespread
3.	Several
4.	Isolated
5.	Non-existent

Prevalence on a country level serves as a good entry in the risk classification of context, because information at this broad level is often available, whereas information on specific locations and industries is more seldom. Country reports about labour rights violations are available from several sources, where the reports from the U.S. Department of State (U.S. Department of State, 2006) and the International Trade Union Confederation (ITUC) (ITUC, 2008) are among the most credible and comprehensive ones serving as basis for many other country reports. Preferably, the assessment that places a country on the prevalence scale above should be based on several different sources of information to ensure a reliable basis for the assessment if available. Different sources of information may however report on labour rights violations in various manners. Therefore, in order to support a uniform assessment, each level of the scale is specified with some general

[1] Read more about contextual adjustment of indicator scores in Chapter 4 and 5 of [1].
[2] Inspired by the unwritten framework of UN reports for determining degree of human rights violations as referenced by (Jungk, 1999).

observations, which characterises the relevant violation pattern in a country to be classified on that level, see Table 4.1. One or several observations in each level may be descriptive for the prevalence of violations in the country. The violation patterns in Table 4.1 may be used as guiding examples in the classification. The meaning of the patterns is elaborated a bit further in the following. Contradictions between different sources of information are frequent and observations within one information source placing the country on different levels in the prevalence scale may also occur, which means that the LCA practitioner cannot avoid to make value judgements to some degree.

Table 4.1 Levels of prevalence of labour right violations in a country presented with common characteristics describing the violation pattern of a particular labour right in the country to be used as guiding examples in classification of contexts. One or several observations in each level may be descriptive for the prevalence of violations in the country.

Violations in the country (Level)	Characteristics of violation pattern
1. Common	▪ Violations are systematic. ▪ Violations take place in society on a common basis affecting most industries and locations. ▪ Violations are culturally conditioned and/or commonly accepted in the country. ▪ Organised violations of labour rights take place. ▪ The reported or estimated number of violations in the country is very high. ▪ A range of different aspects of this particular labour right are violated in the country. ▪ Several different information sources concurrently confirm that violations are common. ▪ Legislation protecting labour rights is absent or insufficient and/or very poorly enforced.
2. Widespread	▪ Violations take place in the country in many different industries and locations. ▪ The reported or estimated number of violations in country is high. ▪ Many different aspects of this particular labour right are violated in the country. ▪ Few aspects of this particular labour right are violated to a very large extent. ▪ There are strong indications of a problem with observing this particular labour right in the country. ▪ Several different information sources concurrently confirm that violations are widespread. ▪ Legislation protecting labour rights is insufficient and/or poorly enforced.
3. Several	▪ Violations take place in the country, however only to a small degree. ▪ The reported or estimated number of violations in country is limited, but occurrences exist. ▪ Few or a limited number of different aspects of this particular labour right are violated in the country. ▪ There are several indications of a problem with observing this particular labour right in the country. ▪ One or several different information sources confirm that violations take place. ▪ In general, legislation protecting labour rights exists and is enforced; however in regards to particular aspects it is insufficient and/or poorly enforced.
4. Isolated	▪ Few occurrences of violations have been reported. These are however sporadic, random and isolated cases. ▪ There is nothing that indicates that particular aspects of this labour right are violated. ▪ There is no indication of a particular problem with observing this labour right in the country. . ▪ No occurrences of violations have been reported, however there are some indications of violations taking place to a very limited extent. ▪ Legislation protecting labour rights exists and is enforced.
5. Non- existent	▪ Several sources of information confirm that there are no reports of violations in the country. ▪ Legislation protecting labour rights exists and is enforced. ▪ It is very unlikely that violations take place in the context.

Aspects of a right being violated. The extent to which different aspects of a particular labour right are being violated influences the prevalence and severity of violations. For example forced labour may take many different forms, e.g. induced indebtedness, prison labour, or physical confinement of employees, and the more taking place in a country, the more serious the problem and the more likely the spread of violations. When a broad spectrum of aspects are being violated it typically

implies that violations of the right in general are *Widespread* or *Common* in the country, whereas when only few aspects are being violated it is usually a sign that violations are less prevalent i.e. *Several* or *Isolated*. Applying the country prevalence assessment in support of the context risk classification (see later) a high placement on the prevalence scale on the basis of number of aspects affected translates to: There are many different aspects that a company situated in this context must address in their management of activities to ensure low risk of violations in the company i.e. a broad management effort and equivalent performance scoring is needed to ensure low risk of violations.

In the situation where violations of one or few aspects occur but to a large extent – perhaps to the extent where they may be considered systematic in a country – it must result in a placement of the country quite high on the prevalence scale despite the fact that only one or few aspects are violated. Applying the country prevalence assessment in support of the context risk classification, a high placement on the prevalence scale in this situation translates to: There are a few aspects that a company situated in this context must be very good at handling in their management practice to ensure a low risk of violations in the company i.e. a focused management effort and equivalent performance scoring must be reflected in the indicator result to ensure low risk of violations.

Reported and estimated number of violations. The more frequently violations occur in a country, the higher it is placed on the prevalence scale. Reported number of violations comprises violations reported through NGO's, labour inspections, and similar channels. It also includes prosecutions and actual court cases. Reports concern all labour rights violations, however labour inspections primarily reveal forced labour and child labour in their inspection of general working conditions. Trade unions themselves are generally the main sources of reports on violations of freedom of association and right to organise and right to collective bargaining, and the country prevalence is typically assessed on this basis. In contrasts to some of the other labour rights violations, the prevalence of discrimination often has to be assessed on the basis of different types of indications, see below.

Estimates of violations are often a necessary mean to assess the prevalence of child labour and forced labour due to the hidden nature of these violations. In countries where reporting systems in general are not developed estimates are necessary means to assess the country prevalence for all types of labour rights violations.

When applying the country prevalence assessment in support of the context risk classification, a high placement on the prevalence scale on the basis of frequency of violations reported or estimated, it translates to: The higher the number of violations in the context, the more pronounced the need for the company situated in this context to consciously manage its activities to ensure a low risk of violations in the company i.e. the company must generally achieve a high performance score.

Indications of a problem with observing labour rights. Most typical indications of discrimination are wage disparities between members of different groups of society, and bias in the representation of certain groups of society in professional positions and in high ranking management positions in both private and public sector. Biases in labour participation rates, unemployment rates, literacy rates, representation in educational system, types of employment occupied etc. may also indicate disparities between different groups of society arising from discrimination, but such observations must be supplemented by other information. Indications of societal discrimination may be in the form of incidents of violence against particular groups of society and occurrences of racism.

In general, we consider an indication of the size of a problem in a country sufficient to place the country on the prevalence scale, considering that the purpose of the country prevalence assessment is to know how active the company in the context must be in order to ensure low risk of violation in the company. If there are indications of violations taking place to a significant degree in the country, the company must be conscious in their management, whether these actually take place or not, in order to be sure.

Relevant legislation protecting labour rights. A country's legislation and its conformity with international laws and norms should only be used at level of indication in the context assessment, since the existence of legislation gives no assurance that the enforcement and the judicial system are working effectively. Even when prescribed, labour inspections may not be carried out with sufficient frequency to be preventive, fines for labour law violations may be too small to prevent employers from speculating in violations, judicial system too slow, prison penalties too mild etc. Therefore the existence of relevant legislation protecting labour rights must be considered in addition to reported and estimated number of

violations. On the other hand, absence of relevant legislation or confirmed lack of enforcement of existing legislation enable violations to thrive and should therefore be considered as an indication. For a company situated in a country where legislation protecting labour rights is absent or insufficient and/or poorly enforced, it is necessary that the company actively manages its activities, i.e. the company must generally achieve a high performance score to ensure a low risk of violations in the company.

1.2 Assessment of proximity to company

Violations in the industry or in near location of the company naturally adds to the risk of violations taking place in the company. The prevalence of violations in proximity to the company reveals the topicality of the issue for precisely the company being assessed, and hereby also the relevance of a strong management effort in that particular company. In the context risk classification we chose to consider three levels of prevalence in proximity to the company:

1. Occurrences in both industry and near location; both near location and industry are mentioned in connection with violations.
2. Occurrences in either industry or near location; either near location or industry is mentioned in connection with violations.
3. Occurrences in neither near location nor industry are mentioned in connection with violations.

Near location is defined as the same region of the nation, the same state or city and supports a distinction which is most relevant for large or very inhomogeneous countries (for small and homogeneous countries, a further distinction of location than the nation may not necessary). For large and inhomogeneous countries, a more precise description of the risk context might be obtained if we distinguished further between the different locations in the classification. When violations are known to take place in the city where the company is located, it makes it more likely that the company is involved in similar activities than if violations are just known to take place in other parts of the region. However, typical sources of information available to the LCA practitioner on labour rights violations are rarely detailed enough to support this level of geographical distinction.

Industry refers to specific trade or line of business e.g. textile manufacturing, mining, tourism. Several violations occurring in one particular industry can be an indication of a general industry problem, whereas violations in the near location can be an indication of insufficient enforcement of national legislation in that particular location. Both situations result in a higher context risk for the company. It is difficult to say which contributes most to the risk environment, occurrences in the same type of industry in the country or occurrences in the near location, but it is clear that the risk is larger if there are occurrences in both industry and near location than when there are occurrences in neither. No distinction is made between trade and location in the risk classification.

By considering prevalence in proximity to the company we have the possibility to take in to account differences that might be in violation pattern for different industries and regional differences within a country. Some general observations concerning risk of violations and type of industry and location is made on the basis existing data on labour rights violations in Box 4.1.

Box 4.1 Some general observations concerning occurrences of violations based on a desk study of labour rights violations.

General observations

- Industries that require unskilled labour are particularly prone to all kinds of labour rights violations, because this group of workers is particularly vulnerable to exploitation by employers. Typical examples are industries in raw material extraction (e.g. forestry, farming, fishing, mining, and agriculture), manufacturing (e.g. textile industry, steel production, construction and refining) and to some degree also businesses from the service sector (e.g. transportation, waste disposal, hotels and restaurants).

- Industries that are naturally located in rural areas (often raw material extraction industries) are particularly prone to labour rights violations for several reasons. Remote locations most often limits labour inspections and due to the remoteness of the workplace, employees are often dependent on the employer in the provision for all basic needs such as accommodation, food, transportation etc. making the employer-employee relation to the advantage of the employer. Violations concerning forced labour, child labour and restrictions on freedom of association and right to collective bargaining are particularly prevalent in these industries.

- Industries involving factory work requiring small hands, like assembly, packaging, embroidery or decoration are particularly prone to engage child labourers.

- Industries located near country borders may attract labour from poorer neighbouring countries. Due to their status as immigrants (legal or illegal), the workers are often limited in legal protection making them a particularly vulnerable group in regards to all kinds of labour rights violations.

- In areas characterised by great poverty and high unemployment, employers have stronger opportunity to exploit their employees due to their desperate situation.

1.3 Combining information about prevalence in country and proximity to company in context risk assessment

When violations in the particular industry or near location are not mentioned in the available sources of information, we can rarely be certain of the reason. Lack of mentioning can be due to the lack detail or incompleteness of the information available or due to the fact that industries and locations affected are irrelevant for the company being assessed and therefore not mentioned. Quality and completeness of data is often not transparent and hence it is rarely possible to confirm that indeed violations do not occur in neither industry nor near location. In many sources the level of detail in the description of violations does not support consideration of proximity to company. The context risk assessment can therefore not depend upon on information about prevalence of violations in proximity to the company. When information is available, confirmation of violations in *proximity to the company* can however be included as a magnifier of the perceived risk as judged on the basis of country prevalence in the assessment of context-related risk, so perceived context risk is enhanced by confirmation of violations occurring in the proximity to the company.

When country prevalence is used as entry to the Context risk classification, it implies that a strong prevalence on a country level will be reflected in the industry and the near location. In general we may accept this assumption; however there are a few situations, where this may not the case, which we must take into consideration. For example, in locations of low unemployment a company's observance of basic labour rights may become a competition parameter in attracting workers, which may make the occurrence in the area less prevalent than predicted from the country prevalence. Similarly, if it is difficult for a specific industry to get skilled workers, observance of basic labour rights can be a necessary measure to attract and retain them. These situations will be exceptions to the rule and may change over a short period of time e.g. with inflow of migrant labour, and therefore the needed management effort to ensure low risk of violations, as implied by the contextual adjustment, must still be in accordance with the general risk environment in the country.

2 Defining contextual risk classes

The assessment of country prevalence and proximity to company does not support distinction of a large number of ranked risk classes. It demands very clear definitions of the prevalence and proximity levels to enable a clear distinction between classes and it is judged to be difficult for the LCA practitioner to distinguish risk situations on the basis of the information sources available to such assessment today (as demonstrated by the observations in Table 4.1). Therefore, a rather simplified approach with ranking in 5 classes of context risk is chosen to facilitate the assessment of context risk, expressing how probable it is that violations take place in the context, *viz.*: 1.very likely, 2. likely, 3. possible, 4. unlikely and 5. very unlikely.

The classification of risk situations represents the assessed magnitude of risk of violations in the company's context based on the simple rules presented in the following. As a general principle, the prevalence of violations in the country governs the classification with the occurrence in proximity of the company as a magnifier.

I. If there is **no information about violations in proximity to the company** the country prevalence level is equivalent to the risk class:

Class	Prevalence of violations in country
1.	Common
2.	Widespread
3.	Several
4.	Isolated
5.	Non-existent

In general it is assumed that if violations are common in the country it is very unlikely that the context of the company is unaffected by this. The risk of violations in the context assumed to be high regardless of whether violations in proximity to the company have been specifically identified in applied sources of information or not.

II. When violations are identified in **either industry or near location to the company**, the context is assigned a risk class one level higher than if there were no violations in proximity to the company to emphasize the increased risk (except for the 'no occurrences' situation), i.e. one class higher than dictated by the country prevalence level. :

Class	Prevalence of violations in country and in proximity to company
1.	Common in country
1.	Widespread in country and occurrences in either industry or near location
2.	Several in country and occurrences in either industry or near location
3.	Isolated in country and occurrences in either industry or near location
5.	Non-existent in country

III. When violations are identified in **both industry and near location to the company**, the context is assigned a risk class two levels higher than if there were no violations in proximity to the company (except for the 'no occurrences' situation) i.e. two classes higher than dictated by the country prevalence level:

Class	Prevalence in country and proximity to company
1.	Common in country
1.	Widespread in country and occurrences both industry and near location
1.	Several in country and occurrences in both industry and near location
2.	Isolated in country and occurrences in both industry and near location
5.	Non-existent in country

The risk situations and belonging risk classes are summarised in the Context risk classification presented in Table 4.2.

In the case where context risk assessment is carried out for a company situated in a small country, where it does not make sense to distinguish country from near location, it is still relevant to consider increased context risk resulting from a branch of industry violating rights. For this exception to the general rule see IV below.

IV (near location equals country). When violations are identified in the industrial branch, which the company belongs to, the context is assigned a risk class two levels higher than if there were no violations in proximity to the company (except for the 'no occurrences' situation) i.e. two classes higher than dictated by the country prevalence level:

Class	Prevalence in country and proximity to company
1.	Common in country
1.	Widespread in country and occurrences both industry and near location
1.	Several in country and occurrences in both industry and near location
2.	Isolated in country and occurrences in both industry and near location
5.	Non-existent in country

Table 4.2 Classification of risk context based on assessment of labour rights violations in the country and their proximity to the company. The contextual risk class expresses how probable it is that violations take place in the context of the company. Combinations of country prevalence (column 3) with proximity to company (column 4) together define risk situations which are descriptive to the context of a company belonging to the contextual risk class (column 1).

CONTEXT RISK CLASSIFICATION			
Contextual Risk Class (CRC)	**Probability of occurrence in context**	**Violations in the country**	**Violations in proximity to company**
1.	**Very likely**	Common	Unknown
		Widespread	Occurrences in both industry and near location
		Widespread	Occurrences in either industry or near location
		Several	Occurrences in both industry and near location
2.	**Likely**	Widespread	Unknown
		Several	Occurrences in either industry or near location
		Isolated	Occurrences in both industry and near location
3.	**Possible**	Several	Unknown
		Isolated	Occurrences in either industry or near location
4.	**Unlikely**	Isolated	Unknown
5.	**Very Unlikely**	Non-existent	-

Despite the use of general terms like *Common* and *Widespread* in the risk classification, it is important to stress that these should not be interpreted as general statements about prevalence of labour rights violations in a country. The risk classification is developed solely for the purpose of Social LCA, and the assessment of country prevalence and following placement of countries in the classification relates to the characteristics described in Table 4.1[3]. Furthermore, some aspects of violations such as forced labour with the purpose of commercial sexual exploitation are not included in the context risk assessment due to the specific application in Social LCA for which they will not normally be relevant.

3 Determining Contextual Adjustment Factors

The context assessment is needed for adjusting the company free rein in the calculation of the company risk (CR) score (see Chapter 5 *Characterisation for obligatory impact categories* in (Dreyer et al, 2010a)). The adjustment is a reduction compensating for situations where good performance is less pertinent than in the reference context. The contextual adjustment factors (CAFs), which are used for this, are determined for each of the contextual risk classes in Table 4.2 using the same approach as for value attribution to scoring in (Dreyer et al, 2010d). An empirically based qualitative assessment of the potential risk of labour rights violations for a sequence of hypothetical company performance scenarios, corresponding to the different contextual risk classes, is used to determine the adjustment factors for different contextual risk situations. The five company performance scenarios are:

0. I_1, II_1 and III_1 are scored for each of all measures: No management performance in regards to the issue. (CFR=1)
1. I_3, II_1 and III_1 are scored for each of all measures: Guidelines and practices exist to enable management of the issue, but no efforts have been made to integrate the measures in the organisation through clear delegation of responsibility for compliance and communication about these, and active control of compliance is not carried out. (CFR=0.75)
2. I_3, II_3 and III_1 are scored for each of all measures: Guidelines and practices exist to enable management of the issue, and responsibility for compliance has clearly been delegated and the internal information level is very high. However, there is no active control of compliance. (CFR=0.5)

[3] In Social LCA the contextual risk adjustment serves the purpose of emphasizing the need for management of specific activities to ensure a low risk of labour rights violations. For this purpose indications of prevalence and severity of violations may be sufficient to place a country in the classification, whereas such practice in country assessments of labour right violations aimed at other applications would be unacceptable. Hence, country assessments aimed at other applications would likely consider another scope of aspects and interpret prevalence differently thus giving the classes *Common*, *Widespread*, etc. a different meaning.

3. I_3 and II_3 are scored for each of all measures and III_1 is scored for one half of these and III_3 is scored for the other half of these: Guidelines and practices exist to enable management of the issue, and responsibility for compliance has clearly been delegated and the internal information level is very high. Active control of compliance exists for half of the measures. (CFR=0.27)
4. I_3, II_3 and III_3 are scored for each of all measures: Optimal management performance in regards to the issue. (CFR=0)

3.1 Defining the Contextual Adjustment Factor range

The reference context of the labour rights indicators is a situation characterised by common violations of labour rights in the country as a whole or in the close proximity of the company (contextual risk class 1 in Table 4.2). The company's management of activities, which are prone to violations, is of utmost importance since it is likely that the company free rein is utilised for violations in this context. To reflect this in the characterisation modelling the adjustment factor must assume the maximum value of 1 in this context in accordance with Eq.1.

$$CR = CFR \times CAF \Leftrightarrow CAF = CR / CFR \quad CFR \in [0;1]\ CR \in [0;1] \qquad \textbf{Equation (1)}$$

Consequently, very high company risk (CR=1) in the Social LCA is associated with performance scenario 0 in a context where violations are common. From (Dreyer et al, 2010d) we are familiar with the company risks associated with different performance scenarios in the context where violations are very likely to occur (Table 3.5 in (Dreyer et al, 2010d)).

In the other end of the Context risk classification scale lies the risk context, where violations are very unlikely to occur and no occurrences of violations have been reported (contextual risk class 5 in Table 4.2). To define the lowest contextual adjustment factor (CAF) we must consider how likely it is that violations are taking place in a company which operates in a low risk context but has made no effort to avoid violations (equivalent to performance scenario 0) i.e. how much should the company free rein be adjusted downwards when there is no or very few violations in the context of the company. A company will usually manage their activities in accordance with the norms and customs of the country, near location or branch of industry of which it forms part, and hereby contribute to the maintenance of these. For example, companies situated in a country, where labour rights are protected through an efficient enforcement of existing legislation will typically have implemented basic managerial measures contained by the multi-criteria indicators to comply with legal requirements. (e.g. legal requirement about regular economic revision in a company ensures that all employees are paid wage).

Since the multi-criteria indicators are developed for a context where the legislation concerning labour rights either does not exist or is poorly enforced and violations of labour rights are common and widely occurring, the indicators contain measures, which will seem basic in the low risk context, but are highly relevant to assess performance against in the high risk context. As a result companies operating in the low risk context are expected to have a certain company performance score level. By performing at this basic level a company at the same time contributes to maintaining this low risk of violations in the context. A company performing above this level promotes even lower risk of violations in the context with its conduct, whereas only performance below this basic level indicates that circumstances are indeed present for violations to take place despite the fact that violations in general are uncommon in the country. The placement in the company risk score range of the basic performance level occurring in a low risk context depends on how the criteria of the labour rights indicators are formulated. We have chosen to formulate them so the basic level of performance will lie in the neighbourhood of CR=0.2 in most low risk contexts. Being a product of a complex interplay between various factors it is difficult to determine managerial measures which place the basic performance at the exact same level in all low risk contexts. To ensure harmonisation, the criteria underlying the labour rights indicators have been developed through an iterative process involving continuous testing aiming at a basic level in the mentioned area[4], and the lowest CAF is defined with consideration for this basic performance level. Consequently, company management associated with performance scenario 0 (CP=0, CFR=1) in a low risk context (contextual risk class 5) will result in *Medium* company risk (See Company risk classification in Table 4.3[5]). In accordance with Eq.1, a conservative CAF factor of 0.4 is determined for the low risk context equivalent to the CR value of the upper part of the *Medium* company risk class $CR \in [0.2;0.4]$. The company risks associated with the different performance scenarios in the lowest risk context are presented in Table 4.4.

[4] See labour rights indicators and their background in (Dreyer et al, 2010b, 2010c).
[5] Read more about the Company risk classification is in (Dreyer et al, 2010d).

Table 4.3 The Company risk classification defines five categories of company risk (CR). (Dreyer et al, 2010d)

COMPANY RISK CLASSIFICATION	
Company risk score	**Definition of company risk**
$0.9 < CR \leq 1.0$	Very high risk
$0.6 < CR \leq 0.9$	High risk
$0.4 < CR \leq 0.6$	High to medium risk
$0.2 < CR \leq 0.4$	Medium risk
$0.0 \leq CR \leq 0.2$	Low risk

Table 4.4 Company risk scores associated with company performance scenarios 0 to 4 in the lowest risk context applying contextual adjustment factor CAF=0.4. Company risk classes are defined in Table 4.3.

Performance scenarios	**Company Free Rein (CFR)**	**Company risk class**	**Company Risk score (CR)**	**Comments to Company risk**
Scenario 0: No integration effort I_1 for all measures	1	Medium	0.40	No actions have been taken to prevent violations from happening, which means that the internal environment is likely to resemble the external environment considering risk of violations to a large extent. However the lack of a basic management effort, which would be expected considering the low risk in the context, means that risk of violations is still present, however only to a very small degree.
Scenario 1: I_3, II_1 and III_1 for all measures	0.75	Medium	0.30	Guidelines and practices have been established ensuring a foundation for good management practice. The lack of communication and delegation of responsibility for compliance makes the viability of these questionable in the daily practice. Considering the context the risk that violations are taking place is however remote.
Scenario 2: I_3 , II_3 and III_1 for all measures	0.50	Low	0.20	Integration of preventive guidelines and practices are ensured through explicit communication and delegation of responsibility for compliance. Despite the lack of active control violations are not very likely to occur. The company management efforts contribute to maintaining a low risk context.
Scenario 3: I_3 , II_3 and III_1 for half of all measures and I_3 , II_3 and III_3 for other half of measures	0.27	Low	0.11	Observance of guidelines and practices in the daily work is ensured through systematic active control for half of the measures making it difficult for violations to take place for the aspects affected even in a high risk context. The risk of violations is therefore faint and the company management effort promotes even lower risk of violations in the context.
Scenario 4: Maximum integration effort. I_3 , II_3 and III_3 for all measures	0	Low	0	A conscious and persevering management effort has been made through implementation of a series of preventive actions hampering violations. The management effort promotes even lower risk in the context and the company may be considered a role model for other companies.

3.2 Determining Contextual Adjustment Factors for classes 2-5

The adjustment factors accompanying the Context risk classification presented in Table 4.2, thus run in the interval 1 to 0.4, CAF=1 being the factor associated with risk class 1 and CAF=0.4 being associated with risk class 5. The ratio between the adjustment factors of highest and lowest risk context is a factor of 2.5, which means that a company free rein of 0.750 (i.e. performance equivalent to 25% of maximum performance) in a context where violations are very unlikely to occur, will result in medium company risk, whereas the same management performance in a context where violations on the other hand are very likely to occur, will result in high company risk (see risk classes in Table 4.3). The influence of the context is thus

expressed as a move of two company risk classes down (*High to medium* risk to *Medium* risk), when contextual risk class 5 is applied instead of 1.

The four remaining contextual risk factors must thus placed in the interval]0.4;1[. The desired placement of performance scenario 0 and 1 according to perceived company risk with consideration for the contextual risk is presented in Table 4.5 and 4.6 respectively together with resulting ranges for the contextual adjustment factors (CAF) belonging to each of the contextual risk classes 2 to 5. The possible collective range for the contextual adjustment factors for each of the contextual risk classes 2 to 5 is derived from the results of Table 4.5 and 4.6 and presented in Table 4.7. Contextual risk classes 1 and 2 comprise the high risk (violations are very likely or likely) in the Context risk classification, whereas class 4 and 5 constitute the low context risk (violations are unlikely or very unlikely). Based on the acceptable ranges determined in Table 4.5 and 4.6 and with the consideration for forming a classification, contextual adjustment factors are suggested in the last column of Table 4.7. Finally, Table 4.8 presents how the performance scenarios 0 to 3 places in the Company risk classification in different risk contexts based on the suggested contextual risk adjustment factors in Table 4.7.

Table 4.5 Acceptable ranges for contextual adjustment factors (CAF) based on desired placement of performance scenario 0 (CFR=1) in company risk classes considering the different company contexts presented in Table 4.2. Placement is given for contextual risk classes 1 and 5 (see section 3.1).

Contextual risk class	Company risk class	Acceptable CAF range
1	Very high risk	CAF = 1
2	High risk	$0.6 < CAF \leq 0.9$
3	High risk	$0.6 < CAF \leq 0.9$
4	High to medium risk	$0.4 < CAF \leq 0.6$
5	Medium risk	CAF = 0.4

Table 4.6 Acceptable ranges for contextual adjustment factors (CAF) based on desired placement of performance scenario 1 (CFR=0.75) in company risk classes considering the different contexts in Table 4.2. Placement is given for contextual risk classes 1 and 5 (see section 3.1).

Contextual risk class	Company risk class	Acceptable CR range	Acceptable CAF range
1	High risk	0.75	CAF = 1
2	High risk	$0.6 < CR \leq 0.9$	$0.8< CAF < 1$
3	High to medium risk	$0.4 < CR \leq 0.6$	$0.53 < CAF \leq 0.8$
4	Medium risk	$0.2 < CR \leq 0.4$	$0.27 < CAF \leq 0.53$
5	Medium risk	0.3	CAF = 0.4

Table 4.7 Acceptable ranges for contextual adjustment factors (CAFs) ensuring desired placement of performance scenario 0 and 1 in company risk classes considering the different contexts presented in Table 4.2. Contextual Adjustment Factors (CAF) suggested belonging to the different contextual risk classes (first column) are presented in the last column.

Contextual risk class	Acceptable CAF range Scenario 0	Acceptable CAF range Scenario 1	Acceptable CAF range Both scenarios 0 & 1	Suggested CAF
1	CAF = 1	CAF = 1		1 Boundary condition
2	$0.6 < CAF \leq 0.9$	$0.8< CAF < 1$	$0.6< CAF < 1$	0.9
3	$0.6 < CAF \leq 0.9$	$0.53 < CAF \leq 0.8$	$0.6 < CAF \leq 0.8$	0.70
4	$0.4 < CAF \leq 0.6$	$0.27 < CAF \leq 0.53$	$0.4 < CAF \leq 0.53$	0.5
5	CAF = 0.4	CAF = 0.4		0.4 Boundary condition

Table 4.8 The placement of the performance scenarios 0 to 3 in the Company risk classification in different risk contexts based on the determined contextual risk adjustment factors in Table 4.7.

Contextual risk class	CAF	Performance Scenarios	Company Free Rein (CFR)	Company risk (CR)	Company risk class
1	**1**	Scenario 0	1	1	Very high risk
		Scenario 1	0.750	0.75	High risk
		Scenario 2	0.500	0.50	High to medium risk
		Scenario 3	0.265	0.27	Medium risk
2	**0.9**	Scenario 0	1	0.90	High risk
		Scenario 1	0.750	0.68	High risk
		Scenario 2	0.500	0.45	High to medium risk
		Scenario 3	0.265	0.24	Medium risk
3	**0.7**	Scenario 0	1	0.70	High risk
		Scenario 1	0.750	0.53	High to medium risk
		Scenario 2	0.500	0.35	Medium risk
		Scenario 3	0.265	0.19	Low risk
4	**0.5**	Scenario 0	1	0.50	High to medium risk
		Scenario 1	0.750	0.38	Medium risk
		Scenario 2	0.500	0.25	Low risk
		Scenario 3	0.265	0.13	Low risk
5	**0.4**	Scenario 0	1	0.40	Medium risk
		Scenario 1	0.750	0.30	Medium risk
		Scenario 2	0.500	0.20	Low risk
		Scenario 3	0.265	0.11	Low risk

4 Application of contextual risk adjustment factors

The contextual adjustment factors to be applied in the characterisation of labour rights indicators in Social LCA is presented in Table 4.9 for each contextual risk class. For each impact category, the risk situation, which is most descriptive for the context in Table 4.2, is identified on basis of general information about the assessed company and various sources of information about labour rights violations (context assessment), and the associated contextual adjustment factor from Table 4.9 is applied in the calculation of category indicator results. Context risk will naturally varying across topics (impact categories) in accordance with varying prevailing of the issues in the context; hence various contextual adjustment factors may be in play in one company assessment.

Table 4.9 Contextual adjustment factors to be applied in characterisation of labour rights indicators in Social LCA. Typical risk situations applying to the different classes may be identified using Table 4.2 and 4.1.

CONTEXTUAL ADJUSTMENT FACTORS		
Contextual Risk Class (CRC)	**Contextual Adjustment Factor (CAF)**	**Probability of occurrence in context**
1.	1.0	Very likely
2.	0.9	Likely
3.	0.7	Possible
4.	0.5	Unlikely
5.	0.4	Very Unlikely

5 Reflections

The main difficulty in the assessment of the company's risk context in a uniform way allowing comparison of countries whilst relying on a variety of information sources are rooted in the fact that it must be possible to assess each country situation separately (placement in rank without reference) and not just one against that of another (ranking using references). Furthermore, the context risk assessment is impeded by the quality and availability of data, and it proved necessary to develop a simple risk classification scheme with only five risk classes each described in terms of general observations and using country prevalence as entry. The contextual risk adjustment has a modest effect on the resulting company risk score due to the limited range of the adjustment factors. This is in accordance with the general aim of the Social LCA to reflect the importance of preventive management approach as a means to distinguish the internal risk environment of the company from that of the context, particularly when the latter is problematic (See *Discussion and outlook* in (Dreyer et al, 2010a)). Moreover, the modest sensitivity towards placement in contextual risk class is consistent with the limited availability and quality of data available for the assessment.

The classification of context risk developed here specifically aims for the modelling of obligatory impact categories concerning fundamental labour right violations in Social LCA. Other classifications of context may be developed for other impact categories or groups of impact categories, for positive as well as negative impacts. For other types of impacts the classification and determination of adjustment factors may be more straightforward due to the availability of country assessments including ranking of probability of particular impacts in the country. Availability of data including ranking of contexts (e.g. countries) enables a simple classification with belonging adjustment factors for application in the Social LCA. For example, Transparency International's Corruption Perceptions Index includes ranking of perception of corruption in 180 countries and territories (TI, 2008), which may be applied in the assessment of context risk in the characterisation modelling of the impact category Corruption.

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11.4 Article 4: Characterisation of social impacts in LCA - Implementation in six company case studies

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Supplementary information:

1. Assessment of contextual risk of fundamental labour rights violations in six case studies
2. Elaborate presentation and discussion of case study results

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SOCIETAL LIFE CYCLE ASSESSMENT

Characterisation of social impacts in LCA. Part 2: implementation in six company case studies

Louise Camilla Dreyer · Michael Z. Hauschild · Jens Schierbeck

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Abstract
Background, aim and scope A characterisation model based on multi-criteria indicators has been developed for each of four impact categories representing the labour rights according to the conventions of the International Labour Organisation (ILO) covering: forced labour, discrimination, restrictions of freedom of association and collective bargaining and child labour (Dreyer et al., *Int J Life Cycle Assess*, 2010a, in press). These impact categories are considered by the authors to be among the obligatory impact categories in a Social LCA. The characterisation models combine information about the way a company manages its behaviour towards some of its important stakeholders, its employees, with information about the geographical location and branch of industry of the company and the risk of violations of these workers' rights inherent in the setting of the company. The result is an indicator score which for each impact category represents the risk that violations occur in the company. In order to test the feasibility and relevance of the developed methodology, it is tested on real cases.
Materials and methods The developed characterisation models are applied to six cases representing individual manufacturing companies from three different continents. Five of the case companies are manufacturing companies while the sixth is a knowledge company. The application involves scoring the management efforts of the case company in a multi-criteria scorecard and translating the scores into an aggregated performance score, which represents the effort of the management in order to prevent violations of the workers' rights to occur in the company. The company performance score is multiplied by a contextual adjustment score which reflects the risk of violations taking place in the context (in terms of geographical location or industrial branch or sector) of the company. The resulting indicator score represents the risk that violations take place of the labour right represented by the impact category.
Results The social impact characterisation is performed for each of the six case studies using the methodology earlier developed. The procedure and outcome are documented through all the intermediary results shown for all four obligatory impact categories for each of the six case studies.
Discussion The results are judged against the risk which was observed during visits and interviews at each of the six case companies, and their realism and relevance are discussed. They are found to be satisfactory for all four impact categories for the manufacturing companies, but there are some problems for two of the impact categories in the case company which represents knowledge work, and it is discussed how these problems may be addressed through

Glossary Terms frequently applied in this article is explained in a glossary available in the back.

Preamble The present paper is the second in a series of two. The characterisation model based on multi-criteria indicators representing fundamental labour rights presented in the first paper is implemented in six company case studies and evaluated on this basis in the present paper. (Part 1: development of indicators for labour rights).

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L. C. Dreyer · M. Z. Hauschild (✉)
Department of Management Engineering, Section for Quantitative Sustainability Assessment,
Technical University of Denmark (DTU),
Produktionstorvet Bygning 426,
2800 Lyngby, Denmark
e-mail: mic@man.dtu.dk

L. C. Dreyer
e-mail: lcd@man.dtu.dk

J. Schierbeck
Saxo Bank A/S,
Smakkedalen 2,
2820 Gentofte, Denmark
e-mail: jsc@saxobank.com

change of the underlying scorecard or the way in which the scoring is translated into a company performance score.
Conclusions It is concluded that it is feasible to perform a characterisation of the impacts related to the four obligatory impact categories representing the labour rights according to the conventions of the ILO covering: forced labour, discrimination, restrictions of freedom of association and collective bargaining and child labour. When compared with the observed situation in the companies, the results are also found to be relevant and realistic.
Recommendations and perspectives The proposed characterisation method is rather time-consuming and cannot realistically be applied to all companies in the product system. It must therefore be combined with less time-requiring screening methods which can help identify the key companies in the life cycle for which a detailed analysis is required. The possibility to apply country- or industry sector-based information is discussed, and while it is found useful to identify low-risk companies and eliminate them from more detailed studies, the ability of the screening methods to discriminate between companies located in medium and high-risk contexts is questionable.

Keywords Corporate social responsibility (CSR) · Human rights · International Labour Organisation (ILO) · Labour rights · Life cycle management (LCM) · Multi-criteria indicators · Social audit · Social LCA · Social LCIA

Abbreviations

CRF	Company free rein
CRC	Contextual risk class
CAF	Contextual adjustment factor
CR	Company risk
CP	Company performance
CP_{max}	Maximum company performance
PRS	Product risk score
ISO	International Organization for Standardization
ILO	International Labour Organisation
NGO	Non-governmental organisation

1 Introduction

Following Dreyer et al. (2005, 2010a), a social life cycle assessment may be composed of individual assessments of the conduct of companies in the product chain towards their main stakeholders (company assessments). For assessing the observance of fundamental employee rights on a company level, multi-criteria indicators have been developed to evaluate the implementation of managerial measures which systematically address the issues raised by the core conventions of the International Labour Organisation (ILO). Each indicator addresses the company's guidelines and practices, its delegation of responsibility for compliance, its internal communication about management practices and policies and the monitoring of all of these. These multi-criteria indicators form the basis for calculating a performance score for four labour right issues, treated as separate impact categories in a subsequent characterisation. In the characterisation, the multi-criteria-based assessments of the company's management efforts are combined with assessments of the external risk environment (context) in which the company is operating. The results are company risk scores, which express the risk that labour rights violations take place in the company. The characterisation method is documented in Dreyer et al. (2010a).

This paper presents the application of the characterisation method in six company case studies. Four Social life cycle assessment (LCA) impact categories are covered, viz. forced labour, discrimination, restrictions of freedom of association, right to organise and collective bargaining[1] and child labour. These four impact categories are all obligatory impact categories from the framework developed in Dreyer et al. (2005)[2]. Chapter 2 of this paper briefly introduces the company case studies, and chapter 3 presents the calculation steps of the characterisation and the results obtained in the six case studies. The multi-criteria indicators, context classification and characterisation method are discussed and evaluated in chapter 4 based on the experience with application of the method; chapter 5 reflects on its general feasibility and applicability leading to conclusions and outlook in chapter 6.

2 Company case studies

Table 1 presents the companies behind the case studies. For each company, an assessment using the four labour rights indicators has been carried out. Companies A–E are all traditional manufacturing companies predominately employing blue-collar workers for handling automated production of a simple industrial product. Company F is an office company, which only employs white-collar

[1] In literature, the term freedom of association is often used as a collective term for all three elements of the ILO Conventions no.97 and no.98: freedom of association, right to organise and right to collective bargaining. For reasons of simplicity, we here chose to abbreviate, in accordance with this practice, the impact category Restrictions of freedom of association, right to organise and collective bargaining to restrictions of freedom of association and the corresponding indicator to freedom of association, even though these have a much broader scope than the abbreviated names suggest.

[2] The indicators developed for these four labour rights impact categories are presented in (Dreyer et al. 2010b, c), and the development of multi-criteria performance indicators and characterisation method for labour rights issues is presented in (Dreyer et al. 2010a).

Table 1 Companies assessed in the case studies

Company	Location	Employees	Type of company
A	Malaysia	148	Manufacture
B	Brazil	105	Manufacture
C	Croatia	180	Manufacture
D	Hungary	388	Manufacture
E	Israel	48	Manufacture
F	Denmark	40	Knowledge

workers for handling product sales, administrative tasks and research and development.

The data collection was carried out in the companies during one visit of 1 to 3 days depending on the presence and availability of the relevant persons needed for interviews, and generally, it included a factory tour. Key respondents were all chosen by the plant manager, but the person responsible for human resources was a mandatory participant. Evidence was presented voluntarily by the companies, and in general, interviews were easily conducted. During the interview other personal was sometimes brought in to answer specific questions on request. In general, the interviews were conducted in a very dynamic manner allowing for some participants to slip in and out while carrying out essential work functions in parallel. This fashion allowed the practitioner to repeat essential questions to verify information or ask silent participants in confidence. Some information was also retrieved during coffee and lunch breaks where otherwise silent participants tipped of the practitioner about inconsistencies and cover-ups. To avoid respondents preparing their answers for the interview, no specific information was given prior to the visit. The interviews were conducted in English, however, in several companies with the help of an interpreter since not all participants spoke English. At the end of each visit, all indicator scorings with explanatory notes were accepted (often after a few revisions) and signed by all participants to avoid any misunderstanding between the data collector and the respondents arisen during the data collection. After the actual data collection, the companies were monitored for a subsequent period of half a year to 2 years.

In addition to the conditions of work exposed during the scoring and later monitoring,[3] the presence of risk in company was also judged more in a more intuitive manner on the basis of the general impression of the facility; visual signs of violations; received awards connected to social or environmental performance; company certifications; transparency of management systems; reporting and other external communication; internal communication and openness in the company; appearance and attitude of employees and managers; employee satisfaction; participants' qualifications, seriousness and engagement; top management's commitment to social responsibility; company openness towards local community and grievances and disputes involving the company.

[3] More elaborate presentation is available in Appendix 2 in the Electronic Supplementary Material.

3 Characterisation of social impacts

The scoring of the company management efforts against the criteria of the four labour rights indicators forms the basis of the impact characterisation described below. The characterisation converts the indicator scorings into a risk score for each of the impact categories passing through three steps: (1) Calculation of company performance, (2) Calculation of company free rein, and (3) Calculation of company risk.[4] The characterisation method applied in the case studies is presented and discussed in detail in Dreyer et al. (2010a), but Section 3.1 gives a brief introduction to the calculation steps and exemplifies them for the forced labour impact category. The results of context risk assessments, which are used in the calculation of the company risk score, are presented in Section 3.2, and the final characterisation scores obtained in the six case studies results are presented in Section 3.3.

3.1 Steps of characterisation

The company performance score (*CP*) expresses a company's efforts and ability to manage a particular issue. It is calculated for each impact category by attributing values to the scoring of the company management efforts using the value set developed for the multi-criteria indicators on labour rights (Dreyer et al. 2010a, d). For each managerial measure of the multi-criteria indicator, the scored implementation degree for each of the three integration efforts is multiplied, and the company performance score is calculated as the sum of the resulting scores across all managerial measures. An example of value attribution and calculation of company performance score is presented in Appendix A for the indicator abolition of forced labour, and results for all six case studies for this indicator are presented in the first row of Table 2.

All indicators cover obligatory managerial measures as well as additional managerial measures. The latter are included in the indicator scoring if they are relevant for the

[4] In addition to these three steps, which concern the assessment of the individual companies in the product chain, there is a fourth step concerning the relation between the companies and the product and the conversion of company scores along the product chain into a social impact score for the product. This step is only relevant when a full LCA is performed and it is hence not implemented in the case studies here (see Characterisation of obligatory impacts in Dreyer et al. (2010a)).

Table 2 Calculation of company performance score (CP), company free rein (CFR) and company risk score (CR) in the characterisation of forced labour impact scores for all six case studies

Steps in characterisation (calculations)	Case study A Malaysia	Case study B Brazil	Case study C Croatia	Case study D Hungary	Case study E Israel	Case study F Denmark
I: Company performance score (*CP*)	164	146	160	208	139	161
Maximum company performance score (CP_{max})	304	272	256	288	272	272
II: Company free rein (*CFR*) $(CP_{max}-CP)/CP_{max}$	0.46	0.46	0.37	0.28	0.49	0.41
Contextual risk class (CRC)	2	1	4	4	3	5
Contextual adjustment factor (CAF)	0.9	1	0.5	0.5	0.7	0.4
III: Company risk score (CR) CFR×CAF	0.42	0.46	0.19	0.14	0.34	0.16

company being assessed (see indicator in Appendix A for illustration; Dreyer et al. 2010c). The number of measures which are applicable for each of the indicators may thus vary from case study to case study, and therefore, the company performance scores are not immediately comparable across the case studies. The company performance score must be seen relative to the highest achievable performance score (CP_{max}) in each case study to allow comparison across impact categories and company assessments. This is done in the company free rein (*CFR*) score, which is calculated by subtracting the actual company performance score (*CP*) from the optimal company performance score (CP_{max}) and subsequently indexing by dividing with the optimal performance (CP_{max}; third row of Table 2). In addition to facilitating comparison across impact categories and case studies, the indexation facilitates the later contextual adjustment. The company free rein expresses the degree to which circumstances allowing violations of labour rights to take place are present.

A company belongs to a specific geographical location and industrial branch or trade, which is characterised by a certain risk of labour rights violations occurring. This context must be taken into account when assessing the risk of violations actually occurring in the company. The company risk score expresses the risk of violations as judged from the assessment of the company's management performance with consideration of the context of the company (last row of Table 2). It is calculated by multiplying the free rein with a factor expressing the context risk (CAF; second last row from the bottom of Table 2). The assessment and classification of the context risk in the case studies are described in Section 3.2.

3.2 Assessment of context risk in case studies

Context risk assessment is performed as a desk study of prevalence of labour rights violations in the context of the case study company. Each context is classified according to the Context risk classification in Table 3 on the basis of frequency of occurrences of violations in the country and in the proximity (geographically as well as in terms of industrial branch or trade) of the company. The risk classes assigned to the contexts of the six case study companies are shown in Table 4. Each contextual risk class of the Context risk classification is accompanied by a CAF expressing context risk on a scale between 0.4 and 1 (Dreyer et al. 2010e). The contextual adjustment factor is applied in characterisation in order to arrive at a company risk score as illustrated in the last three rows of Table 2. The desk study and assessments underlying the results in Table 4 are documented in more detail in Appendix 1 in the Electronic Supplementary Material.

Table 4 shows that the contexts of companies A and B are the most problematic of all case studies in regards to risk of labour rights violations. For all four impact categories, the contexts of these companies are considered to pose high risk (i.e. CRC 1 and 2), which means that violations of labour rights are common or widespread. The management effort in these companies must hence be strong in order to ensure low risk of violations. In the opposite end of the scale is the context of company F, where the violations are much less likely to occur, and hence, less management effort is needed and expected due to the lower prevalence of violations in the context of the company.

3.3 Case study results

Table 5 shows the company free reins in the six case studies. The company free rein is based entirely on performance, whereas the characterised results, the company risks in Table 6, take the external risk environment of the companies into account via the contextual risk adjustment. Both the company free rein and company risk scores run in the interval [0;1]. A high free rein score indicates large possibility of workers' rights violations,

Table 3 Context risk classification and contextual adjustment factors to be applied in characterisation of labour rights indicators in Social LCA

Context risk classification				Attributed value
Contextual risk class (CRC)	Probability of occurrence in context	Violations in the country	Violations in proximity to company	Contextual adjustment factor (CAF)
1	Very likely	Common	Unknown	1.0
		Widespread	Occurrences in both industry and near location*	
		Widespread	Occurrences in either industry or near location*	
		Several	Occurrences in both industry and near location*	
2	Likely	Widespread	Unknown	0.9
		Several	Occurrences in either industry or near location*	
		Isolated	Occurrences in both industry and near location*	
3	Possible	Several	Unknown	0.7
		Isolated	Occurrences in either industry or near location*	
4	Unlikely	Isolated	Unknown	0.5
5	Very unlikely	Non-existent	–	0.4

* Near location is defined as the same region of the nation or the same state or city, where the company is situated (Dreyer et al. 2010e)

while a high company risk indicates a large probability that workers rights are being violated.

The value attribution to the multi-criteria indicator results has been developed so establishment of guidelines or practices in the company's management (integration effort I of the indicator)[5] and communication and delegation of responsibility of these (integration effort II) forms a strong basis for risk minimisation, but active control (integration effort III) is necessary to achieve medium and low company risk (see company risk classification in Table 7) in contexts associated with high risk, e.g. as for case studies A and B (Dreyer et al. 2010d). The contextual adjustment factors have also been set honouring this prerequisite and ensuring that the best achievable company risk placement in a low-risk context is medium with a maximum free rein (*CFR*=1; Dreyer et al. 2010e). More concretely phrased: if a company scores maximum in efforts I and II for all measures in a indicator (a broad effort equivalent to *CFR*=0.5), it will end in the high to medium risk category if the context is classified as CRC 1 or 2, in medium for CRC 3 and 4 and in low for CRC 5. In order for a company assigned CRC 1 or 2 to move into the medium company risk category, it must initiate active control of at least three measures in supplement to the broad management effort. Company B in the restrictions of freedom of association impact category serves as a good example of this. The context of company B is assigned CRC 2, and the company free rein is just below 0.5. The company performs very well in regards to practices (I) and communication and delegation of responsibility for these (II) by scoring maximum for all measures in the indicator. Company B, however, only carries out active control (III) for two measures, which results in a classification in the high to medium risk category, whereas active control of just one more measure would move the company into the medium risk category. Table 8 labels the company risk scores obtained in the six case studies (see Table 6) in risk categories on the basis of the company risk classification in Table 7. The case study results are discussed in the following chapter as part of the evaluation of the multi-criteria indicators and the characterisation method.

4 Evaluation of multi-criteria indicators, context risk classification and characterisation method

The multi-criteria indicators, context risk classification and the characterisation method which have been implemented in the case studies must be evaluated and judged on their feasibility and on their ability to produce reasonable results. Observations made in the case study companies during and after the data collection regarding both the feasibility of the scoring and the presence of risk of labour right violations are valuable inputs to the evaluation of the different elements of the Social LCA method. Furthermore, the desk study of labour rights violations in the case study contexts provides important feedback regarding the feasibility of context risk classification method.

In order for the multi-criteria indicators to contribute to correct prediction of risk by the characterisation model and

[5] See multi-criteria indicator model in Fig. 2 in Dreyer et al. (2010a).

Table 4 Contextual risk classes (CRC) determined for the six case study contexts for each of the four impact categories

Contextual risk class (CRC)	Company A Malaysia	Company B Brazil	Company C Croatia	Company D Hungary	Company E Israel	Company F Denmark
Child labour	2	1	3	4	3	5
Forced labour	2	1	4	4	3	5
Discrimination	1	1	2	2	1	3
Restrictions of freedom of association (abbr.)	1	2	3	2	3	4

The context risk assessments are summarised in Appendix 1 in the Electronic Supplementary Material

ultimately lead to the right management decisions regarding improvements both for the individual company of the life cycle and for the whole life cycle of a product, the assessment parameters of the multi-criteria indicators, subject-dependent as well as subject-independent, must accurately reflect a company's will and ability to manage a labour right issue with the purpose of minimising risk of violations. It follows that, in principle, the managerial measures of the multi-criteria indicator must cover all aspects of a labour right and all possible situations where violations may occur while at the same time be relevant and meaningful even though they in some companies may be of less significance for obtaining a low-risk level due to a influence of a low risk of context. The integration efforts of the multi-criteria indicators must reflect effectiveness in integration of these managerial measures with the purpose of preventing violations from taking place (Section 4.2).

The contextual adjustment step of the characterisation establishes the significance of company management performance and contextual risk of violations in the company by reflecting the need for management effort as consequence of the risk level of branch of industry, near location and country. Whether this relationship is balanced in the characterisation will reflect in relevance of the required management efforts for companies to improve their company risk scores when considering observed risk in the companies and surroundings. However, since contextual risk adjustment emphasises the weighting of integration efforts made in the multi-criteria indicator model with increasing context risk, the relevance of required improvements to lower risk also provides feedback to choices made in the value attribution to scoring (Section 4.3).

Accuracy of assessment will prevail in whether relative (Section 4.3) and absolute (Section 4.4) placement of companies on the company risk scale is in accordance with the observed risk in the companies and their contexts. The accuracy may be adjusted via (1) the individual multi-criteria indicator's way of measuring (representation of aspects and formulation of measures) as well as in the direct and indirect weighting (attribution of value) of integration efforts, aspects and risk situations in the indicators and (2) the magnitudes of contextual adjustment factors (Section 4.4).

4.1 Feasibility of the context risk classification method

From Table 4, it is visible that all classes of the context risk classification (see Table 3) are relevant in this study. For the impact categories child labour and forced labour, the case study companies are distributed between all possible classes, whereas the risk classes are in the high end for the impact categories discrimination and restrictions of freedom of association. This is likely to be a characteristic picture. There are countries without any reported occurrences of forced labour or child labour, whereas discrimination is hard to avoid completely, and even in countries where the trade union movement is strong, violations sometimes occur. The locations of the case study companies are geographically widespread, and their contexts include developed, emerging and developing economies including transitional economies, which beforehand suggest

Table 5 Company free rein (CFR) calculated for each of the six case companies on the basis of their indicator scorings*

Company Free Rein (CFR)	Company A Malaysia	Company B Brazil	Company C Croatia	Company D Hungary	Company E Israel	Company F Denmark
Child labour	0.67	0.54	0.74	0.54	0.67	0.55
Forced labour	0.46	0.46	0.37	0.28	0.49	0.41
Discrimination	0.56	0.14	0.63	0.38	0.50	0.68
Restrictions of freedom of association (abbr.)	0.84	0.45	0.46	0.88	0.57	0.84

* Refer to Table 2 for calculation method

Table 6 Company risk (CR) calculated for each of the six case companies on the basis of their free rein (CFR; Table 5) and contextual adjustment factor (CAF; Table 4)*

Company Risk (CR)	Company A Malaysia	Company B Brazil	Company C Croatia	Company D Hungary	Company E Israel	Company F Denmark
Child labour	0.60	0.54	0.52	0.27	0.47	0.22
Forced labour	0.42	0.46	0.19	0.14	0.34	0.16
Discrimination	0.56	0.14	0.57	0.34	0.50	0.48
Restrictions of freedom of association (abbr.)	0.84	0.41	0.32	0.79	0.40	0.42

* Refer to Table 2 for calculation method

significant differences in risks of labour rights violations. The classification seems sufficiently differentiated to accommodate the risks encountered in the case study contexts, and given the diversity of these contexts, this gives us reason to believe that it will suffice in other cases as well.

In the 24 context assessments, which were carried out as part of the case studies, some cases of ambivalence in the classification arose, particularly regarding class 3 several violations and the border to class 2 widespread violations for those impact categories where estimates of the extent of violations in the context were available (typically forced labour and child labour). In general, class 3 ended up being a rather broad risk class. The class encompasses both contexts where there are few violations, but more than what can be considered isolated and random violations, and contexts where violations are many, but not widespread. For example, the assessment of prevalence of child labour for the contexts of company C and E places them both in class 3 even though risk is considered significantly higher in the context of E. However, it was also often found difficult to distinguish these two violations patterns from each other on the basis of the sources available and hence not justified to make further division of classes.

Overall, the desk study was able to provide the information necessary to determine context risk in accordance with the classification. Considering the quality of the source material for these case studies, it would not have facilitated the risk assessment had the classification in Table 3 been more detailed (i.e. had it contained more risk classes).

Neither of the specific industries of the case studies was mentioned in the source material considered by the desk study as common violators. More generally, small-scale industry, small manufacturing companies and industrial sector were mentioned as violators of specific rights, but these were not specified further. None of the relevant near locations was singled out as particularly problematic in regards to violations, so the determination of contextual risk class was entirely based on assessment of country prevalence of violations for all contexts. Specific industries and near locations were however considered by information sources applied in the desk study on several occasions. These were not consistently considered, but mainly for countries where violations were widespread or common. This indicates that it is relevant to include proximity to company as part of the context risk assessment despite the fact that it was not considered in connection with the six case studies presented here.

Table 7 The Company risk classification defines five classes of company risk (CR; Dreyer et al. 2010d)

Company risk classification	
Company risk score	Definition of company risk
$0.9<CR\leq1.0$	Very high risk
$0.6<CR\leq0.9$	High risk
$0.4<CR\leq0.6$	High to medium risk
$0.2<CR\leq0.4$	Medium risk
$0.0\leq CR\leq0.2$	Low risk

4.2 Scoring company management effort with multi-criteria indicators

4.2.1 Scoring concept of multi-criteria indicators

The scoring concept of the indicators and the indicators themselves were easy to understand for the people involved in the data collection in the case studies, whereas the scoring process showed to be less straightforward and required a skilled practitioner. It was often experienced in the case studies that respondents tended to make the company performance appear better than it actually was, for several reasons, despite the fact that the practitioner had the possibility to validate most of the information presented given his presence on site. Sometimes, it was clear that respondents answered in accordance with their best convictions and when investigated further, their answers showed to be wrong because their perception of things did not agree with how they actually were. This revealed a need for the practitioner always to go into depth, rather than

Table 8 Categorisation of company risks in the six companies (Table 6) according to the company risk classification (Table 7)

Company risk	Company A Malaysia	Company B Brazil	Company C Croatia	Company D Hungary	Company E Israel	Company F Denmark
Child labour	**High to medium**	**High to medium**	**High to medium**	**Medium**	**High to medium**	**Medium**
Forced labour	**High to medium**	**High to medium**	**Low**	**Low**	**Medium**	**Low**
Discrimination	**High to medium**	**Low**	**High to medium**	**Medium**	**High to medium**	**High to medium**
Restrictions of freedom of association *(abbr.)*	**High**	**High to medium**	**Medium**	**High**	**Medium**	**High to medium**

relying on the openness of the process, in order to arrive at a proper assessment of the management performance and the internal risk environment. Hence, these experiences also dismissed the possibility of reliable self-assessment as an alternative to on site data collection.

The case studies also showed that it is important to approach from more than one angle when posing questions during scoring, because the respondents of course only answers the question they think is asked, meaning that if a question is posed in a slightly different way, the response may be entirely different. Even though efforts have been put into formulating precise and unambiguous criteria these were not perceived the same way across countries and cultures. The role of the practitioner as a communicator of the intentions of the criteria therefore showed to be important for the quality and comparability of the result achieved from the scoring.

4.2.2 Integration of efforts I, II and III of the multi-criteria indicators

The indicators' division of management into three main efforts makes it possible to measure the degree of integration into daily work, which results in a more multifaceted reflection of the conditions in the company. As could be expected, implementation of practices (integration effort I) and delegation and communication of responsibility for these (integration effort II) often coincided in scoring, but not always, which advocated for the necessity of having both as separate assessment parameters in the indicators. The combination of integration effort I and II in the scoring was very productive in uncovering inefficiency in existing management systems or specific practices and guidelines during the data collection. It was experienced that some companies had very comprehensive and impressive written management systems with procedures apparently dealing with a variety of processes in the company, but the systems lacked in the actual integration into daily work. Sometimes, the reason was that responsibility for compliance was not directly delegated to the relevant persons or that they lacked procedures for informing new employees (II), while at other times the existing procedures were too comprehensive or impracticable to actually being followed (I).

Active control (integration effort III) was at times difficult to score because the practitioner had to assess what actions the active control had to involve in order to be effective in the concrete organisation and management setup. In the case companies, there was a tendency toward managing many activities (measures) well rather than managing a few activities excellently, i.e. a broad management effort rather than a focused effort. The performance scores in the case studies are thus predominately comprised by integration efforts I and II. In most of the case studies, it was experienced that active control of the measures in the indicators did not move beyond a basic level, which often could be ascribed to presence in a low-risk context. This scoring is what might be expected from companies for whom it is not required to document observance in order to gain some sort of licence to operate or a competitive advantage. Beyond the basic level, which may vary with external circumstances, control or monitoring is more likely to be carried out as part of a targeted management effort focused on the particular issue of the indicator, as for example in company B where they carry out internal audits on the topic of non-discrimination or in conjunction with a certification scheme, which addresses some or all of the measures of an indicator, e.g. ISO14000 (ISO, 2004), OHSAS 18000 (DNV, 1999), SA8000 (SAI, 2001).[6]

Despite the companies' mediocre performance in regards to active control of preventive measures, observations on site confirmed the relevance of active control both in high and medium risk contexts (CRC 1, 2, 3) in order to ensure low risk of violations (see risk classes for the case

[6] Companies A–E are ISO 14001-certified and companies A, D and E are additionally OHSAS 18001-certified. This influenced the scoring in regards to non-discrimination to a small degree. For more details, refer to the more elaborate presentation of case study results in Appendix 2 in the Electronic Supplementary Material.

companies in Table 3). Control is an important part of lowering the risk of violations. Besides having the preventive effect on premeditated as well as unintended violations, it also reveals where procedures, guidelines or practices are insufficient, which may form basis for a continuous improvement process lowering risk if an efficient feedback process is set up. For example, in both companies B (CRC 2) and C (CRC 3), there were indications that the constructiveness of both collective bargaining and consultation (freedom of association indicator) was affected by the lack of competences of the union representatives, a problem which is not uncommon in the mentioned countries. If the companies had been carrying out active control, this problem would most likely have been identified, and the company would have had to address it. In a high-risk context such as that of company A (CRC 1), it was evident that active control would provide reassurance that existing practices indeed were preventive of discrimination (non-discrimination indicator), which rightfully was reflected by the relatively high company risk score and resulting placement in high to medium company risk category for this impact category. Company B showed that active control is feasible in regards to the measures ensuring non-discrimination, which resulted in an impressively low company free rein and a placement in low company risk category despite operating in a high-risk context (CRC 1).

4.2.3 Coverage of multi-criteria indicators

The predominately broad scoring of the companies A–E indicates that the indicators' coverage of risk aspects through preventive measures is good in terms of relevance. In the scoring, the measures neither were excessive effort nor irrelevant because they were overt courses of action. This was further supported by the fact that inadequate performance in the companies was often caused by lack of different measures, rather than the same.[7] Significant risk aspects or risk situations not included or covered by the preventive measures of the indicators were not encountered in the scoring of the companies A–E, but this should be seen in light of the generally responsible conduct of these companies. More case studies including companies associated with higher risk might uncover additional risk aspects.

In the scoring of company F, it was experienced that the minimum age for employment, abolition of forced labour and freedom of association indicators did not work optimally. The three indicators were found not to be adequate in capturing the work situations of salaried professionals on two accounts; firstly, some measures do not apply to the work situation unless interpreted very liberally, and secondly, it is questionable to what degree lack of some measures may serve as indication of presence of circumstances allowing labour rights violations to take place. As a result, actions for improvement on the basis of the scorings for the three indicators did not necessarily lead to lower risk of labour rights violations taking place in the company F (for more details refer to Appendix 2 of the Electronic Supplementary Material). Regarding specific risk aspects or risk situations lacking coverage, none was identified during the scoring of company F or later monitoring.

Since the indicators worked fine in the other cases studies, the problem suggests that it is not the same circumstances that indicate risk of violations in the two different types of companies represented by F (knowledge company) and A–E (manufacturing companies) and therefore not the same measures that work to prevent violations of some labour rights. The cause may be found in the differences in the typical employment conditions and organisation of work in a knowledge company, such as F, compared with a traditional manufacturing company, such as companies A–E. In the scoring of minimum age for employment and abolition of forced labour for case study F, we also find that the possible emergence of risk situations is different for F and A–E, due to the type of work carried out in F. Intellectual work which demands a certain educational level largely rules out the possibility of hiring children. Some intellectual workers may be subjected to milder forms of forced labour, but the degree to which work may be exacted under the menace of penalty or undertaken involuntarily depends very much on the exact nature of the work. The assessment of risk in the company is nevertheless still relevant; the multi-criteria indicators must still be able to give correct indication. In these cases, we must consider that the preventive measures in the multi-criteria indicators should be different in choice and formulation to capture actual risk situations or be able to display the lack of such in this type of company. This is mainly a question of how the ILO conventions are interpreted for the formulation of measures.

The problem with the three labour rights indicators' feasibility in knowledge companies or similar companies cannot be pinned down on the basis of the empirical observations from just one such company, particularly because the low-risk context of company F may distort the observations by emphasising the feeling that the assessments are not meaningful. By comparing results of scoring and observations in the same type of company in different countries, we may be able to distinguish the influence of the low-risk context and determine to what degree the problems with the indicators experienced here are related to the type of company. Even though we do not suspect this to be the cause, more cases will also confirm

[7] For exceptions to this general picture, refer to the more elaborate presentation of case study results in Appendix 2 in the Electronic Supplementary Material.

whether some of the problems encountered in case study F are related to context-specific characteristics, which are not general for a low-risk context, e.g. specific national legislation or if the problem is related to specific company management characteristics, which are not typical for the type of company. Moreover, manufacturing companies are alike in organisation, while intellectual service companies are more likely to differ depending on the specific work carried out and the country of location, which means we may discover that there are additional or other measures that are not working for other knowledge companies.

4.3 Dynamics of characterisation

Overall, the combination of the three management efforts of the multi-criteria indicators and the contextual risk adjustment worked as intended in most of the case studies. The contextual risk adjustment curbed the multiplicative amplification effect of the multi-criteria indicators in low-risk contexts, so active control never became decisive for placement in lower company risk categories, whereas in high-risk contexts it sustained the need for active control, which was in accordance with observed management needs.

Figure 1 shows how the contextual risk adjustment influenced the calculated company free rein (see Table 5) in the calculation of company risk scores (see Table 6) for the child labour impact category. More specifically, Fig. 1 shows that the contextual risk adjustment of free rein has the largest effect on companies D and F indicating significantly lower topicality of child labour in these contexts compared with the contexts of the other companies. Company F is the only company placed in a context where child labour is very unlikely to occur (CRC 5). The free rein of company B is the lowest among the case companies due to the management efforts of this company, but is also the only company located in a context where child labour is considered common (CRC 1). The results for the remaining impact categories are presented in detail in Appendix 2 in the Electronic Supplementary Material.

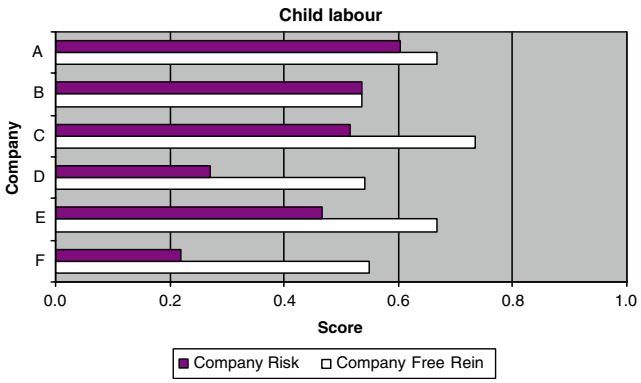

Fig. 1 Company risk (CR) and company free rein (CFR) scores for the six case companies for the child labour impact category (based on Table 5 and 6)

The effect of the contextual risk adjustment is in most of the cases moderate, so the challenges involved in placing companies in the right contextual risk class (see Section 3.2) must be seen in light of its mild influence on the resulting company risk.[8] In almost all cases, the change of contextual risk class one class up or down would not affect the final risk category placement of the company. For example, whether the context of company B is assigned CRC 1 or 2 in regards to child labour does not change the fact that the company risk is assessed to be high to medium (see company risk classification in Table 7).

4.3.1 Companies A–E, the manufacturing companies

The degree of management effort implicitly required of the companies A–E, by the indicators, according to the companies' location in the concerned risk contexts, was generally considered reasonable. The areas of improvement which could be identified on the basis of the indicator assessments in order to lower risk of labour rights violations to a minimum were largely relevant and acceptable for companies A–E when considering the context risk. In the situations where increased active control was the main improvement potential, it could sometimes be debated whether the observed internal risk and the assessed context risk actually justified the strengthened active control which was needed in order for the company to be classified in a slightly lower company risk category.

The relative placement of the companies A–E according to magnitude of the resulting company risk scores was generally concurrent with expectations based on context risk and observations on site during the data collection and the following monitoring. Two noteworthy exceptions were, company C, which has a surprisingly high score (0.515, high to medium risk) for child labour (see Fig. 1), and company D, which has a very low-risk score (0.342, medium risk) for non-discrimination (see Table 6).

For company C, which operates in a context not commonly associated with child labour, the relatively high-risk score arises due to a combination of mediocre management of apprentices and of employee grievances resulting in a high free rein and a modest contextual risk adjustment, which is justified by the context risk assessment. The case is discussed more in detail in Appendix 2 in the Electronic Supplementary Material.

In company D, a system ensuring equal remuneration has not been established and this, combined with the lack of

[8] On the influence of the contextual risk assessment see reflections in contextual risk classification of labour rights violations in Dreyer et al. (2010e).

collective bargaining in the company, gives grounds for concern because neither employee appraisal nor qualification levels or other similar objective criteria are formally applied in the wage setting, which gives room for discrimination. These circumstances ought to have affected the company risk score more significantly, but company D has a reasonably focused management effort in regards to non-discrimination, and the company carries out quite a lot of active control of the implemented practices, which results in a quite high performance score despite the lack of management of equal remuneration. This suggests that the multiplicative effect of the indicator model may be too strong in this case, putting too much emphasis on active control rather than coverage of risk aspects i.e. that the indicator model does not balance broad and focused management effort optimal in performance score in this case.

4.3.2 Company F, the knowledge company

For company F, the risk scores obtained in the characterisation for child labour, forced labour and non-discrimination are reasonable in comparison to the other case companies considering the observed risk of impacts. For restrictions of freedom of association, the company risk score is considered relatively high. Further examination of the characterisation, however reveals that the seemingly reasonable results are largely coincidental. Had the same company been located in a higher-risk context, it is likely that the results for child labour, forced labour and restrictions of freedom of association would have seemed much less reasonable because the contextual risk adjustment would have had less impact on the company free rein resulting in higher company risk scores. The experience with case study F points towards that child labour and forced labour violations are less likely to occur in knowledge companies compared with typical manufacturing companies, a notion which is supported by observations of labour rights violations patterns and type of industry (see Assessment of proximity to company in Dreyer et al. (2010e). Hence, we are in a situation where the branch of industry can be unaffected by the general prevalence level of the country. This poses a challenge for the use of the contextual adjustment carried out in the characterisation. When country prevalence is used as entry to the context risk classification, it builds on the assumption that increasing prevalence of labour right violations in the country increases the risk that violations take place in a company situated in this country. It implies that a strong prevalence on a country level typically will be reflected in the industry and the near location, which in the situation of company F is unlikely because of the type of work carried out. In case study F, there is a coincidence between what we may term "low-risk work" and low country prevalence of violations; so, in this situation, the contextual adjustment coincidentally serves its purpose by lowering expectations to management effort through adjustment of free rein. Everything points towards that characterisation must be adjusted accordingly in order to work for knowledge companies.

4.4 Company risk categorisation

The company risk categorisations presented in Table 8 show that the majority of companies end in the high-risk categories, half of them end in the high to medium company risk class. Even though many of the case companies should improve their management in order to entirely eliminate risk of violations, there is no reason to believe that there are deliberate violations in any of them on the basis of observations made on site in the companies during the data collection and the following monitoring. Therefore, it is a little surprising that the company risk scores generally place so high in the company risk classification. The way performance is assessed by the individual indicators may account for a general high-risk scoring for the individual impact categories, and the effect of the valuation model and contextual risk factors applied in the characterisation may account for a general high-risk scoring for all impact categories. This is discussed in the following sections.

4.4.1 Mode of risk indication by selected labour rights indicators

Eight out of the 12 high to medium risk classifications are found in the child labour and discrimination impact categories and the two high-risk classifications are found in the restrictions of freedom of association impact category, suggesting a closer look at the performance indicators representing these impact categories.

Minimum age for employment indicator observations from the case studies show that high-risk scores (and high free rein scores) in the child labour impact category are not necessarily synonymous with exploitation of children below general minimum age.[9] It is possible to get a high-risk score based on poor management of working conditions for apprentices (which is the case in the scoring of companies C and D) and young workers (which is the case for companies A and E). A general problem experienced with the scoring of the minimum age for employment indicator is that the need for managerial measures does not take into account the extent to which a risk aspect is present, only whether it is present or not. That is, if the company has apprentices or young workers, it must have

[9] The indicator distinguishes between three types of working children: (1) children below general minimum age hired to carry out light work (2) children hired as apprentices, and (3) children between general minimum age and 18 years of age (young workers) hired to carry out non-hazardous work.

practices addressing the working conditions of these to avoid that they carry out work inappropriate to their age, which would classify as child labour, regardless the extent to which apprentices or young workers are present. This is in accordance with the minimum age convention (ILO, 1973). In company A, young workers only work in summer holidays; in companies C and D, apprentices are usually children of employees and very sporadically employed; in company E young workers are most often children of employees. This means that the risk category placement is unrealistically high for the companies C, D, E (and to some degree A) considering the extent to which violations may take place in these companies as a result of the observed lack of management of the risk aspects. On the other hand, there is no doubt that, in general, the measures of the indicator are necessary to manage young workers and apprentices to ensure acceptable working conditions and avoid violations. It is thus acceptable that the company assessment indicates that if a company has working children, they must manage them. However, when many company assessments are combined in an LCA and hot spots are identified, it is important that it is possible to distinguish those companies where these risks are substantial from those where they are more hypothetic or only present to a limited degree. For the child labour impact category, a possible solution to ensure accurate indication on both company and life cycle level could be to increase the significance of the context risk via the contextual adjustment factors for this impact category. The likeliness that child labourers will be present in the company will thus to a higher degree be determined by context risk. We cannot be sure that this solution will provide a better indication, and it removes the incitement (score wise) for a company to appropriately manage working children if they only have a few or if they are located in a low-risk context (CRC 4 or 5), which is problematic in regards to the observance of the labour right. In this light, it is a question whether it is not better to accept the precautionary approach of the present indicator.

Non-discrimination indicator There were no particular problems encountered in the case studies that suggested that the non-discrimination indicator performance measurement was too low. As earlier mentioned, the companies generally had problems with the formalisation of hiring, which is not uncommon for this type of companies, but nonetheless relevant for ensuring equal access to employment. In combination with the possibility of discrimination in the contexts, high to medium risk of violations seems a reasonable assessment of risk for the companies A, C, E and F.

Freedom of association indicator Companies A and D are the only two companies among the case companies where no trade union is present. The companies also show the largest free reins for this impact category and in combination with the prevalence of violations of freedom of association, right to organise and collective bargaining in the respective countries, the companies end in the high company risk category. The indicator is constructed in such a way that, whether or not the company deliberately keeps the trade union out, the absence of trade union representatives on site will impact negatively on the performance score. If the reason for the absence in the specific situation can be explained by circumstances relating directly to the context, e.g. when freedom of association is limited by legislation, the company may take some additional measures (according to the indicator), which will enable higher performance score, but if the cause is of cultural or social nature, the company cannot take additional measures (facilitate parallel means to a union) in order to improve the performance because this could also be a means to obstruct employees freedom of association. In this way, a problem relating to the context can reflect in the company risk score both through the contextual risk adjustment and the performance scoring. It is judged on the basis of the context risk assessments and the interviews carried out during the data collections that it is not legal restrictions that hinder trade union representation in company A and D, and this is contributory to the high free rein scores and hence high-risk scores. It is important to note that there were indications during the interviews in the companies that suggested an attitude which was not entirely open towards unionisation, which could not be measured by the indicator, but which is concurrent with a significant presence of risk. It is debateable whether such indications actually justify a "high" company risk categorisation or whether "high to medium" risk would have sufficed. Considering that it can be difficult to uncover the true cause to absent trade union, it is however deemed acceptable that the indicator in this situation is slightly precautionary.

4.4.2 Value attribution and contextual adjustment factors

If the companies in the low-risk contexts have a tendency to high measured company risks compared with observed risks, it suggests that the contextual adjustment is not strong enough (assuming that the indicators are accurate in their prediction of risk), i.e. the contextual adjustment factors are too high. If the problems are more pronounced for companies operating in high-risk contexts (CRC 1, 2 and possibly 3), it is more likely due to the multiplicative effect of the valuation model because of the broad management effort of the case companies, i.e. that the weight on active control is too high. Value attribution is determined in such a way that active control is necessary to achieve "medium"

and "low" risk categorisation. There seems to be a small tendency to the latter being the situation. For the companies assigned CRC 3, 4 and 5, the placements which seem high can be explained by the general problems observed with company F (for the freedom of association indicator) and with company C and E (for the minimum age for employment indicator) described above. For the companies assigned CRC 1 and 2, only companies B and D in regards to non-discrimination deviate from the general picture that company risk scores generally seem a bit too high. For company B, low-risk score can be explained by an exceptional management effort, and for company D, the reason can largely be ascribed to the focused management effort, which supports that the multiplicative effect might be too strong. It is possible to choose other value-attribution models, which reduce the multiplicative effect in the calculation of performance score and thus lessen the weight of active control in the assessment of performance (see argumentation for choice of model and alternative models in Dreyer et al. (2010d).

The generally high-risk scores and in some cases too high company risk placements observed in the case studies can be attributed directly to the construction of some of the multi-criteria indicators and to some degree to the calculation of the performance score. Too much emphasis on active control was not a distinct problem in the case studies, however, there were some indications that the value attribution is based on a too conservative interpretation of company risk and may require an adjustment. On the basis of more case studies, we will be able to conclude whether it is necessary to adjust the value set or company risk classification, which it is based on, so the characterisation model becomes less conservative in its judgment of risk.

5 Feasibility and applicability of social LCA method

5.1 Applicability of labour rights multi-criteria indicators in different industries

The difficulties experienced with company F as opposed to companies A–E in the case studies teach us that, even though many of the activities concerning employees are the same in the two type of companies (e.g. hiring, firing), the work itself and the organisation of the work are significant for the presence of risk of violations and hence, for how this risk should be determined for some of the labour rights.

Indicators based on a managerial approach such as the labour rights indicators should optimally be formulated according to the type and characteristics of the company in order to capture actions which may result in impacts (actual risk situations) and avoid false indications where the impacts are limited due to the type of work e.g. child labour in knowledge companies. An industry-specific formulation of the indicators seems like the straightforward answer to this problem, but this solution constitutes an immense work task and introduces the risk of biases in the assessment of different types of industries. A grouping of industries on the basis of shared main characteristics influencing the formulation of indicators, e.g. company size, organisation of work, type of workers employed (skill and wage level), regional location of company (rural/urban), may be an alternative to reduce this work task.

The labour rights indicators presented here are best suited for assessment of larger traditional industries primarily employing blue-collar workers. This is the most vulnerable type of workers in terms of labour rights violations being unskilled and typically low-paid and therefore also a main stakeholder of the presented method.

In this paper, we have not discussed how the company risk scores are related to the product in the social LCA[10], but if the product relation of the risk scores of the companies in the product chain is based on the relative number of working hours which each company spends on the product, the industries which are labour intensive in the life cycle will dominate the results of the LCA.

5.2 Scoping using context assessment results

The work and time consumption entailed by the multi-criteria model calls for ways of focusing the analysis work in a Social LCA in order to concentrate on the companies where the largest social impacts are most likely to be found. The context risk assessment method developed for the characterisation model can be used for scoping in Social LCA. The companies in the life cycle can be divided into groups according to their context risk. On one hand, there are the high to medium risk contexts in CRC 1, 2, 3 and on the other the low to medium risk contexts in CRC 4 and 5. Based on experience from the case studies, we are inclined to expect that violations will be limited or of small consequence in the companies belonging to the latter group. If companies belonging to CRC 4 or 5 are given low priority in further investigations, it is considered unlikely that any problematic companies have been excluded. However, it is not possible on the basis of context risk assessment alone to determine how investigations of the remaining should be prioritised according to risk. In the group of companies operating in medium to high-risk contexts, the behaviour of the companies when managing the conditions of their employees strongly influences which companies actually have the highest risk

[10] About product relation, see Characterisation for obligatory impact categories in Dreyer et al. (2010a), Relating company impacts to the product and the functional unit in Dreyer et al. (2005) and Dreyer (2009).

of violations. This calls for a more site-specific assessment among these companies. Company B's management of non-discrimination, which was discussed in chapter 4, is a good example of a company disassociating from its high-risk context with an extraordinary management effort.

When a company works with social responsibility and wishes to improve conditions along its product chain, it may use its leverage to influence life cycle actors to consciously take responsibility for their actions in order to reduce negative impacts and improve positive. This will often entail requests that a company in the product chain distinguishes itself from other competing companies in the same context. Then, it makes little sense to apply a method which assesses social impacts based on the context of the company without consideration for its actual performance. In such situations, context risk assessment can thus not replace site-specific assessment in Social LCA. On the other hand, the method developed in Dreyer et al. (2010a) and applied in this paper simply cannot be applied without site-specific data on company performance. If access to site-specific data is limited, other simplified site-specific models may be considered; however, the limitations of such models must be duly considered before applied.

5.3 General feasibility considerations

The time consumption for carrying out company assessment with the multi-criteria indicators was considerable in the case studies for both data collector and data provider. The level of detail and required level of validation of the multi-criteria indicators makes it difficult to reduce this time consumption. Considering the resources required for conducting Social LCA applying the multi-criteria indicators and characterisation model presented here, it is considered to be less suitable as merely a measurement tool, e.g. for documentation of impacts in the life cycle of a product. The organisation commissioning the LCA must have a broader objective such as intentions of carrying out life cycle management (if product chain owner), and the data providers must have a stake in participation as well. Incentive of data providers may rely on leverage of inquirer and prospects of more business, partnership or similar.

6 Conclusions

The data collection in the case companies A–E shows that the ideal management approach, against which they are assessed via the managerial measures of the labour rights indicators, is suitable for the companies and in accordance with the context risk. Both in the high- and low-risk contexts, we see that required measures are relevant and that the three integration efforts are reasonable, even though we may discuss the emphasis on active control. In general, there was a good correlation between observed risk and assessed risk; however, some minor adjustments to the indicators are necessary, and the characterisation model may require some adjustment. Given the relatively small number of case studies upon which these conclusions are based, it is crucial that these adjustments to the labour rights indicators and characterisation model are based on more extensive empirical data.

The results of case study F indicates that, in their present formulation, abolition of forced labour, minimum age for employment and freedom of association indicators will primarily be applicable to traditional industries and industries employing blue-collar workers and to a lesser degree for companies employing intellectual workers or similar white-collar employees. The cause is to be found in the differences in the typical employment conditions and type and organisation of work carried out in a traditional manufacturing company compared with a knowledge company, where the measures of the indicators primarily are levelled at the former. The determination and formulation of managerial measures in the indicators should therefore be done in more deliberate accordance with the characteristics of type of company in which the indicators are intended to be used, in order to capture the actual risk situations and avoid false indications where the violations are limited due to the type of work, e.g. child labour in knowledge companies. On this basis, it is recommended to consider development of indicators for groups of industries.

The conducted case studies confirm the general applicability and feasibility of the inventory and characterisation steps of the method developed in Dreyer et al. (2010a). On this basis, it is also considered likely that other impacts may be included in Social LCA using this method as long as these can meaningfully be addressed within the managerial perspective underlying the multi-criteria indicators. It can be concluded that the method presents a good alternative to the more traditional direct indicators applied in Social LCA.

Social LCA Glossary for Part 1 and Part 2

Company: in the characterisation method "company" refers to the specific entity in the product life cycle contributing to the making of the product through raw materials extraction, manufacture of product components and semi-products etc., or actual handling of the finished product. That is, the term covers a single production site and not the entire corporation.

Company assessment: the individual assessment of the conduct of a company in the product life cycle towards their main stakeholders. Social LCA is comprised by numerous company assessments. A company assessment consists of

assessment with a number of performance indicators—one for each impact category included in the Social LCA.

Multi-criteria indicator: an indicator comprised of multiple assessment parameters used to collect social life cycle inventory data for an impact category. The multi-criteria indicator consists of a number of impact category dependent assessment parameters and a set of three impact category-independent assessment parameters. The first comprises managerial measures necessary to systematically manage company activities while implementation hereof is assessed using the latter measures efforts in integration into daily work.

Managerial measures: means to systematically manage an organisation's activities (business processes or work routines). Managerial measures are taken to avoid negative impacts on the area of protection. Managerial measures constitute the subject dependent assessment parameters of the multi-criteria indicator model.

Integration efforts: efforts made to integrate managerial measures effectively into daily practice with the purpose of preventing that impacts take place. Integration efforts constitute the subject-independent assessment parameters of the multi-criteria indicator model and comprise: (I) guidelines and practices (II) delegation of responsibility and communication about guidelines and practices and (III) active control.

Social aspect: a characteristic of a social issue of concern to be addressed through certain managerial measures by a company to avoid negative impacts on area of protection.

Company performance: a quantitative representation of a company's efforts and ability to manage a particular issue.

Company free rein: the degree to which circumstances are present in a company that allows negative impacts to take place make up the free rein of that company.

Context: the external environment, which the company forms part of and by which the company conduct may be influenced, for example through legal, social, cultural, economic and political practices.

Reference context: represents the external conditions of the company for which the managerial measures of the multi-criteria indicators are defined as a desirable management effort to ensure a minimum risk of negative impacts. The reference context is characterised by very high risk in order to achieve best possible coverage of indicators.

Context assessment: assessment of probability of impacts in the external environment of a company. Context assessment is carried out for all impact categories for the contexts of the companies comprised by the Social LCA as part of the inventory step. The context assessment forms basis for performing contextual adjustment.

Contextual adjustment: adjustment for the deviation in importance of management performance in a specific context in order to ensure low risk of negative impacts compared with the reference context, for which the subject-dependent assessment criteria of the multi-criteria indicator have been developed.

Context classification: a general categorisation of contexts based on probability of impacts. In the Social LCA study, all contexts of the companies comprised by the LCA are classified according to the context classification on the basis of context assessment as part of the inventory phase.

Contextual class: a category of contexts characterised by a certain probability of impacts in the context classification.

Contextual adjustment factor: applied in adjustment for the deviation in importance of management performance in a specific context in order to ensure low risk of negative impacts and compared with the reference context. Each contextual class of the context classification is represented by a contextual adjustment factor. In the characterisation step for negative impacts, the contextual risk adjustment factor (CAF) is multiplied with the company free rein (CFR) in order to obtain a company risk score (CR).

Company risk classification: a general categorisation of company risk on the basis of company risk scores. The company risk classification is applied in interpretation of company risk scores.

Company risk: expresses the risk of negative impacts taking place in a company (potential impact). It is based on assessment of a company's management performance with consideration for the context of that company. Calculation of company risk scores for all companies comprised by the Social LCA forms part of the characterisation step for negative impacts. The company risk score (CR) is obtained by multiplication of the company free rein (CFR) with the contextual adjustment factor (CAF).

Product relation factor: expresses which weight the social impact profile of a specific life cycle company shall be given in the Social LCA of a product. A product relation factor is determined for each company comprised by the Social LCA as part of product chain analysis performed in the inventory step of a Social LCA study.

Product risk score: expresses the proportion of a potential social impact of company, which can be ascribed to the product for which the LCA study is carried out. Calculation of product risk scores for all companies comprised by the Social LCA forms part of the characterisation step for negative impacts. The product risk score (PRS) is obtained by multiplication of the company risk score (CR) with the product relation factor (PRF).

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Appendix A

Table 9 Example of formation of company performance score (CP) for assessment with Abolition of Forced Labour Indicator

Abolition of forced labour inxdicator	The company has established a practice or issued a guideline, which supports integration of the measure stated in the left column			The company has communicated and delegated responsibility for compliance with the practice/ guideline to relevant managers and employees			The company performs continuous active control to ensure that managers and employees comply with the established practice or guideline			Performance score
Managerial measures **Recruitment**	I_1	I_2	I_3	II_1	II_2	II_3	III_1	III_2	I_1	$I_x \times II_x \times III_x$
1. Birth certificate, passport, identity card, work permit or other original documents belonging to the employee are not under any circumstances retained or kept for safety reasons by the company neither upon hiring nor during employment	0					2	1			0
2. No money deposit or hiring fee is received for a person to be considered for or to enter employment			4			2	1			8
3. Applied recruitment agencies do not charge hiring fees from the company's future employees or are in any other way engaged in any form of forced labour	0			1			1			0
4. Employment contracts that stipulate wage, working time, annual holidays and length of personal holiday, are issued		0.7			1.2		1			0.84
5. Employment contracts that stipulate terms of resignation, which ensure employees voluntary leave of employment after due notice, are issued		0.7			1.2		1			0.84
6. Employment contracts that are comprehensible to the employee as to terms, language and formulation are issued	0			1			1			0
7. Employment contracts are kept on file		0.7				2	1			1.4
During employment										
8. Overtime is voluntary for all employees paid by the hour			4			2	1			8
9. Overtime is always remunerated at premium rate for employees paid by the hour			4			2			2	16
10. Working hours for all employees are recorded			4			2			2	16
11. Wages are paid on time with regular intervals			4			2			2	16
12. Wages amount to at least living wage for the concerned region at all times or at least minimum wage if higher			4			2	1			8
13. Wage including bonuses and other benefits additional to ordinary wage is recorded for all managers and employees			4			2			2	16
14. Deductions in wage are only made with the consent of the employee and never for disciplinary purposes, and they are clearly stated in wage records and on employee wage slip			4			2			2	16

15. All employees and other parties have the possibility to file complaints about labour practices, which conflicts with the principles of employment on a voluntary basis, in confidentiality and without negative consequences	0		1		1		0	
16. A system for handling complaints regarding labour practices, which conflicts with the principles of employment on a voluntary basis has been established to ensure response and a fair, uniform and confidential treatment of complaints	0		1		1		0	
17. All complaints and responses are recorded	0		1		1		0	
End of employment								
18. Letter of resignation is issued and handed over to the employee upon resignation		4		2		2	16	
19.Copies of letters of resignation are kept on file		4		2	1		8	
If the company provides housing for employees								
20. Use of accommodation provided by the company is voluntary and reasonable priced compared with earned wage	N/A							
21. House rules are defined and enforced with respect for the employees' freedom of movement	N/A							
If the company is situated remote from cities								
22. Food, accommodation and other necessities provided by the company are readily available and of a certain quality	N/A							
23. Food and other necessities provided by the company are reasonable priced compared to earned wage to ensure that employees are able to maintain a decent living standard while receiving a fair wage after deductions for these services.	N/A							
If loans, credit or similar schemes indebting the employee is provided by the company								
24. Loans, credit or similar schemes indebting the employee to the employer are subject to fair and transparent management	N/A							
25. Terms of loan, credit or similar schemes indebting the employee to the company is clearly documented in each case and kept on file	N/A							
Total company performance score (CP)							131	

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SOCIETAL LIFE CYCLE ASSESSMENT

Characterisation of social impacts in LCA
Part 2: Implementation in six company case studies

Supplementary material 1-2

Louise Camilla Dreyer • Michael Z. Hauschild • Jens Schierbeck

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L. C. Dreyer
Technical University of Denmark (DTU), Department of Management Engineering, Section for Quantitative Sustainability Assessment, Produktionstorvet Bygning 426, 2800 Lyngby, Denmark
e-mail:lcd@man.dtu.dk

M. Z. Hauschild (*)
Technical University of Denmark (DTU), Department of Management Engineering, Section for Quantitative Sustainability Assessment, Produktionstorvet Bygning 426, 2800 Lyngby, Denmark
e-mail: mic@man.dtu.dk

J. Schierbeck
Saxo Bank A/S, Smakkedalen 2, 2820 Gentofte, Denmark
e-mail: jsc@saxobank.com

Supporting information 1: Assessment of contextual risk of fundamental labour rights violations in six case studies

Context risk assessments are carried out as a desk study for the six contexts comprising six countries where the case study companies A-F are located: Croatia, Hungary, Brazil, Malaysia, Denmark and Israel. Except from company F (located in Denmark) the companies are all in packaging production and are considered small scale industries with between 50 to 400 employees. Company F is an office employing salaried professionals.

The assessments comprise risk of fundamental labour rights violations viz: child labour, forced labour, discrimination, restrictions on freedom of association, right to organise and collective bargaining, in the contexts of the case study companies. On the basis of the context risk assessments it is possible to determine the appropriate risk classes for the contexts (one for each impact category) and belonging contextual adjustment factors to be applied in the characterisation of company impacts in addition to the scores of the labour rights indicators. The applied classification of context shown in Table 1.1, and the development of it, is presented in (Dreyer et al, 2010b).

Table 1.1 Context risk classification and contextual adjustment factors to be applied in characterisation of labour rights indicators in Social LCA. Near location is defined as the same region of the nation, or the same state or city, where the company is situated. The Context classification and contextual adjustment factors are developed in (Dreyer et al, 2010b).Typical risk situations applying to the different classes may be identified using Table 4.1 in also in (Dreyer et al, 2010b).

CONTEXT RISK CLASSIFICATION				**ATTRIBUTED VALUE**
Contextual Risk Class (CRC)	**Probability of occurrence in context**	**Violations in the country**	**Violations in proximity to company**	**Contextual Adjustment Factor (CAF)**
1.	**Very likely**	Common	Unknown	1.0
		Widespread	Occurrences in both industry and near location	
		Widespread	Occurrences in either industry or near location	
		Several	Occurrences in both industry and near location	
2.	**Likely**	Widespread	Unknown	0.9
		Several	Occurrences in either industry or near location	
		Isolated	Occurrences in both industry and near location	
3.	**Possible**	Several	Unknown	0.7
		Isolated	Occurrences in either industry or near location	
4.	**Unlikely**	Isolated	Unknown	0.5
5.	**Very Unlikely**	Non-existent	-	0.4

1 The desk study on labour rights violations

Information about prevalence of labour rights violations tend to be focused on high risk countries and industries, and on the most severe types of violations. For the purpose of carrying out context assessment it is necessary to apply information sources reporting on prevalence of labour rights violations in countries and industries regardless of their topicality and severity. Information sources that report on a series of countries are to be preferred when carrying out many context assessments to be applied in the same LCA in order to make results as comparable as possible.

Availability of information on labour rights violations of different origin is generally limited, which means that information available in different information sources often originates from the same primary source. Primary sources are rarely listed which can make it difficult to detect when information sources overlap. The reason for the lack of references can in many cases be explained by a need for ensuring anonymity of rapporteurs to avoid retribution against these and for the sake of protecting victims of abuses. Sometimes overlap of primary sources can however be detected through identical wordings and concrete phrases in the different information sources. In general the practitioner must be cautious when concluding that

information sources confirm one another in the context assessment. The sources (ITUC, ICFTU, 2008) (U.S. Department of State, 2006) are often cited by other information sources.

The limited availability of information of adequate sophistication makes it difficult to be very selective in the data collection for the context assessment. The information sources primarily used in this study are well-established organisations that may be considered reliable. The Context risk classification has been developed for the purpose of contextual risk adjustment considering the general lack of detail and availability of data, and its simplicity accommodates lack of precision and quality of data. Hence no attempts have been made here to investigate the credibility of the reports presented by information sources further in recognition of the difficulties related to evaluation of the general credibility of reports of labour rights violations.

In the context assessments carried out here it is sought to apply as updated information as possible. Except from (Mula, Tsazanah, 1993), which is used secondarily in regards to child labour in Israel, information no older than 10 years is applied, and the majority of information sources are more recent than this. When information sources are contradictory in their assessments or portray prevalence very differently, the age of information, the comprehensiveness of information collected, collection method (information reliant on other secondary sources are valued lower than sources reliant on primary sources), reliability of the information source itself etc, is used to determine which information source is more reliant.

In the following the desk study on labour rights violations forming basis for the context risk assessments is described in more detail. The scope of assessment is presented for each issue together with descriptions of applied information sources and general observations connected to the use of these in the assessments.

1.1 Main information sources

The context assessments presented here are primarily based on general country reports on violations of human rights and labour rights from the U.S. Department of State (U.S. Department of State, 2006) and the International Trade Union Confederation (ITUC)[1] (ITUC, ICFTU, 2008) respectively. These are considered the most credible and comprehensive information sources among the ones applied in the desk study. Both sources provide detailed accounts for labour rights violations in a country with particular emphasis on the fundamental labour rights. Reports from other organisations are only used as supplementing information in the context assessments, because these often do not cover all relevant countries and topics, but tend to focus on specific countries and/or topics or cases, some broader in spatial scope e.g. child labour in Asia, or more general in regards to topic, e.g. children welfare, or more specific, e.g. child labour in the textile industry in Bangladesh.

U.S. Department of State (U.S. Department of State, 2006) The US Department of State yearly releases Country Reports on Human Rights Practices on their website as part of the United States' effort to promote respect for human rights worldwide. The Department published the first annual country report in 1977. The reports describe the performance of countries in putting into practice their international human rights commitments. The main reference is the UN Universal Declaration of Human Rights, which also embraces basic labour rights. Initial drafts of the country reports are prepared by US embassies and draw on a variety of information sources including: government officials, jurists, armed forces sources, journalists, human rights monitors, academics, and labour activists. The reports review each country's performance during the past year, not one country's performance against that of another. The reports are quite comprehensive and efforts have been made to make the reports objective and uniform, so cross-cutting observations can be made, which is more or less successfully carried out. Country reports are available for all countries considered in this study.

International Trade Union Confederation (ITUC) (ITUC, ICFTU, 2008) ITUC is a confederation of national trade union centres, each of which links together the trade unions of that particular country. It has 236 affiliated organisations in 154 countries and territories on all five continents, with a membership of 155 million. ITUC publishes status reports on the core labour standards in different countries for the WTO general council review of trade policies. The frequency of these reports follows the WTO trade policies review process. Over time all trade policies of all WTO members are reviewed. The frequency of review is either every four or six years, with the possibility of a longer interim period for the least-developed

[1] The International Confederation of Free Trade Unions (ICFTU) recently changed its name to International Trade Union Confederation (ITUC). The country reports applied in this study are all published under the ICFTU name.

countries, depending on the country's share of world trade. The country reports draw on several different information sources sometimes including (U.S. Department of State, 2006). ITUC has published country reports for all countries considered in this study except for Denmark and Croatia. The most recent country reports are applied for the remaining countries.

Human Rights Watch (HRW) (HRW, 2008a) HRW is a NGO founded in 1978 and based in the United States. The organisation tracks developments in human rights abuses in more than 70 countries around the world and yearly it publishes the results of the investigations in a comprehensive world report. HRW publishes annual country reports compiled in one World Report; however this is considered secondary to (U.S. Department of State, 2006) and (ITUC, ICFTU, 2008) in regards to labour rights violations, because the organisation also applies these information sources in its investigations. Information from HRW is therefore only cited in the context assessments when it provides additional information. Primarily the World Reports from 2007 (HRW, 2007) and 2008 (HRW, 2008b) are used in the desk study, except for information about Hungary, which is included from the 2002 report (HRW, 2002), because it is the last time Hungary is included as a separate country – hereafter it is included under EU description in the HRW World Reports. The HRW World Reports reflects the investigative work undertaken during the previous year. Each country entry examines the freedom of local human rights defenders to conduct their work and identifies significant human rights issues. The reports do not cover the human rights areas systematically and it is not possible to conclude that violations do not take place in a country, because they are not mentioned under the country entry, nor that countries not included in the report do not have serious human rights violations.

Information sources used in context assessments in addition to (ITUC, ICFTU, 2008) (U.S. Department of State, 2006) (HRW, 2008a) concern the individual labour right issues. These, and their application in the context assessments, are presented in the specific sections below.

1.2 Child labour

Usually the information sources concerning child labour do not distinguish age groups or their primary focus is on working children below the general minimum age (typically 15 years of age), however all types of work is usually considered including unconditionally worst forms of child labour. The context assessments however primarily focus on the types of child labour, which companies are likely to engage in, and without regard for the particular age groups. Hence commercial sexual exploitation of children in any form, forced recruitment of children for use in armed conflict or in illicit activities are not considered by the context assessment. Trafficking of children for the purpose of economic exploitation (see definition under section 1.3) is included, whereas trafficking for other purposes are not. The context assessment is primarily based on reported occurrences of child labour violations and estimates of child labourers.

1.2.1 Information sources on child labour violations

Information about child labour violations was collected from International Programme on the Elimination of Child Labour (IPEC, 2008), Educational International (EI, 2007), UNICEF (UNICEF, 2008), Save the children (Save the children, 2008) and the ILO Global Report under the Follow-up to the ILO Declaration on Fundamental Principles and Rights at Work regarding child labour 2002 (ILO, 2002) and the statistical background report from IPEC and SIMPOC[2] (IPEC SIMPOC, 2002).

International Programme on the Elimination of Child Labour (IPEC) (IPEC, 2008) IPEC is a programme under the ILO created in 1992 with the overall goal of the elimination of child labour to be achieved through strengthening the capacity of countries to deal with the problem and promoting a worldwide movement to combat child labour. IPEC currently has operations in 88 countries, with an annual expenditure on technical cooperation projects that reached over US$74 million in 2006. It is the largest programme of its kind globally and the biggest single operational programme of the ILO. Reports covering specific industrial sectors, regions and countries are published on the IPEC website. In regards to the contexts considered in this study only information on Brazil is available.

UNICEF (UNICEF, 2008) Part of the United Nations system, UNICEF's mandate and mission is to advocate for children's rights and help meet their needs. The UNICEF website provides country info pages, where the challenges facing children of

[2] SIMPOC (Statistical Information and Monitoring Programme on Child Labour) is the statistical unit of the International Programme on the Elimination of Child Labour (IPEC) under the ILO.

each country are described under the background information. Child labour is mentioned here for some countries; however consistency in reporting on this topic is difficult to clarify. In regards to the contexts considered in this study only information on Brazil is available.

Education International (EI) (EI, 2007) EI is a Global Union Federation representing approximately 30 million teachers and education workers worldwide, from pre-school to university. The Federation comprises 394 member organisations in 171 countries. The EI website provides a comprehensive interactive report of quality of education and respect for human and labour rights in countries around the world called the Education International Barometer of Human & Trade Union Rights in Education. The EI Barometer examines a whole array of issues that concerns the global education sector, such as academic freedom, gender equality, students with special needs, refugee and minority children, and child labour. The country profiles are quite extensive and many countries are covered by the EI Barometer. The EI Barometer applies several of the same sources for compiling the reports, which are already included by the desk study directly e.g. (ITUC, ICFTU, 2008) (U.S. Department of State, 2006) (UNICEF, 2008), however additional information sources are also applied. Country profiles are available for all countries considered in this study.

Save the children International (Save the children, 2008) An NGO based in the United States working worldwide to improve the well-being of children. It is a member of the International Save the Children Alliance, comprising 28 national Save the Children organizations working in more than 110 countries. Save the children International does not work in any of the countries considered by this study.

ILO Global Report - A future without child labour. IPEC and SIMPOC: Every Child Counts – New Global Estimates on Child Labour. The ILO Global ILO Report on child labour 2002 (ILO, 2002) is a status report under the follow-up to the ILO Declaration on Fundamental Principles and Rights at Work. It is primarily applicable in the desk study due to its world estimates of child labour violations and presented cases. The background report (IPEC SIMPOC, 2002) accounts of the methodology used in the estimates presented in (ILO, 2002) and provides more detailed estimates on economically active children, children in child labour that requires elimination and the extent to which children are engaged in hazardous work. Primarily the regional estimates of economically active children ages 5-14 are obtained from the reports and used in the context assessments secondary to more specific information when available.

1.3 Forced labour

Forced labour situations may be grouped into three main types: state imposed; economic exploitation; commercial sexual exploitation. Furthermore, a distinction may be drawn between forced labourers who were trafficked and those who were not trafficked. In the context assessments we primarily focus on the types of forced labour, which companies are likely to engage in i.e. economic exploitation including trafficking in persons for this purpose. It should be noted that if the company being assessed in the LCA is state owned or partly state owned, information about state imposed forced labour should also be included in the assessment. Forced prison labour is relevant to consider in the assessment when information sources describe private companies engaged directly or indirectly in activities involving prison labour from which they benefit economically e.g. when the state hires out prison labour to private companies or when prison labourers produce for a private company.

Several activities included by the abolition of forced labour indicator do not in themselves constitute forced labour e.g. setting of wage and working hours (see background Table 2.3 in (Dreyer et al, 2010a)); however, if poorly managed these may serve as indication of forced labour if this notion is supported by the general risk of forced labour in the context. The context assessment is primarily focused on reported occurrences of forced labour violations (aspects), estimates of forced labourers, or disclosure of work situations indecent to a degree pertaining forced labour thus indicating a forced labour problem in the country.

The presence of a large number of legal and in particular illegal working immigrants in a country may give rise to concern regarding forced labour issues depending on the protection of these by labour law and general enforcement of labour law through inspection. If trafficking occurs and the source material indicates indecency of working conditions for immigrant workers pertaining forced labour, the extent of the forced labour problem may be indicated through the extent to which these workers are present in the country; however this assessment is secondary to more specific information on violations.

1.3.1 Information sources on forced labour violations

Information about forced labour violations was collected from The American Anti-Slavery Group (AASG) (AASG, 2008), Anti Slavery International (Anti Slavery International, 2008), US State Department's Trafficking in persons report 2007 (U.S. Department of State, 2007) and the ILO Global Report under the Follow-up to the ILO Declaration on Fundamental Principles and Rights at Work regarding forced labour 2005 (ILO, 2005) and the statistical background report (Belser et al, 2005).

The American Anti-Slavery Group (AASG) (AASG, 2008) AASG is a NGO that works with former victims of human trafficking to abolish modern-day slavery, focusing primarily on systems of chattel slavery in Sudan and Mauritania. The Group publishes country reports on their website, however not on all countries. In regards to the contexts considered in this study only information on Brazil is available.

Anti Slavery International (ASI) (Anti Slavery International, 2008) ASI is a NGO, founded in 1839 committed to eliminating all forms of slavery throughout the world through exposure of current cases of slavery, campaigning for eradication, support of initiatives of local organisations to release people, and pressure on governments for more effective implementation of international laws against slavery. Information from Anti-slavery International is often of general character describing forms of slavery, servitude and forced labour (here all considered under one as forced labour), but information on individual countries and cases is sometimes available and relevant for context assessment. In regards to the contexts considered in this study only ,information on Brazil is available in an individual report (Sharma, 2006).

US State Department's Trafficking in persons (TIP) report 2007 (U.S. Department of State, 2007) Yearly the US State Department submit a comprehensive account of foreign governments' efforts to eliminate severe forms of trafficking in persons to the U.S. Congress. The TIP report assesses each government's anti-trafficking efforts in a two-step process. First, the Department determines whether a country is "a country of origin, transit, or destination for a significant number of victims of severe forms of trafficking," generally on the order of 100 or more victims. Secondly, countries for which this applies are then placed on one of three tiers according to the extent of government action to combat trafficking (not size of the problem). Countries whose governments fully comply with the minimum standards for the elimination of trafficking of the U.S. law guiding anti-human trafficking efforts, the Trafficking Victims Protection Act of 2000 (TVPA), are placed in Tier 1. Countries whose governments do not fully comply with the TVPA's minimum standards but are making significant efforts to bring themselves into compliance with those standards are placed in Tier 2. Countries whose governments do not fully comply with the minimum standards and are not making significant efforts to do so are placed in Tier 3. Finally countries are placed on the Tier 2 watch list, when governments do not fully comply with the TVPA's minimum standards but are making significant efforts to bring themselves into compliance with those standards and: a) The absolute number of victims of severe forms of trafficking is very significant or is significantly increasing; or b) There is a failure to provide evidence of increasing efforts to combat severe forms of trafficking in persons from the previous year; or c) The determination that a country is making significant efforts to bring themselves into compliance with minimum standards was based on commitments by the country to take additional future steps over the next year. The information on each country is comprehensive. Country information is available from the 2007 TIP report for all the countries considered in this study.

ILO Global Report - A global alliance against forced labour. ILO Minimum Estimate of Forced Labour in the World. The ILO Global Report on forced labour (ILO, 2005) is the second status report under the follow-up to the ILO Declaration on Fundamental Principles and Rights at Work. It is primarily applicable in the desk top study due to its world estimates of forced labour violations and presented cases. The background report (Belser et al, 2005) is a detailed account of the methodology used in the estimates presented in (ILO, 2005). The methodology is experimental and constitutes an alternative approach to estimate hidden problems such as forced labour for which little or no reliable data is available at the country level. Primarily regional estimates are used in the context assessments secondary to more specific information when available.

1.4 Discrimination

Consideration for industry and near location is less meaningful for this topic compared to the other core labour right issues. Discrimination is an expression of general attitude towards different groups in the society as a whole, which can be observed in industries and near locations, and not the other way around. However, there is a tendency to discrimination being more prevalent against low-paid, low-skilled part of the work force and at locations with strong presence of particular vulnerable groups.

The context assessment includes all kinds of discrimination against different groups of society. The prevalence of discrimination is primarily assessed on the basis of indications by consideration of the number of groups of society affected (size of population considered) and the extent to which discrimination is spread to different areas (e.g. access to education, access to health care etc). The assessment consider discrimination aspects which typically are related to the company activities e.g. inequalities in wage, representation in professional positions and high ranking management positions between members of different groups of society, and similar indications of discrimination. Furthermore, in addition to discrimination observed in the country in the form of incidents of harassment and violence against members of particular groups of society, it also includes consideration for laws, regulations and state practices inconsistent with equal access to housing, employment, education and health care, or other governmental benefits for these.

1.4.1 Information sources on discrimination

No specific information was collected in addition to (ITUC, ICFTU, 2008) (U.S. Department of State, 2006) (HRW, 2008a). No other sources were found that report on the aspects of discrimination collectively for countries. Most often information sources focus on the single aspects e.g. equal remuneration, or single groups e.g. gender equality, and in addition the information is often country specific, making it very difficult to compile the necessary basis for assessment through this approach.

1.5 Restrictions on freedom of association and right to organise and collective bargaining

The context assessment considers the presence of legislation concerning workers' freedom of association and right to organise and collective bargaining and whether there are any constraints imposed by law. The absence of relevant legislation or constraints of rights imposed by law will be reflected in practices by employers unless specific actions are taken by these. Moreover trade union rights in practice, as what concerns interference, restrictions and bans imposed by employers or government legal practice, is considered together with actual cases of violations including harassment and violence against union members. The context assessment primarily focuses on practices influencing or taking place in the private sector.

1.5.1 Information sources on violations of freedom of association and right to organise and collective bargaining

Information about restrictions on freedom of association and right to organise and collective bargaining was collected from ITUC (ICFTU, 2006a) in addition to (U.S. Department of State, 2006) (HRW, 2008a). The annual survey of violations of trade union rights published by ITUC is the most comprehensive and reliable source of information of violations.

2 Context risk assessment

The full context risk assessment is shown for case study company B for the topic 'Child labour' in Table 1.2, while the context assessments for the remaining companies and topics are summarised in Table 1.3 to 1.25. The assessment in Table 1.2 includes the following three elements:

- **Basis for assessment** includes citations of source material relevant for the topic. Information sources are cited to the degree considered necessary to make the assessment; therefore the source material may be much more comprehensive than the citation indicates. When the information sources are cited in selected excerpts it is indicated by (…) meaning that the rest of the paragraph is excluded, and (…) (…) meaning that several paragraphs are excluded. Relevant information is only excluded if it clearly overlaps with other cited sources and if the material is particularly comprehensive as is often the case when violations are widespread or common in a country.
- **Comments to information sources** is primarily a short summary of information retrieved from other sources either not suitable for citation (to extensive or specific on one aspect) or results of more general information search. There are reflections on all sources applied in desk study regardless of whether relevant information was retrieved from them or not.
- **Elaborate comments to assessment** presents a short summary of the argumentation underlying the assignment of risk classes if deemed necessary.

Table 1.2 Context risk assessment of child labour for company B located in Brazil.

CHILD LABOUR			
Country prevalence level - Brazil	**Proximity to company level**	**Risk class**	**Adjustment factor**
Widespread to common	Neither industry nor near location mentioned	1	1

Basis for assessment

(U.S. Department of State, 2006) Although the law restricts work that may be performed by children, child labor continued to be a widespread problem.

The minimum working age is 16 years, and apprenticeships may begin at age 14. The law bars all minors under age 18 from work that constitutes a physical strain or from employment in nocturnal, unhealthy, dangerous, or morally harmful conditions; however, the authorities rarely enforced additional legal restrictions intended to protect working minors under age 18. The law requires parental permission for minors to work as apprentices, and apprentices must attend school through the primary grades. Nonetheless, the ILO office in Brazil **estimated that there were five million child labourers between the ages of five and 17**. **Approximately half of child laborers received no income, and 90 percent worked in the unregistered informal sector. Slightly more than half of child laborers worked in rural areas, and two-thirds were boys.**

A report of the Institute for Work and Society Studies identified 69 main rural and urban activities in which children worked. **Common rural activities included: harvesting corn, manioc, and other crops; fishing; mining; raising livestock; and producing charcoal. In urban areas children worked in shoe shining, domestic services, transportation, construction, restaurants, street peddling, begging, drug trafficking, and prostitution**. The ILO estimated that approximately 20 percent of 10- to 14-year-old girls worked as **household domestics**. Most of these workers received less than half the minimum wage and worked in excess of 40 hours a week.

The MTE was responsible for inspecting worksites to enforce child labor laws; its regional offices had special groups to enforce child labor laws, principally by gathering data and developing plans for child labor inspection. Nonetheless, most inspections of children in the workplace were driven by complaints brought by workers, teachers, unions, NGOs, and the media. **Labor inspectors continued to prioritize inspections in the informal sector, but they remained unable to enter private homes and farms, where much of the nation's child labor was found.** In most cases inspectors attempted to reach agreements and to have employers desist from labor law violations before levying fines of $188 (402 reais) per violation up to a maximum of fine of $944 (2,013 reais); for a second or third violation the fine doubles or triples respectively. As a result, few employers were fined for employing children.

The Labor Inspection Secretariat reported that between January and August 2006, a total of 8,326 children and adolescents were removed from exploitive labor situations. MTE inspectors often worked closely with labor prosecutors from the Public Ministry of Labor (MPT)--an independent agency responsible for prosecuting labor infractions--which had broader powers and was able to impose larger fines. The MPT has a national commission to fight child labor. The commission included 50 prosecutors and focused on strategic areas including sexual exploitation, trash collecting, apprenticeships, and work in a family setting. The commission included 50 prosecutors and focused on strategic areas including sexual exploitation, trash collecting, apprenticeships, domestic labor, drug trafficking. Brazil's National Commission to Eradicate Child Labor (CONAETI) developed the 2004-2007 National Plan to Eradicate Child Labor and proposed a series of legal reforms to help bring national laws into full compliance with the conventions.

(ICFTU, 2004a) Brazil ratified Convention No. 138, the Minimum Age Convention, in 2001. It ratified Convention No. 182, the Worst Forms of Child Labour Convention in 2000. Art. 7 of the Federal Constitution prohibits work for children under the age of 16 and night work, or work that is morally harmful, dangerous or unhealthy for children under the age of 18. Apprenticeships can be started at the age of 14. The Statute of Children and Adolescents of 1990 reaffirms the prohibition of manual work as detrimental to the physical, psychological, moral and social development of children and adolescents.

According to the ILO Brazil office, some **2.5 million children between 10 and 14 years, were economically active in 2000, but this number is decreasing**. Government figures showed 2.97 million working children under 14 in 1999. This number decreased to 2.23 million in 2001. The number of economically active children within the age group of 15-19 was almost 10 million in 2000, but is also decreasing (ILO, Brazil). Government figures show that 9% of children in the 5-14 age group worked in 1999. This percentage decreased to 6.8% in 2001.

Children work both in rural areas and urban areas. **Activities include fishing, mining, raising livestock, producing charcoal, harvesting sugarcane, sisal, tobacco, cotton, and citrus fruits, shoe shining, transportation, construction, restaurants, begging, drug trafficking and prostitution.** Workplace accidents are common.

One third of the working children between 5 and 17 work 40 hours or more per week. The majority (83.0%) of the working children between 5 and 9 work less than 20 hours per week. This percentage is 58.6% in the 10-14 age group, whereas 27.7% of this group works between 21 and 39 hours, and 13.6% works more than 40 hours per week. For the working children in the age group of 15-17 years, 27.9% works less than 20 hours, 24.0% between 21 and 39 hours, and 48.1% more than 40 hours per week. **Of those working in the age group 5-17, 43.4% is working in agriculture, and 51.2% of the working children between 5 and 17 works with machinery or chemical products.**

Of those children employed in agriculture, 67.3% is not paid, against 21.1% in non-agriculture work.

Unicef notes that child labour has been reduced by 25% in particular on plantations such as sugarcane, orange, tobacco and sisal, but also on dumps and in other hazardous locations. One important form of child labour remains widespread, which is domestic work. Many girls work as domestic servants, where they are exploited and victims of violence and sexual abuse.

Conclusions: Child labour is common in Brazil, including the worst forms of child labour such as hazardous work, child prostitution,

selling of drugs, and domestic servitude. Most child labour is concentrated in the informal economy, including in agriculture where children work on plantations. Active policies have led to a decreasing trend in child labour in Brazil.

(IPEC, 2008) While child labour has declined substantially in **Latin America and the Caribbean in recent years, there are still 5.7 million working girls and boys who are under the minimum age for employment or are engaged in work that must be abolished** according to ILO Worst Forms of Child Labour Convention No. 182. **The majority of these children work in agriculture, but there are also many thousands of girls and boys working in other high-risk sectors such as mining, dumpsites, domestic labour, fireworks manufacturing and fishing.** Support to defining and mapping hazardous labour, developing child labour monitoring systems and involving the social partners in these processes are IPEC priorities for the region. **In many countries, domestic labour in third party homes is the second largest sector in which children, mostly girls, work.** Programmes are being implemented in Central and South America to address this difficult issue. Indigenous girls and boys, who are often the poorest of the poor and suffer from discrimination and lack of access to social services, are also a priority target group for research and action.

(EI, 2007) The minimum age for work is 16, though apprenticeships may begin at 14. All minors under age 18 are barred from work that constitutes a physical strain or takes place at night or in unhealthy, dangerous or morally harmful conditions. But legal protections for working minors are not always enforced. For minors to work as apprentices, they must get parental permission and must also attend school. **6.7% of children under age 14 work. Half of child labourers receive no income, and 90% work in the informal sector. Slightly more than half of child labourers, two-thirds of whom are boys, work in rural areas. The ILO estimates that approximately 20% of girls aged 10 to 14 work as domestics.** Most receive less than half the minimum wage and work more than 40 hours a week.

UNICEF supports more than 200 programmes to remove children from exploitative work and place them in schools. The private sector for its part helps fight child labour, and the ABRINQ Foundation for Children's Rights identifies companies with a commitment to eliminate child labour. All major trade unions implement programmes to educate union members about the hazards of child labour and encourage members to report instances of child labour to authorities.

(UNICEF, 2008) UNICEF-supported initiatives have brought 109,000 former child workers back to school.

Comments to information sources

(U.S. Department of State, 2006) Cited in excerpts. The report describes many programmes for child labour elimination and a the governmental effort to eradicate child labour.

(HRW, 2008b) No specific mention of a child labour problem in Brazil.

(IPEC, 2008) National survey and statistics available from 2001, however in Portuguese (information not included).

(UNICEF, 2008) Information retrieved from international website. There is also a country website in local language – information has not been retrieved.

(Save the children, 2008) No mention of Brazil specifically.

(ILO, 2002) Latin America and the Caribbean region harbours the third largest number (17,4 million) of child workers (5-14 years of age) on a global scale.

Elaborate comments to assessment

Source material confirms that child labour is a serious problem in Brazil. Estimates of number of child labourers indicate that child labour is widespread (U.S. Department of State, 2006) to common (ICFTU, 2004a). Child labour in both rural and urban activities is mentioned, however with emphasis on rural activities. Both governmental efforts and NGO efforts in the area of child labour are extensive indicating a very serious problem.

There were no reports of violations taking place in proximity to the company (specific industries were mentioned).

Conclusion: It is very likely that child labour takes place in the context; hence risk class 1 is assigned.

2.1 Case study company A

Table 1.3 Summary of context risk assessment of child labour for company A located in Malaysia.

CHILD LABOUR			
Country prevalence level - Malaysia	**Proximity to company level**	**Risk class**	**Adjustment factor**
Several to widespread occurrences	Small scale industry mentioned, but not specified	2	0.9
Elaborate comments to assessment			
Source material confirms that child labour takes place in Malaysia. However, there are no recent estimates of number of child labourers in the country according to (U.S. Department of State, 2006) and (EI, 2007). (ICFTU, 2006b) estimates a total of 60,000 economically active children between 10 and 14 years in 2000 and (HRW, 2008a) in addition estimates 200.000 Indonesian children employed as domestic workers, which suggests a noteworthy child labour problem in the country. Whether as to it actually classifies as *Widespread* or *Several* occurrences is borderline (taking the size of population into account). Considering that (U.S. Department of State, 2006) describe mechanisms for monitoring workplace conditions as inadequate suggesting that the problem could be more extensive, rule for the classification of occurrences as *Widespread*. Child labour is primarily mentioned connection with rural activities and domestic work, however it is also mentioned in connection with small scale industry. **Conclusion:** It is likely that child labour takes place in the context; hence risk class 2 is assigned.			

Table 1.4 Summary of context risk assessment of forced labour for economic exploitation for company A located in Malaysia.

FORCED LABOUR (ECONOMIC EXPLOITATION)			
Country prevalence level – Malaysia	**Proximity to company level**	**Risk class**	**Adjustment factor**
Several to widespread occurrences	No occurrences mentioned	2	0.9
Elaborate comments to assessment			
Source material confirms that forced labour for economic exploitation takes place in Malaysia. Particular (U.S. Department of State, 2006) describes practices taking place involving a variety of forced labour aspects. According to (U.S. Department of State, 2006) migrant workers (legal and illegal) make up app. 20% of the workforce. All sources confirm that migrant workers in general are subjected to conditions of forced labour being a particular vulnerable group to abuses due to legal status in the country. Furthermore, all sources confirm trafficking in persons for the purpose of forced labour. According to (U.S. Department of State, 2007) the government does not criminalize debt-bondage nor current labour practices that promote involuntary servitude conditions. As a result investigations and labour inspections carried out will not necessarily have resulted in reported cases. Therefore the extent of the problem may be much more serious than indicated by reports considering the number of migrant workers. There are mentioned occurrences in the industrial sector. In general it is difficult to determine the prevalence of the forced labour in Malaysia on the basis of the available sources of information. Either *Several occurrences* or *widespread occurrences*. Considering the summarised circumstances and the general spread in the region (ILO, 2005) and the fact that there are mentioned occurrences in the industrial sector (manufacturing) it is assessed that it is likely that occurrences take place in the context. **Conclusion:** It is likely that forced labour for economic exploitation takes place in the context; hence risk class 2 is assigned.			

Table 1.5 Summary of context risk assessment of discrimination for company A located in Malaysia.

DISCRIMINATION			
Country prevalence level – Malaysia	**Proximity to company level**	**Risk class**	**Adjustment factor**
Common	No occurrences mentioned	1	1
Elaborate comments to assessment			
Source material indicates a discrimination problem in Malaysia affecting several groups of the society. Discrimination primarily occurs on the basis of race. The source material confirms that Malaysia applies laws and policies discriminating non-bumiputras (app.38% of the population) in housing, home ownership, awarding of government contracts and jobs, educational scholarships, and other areas. The source material furthermore strongly indicates that discrimination against women occurs, not in access to employment, but in regards to equal remuneration and advancement. Prevalence is assessed to be common on the basis of the large proportion of the population systematically discriminated. **Conclusion:** It is very likely that discrimination takes place in the context; hence risk class 1 is assigned.			

Table 1.6 Summary of context risk assessment of restrictions on freedom of association, right to organise and collective bargaining company A located in Malaysia.

RESTRICTIONS OF FREEDOM OF ASSOCIATION, RIGHT TO ORGANISE AND COLLECTIVE BARGAINING			
Country prevalence level - Malaysia	**Proximity to company level**	**Risk class**	**Adjustment factor**
Common	No occurrences mentioned	1	1
Elaborate comments to assessment			
The source material generally describe that workers face serious problems in exercising their right of association, right to organise and collective bargaining in Malaysia. Foreign workers are indirectly not allowed to join trade unions and since migrant workers constitutes app.20% of the workforce, hereof, however some illegal (U.S. Department of State, 2006), this indicates a widespread problem in itself. Violations are common and involve a range of aspects. Furthermore, the source material strongly indicates that the Government systematically imposes restrictions on workers' right of association, right to organise and collective bargaining in Malaysia. The source material also describes lack of efficiency in the judicial system. **Conclusion:** It is very likely that restrictions are imposed on workers right to associate and right to organise and bargain collectively in the context; hence risk class 1 is assigned.			

2.2 Case study company B

Table 1.7 Summary of context risk assessment of forced labour for economic exploitation for company B located in Brazil.

FORCED LABOUR (ECONOMIC EXPLOITATION)			
Country prevalence level - Brazil	**Proximity to company level**	**Risk class**	**Adjustment factor**
Widespread to common	One violation mentioned in Sao Paulo State	1	1
Elaborate comments to assessment			
Source material confirms that forced labour for economic exploitation is a serious problem in Brazil. Reports of violations are widespread. Violations are reported in following locations: Ceara State, Pará State, Minas Gerais State, Rondonia state, Rio de Janerio State, Sao Paulo state, Goias state, Mato Grosso state, Tocantions state, Maranhão state, Piauí state and Rio Grande do Norte state. Furthermore, remote areas of the Amazon are mentioned. Forced labour for economic exploitation is primarily a problem in rural areas and is common in forestry, charcoal production, raising livestock, and agriculture and similar rural activities. Forced labour however also occurred in the urban activities. The material describes practices taking place involving all aspects of forced labour. **Conclusion:** It is very likely that forced labour for economic exploitation takes place in the context; hence risk class 1 is assigned.			

Table 1.8 Summary of context risk assessment of discrimination for company B located in Brazil.

DISCRIMINATION			
Country prevalence level - Brazil	**Proximity to company level**	**Risk class**	**Adjustment factor**
Common	Neither industry nor near location mentioned	1	1
Elaborate comments to assessment			
Source material confirms that discrimination against women and Afro-Brazilians (app. 45% of the population) is common in Brazil. Furthermore, the source material indicates discrimination against homosexuals, indigenous people and HIVpositive persons. **Conclusion:** It is very likely that discrimination takes place in the context; hence risk class 1 is assigned.			

Table 1.9 Summary of context risk assessment of restrictions on freedom of association, right to organise and collective bargaining company B located in Brazil.

RESTRICTIONS OF FREEDOM OF ASSOCIATION, RIGHT TO ORGANISE AND COLLECTIVE BARGAINING			
Country prevalence level - Brazil	**Proximity to company level**	**Risk class**	**Adjustment factor**
Widespread	Neither industry nor near location mentioned	2	0.9
Elaborate comments to assessment			
The source material generally describe that workers' faces problems in exercising their right of association, right to organise and collective bargaining in Brazil - in particular in rural areas. Violations are however generally widespread and involve many different aspects such as, discrimination of trade unionists (app. 1,4 million complaints), blacklisting of workers who have lodge complaints against companies, intimidation and violence against workers active in trade unions. Furthermore, the source material describes lack of efficiency in the judicial system. **Conclusion:** It is likely that restrictions are imposed on workers right to associate and right to organise and bargain collectively in the context; hence risk class 2 is assigned.			

2.3 Case study company C

Table 1.10 Summary of context risk assessment of child labour for company C located in Croatia.

CHILD LABOUR			
Country prevalence level - Croatia	**Proximity to company level**	**Risk class**	**Adjustment factor**
Several	Neither industry nor near location mentioned	3	0.7
Elaborate comments to assessment			
Source material confirms that child labour takes place in Croatia. In 2005 there was188 violations of labour law involving children (U.S. Department of State, 2006). The low number of violations suggests that these are isolated cases (risk class 4), however (U.S. Department of State, 2006) specifically states the existence of an actual child labour problem, which indicates that the occurrence of child labour in the context actually is possible, hence risk class 3 is assigned. It should be noted that the lack of a country report from ICFTU on Croatia makes the assessment less country specific and comprehensive compared to when included. **Conclusion:** The risk of violations in the context is possible; hence risk class 3 is assigned.			

Table 1.11 Summary of context risk assessment of forced labour for economic exploitation for company C located in Croatia.

FORCED LABOUR (ECONOMIC EXPLOITATION)			
Country prevalence level - Croatia	**Proximity to company level**	**Risk class**	**Adjustment factor**
Isolated	Neither industry nor near location mentioned	4	0.5
Elaborate comments to assessment			
Source material does not indicate that forced labour for economic exploitation is a particular problem in Croatia, however it should be noted that the lack of a country report from ICFTU on Croatia makes the assessment less country specific and comprehensive compared to when included. (ILO, 2005) indicates existence of a problem in the transition economies (which here includes Croatia). In regards to conditions of work (U.S. Department of State, 2006) mentions many labour law violations of aspects pertaining forced labour. The variety of aspects affected is however limited to include indecent working conditions and withholding and non-payment of wages. This does not indicate an actual problem with forced labour for economic exploitation; however it is not possible entirely to rule out that it takes place. **Conclusion:** It is unlikely that forced labour for economic exploitation takes place in the context; hence risk class 4 is assigned.			

Table 1.12 Summary of context risk assessment of discrimination for company C located in Croatia.

DISCRIMINATION			
Country prevalence level - Croatia	**Proximity to company level**	**Risk class**	**Adjustment factor**
Widespread	Neither industry nor near location mentioned	2	0.9
Elaborate comments to assessment			
Source material indicates a serious discrimination problem in Croatia affecting many groups of the society. Discrimination occurs on the basis of gender, race, ethnicity, religious beliefs, sexual orientation and disability. Discrimination against ethnic Serbs, Roma and women being the main problem. The source material indicates widespread societal harassment and discrimination against the minorities ethnic Serbs and Roma in several areas including access to employment, administration of justice (ethnic Serbs), housing and educational system (Roma). Prevalence is assessed to be widespread on the basis of the many groups of society affected by discrimination and the many areas to which this discrimination is spread particularly for ethnic Serbs and Roma. It should be noted that the lack of a country report from ICFTU on Croatia makes the assessment less country specific and comprehensive compared to when included. **Conclusion:** It is likely that discrimination takes place in the context; hence risk class 2 is assigned.			

Table 1.13 Summary of context risk assessment of restrictions on freedom of association, right to organise and collective bargaining company C located in Croatia.

RESTRICTIONS OF FREEDOM OF ASSOCIATION, RIGHT TO ORGANISE AND COLLECTIVE BARGAINING			
Country prevalence level - Croatia	**Proximity to company level**	**Risk class**	**Adjustment factor**
Several	Neither trade nor near location mentioned	3	0.7
Elaborate comments to assessment			
Source material confirms that workers' right of association, right to organise and collective bargaining, generally is recognised in Croatia and exercised by workers. However with a few limitations. Several cases of resistance against trade union's organising drives and obstruction of trade union activities have been reported particularly involving multinational companies. **Conclusion:** It is possible that restrictions are imposed on workers right to associate and right to organise and bargain collectively in the context; hence risk class 3 is assigned.			

2.4 Case study company D

Table 1.14 Summary of context risk assessment of child labour for company D located in Hungary.

CHILD LABOUR			
Country prevalence level - Hungary	**Proximity to company level**	**Risk class**	**Adjustment factor**
Isolated occurrences	Neither industry nor near location mentioned	4	0.5
Elaborate comments to assessment			
Source material confirms that child labour constitute a minimal problem in Hungary. According to (U.S. Department of State, 2006) there have been no reports of any significant violations in 2006. Source material indicates a small problem with working Roma children, who constitute a minority group in Hungary. Prevalence is considered low. **Conclusion:** It is unlikely that child labour takes place in the context; hence risk class 4 is assigned.			

Table 1.15 Summary of context risk assessment of forced labour for economic exploitation for company D located in Hungary.

FORCED LABOUR (ECONOMIC EXPLOITATION)			
Country prevalence level - Hungary	**Proximity to company level**	**Risk class**	**Adjustment factor**
Isolated occurrences	Neither industry nor near location mentioned	4	0.5
Elaborate comments to assessment			
(ICFTU, 1998) explicitly states that there is no reports of forced labour. However, (U.S. Department of State, 2006) indicates that the country was source, transit and destination of trafficking in persons for sexual exploitation, domestic servitude and manual labour. Hereby not specifying if the trafficked persons actually are engaged in manual labour when Hungary is only the destination. Whereas (ICFTU, 2004b) states that trafficking for mainly the purpose of sexual exploitation is a serious problem in the country. Hereby indicating trafficking for other purposes e.g. forced labour for economic exploitation. (U.S. Department of State, 2006) and (ICFTU, 2004b) thus indicate that there might be a problem with forced labour for economic exploitation, whereas (ICFTU, 1998) states that there are no reports. (U.S. Department of State, 2006) and (ICFTU, 2004b) are more recent sources of information compared to (ICFTU, 1998). According to (ICFTU, 1998) risk class 5 should be assigned. However (U.S. Department of State, 2006) and (ICFTU, 2004b) indicate the existence of a problem, however diminutive, which eliminates risk class 5. The extent is however not possible to determine on basis of the available sources. Here we chose to interpret the fact that there is no specific mentioning of occurrences that forced labour is a very small problem in the country. **Conclusion:** It is unlikely that forced labour for economic exploitation takes place in the context; hence risk class 4 is assigned.			

Table 1.16 Summary of context risk assessment of discrimination for company D located in Hungary.

DISCRIMINATION			
Country prevalence level – Hungary	**Proximity to company level**	**Risk class**	**Adjustment factor**
Widespread	Neither industry nor near location mentioned	2	0.9
Elaborate comments to assessment			
Source material indicates a discrimination problem in Hungary affecting several groups of the society. Discrimination primarily occurs on the basis of gender, race and disability. The source material confirms that discrimination against Roma (at least 4% of the population) is a widespread problem in education, housing, penal institutions, employment and access to public places. Persons with disabilities are discriminated against in employment and access to health care, and Women are discriminated against in access to employment, equal remuneration and advancement. Prevalence is assessed to be widespread on the basis of the groups of society affected by discrimination and the many areas to which this discrimination is spread. Particular indication of systematic discrimination of Roma in the society in both private and public sectors is considered. **Conclusion:** It is likely that discrimination takes place in the context; hence risk class 2 is assigned.			

Table 1.17 Summary of context risk assessment of restrictions on freedom of association, right to organise and collective bargaining company D located in Hungary.

RESTRICTIONS OF FREEDOM OF ASSOCIATION, RIGHT TO ORGANISE AND COLLECTIVE BARGAINING			
Country prevalence level - Hungary	**Proximity to company level**	**Risk class**	**Adjustment factor**
Widespread	Neither industry nor near location mentioned	2	0.9
Elaborate comments to assessment			
The source material generally describes that workers' face problems in exercising their right of association, right to organise and collective bargaining in Hungary. Various aspects of freedom of association and right to organise and bargain collectively are violated. Source material particularly describes widespread violations of freedom of association. Several major cases reached courts in 2005. Legal procedures are described by the source material as lengthy and it is indicated that enforcement of rights is insufficient. **Conclusion:** It is likely that restrictions are imposed on workers right to associate and right to organise and bargain collectively in the context; hence risk class 2 is assigned.			

2.5 Case study company E

Table 1.18 Summary of context risk assessment of child labour for company E located in Israel.

CHILD LABOUR			
Country prevalence level – Israel	**Proximity to company level**	**Risk class**	**Adjustment factor**
Several occurrences	Small scale industry mentioned, but not specified	3	0.7
Elaborate comments to assessment			
Source material confirms that child labour that takes place in Israel. Child labour is not considered a widespread problem by the source material, but more of a problem among some groups of the population. (ICFTU, 2006c) provides an estimate of 20000 working children. Child labour in small manufacturing enterprises is mentioned. **Conclusion:** It is possible that child labour takes place in the context; hence risk class 3 is assigned.			

Table 1.19 Summary of context risk assessment of forced labour for economic exploitation for company E located in Israel.

FORCED LABOUR (ECONOMIC EXPLOITATION)			
Country prevalence level - Israel	**Proximity to company level**	**Risk class**	**Adjustment factor**
Several occurrences	Neither industry nor near location mentioned	3	0.7
Elaborate comments to assessment			
Source material confirms that forced labour for economic exploitation takes place in Israel. The material describes practices taking place involving many aspects of forced labour. Even though no convictions of involuntary servitude were made in 2006 many cases of forced labour practices were investigated (708 cases in 2006). Considering this number of cases the problem is however not assessed to be widespread. There were no reports of violations taking place in proximity to the company (specific industries were mentioned). **Conclusion:** It is possible that forced labour for economic exploitation takes place in the context; hence risk class 3 is assigned.			

Table 1.20 Summary of context risk assessment of discrimination for company E located in Israel.

DISCRIMINATION			
Country prevalence level - Israel	**Proximity to company level**	**Risk class**	**Adjustment factor**
Common	Neither industry nor near location mentioned	1	1
Elaborate comments to assessment			
Source material indicates a serious discrimination problem in Israel affecting many groups of the society. Discrimination occurs on the basis of gender, race, ethnicity, nationality, religious beliefs, sexual orientation and disability. The source material furthermore indicates that Israel applies laws and policies discriminating primarily Israeli-Arabs (app. 20% of population (ICBS, 2007)) reflected in the educational system, city planning, social and economic planning, representation in government and governmental institutions. Prevalence is assessed to be common on the basis of the many groups of society affected by discrimination and the many areas to which this discrimination is spread. Particular indication of systematic discrimination against Israeli-Arabs, which constitutes a major group in the society, is considered. **Conclusion:** It is very likely that discrimination takes place in the context; hence risk class 1 is assigned.			

Table 1.21 Summary of context risk assessment of restrictions on freedom of association, right to organise and collective bargaining company E located in Israel.

RESTRICTIONS OF FREEDOM OF ASSOCIATION, RIGHT TO ORGANISE AND COLLECTIVE BARGAINING			
Country prevalence level - Israel	**Proximity to company level**	**Risk class**	**Adjustment factor**
Several	Neither industry nor near location mentioned	3	0.7
Elaborate comments to assessment			
Source material confirms that workers' right of association, right to organise and collective bargaining, generally is recognised in Israel and exercised by workers. However with a few limitations. Several violations occurred in 2005. Discrimination against Palestinian workers took place in elections in Israeli trade unions and Palestinian trade unions located in the West Bank and Gaza were not permitted to carry out trade union activities. Migrant workers are not able to join trade unions due to their status as temporary workers in Israel (these make up 8,5% of the working population). **Conclusion:** It is possible that restrictions are imposed on workers right to associate and right to organise and bargain collectively in the context; hence risk class 3 is assigned.			

2.6 Case study company F

Table 1.22 Summary of context risk assessment of child labour for company F located in Denmark.

CHILD LABOUR			
Country prevalence level - Denmark	**Proximity to company level**	**Risk class**	**Adjustment factor**
No cases	-	5	0.4
Elaborate comments to assessment			
Conclusion: It is very unlikely that child labour take place in the context; hence risk class 5 is assigned.			

Table 1.23 Summary of context risk assessment of forced labour for economic exploitation for company F located in Denmark.

FORCED LABOUR (ECONOMIC EXPLOITATION)			
Country prevalence level – Denmark	**Proximity to company level**	**Risk class**	**Adjustment factor**
No cases	-	5	0.4
Elaborate comments to assessment			
Source material confirms that there are no cases of forced labour for economic exploitation in Denmark and that there is no indication of a hidden problem. **Conclusion:** It is very unlikely that forced labour for economic exploitation takes place in the context; hence risk class 5 is assigned.			

Table 1.24 Summary of context risk assessment of discrimination for company F located in Denmark.

DISCRIMINATION			
Country prevalence level – Denmark	**Proximity to company level**	**Risk class**	**Adjustment factor**
Several	Neither industry nor near location mentioned	3	0.7
Elaborate comments to assessment			
Source material confirms that discrimination on the basis of race takes place in Denmark. Furthermore, the source material indicates that discrimination on the basis of gender also takes place. Discrimination cases are limited, however their existence indicates a discrimination problem in Denmark. **Conclusion:** It is possible that discrimination takes place in the context; hence risk class 3 is assigned.			

Table 1.25 Summary of context risk assessment of restrictions on freedom of association, right to organise and collective bargaining company F located in Denmark.

RESTRICTIONS OF FREEDOM OF ASSOCIATION, RIGHT TO ORGANISE AND COLLECTIVE BARGAINING			
Country prevalence level – Denmark	**Proximity to company level**	**Risk class**	**Adjustment factor**
Isolated	Neither industry nor near location mentioned	4	0.5
Elaborate comments to assessment			
Source material confirms that workers' right of association, right to organise and collective bargaining, generally is recognised in Denmark and exercised by workers. (ICFTU, 2004b) however, indicates restrictions on right to strike and the aspect of reemployment after participation in lawful strike could be a problem. No occurrences of violations reported. **Conclusion:** It is unlikely that restrictions are imposed on workers right to associate and right to organise and bargain collectively in the context; hence risk class 4 is assigned.			

2.7 Summary of all context risk assessments

The contextual risk classes assigned to the contexts of the six case study companies are presented in Table 1.26.

Table 1.26 Summary of assigned contextual risk classes to case study companies according to context risk assessments summarised in Tables 1.3 to 1.25.

Contextual Risk Class (CRC)	Company A Malaysia	Company B Brazil	Company C Croatia	Company D Hungary	Company E Israel	Company F Denmark
Child labour	**2**	**1**	**3**	**4**	**3**	**5**
Forced labour	**2**	**1**	**4**	**4**	**3**	**5**
Discrimination	**1**	**1**	**2**	**2**	**1**	**3**
Restrictions of freedom of association *(abbr.)*	**1**	**2**	**3**	**2**	**3**	**4**

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Supporting information 2: Elaborate presentation and discussion of case study results

This appendix provides a more elaborate description and discussion of the case study results presented in (Dreyer et al, 2010b). For each impact category, the case study results are elaborated through detailed analysis of the measurement by the labour rights indicators and the characterisation, explaining how lack of performance, according to the managerial measures of the indicators, reflects in the internal risk environment and make up free rein for violations, and how this is influenced by the external risk environment. Combined with observations made on the company premises during the data collection and the subsequent period of monitoring we reflect upon the individual indicators approach to measuring performance for the purpose of risk assessment and the coherence between observed and measured risks as they appear in intermediate steps of assessment and in the final company risk categorisation. The labour rights indicators are presented in (Dreyer et al, 2010c).

1 Impact category: Child labour

Company A comes out with the highest company risk score for the *Child labour* impact category, and is placed just on the border between the *High* risk and *High to medium* risk category. It is closely followed by company B, C and E, which are all in the *High to Medium* company risk categories, while company D and F are both in the *Medium* company risk category. See Table 2.1.

The contextual risk adjustment of free rein has largest effect on company D and F indicating significantly lower topicality of child labour in these contexts compared to the reference situation. Company F is the only company placed in a context where child labour is very unlikely to occur, i.e. contextual risk class (CRC) 5. Company B is the only company located in a context where child labour is considered common (see Table 2.1 and Fig. 2.1), but it is also the company that has the lowest free rein for child labour among the case study companies due to the management efforts. However due to the context risk (CRC 1) the company is placed in the *High to medium ris*k category, in accordance with the need for extraordinary management effort in a high risk context. Company C's free rein is the largest of all companies in the case study. The magnitude results in a high company risk despite some modification via contextual adjustment.

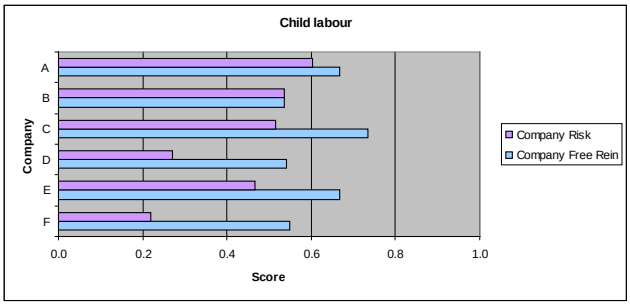


Fig. 2.1 Company Risk (CR) and Company Free Rein (CFR) scores for the six case study companies for the *Child labour* impact category (based on Table 2.1).

Table 2.1 Case study results for the *Child labour* impact category. Company free rein (CFR) is calculated on basis of company performance scores obtained with the *Minimum ages for employment* indicator and contextual risk classes (CRC) are determined on the basis of the context risk assessments presented in (Dreyer et al, 2010g).

Company	Company free rein (CFR)	Contextual risk class (CRC)	Contextual adjustment factor (CAF)	Company risk (CR)	Company risk class
A	0.67	2	0.7	0.60	High to medium risk
B	0.54	1	1.0	0.54	High to medium risk
C	0.74	3	0.7	0.52	High to medium risk
D	0.54	4	0.5	0.27	Medium risk
E	0.67	3	0.7	0.47	High to medium risk
F	0.55	5	0.4	0.22	Medium risk

Characterisation places company F in the *Medium* risk category, but just on the border to the *Low* company risk category where it more rightly belongs. Company F is very unlikely to engage in any kind of child labour considering the location in a low risk context and the high educational level required to fulfil the work functions in the company. The company neither employs apprentices, nor children below general minimum age nor young workers below 18 years of age, which are the three groups of working children the indicator addresses management of. The indicator is designed to deal with such a situation by allowing that measures concerning these are taken out. [1] Hereby the significance of the remaining measures is emphasised. These address: principle on not hiring children below general minimum age; checking of age upon hiring; keeping of detailed employee records; and examination of employee grievances. In accordance with context risk the emphasis of active control of these measures is modified, so high risk contexts demands that such a company is in full control of avoiding employing children in order to be placed low in the Company risk classification, whereas in low risk contexts the requirements to achieve a low company risk class are lower. Company F performs quite well in regards to the remaining measures, which means that these measures largely are relevant for the company and/or that they are a natural result of being in a low risk context[2], however, considering that the type of work is not suitable for child labourers lack of these measures would not be synonymous with larger risk of violations in the company. In a context associated with very high context risk (CRC 1) a company such as company F would be placed in *High to Medium* company risk category with the same management performance. A placement in *Low* risk in such a context would demand active control of all existing practices and implementation of practices concerning handling of employee grievances, which in light of the actual risk is not meaningful. The fact that company F is risk categorised in accordance with observed risk can thus to a large degree be imputed to the presence in a low risk context. This suggests that the indicator does not work optimally for this type of company. This problem with the indicator is subjected to more critical examination in (Dreyer et al, 2010b).

It is a surprising result that company C places in *High to Medium* risk category, even though Croatia, where the company is located is not usually a country associated with child labour. Company C ends in the same group as company A and B, which are located in Brazil and Malaysia respectively, which are countries more commonly associated with child labour violations. The reason for the high score is a combination of mediocre management of apprentices and employee grievances, and contextual risk adjustment. Company C and D are quite similar in scoring, but company D performs better in regards to practices and active control, which can be seen in the differences in free rein; a difference which is emphasized by the contextual adjustment, where the company context of D has a lower risk class than C (CRC 4 and 3 respectively). At first glance, the contextual risk class seems too high for company context C, and further examination reveals that it might be in the high end, but justified. According to a recent information source (U.S. Department of State, 2006) (information sources are generally limited for Croatia) child labour is a problem in Croatia, which makes it impossible to assign risk class 4 in the context risk assessment, because even though the number of violations (188 cases in 2005) is relatively low considering the size of the working population, the problems extend beyond isolated and random violations, which characterises risk class 4.[3] Observations on site in both company C and D confirm that it is unlikely that traditional child labour takes place, but that there is a risk that apprentices, who usually are children of employees, carry out work, which is

[1] See rules for taking out measures of the *Minimum ages for employment* indicator in (Dreyer et al, 2010d).
[2] Companies operating in low risk contexts are expected to have implemented basic managerial measures contained by the multi-criteria indicators in order to comply with legislation and meet societal expectations. Read more about basic performance level in *Contextual risk classification of labour rights* in (Dreyer et al, 2010f).
[3] Context risk assessment of child labour for company C is summarised in Table 1.10 of (Dreyer et al, 2010g), and common characteristics describing the violation pattern in a country used for classification is available in Table 4.1 in (Dreyer et al, 2010f).

not adequate for their age. The assessed company risk category therefore seems somewhat high for company C, despite the risk context, considering the extent to which violations may occur.

The free reins of company A and E are within the same range as company C, however for entirely different reasons. The cause of the large free reins for company A and E is primarily the lack of management of young workers. Furthermore, both companies needs to improve practices concerning ensuring minimum age restrictions in hiring, which is important considering the prevalence of child labour in the related contexts (especially for company A). Observations on site confirm that it is unlikely that traditional child labour takes place, however due to insufficient management efforts risk is present that minors are hired unknowingly. This risk must be considered in light of the fact that child labour takes place in both countries. In both companies young workers take on work on an equal basis with other workers, i.e. risk is indeed present that they carry out work that is hazardous, or work inappropriate hours and/or number of working hours. On the other hand it is extenuating circumstances that in company A young workers only work in summer holidays and in Company E young workers are most often children of employees, which suggests that the number of young workers in both companies is limited and that it is unlikely that systematic violations take place. On this basis the categorisation of Company E in *High to medium*, company risk seems high, whereas it is more reasonable for Company A. Company A is however just on the border to the *High risk* category, which would be too high a placement considering the possible extent of violations.

Company B manages minimum ages for employment very well. Only a little improvement potential is identified with this indicator in regards to implementation of measures, however concerning two central areas considering the high risk context: better communication of principle on not hiring children below general minimum age and including checking age in existing hiring procedures (since such exist – checking ages should be written part of this even though it is common practice to do so). Improvement of these practices will however not bring the company into a *Medium* risk category due to the high context risk, which in addition demands improvement of active control. The practitioner gets the impression from the management of apprentices and the general attitude in the company that intentions are good and the company sees no reason to engage in child labour. Observations on site confirm the impression that it is unlikely that traditional child labour is taking place in the company. The risk category is defendable considering the context, but may be in the high end. Medium risk would also have been defendable in this case considering both specific management efforts and general attitudes in the company.

2 Impact category: Restrictions of freedom of association, right to organise and collective bargaining[4]

For the impact category *Restrictions of freedom of association* company A and D come out with the highest company risk scores. Both are classified as belonging to the *High* company risk category. Company F and B ends in the *High to medium* company risk category (B on the border to *Medium* risk), whereas company C and E are in the *Medium* risk category. See Table 2.2.

Company A, D and F have significantly higher free reins than the other companies due to a general lack of practices. We see this in the comparison of company B and D, which both belong to risk class 2, but have significantly different free reins, 0.424 and 0.878 respectively, resulting in very different company risk scores. For company A and D, the location in a high risk context (CRC 1 and 2 respectively) reinforces the importance of the large free reins in the company risk score. The contextual risk adjustment however has positive effect on the resulting placement of company F, which ends in *High to medium* risk rather than *High risk*, as the other two, due to the significantly lower context risk (CRC 4). For this impact category company F is thus the company for which the contextual risk adjustment has the largest effect (See Table 2.2 and Fig. 2.2).

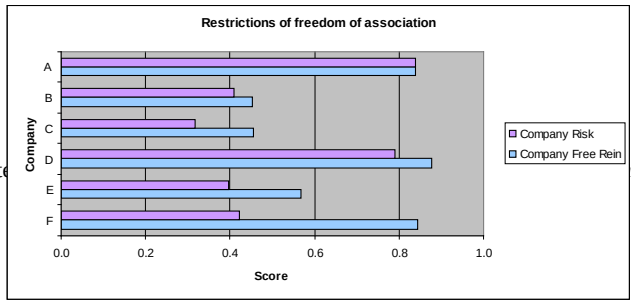


Fig. 2.2 Company Risk (CR) and Company Free Rein (CFR) scores for the six case study companies for the *Restrictions of freedom of association* impact category (based on Table 2.2).

[4] The impact category and corresponding multi-criteria indicator is abbreviate respectively in following.

Table 2.2 Case study results for the *Restrictions of freedom of association* impact category. Company free rein (CFR) is calculated on basis of company performance scores obtained with the *Freedom of association* indicator and contextual risk classes (CRC) are determined on the basis of the context risk assessments presented in (Dreyer et al, 2010g).

Company	Company free rein (CFR)	Contextual risk class (CRC)	Contextual adjustment factor (CAF)	Company risk (CR)	Company risk class
A	0.84	1	1.0	0.84	High risk
B	0.45	2	0.9	0.41	High to medium risk
C	0.46	3	0.7	0.32	Medium risk
D	0.88	2	0.9	0.79	High risk
E	0.57	3	0.7	0.40	Medium risk
F	0.84	4	0.5	0.42	High to medium risk

On the premises of company A, D and F there is no trade union present even though trade unions are allowed in all three countries, and the high free reins assessed in these companies are mainly related to this absence. General lack of practices or inadequate practices in the companies concerning collective bargaining, employee representation, consultation with employees etc. is reflected in the high risk scores. Contrary to the majority of the employees in company A and D, the employees in company F are well educated. They have different educational backgrounds, and hence qualifications and competences, and their work functions are diverse, which in general makes collective bargaining difficult. Even though trade unions are not present at the workplace, most of the employees belong to a union, however not the same one, but according to their educational background. In Denmark where company F is located there is no tradition for collective bargaining for salaried professionals (white-collar employees) in the private sector, but these are protected by the *Danish Employers' and Salaried Employees' Act*. These special circumstances suggest that the free rein is unjustly high[5] for company F and hence that the resulting company risk score is not consistent with the actual risk of violations. Measures concerning the functioning of employee representatives may still be relevant for protecting and furthering the interests of the employees collectively through consultation, e.g. on topics of working environment, however not pertinent for the assessment of risk of violations. A general observation is that the formulation and choice in measures in the indicator is not spot on in capturing the work situation of professionals even though the measures sometimes can be interpreted in liberally in order to apply to it. This problem with the indicator is subjected to more critical examination in (Dreyer et al, 2010b).

There can be many good causes as to why no trade union is present in company A and D without it being related to a direct act of violation of rights by the company management, e.g. workers lack of confidence to join unions or to organise themselves due to historic reasons or lack of representation of a union in the specific geographical area. Some of these causes are likely to apply to the situation of company A and D, however there were small indications during the interviews that suggested an attitude which did not entirely welcome unionisation and what comes with this. So in the cases of company A and D it is acceptable to conclude that there is agreement between indicator result (lack of practices) and the observed risk that restrictions of freedom of association occur. It can be concluded that in the case studies A and D the company risk scores reflect that there are circumstances present in the company which are associated with high risk that restrictions of freedom of association take place, in accordance with the categorisation of the company risk assessed with the multi-criteria indicator.

[5] If Company F had been scored as a company in a country not allowing collective bargaining, it would have been allowed to take out measures concerning this, and the company would have been placed in the *Medium* risk category on the basis of performance of the remaining measures. See rules for taking out measures of the *Freedom of association* indicator in (Dreyer et al, 2010d).

Company B, C and E perform quite well in integrating preventive practices (I) and communication and delegation of responsibility for compliance (II), but the general lack of active control is also prevalent in all three companies making it impossible to entirely dismiss risk of violations. This risk is modified by the context risk (more for company C and E than the B) emphasizing that company B must make a slightly stronger effort in active control in order to minimise risk equivalent to company C and E. Active control, which must be external for this topic, will uncover if the company imposes restrictions of the right of the employees to freely associate and organise and for bargaining collectively by checking if measures are effectively integrated into daily practice; i.e. if collective bargaining indeed is constructive, if facilities needed by union representatives actually are available and adequate, if consultation actually takes place when appropriate etc. Active control involves an iterative improvement circle driven by the frequent control uncovering non-conformances, which are addressed before control is carried out again. This means that it will uncover inconsistencies or if improvements are needed in the business processes in the company.

In both company B and C there were indications that the constructiveness of both collective bargaining and consultation was affected by the lack of competencies by the union representatives, a problem which is not uncommon in the mentioned countries. If the companies had been carrying out active control this is something which had been likely to come up at some time, and they would have had to address the problem in connection with this. Company E employs a lot of Russian Immigrants, whose influence may be impaired by the language barrier or legal rights in the country, something which we cannot entirely uncover judging from the management efforts I and II, but which can be uncovered by active control. The risk categorisation seems acceptable in the three cases on this basis, but there is a small indication that the weight on active control may be too strong since company E is close to *High to Medium* risk category, which would be too high a placement considering observed risk, and company B is close to *Medium* risk category, which would be a more reasonable placement than the present *High to Medium* risk placement.

3 Impact category: Forced labour

Company B has the highest company risk score for the impact category *Forced labour* followed by company A. Both are in the *High to Medium* company risk category. Company E ends in the *Medium* company risk category, whereas company D, F and C are in the *Low* risk category. See Table 2.3.

The adjustment of free rein has largest effect on company D, F and C reflecting significantly lower topicality of forced labour in these contexts compared to the reference situation. Contexts of company F and B are placed in the lowest and highest risk class respectively reflecting that forced labour is very unlikely to occur in context of F and very likely in the context of B.

The free rein of company A and B is the same, and the small difference in context risk places them in the same company risk category. Generally these two companies perform rather well and the free rein is not particularly high, this affects the assessment of company risk which, despite the high risk contexts, results only in a *High to medium* risk classification. The free rein of company E is higher than for A and B, but contextual risk adjustment has a positive effect resulting in a lower company risk score in comparison. (See Table 2.3 and Fig. 2.3)

Fig. 2.3 Company Risk (CR) and Company Free Rein (CFR) scores for the six case study companies for the *Forced labour* impact category (based on Table 2.3).

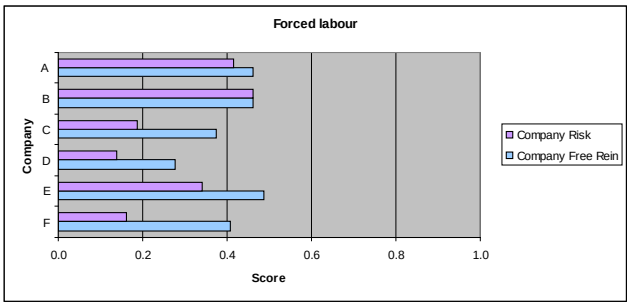


Table 2.3 Case study results for the *Forced labour* impact category. Company free rein (CFR) is calculated on basis of company performance scores obtained with the *Abolition of forced labour* indicator and contextual risk classes (CRC) are determined on the basis of the context risk assessments presented in (Dreyer et al, 2010g).

Company	Company free rein (CFR)	Contextual risk class (CRC)	Contextual adjustment factor (CAF)	Company risk (CR)	Company risk class
A	0.46	2	0.9	0.42	High to medium
B	0.46	1	1.0	0.46	High to medium
C	0.37	4	0.5	0.19	Low
D	0.28	4	0.5	0.14	Low
E	0.49	3	0.7	0.34	Medium
F	0.41	5	0.4	0.16	Low

All case study companies have implemented basic practices which indicate that work under the menace of penalty or lack of consent to work is unlikely in the companies. Basic practices concern: employment contracts, keeping of personal documents, hiring fees and deposits and payment of wage. These measures are unlikely to coexist with forced labour and therefore indicate that the companies generally are well-ordered and decent, as reflected in the relatively low company risk scores and confirmed by observations on sites. None of the companies, for which it was relevant (company A, B, E and F), extended this responsibility to encompass the actions of applied recruitment agencies. Except for the already mentioned observations, it varied, what risk aspects the case study companies did not manage or managed insufficiently: overtime (company A, F), use of financial penalties (company C and D), living wage (company A), employment contracts (company E).

In company A overtime is not voluntary and in company F overtime issues were not at all addressed. The indicator did not apply optimally to the work situation of professionals in company F as we also experienced with the *Minimum ages for employment* and *Freedom of association* indicators. This is not noticeable in the company risk score for F, which expresses observed (low) risk quite well, largely due to the low risk context, which results in significant modification of the free rein. It was possible to score the company management efforts, but the assessment felt somewhat extraneous during the scoring process. Two general observations were made in the scoring regarding the relevance of the specific measures of the indicator. Firstly, it was noticed that the company had taken several measures, which could be perceived as a natural course of action to meet expectations of professionals and that company practices furthermore were affected by its presence in a low risk context (as might be expected) e.g. employment contracts, wage payments, resignation process, use of hiring fees etc were issues managed systematically. Secondly, it was noticed that the measures, which the company lacked, also were measures, which were questionable as indicators of risk of forced labour violations in the particular work situation in the company. These measures concerned: voluntariness of doing overtime, payment of overtime and handling of employee grievances. When it comes to the work of salaried professionals consideration for overtime is often a calculated part of the regular wage and employment conditions without it having any associations with aspects of forced labour. It is also debatable to what extent a system to handle employee grievances, such as the one promoted in the indicator, will be effective in a company employing salaried professionals.

In company A, the scoring uncovered a general problem with overtime and setting of wage, which was indirectly linked to the voluntariness of overtime. Company A had at the time of the assessment for a long period had excessive overtime work, but rarely experienced that employees were reluctant to do overtime. It showed that many employees depended on overtime in order to earn enough money to sustain their household, which revealed that the wages the company paid were low compared to the living expenses in the area even though they were above minimum wage. This lead to two conclusions, firstly, doing overtime was not truly voluntary even though it appeared to be so in the company, and secondly, the indicator did not consider the need for the company to pay a living wage, not only minimum wage, to ensure voluntariness in the employment. The latter was included in the indicator in the measure regarding payment of minimum wage in the scorings of the other case study companies. The necessity of assessing the wage and overtime issue in case study A illustrates the importance of being able to address more than one aspect at a time in assessment of some social impacts.

In company C and D it is practice to make employees liable of damage on equipment or to products and deduct up till 30% in their regular wage on account of this, a practice which is in accordance with the law in both countries. Financial penalties can be a mean of keeping someone in a state of involuntary labour, and may lower employees' wage below minimum wage

and/or living wage. The reasoning behind the practice in the companies was however found to be more that the financial penalties served a disciplinary purpose, i.e. that the threat of wage deductions made employees more careful when handling equipment and products, rather than an conscious act of forcing employees into debt bondage or avoiding payment of agreed wage (which would also be unusual considering the context risk). Even so, the practice resembles acts of forced labour and result in indecent working conditions. Both company C and D are categorised as low risk, because of their low free reins obtained through generally good management effort combined with a significant modification reflecting the location in a low risk context. Based on observation it is considered unlikely that neither of the companies is engaging in traditional forced labour, which is righteously reflected in the company risk categorisation. On the other hand, it is problematic that the companies can actually violate employees' right to obtain adequate pay for services rendered and still be considered to be associated with low risk in the impact assessment. The risk categorisation should have been higher considering this.

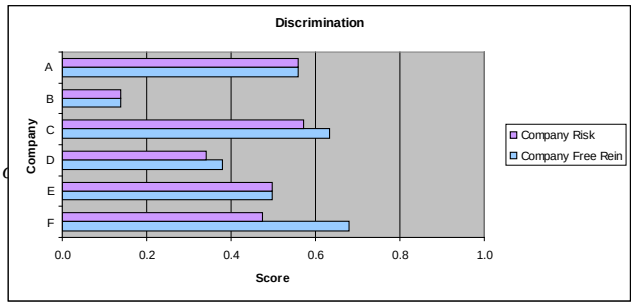
The problem is that this aspect does not weight much in the indicator result compared to many of the others. The use of financial penalties is one aspect represented by two measures, a direct measure and a measure concerning documentation, which can reveal use of penalties. It is quite difficult to make one aspect stand out in the indicator result unless it demands many measures to manage, e.g. employment contracts, where there are many requirements that must be fulfilled for them to protect workers rights. Direct violations are often addressed by just one or two measures in the indicators (e.g. use of hiring fees), because it is something that the company either does or does not. Measures addressing direct violations are not so often included in the indicators, because the unsubtle character of such an approach will often result in an untrue answer. Financial penalties and use of hiring fees are however examples of practices which most often are commonly accepted in the countries where they are practiced, which also is confirmed by the case studies C and D, and therefore these are included in the indicators. The problem is that lack of these practices signifies that violations occur; but that it is not reflected in the risk score to a sufficient degree. The only way to handle this is by putting more weight on these specific measures or by weighing aspects of the indicator equally.[6]

4 Impact category: Discrimination

Company A and C have the highest company risk scores for the *Discrimination* impact category, closely followed by company E and F. All four are in the *High to Medium* company risk categories. Company D ends in the *Medium* company risk category. Company B has a remarkable low company risk score in comparison to the others and is the only company that ends in the *Low* company risk category. See Table 2.4.

In general the contexts are considered in the high end of the scale (See Table 2.4). Company C and D are both assigned risk class 2, but performs very differently and ends in different risk categories. Company D has a focused management effort, i.e. manages small number of measures very well, whereas Company C are not particular systematic in their management efforts resulting in relatively higher risk in comparison. The adjustment of free rein has largest effect on Company F, where discrimination is considered possible. The free rein of Company B actually constitutes the lowest among the case study companies due to their management efforts, and therefore despite the high risk context, the company risk is low. (See Table 2.4 and Fig. 2.4). The low free rein of Company B is in accordance with an exceptional effort in management of employees ensuring equal terms in all aspects of the working place.

Fig. 2.4 Company Risk (CR) and Company Free Rein (CFR) scores for the six case study companies for the *Discrimination* impact category (based on Table 2.4).



[6] Weighting of measures is briefly discussed in *Introduction to development*

Table 2.4 Case study results for the *Discrimination* impact category. Company free rein (CFR) is calculated on basis of company performance scores obtained with the *Non-discrimination* indicator and contextual risk classes (CRC) are determined on the basis of the context risk assessments presented in (Dreyer et al, 2010g).

Company	Company free rein (CFR)	Contextual risk class (CRC)	Contextual adjustment factor (CAF)	Company risk (CR)	Company risk class
A	0.56	1	1.0	0.56	High to medium risk
B	0.14	1	1.0	0.14	Low risk
C	0.63	2	0.9	0.57	High to medium risk
D	0.38	2	0.9	0.34	Medium risk
E	0.50	1	1.0	0.50	High to medium risk
F	0.68	3	0.7	0.48	High to medium risk

Company B's exceptional performance is primarily due to their well-functioning Career and Job Position Management System, which is an internationally recognised management system developed by the global consulting firm, Hay Group. Moreover, the company carries out yearly internal audit on the topic of non-discrimination with the help of colleagues from a subsidiary.

In general all the case study companies had basic practices in place concerning conditions of work and access to welfare facilities. Management of these is often related to employment conditions and hence employment contracts, which all case study companies had in some form (see earlier). It was observed that different certifications entailed control of certain activities also addressed by the indicator. All companies except F are ISO 14001[7] certified and company A, D and E are additionally OHSAS 18001[8] certified, which resulted in management and control of: access to training and training records; job descriptions; and access to health and safety equipment.

All case study companies, apart from company B, have problems with formalisation of the hiring process, which must ensure equal access to employment and hence non-discrimination. This is reflected in inadequate or lack of management of following activities (represented by eight measures): announcement of open positions; selection and treatment of job applicants; and use of recruitment agencies. In the companies A, C, D and E there is a tendency to preference for informal recruitment, i.e. through recommendation of employees or family members. Despite the fact that the majority of the case study companies lack the measures addressing equal access to employment, they still seem relevant considering that company B is able score maximum for all and company F manages most of them quite well. Apart from the above, it varied, what risk aspects the case study companies did not manage or managed insufficiently: career advancement (company C and E), dismissal (company A), access to health and safety equipment (company F), equal remuneration (company D and F).

For company F, the measure concerning access to health and safety equipment seemed rather superfluous because office work do not require such. The respondents in company F however found it relevant to refer to it as access to ergonomic office furniture such as desks, chairs, keyboards etc., which worked well in this situation. Otherwise the measure could be included in the indicator as an additional measure used only in relevant situations.

[7] ISO14001 is an environmental management system standard against which companies can be certified. The standard is managed by The International Organization for Standardization (ISO). (ISO, 2004)
[8] OHSAS 18001 is an occupational health and safety management system standard against which companies can be certified. The standard is managed by Det Norske Veritas (DNV). (DNV, 1999)

A system ensuring that individual remuneration is determined on equal terms for equal job functions has not been established in neither company D nor F. In companies where collective bargaining take place, equal remuneration is often ensured in this process by setting up specific wage levels on the basis of job functions, something which is uncomplicated in a manufacturing company, where the work functions of employees often is similar. We see this is company C and E where collective bargaining takes place. Company B demonstrated to perfection how such a system may work, while company A, C and E had more simple approaches. Despite that equal job functions are more likely to exist in company D, the aspect is still relevant for company F. In company D collective bargaining does not take place and it was emphasized on several occasions that it was sought to differentiate wage as much as possible in order to motivate and remunerate according to ability. A practice, which may be acceptable, if not for the lack of system to substantiate specific wage on the basis of qualifications, which is important considering the very similar jobs carried out in the company. Wage pools were administered by middle managers to their discretion without formalised employee appraisal or qualification levels, which comprise a significant free rein for discrimination not reflected in the company risk score of company D. Company D ends in the *Low* risk category, which is clearly too low considering the actual risk. The reason for this placement is a combination of the influence of the focused management effort of company D on the performance score (manages some measures very well) and a problem with the representation of the equal remuneration aspect in the indicator uncovered by this case. Whether a focused management effort actually is contributory to lowering risk discrimination to this degree is questionable – particularly taking the above into consideration. This raises the question whether the multiplicative effect of the indicator model is too strong, i.e. whether the valuation of scoring places too much emphasis on active control[9], which is reflected upon further in (Dreyer et al, 2010b).

The assessment in company D revealed a small problem with the measures of the *Non-discrimination* indicator representing the aspect of equal remuneration. According to on site observations this risk aspect is the most important issue to address in regards to discrimination at company D, so it must also be the focus of actions for improvements. However on the basis of the scoring actual establishment of a system ensuring equal remuneration may not necessarily be the first course of action due the way this measure is represented in the indicator. In the case of company D, the equal remuneration aspect is represented in the indicator with one measure concerning establishment of a system and five measures, which may support evaluation of equal remuneration for equal work and serve as documentation of such. The result is very little weight on the actual preventive measure in the score, and in the assessments of twenty-seven other measures (in this case) this measure disappears. The problem is that if we interpret the equal remuneration aspect's representation in the indicator, it indicates that practices concerning: conditions for gaining access to bonuses, wage record keeping, employee appraisals and job descriptions; are equally important for managing the risk aspect of equal remuneration as actually having an equal remuneration system. The practices intended as supporting an equal remuneration system only do so if directly linked to the purpose of ensuring equal remuneration, which they are not in formulation at present. For example employee appraisal does not necessarily ensure equal remuneration unless it is carried out with the purpose of fair wage setting in mind. The result is that it is possible to score quite well in regards to the equal remuneration aspect without actually having directly addressed the issue. This problem may be solved by focusing supporting measures for the underlying purpose and additionally by attributing more weight to the actual preventive measure[10]. In regards to Company F it is not critical for the result that the aspect does not receive so much weight since the risk category (*High to medium* risk) already shows that significant risk is present in the company.

It is difficult to uncover discrimination directly unless it is very pronounced, which makes it difficult to evaluate the result of the indicator on the basis of general observations. No serious cases of discrimination were discovered during the work with the companies, but given the lack of attention to the issue, management of activities prone to violations and the discrimination level in the countries, discrimination was likely to take place in all (perhaps except B) to a larger or smaller degree. The indicator results depict that the more informal the handling of the employees in recruitment, during employment and at end of employment, the more likely it is that discrimination takes place in accordance with the general discrimination level in the country. Except for company D, the indicator results seem reasonable.

[9] Valuation of scoring and prerequisites for this is presented in (Dreyer et al, 2010e).
[10] Weighting of measures is briefly discussed in *Introduction to development of labour rights indicators* in (Dreyer et al, 2010d).

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11.5 Letter to the editor: Scoping must be done in accordance with the goal definition, also in Social LCA

Dreyer LC, Hauschild MZ (2006): Scoping must be done in accordance with the goal definition, also in Social LCA. Int J LCA 11 (2), p.87

Letters to the Editor

Scoping Must be Done in Accordance with the Goal Definition, also in Social LCA

Louise Camilla Dreyer[1,2]* and Michael Z. Hauschild[1]

[1] Technical University of Denmark (DTU), Department of Manufacturing Engineering and Management (IPL), Section for Innovation and Sustainability, Produktionstorvet, Building 424, 2800 Lyngby, Denmark
[2] Brødrene Hartmann A/S, Corporate Sustainable Development, Klampenborgvej 203, 2800 Lyngby, Denmark

* **Corresponding author** (lcd@hartmann.dk)

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A Framework for Social Life Cycle Impact Assessment
Dreyer, Louise; Hauschild, Michael; Schierbeck, Jens
This issue, pp. ##–##

In his Letter to the Editor 'ISO 14044 also Applies to Social LCA' [2], Bo Weidema raises the issue of using generic data for the social impacts of products along the product chain when conducting Social LCA. Social LCA is a very new discipline, and, reading our paper [1], Bo Weidema has understood that we dismiss the possibility of using generic data for Social LCA. This is a misunderstanding. We explicitly state in the paper that country- or region-specific information about the product chain may enable a crude assessment. We then continue to state that "…a conclusive assessment must be based on company-specific information for the most important companies in the product chain." This is not different from the approach normally taken in Environmental LCA, but as we go on to state "…in contrast to Environmental LCA, the Social LCA is highly site-specific in its data requirements, and the value of conducting Social LCA on the basis of generic product chains is normally limited."

The framework for a Social LCA methodology, which we describe in our paper, is meant to be applied by companies who wish to minimize the harmful impacts on peoples' lives from their product chains. With this goal, the methodology is naturally focused on those activities and impacts which the company has a possibility to influence by its management decisions. This is a scoping in accordance with our goal definition. As we explicitly state, "A framework developed from a societal perspective rather than a company perspective might thus look different." This would also be the case if we wanted the study to support a Social Life Cycle Impact Profile. Then we would have to aim to include the most important social impacts in the life cycle, regardless whether the company has any possibility to influence them or not.

This being said, we recognize the need for inclusion of the full life cycle in the study, at least at a screening level. Even if the company has no possibility to influence a raw material supplier far back in the product chain, it is still interesting to know whether there are potentially serious social issues in this part of the life cycle. We therefore agree with Bo Weidema that generic data may serve the purpose of filling such data gaps, and here we acknowledge that we have expressed ourselves in an unfortunate way when we state "The need for company-specific information and data has consequences for the scoping of the product system in Social LCA, i.e. which parts of the product system need to be included." The whole life cycle should indeed be included, but, given that the methodology has the goal to support management decisions, it is obvious to focus the data collection efforts on the parts of the life cycle which the company can influence. This is also where the possibilities of getting specific data are the best.

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12 Appendices

This chapter contains the appendices of the dissertation.

Overview:

Appendix 1: Workplace health and safety indicator

Appendix 2: Management of social responsibility with company assessment

Appendix 1

Workplace health and safety indicator

1 Workplace health and safety indicator

Table 1.1 presents a performance indicator 'Workplace health and safety' developed on the basis of the ILO Occupational Safety and Health Convention (No.155) (ILO, 1981).

1.1 Applied definitions

Workplace: *Workplace* covers all places where employees need to be or to go to by reason of their work and which are under the direct or indirect control of the employer. Individual workplaces refer to the place where a employee spend the majority of his working time.

Health: in relation to work, *health* indicates more than merely the absence of disease or infirmity; it also includes the physical and mental elements affecting health, which are directly related to safety and hygiene at work.

Health and safety hazards: including (not exclusively) chemical, physical, biological, ergonomic hazards and monotonous work, machines and work equipment, electrical systems and others.

Accident: Undesired event gives rise to death, injury, ill-health, damage or other loss.

Nearby accident: Accidents occurring without any injury on persons but the possibility to do so.

First aid arrangements: dispensary, first aid post, first aid cupboards, boxes or kits.

Protective clothing and equipment: examples are (non-exhaustive) of coats, overalls, aprons, footwear, earplugs, masks, gloves, harnesses, helmets, goggles, barrier creams, special powders etc.

Table 1.1: Workplace health and safety indicator

Managerial measures	**The company has established a practice or issued a guideline, which supports integration of the measure stated in the left column**			**The *company* has *communicated* and *delegated responsibility* for compliance with the practice/guideline to relevant managers and employees**			**The *company* performs continuous *active control* to ensure that managers and employees comply with the established practice or guideline**		
Management of workplace risks	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
1. All legal requirements are continuously implemented into daily practices in a systematic manner									
2. Identification and assessment of the risks from *health and safety hazards* related to the individual workplaces, working environment, tools, machinery, equipment, processes and work routines is an ongoing activity									
3. A system is in place to ensure implementation of necessary risk control based on the assessment of risks									
4. A system is in place to ensure that chemical, physical and biological substances and agents used on the premises are without risk to health when appropriate measures of protection are taken									
5. All chemicals and hazardous substances are labelled and stored in accordance with national legislation									
6. Safety instructions are issued and updated for each job function in a language understood by all employees									
7. Safety instructions are easily accessible for all employees									
8. *Workplace* hazards are continuously communicated to managers and employees in a language understood by all									
9. Work is organized with respect to hours of work and paid rest breaks									
10. *Health* of employees is monitored and recorded									
11. *Accidents* and *nearby accidents* are recorded									
12. All *accidents* are investigated and corrective and preventive measures are carried out									
13. All *nearby accidents* are investigated and corrective and preventive measures are carried out									
14. Al*l accidents* and *nearby accidents* are communicated to all managers and employees as a prevention measure									
Emergency preparedness									
15. Emergency plans to deal with potential emergencies and accidents are in place									
16. Drills and exercises are carried out on a regular basis to ensure efficiency of emergency preparedness									
17. *First aid arrangements* adequate to the size of the company and risk are available and maintained									

Table 1.1 (contd.): Workplace health and safety indicator

Managerial measures	**The company has established a practice or issued a guideline, which supports integration of the measure stated in the left column**			**The *company* has *communicated* and *delegated responsibility* for compliance with the practice/guideline to relevant managers and employees**			**The *company* performs continuous *active control* to ensure that managers and employees comply with the established practice or guideline**		
Emergency preparedness (contd.)	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
18. An adequate number of fire extinguishers are available at easily accessible spots and they are regularly checked for functionality									
19. An adequate number of emergency exits are available, clearly marked and with clear access at all times									
Health and safety organisation									
20. A health and safety organization has been established appropriate to the size of the company									
21. Employees are represented on health and safety matters by elected employee representative(s)									
22. Employees' representative(s) have access to all information regarding or affecting the workplace health and safety									
23. Employees' representative(s) are consulted and included in decision-making concerning all health and safety matters including in the planning of alterations of work processes, work content or organization of work, which may have health or safety implications for the employees									
24. Employees' representative(s) have access to all parts of the workplace and are allowed to communicate with all employees									
25. Employees' representative(s) have reasonable time during paid working hours to exercise their health and safety functions and to receive training related to these functions									
Training									
26. All new managers, employees, contract workers and other persons going to carry out work on the premises go through an introductory health and safety training course in a language understood by the participants									
27. All new employees receive health and safety guidance specific to their job function before commencing their job in a language they understand									
28. Upon change of job function (reassignment or change of equipment, work technique, process, work routine or similar) new training is provided in a language understood by the employee									
29. Training needs are evaluated on a regular basis for all employees with respect to the competence needed to fulfil the job function and the individual employee's education, experience and ability									
30. Records of training, including information about purpose of training, participants in training, execution date, duration of training, responsible for carrying out training, are kept									

Table 1.1 (contd.): Workplace health and safety indicator

Managerial measures	**The company has established a practice or issued a guideline, which supports integration of the measure stated in the left column**			**The *company* has *communicated* and *delegated responsibility* for compliance with the practice/guideline to relevant managers and employees**			**The *company* performs continuous *active control* to ensure that managers and employees comply with the established practice or guideline**		
Training (contd.)	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
31. Training is obligatory and is carried out during working hours									
Personal Protective Equipment									
32. Adequate personal *protective clothing and equipment* to prevent risk of accidents or adverse effects on health is provided free of charge and is easy to access by employees									
33. Personal protective clothing and equipment is maintained and replaced on a regular basis									
34. All employees receive guidance in proper use of personal protective clothing and equipment with consideration for motivational factors for usage, in a language understood by employees									
35. Consequences of neglecting use of personal protective clothing and equipment and other disregard of safety instructions is clearly formulated									
Grievances									
36. All employees and other parties have the *possibility to file complaints* about any conditions in the workplace concerning the health and safety of employees in confidentiality and without *negative consequences*									
37. A system for handling complaints regarding any conditions in the workplace concerning the health and safety of employees has been established to ensure response and a *fair*, uniform and confidential treatment of complaints									
38. All complaints and responses are recorded									
If the company have employed home based workers									
39. Regular unannounced visits to home based workers are made to ensure that working place, working environment, tools, machinery, equipment, processes and work routines are without risks from health and safety hazards									

Appendix 2

Management of social responsibility with company assessment – The case of Hartmann Embalagens do Brasil Ltda (Case B)

1. Introduction
2. General observations concerning the risk environment
3. Company assessment of Hartmann Embalagens do Brasil Ltda

1 Introduction

The recommendations given to Case B, Hartmann Embalagens do Brasil Ltda. Sorocaba (hereafter abbreviated Hartmann-Sorocaba) on the basis of company assessment is presented in this Appendix as an example of how company assessment can serve as a platform for systematic management of social responsibility in a company.

The case study
The obligatory indicators of Social LCA regarding fundamental labour rights have been developed and tested over a longer period where they have been through several revisions until they reached the form that they were applied in Hartmann Embalagens do Brasil Ltda. Sorocaba in April 2005. Hartmann-Sorocaba participated in the first test of the first performance indicator in March 2004, see **Table 2.1**. The case study results and findings presented and discussed in Chapter 4 and in the following refer to the company assessment performed in April 2005.

Table 2.1*: Course of events Hartmann-Sorocaba case study.*

Period	Activity
March 2004	Indicator on Non-discrimination and equal remuneration is tested in Hartmann-Sorocaba for the first time and subsequently undergoes several changes.
April 2004	Hartmann-Sorocaba improves their management effort on the topic of non-discrimination and equal remuneration significantly and scoring is adjusted in the revised indicator.
February 2005	Hartmann-Sorocaba implements an active control scheme on the issue of non-discrimination and equal remuneration based on the indicator
April 2005	Hartmann-Sorocaba goes through Company Assessment consisting of the following indicators: ▪ Non-discrimination (adjustment of scoring), ▪ Minimum ages for employment ▪ Abolition of forced labour, ▪ Freedom of association, right to organise and collective bargaining

Hartmann-Sorocaba is situated in the town of Sorocaba, a two-hour drive south-west of Sao Paulo, in the Sao Paulo State in Brazil. Hartmann-Sorocaba produces moulded-fibre egg and fruit packaging, and to a small degree industrial packaging e.g. for mobile phones and consumer electronics. At the time of the case study execution, the company had been part of the Hartmann Group (a Danish owned corporation) for eight years.[1] The Hartmann Group had a strong focus on sustainable development and had been working actively in this field for many years, however with a primary focus on environmental management

Data collection for company assessment
The company assessment was performed in April 2005. The participants (respondents) shifted during the interview except for The Training and Quality Management Coordinator who participated in the entire process and had the role of coordinator; See the list of participants in **Table 2.2** below. All participants were employed in the Human and Organisational Development Department at Hartmann-Sorocaba, which covers all areas regarding people, quality, health, safety, environmental management and communication.

Table 2.2*: List of participants in Company Assessment at Hartmann-Sorocaba in April 2005.*

Subject	Participants in interview
Non-discrimination (adjustment of scoring)	Training and Quality Management Co-ordinator People Management Analyst Human Resource Responsible
Minimum ages for employment Abolition of forced labour Freedom of association, right to organise and collective bargaining	Corporate Communication Coordinator Training and Quality Management Co-ordinator Environment, Health and Safety Supervisor People Management Analyst Human Resource Responsible

In general all participants were very active even though it was not everybody who spoke English and therefore had to rely on translations by others. The entire interview process took longer time than expected, because there

[1] In 2007 the Hartmann Group sold all activities in South America including Hartmann-Sorocaba.

were many discussions and the translation between English and Portuguese slowed down the process quite a lot. However, the discussions were considered very valuable, because as the interview progressed the participants all gained a deeper understanding of the issues and became better at relating the issues to their own work. It also seemed to be a great way for them to share knowledge about their work within the group. The participants generally demonstrated good insight in national legislation concerning the raised issues during the interview and in general they were all confident with their own processes.

The time for carrying out all scorings was approximately 7 hours of face-to-face time. It was however mainly the many discussions of specific measures that took up the time. The entire process, which included interviews, preparation and approval of explanatory notes, and presentation of results and recommendations, span over three days.

2 General observations concerning the risk environment

Some general observations were made during the two visits at Hartmann-Sorocaba with relevance for assessment of the risk environment, which are not included by the Company Assessment carried out with the performance indicators. These are structured in twelve accounts:

1. General impression of the facility
The facility presents itself well. The production area was considered relatively clean considered the nature of the production processes, however not without room for improvement.

2. Visual signs of violations
There were no visual signs of violations in the production area.

3. Appearance and attitude of employees and managers
Generally employees looked content and the company seemed to be a nice place to work. The company guard gave the employees a friendly reception. Floor managers blended in with workers, but white collar employees did not generally socialise with blue-collar workers.

4. Received awards connected to social or environmental performance
Hartmann-Sorocaba has distinguished themselves on several accounts in regards to management of both the social and the environmental area, see the list of certifications, awards and other recognitions awarded to the company by independent third party during the past few years in **Table 2.3**.

***Table 2.3**: Awards and certifications received by Hartmann-Sorocaba in the period 2000-2005.*

Award	Organisation	Year
The Best Companies in People Management Award	Hay Group & Valor Financeiro	2004
The National Quality at Work Award – SESI	SESI – Social Service for Industries Employees	2004
Best Company Environmental	Meio Ambiente Magazine	2004, 2003, 2002
Excellence in Management	IPEG – Instituto Paulista de Excência de Gestão	2004
ISO 14001	DNV	2002 (re-certification in 2003, 2004)

5. Company certifications and transparency of management systems
Hartmann-Sorocaba holds an ISO14001 certificate. It was the general impression that the company is very systematic in their management of HR.

6. Reporting and other external communication
Hartmann-Sorocaba issues a sustainability report, which indicates a commitment to sustainable development. However, it is difficult to assess the company performance on the basis of the report.

7. Internal communication and openness in the company

Hartmann-Sorocaba has also produced a video about Hartmann-South America, where they emphasise the commitment to sustainable development and the Hartmann Values (see **Box 2.1**). The video has been shown to all employees. In general the communication level is high in the company with daily dialogue and info's.

***Box 2.1**: Hartmann Values (Hartmann, 2004b)*

At Hartmann we have four fundamental sets of values according to which we as an organisation and as individuals run our company every day:

- We are ambitious and determined
- We are committed
- We are open and team-oriented
- We respect each other and the world around us

8. Employee satisfaction
The employee satisfaction was not investigated specifically during the visits, so conclusions rely on the general observations the Hartmann-Sorocaba employee satisfaction survey. The survey, which was anonymous, revealed a high level of satisfaction.

9. Involved persons' qualifications, seriousness and engagement
All the people who participated in the interviews directly or were who involved indirectly in the process were co-operative, dedicated to their work, responsible, demonstrated competence and enthusiasm.

10. Top management's commitment to social responsibility
The many activities concerning the area indicate a strong top management commitment to social responsibility.

11. Openness towards local community
One, among several projects, involving the community, which Hartmann-Sorocaba participates in, is the open door project for the children in the local community. During the first visit in 2004 the President also gave a lecture at the nearby university about sustainability, and the students were subsequently given a guided tour around the production area with the EHS supervisor.

12. Grievances and disputes involving the company
The company has received many complaints about smells from the wastewater treatment plant. The cause of the problem has however been identified and has been fixed. The company has had many controversies with the Trade union in the past on the subject of work related injuries (monotonous repetitive work). The controversies started already in 1993, before the company became Hartmann- Sorocaba (1997). It is assessed that Hartmann-Sorocaba has shown good will to solve the mentioned grievances (see later).

3 Company Assessment of Hartmann Embalagens do Brasil Ltda (Case B)

The concrete results of the company assessment performed at Hartmann-Sorocaba in 2006 are presented in **Table 2.4** and **Figure 2.1**.

***Table 2.4:** Company Assessment results for Hartmann Embalagens do Brasil Ltda (Hartmann-Sorocaba) April 2006 (also presented in Chapter 4). (Dreyer et al, 2009b, 2009b2)*

Indicator	Company Free Rein (CFR)	Contextual Risk Class (CRC)	Contextual Adjustment Factor (CAF)	Company Risk (CR)	Company Risk Category
Minimum ages for employment	0.54	1	1	0.54	High to medium
Abolition of forced labour	0.46	1	1	0.46	High to medium
Non-discrimination	0.14	1	1	0.14	Low
Freedom of association (abbr.)	0.45	2	0.9	0.41	High to medium

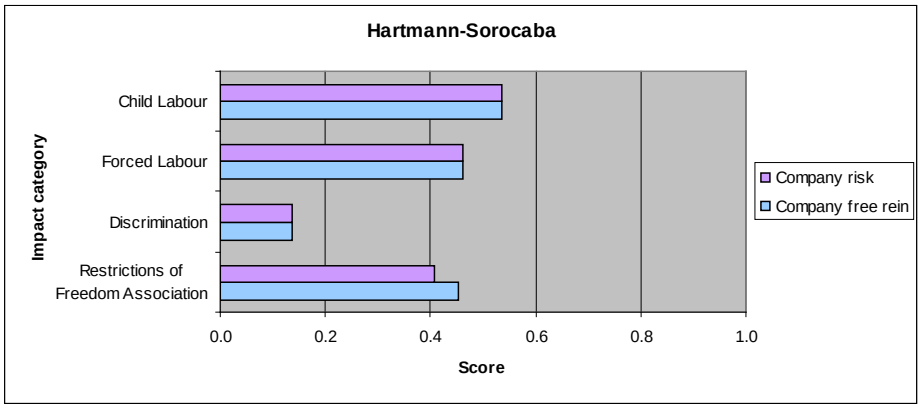

***Figure 2.1**: Impact profile of Hartmann-Sorocaba April 2006. (Dreyer et al, 2009b, 2009b2)*

Below some recommendations are given on the basis of observations made during the visit to Hartmann-Sorocaba in April 2005, the results of the company assessment carried out at that time and assessment of contextual risk (presented in (Dreyer et al, 2009b1). The recommendations aim at improving the existing management system with special reference to secure effectiveness in protection the fundamental employee rights. The recommendations are given with a stepwise improvement approach in mind and should facilitate an order of priority of effort if Hartmann-Sorocaba wishes to improve their performance in this area. The recommendations are also given in accordance with the strategy of the Hartmann Group to continuously improve performance in the social area honouring the Ten Hartmann Sustainability Principles (**Table 2.5**), Hartmann's obligations towards the ten principles of UN Global Compact (UN Global Compact, 2000), and intentions to live up to the Social Accountability 8000 Standard (SA8000) (SAI, 2001).

Table 2.5: The ten Sustainability principles of Brødrene Hartmann A/S launched in 2004. (Hartmann, 2004a)

TEN HARTMANN SUSTAINABILITY PRINCIPLES		
Principle 1	Health and safety in the workplace	Hartmann will endeavour to secure health and safety in the workplace by means of cleaner technologies, procedures and practices as well as by the development of competencies and efforts to change attitudes among the employees. Hartmann will also make an effort to promote similar conditions for employees in companies that are part of the value chain to which the Group belongs.
Principle 2	The well being of employees and their families	Hartmann will endeavour to secure the well being of employees and their families by means of relevant local initiatives, practices and procedures that are in keeping with local traditions, conditions and needs. Hartmann will also make an effort to promote similar conditions for employees and their families in companies that are part of the value chain to which the Group belongs.
Principle 3	Fair wages	Hartmann will endeavour to secure fair wages by means of a wages policy that is consistent with the situation prevailing in other local industrial companies and which enables the Group to attract and retain qualified employees. Hartmann will also make an effort to promote fair wages for employees in companies that are part of the value chain to which the Group belongs.
Principle 4	Good relations to the local community	Hartmann perceives itself as being part of the local community, and the Group therefore endeavours to secure good relations to the local community by means of active participation in social and business-related activities at local level and setting a good example to others.
Principle 5	Non-discrimination and equal opportunities	Hartmann will endeavour to prevent discriminatory practices and secure equal opportunities by means of the application of procedures and practices to prevent discrimination in connection with recruitment or dismissal, career development, training and education, or the granting of staff benefits. Hartmann will endeavor to promote non-discrimination and equal opportunities for employees in companies forming part of the value chain to which the Group belongs.
Principle 6	The right to organise and collective bargaining	Hartmann recognises the right of its employees to be members of a trade union and to negotiate pay and working conditions collectively. The Group further recognises the right to organise and collective bargaining in companies forming part of the value chain to which the Group belongs.
Principle 7	Rejection of forced labour	Hartmann does not accept the use of forced labour – neither inside the Group nor in companies forming part of the value chain to which the Group belongs.
Principle 8	Preventing child labour	Hartmann will not employ persons below the minimum age and the Group will apply preventive procedures and practices accordingly. The Group will make an effort to promote that similar procedures and practices are applied by companies forming part of the value chain to which the Group belongs.
Principle 9	Refraining from bribery and corruption	Hartmann refrains from using bribery and corruption by means of openness towards relevant business partners and by setting up a set of guidelines specifying how to avoid bribery and corruption. Hartmann will also contribute to minimising bribery and corruption in companies forming part of the value chain to which the Group belongs.
Principle 10:	Proactive environmental protection	Hartmann will endeavour to protect, respect and safeguard environmental values by means of the systematic and proactive integration of environmental considerations in its daily business activities, by the development of environmentally friendly production methods and products, by training its employees in environmental issues, and by influencing the stakeholders in the value chain to which the Group belongs.

3.1 All issues

Written standpoints

The Hartmann Group has formulated Ten Sustainability Principles, which expresses Hartmann's standpoint in regards to the fundamental ILO Conventions: 5. non-discrimination and equal opportunities; 8. preventing child labour; 7. rejection of forced labour; 6. the right to organise and collective bargaining. Hartmann-Sorocaba has however not yet deployed the ten principles in the organisation.

Handling of employee grievances

The assessment revealed that Hartmann-Sorocaba has many formal as well as informal channels through which the employees can complain if their rights have been violated. Hartmann-Sorocaba has campaigned for more openness in the organisation and encourages employees to go to their superior, the director or the president with their complaints. On the more formal account, there is a code of conduct system and a company suggestion box.

The company has issued a code of conduct, which all employees are introduced to and have to sign upon hiring. The code of conduct is mainly concerned with the company policy on corruption and bribery, but it also touch upon the company's environmental, health and safety policy, and equal opportunities. Forced labour, child labour and restrictions of freedom of association, right to organise and collective bargaining are however issues that presently are not directly mentioned in the code of conduct. In the new version of the code of conduct

Hartmann-Sorocaba is however planning to include the Hartmann Sustainability Principles, which covers these issues. In connection with the code of conduct all employees are encouraged to report violations of the code through mail, email and in the future also by telephone calls to an answering machine in the Human and Organisational Department. In the code, reporters are ensured confidentiality and that their report will not result in negative consequences for them. The Director of the Human and Organisational Department and the Legal Assistant handles the complaints, but this is not described in the code handed out. Based on the number of reports recorded over the past few years, the system seems to work. Once a year a code of conduct survey is conducted, where employees are asked in form of a questionnaire about observance of the code. The company suggestion box is also used for complaints, but this it not officially the function of it.

Use of recruitment agencies
Hartmann-Sorocaba sometimes uses a recruitment agency to find workers. Two different ones have primarily been applied in the past. There was no requirements posed from Hartmann-Sorocaba to applied recruitment agencies regarding observance of fundamental workers rights, however it is intended that that all suppliers in the future most sign the company code of conduct which will contain the Hartmann Sustainability Principles.

3.1.1 Recommendations for improvement

Written standpoints and handling of employee grievances (short term)
Hartmann-Sorocaba has actually formulated their intentions in writing through the Hartmann Sustainability Principles, it is however recommended that they start the deployment of the Principles, because these will serve as overall guidance in regards conduct of the individual employees and managers as well as the company top-management and commit everybody to act accordingly. Furthermore, as long as the code of conduct does not cover abolition of forced labour, minimum ages for employment and freedom of association, right to organise and collective bargaining, employees are actually not officially ensured the right to complain about these issues even though they have possibility to do so.

The process handling complaints connected to the code of conduct is not described in the actual code of conduct. This could undermine the effectiveness of the system, because the employees may not feel free and confident about complaining, however it seems that employees trust the system as they actually use it, but it is difficult to say whether more employees would use the system if the process for treatment of complaints was described. Additionally, the code of conduct also fails to describe how there will be responded to complaints. It is very important that, as a rule, that responses are made public to the degree possible without comprising the persons filing the complaints. It is recommended that Hartmann-Sorocaba consider this in future updates of the code of conduct.

The code of conduct survey it a good way to make it easy for all employees to give voice to their complaints, however the effectiveness of such surveys are dependent on how they are carried out, i.e. how questions are formulated, how they can be answered and how the surveys in practice are carried out (e.g. how the anonymity of the respondent is ensured). It is recommended that Hartmann-Sorocaba consider this is in future surveys.

Use of recruitment agencies (long term)
It is essential that Hartmann-Sorocaba is well-informed and confident about the recruitment methods used by the chosen recruitment agency. In the recruitment process, the possibility of violation of several fundamental employee rights is prevalent, and when outsourcing this process Hartmann-Sorocaba surrenders its natural control over the decisions made here. The responsibility for securing equal opportunities for future employees however still remain with Hartmann-Sorocaba, and therefore it is very important to take steps to ensure that the methods used by the recruitment agency is in compliance with Hartmann Sustainability Principles. A requirement about addressing the conduct of subcontractors also forms part of SA8000.

It is therefore recommended that Hartmann-Sorocaba enter into a dialogue with the recruitment agency concerning the issues of protection of fundamental labour rights including, but not limited to, a written confirmation from the recruitment agency. There are several ways to do this. One possibility is to make observance to fundamental labour rights part of the contractual terms with the recruitment agency or to require a written statement from the recruitment agency where they confirm that their hiring practices observes

fundamental workers rights. Another possibility is to promote the Hartmann Sustainability Principles by requiring the recruitment agency to sign an agreement of observance of these. Especially application of a non-discriminatory principle in hiring and establishment of practices to support this should be emphasised. Refraining from charging hiring fees or in any other ways engaging in forced labour including contracting of illegal immigrants and respect for minimum ages for employment are other important aspects of observance of employee rights and Hartmann-Sorocaba must consider if it is relevant to emphasise these issues as well.

Follow up with a personal visit and a discussion of Hartmann's stand on these issues and personal assessment of the recruitment agency's performance will demonstrate Hartmann's intentions to enforce the Principles.

It is strongly recommended that Hartmann-Sorocaba deploy the Hartmann Sustainability Principles on site and work actively with the recommendations given here before engaging a process with posing requirements to subcontractors such as recruitment agencies as it seems appropriate to put one's own house in order before posing requirements to others. Furthermore, the experience gained in the work with the recommendations and the internal communication of Hartmann Sustainability Principles will equip the company better for the dialogue with subcontractors.

3.2 Non-discrimination

The assessment in March 2004 showed that Hartmann-Sorocaba could benefit from systematising their recruitment practices in a written guideline to ensure a fair and uniform treatment of applicants. This work was carried out, and immediately after, all managers participated in a workshop introducing the new procedure. During the visit in April 2005 Hartmann-Sorocaba presented the procedure, which also includes references to relevant Brazilian legislation (attached in copies). Recently a new employee has taken over many of the tasks concerning the recruitment process and despite a very short time of employment in this position she demonstrated that it was easy to make one-self acquainted with the content of procedure. The written procedure for the process consolidated the practice and enhanced personal independency in the recruitment.

A feedback system for interviewed applicants has been implemented in 2004 in order to, secure the possibility for interviewed applicants to gain access to their personal file generated during the recruitment process, get more personal feedback if rejected, or to complain about any stage of the recruitment process. Several feedbacks from applicants had already been received and handled in April 2005.

Hartmann-Sorocaba has established practices, guidelines and systems addressing all measures of the indicator. Among these are, several concrete tools to support the recruitment process such as templates, questionnaires and scoring systems etc.; the Employee Management System (EMS); Career and Job Position Management System (Hay Group System); and the Performance Management System (PMS).

In the beginning of the year 2005 Hartmann-Sorocaba carried out an internal audit on the issue of non-discrimination and equal remuneration with two auditors independent of the investigated processes, one from the Sorocaba site and one from the Montes Claros site (another company owned by the Hartmann Group at that time). There were no findings of non-conformances during this audit.

In April 2005, the scoring from March 2004 was adjusted in accordance with the improvements in the management of non-discrimination and equal remuneration carried out during the past year.

3.2.1 Recommendations for improvement

Investigations of human rights practices in Brazil show that discrimination is a prevalent problem (Dreyer et al, 2009b1). When operating under these circumstances companies like Hartmann-Sorocaba can contribute to a positive development by making qualifications, skill and experience the basis for recruitment, placement, compensation, training and advancement. To ensure this, management practices concerning these processes must be clear and transparent, and responsibility for compliance clearly delegated and communicated to the relevant persons in the organisation. Active control of the general practices, guidelines and systems must be performed to ensure effectiveness of these and hence the performance in regards to non-discrimination and equal remuneration.

In Hartmann-Sorocaba a lot of work in the area of people management has been carried out, which is contributing to ensuring non-discrimination and equal remuneration. On this basis recommendations to improvements are few and remain very general and aim at long-term improvements.

People Management System (long term)
Hartmann-Sorocaba manages the people area by means of different systems (EMS, PMS, etc), guidelines and general practices. It is difficult to get an overview of all these management approaches, especially the connection between the systems, i.e. how information flows between them, is not quite clear. More focus on system integration and a general description of the entire People Management system is recommended for two main reasons, to facilitate information flow between systems with the aim of enhancing effectiveness of the entire system; and to comply with the SA8000 requirement to have a management system. The general description should provide short and precise information about the systems, i.e. their purpose in the overall management, their interdependence and the responsible persons.

Awareness training and campaigning (continuous)
Combating discrimination often has to do with changing the mindset of individuals, which requires a continuous effort. Campaigns and awareness training may play a significant role in this. It is recommended that this is taken into consideration in future activities in the people area.

Internal audit (long term)
An internal audit has already been carried out and it is recommended that this is to become a recurrent event yearly or every second year depending on the assessed value of audit as a preventive measure. It is recommended that the audit is carried out in a very systematic manner including the following elements as a minimum: audit plan (problem oriented rather than system oriented), documented outcome, follow up, discussion of results with top management. Interviews may form an important part of the audit and if possible a person not employed at the site should carry them out. Analysis of distributions between male/female and branco/negro/mulattos/indígena[2] in regards to job positions, advancements opportunities, remuneration or similar is valuable input for directing investigations during the audit. Analysis of this may reflect past discrimination, present discrimination, societal discrimination (such access to educational systems), natural segregation of the job market, coincidences or similar.

3.3 Minimum ages for employment

According to the official record, the Labour Department has inspected Hartmann-Sorocaba six times during the past five years, four times in 2004 and twice in 2000. On these occasions there were no remarks regarding employment of persons under the minimum age for regular work. Overview of the management practices and visual impression of the site also confirms this.

During the interview Hartmann-Sorocaba presented examples of employee records. An employee record is made for all employees and contains all relevant information regarding the employment of the person, which results in quite comprehensive files. Upon hiring, photocopies are made of an extensive number of official documents stating the age of the new employee. These forms part of the employee record and can be checked at any time.

Hartmann-Sorocaba employs persons in the age group 14 to 18 years of age as either “office helpers” or apprentices.

“Office helper” is an initiative (GUARDA-MIRIM) supported by the municipality of Sorocaba and it aims to support underprivileged families by providing work to young boys and girls between 16 and 18 years of age to keep them of the streets and to give them the opportunity to earn money. The work tasks are specified and fall under the category of light work.

[2] The Brazilian Institute of Geography and Statistics (IBGE) divides the Brazilian population into groups based on race and ethnic origin: Branco (White), Negro (Black), Amarelo (Yellow) (East Asian), Indígena (Amerindian) and Mulattos (Pardo) (mixture of race).

Apprentices are between 14 and 18 years of age. Apprenticeship programmes are carried out in conjunction with the organisation SENAI (supported by Brazilian companies and the Labour Ministry) and the working conditions are specified as part of the programme. Working hours exceed the ILO maximum of 2 hours per day, but the programme is drawn up to ensure parallel education. All relevant company supervisors for apprentices and office helpers receive specific instructions as regards working time and allowed work tasks upon hiring. At the end of each apprenticeship an evaluation of the stay is carried out by SENAI.

Participation in the two programs for apprentices and office helpers facilitates the management of working children, and, in regards to apprentices, it also adds another control dimension to the authority control. This means that the majority of the measures of the indicator is addressed in this context.

3.3.1 Recommendations for improvement

According to assessment of contextual risk, child labour is common in Brazil (Dreyer et al, 2009b1). In 2006 most Labour Department inspections was motivated by complaints, which supports the notion that inspections do not take place frequently enough to actually uncover child labour. However according to the source material child labour primarily is discovered in the northeast of the country, where Sorocaba is located in the far south, and in other sectors the paper/packaging industry. Given the common country prevalence a strong management effort in the area is dire.

Even though Hartmann-Sorocaba has not employed persons under the minimum age to carry out regular work presently, but they have employed persons below 18 years of age. Company participation in apprenticeship programs and other programs as the “office helper” program is encouraged by NGO’s around the world defending children rights, as long as they are carried out in such a way that the rights of the young persons are protected at all times. When employing young persons, the working conditions for these employees must therefore always be under the strictest control and supervision. In general it is assessed that Hartmann-Sorocaba manages this area quite well in conjunction with the SENAI and GUARDA-MIRIM programs. Recommendations are therefore quite few.

Minimum age for employment (short term)
The assessment revealed that Hartmann-Sorocaba in practice does not employ persons of less than 18 years of age for regular work. This was however not part of the written procedure on recruitment or hiring. It is recommended that this is made part of the guidelines for the recruitment process that if persons under 16-18 years of age are hired, specific guidelines for working conditions for these are developed and implemented. Such guidelines should give instruction to supervisors, foremen and managers and other relevant personal in regards to working hours (maximum of 42 hours a week and eight hours a day), working time (day work only), allowed work tasks (non-hazardous only). Please note that Brazilian law may stipulate stricter requirements in regards to working conditions for persons below 18 years of age. Guidelines should correspond which ever is the strictest, the conditions stipulated here or the law. Note, that in order to comply with SA8000, a clear procedure for managing working persons below 18 years of age is necessary.

Working conditions for young persons – Office helpers (short term)
It is assessed that both the SENAI and GUARDA-MIRIM programs are examples of well-organised programs, however only the SENAI evaluate the course of the stay. It was noted that all employees at Hartmann-Sorocaba register their working time except from the office helpers. Given the fact that the participants in GUARDA-MIRIM Programme are young people that are already vulnerable because of their background, they may be easy victims for exploitation. There was no indication of this what so ever at Hartmann-Sorocaba, however registration of working time would confirm this and serve as objective evidence that office helpers are not exploited in regards to working excessively and not during the night. It is recommended that Hartmann-Sorocaba consider registration the working time of office helpers in the same way as they do for others as a means of internal control of working conditions for young employees. In case of SA8000 certification, auditors are likely to look into issues like this.

Awareness training (continuous)
The importance of education of internal supervisors for office helpers and apprentices are emphasised to ensure observance of the guidelines stipulated by the programs.

3.4 Abolition of forced labour

As was the case with child labour, the Labour Department inspection has not made any remarks regarding forced labour during any of their six visits the past five years at Hartmann-Sorocaba. Overview of the management practices and visual impression of the site also confirms this.

Hartmann-Sorocaba has a very specific practice regarding hiring. Before entering the employment it is practice that copies are made of original documents, and the workbook, which the company is allowed to keep for 24 hours according to law, is usually only kept very shortly. One person is responsible for this. So it is not practice to keep any documents belonging to the employee. All employees have access to a locker with personal key to store private belongings during work hours and hereby it is avoided that the company should store any valuables belonging to the employee during working hours. The general organised state of personal files and Employee Management System supported the improbability of the company retaining personal documents.

Hartmann-Sorocaba has established practices, guidelines and systems addressing almost all measures of the indicator. Among these are, use of official contracts; practices to obtain authorisation to make wage deductions and authorise overtime; systems to register overtime and compensate; and procedure for resignation.

It is clear from the Labour Department inspection record that compliance with many of the measures of the indicator is actually checked during every inspection.

3.4.1 Recommendations for improvement

The use of forced labour in Brazil is prevalent, however based on the geographical location and industrial sector Hartmann-Sorocaba is not a high risk target as such (Dreyer et al, 2009b1). Compared to the general lack of labour inspection throughout the country, six visits to the company over the past five years is actually considered quite significant. Based on the checklist points of the Labour Department inspection record it is very likely that they would have caught violations.

The union is quite strongly represented in Hartmann-Sorocaba and earlier the union has demonstrated its power to get serious workers rights issues on the agenda (see Freedom of association). The presence of a strong union will have a natural preventive effect on abolition of all kinds of forced labour. Based on these observations and the results of the indicator only one recommendation is given.

Contracts with recruitment agencies (short term)
To ensure that recruitment agencies do not require hiring fees from employees or in any other way engages in activities related to forced labour, it is recommended that Hartmann-Sorocaba in the future poses requirements to the recruitment agencies that they apply refrain from this (refer to elaborate recommendations concerning this under *General issues*). To ensure this practice it is recommended that check of observance is written in the recruitment procedure.

3.5 Freedom of association, right to organise and collective bargaining

Approximately 60% of the employees in Hartmann-Sorocaba are members of the Trade union, so the union is quite well represented in the company.

The assessment shows that the collective bargaining is used as forum for addressing workers conditions and that the facilities necessary to assist in the development of collective agreements are provided by the company. It is difficult to conclude on the basis of the assessment to what extent and at what stage the Union generally is involved in matters concerning the welfare of the employees.

Under the former management, Hartmann-Sorocaba has had many controversies with the Trade union on the subject of working conditions. Under the present management many initiatives has been initiated to mend former conduct by the company, which has also involved participation by the Danish Union. Today meetings with the union take place frequently, which was also observed during the period where the assessment was carried out.

3.5.1 Recommendations for improvement

In Brazil collective bargaining is quite widespread, but the assessment of human rights practices in Brazil also suggests that lack of good faith and participants' lack of training often weakens the process (Dreyer et al, 2009b1). In Hartmann-Sorocaba the union seems to be quite well represented and the Danish Union has had an active role in re-establishing a constructive forum for negotiations between the Brazilian Union and Hartmann-Sorocaba, which undoubtedly has strengthened the Brazilian union's influence in company. A lot of activities are ongoing in Hartmann-Sorocaba on this account, and therefore only few small recommendations are given here.

Non-discrimination of union members (short term)
It is recommended that Hartmann-Sorocaba include union membership on the list of characteristics on basis of which discrimination may not take place. It is recommended that union membership is stated here as well to demonstrate the company's acceptance of unions. The procedure makes reference to the law concerning non-discrimination, but it is likely that discrimination of union membership is covered by the law regarding freedom of association.

Employees freedom to exercise their rights (long term)
In general it is difficult for a company itself to investigate whether the employees' right to freedom of association, right to organise and collective bargaining is respected by the company. Therefore it is suggested that Hartmann-Sorocaba considers including in the yearly survey if the employees feel that they are free to exercise their rights or take steps to get an external third party to carry out control.

This Industrial PhD thesis presents the development of a social life cycle assessment (LCA) method for application in life cycle management in companies. The method aims to facilitate companies to conduct business in a socially responsible manner by enabling *d*ecisions on the basis of knowledge about their direct and indirect social impacts throughout the life cycle of their products.

The developed methodology of Social LCA consists of
- a framework for Social LCA
- a method to perform quantitative Social LCA (phases, steps and activities), and
- methods and principles to develop underlying modelling of social impacts.

Concrete models for inclusion of four impact categories representing fundamental labour rights violations are developed and tested in six case studies. The results of the case studies are used to evaluate the Social LCA method and the specific models for labour rights impacts.

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DTU Management Engineering
Department of Management Engineering
Technical University of Denmark

Produktionstorvet
Building 424
DK-2800 Kongens Lyngby
Denmark
Tel. +45 45 25 48 00
Fax +45 45 93 34 35

www.man.dtu.dk