SDG iSelect - Development of a scientific methodology for selecting SDG indicators on project level in the consulting engineering sector

Background Report

Gebara, Caroline Herlev; Poll, Christian; Hauschild, Michael Zwicky

Link to article, DOI:
10.11581/DTU.00000280

Publication date:
2024

Document Version
Publisher's PDF, also known as Version of record

SDG iSelect

Development of a scientific methodology for selecting SDG indicators on project level in the consulting engineering sector

Background report

Caroline Herlev Gebara, Christian Poll, Michael Hauschild

May 2023

SDG iSelect
Development of a scientific methodology for selecting SDG indicators on project level in the consulting engineering sector
Background report

Report
2023

By
Caroline Herlev Gebara, Christian Poll, Michael Hauschild

Cover photo: [Tekst]
Published by: DTU, Department of Environmental and Resource Engineering, Bygningstorvet, Building 115, 2800 Kongens Lyngby Denmark
www.sustain.dtu.dk

ISBN: 978-87-93478-12-1 (electronic version)

DOI: https://doi.org/10.11581/DTU.00000280

Preface

This project was carried out by DTU Sustain with a grant from the COWI Foundation and in dialogue with FRI - The Trade Organization for Consulting Engineers in Denmark. Originally, the project was initiated by COWI with the aim of developing a specific set of indicators, but in order to embrace the entire consulting engineering sector, the project was converted into a methodology development project instead, with the aim of developing a solid platform for companies in the sector to build on, when working with SDG indicators.

Project manager was special consultant at DTU Sustain M. Sci. Eng. Christian Poll
The main authors were PhD student at DTU Sustain Caroline Herlev Gebara and Christian Poll
The project creator and reviewer was professor at DTU Sustain Michael Hauschild

The project was followed by an Advisory Board of:

- The Danish Association of Consulting Engineers, FRI
- COWI
- NIRAS
- Danish Energy Management (DEM)
- EKJ Consulting Engineers
- Artelia A/S (tidl. MOE)
- The Confederation of Danish Industry
- Danish Standards
- Ecolabelling Denmark
- Statistics Denmark
- The Danish 92 Group (umbrella of Danish NGOs)
- Bureau Veritas

Furthermore, the Danish 2030 Panel and the Danish Business Authority have been briefed along the project development.

Lyngby, May 2023

Christian Poll
Special consultant

Contents

Abbreviations and definitions

Abbreviations:

AESA	Absolute Environmental Sustainability Assessment
CSR	Corporate social responsibility
DPSIR	Driver, Pressure, State, Impact, Response
ESG	Environmental, Social and Governance
GHG	Green House Gas
GRI	Global Reporting Initiative
ILCD	International Life Cycle Data system
LCA	Life Cycle Assessment
LCT	Life Cycle Thinking
MECE	Mutually Exclusive and Collectively Exhaustive
PBs	Planetary Boundaries
SDGs	Sustainable Development Goals
WBCSD	World Business Council for Sustainable Development

Chapter 1. Introduction

1.1 Background

In 2015 the United Nations agreed on the 17 sustainable development goals for 2030 (the SDGs). The decision was a culmination of many years of debate at all levels on how to understand sustainable development as defined in the 1987 Brundtland report "Our Common Future"[1]. Since the adoption of the SDGs, the entire world society has been seeking ways to work practically with the goals, targets and indicators, developed for this new framework.

The UN itself has developed normative targets and indicators. At the national level, governments are working on implementing the SDGs, e.g. by adjusting targets and indicators to fit specific national conditions. In Denmark, through an extensive stakeholder involvement process in 2019-20, the project Vores Maal established a set of indicators, adjusted to Danish conditions[2]. Both the UN and the Danish indicator sets are designed for national and publicly available data as for nationally controlled parameters like school systems and public social and health services.

At the sub-national level, agencies, municipalities, societies, institutions and companies are struggling to find ways to work systematically with the SDGs. The 17 goals, 169 target and around 240 indicators of the SDG framework is designed to fulfil national or supra-national goals and activities. Thus, when a local school or a company wish to improve their sustainability effort by introducing the UN SDG framework, there is currently little help on how to select suitable indicators. Not that there is no guidance on how to work with sustainability and the SDGs at the organization level. There are numerous guidelines on how to manage the process of implementing the UN-SDGs in the strategic effort on working with sustainability in organizations (e.g. Global Compact, WBCSD, GRI, the Confederation of Danish Industries etc.), but when it comes to selecting indicators, stringent criteria are not on the top of minds. Rather, users are directed towards large inventories of hundreds of possible indicators to choose more or less randomly from, the SDG Compass and the Inventory of Business Indicators being the most well-known example[3].

Although several approaches have been developed, the process of developing and selecting indicators still remains a challenging task[4]. Indicator selection criteria found in literature are generally diverse and the context of a study plays a big role in how much importance is given to these criteria[5]. Additionally, the precise meaning of some of the mostly used criteria differ between studies[6]. These inconsistencies indicate the lacking consensus among researchers in deriving 'good' indicators.

The lack of guidance on selecting indicators puts SDG practitioners in an awkward situation, because with hundreds of indicators to choose from and no criteria to guide you, the practical choice taken will lack documentation. Why did you choose this indicator, not that one?[7] Are you deliberately twisting the outcome of the exercise or are your choices simply random? That situa-

tion may not only be awkward, it may even invite external criticism that cannot easily be rejected. Therefore, there is a strong need for scientifically based criteria for the selection of indicators for the SDGs.

1.2 Goal and scope

The guideline aims at establishing a set of recommendations for the consulting engineers sector in Denmark about how to select feasible yet sufficient SDG indicators on the project or project type level. A project is defined as a set of activities, in this context carried out by a consulting engineering company, which typically is described in a project description. An example could be the construction of a building or a due diligence assessment of some changes in the facilities of a customer's production site. The scope may be defined narrowly like only the building materials, or it may cover other aspects of the building, like the use and maintenance over 50 years. The term may even be used for a palette of similar projects, assessed as a whole.

This guideline establishes methodology and a set of principles on how to select appropriate SDG indicators for a given case. It provides a generic guide for which principles to follow when selecting SDG indicators in specific contexts. Thus, the guide intends to assist companies or other users who want to develop an SDG indicator selection method that suit their context. The purpose of the methodology is not to develop specific tools or ways of performing the selection process, as this is the role of the company itself or their advisors. There is a growing market for tools, handling the various steps and aspects of managing organization's effort on working with sustainability. Furthermore, such tools may need to vary across disciplines. FRI's members – the consulting engineers – are key providers in Denmark of such services. Instead, this guideline suggests criteria and procedures to qualify and maybe streamline the way such tools give advice on selecting indicators.

Finally, the guideline evolves around the SGD indicator selection and does therefore not consider any further steps, which should be included in a full SDG assessment, e.g. including data collection, performance assessment and target setting. Instead, the guideline is considered a key input to developers and users who need to define a set of SDG indicators to be assesses in SDG assessments. Figure 1 illustrates the scoping of the methodology proposed in this report visually.

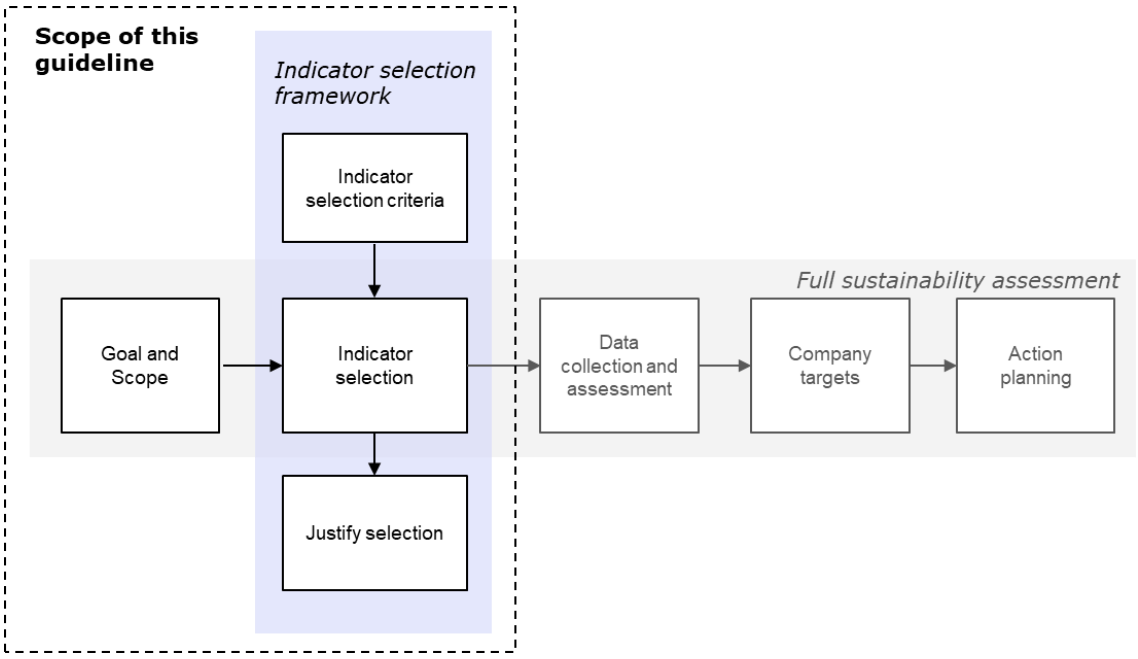

Figure 1. The general steps of sustainability assessments (horizontally) and the cross-cutting steps of the indicator selection process (vertically). The dotted line indicates the scope of this guideline.

1.3 Approach

1.3.1 Stakeholder involvement

For the project to succeed, key stakeholders have been involved during the methodology development. FRI has been central, but also a line of member companies from FRI and other key stakeholders (see the list of members of the Advisory Board in preface). During the project, the developed principles have been tested towards both a real case study and towards fictive cases. The project focusses on the top-down-approach of indicator development methodology, based on objective and scientifically defined criteria. Some researchers describe the alternative bottom-up-approach, which involves collecting stakeholder input in the development and selection of indicators. The advantages of this approach are for example, that the process itself involves the stakeholders which may lead to higher acceptance, and that indicators developed in a bottom-up-process may be more easily understood by non-technical stakeholders.

As this project takes the technical and scientific starting point, aiming at establishing an objective basis for selecting indicators, it does not dig deep into the bottom-up-approach for selecting SDG indicators. However, in practice, a company may very well supplement the scientifically based approach with a bottom-up process if feasible in the specific context, and some of the identified scientific criteria in this project actually address this specifically.

1.3.2 Choosing a feasible methodology

The success of the project is best defined as finding the right balance between what is scientifically dictated and what is practically feasible in a typical project of the consulting engineers sector. Several disciplines have formed the starting points of the study:

- Methodologies on selecting and working with indicators – especially in the field of environmental issues
- Methodologies on life cycle assessment and the application on these in eco-labelling, green procurement, environmental product declaration etc.
- Methodologies on defining absolute boundaries for sustainability

Besides the methodologies, practical experience is scanned. The project has looked into key business guidelines on how to select and work with SDG indicators and thereby into corporate reporting, seeking to identify principles or approaches that may have universal validity, or in the lack of that, just be commonly used. Secondly, scientific literature was reviewed to identify current indicator selection methods or criteria. The methodology for indicator selection was then developed based on our findings and the key disciplines mentioned above. Finally, some test cases were defined to demonstrate the principles/framework (see illustration in Figure 2).

It is not within the scope of the project to develop any form of tool. There is a growing market for tools, handling the various steps and aspects of managing organisation's effort on working with sustainability. Furthermore, such tools may need to vary across disciplines. FRI's members – the consulting engineers – are key providers in Denmark of such services. This project seeks to develop criteria and procedures to qualify and maybe streamline the way such tools give advice on selecting indicators.

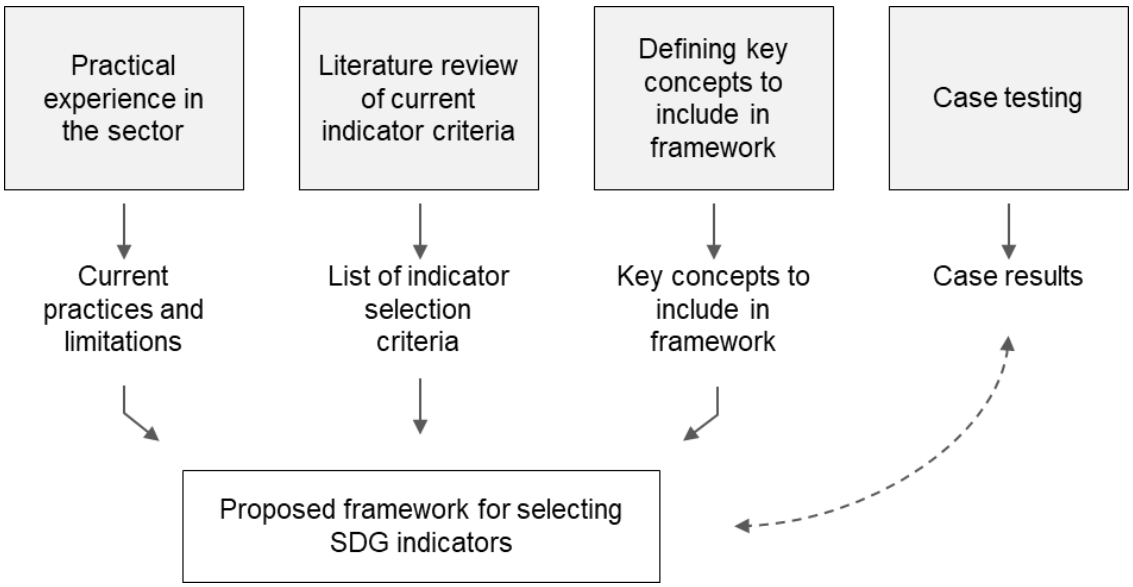

Figure 2. Representation of methodology consisting of four main steps.

1.3.3 Implementation and dissemination of the results

The present report comprises the main result of the project. The report is intended as a deliverable to the COWI Foundation and will be delivered to the advisory board.

Based on the report, FRI intends to build on the methodology and develop an FRI Guide that will hopefully become a branch standard for the selection of SDG indicators.

Chapter 2. Methods behind the development of the guideline

This chapter presents the main methods used prior to the development of the methodology, namely 1) scanning the practical experience with corporate SDG assessments, and 2) a literature review of the existing methods and practices for selecting indicators in scientific and grey literature. These steps served as a basis for understanding the current practices and potential limitations.

2.1 Practical experience with corporate SDG assessment

To get an overview of the status and limitations in the sector of consulting engineering and their activities related to SDG indicators, the two paths have been followed to provide an overview: 1) standard-setting in institution's guiding documents, and 2) practical implementation by companies when working with or reporting on SDGs. The frameworks and experiences listed here should not be seen as an exhaustive list, but as an insight to some key experiences and documents to inspire the development of the guideline.

2.1.1 Standard-setting in institution's guiding documents

UN Global level frameworks

At the global and national level, several reports have been aiming at assessing SDG performances. Hereunder the annual Sustainable Development Report is a global assessment of all UN member countries' progress towards achieving the SDGs[8]. It is complementing the official SDG indicators by the UN by retrieving data for the indicators where possible and replacing by new indicators where data is not available, to obtain country scores for each indicator. Another key report is the 'Indicators and a Monitoring Framework for the Sustainable Development Goals' which report on a consultative work on defining and suggesting indicators for the SDGs led by the Sustainable Development Solutions Network[9]. Several national assessments have likewise suggested different approaches for assessing SDG performances and criteria for indicator selection. Across the assessment, these criteria are to a large extend the same commonly used general selection criteria as the previously mentioned. This includes different varieties of

the following: relevance to scope (e.g. country), data quality, data availability and coverage, sensitivity, clarity, cost-effective, scientific and technically credible (i.e. credibility), reliability, feasibility, ability to set target. The only SDG relevant criteria or principles for selecting indicators cover: relationship to the SDGs and their targets, relevance to the SDG targets.

Corporate level frameworks

The UN Global Compact in collaboration with GRI and WBCSD took up the SDGs shortly after the UN agreement in 2015, publishing the SDG Compass Guide. In the section describing the selection of indicators to work with, no principles are given on how to select feasible indicators. The user is directed to the SDG Compass Inventory of Business Indicators and where it is recommended to consider different types of indicators, expressing inputs, activities, outputs, outcomes and impacts and ensuring a balance between lagging indicators (those that measure outcomes and impacts) and leading indicators (those that predict the outcomes and impacts)[10].

In a later report from UN Global Compact and GRI[1], for each SDG target, a number of "disclosures" are suggested, following some criteria concerning 1) organizational background (e.g. transparency about development phase, collaborative and robust selection process, indicators from SDG Compass), 2) content (e.g. indicator set cover all pillars of sustainable development), 3) applicability (e.g. applicable at different levels), 4) accessibility (e.g. free of cost), and 5) validity (i.e. current and in use). However, the list is not exhaustive and no structured approach for how to use the criteria is proposed.

Some attempts have been made to collect indicators that may be useful for business or public use of SDG indicators at a lower than national level. Probably the largest collection of such indicators are available at the SDG Compass, inventory of business indicators by the UN Global Compact[10] containing approximately 1500 indicators. However, many of those indicators are not directly business controlled indicators, thus not directly relevant for follow up on corporate or project level activities. Most of the indicators in the inventory are simply suggesting how to detailing the official UN indicator. For example, UN indicator 5.5.2 "Proportion of women in managerial positions" is further specified in indicators from the inventory, suggesting e.g. "Number of female board members" or "Firms with female participation in ownership".

This being said, the SDG Compass Inventory does present alternative indicators, coupling the governmental part and the business part of target 5.5. An example is the indicator "Proportion of women interviewed who indicate that they are comfortable voicing their opinions about unequal treatment". This number may indicate the presence of women who might more easily go into politics or hold positions that requires leadership. The SDG Compass Inventory comprise a gross list only. There is no methodology on how to select feasible indicators for any specific context.

For setting objectives, the SDG Compass guide suggests to set goals that aim higher than just 'avoiding harm' and it is suggested to consider taking into account the Planetary Boundaries[11] or use Science Based Targets[12]. However, no detailed guideline is provided on how companies should do this.

[1] https://www.unglobalcompact.org/library/5361

EU frameworks for corporate reporting

The current Non-Financial Reporting Directive (NFRD) requires large companies of EU to report information about environmental and social matters. However, the required information was deemed insufficient, which is why a new directive has entered into force. The Corporate Sustainability Reporting Directive (CSRD) is the new directive for strengthening the rules about the social and environmental information for corporate to report on. The directive requires around 50.000 companies to report on sustainability, including more large-size companies and SMEs[13], for which the first companies will start reporting from 2024. The directive will promote transparency about which impacts the companies have on sustainability parameters (i.e. on people and the environment) and enable comparable reporting across companies.

What needs to be reported under the CSRD, are the European Sustainability Reporting Standards (ESRS), which are drafted standards by the EFRAG. The drafted standards will draw on international standards and while scoped to EU policies. An overview of the first set of drafts can be found here: https://www.efrag.org/lab6.

Danish normative documents on SDG indicator selection

Danish Statistics (DST) holds the responsibility for reporting on Denmark's progress on the SDGs. Furthermore, DST has developed a version of the SDG targets and indicators that is adjusted to Danish conditions, the Our Goals project (www.voresmaal.dk).

Nasdaq, CFA Society Denmark and FSR Danish Accountants has published a guide on recommended ESG (Environmental, Social and Governance) key figures, updated in 2022 (www.fsr.dk). The indicators cover only a small fraction of the UN SDG palette, for example all environmental aspects are covered by four energy related indicators and one on water usage. In total, only 15 indicators are included in this ESG guide. The rationale behind selecting each of the indicators lean mainly on how the indicator is part of something official, like reporting obligations.

The RPS approach has been used by the Nordic eco-labelling society for more than 20 years and is described scientifically[14]. It focuses on 1) Relevance*: Is the indicator relevant, i.e. is there a problem of a certain proportion?* 2) Potential: *Is there a potential for change, i.e. is there a known solution that can lower the impacts?*, and 3) Steerability: *Is the change steerable from the position we are in, i.e. given the power of control of the project, is it possible to make things happen for change*? This approach may be relevant also to the consulting engineers, as it is well proven in eco-labelling and puts a practical layer on top of the scientific investigation on criteria earlier in this report. The RPS approach provides an easy way of prioritizing what to look at in a given situation.

Overall, we find that there is no formal standardised frameworks for how to reporting on the SDGs at corporate level. Furthermore, for the approaches that currently exist, no guideline for

how companies can select indicators has been proposed to the knowledge of the authors of this report.

2.1.2 Practical experience from the Danish consultancy sector on working with SDG indicators

In the Danish consultancy sector, integrating the SDGs into a variety of projects has become more and more common. In this project, we have interviewed some of the practitioners from the sector about which approaches they have been using. In general, the Danish consultancy sector provides advice on how to integrate the SDGs into all kinds of projects and activities, from desk studies to building bridges. Most consultancies focus on the management process and how to build the SDG approach into a classic plan-do-check-improve cycle. Also, many consultancies have developed tools that support the management processes, including how to select which SDGs and targets to focus on. When it comes to selecting or developing SDG indicators, the consultancies do not advice on the process, except presenting the UN indicators, the Danish Vores Maal indicators or other arbitrarily selected indicators, used in other projects. There is no systematic advising in how to translate UN indicators into project indicators, no assessment of the feasibility of 1:1 translation or guidance on how to adjust or further develop or select indicators, based on the specific sector or project type. One consultancy has selected five SDGs and 30 targets for internal management of progress, based also on the project portfolio. But this selection has also been fairly arbitrary, only partly based on the SMART indicator selection approach[15].

In the field of building and construction, most consultancies lean closely towards DGNB[2]. The German system of DGNB was adopted and adjusted to Danish conditions back in 2010-12, involving a majority of the building and construction sector in order to arrive at a broad acknowledgement of the Danish variant. At that time, three years prior to the UN adoption of the SDGs, indicators from the German system was adopted more or less directly, although with minor adjustments. The Danish DGNB was settled with a majority of the sector stakeholders behind, including 270 indicators. A representative from DGNB Denmark describes the principles behind the DGNB system as: 1) Selecting relevant parameters by involving stakeholders, 2) Development of indicators that expresses the parameter, 3) Assessment of each parameter's importance in relation to sustainability, 4) Assessment of the indicator's efficiency and objectivity in relation to the parameter and 5) Weighting of the parameters towards each other based on 3) and 4). This is basically a bottom-up approach, basing the development of indicators on input from stakeholders. It is, therefore, unclear if these indicators have been developed following a scientific methodology for indicators.

Besides DGNB, other systems for assessing sustainability for buildings are evolving and adopted partly by some of the consultancies. The EU is developing "Level(s) – European framework for sustainable buildings"[3] including detailed specifications on how to work with indicators. The B Corp Lab and UN Global Compact have developed the "SDG Action Manager"[4] which is

[2] https://dk-gbc.dk/dgnb

[3] https://ec.europa.eu/environment/levels_en

[4] https://app.bimpactassessment.net/get-started/partner/ungc

an impact assessment method for companies. Neither of these specify the principles behind selecting good indicators; instead, they seem to build on existing indicators in general or from the building sector.

One of the consultancies have established a framework around four energy relevant SDGs, to which a set of indicators have been developed. On the selection of indicators for this setup, the consultancy leaned on a UN report from the post-SDG time, the “Monitoring Framework for the Sustainable Development Goals: Launching a Data Revolution”[5], suggesting “ten principles for global monitoring”:

Thus, based on these ten criteria for good indicators, the consultancy has developed a set of indicators. Each indicator is closely related to a similar official UN SDG indicator, but then adjusted to fit projects. An example is the UN indicator 7.2.1 “Renewable energy share in the total final energy consumption” which has been translated into the following project indicators: “Increase in kWh generated from RE thermal and electricity for feasibility or implementation projects, calculated over lifetime” and “number of projects including initiatives for RE”. There is no explanation on how the transformation has been carried out from the UN indicator to the practical project indicator.

Thus, in conclusion, the approach to selecting SDG indicators in the consultancy sector does not rely on a scientific approach and leans on existing systems that have been developed from bottom-up processes, letting the stakeholders suggest their wishes and then negotiating towards consensus.

2.2 Literature review of indicator criteria

The literature review aimed at identifying methods for assessing SDGs more generally and to map the existing indicators selection criteria for SDG indicators. Thus, the review was used for two things, namely 1) a screening of existing methodologies for the assessing SDGs and 2) an extensive review of indicator selection criteria for assessing SDGs.

For scientific papers, the review was carried out using Google Scholar (scholar.google.com) and Web of Science (webofscience.com) for English literature only. In the search for relevant papers we applied key words for identifying studies that directly mention criteria or methods for indicator selection or develop or select indicators for the SDGs. After identifying the relevant synonyms to identify other wording of the same concept, different combinations of the following key words where adopted: ("criteria" OR "standard" OR "principle" OR "benchmark" OR "method" OR "assessment framework" OR "assessment tool" OR "creating" OR "developing" OR "evaluating" OR "selecting" OR "formulating" OR "applying" OR "suggesting" OR "proposing" OR "recommending") AND ("SDGs" OR "Sustainable Development Goals") AND ("indicator" OR "index" OR "indices").

Since the results targeting SDGs were limited in number, we decided to include the key word "sustainability" as well as alternative to "SDGs" or "Sustainable Development Goals" to draw on the experience of indicators development for sustainability assessment more broadly. The same

[5] https://indicators.report/overview/

search words were applied for the search for grey literature with the google search engine. However, this search was only focusing on sources that explicitly referred to the SDGs and therefore the time was set from 2015 only, due to the infancy of the SDG framework.

Figure 3 shows the methodological steps and outputs from the review of indicator criteria. The papers from the initial search were filtered based on a screening of the title and abstract, where a paper was excluded if 1) it was not focusing on developing sustainability indicators or applying indicator criteria, 2) if the topic was not focusing on sustainability but more on specific technology performance, 3) it is was not focusing on more than one indicator, and 4) if the study was a repetition of another. The remaining papers were investigated in further details and included if they applied or suggested indicator criteria. In total, almost 136 sources were identified applying or suggesting criteria for indicator development, whereof 118 were from the scientific literature (i.e. first grey box in Figure 3). These were kept for further analysis.

The final pool of papers and reports were used for 1) identifying frameworks or processes for assessing sustainability performance/select indicators and 2) identifying and collecting indicator selection criteria to develop a comprehensive set. For the first purpose (i.e. 1 in Figure 3), while screening each of the relevant papers or reports, it was noted if a framework for selecting indicators was presented or not. The papers served as inspiration for suggesting the overall process steps. For the second purpose (i.e. 2 in Figure 3), all identified criteria were gathered into a large pool of individual criteria for which the following information was noted whether SDGs were mentioned or not. The full list of criteria holds more than 800 occurrences[6] of criteria from studies across 1988 to 2022 and various spatial and sectoral scales (i.e. crude list of criteria).

To arrive at a more refined list, the criteria were organized by aligning similar criteria (e.g. using same suffix: the words relevance, relevancy and relevant are all the same criteria). Furthermore, the criteria were grouped in an iterative process with the aim of refining the list even further. Some criteria were synonyms or very similar in meaning, therefore, we gave group names to all criteria that gathered similar criteria into a criteria group name (e.g. the criteria of timely data, measurability, and existing data all falls into the category of data quality and availability). To avoid further redundancy and to keep the set of criteria more condense, the criteria were categorized into overarching categories that framed the main principles of defining strong indicator sets. Finally, the resulting refined list of criteria were evaluated in terms of any missing aspects to complement this list. More detailed description of the method behind the literature review is provided in the article by Gebara et al. "Selecting indicators for measuring progress towards sustainable development goals at the global, national and corporate levels" (2024)[16].

[6] Occurrences refer to each time a criterion was identified and reported. In the crude list of criteria the same criteria names can occur multiple times, thus the 800 occurrences covers all criteria across studies including replicates, however, reported from different sources and descriptions (see A1 for more details).

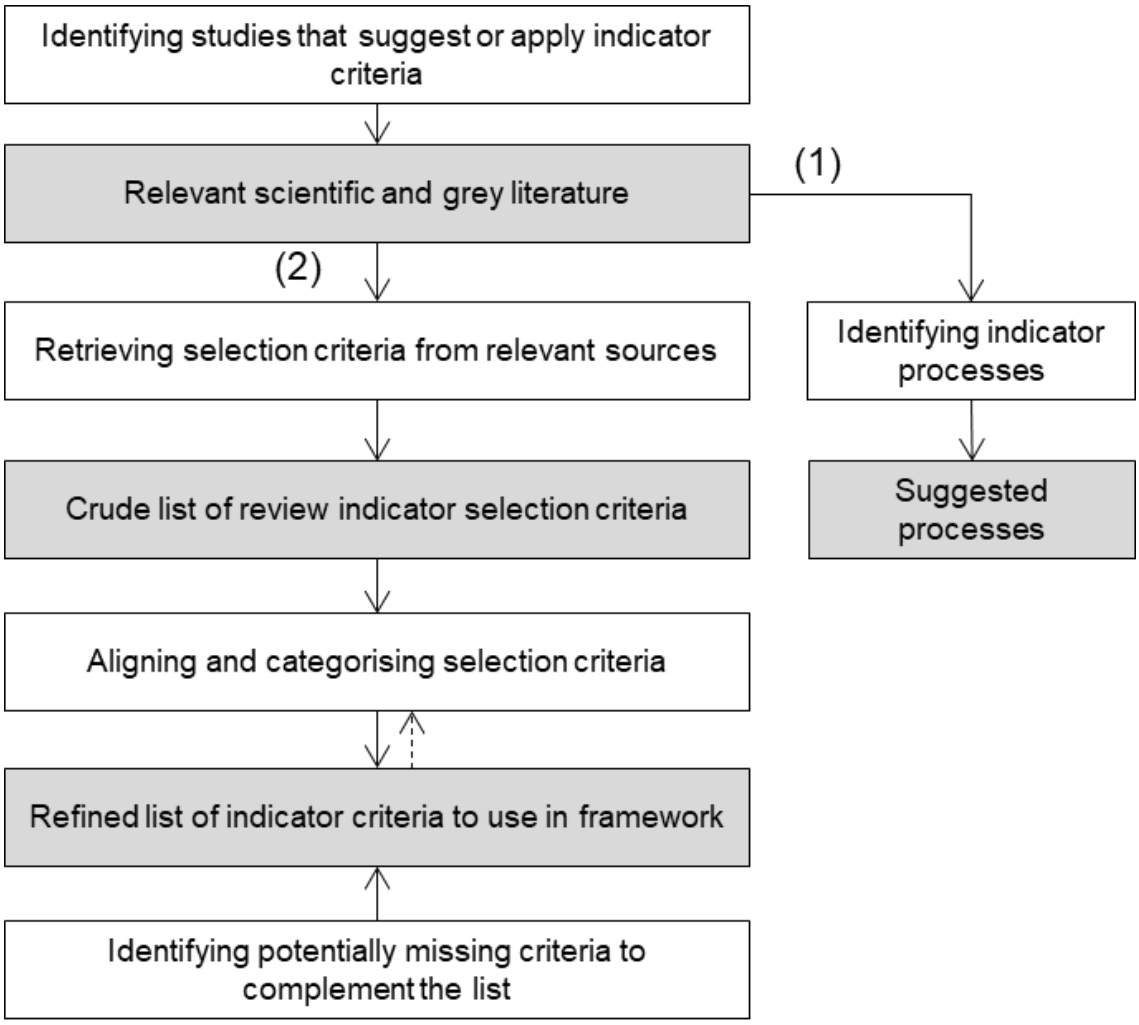

Figure 3. Methodological steps (white boxes) and outputs (grey boxes) from the literature review of indicator selection criteria.

Chapter 3. Description of key concepts

The proposed methodology was developed based on a set of theoretical concepts, which are described in this chapter. These include 1) life cycle thinking, 2) cause effect chain, 3) categorization of the SDGs, 4) absolute sustainability and 5) indicator quality criteria. The set of concepts lay the foundation for the methodology development.

3.1 Life cycle thinking

Life cycle thinking (LCT) is the backbone of Life Cycle Assessment (LCA), which is a recognized methodology for assessing environmental impacts over the life cycle of products and systems. Instead of considering only the impacts from the production of a product or direct emissions from applying a service, LCT considers the impacts (e.g. environmental or societal) related to the whole life cycle of a product or service[17,18]. Most products or services consist of the following main life cycle stages as illustrated in Figure 4: 1) extraction of raw materials from natural resources (e.g. coal, metals, water, etc.), 2) manufacturing and production of the product (e.g. a company's production site, 3) use of the product (e.g. in households, work places), and 4) end of life (EoL) (e.g. waste treatment through incineration, landfill, recycling, etc.). Throughout all steps, some transportation, energy use and water use will most likely appear due to distribution of material and products, and energy and water needed for machinery and production facilities and sometimes for applying the product. Both environmental and societal impacts can be associated to each stage of the life cycle.

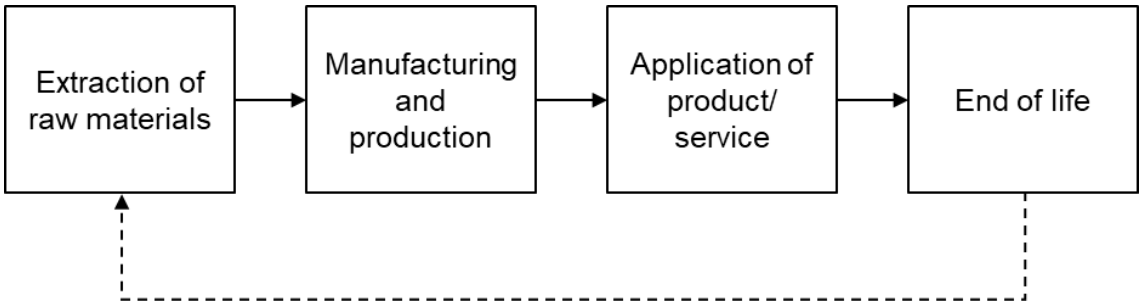

Figure 4. Illustration of life cycle stages. After end of life, the product might be recyclable (illustrated by the dotted line).

To ensure that all impacts related to a project are considered, it is essential to map the full value chain from the extraction of raw materials to the end of life (i.e. also referred to as cradle-to-grave). When practitioners only assess the impacts of producing a product, it is only the direct impacts related to this step that is included. However, as the product potentially causes impacts all throughout the value chain, some impacts further down the chain will be overlooked. Considering the impacts related to a producing company's activities, where the company has a goal of reducing GHG emissions from their production by 30%. However, the emissions from their production only accounts for 10% of all GHG emissions throughout the whole life cycle. Thus, the 30% gain in the production facility is equal to an overall reduction of just 3%. Therefore, in order to capture the total amount of impacts that the product or service is causing, a life cycle perspective is essential.

Considering a corporate context, many companies are familiar with the three scopes used for greenhouse gas accounting following the greenhouse gas protocol for corporate accounting[7]. Instead of following the life cycle stages or value of chain as above presented, the company refers to the three scopes of the company distinguishing the direct and indirect emissions: Scope

[7] https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf

1 (direct emissions from company facilities), Scope 2 (indirect emissions related to energy purchases), and Scope 3 (other indirect emissions related to all upstream and downstream processes). As this way of classifying the scopes of company activities is getting more and more known and applied by many companies, it can be an advantage to follow the same categorization when mapping the life cycle of a company for SDG assessment. However, instead of keeping the assessment to GHG emissions, we extend the scopes to consider all activities and their potential impacts (including both environmental and societal aspects). Table 1 shows the analogies between the different frameworks for categorizing corporate life cycle stages. Now, the activities associated with each stage will differ depending on the type of company. If we consider a manufacturing company, production facilities will lie in Scope 1 and probably be accountable for a large share of the company's emissions. If we consider a consultancy firm, the main Scope 1 activities will probably be office facilities (e.g. heating, electricity, inventory, canteen, etc.).

Table 1. Analogies between different categorisation of life cycle stages.

Upstream processes	**Project facilities and energy purchases**	**Downstream processes**
Scope 3	**Scope 1 + 2**	**Scope 3**
Indirect	**Direct and indirect (energy)**	**Indirect**
• *Extraction of raw materials* • *Extraction, production, transportation of fuels consumed for electricity production* • *Energy losses from transmission* • *Imbedded impacts in all purchased materials needed upstream* • *Transport of purchased products* • *Worker's transport* • *Outsourced activities not controlled by the company/commissioner*	• *Direct impacts from company facilities (e.g. on the environment and employees)* • *Production facilities* • *Office activities* • *Company vehicles* • *Fuel combustion* • *Purchased electricity*	• *Use of product/service* • *Employees business travels* • *Waste treatment* • *Transportation for sold products/ needed in the use stage* • *Transportation to waste treatment*

Moving to project level assessment, the activities in the life cycle stages might differ even further. Here, the direct impacts will be those that are associated to the implementation phase of the project, and thus directly affected by the commissioner. One might therefore ask: "*what does the project have direct effect on?*" to map the activities that belong to Scope 1.

When assessing impacts of a project, it is important to lay the right basis prior to identifying the relevant things to measure and assess impacts. Applying a life cycle perspective can help identifying the different activities that are both directly and indirectly impacted by the project and avoid overlooking impacts caused by the project. Therefore, LCT is considered a core principle when scoping the system for SDG assessments.

3.2 SDG classification

The SDG framework consists of different dimensions of sustainability concerning societal and environmental issue. Thus, it is important to know the differences between the types of goals and what they aim to achieve. As some goals are more outcome oriented (e.g. "achieving zero hunger", and "achieving sustainably use of the oceans") others are more technology oriented and works as linking goals or levers of the other goals (e.g. "sustainable production" or "build resilient infrastructure"). Different ways of categorising the SDGs exists although a common model for categorising the SDGs and their importance is the 'wedding cake' (see Figure 5). The model emphasises that the biosphere is essential for maintaining the social and economic systems, while the social systems are crucial for maintaining economic systems.

Figure 5. The SDG 'wedding cake' showing the categorisation of different SDGs based on their important. Source: Azote Images for Stockholm Resilience Centre, Stockholm University.

Another classification following a similar approach is suggested by Kathrine Richardson, where she identifies some goals as respective goals for improving the global environmental commons and goals for improving human well-being (see Figure 6). SDG 10 is classified as a linking goal between the environmental and well-being dimension, since it can be used for balancing human

needs with environmental pressures, by redistributing wealth and resources. She classifies the remaining goals as 'Levers for transformation' consisting of technological, economic, and governing bodies. Thus, these should not be seen as final goals but rather as means (i.e. levers) for achieving the other goals. It is important to keep this distinction between the goals in mind when working with the SDGs, since it can help in prioritising certain aspect and keep the eyes on the end goals.

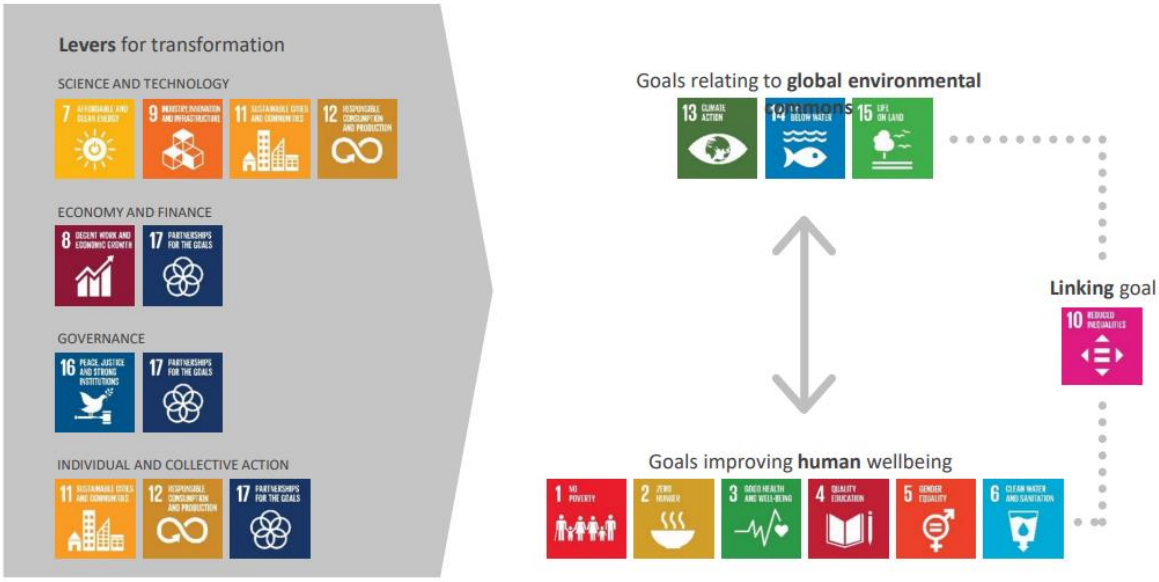

Figure 6. Interactions between the SDGs and categorisation into different aspects. Copied from Richardson, presentation: "bæredygtig (ud)dannelse", 2021, available at: https://aarhusomstiller.aarhus.dk/media/69261/katherine-richardson_slides-193.pdf.

3.3 Absolute sustainability

Sustainability indicators are often used in decision making and used in ranking the sustainability performance of countries and companies[19]. Similarly, LCAs can be used to rank the impact of one system compared to another, thus showing the *relative* impacts of one product compared to another. Therefore, using these types of sustainability measures, can be termed as 'relative sustainability' since the performance is compared relatively to a reference. However, while this is beneficial when checking relative progress over time or choose the most environmentally friendly product between two alternatives, it cannot be used to assess whether something is sufficient; sustainable in absolute terms. To be able to react sufficiently and with the required speed to mitigate the large challenges and respect international goals (i.e. the Paris Agreement), we need to know how far we are and how much is required from us. The concept of 'absolute sustainability' aims exactly at doing this by defining absolute reference values defining when something is sustainable. The two concepts are illustrated in Figure 7**,** where activity A and B are ranked on their environmental performances. In 1) Activity B is ranked as more sustainable, and thus better, in light of its comparison with Activity A. In 2) both activities are deemed unsustainable due to the sustainability reference, where Activity C is the only one, which is deemed sustainable according to the absolute reference.

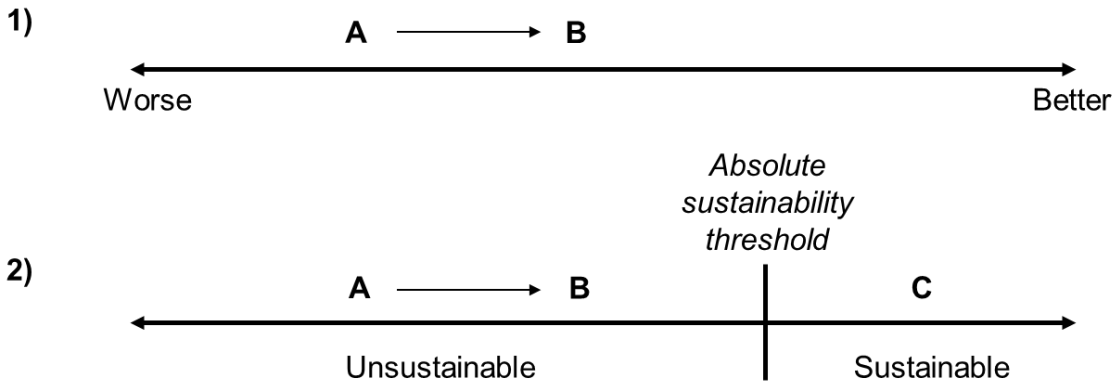

Figure 7. Representation of the concept of relative sustainability (top) and absolute sustainability (bottom). Modified from Bjørn et al. (2016) (REF).

The concept of absolute sustainability has recently gained more attention by the scientific community, with the mainly focus on environmental boundaries. An example of absolute sustainable is the concept of carrying capacity, which has been defined as "*the maximum sustained environmental intervention a natural system can withstand without experiencing negative changes in structure or functioning that are difficult or impossible to revert*". Thus referring to absolute limits for our ecological systems to thrive. An attempt to quantify such limits, and another key concept for assessing global absolute environmental sustainability, is the Planetary Boundaries (PBs) framework. The framework was developed by Rockström et al. (2009) and later updated by Steffen et al. (2015) with the aim of scientifically assessing the risk of destabilization of nine ecosystems caused by human activities (see Figure 8). As the figure shows, we are already exceeding the safe zone in six out of nine boundaries, indicating that our current activities are not sustainable in absolute sense, since we risk destabilizing ecological systems.

Defining absolute sustainability thresholds can also be done politically. A recognised threshold for achieving sustainable development is the political framework of the Paris Agreement, aiming at staying below a 1.5-2 degrees Celsius warming compared to pre-industrial levels (Masson-Delmotte et al., 2018). This can be translated into a 'budget' of a total cumulative amount of GHG emissions of approx. 2,900 Gt CO_2e that the climate can afford without exceeding the 2℃ increase[20]. Since GHGs stay in the atmosphere for many years, (e.g. CO_2 hundreds of years, CH_4 ~10 years, N_2O ~ 110 years), the atmosphere works as a sink of gases. As thus even if we reduce our annual emissions now, we would still contributing to temperature rises, as every single GHG molecule added to the atmosphere, is adding extra GHG to the sink. Other example of a consensus based politically set target, is the agreement on biodiversity that aims to protect 30% of Earth's lands, oceans, coastal areas, inland waters[21].

Now, in addition to the environmental limits, we can also talk about absolute sustainability with regards to the social dimension. Raworth coined the concept of doughnut economics, which defines a social foundation for fulfilling human needs and proposes a set of 12 indicators to focus on (see Figure 9)[22]. When defining absolute sustainability for such indicators, it relies on the

concept of 'zero deprivation', meaning that something can only be absolute sustainability, if no one is deprived (i.e. 'leaving no one behind).

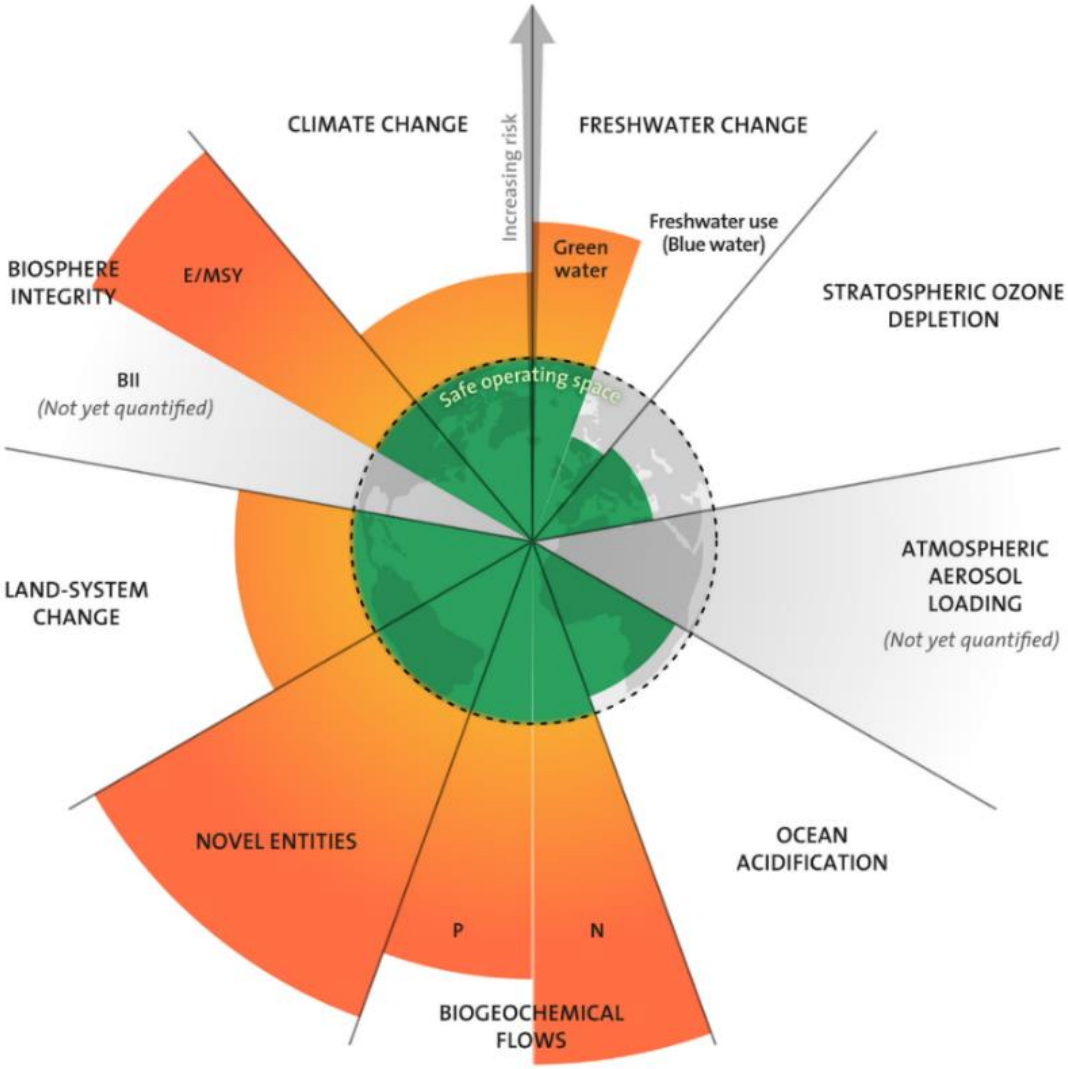

Figure 8. The planetary boundaries (PBs) framework, where the PB is set at the lower points of the uncertainty range (within green zone). The safe operating space (SOS) exists here. (*From Stockholm Resilience Centre, based on analysis in Wang-Erlandsson et al 2022*[8]).

[8] https://www.stockholmresilience.org/research/planetary-boundaries.html

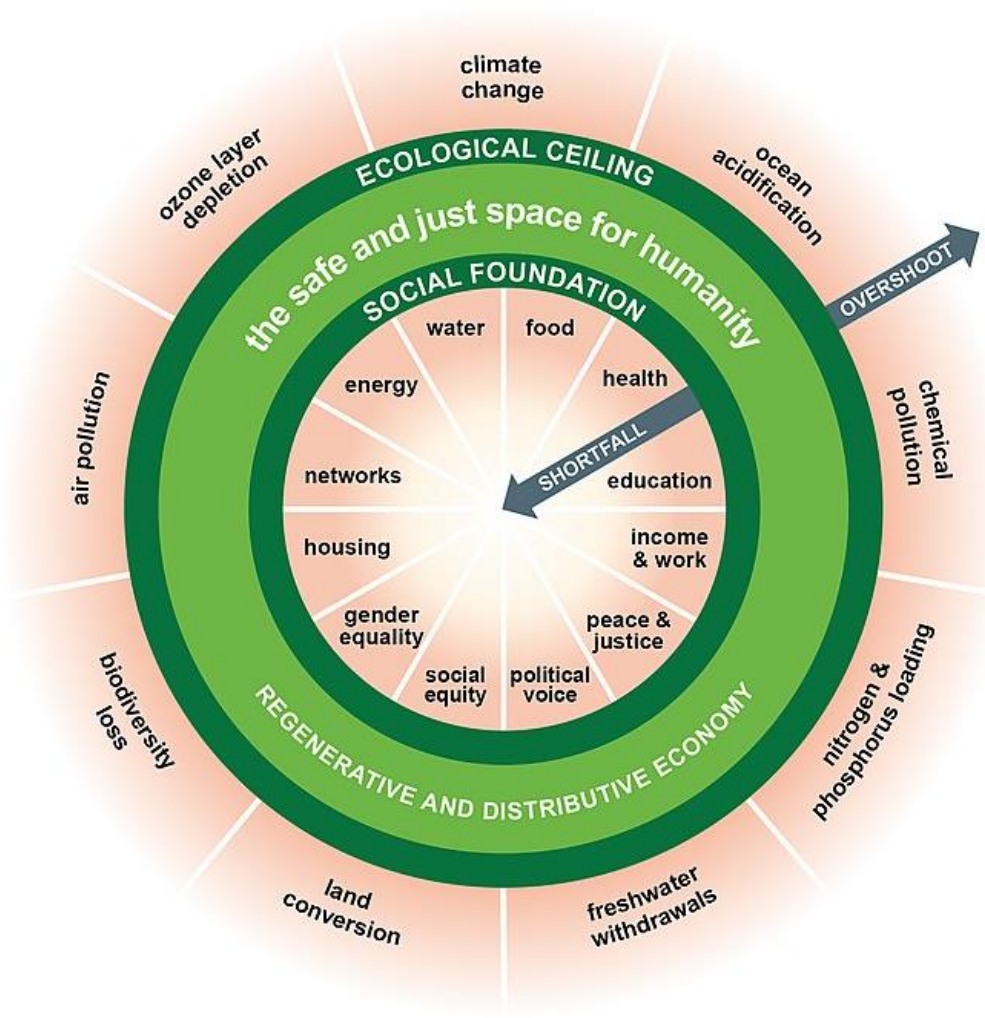

Figure 9. The doughnut economics framework coined by Kate Raworth. The doughnut consists of an ecological ceiling representing the nine environmental boundaries based on the planetary boundaries framework, and a social foundation representing 11 boundaries for human deprivation. The doughnut make up the safe and just space for humanity to thrive in between the two boundaries (*From Kate Raworth, 2012*[22]).

We can define the different between relative and absolute and provide some examples for setting absolute sustainability references, but there might not always be a single answer to where this limit should lie. While absolute sustainability levels can be defined based on objectively defined scientific levels of risking destabilisation of Earth systems, other limits are based on political and culturally defined levels. Therefore, it is important to say that this depends on a number of norms and ethical principles, hereunder i) the future that we wish for (*'do we want inequality? do we want people to starve?*'); ii) the time line that we consider (e.g. *'should we thrive for 20 years? 100 years? eternity?*'), and; iii) how do we prioritize (*'can we sacrifice some climate change impacts, while we slowly mitigate our impacts? Or do can we sacrifice what it takes to stop climate changes right away?).* Thus, with absolute sustainability, we aim to answer: "*when is something good enough?*" or put differently: "*when is something sustainable?*" Thus, there is not always one answer to those questions. Instead, it relies on a set of norms and ethical foundations of what society/world we would like to have. For instance, we need to ask ourselves

questions like: "*how much inequality can we accept*?" and "*how big temperature increases can be accept?... 4, 2, 1.5 degrees*?".

Once we can agree about some of the above mentioned questions, it becomes possible to set absolute sustainability targets. Drawing on the previous section, the way to define such boundaries, depend on the type of SDG. For environmental SDGs, these can be derived based on scientifically based methods (e.g. how much is our global CO_2 budget if we do not want to destabilise the climate system?), for the human well-being or socially oriented, these can be based on the principle of zero deprivation (i.e. Raworth, 2012[22]) or 'leave no one behind' (i.e. as promised by the 2030 Agenda for Sustainable Development). Now, we are left with the question about the more "transformative" SDGs or "levers" (see previous section), e.g. "*what is the absolute sustainability boundary for the production levels, our economies or the energy production?*". This answer to this question is more complex as it depends on which absolute sustainability goal we focus on and how the levers are linked to these aspects.

3.3.1 Linking absolute sustainability the SDG framework

While there is currently no formal way of linking the SDGs to absolute sustainability, it is still relevant to consider whether what we measure can tell us something about the contribution to absolute levels of sustainability. *A starting point can be to ask "what are the currently known crises that we need to tackle?"* or *"what consensus-based absolute sustainability targets exist to date*?" An approach could be to use the dimensions defining the ecological ceiling and the social foundation as suggested above.

Now, the next tricky tasks would be to link this to the SDGs. Here, an analysis of what contemplates each SDG could be carried out, to identify which SDGs relate to the aspects of the absolute sustainability measures. An example of illustrating this link is provided in Table 2, where each indicator of the ecological ceiling and the social foundation is linked to the SDGs deemed relevant. An example of how an absolute boundary could be defined is also provided in the last column. The table should be seen a conceptual illustration of this linking, not a complete linking, as no deep analysis of each SDG has been carried out.

Table 2. Example of how to link the SDGs to relevant aspects when defining absolute sustainability levels. The example of indicators used to assess absolute sustainability are taken from the Planetary Boundary framework[11] and the doughnut economy model by Raworth[22].

Indicator	**SDG link**	**Example of absolute boundary**
Ecological ceiling		
Climate change	SDG 13	*GHG budget, annual emission cap*
Ocean acidification	SDG 14	*GHG budget, annual emission cap*
Chemical pollution	SDG 12, (SDG 3)	*tbd.*

Indicator	**SDG link**	**Example of absolute boundary**
Nitrogen and phosphorus loading	SDG 12, (SDG 2)	*Annual emission cap*
Freshwater withdrawals	SDG 14, (SDG 6)	*Annual consumption*
Land conversion	SDG 15, (SDG 2)	*Annual land use changes*
Biodiversity loss	SDG 13, SDG 14, SDG 15	*Number of annual disappearing fraction*
air pollution	SDG12, (SDG 3)	*Annual emission cap*
ozone layer	SDG12	*Annual emission cap*
Social foundation		
Food	SDG1, SDG2, SDG12	*Zero hunger*
Water	SDG6, SDG12	*Access to clean water for all*
Health	SDG3	*Access to health care for all*
Education	SDG4	*Access to education for all children and adolescences*
Income and work	SDG 1, SDG8	*Zero child labour, zero forced labour*
Peace and justice	SDG 16	*No corruption, no war*
Political voice	SDG 16, SDG 10, SDG 5	*Equal right to speech for all*
Social equity	SDG 10	*Zero inequality, zero discrimination*
Gender equality	SDG 5	*Zero inequality, zero discrimination*
Housing	SDG1, SDG11	*Shelter for all*
Networks	…	*tbd.*
Energy	SDG7, SDG12	*Access to energy for all*

3.4 Indicator selection criteria

A core task for selecting indicators is to define a set of requirements or criteria that can qualify the validity for specific purposes. As mentioned, there is currently no consensus on how to select sustainability indicators (incl. for the SDGs), and in many previous calls for developing a systematic framework, this have been raised[23,24]. An extensive literature study was carried out to map the existing sustainability indicator criteria and to arrive at a condensed and comprehensive list of criteria that can we applied when selecting SDG indicators at different levels. The list comprises 14 criteria for individual indicators and eight criteria for indicator sets presented in Table 7 and Table 10 in the main report. respectively. The 12 indicators are grouped into six overarching characteristics which cover the important aspects of indicator criteria. These are specified further in the following.

3.4.1 Criteria for individual indicator performance

Relevance

It is important to put the project into the right context, and thus consider a realistic scope, addressing relevant aspects from the sector, the key crises and important political issues. Therefore, the criterion of relevance is one of the most important factors when assessing the quality of an indicator. Here the relevance is divided into two aspects, namely i) relevance to scope and ii) relevance to the SDG of consideration. For the former, this covers spatial and temporal relevance (e.g. *is it relevant to the context of a specific country or company? Is it specific to challenges of today's society?*) and sectoral relevance (e.g. *is it relevant to the field considered?*). For the latter, it concerns whether the indicator is important for the aspects of the SDG (e.g. *does it target the SDG and its relevant sub-components?*). When deciding if something it relevant, it is important to consider the importance of what is being measured to the scope of the assessment, hereunder the magnitude and severity of a potential impact. If the activity being assessed does not have a notable impact on the indicator, it might not be relevant to include it in the assessment. It some cases, it might not be relevant to include indicator that the company or project cannot influence. However, this might still be relevant for benchmarking purposes or comparison of the project compared to other projects. Thus this depends on the goal of the assessment.

General indicator qualities

This group of criteria is sometimes referred to as *scientific criteria*. It covers general quality criteria that indicators should have in order to be considered scientifically valid, here scientific soundness, measurability, sensitivity, and comparability. Scientific soundness refers to whether the indicator is built on a solid scientific basis and having scientific backing in terms of targeting the issue of consideration. Whether an indicator is measurable can either be quantitatively or qualitatively. Often quantitative indicators are preferred but in some cases this might not be possible or qualitative measures might be more representative (e.g. social sciences). However, the indicator needs to be able to measure in one or the other way. Another important quality aspect is that the indicator should be sensitive towards the issue that we want to tackle/measure. This can be linked to the causality chain of the matter of concern (e.g. human industrial activities →

GHG emissions → temperature rise). Thus, the closer the indicator lies to the thing we want to detect in the causality chain, the more sensitive the indicator is. If the link is too far away, it might not be able to show any valuable changes. Finally, the indicator should be comparable within the scope of consideration. This means, that if the purpose of a project includes the benchmarking towards other projects, previous years or other countries, the indicator should be applicable across projects, times and geographical scope.

Data aspects

The data oriented criteria cover the availability, accessibility and quality of the data. For the indicators to be measured, the suitable data needs to exist and be maintained, this also refers to temporal availability (i.e. *does the data exist for different years, months, etc.? Is it being frequently updated?*) and spatial availability (i.e. *does the data exist for all the relevant locations and/or sectors?*). Having both high temporal and spatial availability allows for measuring progress over time and compare across different geographical or sectoral areas. Furthermore, the data needs to be easily accessible to the user, which will improve the usability of the indicator. Finally, the data quality needs to be considered to ensure that the data is from a reliable and sounds source and accurately measures what the indicator intends.

In general, data on a project may on one hand be very concrete and origin from a specific construction site. On the other hand, some SDG relevant data are very complex and of uncertain sources. It is a useful approach to go for a variety in data types and thereby introduce some cross-checking. Only, this requires transparency about possible overlapping. In some sectors, much data will be available at the sector level, providing well-defined indicators supplied with data of known quality and coverage.

Acceptance

A broad acceptance among stakeholders and other involved parts of a project, can create a stronger feeling of motivation and enhance the applicability of the indicator. This can be acceptance by internal and external stakeholder, the local community or potential end-users of a product of service. A way to improve the acceptance, can be to choose indicators that align with existing systems or standards representing a general consensus on a certain topic. In the case of new indicators, if a general acceptance can be achieved, it might be further enhanced if turned into a new standards reinforcing the acceptance among users. A broad acceptance can also be achieved through participation in the indicator development phase, such as involving stakeholder and end users to define the indicator sets.

Acceptance is much about working bottom-up with the stakeholders around the project. This approach should be considered a supporting activity to the science based selection of indicators, as a dominating bottom-up approach will bear the risk of ending up with indicators, which do not fulfil the scientific criteria. On the other hand, the aspect of acceptance also contains the aspect of motivation. Thus, when a gross list of indicators is on the table, one should look into the acceptance and motivation aspects and identify those indicators that add to activating the users within and around the project.

Applicability

Linked to acceptability, this criterion stresses the importance of how easily the indicator is to apply. One important factor, which is one of the most mentioned criteria, is that the indicator should be clear and understandable. This implies that it should not be ambiguous and written in a clear language, which is understood by stakeholders, policy makers and end users. This enhances the usability and avoids that the indicator exclusively will be used by experts. It should further be clear what it means when the indicator performance moved in a certain direction. To additionally ensure good applicability of indicators, having a link to direct actions or policy targets is relevant. If an indicator is relevant and provides information to decision-takers, it becomes easier to formulate policies or actions that can increase further the commitment and possibility of direct action outputs from applying the indicator.

3.4.2 Criteria for indicator system performance

Indicator systems aspects

While the previous topics were linked to aspects of one indicator, there is an extra dimension on the level of indicator systems, or sets of indicators. Here the key principle to follow is that the set should consist of Mutually Exclusive and Collectively Exhaustive, also referred to as the MECE principle. This means that the list of indicators should be comprehensive and thoroughly represent all important aspects of the system, while all individual indicators provide additional information without overlapping. This principle can often be difficult to follow in practice as one can often continue to find new indicators that tell a slightly different story than the others and hence increase the complexity of the indicator system. Therefore, it is important to keep the set in a manageable size, as too many indicators quickly becomes unpractical. Here is it important to be clear about the scope of the project to limit the indicator set to cover the essential aspects needed to measure the objective (e.g. an SDG). Sometime indicators might appear to tell two different things, although they might lead to the same overall conclusion of need of action. So it is important here to ask "*what would that tell us if the indicator performed like this or that?*" and "*does it lead to new conclusions than what we can already track by other indicators?*"

To enable a comprehensive set of indicators, it is important that the whole life cycle is considered (see section 3.1), to enable to capture aspects associated to different stages and to avoid overlooking certain things (i.e. *burden shifting*). Furthermore, it is important to have a sufficient coverage of sustainability aspects to make sure that potential trade-offs are accounted for. When choosing an indicator, it is important to consider whether it might come at the expense of other aspects, so that a good performance of one indicator does not lead to a worsening somewhere else in the system, which is not covered by the indicator system. An example could be that when assessing SDG 7 (i.e. sustainable energy), we can choose an indicator that measures the share of the population with access to electricity, since the goal focuses on providing energy to all. However, if we increase the energy access and thus production, it will most likely result in increased emissions and resource uses. Thus, since a part of the goal is to achieve "sustainable energy" it is important to cover this aspect concerning environmental impacts as well (e.g. *'share of renewable energy'* or *'amount of emissions from production/consumption'*). While most SDGs will have link to different aspects of sustainability, some goals

might primarily just tackle one dimension of sustainability, e.g. SDG 1 ('end poverty in all its forms everywhere') or SDG 14 ('conserve and sustainably use the oceans, seas and marine resources for sustainable development'). It is therefore important to consider for each SDG, which aspects are necessary for effectively achieving the goal. Finally, if effort is put in getting around all aspects within each SDG and all SDGs are considered, this delivers in itself some kind of assurance of a broad coverage of sustainability, thanks to the 17 well-defined goals and 169 targets. However, this should be supplemented with the life cycle approach, ensuring that all phases of the activities' life are being covered.

For the criterion on linking to absolute sustainability, this was included to enable an SDG assessment that related to absolute sustainability targets. The reason that we recommend this for the set and not as a requirement for each individual indicator is that, the absolute sustainability assessment should be seen as a complement to the relative sustainability assessment. Thus, it can still be relevant to test relative performance (e.g. *how is the performance this year compared to last year*?) and thus it is important to include indicators that can assessment both aspects. Furthermore, as the methodology in this work only focus on the indicator development, we abstain from suggesting the targets, and thus this criterion simply means to *enable* linking, not necessarily to define a value. Enabling this link includes to choose indicators for which we have a solid justification for defining the level for when something is actually sustainable (i.e. absolute sustainability). An example could be that, as climate change is an important crisis to cover and we can define absolute boundaries based on either the PB framework (e.g. 350 ppm CO_2) or the Paris Agreement (2 degrees), we could choose an indicator that reflects the contribution to climate change, e.g. total GHG emissions.

3.4.3 Hierarchical considerations/prioritization

The different criteria serves different purposes and some will have higher priorities than others will. Some indicator criteria refer to the core qualities of the indicators, such as the relevance of the indicator. If these criteria is not met, the indicator is already disqualified and thus other criteria are not important. If the indicator is deemed relevant, other criteria can be checked, such as whether data exist or whether it is easy to apply. Considering the other way around, if the data is available but the indicator is not relevant, the indicator should not be applied. Therefore, indicator criteria are sometimes divided into 'critical' criteria and 'supplementary' criteria, where the former covers criteria that needs to be fulfilled for considering the indicator and the latter are additional criteria that can improve the indicator[25–27]. Acknowledging that criteria might have different prioritization, we suggest dividing the criteria into two levels of importance, respectively Level A and Level B.. Level A refers to the mandatory criteria and Level B refers to other recommended criteria (see Gebara et al. (2024)[16] for further information). The reasoning behind the two levels is that if an indicator complies with the Level A criteria it can be accepted, and if it does not comply with all Level B criteria, it can be improved, but it does not disqualify. Oppositely, if an indicator complies with the Level B criteria but does not comply with the Level A criteria, it disqualifies, as the Level A criteria covers inherent indicator qualities that cannot be improved for the indicator of concern.

In the article by Gebara et al. (2024)[16], a stepwise guide was suggested for how to assess a set of SDG indicators across the different levels. Two variants were suggested, respectively for 1) evaluation of existing indicator sets and 2) selection of new indicators. As the goal of this project

is to develop a methodology for indicator selection, we focus on the second variant. The main report, supported by this document,, presents the guideline for application of this variant in the context of the consultant engineering sector.

3.4.4 Additional considerations

When settling on the final set of SDG indicators for each SDG included in the assessment it might be useful to consider the desirability of deriving a core set of mandatory indicators at sectoral level, which are common for all companies, and a set of more optional company-specific indicators that are freer for selection and linked to the company. This was also proposed by SDG guidelines from UNCTAD, suggesting that the selected core indicators should be common to any business, while it remains up to the company whether to provide additional information (i.e. indicators) to reflect more company-specific practices and needs related to the SDGs[28]. Having such a differentiation enables both i) comparability between projects and companies and transparency about what is assessed for which SDG and ii) provides the flexibility to the company to add any additional indicators that are more linked to their activities.

Core indicators
The methodology suggested in the current report is intended for defining such common practice for selecting SDG indicators. However, for the core set of indicator to be fully effective, it would require the development of a common standard for SDG indicators at company level, or a consensus based set of indicators within different sectors. The methodology proposed in this report can be used as basis for such development. Results/effect indicators!

Company-specific indicators
Waiting for the development of a core set of indicators that adhere to some stricter requirements or agreed standards within the field or sector of consideration, does not prevent the user to complement the assessment with company-specific indicators. It can be helpful for companies/projects to have such indicators that are less restricted to overarching requirements and have a better link to the project. However, it is still very important to keep a high level of transparency about the selection of indicators. For company-specific purposes, we recommend that such indicators be used solely for internal communication and target setting, not for external benchmarking. leading/driver/cause!

Chapter 4. Additional supporting tables

4.1 Translation of goals to project level

The following tables aims at identifying and summarising the main aspects to cover within the four SDGs (i.e. SDG5, 7, 12, and 13). When selecting proper indicators for each SDG, it is important to know what should be targeted, thus getting an overview of the aspects an a detailed definition of the goal that should be targeted it necessary for selecting good indicators.

Table A1. Example of identifying main aspects of SDG 5 based on goal and target definition.

SDG goal and targets	Identified topics/aspects
SDG 5: Achieve gender equality and empower all women and girls	→ **Gender equality and empowerment**
5.1 End all forms of discrimination against all women and girls everywhere	→ **Discrimination of women and girls in all forms**
5.2 Eliminate all forms of violence against all women and girls in the public and private spheres, including trafficking and sexual and other types of exploitation	→ **Violence against women and girls** → **Trafficking and exploitation**
5.3 Eliminate all harmful practices, such as child, early and forced marriage and female genital mutilation	→ **harmful practices (e.g. child marriage)**
5.4 Recognize and value unpaid care and domestic work through the provision of public services, infrastructure and social protection policies and the promotion of shared responsibility within the household and the family as nationally appropriate	→ **Value unpaid care and domestic work** → **Public services and infrastructure** → **Promote shared responsibilities in households**
5.5 Ensure women's full and effective participation and equal opportunities for leadership at all levels of decisionmaking in political, economic and public life	→ **Women's participation in leadership**
5.6 Ensure universal access to sexual and reproductive health and reproductive rights as agreed in accordance with the Programme of Action of the International Conference on Population and Development and the Beijing Platform for Action and the outcome documents of their review conferences	→ **Universal rights regarding sexual and reproductive health**

Table A2. Example of identifying main aspects of SDG 7 based on goal and target definition.

SDG goal and targets	Identified topics/aspects
SDG 7: Ensure access to affordable, reliable, sustainable and modern energy for all	→ **Affordable energy and access for all** → **Reliable energy**

SDG goal and targets	Identified topics/aspects
	→ **Sustainable energy**
7.1 By 2030, ensure universal access to affordable, reliable and modern energy services	→ **Energy access for all** → **Affordable, reliable and clean energy**
7.2 By 2030, increase substantially the share of renewable energy in the global energy mix	→ **Renewable energy**
7.3 By 2030, double the global rate of improvement in energy efficiency	→ **Energy efficiency**

Table A3. Example of identifying main aspects of SDG 12 based on goal and target definition.

SDG goal and targets	Identified topics/aspects
SDG 12: Ensure sustainable consumption and production patterns	→ **Sustainable production** → **Sustainable consumption**
12.1 Implement the 10-Year Framework of Programmes on Sustainable Consumption and Production Patterns, all countries taking action, with developed countries taking the lead, taking into account the development and capabilities of developing countries	→ **Implement programmes/strategies on sustainable consumption and production practices**
12.2 By 2030, achieve the sustainable management and efficient use of natural resources	→ **Sustainable management of resources** → **Efficient use of natural resources**
12.3 By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses	→ **Half food waste** → **Reduce food losses**
12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment	→ **environmentally sound handling of chemicals and wastes** → **Reduce chemical substance emissions to air, water and soil**

SDG goal and targets	Identified topics/aspects
12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse	→ **Reduce waste generation (prevent, reduce, recycle, reuse)**
12.6 Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle	→ **Sustainable practices** → **Report on sustainability information**
12.7 Promote public procurement practices that are sustainable, in accordance with national policies and priorities	→ **Sustainable public procurement practices**
12.8 By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature	→ **information and awareness for sustainable development and lifestyles**

Table A4. Example of identifying main aspects of SDG 13.

SDG goal and targets	Identified topics/aspects
SDG 13: Take urgent action to combat climate change and its impacts	→ **Urgent action**
13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	→ **Resilience and capacity building**
13.2 Integrate climate change measures into national policies, strategies and planning	→ **Climate change measures in strategies and policies**
13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	→ **Awareness raising on adaptation, mitigation and early warning**

Table A5. Assessing SDG 5 against indicator selection criteria

Target	UN indicator	Comments
5.1 End all forms of discrimination against all women and girls everywhere	5.1.1 Whether or not legal frameworks are in place to promote, enforce and monitor equality and non-discrimination on the basis of sex	This target is very broad and may be covered in many different ways. Related to a project, much effort must be put on assessing the relevance and possible coherence by searching for key aspects of possible discrimination. Suggestion: Look at working environment violation records from the companies behind the project or in similar organisations to get hints on possible agendas. The UN indicator is purely regulatory and cannot be used at project level. However, the indicator advises us to enforce regulation and adopt principles from it into the project organisation structure.
5.2 Eliminate all forms of violence against all women and girls in the public and private spheres, including trafficking and sexual and other types of exploitation	5.2.1 Proportion of ever-partnered women and girls aged 15 years and older subjected to physical, sexual or psychological violence by a current or former intimate partner in the previous 12 months, by form of violence and by age 5.2.2 Proportion of women and girls aged 15 years and older subjected to sexual violence by persons other than an intimate partner in the previous 12 months, by age and place of occurrence	At the project level, violence against women is normally out of scope and boundaries, unless it is a case of working environment violation. Thus, this is then an advice to monitor this issue responsibly. Indirectly, this target suggest to look into violence against women around the project, e.g. in the spheres of the employees and by expressing the concern to co-workers and collaboration parties in the project.

Target	UN indicator	Comments
5.3 Eliminate all harmful practices, such as child, early and forced marriage and female genital mutilation	5.3.1 Proportion of women aged 20–24 years who were married or in a union before age 15 and before age 18 5.3.2 Proportion of girls and women aged 15–49 years who have undergone female genital mutilation/cutting, by age	See comment for 5.2.
5.4 Recognize and value unpaid care and domestic work through the provision of public services, infrastructure and social protection policies and the promotion of shared responsibility within the household and the family as nationally appropriate	5.4.1 Proportion of time spent on unpaid domestic and care work, by sex, age and location	See comment for 5.2.
5.5 Ensure women's full and effective participation and equal opportunities for leadership at all levels of decisionmaking in political, economic and public life	5.5.1 Proportion of seats held by women in (a) national parliaments and (b) local governments 5.5.2 Proportion of women in managerial positions	Within the project organisation, it is obvious simply to record the proportion of women in managerial positions. However, it is important to be clear about the definitions of which positions count in and out and other conditions. Furthermore, it may be relevant to consider mechanisms that support women's opportunities to manage a position in politics, which also would contribute to target 5.4. If women are payed hours to manage such positions, an indicator could reveal what difference such initiative makes.
5.6 Ensure universal access to sexual and reproductive health and reproductive	5.6.1 Proportion of women aged 15–49 years who make their own informed decisions	

Target	UN indicator	Comments
rights as agreed in accordance with the Programme of Action of the International Conference on Population and Development and the Beijing Platform for Action and the outcome documents of their review conferences	regarding sexual relations, contraceptive use and reproductive health care 5.6.2 Number of countries with laws and regulations that guarantee full and equal access to women and men aged 15 years and older to sexual and reproductive health care, information and education	

References

1. Brundtland, G. H. *Report of the World Commission on Environment and Development: Our Common Future*. *United Nations* vol. 64 (1987).
2. Danmarks Statistik & 2030-Panelet. *GØR VERDENSMÅL TIL VORES MÅL - 197 danske målepunkter for en mere bæredygtig verden*. (2019).
3. GRI, UNGC & WBCSD. Inventory of Business Tools – SDG Compass. https://sdgcompass.org/business-indicators/ (2020).
4. Almeida, A. C. L. Multi actor multi criteria analysis (MAMCA) as a tool to build indicators and localize sustainable development goal 11 in Brazilian municipalities. *Heliyon* **5**, (2019).
5. Lebacq, T., Baret, P. V. & Stilmant, D. Sustainability indicators for livestock farming. A review. *Agron. Sustain. Dev.* **33**, 311–327 (2013).
6. Bockstaller, C. *et al.* Comparison of methods to assess the sustainability of agricultural systems. A review. *Agron. Sustain. Dev* **29**, 223–235 (2009).
7. Waniak-Michalak, H., Sapkauskiene, A. & Leitoniene, S. Do companies manipulate CSR information to retain legitimacy? *Eng. Econ.* **29**, 352–360 (2018).
8. Sachs, J., Kroll, C., Lafortune, G., Fuller, G. & Woelm, F. *Sustainable Development Report 2021*. *Sustainable Development Report 2021* (2021). doi:10.1017/9781009106559.
9. Sustainable Development Solutions Network. Indicators and a Monitoring Framework for the Sustainable Development Goals: Launching a data revolution for the SDGs. *A Rep. by Leadersh. Counc. Sustain. Dev. Solut. Netw.* 160 (2015).
10. SDG Compass. The guide for business action on the SDGs. 30 (2016).
11. Steffen, W. *et al.* Planetary boundaries: Guiding human development on a changing planet. *Science (80-.).* **347**, (2015).
12. Science Based Targets. About Us - Science Based Targets. https://sciencebasedtargets.org/about-us (2022).
13. European Union. /43/EC and Directive 2013/34/EU, as regards corporate sustainability reporting (Text with EEA relevance).
14. Bratt, C., Hallstedt, S., Robèrt, K. H., Broman, G. & Oldmark, J. Assessment of eco-labelling criteria development from a strategic sustainability perspective. *J. Clean. Prod.* **19**, 1631–1638 (2011).
15. George T. Doran. There's a S.M.A.R.T. way to write managements' goals and objectives. *Manage. Rev.* **70**, 35–36 (1981).
16. Gebara, C. H., Thammaraksa, C., Hauschild, M. & Laurent, A. Selecting indicators for measuring progress towards sustainable development goals at the global, national and corporate levels. *Sustain. Prod. Consum.* **44**, 151–165 (2024).
17. Mazzi, A. Introduction. Life cycle thinking. in *Life Cycle Sustainability Assessment for Decision-Making: Methodologies and Case Studies* 1–19 (Elsevier, 2019). doi:10.1016/B978-0-12-818355-7.00001-4.
18. Unep & Setac. What is Life Cycle Thinking? | Life Cycle Initiative. 1–5 https://www.lifecycleinitiative.org/starting-life-cycle-thinking/what-is-life-cycle-thinking/ (2013).
19. Bjørn, A., Margni, M., Roy, P. O., Bulle, C. & Hauschild, M. Z. A proposal to measure absolute environmental sustainability in life cycle assessment. *Ecol. Indic.* **63**, 1–13 (2016).
20. IPCC. *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]*. (2014).
21. Joly, C. A. The Kunming-Montréal Global Biodiversity Framework. *Biota Neotrop.* **22**, 1–14 (2022).
22. Raworth, K. A safe and just space for humanity: can we live within the doughnut? Oxfam Discussion Paper. *State of the World 2003: Progress Towards a Sustainable Society:*

20th Edition 1–240 (2012).
23. Niemeijer, D. & de Groot, R. S. A conceptual framework for selecting environmental indicator sets. *Ecol. Indic.* **8**, 14–25 (2008).
24. Hák, T., Janoušková, S. & Moldan, B. Sustainable Development Goals: A need for relevant indicators. *Ecol. Indic.* **60**, 565–573 (2016).
25. Mascarenhas, A., Ramos, T. B. & Nunes, L. Developing an integrated approach for the strategic monitoring of regional spatial plans. *Land use policy* **29**, 641–651 (2012).
26. Tanguay, G. A., Rajaonson, J. & Therrien, M. C. Sustainable tourism indicators: Selection criteria for policy implementation and scientific recognition. *J. Sustain. Tour.* **21**, 862–879 (2013).
27. Twining-Ward, L. & Butler, R. Implementing std on a small island: Development and use of sustainable tourism development indicators in samoa. *J. Sustain. Tour.* **10**, 363–387 (2002).
28. UNCTAD. *Guidance on Core Indicators for Entity Reporting on Contribution Towards Implementation of the Sustainable Development Goals*. (2019) doi:10.18356/1902575e-en.