



Life cycle assessment: Development and evolution of methods for addressing health and environmental life-cycle impacts

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Abstract Book

Society of Environmental Toxicology and Chemistry
North America 40th Annual Meeting

Great Together: Separate Challenges and Collective Solutions
3-7 November 2019 | Toronto, Ontario, Canada



Behind each ERA is a decision problem. Better correspondence between decision analysis and ERA will lead to improved risk assessments and information for managing environmental stressors.

101 SETAC's role in establishing the science foundation behind life cycle assessment

J.A. Fava, Anthesis

In 1990, the Society of Environmental Toxicology and Chemistry (SETAC) sponsored an international Pellston workshop (in Smugglers Notch, Vermont, USA) where the term 'Life cycle assessment' was coined. SETAC (NA and Europe) and its global members played key on-going and global roles in the continued advancement of the understanding and use of the LCA framework, methodology, and data through effort through a) SETAC's own LCA advisory groups, b) establishment and development of the International Organization for Standardization (ISO) - life cycle assessment standards, TC-207 - SC5 on Life cycle assessment, and c) co-founded the UNEP/SETAC Life cycle Initiative. As SETAC grew and expanded on its own and with its supporters and partners, it continues to advance the understanding and use of LCA while ensuring that science is kept at the forefront of LCA development. The presentation will outline the key roles that SETAC has played in establishing the scientific foundation for LCA.

102 Life Cycle Assessment: Development and Evolution of Methods for Addressing Health and Environmental Life-Cycle Impacts

O. Jolliet, University of Michigan; T.E. McKone, University of California / School of Public Health; P. Fantke, Technical University of Denmark / Quantitative Sustainability Assessment Division; B.W. Vigon, Breveja Environmental Consulting, LLC

Life Cycle Assessment (LCA) aims to compare environmental impacts of products and services on a functional basis. With life-cycle inventories established, LCA must provide in its Life Cycle Impact Assessment (LCIA) phase impact factors per kg of chemical emission/extracted resources, expressed in term of impacts on human health, ecosystem quality, or resources depletion. In this presentation, we track the development and evolution of LCIA methods over three decades and focus on the role of SETAC in collaboration with the United Nations Environment Program in forming the Life-Cycle Initiative to establish, interpret, and disseminate a globally harmonized LCIA approach. The Initiative has hosted a series of complementary efforts for LCIA consensus building, striving for recommendations and guidance on LCIA methods and factors. SETAC conferences and Pellston Workshops have provided important venues for the Initiative process. Three rounds of SETAC working groups have resulted in category-specific recommendations for developing LCIA impact indicators, taking advantage of broader consensus efforts, such as the World Health Organization, USEPA, and EU health risk assessment efforts. A combination of academic, government, and industry experts have participated in these efforts. As an informative example we will review the development and dissemination of the USEtox global scientific consensus model, which provides LCIA characterization factors for human toxicity and ecotoxicity, and which is now used worldwide. It is the default tool in both the European Union and North America. We conclude by considering future needs and opportunities for LCIA with a focus on the continuing role of SETAC.

103 Panel Discussion on Past Successes and Future Needs in Risk and Life Cycle Assessment

B.W. Vigon, Breveja Environmental Consulting, LLC; E.J. Dorward-King, Newmont Mining Corporation / Sustainability and External Relations

A spotlight session at the 40th Annual Meeting of the Society of Environmental Toxicology and Chemistry (SETAC) represents an opportunity to reflect on our progress, consider the current state of the science, and look to the future. There will be two panel discussions during this session: this one from the morning session and one from the afternoon session reflecting talks in environmental fate and modeling, aquatic

toxicology, and terrestrial and wildlife toxicology. The six representative speakers and several invited guests will participate in the panel discussion to allow questions and interaction with the SETAC audience. The speakers will address development of the science and application of risk assessment and life cycle assessment, particularly highlighting SETAC contributions over the past four decades, will evaluate and address the current state of play and will give perspectives on future scientific needs that could be encouraged through SETAC. This is an excellent opportunity for coordinated discussions from the audience with key leaders in the field that represent long-standing contributions to the science and application development RA and LCA. We believe this session and the discussion panel will be of historical significance since some of the participants in this panel will represent expertise in RA and LCA and involvement in SETAC in these areas for decades. We welcome SETAC members and guests to join us for this anticipated and very interesting panel discussion where they will have the opportunity to ask questions and interact with significant leaders in our fields of science.

Mollusca Toxicology: An Ecologically Important and Imperiled Phyla but Often Left Out

104 Assessing the efficacy of EarthTec QZ for controlling *Bithynia tentaculata* populations in the Upper Mississippi River

A. Galbraith, N. Carmosini, University of Wisconsin, La Crosse / Chemistry & Biochemistry; G. Sandland, University of Wisconsin, La Crosse / Biology

The invasive freshwater snail species, *Bithynia tentaculata*, has become a growing concern to the Great Lakes and Mississippi River Regions since its introduction from Europe in the late 1800s. *Bithynia tentaculata* is a carrier of multiple parasites that have caused the death of over 200,000 waterfowl since 2002. Because of this, and due to the fact that the species may be outcompeting native species, there has been great interest in identifying strategies that mitigate the spread of this snail and its associated parasites. For this project, we conducted two separate laboratory studies that assessed the effectiveness of a novel copper-based molluscicide, EarthTec QZ, on our target species, *B. tentaculata*. In the first study we compared the effects of two concentrations of EarthTec QZ on the adult life stage of *B. tentaculata* and a coexisting native snail species, *Physa gyrina*. Upon completion of this study, we observed that *B. tentaculata* adults were better able to persist at higher concentrations of Cu^{2+} (the active ingredient of EarthTec QZ) than their native counterparts. We also found that female *B. tentaculata* experienced higher mortality than males after exposure to the compound, which may generate consequences for local populations of this species. In the second study, we conducted LC50 experiments on the adult life stage of the two snail species in which we identified the EarthTec QZ concentrations required to eradicate 50% of a population of exposed adult *B. tentaculata* and 50% of a population of exposed adult *Physa gyrina*. Together, our results demonstrate that Earthtec QZ holds potential for *B. tentaculata* control, but further work needs to be conducted in order to minimize the negative effects of this compound on non-target, native species.

105 Ecotoxicological Consequences of the Invasive Apple Snail *Pomacea maculata* in Louisiana wetlands

S. Banerjee, P.L. Klerks, University of Louisiana, Lafayette / Department of Biology

The apple snail *Pomacea maculata* is an invasive species that has recently been introduced and is now present in several marsh areas in the southern United States. The introduction and range expansion of this species are bound to have a variety of ecotoxicological consequences, including possible changes in the biogeochemical cycling of metals. Such changes can result from diverse activities of the snail including feeding by pedal surface collecting from the water column, benthic grazing and sediment resuspension, and herbivory. In addition, fecal matter deposition on the sediment surface can enhance metal flux from water column to the