

# A Life Cycle Analysis Model And Decision Support Tool For

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*Life Cycle Assessment Handbook* - Mary Ann Curran 2012-11-07

The first book of its kind, the LCA Handbook will become an invaluable resource for environmentally progressive manufacturers and suppliers, product and process designers, executives and managers, and government officials who want to learn about this essential component of environmental sustainability. [Environmental Life Cycle Assessment of Goods and Services](#) - Chris T. Hendrickson 2010-09-30  
Environmental life cycle assessment is often thought of as cradle to grave and therefore as the most complete accounting of the environmental costs and benefits of a product or service. However, as anyone who has done an environmental life cycle assessment knows, existing tools have many problems: data is difficult to assemble and life cycle studies take months of effort. A truly comprehensive analysis is prohibitive, so analysts are often forced to simply ignore many facets of life cycle impacts. But the focus on one aspect of a product or service can result in misleading indications if that aspect is benign while other aspects pollute or are otherwise unsustainable. This book summarizes the EIO-LCA method, explains its use in relation to other life cycle assessment models, and provides sample applications and extensions of the model into novel areas. A final chapter explains the free, easy-to-use software tool available on a companion website. ([www.eiolca.net](http://www.eiolca.net)) The software tool provides a wealth of data, summarizing the current U.S. economy in 500 sectors with information on energy and materials use, pollution and greenhouse gas discharges, and other attributes like associated occupational deaths and injuries. The joint project of twelve faculty members and over 20 students working together over the past ten years at the Green Design Institute of Carnegie Mellon University, the EIO-LCA has been applied to a wide range of products and services. It will prove useful for research, industry, and in economics, engineering, or interdisciplinary classes in green design.

**Sustainability Assessment at the 21st Century** - Maria Jose Bastante-Ceca 2020

[Wells to Wire](#) - Sarah Marie Jordaan 2021-07-08

This book presents an unbiased, comprehensive examination of the state of knowledge for life cycle assessments (LCAs) of natural gas-fired electricity, covering a suite of environmental impact categories. An exploration of the life cycle environmental impacts of gas-fired electricity is used to introduce the field of LCA, advancements in methods and data, and the limitations thereof. Natural gas, particularly as a fuel for electricity generation, serves as a dichotomy within energy and environmental systems analysis. While the cleanest burning fossil fuel, it is not without impacts, making it an excellent case study for introducing life cycle assessment. This book introduces readers to the field of LCA using natural gas-fired electricity as a case study, as well as providing a comprehensive review of the state of the art in life cycle data, research, and scientific debate related to this product system. The author also elucidates data and methodological challenges inherent to the field of LCA, exemplified using published research. The text explores how to conduct LCA, describing the analysis from the perspective of a numerator and denominator. With each chapter, the complexity of undertaking a LCA of gas-fired power is unravelled beyond a simple fraction to the expansive network of infrastructure examined in this type of research. Students, instructors, LCA practitioners, and energy professionals will benefit from not only the introduction to data and methods, but also this useful summary of the state of the art in the field. Policymakers and the interested public can learn more about the implications of LCA results for decision-support and the commentary about the economics

of natural gas and its role as a bridge fuel. This book provides not only a useful reference, but also a springboard for researchers and experts interested in specializing in LCA, natural gas, or both.

**Life Cycle Assessment** - Michael Z. Hauschild 2017-09-01

This book is a uniquely pedagogical while still comprehensive state-of-the-art description of LCA-methodology and its broad range of applications. The five parts of the book conveniently provide: I) the history and context of Life Cycle Assessment (LCA) with its central role as quantitative and scientifically-based tool supporting society's transitioning towards a sustainable economy; II) all there is to know about LCA methodology illustrated by a red-thread example which evolves as the reader advances; III) a wealth of information on a broad range of LCA applications with dedicated chapters on policy development, prospective LCA, life cycle management, waste, energy, construction and building, nanotechnology, agrifood, transport, and LCA-related concepts such as footprinting, ecolabelling, design for environment, and cradle to cradle. IV) A cookbook giving the reader recipes for all the concrete actions needed to perform an LCA. V) An appendix with an LCA report template, a full example LCA report serving as inspiration for students who write their first LCA report, and a more detailed overview of existing LCIA methods and their similarities and differences.

**Gaseous Carbon Waste Streams Utilization** - National Academies of Sciences, Engineering, and Medicine 2019-02-22

In the quest to mitigate the buildup of greenhouse gases in Earth's atmosphere, researchers and policymakers have increasingly turned their attention to techniques for capturing greenhouse gases such as carbon dioxide and methane, either from the locations where they are emitted or directly from the atmosphere. Once captured, these gases can be stored or put to use. While both carbon storage and carbon utilization have costs, utilization offers the opportunity to recover some of the cost and even generate economic value. While current carbon utilization projects operate at a relatively small scale, some estimates suggest the market for waste carbon-derived products could grow to hundreds of billions of dollars within a few decades, utilizing several thousand teragrams of waste carbon gases per year. *Gaseous Carbon Waste Streams Utilization: Status and Research Needs* assesses research and development needs relevant to understanding and improving the commercial viability of waste carbon utilization technologies and defines a research agenda to address key challenges. The report is intended to help inform decision making surrounding the development and deployment of waste carbon utilization technologies under a variety of circumstances, whether motivated by a goal to improve processes for making carbon-based products, to generate revenue, or to achieve environmental goals.

**Life Cycle Sustainability Assessment for Decision-Making** - Jingzheng Ren 2019-12-04

*Life Cycle Sustainability Assessment for Decision-Making: Methodologies and Case Studies* gives readers a comprehensive introduction to life cycle sustainability assessment (LCSA) methodology for sustainability measurement of industrial systems, proposing an efficiency methodology for stakeholders and decision-makers. Featuring the latest methods and case studies, the book will assist researchers in environmental sciences and energy to develop the best methods for LCA, as well as aiding those practitioners who are responsible for making decisions for promoting sustainable development. The past, current status and future of LCSA, Life Cycle Assessment method (LCA), Life Cycle Costing (LCC), Social Life Cycle Assessment (SLCA), the methodology of LCSA, typical LCSA case studies, limitations of LCSA, and life cycle

aggregated sustainability index methods are all covered in this multidisciplinary book. Includes models for assessing sustainability in environmental, energy engineering and economic scenarios Features case studies that help define the advantages and obstacles of real world applications Presents a complete view, from theory to practice, of a life cycle approach by exploring the methods and tools of sustainability assessment, analysis and design of sustainability assessment

**Life Cycle Assessment for Sustainable Mining** - Shahjadi Hisan Farjana 2021-01-14

Life Cycle Assessment for Sustainable Mining addresses sustainable mining issues based on life cycle assessment, providing a thorough guide to implementing LCAs using sustainability metrics. The book details current research on LCA methodologies related to mining, their outcomes, and how to relate sustainable mining concepts in a circular economy. It is an in-depth, foundational reference for developing ideas for technological advancement through designing reduced-emission mining equipment or processes. It includes literature reviews and theoretical concepts of life cycle assessments applied in mining industries, sustainability metrics and problems related to mining and mineral processing industries identified by the life cycle assessment results. This book will aid researchers, students and academics in the field of environmental science, mining engineering and sustainability to see LCA technology outcomes which would be useful for the future development of environmentally-friendly mining processes. Details state-of-the-art life cycle assessment theory and practices applied in the mining and mineral processing industries Includes in-depth, practical case studies outlined with life cycle assessment results to show future pathways for sustainability enhancement Provides fundamental knowledge on how to measure sustainability metrics using life cycle assessment in mining industries

**Measures of Environmental Performance and Ecosystem Condition** - National Academy of Engineering 1999-05-19

When Cleveland's Cuyahoga River caught fire in 1969, no environmental measurements were necessary to know the seriousness of the problem. Incidents like the Cuyahoga fire raise an important question: Can catastrophes-in-the-making be detected early enough to be prevented? For those in industry, such disasters point to the need for measures that can improve the environmental performance of processes, products, business practices, and linked industrial systems. In Measures of Environmental Performance and Ecosystem Condition, experts share their insights on environmental metrics. The volume explores the most productive relationship between measures of environmental performance and measures of ecosystem conditions. It reviews current approaches, evaluates structures for business decisionmaking, and includes a matrix for determining the environmental performance of industrial facilities. Case studies include: Development and application of a water-quality rating scheme for streams and reservoirs in the Tennessee Valley. Three years of successful experience with waste metrics at 3M. The book covers the range of environmental performance and condition metrics, from the use of material flow data to monitor environmental performance at the national level to the use of bioassays to measure the toxicity of industrial effluents. This book offers something for everyone--policymakers, executives, engineers, managers, and advocates--with a stake in the measurement of environmental performance and ecological conditions.

**Handbook on Life Cycle Assessment** - Jeroen B. Guinée 2006-04-11

Environmental policy aims at the transition to sustainable production and consumption. This is taking place in different ways and at different levels. In cases where businesses are continuously active to improve the environmental performance of their products and activities, the availability of knowledge on environmental impacts is indispensable. The integrated assessment of all environmental impacts from cradle to grave is the basis for many decisions relating to achieving improved products and services. The assessment tool most widely used for this is the environmental Life Cycle Assessment, or LCA. Before you is the new Handbook of LCA replacing the previous edition of 1992. New developments in LCA methodology from all over the world have been discussed and, where possible, included in this new Handbook. Integration of all developments into a new, consistent method has been the main aim for the new Handbook. The thinking on environment and sustainability is, however, quickly evolving so that it is already clear now that this new LCA Handbook does not embrace the very latest developments. Therefore, further revisions will have to take place in the future. A major advantage of this Handbook is that it now also advises which procedures should be followed to achieve adequate, relevant and accepted results. Furthermore, the distinction

between detailed and simplified LCA makes this Handbook more broadly applicable, while guidance is provided as to which additional information can be relevant for specialised applications.

**Life Cycle Management** - Guido Sonnemann 2015-07-16

This book provides insight into the Life Cycle Management (LCM) concept and the progress in its implementation. LCM is a management concept applied in industrial and service sectors to improve products and services, while enhancing the overall sustainability performance of business and its value chains. In this regard, LCM is an opportunity to differentiate through sustainability performance on the market place, working with all departments of a company such as research and development, procurement and marketing, and to enhance the collaboration with stakeholders along a company's value chain. LCM is used beyond short-term business success and aims at long-term achievements by minimizing environmental and socio-economic burden, while maximizing economic and social value.

**New Frontiers on Life Cycle Assessment** - Antonella Petrillo 2019-06-05

The purpose of this book is to collect a high-quality selection of contemporary research articles on life cycle perspectives when we want to assess and predict the sustainability of solutions that lie in front of us. The book focuses on methodologies and tools used for life cycle sustainability management covering environmental, social, and economic aspects in business practices, including modeling and simulation-based approaches. In particular, the book aims to collect research, applications, and case studies in the field of environmental analysis and industrial ecology, with a focus on how to assess contributions to increase resource efficiency and reduce environmental impact on production and service systems in a life cycle perspective (raw material extraction, production, use, and end-of-life management). This book is intended to be a useful resource for anyone who deals with this issue.

**Goal and Scope Definition in Life Cycle Assessment** - Mary Ann Curran 2016-09-22

This book describes the importance of the goal and scope phase for the entire LCA study. In this first phase of the LCA framework (ISO standardized), the purpose of the assessment is defined and decisions are made about the details of the industrial system being studied and how the study will be conducted. Selecting impact categories, category indicators, characterization models, and peer review is decided during goal and scope definition. The book provides practical guidance and an overview of LCIA methods available in LCA software. Although not specified in the ISO standards, Attributional LCA and Consequential LCA are presented in order to appropriately determine the goal and scope of an assessment. The book closes with the interconnection between goal and scope definition and the interpretation phase. Example goal and scope documents for attributional and consequential LCAs are provided in the annexes.

**Life Cycle Assessment** - Kun-Mo Lee 2004

**Life Cycle Assessment of Energy Systems** - Guillermo San Miguel 2021-04-14

This Special Issue on "LCA of Energy Systems" contains inspiring contributions on assessing the sustainability of novel technologies destined to shape the future of our energy sector. These include battery-based and plug-in hybrid electric vehicles, geothermal energy, hydropower, biomass gasification, national electricity systems, and waste incineration. The analysis of trends and singularities will be invaluable to product designers, engineers, and policy makers. Furthermore, these exercises also contribute to refining the life cycle framework and harmonizing methodological decisions. Our hope is that this should be a step toward promoting the use of science and knowledge to shape a better world for everyone.

**Perspectives in Life Cycle Impact Assessment** - Patrick Hofstetter 1998-11-30

Perspectives in Life Cycle Impact Assessment: A Structured Approach to Combine Models of the Technosphere, Ecosphere, and Valuesphere presents a proposal for a second generation framework and method for Life Cycle Impact Assessment. Many of the suggested elements are either based on other tools for environmental analysis, e.g. risk assessment, or fit in well with tools and concepts such as industrial ecology, technology assessment, or environmental impact assessment. The research presented in this book goes beyond the scope of presently used methods for Life Cycle Assessment and may stimulate new developments in a variety of areas.

**Designing Sustainable Technologies, Products and Policies** - Enrico Benetto 2018-07-03

This open access book provides insight into the implementation of Life Cycle approaches along the entire business value chain, supporting environmental, social and economic sustainability related to the development of industrial technologies, products, services and policies; and the development and management of smart agricultural systems, smart mobility systems, urban infrastructures and energy for the built environment. The book is based on papers presented at the 8th International Life Cycle Management Conference that took place from September 3-6, 2017 in Luxembourg, and which was organized by the Luxembourg Institute of Science and Technology (LIST) and the University of Luxembourg in the framework of the LCM Conference Series.

**Pavement, Roadway, and Bridge Life Cycle Assessment 2020** - John Harvey 2020-05-30

An increasing number of agencies, academic institutes, and governmental and industrial bodies are embracing the principles of sustainability in managing their activities. Life Cycle Assessment (LCA) is an approach developed to provide decision support regarding the environmental impact of industrial processes and products. LCA is a field with ongoing research, development and improvement and is being implemented world-wide, particularly in the areas of pavement, roadways and bridges. Pavement, Roadway, and Bridge Life Cycle Assessment 2020 contains the contributions to the International Symposium on Pavement, Roadway, and Bridge Life Cycle Assessment 2020 (Davis, CA, USA, June 3-6, 2020) covering research and practical issues related to pavement, roadway and bridge LCA, including data and tools, asset management, environmental product declarations, procurement, planning, vehicle interaction, and impact of materials, structure, and construction. Pavement, Roadway, and Bridge Life Cycle Assessment 2020 will be of interest to researchers, professionals, and policymakers in academia, industry, and government who are interested in the sustainability of pavements, roadways and bridges.

**Life Cycle Assessment in Industry and Business** - Paolo Frankl 1999-11-26

1.1 Life Cycle Assessment (LeA): a fascinating and sophisticated tool The greening of the economy is not a new task, but it is a challenge for which a lot of tasks still have to be done. It is known that the main source of environmental deterioration by industry is not any more the chimneys and other process related emissions, but the products and services produced. Products are regarded as carriers of pollution: they are not only a potential source of pollution and waste during their use; they are also a cause of resource depletion, energy consumption, and emissions during their life starting with the extraction of the raw materials and ending with their disposal (i.e. connecting production and consumption stages). The challenge of these decades is now the greening of products and services. The new focus on products (cp. Oosterhuis/Rubik/Schol 1996) was introduced as a policy approach of shared responsibility in which different actors are involved along the life-cycle of a product, each having specific responsibilities.

**Guidelines for Social Life Cycle Assessment of Products** - United Nations Environment Programme 2009

The Guidelines for Social Life Cycle Assessment of Products provides a map, a skeleton and a flash light for stakeholders engaging in the assessment of social and socio-economic impacts of products life cycle. The map describes the context, the key concepts, the broader field in which tools and techniques are getting developed and their scope of application. The skeleton presents key elements to consider and provide guidance for the goal and scope, inventory, impact assessment and interpretation phases of a social life cycle assessment. The flash light highlights areas where further research is needed. Social Life Cycle Assessment is a technique available to account for stories and inform systematically on impacts that otherwise would be lost in the vast and fast moving sea of our modern world. May it help stakeholders to effectively and efficiently engage to improve social and socio-economic conditions of production and consumption

*Life-Cycle Assessment* - Battelle Memorial Institute 2020-09-11

Life-Cycle Assessment presents a brief overview of the development of the life-cycle assessment process and develops guidelines and principles for implementation of a product life-cycle inventory analysis. The book describes inventory analysis, impact analysis, and improvement analysis—the three components of a product life-cycle assessment. It discusses the major stages in a life cycle, including raw materials acquisition, materials manufacture, final product fabrication, filling/packaging/distribution, and consumer use and disposal.

Environmental Life Cycle Assessment (Open Access) - Olivier Jolliet 2015-11-18

Environmental Life Cycle Assessment is a pivotal guide to identifying environmental problems and reducing related impacts for companies and organizations in need of life cycle assessment (LCA). LCA, a unique sustainability tool, provides a framework that addresses a growing demand for practical technological solutions. Detailing each phase of the LCA methodology, this textbook covers the historical development of LCA, presents the general principles and characteristics of LCA, and outlines the corresponding standards for good practice determined by the International Organization for Standardization. It also explains how to identify the critical aspects of an LCA, provides detailed examples of LCA analysis and applications, and includes illustrated problems and solutions with concrete examples from water management, electronics, packaging, automotive, and other industries. In addition, readers will learn how to: Use consistent criteria to realize and evaluate an LCA independently of individual interests Understand the LCA methodology and become familiar with existing databases and methods based on the latest results of international research Analyze and critique a completed LCA Apply LCA methodology to simple case studies Geared toward graduate and undergraduate students studying environmental science and industrial ecology, as well as practicing environmental engineers, and sustainability professionals who want to teach themselves LCA good practices, Environmental Life Cycle Assessment demonstrates how to conduct environmental assessments for products throughout their life cycles. It presents existing methods and recent developments in the growing field of LCA and systematically covers goal and system definition, life cycle inventory, life cycle impact assessment, and interpretation.

*Integrated Life-Cycle and Risk Assessment for Industrial Processes and Products* - Guido Sonnemann 2018-10-10

Life-cycle assessment is a methodology used to evaluate the environmental impacts of a product, process, or service during its life cycle, and risk assessment is a tool to evaluate potential hazards to human health and the environment introduced by pollutant emissions. The United Nations Sustainable Development Goals call for, among other objectives, responsible consumption and production by decoupling environmental resource use and environmental impacts from economic growth and human well-being. Life-cycle assessment and risk assessment are both analytical system approaches that allow scientists and other decision makers to address these issues and objectives according to the current understanding of environmental mechanisms. This book is the first attempt to illustrate the existing interfaces between life-cycle assessment and risk assessment and to indicate options for further integration of both tools. The second edition: Focuses on sustainability Considers new developments in life-cycle assessment and environmental risk assessment over the last ten years at the international level Introduces broader concepts and discussions on integrative versus the complementary use of life-cycle and risk assessments Extends the scope of integrated life-cycle and risk assessments to critical raw materials Includes more case studies and discusses engineered nanomaterials Featuring contributions from leading experts, Integrated Life-Cycle and Risk Assessment for Industrial Processes and Products is a great reference for graduate students and professionals in environmental management and intends to catalyze communication between life-cycle assessment and risk assessment experts and scientists in academia, industry, and governmental agencies. The practical format of the book—illustrated with flowcharts, examples, exercises, and concrete applications—makes it a useful manual for analyzing situations and making decisions.

Life Cycle Impact Assessment - Michael Z. Hauschild 2015-03-24

This book offers a detailed presentation of the principles and practice of life cycle impact assessment. As a volume of the LCA compendium, the book is structured according to the LCIA framework developed by the International Organisation for Standardisation (ISO) passing through the phases of definition or selection of impact categories, category indicators and characterisation models (Classification); calculation of category indicator results (Characterisation); calculating the magnitude of category indicator results relative to reference information (Normalisation); and converting indicator results of different impact categories by using numerical factors based on value-choices (Weighting). Chapter one offers a historical overview of the development of life cycle impact assessment and presents the boundary conditions and the general principles and constraints of characterisation modelling in LCA. The second chapter outlines the considerations underlying the selection of impact categories and the classification or assignment of

inventory flows into these categories. Chapters three through thirteen explore all the impact categories that are commonly included in LCIA, discussing the characteristics of each followed by a review of midpoint and endpoint characterisation methods, metrics, uncertainties and new developments, and a discussion of research needs. Chapter-length treatment is accorded to Climate Change; Stratospheric Ozone Depletion; Human Toxicity; Particulate Matter Formation; Photochemical Ozone Formation; Ecotoxicity; Acidification; Eutrophication; Land Use; Water Use; and Abiotic Resource Use. The final two chapters map out the optional LCIA steps of Normalisation and Weighting.

Life Cycle Analysis and Assessment in Civil Engineering: Towards an Integrated Vision - Robby Caspeele 2018-09-14

This volume contains the papers presented at IALCCE 2018, the Sixth International Symposium on Life-Cycle Civil Engineering, to be held in Ghent, Belgium, October 28-31, 2018. It consists of a book of extended abstracts and a DVD with full papers including the Fazlur R. Khan lecture, keynote lectures, and technical papers from all over the world. All major aspects of life-cycle engineering are addressed, with special focus on structural damage processes, life-cycle design, inspection, monitoring, assessment, maintenance and rehabilitation, life-cycle cost of structures and infrastructures, life-cycle performance of special structures, and life-cycle oriented computational tools. The aim of the editors is to provide a valuable source for anyone interested in life-cycle of civil infrastructure systems, including students, researchers and practitioners from all areas of engineering and industry.

**Addressment of Uncertainty and Variability in Attributional Environmental Life Cycle Assessment** - Vairavan Subramanian 2016

'Attributional' Life Cycle Assessment (LCA) quantitatively tracks the potential environmental impacts of international value chains, in retrospective, while ensuring that burden shifting is avoided. Despite the growing popularity of LCA as a decision-support tool, there are numerous concerns relating to uncertainty and variability in LCA that affects its reliability and credibility. It is pertinent that some part of future research in LCA be guided towards increasing reliability and credibility for decision-making, while utilizing the LCA framework established by ISO 14040. In this dissertation, I have synthesized the present state of knowledge and application of uncertainty and variability in attributional LCA, and contribute to its quantitative assessment. Firstly, the present state of addressment of uncertainty and variability in LCA is consolidated and reviewed. It is evident that sources of uncertainty and variability exist in the following areas: ISO standards, supplementary guides, software tools, life cycle inventory (LCI) databases, all four methodological phases of LCA, and use of LCA information. One source of uncertainty and variability, each, is identified, selected, quantified, and its implications discussed. The use of surrogate LCI data in lieu of missing dataset(s) or data-gaps is a source of uncertainty. Despite the widespread use of surrogate data, there has been no effort to (1) establish any form of guidance for the appropriate selection of surrogate data and, (2) estimate the uncertainty associated with the choice and use of surrogate data. A formal expert elicitation-based methodology to select the most appropriate surrogates and to quantify the associated uncertainty was proposed and implemented. Product-evolution in a non-uniform manner is a source of temporal variability that is presently not considered in LCA modeling. The resulting use of outdated LCA information will lead to misguided decisions affecting the issue at concern and eventually the environment. In order to demonstrate product-evolution within the scope of ISO 14044, and given that variability cannot be reduced, the sources of product-evolution were identified, generalized, analyzed and their implications (individual and coupled) on LCA results are quantified. Finally, recommendations were provided for the advancement of robustness of 'attributional' LCA, with respect to uncertainty and variability.

**Life Cycle Assessment (LCA)** - Allan Astrup Jensen 1998

Life Cycle Assessment

Life Cycle Analysis and Assessment in Civil Engineering: Towards an Integrated Vision - Robby Caspeele 2018-10-31

This volume contains the papers presented at IALCCE2018, the Sixth International Symposium on Life-Cycle Civil Engineering (IALCCE2018), held in Ghent, Belgium, October 28-31, 2018. It consists of a book of extended abstracts and a USB device with full papers including the Fazlur R. Khan lecture, 8 keynote lectures, and 390 technical papers from all over the world. Contributions relate to design, inspection,

assessment, maintenance or optimization in the framework of life-cycle analysis of civil engineering structures and infrastructure systems. Life-cycle aspects that are developed and discussed range from structural safety and durability to sustainability, serviceability, robustness and resilience. Applications relate to buildings, bridges and viaducts, highways and runways, tunnels and underground structures, off-shore and marine structures, dams and hydraulic structures, prefabricated design, infrastructure systems, etc. During the IALCCE2018 conference a particular focus is put on the cross-fertilization between different sub-areas of expertise and the development of an overall vision for life-cycle analysis in civil engineering. The aim of the editors is to provide a valuable source of cutting edge information for anyone interested in life-cycle analysis and assessment in civil engineering, including researchers, practising engineers, consultants, contractors, decision makers and representatives from local authorities.

**Assessing the Environmental Impact of Textiles and the Clothing Supply Chain** - Subramanian Senthilkannan Muthu 2020-03-20

Assessing the Environmental Impact of Textiles and the Clothing Supply Chain, Second Edition, is a fully updated, practical guide on how to identify and respond to environmental challenges across the supply chain. This new edition features updates to important data on environmental impacts and their measurements, the sustainable use of water and electricity, and new legislation, standards and schemes. Chapters provide an introduction to the textile supply chain and an overview of the methods used to measure environmental impacts, including greenhouse gas emissions, water and energy footprints, and a lifecycle assessment (LCA) on environmental impacts. This book will be a standard reference for R&D managers in the textile industry and academic researchers in textile science. Provides a holistic view of the sustainability issues that affect the textile value chain Explains ways to calculate the textile industry's use of resources, its impact on global warming, and the pollution and waste it generates Reviews key methods for the reduction of the environmental impact of textile products and how they are implemented in practice Includes methods for calculating product carbon footprints (PCFs), ecological footprints (EFs) and lifecycle assessments (LCA)

Life Cycle Sustainability Assessment (LCSA) - Subramanian Senthilkannan Muthu 2021-09-21

Environmental Life Cycle Assessment (ELCA) that was developed about three decades ago demands a broadening of its scope to include lifecycle costing and social aspects of life cycle assessment as well, drawing on the three-pillar or 'triple bottom line' model of sustainability, which is the result of the development of the Life Cycle Sustainability Assessment (LCSA). LCSA refers to the evaluation of all environmental, social and economic negative impacts and benefits in decision-making processes towards more sustainable products throughout their life cycle. Combination of environmental and social life cycle assessments along with life cycle costing leads to life cycle sustainability assessment (LCSA). This book highlights various aspects of life cycle sustainability assessment (LCSA).

Life Cycle Assessment - Kathrina Simonen 2014-04-16

Life Cycle Assessment addresses the dynamic and dialectic of building and ecology, presenting the key theories and techniques surrounding the use of life cycle assessment data and methods. Architects and construction professionals must assume greater responsibility in helping building owners to understand the implications of making material, manufacturing, and assemblage decisions and therefore design to accommodate more ecological building. Life Cycle Assessment is a guide for architects, engineers, and builders, presenting the principles and art of performing life cycle impact assessments of materials and whole buildings, including the need to define meaningful goals and objectives and critically evaluate analysis assumptions. As part of the PocketArchitecture Series, the book includes both fundamentals and advanced topics. The book is primarily focused on arming the design and construction professional with the tools necessary to make design decisions regarding life cycle, reuse, and sustainability. As such, the book is a practical text on the concepts and applications of life cycle techniques and environmental impact evaluation in architecture and is presented in language and depth appropriate for building industry professionals.

**Life Cycle Sustainability Assessment for Decision-Making** - Jingzheng Ren 2019-11-19

Life Cycle Sustainability Assessment for Decision-Making: Methodologies and Case Studies gives readers a comprehensive introduction to life cycle sustainability assessment (LCSA) methodology for sustainability

measurement of industrial systems, proposing an efficiency methodology for stakeholders and decision-makers. Featuring the latest methods and case studies, the book will assist researchers in environmental sciences and energy to develop the best methods for LCA, as well as aiding those practitioners who are responsible for making decisions for promoting sustainable development. The past, current status and future of LCSA, Life Cycle Assessment method (LCA), Life Cycle Costing (LCC), Social Life Cycle Assessment (SLCA), the methodology of LCSA, typical LCSA case studies, limitations of LCSA, and life cycle aggregated sustainability index methods are all covered in this multidisciplinary book. Includes models for assessing sustainability in environmental, energy engineering and economic scenarios Features case studies that help define the advantages and obstacles of real world applications Presents a complete view, from theory to practice, of a life cycle approach by exploring the methods and tools of sustainability assessment, analysis and design of sustainability assessment

The Computational Structure of Life Cycle Assessment - R. Heijungs 2002-05-31

Life Cycle assessment (LCA) is a tool for environmental decision-support in relation to products from the cradle to the grave. Until now, more emphasis has been put on the inclusion quantitative models and databases and on the design of guidebooks for applying LCA than on the integrative aspect of combining these models and data. This is a remarkable thing, since LCA in practice deals with thousands of quantitative data items that have to be combined in the correct manner. For this, one needs mathematical rules and algorithmic principles for carrying out an LCA. This book presents the first coherent treatment of the mathematical and algorithmic aspects of LCA. These computational aspects are presented in matrix form, so that a concise and elegant formulation is achieved. This form, moreover, provides a platform for further extension of analysis using perturbation theory, structural theory and economic input-output analysis.

Product Design and Life Cycle Assessment - Ireneusz Zbicinski 2006

**Reliability and Life-Cycle Analysis of Deteriorating Systems** - Mauricio Sánchez-Silva 2015-11-27

This book compiles and critically discusses modern engineering system degradation models and their impact on engineering decisions. In particular, the authors focus on modeling the uncertain nature of degradation considering both conceptual discussions and formal mathematical formulations. It also describes the basics concepts and the various modeling aspects of life-cycle analysis (LCA). It highlights the role of degradation in LCA and defines optimum design and operation parameters. Given the relationship between operational decisions and the performance of the system's condition over time, maintenance models are also discussed. The concepts and models presented have applications in a large variety of engineering fields such as Civil, Environmental, Industrial, Electrical and Mechanical engineering. However, special emphasis is given to problems related to large infrastructure systems. The book is intended to be used both as a reference resource for researchers and practitioners and as an academic text for courses related to risk and reliability, infrastructure performance modeling and life-cycle assessment.

**Pavement Life-Cycle Assessment** - Imad L. Al-Qadi 2017-04-11

An increasing number of agencies, academic institutes, and governmental and industrial bodies are embracing the principles of sustainability in managing their activities and conducting business. Pavement Life-Cycle Assessment contains contributions to the Pavement Life-Cycle Assessment Symposium 2017 (Champaign, IL, USA, 12-13 April 2017) and discusses the current status of as well as future developments for LCA implementation in project- and network-level applications. The papers cover a wide variety of topics: - Recent developments for the regional inventory databases for materials, construction, and maintenance and rehabilitation life-cycle stages and critical challenges - Review of methodological choices and impact on LCA results - Use of LCA in decision making for project selection - Implementation of case studies and lessons learned: agency perspectives - Integration of LCA into pavement management systems (PMS) - Project-level LCA implementation case studies - Network-level LCA applications and critical challenges - Use-phase rolling resistance models and field validation - Uncertainty assessment in all life-cycle stages - Role of PCR and EPDs in the implementation of LCA Pavement Life-Cycle Assessment will be

of interest to academics, professionals, and policymakers involved or interested in Highway and Airport Pavements.

**Progress in Life Cycle Assessment 2018** - Frank Teuteberg 2019-02-14

This book comprises recent developments in life cycle assessment (LCA) both with regards to the methodology and its application in various research fields, including mobility, engineering and manufacturing. Containing numerous original research articles from leading German research institutes, the book provides an insightful resource for professionals working in the field of sustainability assessment, for researchers interested in the current state of LCA research as well as for advanced university students in different scientific and engineering fields.

**Taking Stock of Industrial Ecology** - Roland Clift 2015-12-11

How can we design more sustainable industrial and urban systems that reduce environmental impacts while supporting a high quality of life for everyone? What progress has been made towards reducing resource use and waste, and what are the prospects for more resilient, material-efficient economies? What are the environmental and social impacts of global supply chains and how can they be measured and improved? Such questions are at the heart of the emerging discipline of industrial ecology, covered in Taking Stock of Industrial Ecology. Leading authors, researchers and practitioners review how far industrial ecology has developed and current issues and concerns, with illustrations of what the industrial ecology paradigm has achieved in public policy, corporate strategy and industrial practice. It provides an introduction for students coming to industrial ecology and for professionals who wish to understand what industrial ecology can offer, a reference for researchers and practitioners and a source of case studies for teachers.

**Sustainability** - Tom Theis 2018-01-23

With "Sustainability: A Comprehensive Foundation," first and second-year college students are introduced to this expanding new field, comprehensively exploring the essential concepts from every branch of knowledge - including engineering and the applied arts, natural and social sciences, and the humanities. As sustainability is a multi-disciplinary area of study, the text is the product of multiple authors drawn from the diverse faculty of the University of Illinois: each chapter is written by a recognized expert in the field.

**Life Cycle Assessment Student Handbook** - Mary Ann Curran 2015-06-29

This student version of the popular bestseller, Life Cycle Assessment Handbook, is not a watered-down version of the original, but retains all of the important information and valuable lessons provided in the first book, along with helpful problems and solutions for the student learning about Life Cycle Assessment (LCA). As the last several decades have seen a dramatic rise in the application of LCA in decision making, the interest in the life cycle concept as an environmental management and sustainability tool continues to grow. The LCA Student Handbook offers a look at the role that life cycle information, in the hands of companies, governments and consumers, may have in improving the environmental performance of products and technologies. It concisely and clearly presents the various aspects of LCA in order to help the reader better understand the subject. The international success of the sustainability paradigm needs the participation of many stakeholders, including citizens, corporations, academia, and NGOs. The handbook links LCA and responsible decision making and how the life cycle concept is a critical element in environmental sustainability. It covers issues such as building capacity in developing countries and emerging economies so that they are more capable of harnessing the potential in LCA for sustainable development. Governments play a very important role with the leverage they have through procurement, regulation, international treaties, tax incentives, public outreach, and other policy tools. This compilation of points to the clear trend for incorporating life cycle information into the design and development processes for products and policies, just as quality and safety concerns are now addressed throughout product design and development. The Life Cycle Assessment Student Handbook is not just for students. It is also a valuable resource for practitioners looking for a desktop reference on LCA or for any engineer, manager, or policy-maker wishing to learn about LCA.