

Life Cycle Assessment Thinkstep

The main topic of the conference (since 2007) is energy (dielectrics, high voltage technologies, nuclear technics, power engineering, renewables, etc) We would like to provide an opportunity for young researchers (MSc, PhD students and other young professionals) to present their work in any field related to energy, and support them in establishing new contacts It is also an occasion to establish personal contacts between the presenters and the well known professionals representing actors of the industry and education We are also planning to organize an exhibition and poster session beside the plenary sessions and oral sessions

This volume contains the papers presented at IALCCE2016, the fifth International Symposium on Life-Cycle Civil Engineering (IALCCE2016), to be held in Delft, The Netherlands, October 16-19, 2016. 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.

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.

In an effort to contribute to global efforts by addressing the marine pollution from various emission types, this Special Issue of Ship Lifecycle for Journal of Marine Science and Engineering was inspired to provide a comprehensive insight for naval architects, marine engineers, designers, shipyards, and ship-owners who strive to find optimal ways to survive in competitive markets by improving cycle time and the capacity to reduce design, production, and operation costs while pursuing zero emission. In this context, this Special Issue is devoted to providing insights into the latest research and technical developments on ship systems and operation with a life cycle point of view. The goal of this Special Issue is to bring together researchers from the whole marine and maritime community into a common forum to share cutting-edge research on cleaner shipping. It is strongly believed that such a joint effort will contribute to enhancing the sustainability of the marine and maritime activities. This Special Issue features six novel publications dedicated to this endeavor. First of all, as a proactive response to transitioning to cleaner marine fuel sources, numerous aspects of the excellence of fuel-cell based hybrid ships were demonstrated through four publications. In addition, two publications demonstrated the effectiveness of life cycle assessment (LCA) applicable to marine vessels.

Life Cycle Assessment

A comprehensive guide for both fundamentals and real-world applications of environmental engineering Written by noted experts, Handbook of Environmental Engineering offers a comprehensive guide to environmental engineers who desire to contribute to mitigating problems, such as flooding, caused by extreme weather events, protecting populations in coastal areas threatened by rising sea levels, reducing illnesses caused by polluted air, soil, and water from improperly regulated industrial and transportation activities, promoting the safety of the food supply. Contributors not only cover such timely environmental topics related to soils, water, and air, minimizing pollution created by industrial plants and processes, and managing wastewater, hazardous, solid, and other industrial wastes, but also treat such vital topics as porous pavement design, aerosol measurements, noise pollution control, and industrial waste auditing. This important handbook: Enables environmental engineers to treat problems in systematic ways Discusses climate issues in ways useful for environmental engineers Covers up-to-date measurement techniques important in environmental engineering Reviews current developments in environmental law for environmental engineers Includes information on water quality and wastewater engineering Informs environmental engineers about methods of dealing with industrial and municipal waste, including hazardous waste Designed for use by practitioners, students, and researchers, Handbook of Environmental Engineering contains the most recent information to enable a clear understanding of major environmental issues.

This book reviews the assessment of industrial biotechnology products and processes from a sustainable perspective. Industrial Biotechnology is a comparably young field which comes along with high expectations with regard to sustainability issues. These stem from the promise of reducing greenhouse gas emissions and replacing fossil resources in the near or later future and using green technology, i.e. more environmentally friendly technologies. The intended economic, ecological and social benefits, however, need to be proven, resulting in a variety of challenges, both from a methodological and application point of view. In this book, specific assessment and application topics of industrial biotechnology are addressed, highlighting challenges and solutions for both developers and users of assessment methods. In twelve chapters, experts in their particular fields define the scope, characterize industrial biotechnology and show in their contributions the state of the art, challenges and prospects of assessing industrial biotechnology products and processes. The chapter 'Societal and Ethical Aspects of Industrial Biotechnology' of this book is available open access under a CC BY 4.0 license at link.springer.com This book focuses on the food safety challenges in the vegetable industry from primary production to consumption. It describes existing and innovative quantitative methods that could be applied to the vegetable industry for food safety and quality, and suggests ways in which such methods can be applied for risk assessment. Examples of application of food safety objectives and other risk metrics for microbial risk management in the vegetable industry are presented. The work also introduces readers to new preservation and packaging methods, advanced oxidative processes (AOPs) for disinfection, product shelf-life determination methods, and rapid analytic methods for quality assessment based on chemometrics applications, thus providing a quantitative basis for the most important aspects concerning safety and quality in the vegetable sector.

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. The background of the thesis arises from the Life European project Sustainhuts % Sustainable Mountain Huts in Europe. The main goals of the project are modernization and optimization of energy generation in mountain huts. This is addressed by means of automatization, introduction of renewable energy sources as a substitute for fossil fuels and reduction of required energy for operation and transportation. Consequently, the reduction of environmental impacts is achieved, which is especially important in the areas where mountain huts are located. Life Cycle Assessment (LCA) regarding the operational phase of ten mountain huts in four countries across Europe is performed in this thesis. Specifically, it is focused on electricity and heat generation, as well as transportation required. In this way, energy balance of each mountain hut is accessed at the %%State Of Play at the Beginning%% (SOPB) and after modification of energy systems at the %%State Of Play at the End%% (SOPE). After completing a proper preliminary study, GaBi Thinkstep software is used to set up LCA models for energy generation and transportation for every mountain hut case. Environmental balances of LCA models provide results regarding emissions. Particularly, CO₂, NO_x, SO_x and particles (PM) are the target emissions of the study. Additionally, Carbon Footprint is calculated for all huts at the SOPB and the SOPE. Detailed analysis of results is completed to assess the effect of the newly suggested and installed solutions on emissions to environment. The results are presented for each hut and in one case the presentation of results is done more deeply to present the basic approach used. Overall, target emissions are reduced on average by 45%, considering all the mountain huts involved in the study. On account of this, it can be concluded that current energy generation systems in mountain huts enable rapid improvements that are economically feasible and have big potential in environmental impacts reductions. Results offer some general conclusions that could be implemented to all other mountain huts across Europe.

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.

This Proceedings contains the papers of the fib Symposium “CONCRETE Innovations in Materials, Design and Structures”, which was held in May 2019 in Kraków, Poland. This annual symposium was co-organised by the Cracow University of Technology. The topics covered include Analysis and Design, Sustainability, Durability, Structures, Materials, and Prefabrication. The fib, Fédération internationale du béton, is a not-for-profit association formed by 45 national member groups and approximately 1000 corporate and individual members. The fib’s mission is to develop at an international level the study of scientific and practical matters capable of advancing the technical, economic, aesthetic and environmental performance of concrete construction. The fib, was formed in 1998 by the merger of the Euro-International Committee for Concrete (the CEB) and the International Federation for Prestressing (the FIP). These predecessor organizations existed independently since 1953 and 1952, respectively. Construction is one of the main sectors that generates greenhouse gases. This industry consumes large amounts of raw materials, such as stone, timber, water, etc. Additionally, infrastructure should provide service over many years without safety problems. Therefore, their correct design, construction, maintenance, and dismantling are essential to reducing economic, environmental, and societal consequences. That is why promoting sustainable construction has recently become extremely important. To help address and resolve these types of questions, this book explores new ways of reducing the environmental impacts caused by the construction sector, as well promotes social progress and economic growth. The chapters collect the papers included in the “Sustainable Construction” Special Issue of the Sustainability journal. The papers cover a wide spectrum of issues related to the use of sustainable materials in construction, the optimization of designs based on sustainable indicators, the life-cycle assessment, the decision-making processes that integrate economic, social, and environmental aspects, and the promotion of durable materials that reduce future maintenance.

Plastics & Sustainability clearly lays out the thorny and contentious issues that we encounter at the nexus of plastics and sustainability. The book serves as a practical guide for making sustainability decisions about how plastics are made and used, including current developments in the newest bio-based plastics. Designers, marketers, academics, and engineers will all find something of value in this balanced and thoughtful second edition. Increased public scrutiny of plastics materials and the plastics industry has led, paradoxically, to both a deeper understanding and growing confusion about polymers, their origins, their uses, their risks, and ultimately their disposal. The author makes objective comparisons among major polymer grades and bioplastics including their life cycle assessments and practical performance in commercial applications.

Life-Cycle Assessment of Semiconductors presents the first and thus far only available transparent and complete life cycle assessment of semiconductor devices. A lack of reliable semiconductor LCA data has been a major challenge to evaluation of the potential environmental benefits of information technologies (IT). The analysis and results presented in this book will allow a higher degree of confidence and certainty in decisions concerning the use of IT in efforts to reduce climate change and other environmental effects. Coverage includes but is not limited to semiconductor manufacturing trends by product type and geography, unique coverage of life-cycle assessment, with a focus on uncertainty and sensitivity analysis of energy and global warming missions for CMOS logic devices, life cycle assessment of flash memory and life cycle assessment of DRAM. The information and conclusions discussed here will be highly relevant and useful to individuals and institutions.

Life Cycle Assessment (LCA) A Guide to Approaches, Experiences and Information Sources European Communities

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.

This book outlines the methodologies, approaches and tools for modelling chemicals in a Life Cycle Assessment (LCA) perspective, and also covers the main advantages and drawbacks of applying LCA to chemical processes. In the first part of this book, authors pay close attention to the limitations of modelling the environmental and social impacts of chemical processes, providing valuable insights to the problems of the Life Cycle Inventory (LCI) analysis for chemical processes. In the second part of this book, readers will learn about the LCA application to chemical processes in the laboratory and industrial scale. In each chapter of this book, readers will also find specific case studies on the modelling and application of LCA in the chemical industry.

The depletion of natural energy resources provides evidential adverse impacts on world economy functionality. The strong requirement of a sustainable energy supply has escalated intensive research and the discovery of cleaner energy sources, as well as efficient energy management practices. In the context of a circular economy, this research not only targets the optimisation of resources utilisation at different stages but also emphasises the eco-design of products to extend production life spans. Based on this concept, this book discusses the roles of process integration approaches, renewable energy sources utilisation and design modifications in addressing the process energy and exergy efficiency improvement. The primary focus is to enhance the economic and environmental performance through process analysis, modelling and optimisation. The articles mainly show the contribution of each aspect: (a) design and numerical study for innovative energy-efficient technologies, (b) process integration—heat and power, (c) process energy efficiency or emission analysis, and (d) optimisation of renewable energy resources' supply chain. The articles are based on the latest contribution of this journal's Special Issues in the 21st conference entitled "Process Integration, Modelling and Optimisation for Energy Saving and Pollution Reduction (PRES)". This book is complemented with an editorial review to highlight the broader state-of-the-art development.

The first International Conference on Engineering Solutions and Sustainable Development which is organized by the University of Miskolc, Hungary is a significant and timely initiative creating the capacity of engineering students, educators, practicing engineers and industries to demonstrate values, problem solving skills, knowledge, and attitude that are required to apply the principles of sustainable development throughout their professional career. The aim of the ICESSD conference was creating an interdisciplinary platform for researchers and practitioners to present and discuss the most recent innovations, trends, and concerns as well as practical challenges encountered and solutions adopted in the fields of Technical and Environmental Science. The conference covers the following topics: Process Engineering, Modelling and Optimisation Sustainable and Renewable Energy and Energy Engineering Waste Management and Reverse Logistics Environmental Management and Ecodesign Circular Economy and Life Cycle Approaches Smart Manufacturing and Smart Buildings Innovation and Efficiency Earth Science Academics, scientists, researchers and professionals from different countries and continents have contributed to this book.

The book contains the latest developments in the field of life cycle assessment (LCA) and its application. It contains numerous research articles from leading German research institutes working towards the further development of the methodology. The book provides important insights for professionals working in the field of sustainability assessment, for researchers interested in the current state of the research of the methodology and its application as well as for advanced university students in different science and engineering fields.

This book highlights the diverse nature of the scientific domains associated with landscape architecture. It emphasises the need to acknowledge that the contribution of each research domain is equally important, offering complementary development opportunities while enabling landscapes to fulfill their multiple functions and ecosystem services in an integrated way, underlining the relevance of theory, methods, and practice to promote sustainable landscape planning and design.

Workflows are being rethought and remodelled across the architecture, engineering and construction (AEC) spectrum. The synthesis of building information modelling (BIM) platforms with digital simulation techniques and increasing access to data, charting building performance, is allowing architects to engage in the generation of new workflows across multidisciplinary teams. By merging digital design operations with construction activities, project delivery and post-occupation scenarios, architects are becoming instrumental in the shaping of buildings as well as the design process. Workflows expand the territory of architectural practice by extending designers' remit beyond the confines of the design stage. The implications for the AEC industry and architecture as a profession could not be greater. These new collaborative models are becoming as important as the novel buildings they allow us to produce. Contributors include: Shajay Bhooshan, John Cays, Randy Deutsch, Sean Gallagher, Ian Keough, Peter Kis, Jonathan Mallie, Adam Modesitt, Rhett Russo, Dale Sinclair, and Stacie Wong. Featured architects: Arup, Diller Scofidio + Renfro, GLUCK+, GRO Architects, PLANT, Populous, Young & Ayata, and Zaha Hadid Architects.

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.

The transition towards renewable energy sources and “green” technologies for energy generation and storage is expected to mitigate the climate emergency in the coming years. However, in many cases, this progress has been hampered by our dependency on critical materials or other resources that are often processed at high environmental burdens. Yet, many studies have shown that environmental and energy issues are strictly interconnected and require a comprehensive understanding of resource management strategies and their implications. Life cycle assessment (LCA) is among the most inclusive analytical techniques to analyze sustainability benefits and trade-offs within complex systems and, in this Special Issue, it is applied to assess the mutual influences of environmental and energy dimensions. The selection of original articles, reviews, and case studies addressed covers some of the main driving applications for energy requirements and greenhouse gas emissions, including power generation, bioenergy, biorefinery, building, and transportation. An insightful perspective on the current topics and technologies, and emerging research needs, is provided. Alone or in combination with integrative methodologies, LCA can be of pivotal importance and constitute the scientific foundation on which a full system understanding can be reached.

An up-to-date and two volume overview of recent developments in the field of chemocatalytic and enzymatic processes for the transformation of renewable material into essential chemicals and fuels. Experts from both academia and industry discuss catalytic processes currently under development as well as those already in commercial use for the production of bio-fuels and bio-based commodity chemicals. As such, they cover drop-in commodity chemicals and fuels, as well as bio-based monomers and polymers, such as acrylic acid, glycols, polyesters and polyolefins. In addition, they also describe reactions applied to waste and biomass valorization and integrated biorefining strategies. With its comprehensive coverage of the topic, this is an indispensable reference for chemists working in the field of catalysis, industrial chemistry, sustainable chemistry, and polymer synthesis.

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.

This book investigates the enhancement of properties of acacia wood and its surface treatment for high strength bio-composites. It describes the tensile, flexural and impact strength, surface behaviour, morphological analysis, infrared spectral functional analysis, thermal properties analysis and dielectrical properties of acacia wood bio-composites. It reports efforts on the optimization of fabrication techniques to prepare acacia wood reinforced bio-composites based on PLA, PHA, Etc. The book also reports on environmental impact analysis of acacia wood bio-composites. A special chapter is dedicated to the nano-enhancement of acacia wood bio-composites and their possible use in applications in terms of sustainability and economics.

This book covers the latest developments in life cycle assessment LCA both in terms of methodology and its application in various research areas. It includes methodological questions as well as case studies concerning energy and mobility, materials and engineering, sustainable construction and future technologies. With numerous research articles from leading German and Austrian research institutes, the book is a valuable source for professionals working in the field of sustainability assessment, researchers interested in the current state of LCA research, and advanced university students in various scientific and technical fields. Chapter “Life Cycle Assessment of a Hydrogen and Fuel Cell RoPax Ferry Prototype” is available open access under a Creative Commons Attribution 4.0 International License via link.springer.com.

The packaging industry is under pressure from regulators, customers and other stakeholders to improve packaging’s sustainability by reducing its environmental and societal impacts. This is a considerable challenge because of the complex interactions between products and their packaging, and the many roles that packaging plays in the supply chain. Packaging for Sustainability is a concise and readable handbook for practitioners who are trying to implement sustainability strategies for packaging. Industry case studies are used throughout the book to illustrate possible applications and scenarios. Packaging for Sustainability draws on the expertise of researchers and industry practitioners to provide information on business benefits, environmental issues and priorities, environmental evaluation tools, design for environment, marketing strategies, and challenges for the future.

The conference addresses general topics on how products and materials can be recycled and looks for application examples. The focus is on the areas: · Material and Energy

Flow Assessment · Sustainable Mobility · Industrial Ecology with a focus on renewable energy sources or WEEE · (Re-) Manufacturing · Cascade Use and Waste Management 4.0

Comprehensively covers the definition, methodology, and current applications of the principles of sustainability and resiliency in every engineering discipline. This book contains detailed information about sustainability and resiliency principles and applications in engineering practice, and provides information on how to use scientific tools for sustainability assessment that help engineers select the best alternative for each project or activity. Logically organized around the three pillars of sustainability—environment, economy, and society—it is a primary resource for students and professionals alike. *Sustainable Engineering: Drivers, Metrics, Tools, and Applications* offers numerous ways to help engineers contribute towards global sustainable development while solving some of the grand challenges the world is facing today. The first part of the book covers the environmental, economic, and social impacts associated with project/product development as well as society as a whole. This is followed by a section devoted to sustainability metrics and assessment tools, which includes material flow analysis and material budget, carbon footprint analysis, life cycle assessment, environmental health risk assessment, and more. Next comes an in-depth examination of sustainable engineering practices, including sustainable energy engineering, sustainable waste management, and green and sustainable buildings. The book concludes with a look at how sustainable engineering may be applied to different engineering (i.e. environmental, chemical, civil, materials, infrastructure) projects. Some of the key features of this book include the following: Provides a complete and sensible understanding of the important concepts of sustainability, resiliency, and sustainable engineering. Offers detailed explanations of sustainable engineering practices in waste management and remediation of contaminated sites, civil construction and infrastructure, and climate geoengineering. Presents a set of case studies across different engineering disciplines such as bio/chemical, environmental, materials, construction, and infrastructure engineering that demonstrate the practical applicability of sustainability assessment tools to diverse projects. Includes questions at the end of each chapter as well as a solutions manual for academic adopters. The depth of coverage found in *Sustainable Engineering: Drivers, Metrics, Tools, and Applications* makes it an ideal textbook for graduate students across all engineering disciplines and a handy resource for active professionals.

Computing the Environment presents practical workflows and guidance for designers to get feedback on their design using digital design tools on environmental performance. Starting with an extensive state-of-the-art survey of what top international offices are currently using in their design projects, this book presents detailed descriptions of the tools, algorithms, and workflows used and discusses the theories that underlie these methods. Project examples from Transsolar Klimaengineering, Buro Happold's SMART Group, Behnisch Behnisch Architects, Thomas Herzog, Autodesk Research are contextualized with quotes and references to key thinkers in this field such as Eric Winsberg, Andrew Marsh, Michelle Addington and Ali Malkawi.

Microalgae are a group of single-celled, photosynthetic microorganisms. They are of great commercial interest as they are capable of producing biomass (with a vast array of biochemical) using sunlight, CO₂ and various other naturally occurring nutrients. Correctly utilised, they have the potential to provide sustainable supply of commercially relevant biochemicals, biofuels, nutraceuticals, food and feed supplements. The field of microalgal biotechnology is a fast-paced area of research, with technologies coming ever closer to commercial viability. *Microalgal Biotechnology* consolidates the latest research in the field together with a look at market potential and policy considerations. Highlighting the huge potential of microalgae as commercial commodities, it covers progress on various fronts including; bio-refinery and its technological challenges, genetic engineering, biosafety and regulatory issues, open and closed photo-bioreactors for biomass production, market space and sustainability for algal products. This book is a useful resource for researchers, academicians, postgraduate students, industries, policy makers and anyone interested in the status and future possibilities of microalgae commercialisation.

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.

The goals of the Circular Economy clearly point towards the cascading approach. Reuse and recycling of materials and products keeps secondary resources circulating and thus protects primary resources from being exploited. *Cascade Use in Technologies* is dedicated to cascading approaches of materials and products and fits perfectly to the Circular Economy discussion within Europe and the rest of the world. Most methods used in this context can be more or less allocated to life cycle management approaches with a rather technical perspective, as most of the articles presented in this book are engineering-driven. Therefore, it is a novel forum for reporting technological breakthroughs regarding cascading use of materials and products in the domains of automotive, electronics, and computing, and regarding resource criticality in general. Content · Material and Energy Flow Assessment · Sustainable Mobility · Industrial Ecology with a focus on renewable energy sources or WEEE · (Re-) Manufacturing · Cascade Use and Waste Management 4.0 Audience · Researchers · Scientists and technologists from industry, universities, research firms · Employees of government agencies Editors Dr.-Ing. Alexandra Pehlken studied Mining Engineering at RWTH Aachen University, specializing in mineral processing. She received the Lise-Meitner Scholarship from the State of North Rhine-Westfalia and spent two years in Canada. She has headed the BMBF-funded "Cascade Use" research group at the Carl von Ossietzky University of Oldenburg and is now working for OFFIS. Dr. Matthias Kalverkamp is a Post-Doc researcher in the "Cascade Use" research group and focuses on remanufacturing supply chains in the context of the circular economy. During his PhD studies, he conducted research in Europe, North America and Chile. Prior to that, he worked in project management at the BIBA - Bremer Institut für Produktion und Logistik GmbH. Rikka Wittstock studied Sustainability Economics and Management at the Carl von Ossietzky University of Oldenburg and completed her master thesis within the framework of the "Cascade Use" project, focusing on fuel cell vehicles and their impact on platinum demand. She is currently a PhD student at the University of Osnabrueck.

Sustainable Construction Technologies: Life-Cycle Assessment provides practitioners with a tool to help them select technologies that are financially advantageous even though they have a higher initial cost. Chapters provide an overview of LCA and how it can be used in conjunction with other indicators to manage construction. Topics covered include indoor environment quality, energy efficiency, transport, water reuse, materials, land use and ecology, and more. The book presents a valuable tool for construction professionals and researchers that want to apply sustainable construction techniques to their projects. Practitioners will find the international case studies and discussions of worldwide regulation and standards particularly useful. Provides a framework for analyzing sustainable construction

technologies and economic viability Introduces key credit criteria for different sustainable construction technologies Covers the most relevant construction areas Includes technologies that can be employed during the process of construction, or to the product of the construction process, i.e. buildings Analyzes international rating systems and provides supporting case studies

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.

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.

The Material Basis of Energy Transitions explores the intersection between critical raw material provision and the energy system. Chapters draw on examples and case studies involving energy technologies (e.g., electric power, transport) and raw material provision (e.g., mining, recycling), and consider these in their regional and global contexts. The book critically discusses issues such as the notion of criticality in the context of a circular economy, approaches for estimating the need for raw materials, certification schemes for raw materials, the role of consumers, and the impact of renewable energy development on resource conflicts. Each chapter deals with a specific issue that characterizes the interdependency between critical raw materials and renewable energies by examining case studies from a particular conceptual perspective. The book is a resource for students and researchers from the social sciences, natural sciences, and engineering, as well as interdisciplinary scholars interested in the field of renewable energies, the circular economy, recycling, transport, and mining. The book is also of interest to policymakers in the fields of renewable energy, recycling, and mining, professionals from the energy and resource industries, as well as energy experts and consultants looking for an interdisciplinary assessment of critical materials. Provides a comprehensive overview of key issues related to the nexus between renewable energy and critical raw materials Explores interdisciplinary perspectives from the natural sciences, engineering, and social sciences Discusses critical strategies to address the nexus from a practitioner's perspective

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