

Five Key Components of Zero Carbon Buildings



Renewable Energy Generation

A requirement that renewable energy be generated on-site or procured directly in order to ensure the addition of clean power generation.



Energy Intensity Metrics

Energy intensity metrics to incentivize the design of highly efficient, reliable and resilient buildings.



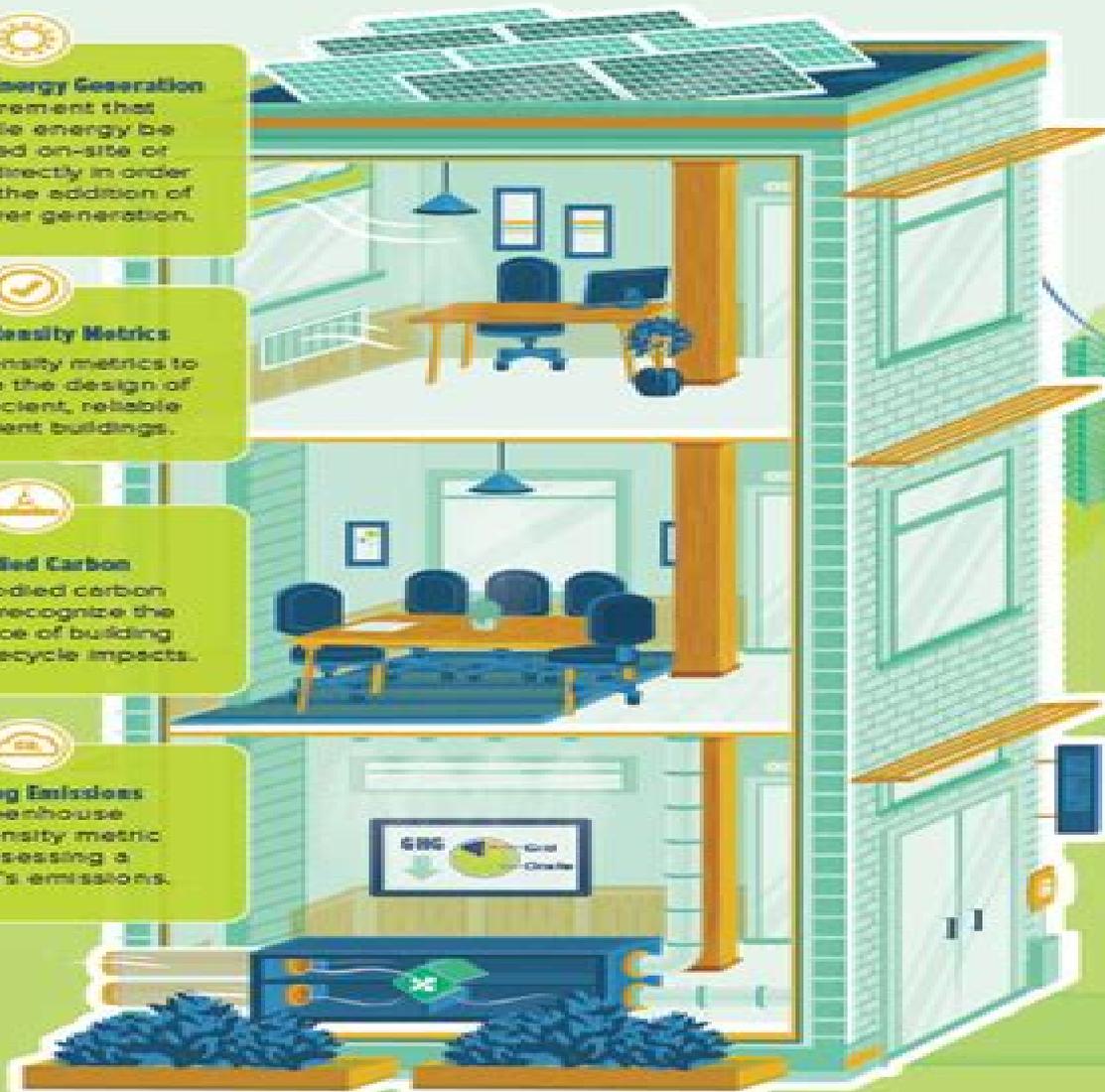
Embodied Carbon

An embodied carbon metric to recognize the importance of building material lifecycle impacts.



Lowering Emissions

A greenhouse gas intensity metric for assessing a building's emissions.



A Zero Carbon Building is...

A highly energy efficient building that produces on-site, or procures, carbon-free renewable energy in an amount sufficient to offset the annual carbon emissions associated with building operations.



Reducing Peak Energy Demand

A peak energy demand metric to encourage the use of "peak shaving" measures.



Zero Emission Buildings And Architecture

Marwa Dabaieh



Zero Emission Buildings And Architecture:

Zero Emission Buildings Anne Grete Hestnes, Nancy Lea Eik-Nes, 2017 Zero Emission Buildings shows what can be achieved when researchers and practitioners work together to develop the building performance level of tomorrow that is needed today This book is based on the research and development activities performed in the Research Centre on Zero Emission Buildings the ZEB Centre from 2009 to 2017 Emissions of CO₂ and other greenhouse gases must be reduced to limit global warming Thus the goal of the ZEB Centre has been to develop knowledge competitive products and solutions for existing and new buildings whose production operation and demolition give zero emissions of greenhouse gases while also considering the users needs for comfort and flexibility The results presented here are based on research as well as experience from the development of nine real demonstration buildings The key knowledge areas needed when designing building and operating zero emission buildings is discussed in detail This book should be read by students of architecture and engineering as well as practitioners looking for ways to contribute to a sustainable future Subject Architecture Environmental Studies Sustainability Green Design

Net Zero Energy Building Ming Hu, 2019-03-25 What do we mean by net zero energy Zero operating energy Zero energy costs Zero emissions There is no one answer approaches to net zero building vary widely across the globe and are influenced by different environmental and cultural contexts Net Zero Energy Building Predicted and Unintended Consequences presents a comprehensive overview of variations in net zero building practices Drawing on examples from countries such as the United States United Kingdom Germany Japan Hong Kong and China Ming Hu examines diverse approaches to net zero and reveals their intended and unintended consequences Existing approaches often focus on operating energy how to make buildings more efficient by reducing the energy consumed by climate control lighting and appliances Hu goes beyond this by analyzing overall energy consumption and environmental impact across the entire life cycle of a building ranging from the manufacture of building materials to transportation renovation and demolition Is net zero building still achievable once we look at these factors With clear implications for future practice this is key reading for professionals in building design architecture and construction as well as students on sustainable and green architecture courses

Circular Design for Zero Emission Architecture and Building Practice Marwa Dabaieh, 2022-12-03 Circular Design for Zero Emission Architecture and Building Practice It is the Green Way or the Highway presents the main concepts of circular architecture and building design focusing on emerging trends in zero emission buildings particularly zero and minus carbon practice The book is structured around practical design solutions including research based passive solutions for extreme climates It discusses passive and low carbon cooling and heating and natural ventilation lifecycle assessment and life cost analysis The book presents examples and case studies from innovative low tech to high tech approaches covering a wide spectrum of climate zones to show lessons learned and proof of concept Vulnerable groups of people such as climate refugees are discussed alongside how vernacular architecture can help

introduce practical methods into low carbon building practices This book presents theoretical and practical coverage of circular design for zero emission architecture and building in relation to the global challenges of climate change and extreme weather Presents key concepts of circular architecture and building design Offers practical design solutions including solutions for extreme climates Gives practical solutions for design resilience construction climate mitigation adaptive behavior building resilience and environmental impact Considers vernacular tradition and locale based climate response and adaptive approaches to sustainable building and design Discusses the application of design after disasters and extreme climate events Gives practical case studies of both low and high tech design solutions from across climate zones

Net Zero Energy Design Thomas Hootman,2012-09-25 Conveniently organized and packed with robust technical content and clear explanations of key principles Written by an architect who is the director of sustainability at a global architecture firm Net Zero Energy Design is a practical guide for architects and related construction professionals who want to design and build net zero energy commercial architecture It offers no nonsense strategies step by step technical analysis and valuable examples in addition to developed case studies With a focus on application in a variety of building types and scales the book also develops a broad based understanding of all the integrated principles involved in achieving net zero energy This book is an indispensable resource for anyone venturing into net zero energy design construction and operation and it also serves as an excellent resource on a variety of sustainable design topics Important features include Organization based upon the commercial building delivery process Robust technical content for use in actual project applications Analysis examples that demonstrate key technical principles Plenty of design data for use as a valuable design resource Abundant and sophisticated information graphics and color illustrations and photographs A distinct design focus on the content that inspires adoption of principles into projects

International Symposium for Intelligent Transportation and Smart City (ITASC) 2025 Proceedings Xiaoqing Zeng,Xiongyao Xie,Jian Sun,Limin Ma,Yinong Chen,2025-08-20 This book presents selected papers of the 6th International Symposium for Intelligent Transportation and Smart City ITASC held at Tongji University Shanghai on May 16 17 2025 It investigates in detail aspects of intelligent transportation and smart city mainly focusing on the green traffic and urban utility tunnels Due to rapid development in the domain of intelligent transportation and smart city there are many popular topics such as the 2BMW system bus bike metro and walking transportation safety and environment protection urban utility design and application and the application of BIM in the city design It collects dozens of papers and lectures with high quality including some authoritative scholars and most experienced engineers latest achievements which provide guidance to those both in universities and entrepreneurs

The New Net Zero Bill Maclay,2014 The new threshold for green building is not just low energy it s net zero energy In The New Net Zero sustainable architect Bill Maclay charts the path for designers and builders interested in exploring green design s new frontier net zero energy structures that produce as much energy as they consume and are carbon neutral In a nation where traditional buildings use roughly 40 percent of the

total fossil energy the interest in net zero building is growing enormously among both designers interested in addressing climate change and consumers interested in energy efficiency and long term savings Maclay an award winning net zero designer whose buildings have achieved high performance goals at affordable costs makes the case for a net zero future explains net zero building metrics integrated design practices and renewable energy options and shares his lessons learned on net zero teambuilding Designers and builders will find a wealth of state of the art information on such considerations as air water and vapor barriers embodied energy residential and commercial net zero standards monitoring and commissioning insulation options costs and more The comprehensive overview is accompanied by several case studies which include institutional buildings commercial projects and residences Both new building and renovation projects are covered in detail The New Net Zero is geared toward professionals exploring net zero design but also suitable for nonprofessionals seeking ideas and strategies on net zero options that are beautiful and renewably powered

Microalgae Building Enclosures
Kyoung Hee Kim, 2022-03-30 Microalgae architecture has gained awareness for its biotechnical potential to achieve net zero energy architecture while also promoting ecological sustainability and occupant well being Microalgae Building Enclosures Design and Engineering Principles aims to provide design engineering and biotechnical guidelines for microalgae building enclosures that need to be considered for symbiotic relations among the built environment humans and ecosystems Part I of the book introduces the theoretical background of microalgae as a bioremediator and future energy system and their potential roles toward sustainable and healthy built environments Part II exemplifies interventions and multiple benefits of microalgae systems in product architecture urban and infrastructure applications across the globe including Africa Asia Australia Europe South America and North America Part III explains the design and engineering criteria biotechnical design requirements and various performance metrics for microalgae architecture Finally Part IV investigates potential building applications in low rise buildings high rise buildings and energy efficient retrofitting The book also includes international case studies of microalgae building systems within various building types and climates As one of the first books to comprehensively cover this emerging area of microalgae building enclosures Microalgae Building Enclosures is an essential source for professionals and students looking to expand architectural discourse on nature integrated building systems to achieve the triple bottom line of sustainability

Designing Zero Carbon Buildings
Ljubomir Jankovic, 2024-06-17 In this significantly revised third edition Designing Zero Carbon Buildings combines embodied and operational emissions into a structured approach for achieving zero emissions by a specific year with certainty Simulation and quantitative methods are introduced in parallel with analogue scale models to demonstrate how things work in buildings Where equations are provided this is also explained with common analogue objects pictures and narratives A Zero Equation introduced in this book is not only explained as an equation but also as an analogy with a jam jar and spoons making the book accessible for a range of audiences Tasks for simple experiments exercises discussion questions and summaries of design principles are provided in

closing lines of chapters This book introduces new case studies in addition to an updated case study of the Birmingham Zero Carbon House applying embodied and operational emissions to assess their status using the Zero Equation The approach introduced brings about a sense of realism into what true zero emissions mean Written for students educators architects engineers modellers practising designers sustainability consultants and others it is a major positive step towards design thinking that makes achieving zero carbon emissions a reality **Net Zero Energy Buildings** Linda Reeder,2016-03-31 This book presents 18 in depth case studies of net zero energy buildings low energy building that generate as much energy as they consume over the course of a year for a range of project types sizes and U S climate zones Each case study describes the owner s goals the design and construction process design strategies measurement and verification activities and results and project costs With a year or more of post occupancy performance data and other project information as well as lessons learned by project owners and developers architects engineers energy modelers constructors and operators each case study answers the questions What were the challenges to achieving net zero energy performance and how were these challenges overcome How would stakeholders address these issues on future projects Are the occupants satisfied with the building Do they find it comfortable Is it easy to operate How can other projects benefit from the lessons learned on each project What would the owners designers and constructors do differently knowing what they know now A final chapter aggregates processes to engage in and pitfalls to avoid when approaching the challenges peculiar to designing constructing and owning a net zero energy building By providing a wealth of comparable information this book which will flatten the learning curve for designing constructing and owning this emerging building type and improve the effectiveness of architectural design and construction [The Routledge Handbook of Architecture, Urban Space and Politics, Volume II](#) Nikolina Bobic, Farzaneh Haghighi,2024-11-22 Architecture and the urban are connected to challenges around violence security race and ideology spectacle and data The first volume of this handbook extensively explored these oppressive roles This second volume illustrates that escaping the corporatized and bureaucratized orders of power techno managerial and consumer oriented capitalist economic models is more urgent and necessary than ever before Herein lies the political role of architecture and urban space including the ways through which they can be transformed and alternative political realities constituted The volume explores the methods and spatial practices required to activate the political dimension and the possibility for alternative practices to operate in the existing oppressive systems while not being swallowed by these structures Fostering new political consciousness is explored in terms of the following themes Events and Dissidence Biopolitics Ethics and Desire Climate and Ecology Urban Commons and Social Participation Marginalities and Postcolonialism Volume II embraces engagement across disciplines and offers a wide range of projects and critical analyses across the so called Global North and South This multidisciplinary collection of 36 chapters provides the reader with an extensive resource of case studies and ways of thinking for architecture and urban space to become more emancipatory Chapter 1 of this book is freely available as

a downloadable Open Access PDF at <http://www.taylorfrancis.com> under a Creative Commons Attribution CC BY 4.0 license

Transforming Markets in the Built Environment Susan Roaf, 2012 There is an urgent need to build human capacity to make the often vulnerable and exposed buildings and communities we live and work in more resilient to the changing social economic and physical environments around us Extensive research has been done over the last decades on both mitigation and adaptation to climate change in the built environment but the outputs of much of this research have failed to result in the wider uptake of effective greenhouse gas emission reduction solutions This volume introduces credible fresh thinking on how this may be done For the first time an emerging generation of research is brought together that is directly concerned with understanding influencing and leading the transformation of markets and thinking in the built environment Chapters cover defining values setting targets consumer motivation selling existing ideas better developing new design principles paradigms and programmes optimizing solutions to ensure that when change does happen it does so in the right direction Papers are contributed by leading experts in fields ranging from philosophy the social political and physical sciences engineering architecture mathematics and complexity science The resulting volume will be essential reading for all those involved with changing the mindsets of a generation on the need to and ways to build resilience to rapid change and transforming markets in the built environment

Advances in Empirical Economic Research Nicholas Tsounis, Aspasia Vlachvei, 2023-07-19 This volume presents new empirical methods and applications in economics with special interest in advances in empirical macroeconomics microeconomics financial economics international economics and agricultural economics Featuring selected contributions from the 2022 International Conference of Applied Economics ICOAE 2021 this book provides country specific studies with potential applications in economic policy It is beneficial to researchers scholars academics and policy makers in quantitative economic research in both methods and applications

Net zero energy buildings Karsten Voss, Eike Musall, 2012-12-10 Net zero energy buildings equilibrium buildings or carbon neutral cities depending on location and the reasons for making the calculation the numbers are run differently The variety of terms in use indicates that a scientific method is still lacking which is a problem not just in regard to international communication but also with respect to planning processes as a response to energy challenges The clarification and meaning of the most important terms in use is extremely important for their implementation Since October 2008 a panel of experts from an international energy agency has concerned itself with these topics as part of a project entitled Towards Net Zero Energy Solar Buildings The objective is to analyse exemplary buildings that are near a zero energy balance in order to develop methods and tools for the planning design and operation of such buildings The results are documented in this publication In addition to the presentation of selected projects it is not just architectural showcase projects that are shown the focus is on relaying knowledge and experience gained by planners and builders Even if many questions remain unanswered Project examples that have already been implemented prove on a practical basis that the objective of a zero energy balance is already possible today

Build

Beyond Zero Bruce King, Chris Magwood, 2022-06-16 Net Zero has been an effective rallying cry for the green building movement signaling a goal of having every building generate at least as much energy as it uses Enormous strides have been made in improving the performance of every type of new building and even more importantly renovating the vast and energy inefficient collection of existing buildings in every country If we can get every building to net zero energy use in the next few decades it will be a huge success but it will not be enough In *Build Beyond Zero* carbon pioneers Bruce King and Chris Magwood re envision buildings as one of our most practical and affordable climate solutions instead of leading drivers of climate change They provide a snapshot of a beginning and map towards a carbon smart built environment that acts as a CO2 filter Professional engineers designers and developers are invited to imagine the very real potential for our built environment to be a site of net carbon storage a massive drawdown pool that could help to heal our climate The authors with the help of other industry experts show the importance of examining what components of an efficient building from windows to solar photovoltaics are made with and how the supply chains deliver all those products and materials to a jobsite *Build Beyond Zero* looks at the good and the bad of how we track carbon Life Cycle Assessment then takes a deep dive into materials with a focus on steel and concrete and biological architecture and wraps up with education policy and governance circular economy and where we go in the next three decades In *Build Beyond Zero* King and Magwood show how buildings are culprits but stand poised to act as climate healers They offer an exciting vision of climate friendly architecture along with practical advice for professionals working to address the carbon footprint of our built environment *Designing Zero Carbon Buildings Using Dynamic Simulation Methods* Ljubomir Jankovic, 2013-07-03 As we increasingly become aware of the causes and consequences of the climate change there is a sense that we are dealing with an almost impossible problem to solve that our targets for zero carbon buildings are far in the future and that our targets are hard to achieve This book develops a structured method for zero carbon design and demonstrates that it is perfectly possible to design new or retrofit zero carbon buildings today using existing technologies Dynamic simulation is an essential ingredient of this method and a pre requisite for the level of analysis and optimization that is needed in order to achieve zero carbon design The second essential ingredient is the economic analysis and the book demonstrates how zero carbon designs can be optimised to result in lucrative rates of return on investment The third essential ingredient is the achievement of thermal comfort The book argues that zero carbon living is not about a considerable change of behaviour but that it is about design that works with climate rather than against it that uses predominantly passive rather than active means for achieving thermal comfort and that is well tested integrated and optimised using dynamic simulation Using this method designers can start making a difference today This book therefore makes a case for change a change of our perceptions that we are dealing with an impossible problem to solve a change of our business and economic models and a change of our attitudes towards zero carbon design and zero carbon living **Lowex Building Design for Zeroemission Architecture** Hansjuerg

Leibundgut, Marcel Bruelisauer, Forrest Meggers, Matthias Mast, 2017-09-08 Zero emission during operation this has to be the target for buildings in the near future This book approaches this goal with the application of the thermodynamic concept of exergy to the built environment allowing new design and technology concepts that go beyond mere energy saving This approach reopens rigid passive design paradigms and offers more architectural freedom while ensuring the high performance of buildings By introducing new approaches for the understanding and analysis of building systems and the dynamic interaction between the active and passive elements of a building it describes key components required for LowEx building systems The building cases analysed cover climates as different as the moderate climate of Europe and the hothumid tropics of SouthEast Asia and provide detailed investigation of both the conceptual and deployment details

Green Oslo Dr Mark Luccarelli, Dr Per Gunnar Røe, 2013-02-28 As urban regions face the demand to decrease fossil fuel dependency many cities in the developing world are undertaking initiatives designed to create a greener city by aiming for a more sustainable form of urban development and to do so they need to evaluate existing modes of transportation and patterns of land use Focusing on Oslo an early leader in urban environmental policy making and a European green city award winner it argues that this evaluation must adopt and integrate two approaches firstly as a process of ecological modernization based on a combination of transit densification and mixed use development and secondly as an opportunity to reconsider the character and substance of the built environment as a reflection of natural values landscapes and natural resources of the wider region Environmental debate and concern is widespread in Oslo and this is reflected in its earlier planning decisions to leave intact large forest reserves its successful ecological restoration of the Oslo fjord the importance of outdoor culture among its residents the relatively progressive political agenda of Norway This book provides an opportunity for a critical assessment of the limitations and opportunities inherent in green Oslo and suggests the need for much broader integrative approaches It concludes by highlighting lessons which other cities might learn from Oslo

Advances in Building Materials, ICSBM 2011 Lijuan Li, 2010-12-06 Selected peer reviewed papers from the 2011 International Conference on Structures and Building Materials ICSBM 2011 7 9 January 2011 Guangzhou China **Design Professional's Guide to Zero Net Energy Buildings** Charles Eley, 2016-11-15 In the Design Professional's Guide to Zero Net Energy Buildings Charles Eley draws from over 40 years of his own experience and interviews with other industry experts to lay out the principles for achieving zero net energy ZNE buildings which produce as much energy as they use over the course of a year Eley emphasizes the importance of building energy use in achieving a sustainable future describes how building energy use can be minimized through smart design and energy efficiency technologies and presents practical information on how to incorporate renewable energy technologies to meet the lowered energy needs The book shows the reader through examples and explanations that these solutions are viable and cost effective *Net Zero Energy Buildings (NZE)* Shady Attia, 2018-03-26 Net Zero Energy Buildings NZEB Concepts Frameworks and Roadmap for Project Analysis

and Implementation provides readers with the elements they need to understand combine and contextualize design decisions on Net Zero Energy Buildings The book is based on learned lessons from NZEB design construction operation that are integrated to bring the most relevant topics such as multidisciplinary climate sensitivity comfort requirements carbon footprints construction quality and evidence based design Chapters introduce the context of high performance buildings present overviews of NZEB cover the performance thresholds for efficient buildings cover materials micro grid and smart grids construction quality performance monitoring post occupancy evaluation and more Offers a roadmap for engaging in energy efficiency in high performance buildings projects Combines solid grounding in core concepts such as energy efficiency with a wider context that includes the technical socio cultural and environmental dimensions Covers key areas for decision making Provides a logical framework to analyze projects in the context of environmental change Presents worldwide examples and cases for different climates and societies

Embracing the Beat of Appearance: An Mental Symphony within **Zero Emission Buildings And Architecture**

In a world eaten by displays and the ceaseless chatter of quick communication, the melodic splendor and mental symphony developed by the published term usually fade into the backdrop, eclipsed by the relentless noise and interruptions that permeate our lives. But, set within the pages of **Zero Emission Buildings And Architecture** an enchanting fictional value full of natural emotions, lies an immersive symphony waiting to be embraced. Constructed by an outstanding composer of language, that charming masterpiece conducts visitors on a mental trip, skillfully unraveling the hidden tunes and profound influence resonating within each cautiously constructed phrase. Within the depths with this poignant examination, we can investigate the book is central harmonies, analyze their enthralling writing design, and submit ourselves to the profound resonance that echoes in the depths of readers souls.

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