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Urbanization and globalization have shaped the last hundred years. These two dominant trends are mutually reinforcing:

globalization links countries through the networked communications of urban hubs.

The urban population now generates more than eighty percent of global GDP. Cities account for enormous flows of energy and materials -- inflows of goods and services and outflows of waste. Thus urban environmental management critically affects global sustainability. In this book, Paulo Ferr o and John Fern ndez offer a metabolic perspective on urban sustainability, viewing the city as a metabolism, in terms of its exchanges of matter and energy. Their book provides a roadmap to the strategies and tools needed for a scientifically based framework for analyzing and promoting the sustainability of urban systems. Using the concept of urban metabolism as a unifying framework,

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Ferreira and Fernandez describe a systems-oriented approach that establishes useful linkages among environmental, economic, social, and technical infrastructure issues. These linkages lead to an integrated information-intensive platform that enables ecologically informed urban planning. After establishing the theoretical background and describing the diversity of contributing disciplines, the authors sample sustainability approaches and tools, offer an extended study of the urban metabolism of Lisbon, and outline the challenges and opportunities in approaching urban sustainability in both developed and developing countries.

A textbook that introduces integrated, sustainable design of urban infrastructures, drawing on civil engineering, environmental engineering, urban planning, electrical

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engineering, mechanical engineering, and computer science. This textbook introduces urban infrastructure from an engineering perspective, with an emphasis on sustainability. Bringing together both fundamental principles and practical knowledge from civil engineering, environmental engineering, urban planning, electrical engineering, mechanical engineering, and computer science, the book transcends disciplinary boundaries by viewing urban infrastructures as integrated networks. The text devotes a chapter to each of five engineering systems—electricity, water, transportation, buildings, and solid waste—covering such topics as fundamentals, demand, management, technology, and analytical models. Other chapters present a formal definition of sustainability; discuss population forecasting techniques; offer a history of urban planning, from the Neolithic era to Kevin

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Lynch and Jane Jacobs; define and discuss urban metabolism and infrastructure integration, reviewing system interdependencies; and describe approaches to urban design that draw on complexity theory, algorithmic models, and machine learning. Throughout, a hypothetical city state, Civitas, is used to explain and illustrate the concepts covered. Each chapter includes working examples and problem sets. An appendix offers tables, diagrams, and conversion factors. The book can be used in advanced undergraduate and graduate courses in civil engineering and as a reference for practitioners. It can also be helpful in preparation for the Fundamentals of Engineering (FE) and Principles and Practice of Engineering (PE) exams.

A unified framework for analyzing urban sustainability in terms of cities' inflows and outflows of matter and energy. Urbanization

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An overview of the cultural evolution of material flows and stocks with an emphasis on the design of metabolic processes in urban systems. Over the last several thousand years of human life on Earth, agricultural settlements became urban cores,

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and these regional settlements became tightly connected through infrastructures transporting people, materials, and information. This global network of urban systems, including ecosystems, is the anthroposphere; the physical flows and stocks of matter and energy within it form its metabolism. This book offers an overview of the metabolism of the anthroposphere, with an emphasis on the design of metabolic systems. It takes a cultural historical perspective, supported with methodology from the natural sciences and engineering. The book will be of interest to scholars and practitioners in the fields of regional development, environmental protection, and material management. It will also be a resource for undergraduate and graduate students in industrial ecology, environmental engineering, and resource management. The authors describe the characteristics of material stocks and flows

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of human settlements in space and time; introduce the method of material flow analysis (MFA) for metabolic studies; analyze regional metabolism and the material systems generated by basic activities; and offer four case studies of optimal metabolic system design: phosphorus management, urban mining, waste management, and mobility. This second edition of an extremely influential book has been substantially revised and greatly expanded. Its new emphasis on design and resource utilization reflects recent debates and scholarship on sustainable development and climate change.

How to make city cycling--the most sustainable form of urban transportation--safe, practical, and convenient for all cyclists. Cycling is the most sustainable mode of urban

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transportation, practical for most short- and medium-distance trips--commuting to and from work or school, shopping, visiting friends, going to the doctor's office. It's good for your health, spares the environment a trip's worth of auto emissions, and is economical for both public and personal budgets. Cycling, with all its benefits, should not be reserved for the fit, the spandex-clad, and the daring. Cycling for Sustainable Cities shows how to make city cycling safe, practical, and convenient for all cyclists.

Cities have experienced an unprecedented rate of growth in the last decade. More than half the world's population lives in urban areas, with the U.S. percentage at 80 percent. Cities have captured more than 80 percent of the globe's economic activity and offered social mobility and economic prosperity to millions by clustering creative, innovative,

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and educated individuals and organizations. Clustering populations, however, can compound both positive and negative conditions, with many modern urban areas experiencing growing inequality, debility, and environmental degradation. The spread and continued growth of urban areas presents a number of concerns for a sustainable future, particularly if cities cannot adequately address the rise of poverty, hunger, resource consumption, and biodiversity loss in their borders. Intended as a comparative illustration of the types of urban sustainability pathways and subsequent lessons learned existing in urban areas, this study examines specific examples that cut across geographies and scales and that feature a range of urban sustainability challenges and opportunities for collaborative learning across metropolitan regions. It focuses on nine cities across the United States and Canada (Los Angeles,

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CA, New York City, NY, Philadelphia, PA, Pittsburgh, PA, Grand Rapids, MI, Flint, MI, Cedar Rapids, IA, Chattanooga, TN, and Vancouver, Canada), chosen to represent a variety of metropolitan regions, with consideration given to city size, proximity to coastal and other waterways, susceptibility to hazards, primary industry, and several other factors.

This open access book is the first to systematically introduce the principles of urban informatics and its application to every aspect of the city that involves its functioning, control, management, and future planning. It introduces new models and tools being developed to understand and implement these technologies that enable cities to function more efficiently – to become ‘ smart ’ and ‘ sustainable ’ . The smart city has quickly emerged as computers have become ever smaller to the

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point where they can be embedded into the very fabric of the city, as well as being central to new ways in which the population can communicate and act. When cities are wired in this way, they have the potential to become sentient and responsive, generating massive streams of ‘ big ’ data in real time as well as providing immense opportunities for extracting new forms of urban data through crowdsourcing. This book offers a comprehensive review of the methods that form the core of urban informatics from various kinds of urban remote sensing to new approaches to machine learning and statistical modelling. It provides a detailed technical introduction to the wide array of tools information scientists need to develop the key urban analytics that are fundamental to learning about the smart city, and it outlines ways in which these tools can be used to inform design and policy so that cities can become more efficient with a

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greater concern for environment and equity.

A unified framework for analyzing urban sustainability in terms of cities' inflows and outflows of matter and energy. Urbanization and globalization have shaped the last hundred years. These two dominant trends are mutually reinforcing: globalization links countries through the networked communications of urban hubs. The urban population now generates more than eighty percent of global GDP. Cities account for enormous flows of energy and materials—inflows of goods and services and outflows of waste. Thus urban environmental management critically affects global sustainability. In this book, Paulo Ferrã o and John Fern á ndez offer a metabolic perspective on urban sustainability, viewing the city as a metabolism, in terms of its exchanges of matter and energy. Their book provides a

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Provides guidelines for assessing the

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sustainability of urban systems including
theory, methods and case studies.

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