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1 Introduction to the Sustainable Built Environment

Begum Sertyesilisik, Ahmed Al-Shamma'a, Amr Sourani, Anupa Manewa, Bernd Kochendoerfer, Margarete Roigk, Basak Guçyeter, H. Murat Gunaydin, Tofigh Tabesh, Laurence Brady, David Phipps, Derek King and Jack Rostron

The world's habitat is deteriorating in terms of global warming, the extinction of natural resources and the loss of biodiversity, due to the environmental footprint of human beings through the emission of greenhouse gasses arising from industrialisation and the exploitation of natural resources. The construction industry is one of the industries that affects the environment adversely. The construction industry affects the environment through its outputs (the built environment) and through production processes (material manufacturing, building processes). For this reason, there is a need for a sustainable built environment based on principles that allow the environmental footprint of the built environment to be reduced. A sustainable built environment aims to achieve zero negative impact on the environment.

Aims and rationale

This book aims to provide knowledge on the technical, managerial, legal and economic aspects of the sustainable built environment (Figure 1.1).

The book is designed to help researchers, academics and students as well as practitioners in the field of construction. There are nine chapters in the book, all written by expert contributors. The content of each is summarised here:

This first chapter provides information on the rationale and content of the book.

Chapter 2 focuses on sustainable procurement. There is a need to move from the adoption of "conventional" procurement strategies towards more "sustainability-oriented" procurement strategies. The chapter aims to explain the concept of "sustainable procurement" and its application to the context of construction. The chapter outlines concepts and principles relating to sustainability, and their relevance towards achieving organisational goals as well as their adaptation to the construction industry. Much can be done to achieve sustainability within the value-for-money approach, which is the aim of construction procurement. Integrating sustainability into the project brief and contract specifications, choosing an appropriate procurement system from a sustainability perspective, using multi-criteria decision-making techniques, evaluating and selecting contractors on the basis of value and provision of incentives and rewards are all examples of actions that can improve the contribution of procurement strategies towards sustainability. There are also other enablers that can enhance the development of "sustainability-oriented" procurement strategies. These enablers

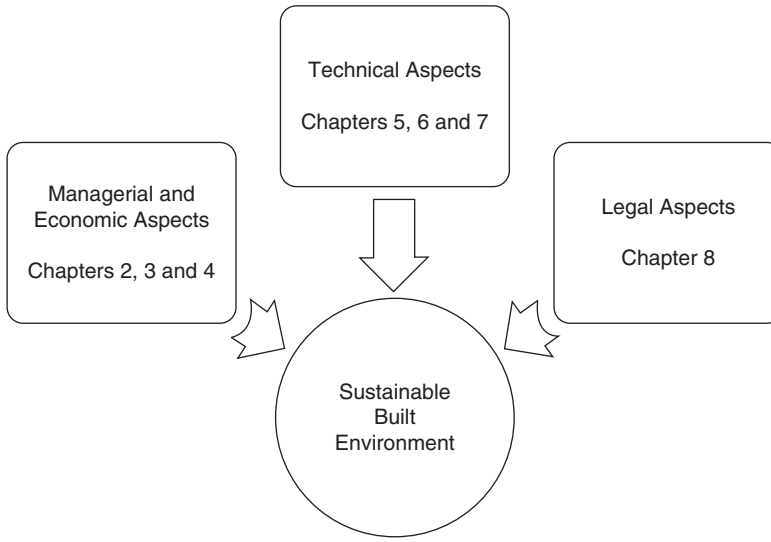

Figure 1.1 Structure and scope of the book

include knowledge and perception, and political and regulative, financial, instrumental, logistical, organisational and management and strategic enablers.

Chapter 3 focuses on cost modelling for sustainability. Sustainability is a term that encompasses a broad definition, which focuses on maintaining and improving the social, economic and environmental state of present and future generations. This broad scope of sustainability is usually rendered to quantifiable aspects that are directly related to reduction of the energy consumed or materials used/wasted. However, costs in the life cycle of buildings should be considered to be one of the essential parameters in assessment of sustainability measures, since any effort in achieving sustainable measures for the built environment is evaluated through financial value. Thus, in today's world, there is an absolute necessity to provide cost efficient applications for the establishment of the sustainable built environment. Chapter 3 focuses on determination and optimisation of life-cycle costs for sustainable construction and their relationship with energy conservation and management. It covers definitions such as cost, cost accounting and accounting for sustainability. It introduces methods and tools on how cost control systems are integrated into life-cycle considerations for the built environment. The chapter covers interdisciplinary methods for optimisation of the life-cycle costs, such as life-cycle engineering, facility management, primary energy and impact assessment, with an emphasis on their importance in decision making needed for the establishment of the sustainable built environment. Furthermore, the last section provides a brief exploration of current research on life-cycle cost assessment of buildings and their relationship with the sustainable built environment.

Chapter 4 continues the focus on managerial and economical aspects of the sustainable built environment. This chapter on the sustainable building process provides a detailed analysis of sustainable construction in three main phases, namely: pre-construction, construction and post-construction and outlines key

aspects of each phase. The lean construction concept is investigated as a key for enhancing sustainability performance of the construction project management.

Chapter 5, which is on sustainable buildings, focuses on the definition of and drivers for sustainable buildings, building assessment tools and key technical aspects of sustainable buildings, including topics such as the selection of building materials, the building envelope, heating, ventilating and air conditioning.

Chapter 6 introduces low- and zero-carbon technologies used in sustainable buildings. Low- and zero-carbon technologies are becoming more relevant as awareness of environmental factors such as global warming increases. Low- and zero-carbon technologies can make the difference in creating a successful sustainable project. Nevertheless, the chapter points out that these technological solutions are only part of a strategy for minimising carbon emissions from buildings. In fact, intelligent architectural and structural design can utilise the building fabric and layout to absorb heating and cooling loads, as well as encouraging natural ventilation. The combination of renewable engineering services and effective environmental control by architectural means indicates that, to achieve low carbon targets for buildings, modern design teams must co-operate effectively.

Chapter 7 focuses on sustainability in utilities and water-efficient sustainable buildings, and aims to set out the broad principles of domestic water efficiency. Providing an adequate, secure, domestic water supply for intensely urbanised, developed societies is now a growing problem worldwide. Satisfying demand by increasing conventional supply is seen as unsustainable. Some limited help on the supply side may come from adopting alternative primary supplies such as rain- and stormwater capture or by employing grey- and blackwater for non-potable uses, though many technical problems still remain to be addressed. It is widely recognised that the only effective strategy will involve reducing demand by improving the efficiency of water use.

Chapter 8 focuses on the legal aspects of the sustainable built environment. It focuses on the interrelationship of sustainable development and environmental impact assessment. It defines sustainable development and the evolution of policy. It explains reporting requirements along with the indicators used as well as the technical process of assessment. It reviews the origins of planning controls, which essentially started in the early part of the twentieth century. The legal background to environmental impact assessment is explained. This includes the range of land uses and types of development that require an assessment to be produced before a planning application can be considered for approval. The process for the submission and consultation requirements is described, along with the environmental impact assessment regulatory requirements.

Chapter 9 concludes the book, drawing together the material from each of the different chapters.

The book is aimed at undergraduate and graduate students, researchers, tutors and practitioners in the field of construction. Readers can choose between reading the book from the beginning to the end or starting with the chapter in which they have most interest. We hope that the readers will enjoy reading this book and increasing their knowledge about the sustainable built environment.

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