

Spatial Planning and Sustainable Development

Ying Long  
Enjia Zhang

# Data Augmented Design

Embracing New Data for Sustainable  
Urban Planning and Design

 Springer

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Spatial Planning and Sustainable Development

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# Data Augmented Design

Embracing New Data for Sustainable Urban  
Planning and Design

 Springer

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## Preface

With the booming of information and communications technology (ICT), “Big data” such as mobile phone signal traces, public transportation smart card records, and “open data” from commercial websites and government data portals jointly promote the formation of the “new data environment,” which provides a novel and supplementary perspective for planning and design and stirs up their methodology transition in essence. The concepts traditionally associated with healthcare architecture, such as evidence-based design (EBD), and other concepts like data-driven design and design with data are being integrated into urban planning and design. Quantitative data is encouraged to be used to find the right problems/opportunity areas, understand urban activities, and help decision-making and design process.

In such a condition, we have proposed a new planning and design methodology termed data augmented design (DAD) to highlight data (science) in and for design (Long and Shen, 2015).<sup>1</sup> Empowered by emerging big and open urban data, together with quantitative spatial analysis and statistical approaches and cutting-edge techniques like artificial intelligence and ubiquitous sensors, DAD provides a supporting platform for the whole (urban) design process, ranging from field investigation, existing condition analysis, future forecasting, scheme design, operation evaluation and feedback. It is hoped that the application of DAD in urban design practice could (and should) improve the scientific level of planning and design and inspire the creativity of planners and designers. Based on our understanding upon supporting tools for planning and design, the proposed DAD belongs to a new planning and design support form after CAD (computer-aided design), (S)DSS ((spatial) decision support system), GIS (geographical information system), and PSS (planning support system). In the past several years, we have been working on continually improving its application in design teaching and project practice. This book will discuss the main body of DAD and review its applications in design practice.

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<sup>1</sup> Long Y and Shen Y (2015) Data Augmented Design: Urban Planning and Design in the New Data Environment. Shanghai Urban Planning Review, (02): 81–87 (in Chinese with English abstract).

DAD provides supporting tools covering the whole urban design process from investigation, analysis, and project design to evaluation and feedback. Typically, there are three main types of applications of DAD that aid site design—those that seek to understand the elements of the site, those that learn from other excellent cases, and those that embrace the most advanced technology and the future built environment. This book is organized at a conceptual and methodology level. Competitions and projects are divided into three parts according to their concepts and methods to adopt the DAD.

Part I is the overview of DAD, in which its definitions, dimensions, performance, and applications are introduced. Before that, conditions of contemporary cities in transition and some significant trends are illustrated to interpret the background of the proposal of DAD. Moreover, to better describe the merit of DAD in micro-space field, human-scale urban form and its applications in DAD are also presented in this part.

Part II is the first type of DAD applications, which aim to objectively understand the elements of a site to better design a site. In details, DAD can be applied to redevelopment-oriented design, which helps find problems via an existing condition analysis based on multidimensional data, and quantitatively evaluate the implementation of designs after site operation. Based on this method, three teams using DAD in urban design competitions have been supervised and received very good outcomes. In these three works, DAD as a methodology for urban design provided different methods for analyzing big and open data in different dimensions.

Part III is the second type of DAD applications that is learning from other cases to better design a site. In this part, DAD can be applied to the expansion-oriented design, which helps to extract spatial indexes from existing cases to form a classified “gene pool” for quantification and a reference index system for new designs. Based on this method, DAD has been successfully applied in the projects of the subcenter of Beijing and Xiong’an New District in China, proving the applicability of the type of DAD.

Part IV is the third type of DAD applications and the most future-oriented one. We describe it embracing advanced technologies and transitioning of cities to better design sites. As we illustrate in Part I, we live in an era of very rapid development and change that is driven by various forms of technologies, which have the potential to change the way we live, work, and play. Only by embracing the most advanced technology and transitions in cities can a better future be created. This concept reflects on two previous projects. One is about the future form of settlement and the other one focuses on the future form of an island.

Moreover, in the appendix, we have listed the related data for readers to better understand and utilize the framework of DAD, and we also collected the related research centers/labs and their representative projects for readers to gain further knowledge related to data science and data-driven urban design. Besides, in our

opinion, educating graduate and undergraduate students, most of whom are the future urban planners, with a sense and knowledge of DAD is important as well for advancing its further application. As a result, established courses in colleges and universities around the world are also listed in the appendix as well.

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All contents in this book are studies and designs from our research laboratory - Beijing City Lab (<http://www.beijingscitylab.com>). We want to express our thanks to the contributors listed below for their preparation of some chapters. On the basis of their work, we are able to edit in-depth to make this book a more integrated one.

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