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Integrated Spatial and Energy Planning

Supporting Climate Protection and the Energy Turn with Means of Spatial Planning

Springer

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ISSN 2191-530X ISSN 2191-5318 (electronic)
SpringerBriefs in Applied Sciences and Technology
ISBN 978-3-319-31868-4 ISBN 978-3-319-31870-7 (eBook)
DOI 10.1007/978-3-319-31870-7

Library of Congress Control Number: 2016935211

Printed on acid-free paper

This Springer imprint is published by Springer Nature
The registered company is Springer International Publishing AG Switzerland

Preface

Energy issues and spatial planning become increasingly interwoven. The more we talk about sustainable energy systems, energy resource limitations or greenhouse gas reduction, and climate change mitigation, the more we move into the thicket of the jungle of interrelations between space and energy. This book is meant to provide the reader with a reliable compass but also with other necessary tools to find his way through this jungle and arrive at the other side of the thicket at practical planning solutions.

One of the vexing features of the link between energy and spatial planning is that it cuts not only across two of the most basic scientific concepts, space and energy, but puts very different actors with various backgrounds in the same boat. This is true on the scientific level, where integrated spatial and energy planning is almost synonymous with interdisciplinary. It requires expertise in spatial planning, energy, and grid engineering, but also in fields as far apart as agriculture and civil engineering. This variety of actors applies however to the planning process, too. Gone will be the times where the only principal players for energy systems will be big utilities, public authorities, and possibly developers and investors. In an area of dynamic technological progress in both energy provision and energy efficiency technologies, with ever-increasing possibilities for decentralized small-scale installations and "smart grids," energy systems can become democratized. This makes planning processes arguably more complex as they become increasingly participatory. It makes them however certainly more interesting and challenging.

This increased complexity of the spatial planning process when energy issues become involved also requires a new quality for any tool used in this endeavor. Tools become means to facilitate the discourse between stakeholders. They have to provide scientific and technical rigor while allowing at the same time to accommodate different viewpoints and interests of stakeholders. It is not only the end result of a calculation or design that counts. Almost as important is the information about different aspects of complex spatial solutions for energy systems that

stakeholders can glean from using a tool. Tools must make hidden systemic links within energy systems transparent. They must also provide a graphic and understandable description of the behavior of energy systems within spatial contexts, so that stakeholders can base their decisions on their outcome. This means that as integrated spatial and energy planning becomes more systemic, so must the tools involved.

According to the systemic and interdisciplinary challenges of integrated spatial and energy planning, this book has been an interdisciplinary exercise. It combined authors with spatial planning as well as engineering backgrounds who had had already a long tradition in jointly working in integrated spatial and energy planning projects in various settings. Besides providing different vantage points on integrated spatial and energy planning and fuse engineering as well as spatial planning expertise based on long cooperation, it is the practical experience in using tools in participatory planning processes that is important. The book is meant to provide practical guidance for integrated spatial and energy planning that requires guides who do have theoretical knowledge but can also report from experience.

The authors are therefore particularly grateful to those persons and institutions that allowed them to gain this experience in a number of interesting and challenging action research projects and for providing valuable feedback on the application of the tools described in this book. We want to thank the Austrian Climate and Energy Fund for supporting fundamental as well as applied research projects such as the project PlanVision and the development of the ELAS Calculator, as well as the establishment of the resource plan for the Mühlviertel region. The city of Freistadt has been a particularly valuable partner in many projects, some of them co-funded by the Austrian Climate and Energy Fund. Without that support and cooperation neither the Energy Zone Mapping could have been developed nor could the progress in Process Network Synthesis have been achieved that finally led to the development of RegiOpt.

In many projects Austrian Federal State administrations were either funding partners or valuable sounding boards. We are particularly thankful to the Federal Ministry of Agriculture, Forestry, Environment, and Water Management as well as to the Federal State Government of Upper Austria, Salzburg and Lower Austria for their support. Our thanks also extend to the cities of Graz and Vienna for providing support, data, and funds for projects that considerably contributed to honing the tools presented here. Especially, we want to thank our action research and practice partners with whom we have established long-lasting cooperation in projects that constitute the basis of this book, in particular (in alphabetical order) Hans Emrich, Winfried Ginzinger, Christian Jachs, Siegfried Kautz, Helmut Koch, Gilbert Pomaroli, Friedrich Stockinger, Oskar Stöglehner, and Werner Thalhammer. Finally, we want to thank our fellow researchers in these interdisciplinary research projects.

We hope that this book will help the reader to get new insight into integrated spatial and energy planning. We also hope that the theoretical framing, the planning principles, and the tools presented here will prove helpful in the challenge to create sustainable solutions that reduce the environmental impact from energy provision and provide secure and sufficient energy supply while reducing the long-term costs for energy services and infrastructure.

Vienna, Graz
May 2016

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Chapter 1
Introduction

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Abstract "Integrated spatial and energy planning" constitutes an important strategy to implement the energy turn. This chapter gives a brief introduction, discussing the dynamic of energy flows as well as the spatial distribution of energy sources and energy demand first. Secondly, spatial structures determine the possibilities to support the energy turn in given spatial contexts and how energy efficiency can be organized on the scale of spatial structures. Finally, the scope of this book is defined.

Shifting from a fossil and nuclear to a renewable energy resource base is an imperative societal and political target. Numerous political strategies have been formulated in recent years from the supranational, national to the regional and local levels to move toward this "energy turn."[1] Among others, arguments for the energy turn are climate change mitigation (IPCC 2014), the anticipated scarcity of fossil and nuclear resources in the near future (catchword "peak oil," see, e.g., Aleklett 2012), the use of regional energy resources in order to gain more autonomy from fuel imports, the striving for positive regional–economic effects, or the creation of green jobs. Many strategies for the long-term implementation of the energy turn have been formulated that mainly rest on two pillars (see, e.g., European Commission 2011a; BFE 2015; BMWi 2015; BMLFUW and BMWFW 2010): (1) the reduction of the energy consumption, e.g., by changes of lifestyles and economic practices as well as energy efficiency measures; and (2) the substitution of fossil and nuclear energy by renewable energy sources.

In policy making, research, and development, much attention has been paid to the technological aspects of the energy turn, which allows us now to choose between a wide range of options for energy saving and the generation of renewable energy, with some technological issues such as energy storage still partly unsolved. Yet, implementing the energy turn does not only mean to deal with technologies. A complex fabric of issues influences possibilities and options to proceed toward the energy turn, which are, inter alia, the base values of society, the interplay of

[1]In the German-speaking world, "Energiewende," which literally translates to "energy turn," is the common phrase to describe this shift toward a renewable energy system.

G. Stoeglehner et al., *Integrated Spatial and Energy Planning*,
SpringerBriefs in Applied Sciences and Technology,
DOI 10.1007/978-3-319-31870-7_1