

# **SpringerBriefs in Earth Sciences**

More information about this series at <http://www.springer.com/series/8897>

Graciela Metternicht

# Land Use and Spatial Planning

Enabling Sustainable Management  
of Land Resources

 Springer

Graciela Metternicht  
School of Biological, Earth and  
Environmental Sciences, PANGEA  
Research Centre  
University of New South Wales  
Sydney, NSW  
Australia

ISSN 2191-5369 ISSN 2191-5377 (electronic)  
SpringerBriefs in Earth Sciences  
ISBN 978-3-319-71860-6 ISBN 978-3-319-71861-3 (eBook)  
<https://doi.org/10.1007/978-3-319-71861-3>

Library of Congress Control Number: 2017959544

© The Author(s) 2018

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Printed on acid-free paper

This Springer imprint is published by Springer Nature  
The registered company is Springer International Publishing AG  
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

# Preface

Competition for land is increasing as demand for multiple land uses and ecosystem services rises. Pressures for the conversion of agricultural land to other uses such as reforestation and biofuels are raising underpinned by issues related to food security, renewable energy, and emerging carbon markets. This is happening in tandem with greater demands from land systems for the supply of ecosystem services (provisioning, regulating, supporting, and cultural). Managing increasing competition for the supply of these services while accounting for different stakeholders' interests requires efficient allocation of land resources. Land use planning can aid in finding a balance among competing and sometimes contradictory uses, while promoting sustainable land use options.

This Brief identifies and discusses evidence of land use planning, spatial planning, territorial (or regional) planning, and ecosystem-based or environmental land use planning as tools that can strengthen land governance, improve economic opportunities based on sustainable management of land resources, and develop land use options that reconcile conservation and development objectives.

Case studies analyzed show that as process and/or instrument, spatial and land use planning can contribute to sustainable land management (SLM) through, inter alia, protecting natural capital, including lands of agricultural significance from urban and peri-urban encroachment; ensuring land use reflects land capability or land suitability; preventing or limiting vegetation clearing; avoiding the occurrence, and/or planning for the rehabilitation, of degraded land and contaminated sites; promoting conservation and enhancement of ecological corridors; and accounting for sea-level rise and increased storm surge, arising from coastal development (Australia 2008, 2011, 2013).

Land use planning can also contribute to protecting the quality and quantity of freshwater resources, to enhancing management of areas prone to natural disasters (e.g., floodplains), and to protecting natural habitats from destruction and fragmentation. In areas of communal land tenure, land use planning assists in the sustainable management of rangelands, inter alia, resolving issues related to competing land uses and land tenure conflicts, and strengthening land governance.

The main policy messages arising from this Brief are:

1. Comprehensive land use planning is an instrument for sustainable land management, concurrently advancing sustainable development (Walsh 2006); it creates the preconditions required to achieve a type of land use that is environmentally sustainable, socially just and desirable, as well as economically sound (GIZ 2012).
2. Land use planning should be approached from both land cover and land functionality perspectives, as the latter is a nexus to other transversal land issues.
3. Land use planning is centered around a participatory definition of future land uses; it is, therefore, a useful approach whenever natural capital and biodiversity are to be protected, restored, and/or rehabilitated, and unexplored land use potential has to be identified and evaluated.
4. Land use and spatial planning can: (a) reconcile land use with environmental concerns and resolve potential conflicts between sectoral interests and potential uses (ESPON 2012); (b) clarify customary land tenure of communal lands and increase land tenure security.
5. Policy responses to coordinate human activities with environmental conservation—alongside suitable financial, legal, and technical support—are needed to guide land use planning in supporting sustainable land management, and to help resolve conflicting land use demands.
6. The integration of cross-sectoral policies (e.g., land use, energy, and water management) into a single planning instrument at the regional level, based on an understanding of territorial dynamics, can bolster sustainable land management.
7. Planning at the regional scale enables the cumulative impacts of future development on the natural capital of a region to be accounted for, and the sharing of responsibility for protection and management across a wider number of stakeholders.
8. As a process undertaken at national and/or territorial level, following well-established principles of participation, integration, and assessment of land and water potential, LUP can address systemic issues of policy and institutional coherence, multi-stakeholder partnership, and high-quality data availability, identified as essential factors to strengthen the means of implementation of the Sustainable Development Goals.

Sydney, Australia  
October 2017

Graciela Metternicht

# **Acknowledgements**

This report benefited from the inputs of Sasha Alexander (UNCCD) and two anonymous reviewers. The author is thankful to Natalia Ipatow from Munich University of Applied Sciences (Germany) for the cartography of this brief. This report was commissioned by the UNCCD.

# Key Definitions

**Best practice:** a procedure that has been shown by research and experience to produce optimal results and that is established or proposed as a standard suitable for widespread adoption (Merriam-Webster, n.d.).

**Ecosystem restoration:** the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed (SER 2004).

**Land use planning:** the systematic assessment of land and water potential, alternatives for land use and economic and social conditions in order to select and adopt the best land use options. Its purpose is to select and put into practice those land uses that will best meet the needs of the people while safeguarding resources for the future FAO 1993.

See Table 2.1 for:

- **Ecological land use planning;**
- **Integrated land use planning;**
- **Participatory land use planning;**
- **Regional land use planning;**
- **Rural territorial land use planning; and**
- **Spatial land use planning.**

**Multi-functional landscapes:** landscapes which serve different functions and combine a variety of qualities (i.e., different material, mental, and social processes in nature and society occur simultaneously in any given landscape and interact accordingly); ecological, economic, cultural, historical, and aesthetic functions coexist in a multi-functional landscape (ESPON 2012).

**Peri-urban zone:** area between an urban settlement and its rural hinterland. Larger peri-urban zones can include towns and villages within an urban agglomeration. Such areas are often fast changing, with complex patterns of land use and landscape, fragmented between local and regional boundaries (Zivanovic-Miljkovic et al. 2012).



**Policy:** a course or principle of action adopted or proposed by an organization or individual (Dictionaries, n.d.). Strategies provide a means to implement policies. Actions describe specific elements within a strategy.

**Sustainable use:** the use of components of biological diversity in a way, and at a rate, that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of the present and future generations (Convention on Biological Diversity 1992).

**Sustainable land management (SLM):** adoption of land use systems that, through appropriate management practices, enable land users to maximize the economic and social benefits of land, while maintaining or enhancing the ecological support functions of its resources (soil, water, vegetation, and animal resources) (Liniger et al. 2011). SLM combines technologies, policies, and activities aimed at integrating socioeconomic principles with environmental concerns, so as to simultaneously maintain or enhance production, protect the potential of natural resources, and prevent (or halt) soil, vegetation, and water degradation, while being economically viable and socially acceptable (Smyth and Dumanski 1993).

# Contents

<b>1 Introduction</b> .....	1
1.1 Land Use Planning—A Contribution to Sustainable Land Management (SLM) .....	2
1.2 The Nexus Between Land Use Planning and Changes in the Land System .....	3
1.3 Land Use, Land Governance and Land Tenure: Interdependent Factors Influencing Land Use Planning .....	4
<b>2 Planning: Definitions and Evolution in the Context of SLM</b> .....	7
2.1 Definition .....	7
2.2 Types of Land Use Planning .....	7
2.3 Land Use Planning Approaches: Basic Requirements .....	12
<b>3 Principles of Best Practice in Land Use Planning for SLM</b> .....	15
3.1 Introduction .....	15
3.2 Socio-political and Legal Contexts .....	17
3.3 Multi-stakeholder Engagement: Integration and Participation .....	18
3.4 Multi-scale Relevance and Vertical Integration .....	20
3.5 Multi-sectoral Coordination .....	20
3.6 Multi-functionality of the Land .....	22
3.7 Best Planning Policies and Practices: Representative Case Studies .....	23
3.8 Key Directions for Supporting SLM Through Land Use Planning Policy .....	23
<b>4 Contributions of Land Use Planning to Sustainable Land Use and Management</b> .....	35
4.1 Introduction .....	35
4.2 Land Use Planning: An Instrument for SLM .....	39
4.3 Land Use Planning: An Instrument for Promoting Sustainable Land Use and Ecosystem Restoration .....	41

4.4	Land Use Planning: A Tool for Sustainable Infrastructure Development . . . . .	45
4.5	Land Use Planning: A Tool to Improve Economic Opportunities . . . . .	45
4.6	Land Use Planning: A Tool to Strengthen Land Governance . . . . .	48
<b>5</b>	<b>Land Use Planning for Advancing Internationally Agreed Development Goals . . . . .</b>	<b>53</b>
5.1	LUP and the 2030 Sustainable Development Agenda . . . . .	53
5.2	LUP Supporting Other International Agreed Environmental Goals . . . . .	54
<b>6</b>	<b>Concluding Remarks . . . . .</b>	<b>61</b>
6.1	Opportunities of LUP for SLM . . . . .	61
6.2	Remaining Challenges of LUP for SLM . . . . .	62
6.3	Policy Messages . . . . .	64
	<b>Appendix A: Methodology . . . . .</b>	<b>67</b>
	<b>Appendix B: Selected Land Use Policy Case Studies . . . . .</b>	<b>69</b>
	<b>Appendix C: Sustainable Development Goals and Targets . . . . .</b>	<b>107</b>
	<b>References . . . . .</b>	<b>111</b>

# List of Figures

Fig. 1.1	Drivers and pressures of land use change; their underpinning of the need for planning, and planning as a response. Adapted from (Walsh 2006).	3
Fig. 2.1	The land use planning universe	12
Fig. 2.2	Steps of the land use planning process	13
Fig. 3.1	Role of function-analysis and valuation in environmental planning, management and decision making (de Groot 2006)	22
Fig. 4.1	Suitability of irrigated annual crops in Northern Australia. Most land is marginal or unsuitable for that specific use (Classes C1 and C2)	46
Fig. 5.1	Key elements of the scientific conceptual framework for LDN and their interrelations. From: Orr et al. (2017).	56
Fig. 5.2	Integrated LUP for sustainable development and LDN. From: Orr et al. (2017).	57
Fig. 5.3	Sustainable development goal target 15.3 on achieving land degradation neutrality as a catalyst for advancing other SDG targets. From: Akhtar-Schuster et al. (2017)	58
Fig. 5.4	SDG targets that explicitly (inside green circle) or implicitly (inside grey circle) recognize LUP as process or instrument to their achievement.	58
Fig. B.1	Overview of Western Australia's centralized planning system	70
Fig. B.2	Western Australia State Planning Framework	71
Fig. B.3	Western Australia approach to State planning	73
Fig. B.4	Approach to spatial planning in Denmark	85
Fig. B.5	Approach of territorial LUP in Mexico (Wong-González 2009). Programas de Ordenamiento Ecológico del Territorio (POET) mandate of SEMARNAT; Ordenamiento Territorial (OT); Programas Estatales de Ordenamiento del Territorio (PEOTs), mandate of SEDESOL.	99

Fig. B.6 The LUP process of Singapore ..... 101

Fig. B.7 Hierarchy, responsibilities and interlinkages of spatial planning  
in Indonesia ..... 104

# List of Tables

Table 2.1	Land use planning and its variants, including spatial land use planning . . . . .	9
Table 3.1	Best land use policy case studies and criteria of best practice. . . . .	24
Table 3.2	Summary table of case studies. <u>Underlined are exemplary</u> best practice criteria identified . . . . .	26
Table 4.1	Examples of LUP which identifies and promotes sustainable land use options . . . . .	36
Table B.1	Summarizes the planning and land use policy instruments adopted at different administrative levels . . . . .	86
Table C.1	SDG targets that explicitly (green cells) or implicitly (grey cells) recognize the relevance of LUP as process or instrument to their achievement. . . . .	107

# List of Boxes

Box 1	Land under pressure . . . . .	2
Box 2	Example of the impact of governance and lack of land use planning on rangelands, leading to degradation . . . . .	4
Box 3	Land tenure issues relevant for land use planning . . . . .	5
Box 4	Principles of leading LUP practices . . . . .	16
Box 5	Socio-political and legal contexts enabling LUP: evidence from Latin America . . . . .	17
Box 6	Challenges associated to participatory land use planning (PLUP) in developing countries . . . . .	19
Box 7	Spatial planning in Denmark: multi-scale and multi-sectoral coordination . . . . .	20
Box 8	Land use planning and multi-sectoral coordination: an essential nexus for more integrated policies . . . . .	21
Box 9	Joint village LUP for sustainable rangeland management—Tanzania . . . . .	39
Box 10	Land use planning to promote sustainable land use and conservation of tropical forest . . . . .	41
Box 11	Biodiversity conservation through land use planning in Western Australia . . . . .	42
Box 12	Efficient land allocation and spatial targeting: planning future land use alternatives . . . . .	47
Box 13	Improving economic and environmental performance through planning land use change . . . . .	47
Box 14	Participatory rural LUP to increase tenure security and resolve land use conflicts: Laos . . . . .	49
Box 15	Land use, land tenure and sustainable wildlife management in Kenya . . . . .	51
Box 16	LUP as key process and tool supporting the implementation of the SDGs in a coherent and integrated manner . . . . .	54