



READING LIST IN SUSTAINABILITY SCIENCE

Educational material in Sustainability Science

For students and teachers in Natural resource
management and Social-ecological systems

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CONTENT: This reading list represents an overview of some of the authors own educational material in natural resource management and studies of social-ecological systems. The material is suitable at courses and programs for teachers and students in higher education, particularly in Sustainability Science, and deals with a number of analytical frameworks and basic theoretical concepts to study resilience management of natural resources in interlinked social and ecological systems.

Purpose of the report

The learning materials listed herein is intended to inspire both teachers and students in Sustainability Science with a number of typical and instructive publications in natural resource management with examples of the author's research from both rural and urban settings. Readers will become familiarized with different interdisciplinary approaches for studying coupled linkages in social and ecological systems and are presented a facet of topics addressed in current Sustainability Science, including resilience thinking, ecosystem services, urban sustainable design and planning, and the role of institutions for building resilience in social-ecological systems.

The material is suitable at courses and programs in higher education that aim to provide a basic understanding of the characteristics and dynamics of ecosystem succession, and different ways humans manage natural resources and ecosystems. The material also covers different types of ecological knowledge systems, management practices, informal institutions and property rights that underly ecosystem management in both non-urban and urban settings. Through the reading material, students will become acquainted with useful analytical frameworks for studying interlinked social and ecological systems and will gain an increased understanding of basic theoretical concepts such as resilience, ecosystem services, urban ecology, informal ecosystem management and social-ecological urbanism. The publications also cover practical ecosystem management approaches, ranging from urban management designs to management of urban gardens and golf courses in human-dominated settings where nature and people closely interact.

Natural resource management

One of society's greatest challenges is to sustain natural resources in different forms, while at the same time promote economic growth and quality of life for both humans and non-human species. Society must therefore have adequate measures and strategies to safeguard and distribute resources in fair, sustainable and resilient ways. There is, however, increasing awareness that our global ecological life support systems are at risk, and that the resilience

(buffering capacity) of many ecosystems and resource management systems are critically contracted. Decisions made on the basis of local, narrow, and short-term criteria can lead to devastating results in the long run. There is also increasing awareness that traditional economic and ecological models and concepts fall short in their ability to adequately deal with current environmental problems; hence, alternative economic models (e.g. ecological economics) that take ecosystems into account and view the biosphere as a fundament for all human activities, have been developed during the last two decades to promote resilience in social-ecological systems.

Natural resources refer to both nonrenewable and renewable resources that are obtained from biophysical systems. The former are resources found inside the earth, and have taken millions of years to form, and include e.g. oil, natural gas, and coal. The latter are resources that can be replenished to replace the portion depleted by usage and consumption, either through natural reproduction or other recurring processes such as management within a human time scale.

Sustainability Science

Natural resource management represents a central tenet of Sustainability Science, which is a rather new scientific field that emerged in the beginning of year 2000 as a new academic discipline that brings together several disciplines across the natural and social science fields. Sustainability Science normally comprises concepts, theories, methods and models that describe and answer questions related to the connections between the environment, humans and technology. Environment in this context could refer to both the natural environment as well as the social and built environment, such as urban form.

An important part of Sustainability Science is to inform both scholars and professionals about ways and strategies that can contribute to low environmental impacts through sustainable management, planning and housekeeping with natural resources and with limited emissions to air, land and water. In extension the aim is to increase human well-being, from a systemic, societal and individual perspective. Natural resource management can offer useful ways for how to achieve these ends. It refers to the management of specific natural resources as well as to the structures, functions and processes that make up whole ecosystems and their services. In Sweden natural resource management represents a major subject field in Sustainability Science at several higher educational institutions, each offering its own unique blend of course composition.

Ecosystem management and social-ecological systems

An important part of natural resource management is *ecosystem management*, which is concerned with management of whole ecosystems and their services and can be distinguished from natural resource management, which often tend to focus on managing particular resources, such as a few species of agricultural crops, or trees in a forest for timber. *Ecosystem services* comprise renewable natural resources that provide social, environmental and economic benefits to humans. Hence, they are anthropocentrically defined. The increased focus on ecosystem services has led to increasing numbers of regulations geared toward protecting natural resources. Ecosystem management entails the preservation of structures, functions and processes that are critical for ecosystems to renew themselves over space and time. Humans are regarded as critical ecosystem components to

such a degree that one can view social and ecological systems as deeply interlinked. Hence, the delineation between social and ecological systems is artificial and arbitrary. However, traditional academic approaches for addressing and solving environmental problems have long treated social and ecological systems in isolation and as separated entities. Interdisciplinary social-ecological systems approaches are, however, increasingly being developed in Sustainability Science to better understand these processes.

Academic textbooks and chapter contributions



Full volumes:

- Berkes, F., Folke, C., and Colding, J. 1998. *Linking Social and Ecological Systems: Institutional learning for resilience*, Cambridge University Press, Cambridge, UK. Available as E-book at Stockholm University Library (or similar academic service).
- Berkes, F., J. Colding, and C. Folke. 2003. *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change*. Cambridge University Press, U.K.

Chapter contributions:

- Folke, C., Berkes, F. and Colding, J. 1998. Synthesis and Conclusions: Social mechanisms for resilience and sustainability. In: Berkes, F., Folke, C., and Colding, J. (eds.), *Linking Social and Ecological Systems: Institutional learning for resilience*, Cambridge University Press, Cambridge, UK. Available as E-book at Stockholm University Library (or similar academic service).
- Colding, J., Elmqvist, T. and Olsson, P. 2003. Living with disturbance: building resilience in social-ecological systems. Pages 163-186 in: Berkes, F., J. Colding, and C. Folke. (editors), *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change*. Cambridge University Press, U.K.
- Folke, C., J. Colding and F. Berkes. 2003. Synthesis: Building Resilience and Adaptive Capacity in Social-Ecological Systems. Pages 352-387 in: Berkes, F., J. Colding and C. Folke (eds.). *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change*. Cambridge University Press, Cambridge.
- Berkes, F., J. Colding and C. Folke. 2003. Introduction. Pages 1-29 in: Berkes, F., J. Colding and C. Folke (eds.). *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change*. Cambridge University Press, Cambridge.
- Colding, J. 2011. Creating incentives for increased public engagement in ecosystem management through urban commons. Pages 101-124 in *Adapting Institutions: Governance, Complexity and Social-Ecological Resilience*. Emily Boyd and Carl Folke (Eds.). Cambridge University Press, Cambridge, UK.

- Colding, J. 2011. The role of ecosystem services in contemporary urban planning. Pages 228-237 in J. Niemelä, (ed.), *Urban Ecology: Patterns, Processes and Applications*. Oxford University Press, Oxford, UK.
- Barthel, S., Colding, J., Ernstson, H., Erixon, H., Grahn, S., Kärsten, C., Marcus, L. and Torsvall, J. 2013. *Principles of Social-Ecological Urbanism. Case study: Albano Campus, Stockholm*. TRITA-ARK- Forskningspublikationer 2013:3, Unversitetservice US-AB, Stockholm, Sweden. Freely available at: https://www.researchgate.net/publication/261031967_Principles_of_Social-Ecological_Urbanism_-_Case_Study_Albano_Campus_Stockholm
- Colding, J. 2013. Revisiting the Stockholm Urban Assessment. Pages 313-336 in Elmqvist et al. (eds.), *Urbanization, Biodiversity, and Ecosystem Services: Challenges and Opportunities*. Springer. This chapter is an open access publication, it can be downloaded for free on link.springer.com https://link.springer.com/chapter/10.1007/978-94-007-7088-1_17
- Kronenberg, J., Tezer, A., Haase, D. and Colding, J. 2013. Regional Assessment of Europe. Pages 275-278 in Elmqvist, T. et al. (eds.), *Urbanization, Biodiversity and Ecosystem Services: Challenges and Opportunities*. Springer. This chapter is an open access publication, it can be downloaded for free on link.springer.com https://link.springer.com/chapter/10.1007/978-94-007-7088-1_13

Handbooks and manuals in natural resource management



- Folke, C. and Colding, J. 2001. Traditional Conservation Practices. *Encyclopedia of Biodiversity (Second Edition)*, 2001, Volume 5: 226-233. Edited by Simon Levin. Academic Press, San Diego, Ca. <https://doi.org/10.1016/B978-0-12-384719-5.00144-1>
- Folke, C., Colding, J., Olsson, P. and Hahn, T. 2007. Interdependent Social-Ecological Systems and Adaptive Governance for Ecosystem Services. Pages 536-552 in *Sage Handbook on Environment and Society*, Edited by Jules Pretty, Andy Ball, Ted Benton, Julia Guivant, David Lee, David Orr, Max Pfeffer and Hugh Ward, SAGE Publications, London. Available as E-book. <https://uk.sagepub.com/en-gb/eur/the-sage-handbook-of-environment-and-society/book228312#contents>
- Colding, J. and Lundberg, S. 2009. *Golfbanan som våtmarksresurs: Handbok för att främja biologisk mångfald i dammar och småvatten på golfbanan*. The Scandinavian Turfgrass and Environment Research Foundation (STERF), 2009. Freely available at: <http://www.sterf.org/Media/Get/1221/golfbanan-som-vatmarksresurs.pdf>
- Colding, J., Marcus, L., Barthel, S., Andersson, E., Jansson Å, and Borgström, S. 2013. *Ekosystemtjänster i Stockholmsregionen: Ett underlag för diskussion och planering*.

Rapport 2013:3. Stockholms Läns Landsting. Tillväxt, miljö- och regionplanering, Stockholm, Sweden. Freely available at: http://www.rufs.se/globalassets/h.-publikationer/ekosystemtjanster_slutversion_lowres.pdf

- Colding, J. 2015. Stärkt hållbarhet. Pages 25-32 in *Sju perspektiv på hållbar utveckling. Om hur hållbarhetsperspektivet kan stärkas i en ny regional utvecklingsplan för Stockholmsregionen*. Tillväxt- och regionplaneförvaltningen, Stockholms Läns Landsting. ISSN 1654-885x. Arbetsmaterial 2015:1. Freely available at: http://www.rufs.se/globalassets/h.-publikationer/pm-samling_lowres.pdf

Open access films as learning tools in Sustainability Science, produced in collaboration with the Stockholm Resilience Centre (SU) and FORMAS



- PRINZESSINNENGÄRTEN, BERLIN: <http://www.urbangreencommons.com/film1.html>
- GARDEN ON THE TRACK, STOCKHOLM: <http://www.urbangreencommons.com/film2.html>
- FOLKODLARN I SKARPNÄCK AND KÄRRTORP GUERRILLA GARDENING: <http://www.urbangreencommons.com/film3.html>
- ÖKOGARTEN BUSHGRABEN GERHARD BORNÉ BERLIN: <http://www.urbangreencommons.com/film4.html>

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