

Introduction

Despite the fast development of environmental governance and environmental law over the past decades, the world is facing fundamental threats to the environment and the earth system. Some of the most urgent problems today are both huge threats on their own, as well as being interconnected and creating an even more problematic situation together, as in, for example, climate change; biodiversity loss; pollution to air, water and oceans; as well as chemical pollution. Many scholars argue that the world is entering the Anthropocene, a new geological epoch represented by the fact that the earth now in an unprecedented way is shaped by human activities.¹ In addition to reflecting the global scale of the environmental problems, this perspective also emphasizes the complex and intertwined relationship between the human and the natural systems (i.e., the social and the ecological). Human activities are both driven by, and themselves affecting, the environment and the natural resources. The human impact shapes the conditions provided by the ecosystems; at the same time, the conditions created are unpredictable and affect the

¹ The concept of the Anthropocene was first introduced by Crutzen, P. J., "Geology of Mankind," *Nature*, Vol. 415, no. 6867, 2002, p. 23. See also e.g. Steffen, W., Crutzen, P. J. and McNeill, J. R., "The Anthropocene: Are Humans Now Overwhelming the Great Forces of Nature?," *Ambio*, Vol. 36, No. 8, 2007, p. 614; Steffen, W., et al., "The Anthropocene: From Global Change to Planetary Stewardship," *Ambio*, Vol. 40, No. 7, 2011, p. 739; Biggs, R., Schlüter, M. and Schoon, M. L., "An Introduction to the Resilience Approach and Principles to Sustain Ecosystem Services in Social-Ecological Systems," in Biggs, R., Schlüter, M. and Schoon, M. L. (eds.), *Principles for Building Resilience: Sustaining Ecosystem Services in Social-Ecological Systems*, Cambridge University Press, 2015b, pp. 4–5; Stephens, T., "What Is the Point of International Environmental Law Scholarship in the Anthropocene?," in Pedersen, O. W (ed.), *Perspectives on Environmental Law Scholarship: Essays on Purpose, Shape and Direction*, Cambridge University Press, 2018a; Kotzé, L. (ed.), *Environmental Law and Governance for the Anthropocene*, Hart Publishing, 2017; Benson, M. H. and Craig, R. K., *The End of Sustainability: Resilience and the Future of Environmental Governance in the Anthropocene*, University Press of Kansas, 2017.

conditions for human activities in turn. In the Anthropocene, we cannot assume that the earth system will continue in the same predictable manner as in the Holocene, and this has consequences for law and governance.² In this respect, the Anthropocene can also be a concept that describes the complexity of environmental problems, with sudden and unpredictable changes, chain reactions in ecosystems across scales, elements of surprise, and in addition, it describes an intertwined and connected system where human impact is no longer having foreseeable or linear effects on the ecosystems. Given this view of the earth system and the biosphere, the idea of sustainability or sustainable development is increasingly viewed as an ill-fitting description of what needs to be accomplished. The sustainability concepts seem to build on an assumption of some level of predictability in the system governed.³ Against this background, it is clear that the general legal concepts, approaches and goals are tested.

If environmental law is to stay relevant, it must develop in line with the knowledge that is provided by these perspectives on the earth system and the environment. It is a fact, of course, that law always develops and changes its applicability in relation to the development of society and that environmental law generally extends its interpretation in line with new scientific knowledge. However, the perspectives presented above raise a demand for other changes and pose new questions – questions of the effectiveness of environmental law and governance in this new context. Some scholars even argue that we need to reassess the entire content and effectiveness of environmental treaty regimes and take the lead to change law beyond its normative scope.⁴ Either way, these new perspectives call for new legal approaches and pose significant challenges for legal design and for legal scholars to explore. New concepts and theories for effective laws are necessary.

The purpose of this book is to partake in that exploration of new theories and concepts, with a focus on international and EU environmental law. The aim is not to suggest a redesign of law as such. In fact, the aim, which is threefold, is (1) to explore the possibilities at hand within the scope of already existing legal regimes, (2) to propose a tool for assessing the potential effectiveness or vulnerability of environmental laws and legal systems, and (3) to reveal the

² Stephens, T., “Wishful Thinking? The Governance of Climate Change-Related Disasters in the Anthropocene,” in Lyster, R. and Verchick, R. R. M. (eds.), *Research Handbook on Climate Disaster Law: Barriers and Opportunities*, Elgaronline, 2018b, p. 45.

³ Benson, M. H. and Craig, R. K., 2017, p. 24, pp. 48–49 and pp. 48ff.

⁴ Stephens, T., 2018a, pp. 124 and 137–138. See also Kotzé, L. J. and Kim, R. E., “Earth System Law: The Juridical Dimensions of Earth System Governance,” *Earth System Governance*, Vol. 1, 2019.

necessary components for designing environmental laws or legal regimes equipped for an increasingly unpredictable earth system. The subject of this book is in a field of environmental law, which combines law with theories of social-ecological resilience (resilience theories). Social-ecological resilience is a transdisciplinary theoretical field within environmental science with close connections to policy and governance (see further in Section 1.1). The resilience theories are centered in the dynamic and complex interconnectedness that exists between human social systems and ecosystems, as described previously. The theories on social-ecological resilience provide an environmental governance framework with principles that take into account many crucial aspects that characterize such complex environmental problems (resilience governance).⁵ This kind of governance represents ‘effectiveness’ in this study. Effectiveness is in this context understood as the ability of law and governance to safeguard or manage ecosystems and natural resources in the pursuit of human activities, so that the ecosystems remain resilient or in a ‘sustainable’ state. Understanding the role of law in resilience governance provides guidance on how law should be designed and operationalized in such environmental issue areas that are characterized by nonlinearity and complexity. Hence, exploring the role of law in resilience governance can provide answers to the challenges and questions posed here on the effectiveness of environmental law in the era of the Anthropocene with increasingly complex threats to the earth system.

Areas characterized by nonlinearity are areas that law generally has had trouble dealing with in a satisfactory manner.⁶ This is why new legal methods and approaches need to be explored to find solutions. Complexity and nonlinear environmental problems are beyond the more traditional scope or assumptions of law. Besides the fact that the earth system may have been more predictable, or have been perceived as such, thus shaping laws that build on this assumption, law

⁵ See e.g. Biggs R., Schlüter M. and Schoon M. L. (eds.), *Principles for Building Resilience: Sustaining Ecosystem Services in Social-Ecological Systems*, Cambridge University Press, 2015a; Chapin, F. S., Kofinas, G. P. and Folke, C., (eds.), *Principles of Ecosystem Stewardship – Resilience-Based Natural Resource Management in a Changing World*, Springer, 2009; Reyers, B., et al., “Social-Ecological Systems Insights for Navigating the Dynamics of the Anthropocene,” *Annual Review of Environment and Resources*, Vol. 43, 2018, pp. 267–289; Lebel, L., Anderies, J. M., Campbell, B., et al., “Governance and the Capacity to Manage Resilience in Regional Social-Ecological Systems,” *Ecology and Society*, Vol. 11, No. 1, 2006.

⁶ See inter alia environmental law theories on this matter in Westerlund, S., *Miljörättsliga Grundfrågor 2.0*, IMIR Institutet för miljö rätt, Åmyra förlag, Uppsala 2003, at pp. 56–70, and pp. 95–100; and Westerlund, S., *Fundamentals of Environmental Law Methodology*, Uppsala: Uppsala University, Department of Law, 2007, electronic version at <http://uu.diva-portal.org/smash/get/diva2:903401/FULLTEXT01.pdf> [2020-08-18], pp. 156ff.

is also based on its own need or assumption of predictability in relation to the principles of rule of law and legitimacy. The latter are also issues that must be taken into account when combining law with the theories of social-ecological resilience with the aim to explore new legal methods and approaches for complexity. In addition to the purpose of developing a proposed legal design that can deal with the complexity and interconnectedness of social-ecological systems and to the development of more effective environmental laws, reasons for writing a book where law is combined with and compared to theories on social-ecological resilience are also to contribute to an increasingly diverse transdisciplinary theoretical framework. To this end, it is an additional secondary aim to contribute to the practical application of the resilience theories. The book aims to be a practical guide besides its theoretical approach to the issues investigated. Many law scholars have explored the connection between law and social-ecological resilience from different perspectives, and much of that research enlightens the analysis in this study. The focus and method in this study are, however, reversed from most previous research (Section 1.2)

The theoretical approach chosen can provide answers to the questions and problems of environmental law for earth system governance characterized by complexity. However, the new conditions provided by an unpredictable and intertwined social-ecological earth system also create fundamental changes to the conditions for human activities and the basics of human life. The consequences for human activities, human lives and living conditions are also dimensions of social-ecological systems where law generally has an important role in creating stability and security. When natural resources are limited and the changes in the earth system also change the living conditions for large groups of people, then the access and distribution of such resources and the rights for those groups become central. Social stability is an issue of so-called social resilience (Section 1.1). It is definitely a task for law to control and regulate such rights and access to resources, and thus in this context, there is a central role for law in achieving social resilience.⁷ Equity and fair distribution of

⁷ This can be addressed in many different perspectives, see e.g. Raworth, K., "A Safe and Just Space for Humanity: Can We Live within the Doughnut?" Oxfam Discussion Paper, *Oxfam Policy and Practice: Climate Change and Resilience*, Vol. 8, No. 1, 2012, pp. 1–26; Dearing, J. A., et al., "Safe and Just Operating Spaces for Regional Social-Ecological Systems," *Global Environmental Change*, Vol. 28, 2014, pp. 227–238; Craig, R. K., et al., "Balancing Stability and Flexibility in Adaptive Governance: An Analysis of Tools Available in U.S. Environmental Law," *Ecology and Society*, Vol. 22, No. 2, 2017, p. 3; Folke, C., et al., "Transnational Corporations and the Challenge of Biosphere Stewardship," *Nat. Ecol. Evol.*, Vol. 3, 2019, pp. 1396–1403; Gonzales, C. G., "Global Justice in the Anthropocene," in Kotzé, L. J. (ed.), *Environmental Law and Governance for the Anthropocene*, Bloomsbury Publishing, 2017, eBook.

resources not only is a question of ethics but may also become a question of stability and of avoiding human disasters. However, these questions need to be covered by a separate study and will not be dealt with in depth in this book, although it is an equally important issue.

The resilience theories have developed over the past decades and rapidly become important at different levels of policy. They are also important for governance and management in many parts of the world, including in European and international environmental cooperation. The theoretical framework of social-ecological resilience is transdisciplinary; the study of and development of these theories include both ecology or other natural sciences, as well as different branches of humanity and social science, such as law, political science and sociology. The book builds on this previous research; it is both a stepping stone for this study as well as the backdrop against which the chosen perspectives are tested.

1.1 SOCIAL-ECOLOGICAL RESILIENCE

Resilience in social-ecological systems is a theoretical framework for research on environmental governance and management with a transdisciplinary perspective. There is no single theory on resilience, but resilience is generally described as a concept for assessing the resistance to pressures within a system. In an environmental context, this is seen as a state where a system can cope with threats, such as pollution or depletion of biological resources, and sustain its main structures and functions, thus avoiding a collapse or abrupt change. In this respect, a social-ecological resilience perspective generally takes a broad approach to the environment and mirrors a complex relationship between human social systems and natural ecological systems, where human beings and the social systems are seen as an integrated part of the biosphere or the earth system. The social-ecological system is then characterized as a complex adaptive system. Put simply, this means that environmental problems do not act in a linear or foreseeable way – as described in the introduction. Instead, they are characterized by irregular responses like surprise and cascading effects.⁸

⁸ On the theoretical framework of Social-Ecological Resilience and its origin, see inter alia Biggs, R., Schlüter, M. and Schoon, M. L., (eds.), *Principles for Building Resilience: Sustaining Ecosystem Services in Social-Ecological Systems*, Cambridge University Press, 2015; Folke, C., “Resilience: The Emergence of a Perspective for Social-Ecological Systems Analysis,” *Global Environmental Change*, Vol. 16, No. 3, 2006, pp. 253–267; Walker, B. and Salt, D., *Resilience Thinking – Sustaining Ecosystems and People in a Changing World*, Island Press, 2006; Folke, C., et al., “Resilience and Sustainable Development: Building Adaptive Capacity in a World of Transformations,” *Ambio*, Vol. 31, No. 5, 2002, pp. 437–440; Liu, J., et al.,

A state of resilience entails prerequisites for a system to resist external pressures and retain its basic functions. From the perspective of ecology, this means a state where the ecosystem is able to continue developing and maintain the production of what we generally call ecosystem services.⁹ The theories on resilience were originally developed by ecologists as a way to describe changes and interactions of ecological dynamics in and between ecosystems. In more elaborate terms, resilience in this context is the ability of a system to endure or absorb disturbances and external shocks in a way that makes it possible for the ecosystem to still maintain its particular dynamics, structure and functions. The connection made with social-ecological systems means a state where the social and ecological systems together create a resilient interconnected system. A resilient social-ecological system is, in simple terms, a state where the social system can gain from ecosystems services to maintain its basic needs and functions, and at the same time create prerequisites for ecosystem resilience and thus not overharvest and not create disturbances that pushes the ecosystems beyond the border of a resilient state. At the same time, acknowledging this interconnectedness also creates unpredictable and spontaneous changes that need to be accounted for in governance.

Beyond the connection and prerequisites created by ecosystem services for the state of social resilience, it must also be further explored what social resilience means. The knowledge on social resilience and how it is accomplished is less explored than ecological resilience. However, it seems easy to establish that law must have an important role in creating social resilience, beyond its dependence on resilient ecosystems. Not least issues of justice, access to resources and social justice are increasingly the focus of environmental governance. If these issues are not addressed, social resilience will not be achieved. What social resilience means and includes can be discussed, but generally social resilience is a prerequisite for social-ecological resilience (see Sections 3.3 and 3.4). Although the main focus in this study is on the role of law for governance of ecosystems, some aspects of the role of law for social resilience in connection to ecosystem governance are also further discussed.

“Complexity of Coupled Human and Natural Systems,” *Science*, Vol. 317, No. 5844, 2007, pp. 1513–1516; Folke, C., et al., “Resilience Thinking: Integrating Resilience, adaptivity and Transformability,” *Ecology and Society*, Vol. 15, No. 4, 2010, pp. 20–28; Folke, C., Jansson, Å., Rockström, J., et al., “Reconnecting to the Biosphere,” *Ambio*, Vol. 40:719, 2011; Carpenter, S., et al., “From Metaphor to Measurement: Resilience of What to What?,” *Ecosystems*, Vol. 4, 2001.

⁹ Ecosystem services are generally seen to be the material or energy outputs from ecosystems, including food, water and other resources or necessary functions of the ecosystem.

Effective environmental governance structures should aim to create resilience in social-ecological systems. The descriptions of the complex changes and interactions of ecological and social dynamics that are included in the resilience theories should constitute the basis for the governance approach and measures chosen – especially in the light of the Anthropocene. The resilience perspective and research on social-ecological resilience provide an important framework for identifying how to regulate environmental problems that are characterized by complexity and nonlinearity. As mentioned, these are also problems that create scenarios where the legal system is often challenged, since law originally builds on an idea of more linear causal relationships.¹⁰ Moreover, the concept of social-ecological resilience creates a frame for a more integrated perspective on the operationalization of sustainable development. Many have argued for law and governance based on the principle of sustainable development and that it should be the ecological factors, which set the prerequisites for any other development (i.e., social and economic development in the concept of sustainable development).¹¹ The concept of social-ecological resilience also acknowledges that the environment sets the base and boundaries for any social-ecological system; however, it also acknowledges that the relationship between the different elements of social-ecological systems is complex.¹² It provides, as suggested, tools for how to manage these systems accordingly.

1.2 COMBINING SOCIAL-ECOLOGICAL RESILIENCE AND LAW

Because of the urgent need to find new solutions and new perspectives on sustainability, the theories on resilience and resilience governance are

¹⁰ See e.g. Westerlund, S., 2003, at pp. 56–70, and pp. 95–100; and Westerlund, S., 2007, electronic version at <http://uu.diva-portal.org/smash/get/diva2:903401/FULLTEXT01.pdf> [2020-08-18], pp. 156ff.

¹¹ That is, the social system elements of sustainable development as discussed in, for example, the UN Report on Sustainable Development Report of the World Commission on Environment and Development: Our Common Future, 1987 (the Brundtland Report), Transmitted to the General Assembly as an Annex to document A/42/427 – Development and International Cooperation: Environment. The report laid out the concept of sustainable development as containing environmental, economic and social aspects. See e.g. Bosselmann, K., *The Principle of Sustainability: Transforming Law and Governance*, Ashgate, 2008, eBook [accessed 2016-09-11], generally and pp. 22ff.; and Bosselmann, K., Engel, R. and Taylor, P., *Governance for Sustainability: Issues, Challenges, Successes*, UCN Environmental Policy and Law Paper No. 70, IUCN, Gland, Switzerland, 2008 [accessed 2016-11-26], pp. 3ff. Cf. Benson, M. H. and Craig, K. R., 2017, where the authors argue that sustainability is no longer a useful concept in light of increasing complexity and unpredictability of the earth system.

¹² Chapin, F. S., Folke, C. and Kofinas, G. P., “A Framework for Understanding Change,” in Chapin, F. S., Kofinas, G. P., Folke, C., (eds.), *Principles of Ecosystem Stewardship – Resilience-Based Natural Resource Management in a Changing World*, Springer, New York, 2009, p. 6; Folke, C., et al., 2002.

receiving growing attention, from many directions – not least in policy making. Resilience theories also have an important connection to more general ideas of adaptive governance. As described, the concept of resilience was initially developed by ecologists and further on in transdisciplinary contexts, by environmental science, social science, humanities, and not least within political science. Law scholars are also exploring this field of research and have approached these topics with increasing interest in the past decade.¹³ The study in this book builds on this previous research that has contributed and extended the resilience theories, both transdisciplinary and legal research. Much of the previous legal research on resilience governance and adaptive governance establishes the foundation of and adds to the understanding of the different components of governance that are identified and discussed here. However, much of the research done on resilience draws conclusions based on case studies. The approach taken in this study is the opposite; it aims to propose a legal design with a general applicability to any given case and does not take any specific case as its stepping stone.

The conclusions that other researchers have drawn based on case studies have provided a set of principles and features that are important in resilience

¹³ Some of the most significant pieces of work in the field of integrating legal research with research on social-ecological resilience specifically are Arnold, C. A. and Gunderson, L. H., “Adaptive Law and Resilience,” originally printed in *Environmental Law Reporter*, Vol. 43, No. 10427, 5–2013, Reprinted with copyright to Environmental Law Institute, Washington DC, 2013, University of Louisville, Legal Studies Research Paper Series, Paper No. 2104-04; Cosens, B. A., “Transboundary River Governance in the Face of Uncertainty: Resilience Theory and the Columbia River Treaty,” *University of Utah Journal of Land Resources, and Environmental Law* Vol. 30, No. 2, 2011, pp. 229ff.; Cosens, B. and Gunderson, L. H., (eds.), *Practical Panarchy for Adaptive Water Governance – Linking Law to Social-Ecological Resilience*, Springer International Publishing AG, 2018; Ebbesson, J., “The Rule of Law in Governance of Complex Socio-Ecological Changes,” *Global Environmental Change*, Vol. 20 (3), 2010, pp. 414–422; Garmestani, A. S., Allen, C. R. and Cabezas, H., “Panarchy, Adaptive Management and Governance: Policy Options for Building Resilience,” *Nebraska Law Review*, Vol. 87, 2008, pp. 1036ff.; Garmestani, A. S. and Allen, C. R. (eds.), *Social-Ecological Resilience and Law*, Columbia University Press, 2014a; Green, O. O., et al., “Barriers and Bridges to the Integration of Social–Ecological Resilience and Law,” *Frontiers in Ecology and the Environment*, Vol. 13, 2015a, pp. 332–337; Special Feature in *Ecology and Society* (two parts/issues): Part I – Garmestani, A. S., Allen, C. R. and Benson, M. H. (guest editors), “Special Feature on Law and Social-Ecological Resilience, Part I: Contributions from Resilience 2011,” *Ecology and Society*, 2013, Vol. 18(2); and Part II – Ebbesson, J. and Hey, E. (guest editors), “Part II: Contributions from Law for Social-Ecological Resilience Symposium, Stockholm, Sweden, 2010,” *Ecology and Society*, 2013, Vol. 18(3); Special Feature in *Ecology and Society*, Chaffin, B., Gunderson, L. and Cosens, B. C. (guest editors), “Practicing Panarchy: Assessing Legal Flexibility, Ecological Resilience, and Adaptive Governance in U.S. Regional Water Systems Experiencing Climate Change,” *Ecology and Society*, 2018, Vol. 23(1).

governance. The study in this book builds on these principles for governance and explores how they are represented in law and legal systems, or how law in other ways can contribute to their role in the wider governance system. In this analysis, previous legal studies of social-ecological resilience are included as support and substantial understanding of how law can be seen in this context. The study also investigates potential obstacles or limits of the role of law in resilience governance based on these given governance principles. With the basis in this investigation, the study analyses the role of law in resilience governance structures and concludes on what components a legal design for resilience governance should include. The result is a proposed legal design or tools for the assessment of legal design with a broad application. Of course, that being said, all cases are unique and demands specific adjustments – the proposed components for legal design are not fixed, they must be seen as part of bigger system. As the study will show, the legal components or features discussed and presented are inter-dependent, and so the legal design with its different components will in the end also depend on how the other components are designed or function in each specific case. However, it will provide some answers to what kind of environmental laws, legal mechanisms and regimes may be necessary to approach such unpredictable and complex environmental problems that are characteristic of the Anthropocene.

In this book, a model for a legal system compatible with resilience theories and governance is created through comparing the main principles of resilience governance with law, legal principles and other law mechanisms. Mechanisms in this sense means functions of law and legal regulatory constructions. The study both reviews the fundamentals of law and its principles as such, and addresses legal institutional frameworks or structures as they normally are constituted, both in terms of deliberate functions and features, and in how they have come to be developed in perhaps a more dynamic and spontaneous way to adopt certain functions and features. Such a legal system model, as suggested, will represent a structure for how law should be designed and combined in order to serve the same purpose as, and otherwise contribute to, resilience governance. To this end, the book provides a comprehensive review of some of the most fundamental components of the governance framework for social-ecological resilience and their compatibility with law – more specifically, the compatibility with international and EU law. As such, it presents a theoretical analysis of how these main components of resilience governance compare to and can be integrated in law, as well as how they can be operationalized in a legal structure. The main focus is put on the

theoretical basis for the design of such legal system, but it will be illustrated and exemplified by examples from case law and contemporary regulatory structures.

1.3 THE CHALLENGES FOR ENVIRONMENTAL LAW AND GOVERNANCE

International environmental law started to develop in the late 1960s with the United Nations Conference on the Human Environment (the Stockholm Conference) in 1972 as a first milestone. Its development was both a response to and in parallel with increasing environmental concerns. It is increasingly acknowledged and accepted that laws can be regarded as one component in a network of institutions, steering instruments and measures included in governance and management.¹⁴ Environmental law has thus developed beside and partly together with developments in theories on environmental governance. International environmental law is also continuously developing as a response to changing knowledge and perception of environmental problems and environmental values – and has provided more and less precise answers to the need for governing transboundary international commons and other shared resources of environmental concern.

Environmental law is primarily characterized by its aim to balance significant scientific uncertainties in the dynamics and complexity of environmental problems with other more direct values and measures in the social system, such as the fundamental values of legal systems and the rule of law. Additionally, environmental law must balance or value economic and political dimensions in connection to environmental protection. These aspects are also connected to the role of law for social resilience. As discussed in the introduction, the growing environmental complexity confronts the legal system with new challenges; this also opens the matter to other viewpoints and disciplinary fields in a manner similar to that of governance for social-ecological resilience. This is displayed through adjustments in the legal approaches to environmental challenges and changes. Environmental law instruments aim to be dynamic, holistic and adaptive in response to the environment. As a result, however, questions also increasingly arise about effectiveness, legitimacy in relation to the choice of legal instrument, legal design and new approaches. Furthermore, these concepts of law may include

¹⁴ See e.g. the definition of global governance in: Commission on Global Governance, *Our Global Neighbourhood – The Report of the Commission on Global Governance*, Oxford University Press, 1995, p. 2f.

or entail both legal and extra-legal measures or mechanisms, all with the aim of matching environmental governance and management structures.¹⁵

The resilience perspective views humans as part of the biosphere or the earth system and assumes that the resulting intertwined social-ecological systems behave as so-called complex adaptive systems.¹⁶ Social-ecological resilience has developed since the 1970s as a school of interdisciplinary research on the interplay and integration of social and ecological systems, searching for factors that promote social-ecological resilience. Law has developed in parallel. Already in the 1972 Declaration of the United Nations Conference on the Human Environment¹⁷ (the Stockholm Declaration), a scenario similar to that of the Anthropocene was described, stating that “through the rapid acceleration of science and technology, man has acquired the power to transform his environment in countless ways and on an unprecedented scale.”¹⁸ This highly important issue has continued to receive attention but remains insufficiently addressed.

The ultimate goal for sustainable development is a world where the prerequisites for social and economic development are coherent with an environmental frame and thus the limits of the biosphere.¹⁹ In the same way, social-ecological resilience inter alia signifies the state described previously – a state in which the interdependence between social and ecological systems is at a level where the ecosystem can resist pressures, and retain its function and structure despite these pressures. Ecosystems must retain their functions and structures for many different reasons. It is important with regard to the ecosystem itself and with regard to social systems, as with regard to sustaining

¹⁵ See e.g. de Sadeleer, N., *Environmental Principles – From Political Slogans to Legal Rules*, Oxford University Press, 2002, pp. 305ff.; Bodansky, D., Brunnée, J. and Hey, E., “International Environmental Law – Mapping the Field,” in Bodansky, D., Brunnée, J. and Hey, E. (eds.), *The Oxford Handbook of International Environmental Law*, Oxford University Press, 2007b, generally and at pp. 21–23.

¹⁶ Biggs, R., Schlüter, M. and Schoon, M. L., 2015b, p.1.

¹⁷ 11 ILM 1972, p. 1416.

¹⁸ Declaration of the United Nations Conference on the Human Environment (the Stockholm Declaration), Preamble, paragraph 1.

¹⁹ See World Commission on Environment and Development: Our Common Future, 1987, Chapter I – Section 3, Para 27, stating: “Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs. The concept of sustainable development does imply limits – not absolute limits but limitations imposed by the present state of technology and social organization on environmental resources and by the ability of the biosphere to absorb the effects of human activities.” More on how this concept has developed as a general principle, its interpretation and legal status can be found in Barstow Magraw, D. and Hawke, L. D., “Sustainable Development,” in Bodansky, D., Brunnée, J. and Hey, E., (eds.), 2007, pp. 613 ff.

social-ecological resilience. One particular factor that is often brought to attention with regard to ecosystem functions, however, is the connection to so-called ecosystem services in resilient ecosystems. Ecosystem services are the aspects of the ecosystem functions that are directly important, or even absolutely necessary, for social welfare and development on a number of levels and in many different ways.²⁰

As a reaction to this transformational, all-encompassing environmental impact, and the large-scale human transformations of the earth system, environmental research is now focusing on identifying boundaries or buffer zones for environmental transformations of the earth system. Seeking to avoid catastrophic risks for society and irreversible environmental change on both regional and a global, planetary scale, this research strives to find limits to the use of environmental resources – through pressures and ecosystem services – which humans must keep within. So far, this research has suggested nine specific areas of planetary boundaries as particularly important.²¹ These nine planetary boundaries are climate change, changes in biosphere integrity, stratospheric ozone depletion, ocean acidification, biogeochemical flows, land-system change, freshwater use, atmospheric aerosol loading and novel entities (new substances, new forms of existing substances and modified life-forms that have the potential for unwanted geophysical and/or biological effects – like chemical pollution etc.). The research on planetary boundaries shows that some of the boundaries are connected and that several already are transgressed. Although these planetary boundaries are quantified primarily on a global scale, they must be controlled and governed to the greatest extent on the regional and local scale.²² The operationalization of such goals in political and global institutional structures may meet obstacles.²³ The resilience governance must aim to keep the earth system within these boundaries – hence, this is also the new role of law on a global scale.

In the situation as it is pictured here, almost all these global environmental problems are connected to regional and sometimes local scales. To a large extent, global problems are the sum of degradation in different regions. Not

²⁰ Biggs R., Schlüter, M. and Schoon, M. L., 2015b, pp. 13ff.

²¹ More specific definition of these are found in Rockström, J., et al., “Planetary Boundaries: Exploring the Safe Operating Space for Humanity,” *Ecology and Society*, Vol. 14(2):32, 2009.

²² Rockström, J., et al., 2009; Biermann, F., et al., “Navigating the Anthropocene: Improving Earth System Governance,” *Policy Forum, Science*, Vol. 335, No. 6074, 2012; Steffen, W., et al., “Planetary Boundaries: Guiding Human Development on a Changing Planet,” *Science*, Vol. 347, No. 6223, 2015.

²³ Saunders, F., “Planetary Boundaries: At the Threshold . . . Again: Sustainable Development Ideas and Politics,” *Environment, Development and Sustainability: A Multidisciplinary Approach to the Theory and Practice of Sustainable Development*, Vol. 17(4), 2015, pp. 823–835.

many of the global scale problems confronting the world today will be solved only through cooperation on a global scale. While global communication and cooperation through universal agreements are necessary in many issue areas, in creating prerequisites for action around the world, the solutions will mainly be found on smaller spatial scales. The global issues will be narrowed down to regional cooperation and national or local action.²⁴ Through cooperation on common-pool resources or common-pool problems, on all scales, we can also bridge the boundaries set up by State borders, of which pollution and environmental damage take no notice. Therefore, success in solving the crucial global problems facing us today will depend greatly on how we manage our international cooperation both globally and especially on a regional scale. If we find mechanisms, structures and tools that work and spread incentives for action, it is most likely that they will be implemented and successful on a regional scale. That is why it is also relevant to discuss the design of international environmental law, environmental legal agreements, international treaty regimes, as well as EU law – with great significance for the whole European region. This is also why it is important not only to scrutinize existing structures to find solutions to obvious problems, but also to identify the components that may make the difference. It is not least important, then, to identify the role of law, and legal mechanisms, that plays a part in these processes and in successful institutions.

This book introduces a theoretical perspective on how law should be designed to provide a suitable institutional structure for the promotion of social-ecological resilience and to keep the earth system within the planetary boundaries. The chosen perspective on law in this book is part of a new, rapidly growing, theoretical area of interest in law and environmental governance. Increasing internationalization and globalization make the causes and effects of environmental problems more difficult to define, just as the different actors involved, and thus the problems are more difficult to control. They are difficult to control since they are complex environmental problems, and complexity is generally due to nonlinear causality in the relationships between societies and ecosystems. It all reflects an increasingly plural, polycentric world order and societies with many different operators and stakeholders, including both polluters and regulators, which complicates the interconnected relationship between humans and the environment and makes the context of legal rules more difficult to overview. Altogether, this creates a situation with many dimensions that blurs the possibility for traditional foreseeability, strict rules, and strict control. As a consequence, environmental problems must be seen in new

²⁴ See also Folke, C., et al., 2010.

perspectives; other forms of legislation techniques, as well as other forms of compliance review, may be called for. In addition, the concept of the ecosystem approach is becoming a common approach within many modern environmental law instruments. The theories presented on social-ecological resilience can provide support to the interpretation and implementation of an ecosystem approach in legal systems. The study also includes a discussion on the connection between social-ecological resilience and the concept of ecosystem approach. There are strong similarities between typical features in a governance system reflecting characteristics for social-ecological resilience and features and governance principles constituting the concept of ecosystem approach. The resilience theories therefore also form an interesting basis for evaluating the implementation of an ecosystem approach.

1.4 OUTLINE

The book can thematically be seen as divided in two different parts. The first part (Chapters 1–4) introduces the subject and the foundations that the study will be built on, or take as stepping stones. The second part (Chapters 5–9) analyzes the compatibility between law and social-ecological resilience based on a range of features that are defined and discussed in the first part (Chapter 4).

So, after this first general introduction to the subject and purpose (Chapter 1), the book continues to engage more specifically with the different foundations that form the study. The characteristics of environmental law are reviewed (Chapter 2). The general objectives and approaches of international and EU environmental law are presented and the overall scope of environmental law today is analyzed. The study aims to compare law with resilience governance and build a matching legal design; therefore it is necessary to start looking at the building blocks that environmental law provides us with. The core of this study is the role of law in governance and specifically in resilience governance, and thus the next chapter reviews the connection between environmental governance, law and social-ecological resilience (Chapter 3). This is an evaluation and analysis of the relationship between law and governance, and includes the important task of placing law in the theoretical framework of governance for social-ecological resilience. With these ground stones laid out, the following chapter reviews more specifically the theories of social-ecological resilience and resilience governance (Chapter 4). This review of the theories of social-ecological resilience includes analyzing and defining some core principles or features for resilience governance. These features for governance set the structure for further study.

In the second part, law is analyzed based on the defined resilience features. In this way, the components of a legal design for social-ecological resilience are being shaped and assessed and the role of law for resilience governance is analyzed. The features analyzed are adaptivity, flexibility and transformability; multidimensional and polycentric structures; stakeholders and structures for participation; and operationalization, monitoring, compliance and trust building. The chapter on adaptivity, flexibility and transformation reviews the ability and potential obstacles for law to include adaptive and flexible legal mechanisms in the same manner as resilience governance (Chapter 5). Multidimensional and polycentric structures is a chapter that reviews to what extent law reflects the resilience governance aim of multilevel governance, redundant approaches and cross-scale interaction, with the aim to match the dynamics of the ecosystem (Chapter 6). The resilience theories address many important aspects of including stakeholders in the governance and the reflection of these features is reviewed in the chapter on stakeholders and structures for participation (Chapter 7). Finally, the ultimate aim of all environmental governance – the ability to actually make change and steer the ecosystem toward a more sustainable or resilient state – is also discussed. In the context of law and legal terms, this is analyzed in terms of operationalization, monitoring, compliance and trust building (Chapter 8). The last chapter summarizes the finding of the review of resilience features and the legal design for social-ecological resilience (Chapter 9). It also presents some final aspects that are important to take into account when applying the legal model created.