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Transdisciplinary Learning Across Case Studies

By Jill Slinger and Susan Taljaard

Seven international case studies in coastal management are examined in this book. Each of the case studies dealt with an inlet or mouth management issue, but they were not selected based on similarity in their ecological (biophysical) or social systems. The case studies also differed in terms of the dominant environmental paradigm used by the scientists in their original analyses, as clarified in the introductory and other chapters. During the international cross-comparative workshop, aimed at transdisciplinary learning within and across the case studies, the marked differences in the research emphasis placed on the ecological and/or the social system (the object of inquiry), in the connections made to management practice and policy decision making (the theoretical lenses informing the way of inquiry), and in the knowledge sources used (the way of inquiry), became apparent. Accordingly, in the following sections the learning from the transdisciplinary research endeavour is synthesised by cross-comparing the coastal systems (S), the methods (M) applied and the concepts employed by the involved scientists (C). The cross-comparison is itself informed by concepts from systems thinking and policy analysis, with the aim of

influencing coastal management and research practice internationally.

9.1. Insights from the case studies

In this section, the insights deriving directly from each of the case studies are summarised. The focus of each of the case studies, conceived as nested within a broad social-ecological system, is clarified and the relevance for coastal management practice is explained.

The two case studies of big bays or inlet systems, namely Texel Inlet and Dundalk Bay, reveal a move to involve stakeholders and communities in the integrated planning and management of these large systems. So, the focus shifts from the biophysical system alone to encompass an integrated social-ecological system. The case studies involving small, wave-dominated estuaries, namely the Maha Oya, Russian River, Groot Brak and Slufter estuaries, are more diverse in their emphases, varying from science pro-actively signalling a need for management, to intensive co-management of an estuary and its mouth. All case studies highlight the need for improved understanding of the estuaries as social-ecological systems, with due consideration for interlinkages between the social and ecological systems. As such, they also indicate a shift towards a broader contextualised understanding of the inlet and mouth management issues. Indeed, the Bigi Pan reveals that biophysical system understanding is fundamental to effective and sustainable management, and the Slufter case study reveals the value of social system understanding in moving to new integrated management strategies.

The Texel Inlet case study highlights how flood risk management has dominated other potential concerns in determining the objectives for coastal management. This single issue focus and the intensive and sustained collection of monitoring data to enable analysis of the efficacy of management interventions, has succeeded in the goal of protecting the inhabitants of south west Texel from flooding over a long period of time. Scientific insights on the geomorphological dynamics of the ebb-tidal delta at the inlet reveal that continued investment in ongoing sand nourishments may not be required to maintain coastal safety in the near future. Indeed, there is an indication that the sandy shoal Noorderhaaks may conjoin with the adjacent coastline delivering vast quantities of sand in a natural manner. Uncertainty remains as to the timing of this anticipated dynamic change and the precise mechanisms by which it could occur (Wijnberg et al., 2017). The societal costs and consequences are not addressed in this case study. Instead, the need to move to a collaborative, participatory approach in designing alternative coastal management strategies that take this new understanding into account is highlighted.

The Dundalk Bay case study rests on a thorough environmental assessment of the catchment and bay systems, but also highlights a move towards engaged co-management approaches at the community level. These efforts are directed at learning and supporting sustained social involvement with the integrated management of the catchment-bay system.

The Maha Oya case study illustrates the role of scientific knowledge in alerting coastal managers of the need to plan for future environmental change, because of the strong effects on the linked social system. The intermittent closure regime of the Maha Oya Estuary mouth is anticipated to change, affecting local fisherman, sand mining, tourism

and many other livelihood associated functions in the future. The strong influence of mouth condition on the ecological health of the estuary is similar to the Russian River in California. Here, the biophysical system knowledge drawn from an extensive data set is used to determine habitat suitability for an endangered species, and the management of the mouth is then optimised for this single species objective. Science thus serves to give form to policy, and mouth management is focussed on one critical indicator.

In the Groot Brak Estuary the condition of the estuary impacts the social system associated with it. Activities and (dis)services deriving from the estuary such as tourism, aesthetic value, fishing and flooding are affected by the condition of the mouth. The case study reveals ongoing learning regarding the character and functioning of the estuary, and highlights how the growing scientific understanding, commencing in the late 1980's with the construction of an upstream reservoir, has influenced management practice and policy. The co-evolution of the Groot Brak Estuary and her people (see Slinger et al., 2012) highlights the strong interlinkages in a social-ecological system.

The Bigi Pan case study evaluates the management of the Multiple Use Management Area (a social-ecological system), drawing upon an extensive round of stakeholder interviews amongst people living in the area and the managing authorities. It highlights the need for (biophysical) system understanding as the foundation for effective coastal management, and identifies a number of strategies to address this gap and improve the existing ecosystem-based management of the Bigi Pan wetland in Suriname.

An extensive process of stakeholder engagement also characterises the Slufter case study. Here, the divergent perspectives and values of local stakeholders in regard to inlet management were explored with the aid of system dynamics modelling (D'Hont, 2014). The role of (social-ecological) system understanding is shown to be fundamental to learning in regard to coastal management.

9.2. Framing the case studies in terms of the system diagram of policy analysis

The seven international case studies were undertaken within diverse theoretical paradigms, leading to diversity in their focus - which object of study, or system (S) they see. As the overarching goal of this book is to learn within and across case studies, we adopt a broad social-ecological systems lens and draw upon systems thinking and policy analysis methods to locate each of the case studies on the system diagram. This enables us to clarify the emphasis of each of the studies relative to one another, and to understand which insights they contribute towards coastal management practice.

First, we locate Texel Inlet at the interface between actions/interferences and the system box (ellipse 1 in Figure 9.1), because this case study focuses on interventions to maintain coastal safety taking the physical dynamics of the environment into account. The objectives for coastal safety are even formulated in terms of the physical environment, although there is growing awareness of managing for multiple objectives. Indeed, the case study highlights the need to move towards more stakeholder-inclusive approaches in coastal management. The Dundalk Bay case study provides an overall assessment of the bay system, including the inflowing rivers, examining the impacts of actions and relating

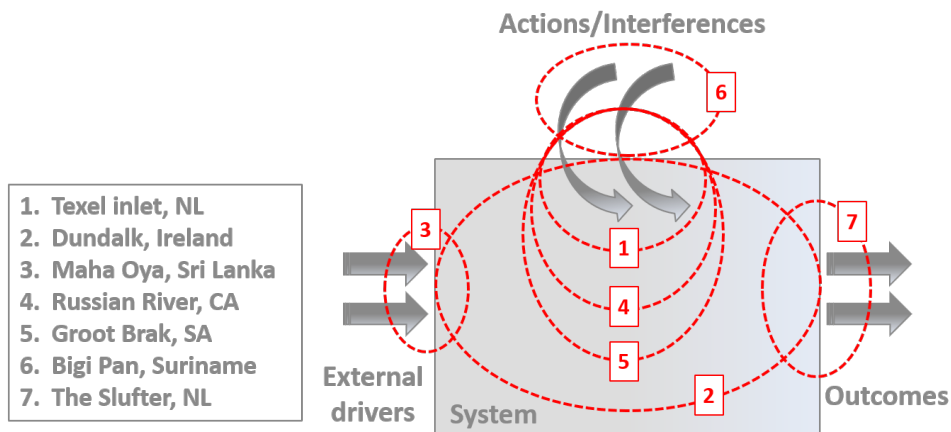


Figure 9.1. Framing the dominant focus of the case studies in terms of a system diagram

these outcomes, but focussing on the state of the environment of the bay system itself. It is therefore located entirely within the system box (ellipse 2 in Figure 9.1). In contrast, the Maha Oya case study provides a pro-active environmental assessment focussing on an external driver, namely climate change, and its effects primarily on the mouth of the estuary. It is therefore located at the interface between external drivers and the system box (ellipse 3 in Figure 9.1). The Russian River case study investigates the implementation of proposed actions in the system to achieve given objectives, elucidating the physical dynamics, water quality and biotic (single species) responses. Some associated social issues, e.g., fisheries, conservation are also addressed. Accordingly, this case study encompasses actions/interferences and protrudes into the systems box (ellipse 4 in Figure 9.1), to accommodate the depth of environmental systems knowledge that is used. The Groot Brak case study adaptively implements flow release and mouth management actions in the system focussing on physical, water quality and multiple biotic components (vegetation, invertebrates and fish) and associated social use, e.g., flood protection, tourism, and ecosystem health linked to aesthetics. It therefore encompasses actions/interferences and also protrudes into the systems box a little further than the Russian River to indicate the multiple species considerations (ellipse 5 in Figure 9.1). The Bigi Pan case study used an ecosystems-based approach to engage with stakeholders in seeking to identify improved actions/interventions than those implemented at the time of the study, to deal with the problems then experienced with the management of the coastal wetland. The understanding of the biophysical system held by those interviewed was not extensive, and the case study is therefore located at the interface between actions/interventions and the systems box (ellipse 6 in Figure 9.1). The case study highlighted the need for system understanding in informing actions. Finally, in the Slufter case study a social-ecological systems approach was used to engage with stakeholders on their expectations/values as potentially affected by management actions in the system, so as to negotiate desirable outcomes. Knowledge on biophysical systems functioning was also used in the engagement process. This means that the Slufter is located at the interface between the system box and the outcomes (ellipse 7 in Figure 9.1).

The location of the case studies on the system diagram enables us to understand that just as the underlying theoretical paradigms (C) were diverse, each of the case studies differs in their focus (their object of study - S), yielding a range of insights and using different types of knowledge in doing so (their strategy of inquiry - M). Some focus on the biophysical system, signalling to the social system, some focus on the social system emphasising the need for biophysical understanding, and others reveal co-evolutionary management of the social-ecological system. Next, the contribution of key knowledge sources to each of the case studies will be explored.

9.3. Framing the key knowledge sources of the case studies

In coastal management practice and research, three generic groups of stakeholders (termed actors) are involved, namely scientists, policy makers and coastal citizens. It follows that three actor-based knowledge sources can be distinguished. First, there is scientific knowledge, encompassing the many disciplines concerned with the coast. These include (i) the empirically focussed disciplines of geology, geomorphology, physics (hydrodynamics), (water and soil) chemistry and ecology, (ii) the pragmatically oriented disciplines of resource management, policy analysis, simulation modelling and agriculture, (iii) the normative disciplines of planning, engineering design, law, and education, as well as the purposive disciplines of ethics and philosophy (cf. Max-Neef, 2005). The actor-based knowledge of scientists includes knowledge of the research methods (M) appropriate to their disciplines, how to conduct field work, and methods for communicating their research findings, for instance.

Second, there is the knowledge of policy makers regarding the decision making processes operative in the context within which they work. This knowledge is founded on their underlying disciplinary expertise and training, but in the context of coastal management we take it as including the experiential knowledge of their own governance context and how to work effectively within this context (M). It therefore includes knowledge on the formal and informal rules at play, who has what influence, who controls which resources and the distribution of power relations (Ostrom, 2009). Furthermore, it includes knowledge of the actor-network of citizens, scientists and (local) coastal management practitioners in their area.

Third, there is the knowledge of citizens resident in the coastal area of interest. This knowledge is place-based and spread amongst different people. It is often integrated in nature, rather than reductionist, having to do with living in the particular coastal area and experiencing the effects of different coastal management interventions over time. This knowledge can reveal the unexpected side effects of interventions as opposed to the effects envisaged at the time of their introduction. As such, it represents valuable input to effective coastal management, but requires social science methods and policy analysis expertise (M) to access and involve appropriately.

A comparison across the case studies reveals that the key knowledge sources that were used differ substantially. This is reflected in Figure 9.2, which depicts the ex-post positioning of the case studies undertaken using policy analysis methods. The further a case study is from an actor-based knowledge node, the less this knowledge source has

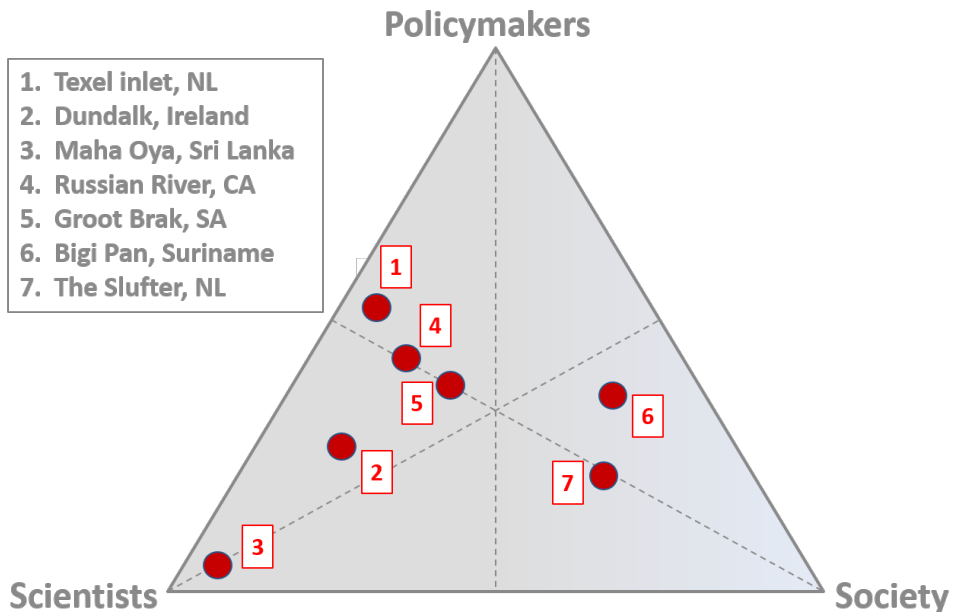


Figure 9.2. Relative contribution of three actor-based knowledge sources to the case studies.

been used in the case study. A case study located in the middle of the triangle would have an equal contribution from all knowledge sources. A case study located at the middle of a border between two knowledge sources would have a relative contribution of 50% from each of the adjacent knowledge sources and 0% from the opposing node. A case study located at a node would have a relative contribution of 100% from this knowledge source.

The case studies drawing most extensively on knowledge from society (local, place-based knowledge of citizens) are the Bigi Pan in Suriname and the Slufter in the Netherlands (Figure 9.2). Both case studies employed interviews with stakeholders as a research and knowledge acquisition strategy. The case study with the most knowledge sourced from policy is the Texel Inlet in the Netherlands. Although, it should be remembered that this analysis merely reflects the knowledge delivery as presented in these case descriptions. A wider issue focus than mouth management in the Groot Brak Estuary in South Africa would have revealed strong policy knowledge sources in the estuary management (see Slinger et al., 2005, 2012). In this instance, however, the Groot Brak Estuary case study is positioned as drawing very equally on knowledge sources from science and policy, as is the Russian River in California (Figure 9.2). In contrast, the Maha Oya Estuary in Sri Lanka is located close to the scientific knowledge node, because it is scientific knowledge that is being used to alert coastal managers and policy makers to the potential changes in mouth closure owing to climate change and the associated potential impacts on citizens (Figure 9.2). In effect, it is a wake-up call. The Dundalk Bay case study is similar in that scientists are collating information, assessing environmental status in order to begin to engage effectively in a dialogue about the integrated management of the bay system and its catchment (Figure 9.2).

The positioning of the case studies in terms of the relative contribution of actor-based knowledge sources is useful for clarifying (i) the means of learning employed within the case studies (M), and (ii) indicating potential additional sources of information and knowledge to supplement the existing efforts in coastal management (potential new M). At the same time, it sheds light on the extent of the object of study within the broad social-ecological coastal system (S). Where scientists have been involved for a longer period of time and the subject of involvement is well established, the knowledge sources accessed seem to be more distributed. Where new issues are raised or scientists are in the early stages of involvement, the knowledge sources are localised between one or two nodes. This is not to imply that studies will or should necessarily broaden their focus over time. The reason for scientists engaging in these case studies at the outset remains an inlet or mouth management issue. This study has highlighted that engaging with environmental management on the part of scientists, policy makers and local stakeholders is beneficial even when the state of knowledge of the ecological system is still a limiting factor. Such engagement appears to stimulate the development of different types of knowledge that then act to anchor the management approach within the social system, arguably making it more robust owing to the distributed learning of the involved stakeholders. So it is not necessarily the passage of time that engenders this effect, but the experiential learning of the people involved and its distribution amongst the actor-groups concerned. This serves to widen the object of study (S), that is it broadens the focus of the system that is seen.

9.4. Stepping towards the future

The goal of this research was to learn from a number of coastal case studies. The case studies in the international cross-comparison are each characterised by an inlet management or estuary mouth management issue that is understood by the involved scientists to be nested within a broader ecological and social context. We did not require the case studies to be located within similar biophysical or social systems. This means that specific, disciplinary insights were unlikely to emerge from cross-comparison. Instead, drawing upon systems thinking and policy analysis approaches (the way of inquiry of the overarching transdisciplinary endeavour), similarities and differences in the foci of the coastal case studies (S), and the types of knowledge employed (M) based on the diverse theoretical paradigms (C) adopted by the researchers, were distinguished.

In all of the case studies, deep place-based knowledge was used. Sometimes this came primarily from the scientists through measurements and modelling (e.g., Maha Oya, Texel Inlet) and sometimes this derived from local citizens and scientists (e.g., Russian River, Groot Brak). Some cases were predominantly focussed on the social aspects and some on the environmental system only. In summary, these analyses:

- reveal that no case study examined the social-ecological system as a whole,
- identify which aspects would need to be address should the focus broaden to address the whole system, and
- clarify the under-utilised actor-based sources of knowledge.

Drawing on this cross-comparative analysis with its social-ecological systems view and policy analytic strategy of inquiry, we can infer strengths and weaknesses of the individual

case studies, and so clarify which aspects, deriving initially from the predominant paradigm underlying each case study, should still be maintained in their further study and management. In Table 9.1, we also identify which aspects need to be included in taking steps to broaden the case studies to address the full social-ecological system and strengthen coastal management into the future.

Finally, we conclude by reflecting that the transdisciplinary research synthesised in this book represents an endeavour to learn by action research and policy analysis methods (M) across a (nested) social-ecological research system comprising scientists with their case studies. We trust that this endeavour will inspire others to undertake transdisciplinary learning and contribute to wise coastal research and practice.

Table 9.1. Stepping into the future – which aspects need to be maintained and included as the predominant paradigm underlying each of the case studies is broadened to the full social-ecological system

Case Studies	Predominant theoretical paradigm per case study	Transdisciplinary learning implies the following actions per case study	
Texel Inlet	Objectives-based Management	Include	Multiple objectives Co-design with stakeholders
		Maintain	Environmental monitoring
Dundalk Bay	Environmental Assessment	Include	Community engagement Enhanced integration of catchment and bay
		Maintain	Environmental monitoring
Maha Oya	Environmental Assessment	Include	Engagement with authorities and community Environmental monitoring
		Maintain	Climate change predictive science
Russian River	Objectives-based Management	Include	Multiple objectives
		Maintain	Environmental monitoring Community engagement
Great Brak	Adaptive Management	Include	Co-design
		Maintain	Adaptive scientific and community learning Environmental monitoring
Bigi Pan	Environmental Assessment	Include	Biophysical system understanding Stakeholder-engagement at local level Ecosystem-based management implemen
		Maintain	Ecosystem-based management planning
The Slufter	Social-Ecological Systems	Include	Co-design Stakeholder perception monitoring
		Maintain	Environmental monitoring

9.5. References

- D'Hont, F. M. (2014). *Does deepening understanding of make sense? A partial success story from the Slufter, Texel*. MSc Thesis. Delft University of Technology. Retrieved from <http://repository.tudelft.nl/view/ir/uuid%3Af79420ff-9c9a-42b5-a7d4-65bb5db10ac3/>
- Max-Neef, M. A. (2005). Foundations of transdisciplinarity. *Ecological Economics*, 53(1), 5–16. <https://doi.org/10.1016/j.ecolecon.2005.01.014>
- Ostrom, E. (2009). A general framework for analyzing sustainability of social-ecological systems. *Science*, 325(5939), 419–422. <https://doi.org/10.1126/science.1172133>
- Slinger, J. H., Huizinga, P., Taljaard, S., van Niekerk, L., & Enserink, B. (2005). From impact assessment to effective management plans: Learning from the Great Brak Estuary in South Africa. *Impact Assessment and Project Appraisal*, 23(3), 197–204. <https://doi.org/10.3152/147154605781765562>
- Slinger, J. H., Linnane, S., Taljaard, S., Palmer, C., Hermans, L., Cunningham, S., ... Clifford-Holmes, J. (2012). From policy to practice: enhancing implementation of water policies for sustainable development. *The Story of the Great Brak: Water and Society*. Delft, The Netherlands: Delft University of Technology.
- Wijnberg, K. M., van der Spek, A. J. F., Silva, F. G., Elias, E., Wegen, M. van der, & Slinger, J. H. (2017). Connecting subtidal and subaerial sand transport pathways in the Texel inlet system. *Coastal Dynamics Proceedings*, (235), 323–332.