

Governance of Transboundary Waters: Roles of Young Professionals

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Abstract

The effective governance of transboundary waters requires an integrated and interdisciplinary approach. In order to make sense of the complexity of systems, such as transboundary river basins, there has been a legacy of rationalising this complexity into silos of understanding based on academic disciplines. These disciplines; natural, social, economic and political sciences; all utilise a different language and have evolved from different philosophies, and are often in direct conflict. There is now, however, increasing recognition that a holistic and more integrated approach to understanding complex systems is needed and a move towards inter- and transdisciplinary research programmes. Although necessary for in-depth understanding and effective governance of transboundary waters, this integrated and interdisciplinary approach poses some challenges. Young professionals need to develop the ability to understand the epistemologies of the natural, social, economic and political sciences in order to be able to bridge the conceptual gaps between these disciplines and to identify institutions and mentors that support such interdisciplinary research.

Introduction

The way water is managed has evolved over the past 30 years from water not being regarded as an economic resource to one where water is recognised as a social and economic resource. This evolution can be explained by two driving forces of change within the water sector – the locus of control (where the decisions are being taken) and the focus of control (what the core management decisions are about). This is represented in Figure 1 with the vertical axis representing the locus of control and the horizontal axis the focus of control (Turton et al, 2005).

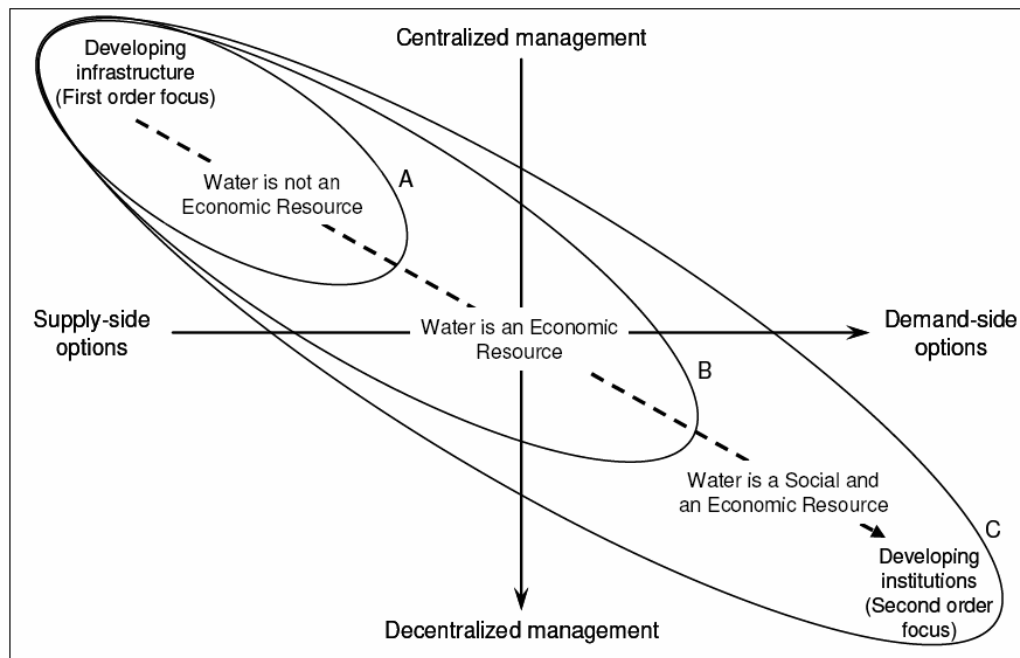


Figure 1. Conceptual model illustrating the general trend of change as water resource management approaches (modified from Turton, 2002, In Turton et al, 2005).

Most countries initiate water resource management through developing infrastructure (the upper left quadrant in Fig. 1) and then as a broader scope of management approaches becomes possible, there is a shift in focus towards the development of decentralised institutions for demand side driven management such as water conservation and water efficiency strategies. Many developing countries are still located in the developing infrastructure phase of water resource management where water is often not regarded as an economic resource (Path A: Fig.1). This is also known as the 'hydraulic mission' phase of society (Reisner, 1993) where water resource infrastructure provides the foundation for economic development. The Dublin Principles and the UN Conference on Environment and Development called for the commodification and the democratization of water, hence water began to be considered as an economic resource (Path B: Fig.1). With the evolution of time, the global discourse on sustainable development is driving the approach to water resource management in the direction of regarding water as both a social and economic resource (Path C: Fig.1), which embraces highly decentralized management in the framework of water conservation strategies. This is the foundation of the Integrated Water Resource Management (IWRM) discourse that is now almost universally accepted by water resource management professionals.

The decentralisation of water management institutions and a focus on demand side water management makes sense in the current global political environment of water reform. However, it is essential to recognise that a shift in water management approaches requires a

similar shift in the expertise or capacity of decision makers and professionals in this field. The type and mix of skills in the upper left hand quadrant of Figure 1 differs fundamentally from those needed in the lower right hand quadrant. The former consists mainly of engineers and hydrologists who see problems through similar eyes as the government officials overseeing the process of water resource management. The latter consists of a wider range of specialists, from ecological and water quality management professionals, through water conservation, legal reform, public participation experts to those knowledgeable about incentive development and institutional evolution. This is a challenge we face – mobilizing the right mix of skills to staff the wider range of specialist posts now becoming relevant in a decentralized management environment where a balance needs to be struck between use and protection under the broader ambit of water conservation and sustainable development.

There is a clear causal link between the sanctioned discourse of water resources management and the evolution of perceptions of water as not being an economic good to one as a social and economic good (Turton, 1999). The mix of skills comprising the discursive elite or the ‘gate keepers’ of a new sanctioned discourse have by necessity become more inclusive as water resource management has progressed through Path A to Path C (see Fig. 1). Engineers and politicians dominated during the supply side management phase of water management, with ecologists, economists and social scientists becoming more necessary to decision making processes as a more demand side, decentralised management approach is adopted (Turton, 1999). The discursive elite has co-evolved with the progression of demand side and decentralised water management and is characterised by interdisciplinary teams. Because of this the decision making process has become an interdisciplinary one and hence research in support of policy and management has also become more interdisciplinary.

Interdisciplinarity and Beyond

Interdisciplinarity is however not simply “achieved through the accumulation of different brains. It must occur inside each of the brains” (Max-Neef, 2005:5). There is often a perception that integration can be achieved by ensuring a representative from each major relevant discipline on a project team and through a collection of chapters written by different specialists bound together in a single report. Max-Neef (2005) defines the terms disciplinary, multidisciplinary, interdisciplinarity and transdisciplinarity:

- *Disciplinary* focuses on one discipline which represents specialisation in isolation. E.g. the discipline of biology (see Fig. 2).
- *Multidisciplinarity* involves many disciplines where team members undertake their analyses separately as seen from the perspective of their own disciplines without any integrating synthesis (see Fig. 2).
- *Interdisciplinarity* can be defined by two hierarchical levels. There is co-ordination between disciplines at the lower level due to a common sense of purpose being introduced as defined by the higher level in the hierarchy. In other words, co-ordination between many disciplines is driven by a higher order purpose (see Fig. 2). There are four examples of interdisciplinary hierarchies; the empirical hierarchy which includes for example disciplines such as economics, ecology and sociology; the pragmatic hierarchy which includes disciplines such as engineering, architecture and agriculture amongst others; the normative hierarchy which includes planning, politics, and environmental design amongst others; and the value hierarchy which includes disciplines such as ethics, philosophy and theology.

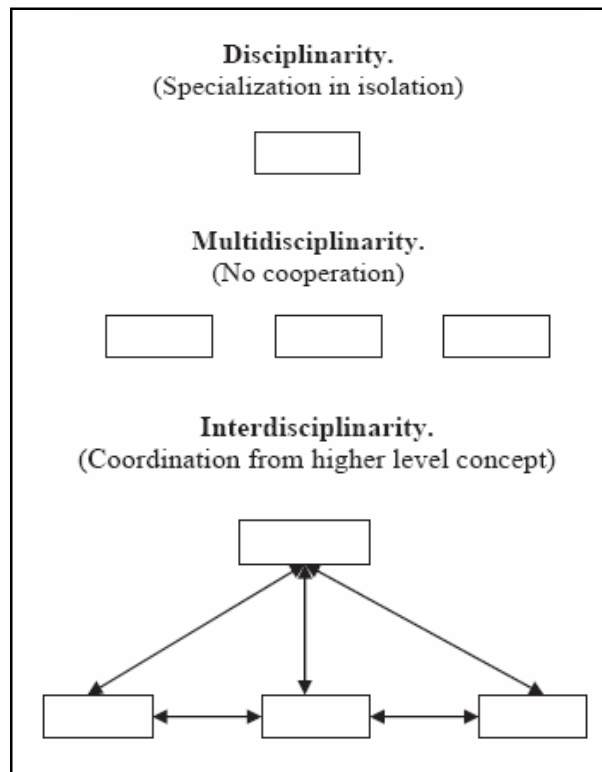


Figure 2. Definitions of disciplinarity, multidisciplinary, interdisciplinarity (adapted from Max-Neef, 2005).

Transdisciplinarity is defined as the co-ordination of all four hierarchy types described above. The disciplines at the base of the pyramid describe the world as we see it and asks and answers the question ***What exists?*** The next level is composed mainly of technological disciplines and asks and answers the question ***What are we capable of doing?*** The normative level asks and answers the question ***What is it we want to do?*** and the value level asks and answers ***How should we do what we want to do?*** (Fig. 3).

Academic institutions for a number of reasons, such as competition for research funds, academic prestige and disciplinary autonomy, do not advocate a transdisciplinarity approach (Max-Neef, 2005) resulting in silos of understanding based on academic disciplines. This isolation of disciplines has impeded the expansion of knowledge and the ability of researchers to interrogate and understand complex issues.

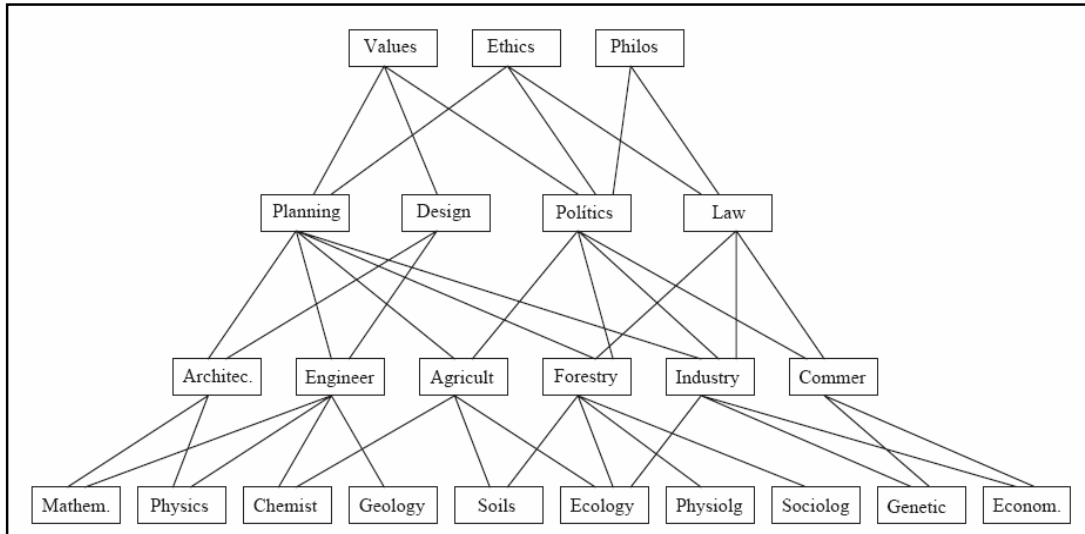


Figure 3. Definition of transdisciplinarity (Max-Neef, 2005).

Knowledge

The perpetuation of the separation of knowledge into silos based on academic disciplines has resulted in the simplification of our understanding of the world in which we live and a growing problem of experts and scientists not being able to understand each, because they are talking a ‘different language’. This communication gap is the product of the underpinning philosophical foundations of many of the core scientific disciplines. The quest for knowledge has resulted in many methods for acquiring knowledge – the most universally accepted approach is based on Newtonian scientific principles. The dominant metaphor in Newtonian science is the machine (Zimmerman et al, 1998). The machine can be explained by understanding each part separately i.e. using reductionism and rational thought. The parts are controlled by prescribed laws of behaviour and are thus predictable. In the last century the assumptions that the world we live in can be described in simple, linear logic terms has come under increasing pressure, although it must be recognised that this approach to knowledge acquisition has contributed significantly to our levels of knowledge. There is however increasing discomfort amongst many scientists that this quest for knowledge has not co-evolved with congruent levels of understanding (Max-Neef, 2005).

There is a natural progression in the development and growth of a body of knowledge that is illustrated conceptually in Figure 4. As one progresses up the metaphorical staircase from observation and measurement to knowledge and, ultimately, through intelligence and understanding to wisdom, the ability to provide vision and leadership in a particular field increases. The steps of understanding and wisdom are the ones where the most value is added to fulfil society’s needs, which in recent times is becoming the research imperative rather than one for the sake of knowledge acquisition alone.

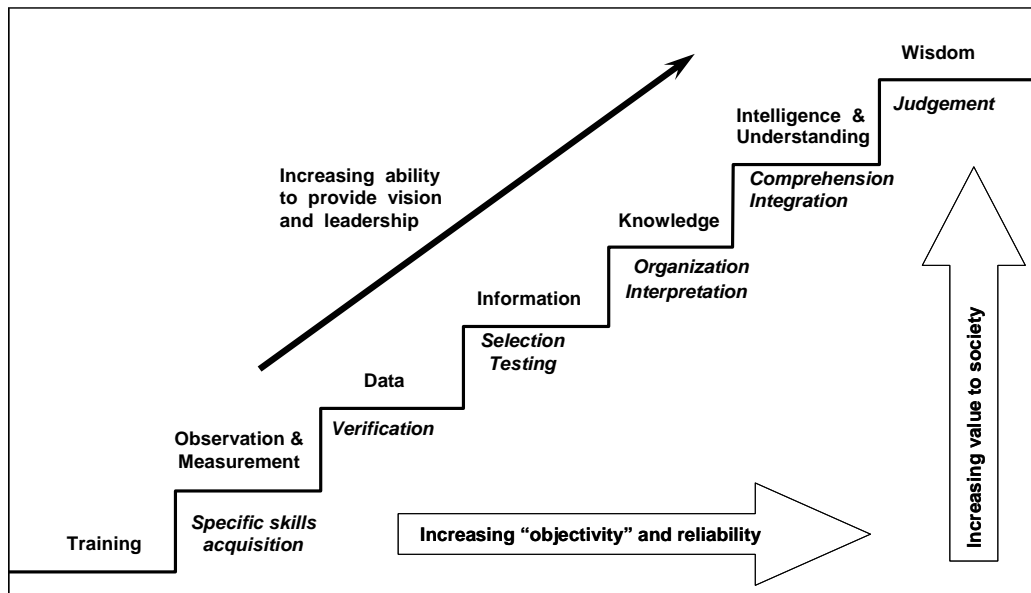


Figure 4. Conceptual diagram illustrating the progressive increase in the types of skills needed (italicized text at vertical risers) to achieve specific outcomes in terms of the increasing value of data through information and intelligence to wisdom. (Figure redrawn from Ashton, 2005).

Complexity and Socio-Ecological Systems

The change in the research imperative to one based on value to society's needs is a reflection of how our quest for knowledge has evolved with change in our surrounding environment. When natural resources were unlimited relative to use, the quest for knowledge was based on a need to understand our environment better (Nyambe & Breen, nd). As resources became increasingly a limiting factor on human development, research focused on managing productivity and use. Currently, demand is exceeding production resulting in a third shift in our quest for knowledge to one based on achieving sustainable use (Nyambe & Breen, nd). This shift in research imperative as natural resources come increasingly under threat has also lead to the realisation that natural systems are complex, subject to change and are unpredictable. In addition, human and natural systems can no longer be regarded as separate systems that can be treated independently, hence the sciences traditionally used in our quest for knowledge within human systems and natural systems can also no longer be regarded as separate. This realisation has led to a need for a new logic, different from Newtonian linear logic, that is able to accommodate complexity, chaos, non-linear processes and multiple disciplines.

Complexity science has emerged as a possible candidate in fulfilling the new requirements for a different logic. Complexity science is the study of complex adaptive systems - the patterns of relationships within them, how they are sustained, how they self-organize and how outcomes emerge. It is highly interdisciplinary including biologists, anthropologists, economists, sociologists, management theorists and many others in a quest to answer some fundamental questions about living, adaptable, changeable systems (Zimmerman et al, 1998). An example of such a complex adaptive system is socio-ecological systems. Socio-ecological systems are ecological systems that are intricately linked with and affected by one or more social systems (Anderies et al., 2004). The concept of socio-ecological systems is underpinned by complexity science in that they are characterised by:

- **Non-linear Behaviour:** The system behaves as a whole and cannot be understood by simply decomposing it into pieces which are added or multiplied together.

- **Hierarchical:** The system is nested within a system and is made up of systems. Such nesting cannot be understood by focusing on one hierarchical level alone. Understanding comes from multiple perspectives of different types and scale.
- **Internal causality:** The system is non-Newtonian, it is not a mechanism, but rather is self-organizing. It is characterized by goals, positive and negative feedback, emergent properties and surprise.
- **Catastrophic behaviour :** This is the norm - moments of unpredictable behaviour, sudden discontinuities, rapid change and a shifting steady-state mosaic (Kay et al, 1999)

Transboundary River Basins: Complex Adaptive Systems

In Africa, transboundary river basins cover 61% of the total area of the continent, and provide 93% of the renewable surface water. There are 53 countries in Africa and 63 river basins that cross international borders (Figure 5). There are consequently more transboundary river basins than there are sovereign states. In addition to the implications of this in terms of co-operation around water quantity and quality management between sovereign states, there are many issues that contribute to the complexity of managing international river basins. These include (*inter alia*):

- Gaps in datasets from different countries;
- Mismatching formats and units of measurements for data;
- Non-agreement on standardization of sampling methods;
- Resolutions of data collections differing from very fine to very coarse;
- Uneven levels of access to resources, capacity and competence needed to manage complex ecosystems;
- Non aligned national laws;
- Different policy objectives and national imperatives;
- Conflicting economic agendas;
- Variety of languages and cultures that make communication difficult ; and
- Often even differing value systems.

These characteristics of transboundary river basins define a system that typifies complex socio-ecological systems. The governance of transboundary river basins encompasses the full range of water management approaches described in Figure 1. This is especially the case where water is a scarce resource and where riparian states are at different levels of development and hence have different priorities for water security. The need for multidisciplinary teams is not only driven by the evolution of water management approaches but also by the need for inclusion of the major stakeholders from each of the riparian states.

Transboundary water resource management is not only a necessity due to the number of river basins that cross international borders but is also driven by co-operation between states for the common good of improving the quality of lives of those communities that live in shared river basins. The acquisition of knowledge in the field of transboundary water resource management must therefore aspire to climb the staircase described in Figure 4 to reach the point of understanding and ultimately wisdom if it is to fulfill its mandate of improving the quality of people's livelihoods. Research and policy development in this field therefore needs to be applicable and socially relevant.



Figure 5. Transboundary rivers basins in Africa (TFDD 2004).

In order to be socially relevant the question of *How should we do what we want to do?* should be the driving motivation for the development of research programmes. In order to ensure this happens a transdisciplinary approach is paramount. In order to answer this question one also needs to ensure that the foundations and the intermediary levels of the transdisciplinary pyramid (Figure 3) are relevant, scientifically rigorous and legitimate to all the stakeholders in the riparian states.

By its very nature, the governance of transboundary river basins is grounded in the same characteristics as complexity science and socio-ecological systems. This provides a useful framework for defining the system and all the variables and components that need to be taken into account when managing transboundary river basins.

The Role of Young Professionals

Young professionals in the field of transboundary waters need to be armed with the knowledge and understanding of the systems they are investigating from a number of perspectives. Firstly, we need to recognise that we are working in a complex environment which has significant implications for how the parameters and scope of our research is defined. We need to take personal responsibility to ensure that we have a detailed understanding of the different philosophies and logic that give rise to assumptions in our research and the management approaches we recommend. This is based on the recognition that our background training places limitations on our understanding and that we need to be

open to new and different ways of understanding the world we live in. In addition, we need to understand our own guiding ethics and value systems as they dictate our own behaviour and thus influence our research.

Secondly, we need to take personal responsibility to design transdisciplinary research projects as it is only through this approach that we can ensure that cognisance is taken of the social context as related to our research i.e. that broader societal values and needs are addressed. We can do this by influencing research design at proposal stage and by identifying institutions and funding agencies that support trans- and interdisciplinary research. We as young professionals are obliged to network with each other to ensure shared learning and understanding of a global issue. We need to develop collaborative research teams that representative the variety of required disciplines as well as stakeholders within the river basins we are studying.

There are many not so young professionals in the field of transboundary water that are bridging the gap between disciplines and embracing the complexity of international river basins. We need to identify these people and develop mentoring relationships with them and learn from their experience and expertise. Lastly, we as young professionals in the field also have an obligation to play a mentorship role to each other and the next generation of professionals in this field. Knowledge and understanding is not selfish, one way to break the silos of knowledge is be comfortable with the idea of sharing what we know and learning from others.

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