

New Directions in Natural Resource Management

The Offer of Actor-Network Theory

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1 Introduction

In natural resource management (NRM) scenarios, there are divergent claims on and stakes in the resource system. There is a high level of ecological and socio-economic interdependency, and often different management regimes prevail. The range of factors affecting resource management is immense, thus increasing the number and degree of uncertainties that stakeholders may face. Some stakeholders may experience a significant influence from certain contextual factors; others may feel little or no effect from the same factors (Buck 1999). These characteristics make NRM a complex undertaking. In NRM debates, much of the discussion of how people deal with uncertainties has focused on how resource users internalise (calculable) risks associated with common-pool resources (CPRs). In this context, CPR theory has shown that institutions governing access to, and control over, the resource provide a mechanism to transcend the so-called 'tragedy of the commons'. CPR theory has contributed tremendously to our understanding of NRM by demythologising the 'tragedy of the commons' thesis and developing a joint vocabulary and heuristic tools for the analysis of CPR management. Yet, CPR theory fails to reflect the increasing complexities and uncertainties that characterise complex NRM today (Mehta *et al.* 1999; Steins *et al.* 2000).

A critical analysis reveals a number of problems. First, conceptual frameworks employed by CPR theory are largely based on the analysis of management regimes for single resource units. In reality, however, resource systems tend to be used for multiple uses, often by different users. Moreover, (conflicting) claims by various groups over one single resource unit may prevail (e.g. Meinzen-Dick and Bakker 1999). Second, CPR theory is based on a static rationality model which assumes that only shared norms of behaviour in a community affect individual choices. This is problematic because (i) it marginalises the role of the social world to an entity that prescribes a normative context for action, and (ii) it regards the actor-world relation as a subject-object model where the actor is a lonely subject who only cooperates when it fits with his egocentric calculus of utility (Habermas 1997). Finally, collective action is essentially seen as an institutionalised set of procedures to guide or regulate human behaviour. The design principles

for collective action (e.g. Ostrom 1990) divert attention from the stakeholders' constructions of CPR management and the process through which collective action evolves.

Alternative views of NRM are rapidly emerging, focusing on complexity, heterogeneity, social interaction, pluralism, process and adaptability (Mehta *et al.* 1999). Insights from Actor-Network Theory (ANT) have much to offer in developing alternative perspectives and making visible how actors deal with uncertainties in the management of natural resources. The article introduces these insights and discusses how ANT may assist the further development of NRM perspectives.

2 Actor-Network Theory

Actor-network theory (ANT) is one amongst a number of sociological approaches that view reality to be socially constructed rather than naturally given or merely taken for granted. Its foundation lies in the sociology of science and technology, which considers knowledge as 'a *social product* rather than something generated through the operation of a privileged scientific method' (Law 1992: 381). ANT is a theory of agency, knowledge and organisation. However, what distinguishes ANT from other social constructivist perspectives is that it studies the state of affairs in an action arena as the effect of interactions amongst social actors and *non-human entities*. After all, we do not consider human beings as mere organisms but as people (or social actors) because they have material properties and a history of social relations over which they may have some control but on which they equally depend (Law 1994). For instance, without his vessel, nets, oilskins, navigation equipment, fishing licences, crew, competing colleagues, and buyers of his catch, the fisherman would not be a fisherman. Equally, ANT considers natural resource managers, common property regimes, the economy and technology to be ordered networks of heterogeneous materials that are constantly being shaped and reshaped as new human and non-human entities enter the arena. Such ordered networks of heterogeneous materials are referred to as (nested) *collectifs*.

The explicit recognition of the role of non-human entities in shaping the social raises the question of

whether or not non-humans (objects) can have agency and, indeed, if agency is an exclusive human property as conventional sociology argues. ANT starts from the position that non-human agency is not a contradiction in terms. Rather, agency is a property that emerges through interactions of people and objects and through relational networks. The recognition that 'by themselves, things don't act' (Law 1994: 485) can be said for humans too. Take the following example from Latour (1994: 35):

It is by mistake, or unfairness, that our headlines read 'Man flies' and 'Woman goes into space'. Flying is a property of the whole association of entities that includes airports and planes, launch pads and ticket counters. B-52s do not fly, the US Airforce [the *collectif*] flies.

Social structure thus emerges as 'a site of struggle, a relational effect that recursively generates and reproduces itself' (Law 1992: 386). The process in which sets of relations between projects, interests, goals and naturally occurring entities are proposed and brought into being is called *translation* (Callon and Law 1989: 58–59).

An example of such a translation process is presented in Callon and Law's (1989) article on the development of scallop (*Pecten maximus*) farming in the French Bay of St. Brieuc. The authors show how the demand for scallops by the French consumer is linked with the aims of three scientists who wish to increase their knowledge about scallop habitats in order to develop farming techniques. The connection between the consumers and the scientists is forged through the following translation process: the scientists claimed that in order to satisfy consumer demands, it was first necessary to study the behaviour of scallops and then organise their domestication through the development of farming methods. In this way a link between economy and science was created. However, as the authors point out, it is more than a link. In order to achieve their objective (development of scallop farming), the scientists had to convert themselves into *spokespersons* for (i) local fishermen (who had overfished the native scallops and would benefit from the development of farming techniques), (ii) consumers (who would like to have scallops on their plates) and

(iii) local government (interested in economic benefits for the area). The scientists then had to *mobilise* and *link* these groups together through an *intermediary*: the scallops.

ANT scholars seek to explore the tactics of translation. In doing so, they employ two basic principles: *generalised agnosticism* tells us to abolish the conventional practice of studying phenomena in terms of pre-defined categories (Callon and Law 1989); *symmetry* tells the researcher that everything deserves explanation and that each phenomenon s/he seeks to explain should be approached in the same way (Law 1994). The reason for adopting this principle is that judgements about truth and falsity are socially constructed. Any research that starts with the assumption that, for example, some form of NRM is successful while another is a failure will 'never get to analyse how the distinction is used and constructed' (Law 1994: 12).

For the researcher, following these principles has a number of methodological implications. First, it demands engagement rather than neutrality. Second, it requires some form of methodological relativism, giving maximum control over the information obtained to the subjects under study. Third, methodological interactionism is needed in order to guarantee that the story remains interested in the practice of its subjects (Knorr-Cetina 1981). According to Latour (1987) the researcher's task is to unravel the nested *collectif* under study, focusing on the linkages with material resources and less visible actors. The researcher leaves the boundaries open and closes them only when the people s/he follows close them.

Having introduced the basic research principles of ANT, I now discuss why these principles have so much to offer to NRM perspectives.

3 The Offer of ANT to NRM Perspectives

In the introduction, I discussed that the static model of bounded rationality underlying mainstream views of NRM hinders our understanding of the complex processes inherent in NRM scenarios. The notion of the nested *collectif* as developed in ANT has much to offer in making visible the decisions actors make, particularly in view of the

uncertainties they face. NRM is not merely a human process; it also involves factors such as a common good or problem, a certain resource unit or resource system, a certain technology, paperwork, institutions and so on. Decisions for a certain course of action will be influenced by: (i) networks of social and technical relations, (ii) the meaning that is attributed to the management system, (iii) perceptions of the external environment, and (iv) social experience. Over time, these networks, meanings, perceptions and social experience will be reshaped through the process of collective action itself. However, they can never be thoroughly understood without considering the non-human entities that are part of the process.

In the process of translation, different forms of rationality emerge. Purposive rationality is oriented at successful individual utility maximisation. Communicative rationality is oriented at reaching understanding to coordinate multiple actors' activities (Habermas 1997). This puts actors in a social dilemma position, since what actually happens depends on the actions of a whole range of other actors and factors.

For example, a group of oyster fishermen in the English harbour of Cowes initiated a process to privatise their common property fishery which was regulated by informal agreements. Access to this fishery was threatened by increasing navigational claims and nature conservation interests. The fishermen who initiated the translation process that was aimed at securing access to the fishery emphasised that in order to pursue their individual goals (fishing the oyster beds) the fishermen would have to agree upon a joint plan of action on the basis of a collective assessment of the problem. This resulted in the idea of applying for private property rights. Thus, communicative rationality emerged as the best strategy. To increase the chances of success, the fishermen decided that they would have to get the other relevant stakeholders on their side before they submitted the application; here strategic rationality proved to be the best strategy. In their discussion with the harbour master, who had a crucial vote in the final decision on privatisation, communicative rationality emerged again as important when they agreed on a compromise on the basis of a joint assessment of the problem that would benefit all parties (Steins 1999).

By considering actors as nested *collectifs* rather than rational, atomised actors, our understanding of NRM will increase. Decisions for certain courses of actions in NRM can only be appreciated by taking into account: (i) the very non-human entities that constitute the various stakes and are the pivot of the trials of strength that take place amongst the different *collectifs* throughout the process of shaping resource management; and (ii) the dynamic and different forms of rationality that emerge depending on the situation and the action that is considered necessary.

Mainstream views of NRM tend to analyse management regimes in terms of pre-defined categories of success and failure, such as abiding and free riding or rational and irrational users. The outcomes of management processes are linked to the presence of favourable conditions or design principles. This draws attention away from the users' constructions and perceptions of NRM and the process through which management evolves. For instance, in the above case of the oyster fishery, the design principles identified by Ostrom (1990) were all present and the informal common property regime was satisfactory to its users; yet privatisation was deemed necessary. Thus, what may be a condition for successful collective management in one scenario does not necessarily have to be one in another. Moreover, the stakeholders' priorities will be reshaped over time and space through interactions with other *collectifs*. A decade ago a similar privatisation attempt by the same oyster fishermen was abandoned. This time, however, the threat of closure due to navigational considerations and nature conservation interests, combined with the preparation of an estuary management plan, acted as catalysts for the fishermen to join forces and breathe new life into the privatisation project.

Furthermore, the presence of design principles does not automatically guarantee success. For example, as part of their share in their common property oyster fishery, members of an Irish shellfish cooperative had to contribute a number of labour days to its management. The conditions for successful management (Ostrom 1990) were abundant, yet two-thirds of the shareholders became free riders within a year of setting up the management regime. Analysis revealed that the period of the required work coincided with the

tourist season, which resulted in direct rewards. The presence of tourism and its part in contributing to an opportunity cost is an example of how contextual factors influence NRM (Steins *et al.* 1999). Thus, the setting within which the management system is located influences priorities and, consequently, to what extent nested *collectifs* are prepared to fulfil the demands made by the CPR. These priorities not only vary between geographical settings and over time, but also differ amongst nested *collectifs* who are engaged in the same management system.

Finally, judgements and perceptions about success, failure and rational behaviour are socially constructed, not only by the stakeholders involved but also by researchers, policymakers and bystanders. Again, the Irish cooperative is a good example. After spending several months in the community and building up a relationship of trust, I was told that the cooperative was established under the guise of improving income opportunities for local fishermen. Its hidden objective was to create property rights to parts of the local bay to prevent a salmon farm from expanding in the fishing grounds. Once the cooperative was initiated and shareholders contributed to resource management, two-thirds became free riders. Many would be tempted to say that collective action in this case has failed and that the logic of rationality had driven the free riders to opt for a collectively irrational outcome. However, if we look at the hidden objective, namely securing access to fishing grounds, the cooperative is very successful.

By following the conventional scientific belief that reality can be divided into categories and that its shaping mainly operates through cause-effect relations, the NRM process is limited to the development of even more categories for successful management. Prescriptive models are not sufficient as they will never be able to help us to know how actors construct NRM. Furthermore, categorisation does not do justice to the uniqueness of the management setting and imposes categories upon local and cultural contexts that may be completely alien to those concerned, and, consequently, may lead to erroneous judgements. Finally, success itself remains unexplained. Instead it is reduced to an abstract status that can be achieved by getting the mix of institutional ingredients right. What is

needed is a focus on the socio-material and structural characteristics of the *context* that shapes NRM strategies.

4 Lessons Arising out of ANT

Mainstream views in NRM, tend to focus analysis on the internal characteristics of the management regime, neglecting the role of contextual factors.¹ In a special issue of the *Journal of Environmental Policy and Planning* (1999), CPR scholars demonstrated the importance of contextual factors and the need to include them in analysis. Using case study material, they showed that there is a large variety of contextual factors affecting NRM. Contextual factors, including uncertainties, will differ from case to case and will evolve across time and space. This is, however, no reason to exclude them from the research agenda.

A lack of knowledge of contextual factors can lead us to make simplified judgements about actor behaviour in NRM. From an analytical point of view, it is useful to distinguish between local and remote contextual factors (Edwards and Steins 1999). Local contextual factors affect both the demand and supply of products, benefits and services from the resource system and, therefore, have a direct effect on its use and management. Generally, stakeholders will (partly) be able to influence local contextual factors. For example, the status of the Dutch Wadden Sea as an important breeding and staging ground for birds is one of the local contextual factors that eventually resulted in a co-management plan for shellfish fisheries made by fishermen, the government, scientists and nature conservation groups, in an attempt to deal with changing nature conservation demands and attitudes towards shellfish fishing in the area. Remote contextual factors usually have an indirect effect on the resource system and tend to be outside the control of the stakeholders. They are associated with a high level of uncertainty. For example, a number of consecutive cold winters in combination with storms affected the shellfish stocks in the Wadden Sea. Even if the shellfish fisheries had not been established, there would have been a food shortage for birds. This led to the need for efforts to distribute shellfish between birds and fishermen under the co-management regime.

Thus, the analysis of contextual factors is critical. Clearly, there is a limited extent to which researchers can study the entire external world of collective management regimes for natural resources. Starting with one outcome or point of passage in a collective action trajectory, for instance the establishment of a co-management platform, and focusing on critical incidents by backsolving (Oakerson 1992) or tracing back the tactics (Law 1994), can help make visible contextual factors. From a methodological point of view, distinguishing between local and remote contextual factors and making them visible through backsolving and comparative analysis are important guidelines for the analysis of contextual factors in NRM.

While contextual factors are broadly embedded in a number of spheres, such as the ecological, economic, demographic, social, cultural, political, legal, technological and infrastructural environment, their presence and impact on NRM will vary from situation to situation. From an analytical perspective, it might be tempting to define categories of contextual factors on the basis of a comparison of case studies, as has been the case for the design principles, for instance. However, as was pointed out earlier, the use of pre-defined categories cannot be advocated. By using a priori categories, researchers may easily lapse into generalisations by attributing the same weight to each contextual factor in the translation process and may run the risk of overlooking contextual factors that are not listed but may have been crucial in the translation process. A key question in the analysis is therefore: through which *mediating mechanisms* do these contextual factors affect and modify the tactics of translation amongst nested *collectifs* (cf. Crozier and Friedberg 1980).

ANT's principle of generalised agnosticism is crucial for the appreciation of NRM processes. The principle of generalised agnosticism tells us to abandon a priori categories and design principles as they thwart the analysis of the stakeholders' constructions of CPR management and the way these constructions are used. The focus of analysis should be on the tactics of translation through following the nested *collectifs* in the way they mobilise social and material means to enrol others in their projects. We can take into account the interdependent relationship between these

questions and the dynamic forces from the external world that impinge upon NRM. The abolition of the human category in favour of the notion of nested *collectifs*, which was discussed earlier, also fits in this principle.

The ANT principle of symmetry tells us that everything in an NRM situation needs explaining and can help understand collective action process. This means that regardless of whether a (collective) NRM is successful or robust, in-depth analysis is required. Thus success itself cannot be used as a self-understood principle, as is the case with the design principles that have been formulated on the basis of successful cases. Instead, success, too, needs to be explained on a case-by-case basis. In sum, the presence of collective action should be analysed in the same way as is its absence.

Through the adoption of the principles of generalised agnosticism and symmetry, the largely descriptive mainstream approaches of NRM can develop to encompass broader explanatory and multi-dimensional perspectives. These principles are also of key interest to emerging alternative approaches. From an epistemological point of view, this new ontological foundation means that the position of researchers, practitioners and policy-makers in relation to the natural resource and the nested *collectifs* that have a stake in it, drastically changes. Guba and Lincoln (1989: 84) describe this new relationship as follows: 'an inquirer and the inquired-into are interlocked in such a way that the findings of an investigation are the literal creation of the inquiry process.'

Thus, at the outset of the investigation only broad phenomena can qualify for analysis. The inquired-into should determine how the analysis of these broad phenomena will ensue, i.e., they are the ones who set the research agenda. The researcher's role is to follow the actors (Latour 1987). How would this work if one wanted to carry out research on 'cooperation as a mechanism to achieve sustainable fisheries management'? If, for example, the inquired-into have never heard of the concept of sustainability, it makes little sense to carry this research through. The idea for this research may have arisen because the particular researcher misinterpreted or romanticised the existing collective organisation of fisheries exploitation as

an institution aimed at sustainable management, whereas for those involved, it is a mere distributional arrangement. In such a scenario, cooperation itself is that which warrants examination.

5 Conclusion

Management regimes for natural resources are subject to dynamic internal and external changes. Some have been present for centuries and may evolve around one or multiple resource units; others have more recently witnessed the arrival of new stakes and have been slightly adapted or completely transformed in response to the new demands placed upon the resource system. While some stakeholders have been able to adapt their management regime(s) to changing circumstances (e.g. Edwards and Steins 1999), others have proven incapable of adaptive management (e.g. McKean 1986).

This article has outlined the various uncertainties and complexities in NRM scenarios. However, despite all these uncertainties, there is one certainty: there is always an outcome to NRM. Here lies the challenge: how and why was this outcome achieved and how does it evolve? Mainstream perspectives of NRM tend to take snapshot news, describing the state of affairs in an NRM scenario at a specific point in time rather than focusing on the dynamics of NRM.

ANT offers a perspective that avoids snapshot perspectives and is applicable to NRM theory as a whole. Its principles of generalised agnosticism and symmetry help facilitate our understanding of the contingencies involved in the shaping and re-shaping of collective action processes. This is achieved by focusing on the sociomaterial construction of NRM and the internal and contextual factors that influence the emerging action strategies by nested *collectifs*. In this analytical process, any (uncertain) outcome of NRM is regarded as an effect of the interplay and trials of strength amongst the different stakes in the resource and the way they mobilise social and material resources. Analysing the processes involved in those changes, therefore, becomes the enterprise of NRM theory.

But the most radical ontological shift lies in the new status accorded to the concept of rationality.

From a limited 'under-socialised conception' of the resource user (Granovetter 1992, in Wilson and Jentoft 1999: 63), we move to the other end of the continuum in conceptualising appropriators as nested *collectifs*. Their agency and rationality are not given properties, but are the emergent outcomes of interactions of human and non-human entities. This radical change in the assumptions underlying collective action processes is a basic requirement. By moving away from fixed notions of purposive rationality, we begin to understand the importance of strategic or communicative action in (collective) NRM and the role of nested *collectifs*.

These go a long way towards enhancing our understanding of the constructed, contingent and complex nature of NRM processes.

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Note

1. While contextual factors are often recognised as determining factors in the downfall of a common property regime, CPR theory generally does not venture beyond the internal world of the resource regime to provide a fuller explanation of the significance of context in management strategies (Edwards and Steins 1999).

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