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FOR A POLITICAL SOCIOLOGY OF WATER RESOURCES MANAGEMENT

Peter P. Mollinga

Summary

This paper uses the growing volume of scholarly work on 'water and politics' to conceptually and methodologically frame an approach to the social analysis of water resources management. This paper sets out the thrust and focus of such a 'political sociology of water resources management'. The framing draws theoretical insights from sociology, development studies, and, obviously, water resources studies. The main theoretical inputs are: a) critical realism as the general ontological and epistemological foundation (Bhaskar, 1989; Sayer, 1984); b) sociological theory on structure-agency dynamics (Giddens, 1984; Archer, 1995) and the notion of public sociology (Burawoy, 2005a); development studies' understanding of the different meanings of 'development' (Thomas, 2000); d) theory on politics and social power (Kerkvliet, 1990; Lukes, 2005); and e) my own reading of the water resources literature through the lens of the boundary concept of 'water control'.

The structure of the paper is as follows.

Section 1 explains where the attempt at defining a field of water resources management studies in this particular way comes from. The section situates the field in relation to development sociology as the intersection of sociology and development studies; discusses how the notions of discipline and scientific community help to understand the field's characteristics; and briefly presents my own intellectual trajectory as part of this account.

Section 2 discusses the object of a political sociology of water resources management. That discussion has four components: a) presenting 'water control' as a boundary concept that captures the multidimensionality of water resources management; b) conceptualising the interplay of structure and agency in water resources management as 'morphogenetic practice', that is, a cyclic process stretched over time and space; c) discussing the embeddedness of water resources management in the broader process of development; and d) showing the inherently political nature of water resources management and presenting a framework to analyse the working of social power in water control.

Section 3 maps the field by presenting the five domains in which contested water resources management plays out: a) the everyday politics of water; b) the politics of water policy in the context of sovereign states; c) hydropolitics; d) the global politics of water; and e) the linkages through which water resources management issues travel across domains.

Section 4 presents the approach and method of the political sociology of water resources management. The presentation moves in four steps: a) a discussion of Burawoy's notion of 'public sociology' to clarify the 'for what and for whom' of knowledge generation in the field; b) a discussion of the unit of investigation of the field – arguing that 'problemshed' and 'issue network' are more helpful units than 'watershed' and 'basin'; c) an argument for a comparative approach to research in the field given existing regional and sector fragmentation of water resources studies; and d) a look at the challenges for further development of the field.

Keywords

Water resources management, politics, sociology, development studies, interdisciplinarity

1. ON DISCIPLINARY CONSTRUCTION, FIELDS AND SCIENTIFIC COMMUNITIES – LOCATING DEVELOPMENT SOCIOLOGY AND WATER RESOURCES STUDIES

This paper was written as part of a Habilitationssverfahren that hopes to end in the granting of the *venia legendi* development sociology.¹ To situate the paper in that field, this section begins with a brief discussion of development sociology as the intersection of sociology and development studies. I subsequently discuss the limitations of disciplines as organisational forms for scientific fields defined in a subject-specific and problem-focused manner. Instead, it may be more productive to think of a field like the ‘political sociology of water resources management’ as being researched by a (interdisciplinary) scientific community. Starting from my own background as an irrigation scholar, I describe the evolution of the field of water resources studies, in relation to developments in sociology and development studies. This takes up the larger part of the section. I conclude with a listing of the conditions of possibility for the formulation of a political sociology of water resources management.

1.1. DEVELOPMENT SOCIOLOGY

A very simple characterisation of ‘development sociology’ as a field or discipline is to say that it is the intersection of ‘sociology’ on one hand and ‘development studies’ on the other. Development sociology would then be that part of sociology that studies development, and that segment of development studies that takes a sociological perspective.

The credentials of sociology, being an ‘old’ discipline originating in the late 19th century, require little justification, certainly in Germany, with Marx, Weber and Durkheim among the founding fathers of the field (Giddens et al., 2007; Kaesler, 2006; Korte, 2006). Development studies is a relatively ‘new’ field, born in the 1950s-1960s period (Corbridge, 1995, 2007).² Because of the young age of development studies, it may be felt that development sociology should be seen primarily as an offshoot of sociology, rather than a field at the intersection of sociology and development studies. This is, for example, how Dieter Goetze’s *Einführung* into development sociology starts. He situates the field in the history of the discipline of sociology, and integrates elements and perspectives from the field of development studies into it (Goetze, 2002). Rather than delving into questions of historical seniority or other primacy arguments, I would like to suggest that both the discipline of sociology and that of development studies have significantly shaped the field of development sociology. Sociology provides the basic theoretical and methodological thrust; development studies provides the main themes and questions that the field of development sociology focuses on. How the balance is exactly struck in concrete academic practice varies across time and place.³

Giddens (1984:xiii) states that “[s]ociology is by its very nature controversial”, while Corbridge (2007:1779) finds that “[d]evelopment studies is an unusual enterprise.” Both disciplines have in their

¹ The paper has been edited to fit the requirements of a ZEF working paper. I thank Jos Mooij for her detailed comments on a draft version of this text, and the participants in the ‘Water, Politics and Development’ initiative for the intellectual inspiration and support in the process leading to this formulation of the perspective. The usual disclaimers apply.

² Corbridge (2007) as part of a discussion of the (im)possibility of development studies, briefly sketches the emergence of development studies in the English language domain by listing the starting dates of some well known US and UK based development studies journals: *Economic Development and Cultural Change* (1952), *Development* (1957; journal of the Society for International Development <http://www.sidint.org>), *Journal of Development Studies* (1964), *Development and Change* (1970), *World Development* (1973), *Third World Quarterly* (1979), *Journal of International Development* (1989), which is the journal of the Development Studies Association (<http://www.devstud.org.uk/>) and *Progress in Development Studies* (2001). To this could be added, for instance, *The European Journal of Development Research* (1989), the journal of EADI, the European Association of Development Research and Training Institutes (<http://www.eadi-online.org/>) and *Studies in Comparative International Development* (1965). *Peripherie. Zeitschrift für Politik und Ökonomie in der Dritten Welt* (1980) is the German development studies journal, published by the Wissenschaftliche Vereinigung für Entwicklungstheorie und Entwicklungspolitik.

³ Development sociology/sociology of development textbooks and readers include the already mentioned *Einführung* by Goetze (2002), Barnett (1988), Kiely (1995) and Long (2001).

long and short history experienced ups and downs, intellectually as well as institutionally, and gone through intensively reflected upon impasses and crises (Boudon, 1980; Collins, 1989; Prus, 1990; Booth, 1985; Schuurman, 1993; Leys, 1996). Such turmoil is to be expected given the subject matter of sociology, development studies and development sociology: society and societal transformation. Given the turbulent contestation of societal transformation in the 20th century it is only logical that the knowledge about these processes is fiercely contested. The positive side of this coin is that the three fields have produced a diverse and rich literature, developed in close interaction with ongoing processes of social change. The challenge is to make constructive use of the existing theoretical (and ideological) plurality, or to speak with Burawoy (see section 4.1), existing 'antagonistic interdependence'.

1.2. DISCIPLINES AND SCIENTIFIC COMMUNITIES

The regular declaration of crises and impasses may be related to a yearning for a form of unified science, a single 'best' theory defining a field or discipline. However, it is doubtful whether disciplines are very prospective frames within which theoretical coherence can be achieved, even at much less grand ambition levels than unified science. Some whose heart lies with interdisciplinary science have even felt that disciplines are 'academic administrative artefacts', hindering effective addressing of society's contemporary problems (Lele and Norgaard, 2005). Becher and Trowler (2001) provide an eloquent, though disturbing, description of the institutional dynamics of the 'academic tribes and territories' that we call disciplines, and of the labour of social (re)construction that goes into their maintenance. The disciplinary fragmentation of water resources related science and its detrimental effects on the 'integrated' approaches needed for addressing the complexities of water resources management questions, has been well captured by Robert Chambers (1988).

Chambers describes the standard professional attitudes, reflexes and standard science of water resources professionals, educators and researchers with the term 'normal professionalism'. "Normal professionalism is the thinking, values, methods and behaviour dominant in a profession. Reproduced through education and training and sustained by hierarchy and rewards, it tends to specialised narrowness." (Chambers, 1988:68) His basic argument is that this 'specialised narrowness' leads to fragmented and partial approaches to problem solving and planning. Every profession and discipline has its own (reduced) perception of a specific concrete water resources management problem, and its own (reduced) solution for it. This is summarised in table 1. Both social science and natural science disciplines/professions are shown to exhibit this trait.

TABLE 1: NORMAL PROFESSIONALISM

Professionals	Normal problems	Normal solutions
Administrators	Lack of coordination	Coordination by administrators
Agricultural engineers	Poor leveling	Physical development below outlet
Agricultural extensionists	Farmers' ignorance of water management practices	Communicate to and 'educate' farmers
Agronomists	Water supply is too much, too little or untimely	Supply exact plant water requirements
Economists	Waste of water	Water pricing
	Underutilisation of potential	Further investment
Irrigation engineers	Inadequate physical works	Construct better works
	Inadequate maintenance	More resources for maintenance
	Waterlogging	Line canals, pump out ground water, construct drains
Social scientists	Inequity and conflict over water below the outlet	Organisation for conflict resolution below the outlet

Source: Extracted from Chambers, 1988: 84, table 4.5

What should be avoided, however, is to set up the issue of disciplinary delimitation and specialisation on one hand, and the need for integrative and comprehensive analysis for addressing complex issues on the other, in a dichotomous manner. Presenting the issue as a choice between 'depth' and 'breadth', between disciplinarity and interdisciplinarity, or other polar opposites, is better avoided. At this point, it is useful to remember that many disciplines are actually interdisciplines, having been forged from components of pre-existing disciplines.⁴ Lele and Norgaard (2005:972) suggest why it may be helpful to liberate oneself from the disciplining frame of disciplines, both in the natural and the social sciences.

"There is both a great deal in common across disciplines and much variety within them. In the social sciences, market economic models are used in economics, anthropology, history, sociology, political science, public policy, and even psychology; those from different disciplines who use these models may have more in common with each other than with those from the same departments who use Marxist perspectives. The biological sciences have reorganized over the past quarter-century, dropping the historic disciplinary distinctions, for example, between the plant and animal world and organizing more on levels of analysis from the gene to the organism to the ecosystem. Yet evolutionary biology cuts across all levels of analysis, and ecologists use genetic techniques to understand ecological systems and processes. Thus the structure of scientific knowledge and the differences in epistemologies, theories, and methods among scientists have little to do with what have historically been called disciplines. So, when approaching collaborative work between scientists, forget disciplines; think scientific communities. *ibid.*:972)

In Lele and Norgaard's perspective, scientific communities share among their members a similar perspective that has the following elements:

- a subject focus;
- underlying assumptions of the factors they study (for example the nature of human agency);
- assumptions about the larger world they do not study (for example assumptions about predictability);
- the type of models they use;
- the type of methods they use;

⁴ This is often directly visible from the name of disciplines, as for example with physical chemistry, and institutional economics. In the Bonn University Agriculture Faculty *Wirtschaftssoziologie* and *Ernährungssoziologie* (Kutsch, 1993; Kutsch et al., 1986) are examples. But also a 'big' discipline like political science has grown out of a number of pre-existing disciplines, including history and philosophy. Disciplines like geography and human nutrition/food science are intra-interdisciplinary (Mooij, 2003) due to the way their object is defined. For more discussion, see Mollinga (2008 forthcoming).

- the audience they strive to inform through research (ibid.:972).⁵

The attempt in this chapter to ground a 'political sociology of water resources management' is to describe object, theory and method of a field academically cultivated, in the double sense of protected and belaboured, by such a scientific community: that of critically and sociologically minded water resources scholars with an interest in development. The challenges in terms of the cultivation metaphor would be, firstly, to demarcate the field while keeping it open, avoiding the exclusion, fence building and boundary guarding connected with Bercher and Trowler's tribalism and territorialism, and, secondly, avoid sterility due to over-exploitation and adopt a style of knowledge cultivation that increases fertility. As in real farming, relations with neighbouring plots and care for the larger landscape plus well developed social networks, locally and globally, are essential for successful reproduction and transformation (Nolten, 1998).

1.3. THE DEVELOPMENT OF WATER RESOURCES STUDIES

Like people construct academic disciplines, fields and communities, these academic disciplines, fields and communities construct people – an instance of structure/agency dynamics. My personal intellectual trajectory is an example of such a simultaneously individual and collective dynamics. I have now arrived at the disciplinary home of development sociology, in an attempt to conceptually and practically profile a field labelled political sociology of water resources management, to help strengthen the networking and collaboration of those working within it as a scientific community.

Being trained at Wageningen University, the Netherlands as an irrigation engineer⁶ in a study programme that was transforming itself from a disciplinary (hydraulics and agronomy based) identity to an interdisciplinary identity⁷, my first social science home was that of development studies. Within development studies the 'peasant studies' stream was the main reference (Bernstein, 1979; Byres, 1981; Long, 1986)⁸. My one and a half years (1988-89) with the Development Policy and Practice group at The Open University, Milton Keynes explains the strong orientation towards UK based development studies and the political economy of agrarian change in my work, including this paper. From 1993-2000 I taught an advanced Masters course called 'Irrigation and Development' as part of the transformation of the irrigation programme at Wageningen. The work of Norman Long, professor of Sociology of Development at Wageningen University, was a main influence on the methodological front. His 'actor oriented'

⁵ As an extension of Lele and Norgaard's statement, it may also be argued that while a discipline as a whole may be highly diverse, individual instances of it, say departments, may be quite homogeneous. Diversity in approach within a discipline make that disciplines are to a degree indeed Lele and Norgaard's 'academic administrative artefacts'. Homogeneity of perspective in work units suggests that there does not necessarily have to be as strong a difference between concretely existing instances of disciplines and scientific communities as Lele and Norgaard seem to suggest. I would propose that what distinguishes one discipline/community from the other and makes it more or less (inter)disciplinary is primarily the way the object is defined. Objects can be defined in a range from mono-dimensionality to multi-dimensionality, and from generic to concrete, and in different combinations of these. A sociological perspective on power would be an example at the mono-dimensional generic end of the spectrum, and an integrated approach to water resources management in Germany an example at the multi-dimensional concrete end. When it is acknowledged that both these delineations, and others in between and around them, have a contribution to make, excessive tribalism and territorialism can perhaps be avoided. Blackburn's (2006) analysis of Germany's history of water resources management and nation building is an excellent example of the benefits of cross-boundary and inclusionary thinking. I thank Conrad Schetter for alerting me to this book.

⁶ To be precise, the name of the Masters programme from which I graduated was 'Tropische Cultuurtechniek'. This translates well into German, but not into English – an example of the socio-cultural history of disciplines!

⁷ It incorporated elements of development sociology and the political economy of agrarian change in the early 1980s (see Eggink and Ubels, 1984), quickly followed by elements of other social science disciplines, notably anthropology, gender studies, law and political science.

⁸ My second intellectual home has – thus – been the social study of technology – an avenue not pursued in this paper (but see section 1.4.4). At Wageningen University this initially revolved around debates on the 'code of technology' in the early 1980s, which expanded into an interest in labour process theory, and from the late 1980s was inspired by the then emerging field of the social study of science and technology (Pinch and Bijker, 1984; MacKenzie and Wajcman, 1985; Bijker and Law, 1992), now almost a 'discipline' by itself. Among the Wageningen sociologists, Jan Douwe van der Ploeg's work was particularly influential (van der Ploeg, 1990). He is now a professor of rural sociology at Wageningen University.

development sociology (Long, 2001) with its combination of sociological and anthropological research methods has defined my, and many of my water resources colleagues', approach to fieldwork and sociological analysis, reflecting the 'behavioural turn' in sociology/social anthropology and development studies more generally. At Wageningen the actor oriented perspective aligned well with the desire of many development studies oriented students to work with and for small farmers.

These sociological influences resonated with developments in the field of water resources studies itself. From the 1970s the study of water resources management underwent strong expansion as well as transformation. Before this period, water resources studies consisted of two unconnected clusters of scientific work. The first cluster was the engineering field, inhabited by disciplines like civil engineering and hydrology, and for agricultural water resources management, the different agronomic and Kulturtechnik disciplines. This was an alignment of natural science and engineering disciplines, combined with a bit of economics to calculate costs and benefits. The alignment was pursuing what has been recently described by J.A. Allan as the 'hydraulic mission' (Allan, 2006). This is a modernisation project started in the colonial period, continued after decolonisation as planned development, aimed at 'harnessing' rivers, to increase the supply of irrigation water to crops, protect land and people against floods, and generate hydroelectric energy by means of large-scale infrastructural works.

The second cluster was that of academic social science work on water. The most prominent social science work on water resources was a combination of anthropology and political science. The (in)famous debate is that on Karl Wittfogel's hydraulic society and oriental despotism thesis (Wittfogel, 1957; for a succinct and helpful review see Scarborough, 2003). This historically linked irrigation with state formation. He presented a deterministic view of the role of irrigation in shaping statecraft and 'total power' in particularly Asian societies. Steward (1955) brought Wittfogel's work into the domain of anthropology. It was found that the thesis that irrigation gave rise to state complexity was too simple, and that irrigation was only one in a myriad of factors explaining forms of statehood (Adams, 1966, 1981; Millon, 1971; Lees, 1974). The two most damaging findings for Wittfogel's thesis that subsequent research produced were 1) that cities and associated indicators of complexity and scale often predate canal systems; 2) that many non-state groups have developed sophisticated water management schemes. (Scarborough, 2003:19) Nevertheless, the thesis had generated an important stream of anthropological research on water.

As stated, the two clusters of water resources studies just mentioned were pursued largely independently. This started to change in the 1970s. The pursuit of the hydraulic mission post independence by many governments of developing countries in the form of the construction of multiple large dams started to be commented on critically from the mid-1960s, and particularly in the 1970s (Wade and Chambers, 1980; Wade, 1982; Chambers, 1988; Mollinga, 2003). The irrigation systems constructed were underutilised, irrigation water was distributed unequally, negative ecological effects started to emerge, the systems created generated insufficient state revenue due to populist water pricing/taxing policies, and corruptive practices in the state bureaucracy were observed, while the dams and the irrigation systems they supplied with water were hugely costly undertakings. While engineers talked about the 'operation' of the infrastructural systems, the 1970s saw the introduction of 'management' as a core category. This reflected the growing awareness that the use of the water resources systems was complex and had a strong social dimension. This current culminated in the establishment of the International Irrigation Management Institute (IIMI) in Sri Lanka in 1984, as a CGIAR (Consultative Group on International Agricultural Research) institute.⁹ Trying to deal with the new issue of 'management', critiques of the green revolution, and the emergence of 'participation' as a core item in development programmes, a lot of internationally funded research on water resources management was generated. The prime academic institute at the global level in this period was the water resources group at Cornell University, USA. Graduates from and associates with this group played an important role in the growth of IIMI and other international research programmes on water resources management.

It is on this wave that the programme at Wageningen University transformed itself, from 1980, into an interdisciplinary programme with a strong focus on 'water management', thus reflecting a global trend.

⁹ The institute has been renamed International Water Management Institute (IWMI) since then.

In this global trend, the two earlier unconnected bodies of water studies started to interact with each other (an early and influential example is Coward, 1980). Social science perspectives started to be taken up in the 'mainstream', engineering dominated, water resources domain. Actor oriented methodologies proved extremely useful as they allowed the investigation of actually existing water management practices, which was highly necessary given the disappointing results of state-led planned development approaches. The encounters that emerged at the interfaces between academic social science on water, policy-oriented water research, and public debate on the effects of water resources development programme in the 1970s and 1980s are still evolving.

While sociological approaches were very popular in this water resources management discourse in the 1980s, particularly centred around the notions of participation and equity (cf. Chambers, 1988), the 1990s were the decade of the more economic perspectives, particularly that of the new institutional economics. After the collapse of the Soviet Union, the neo-liberal development paradigm reigned supreme for about a decade. In the water resources management domain this is reflected, among other things, in the importance given to the idea of tradable water rights (as introduced in Chile, see Bauer, 2004) and (private) property rights more generally (cf. the discussion on water in the context of the WTO negotiations, cf. Conca, 2006: chapter 7). At the same time international investment in large-scale water infrastructure continued to decline, partly as a result of declining world food prices, reducing the attractiveness and urgency of investment in agricultural production infrastructure, partly as a result of the increasingly powerful social and ecological critique of the negative developmental effects of the construction of large dams, in parallel with a rise of the 'sustainable development' paradigm. In the water sector this critique resulted in the establishment of the World Commission on Dams (WCD) in an effort to find ways to deal with dams responsibly, and to the rise to prominence of the notion of Integrated Water Resources Management (IWRM). The Global Water Partnership (GWP) was established in 1996 and has become the main advocate of IWRM as the core policy concept of 'reflexive modernity' (Allan, 2006). As regards drinking water there has been successful advocacy for accepting access to water as a human right.

Conceptually, this process was marked by another shift in the water resources management discourse. The notion of 'governance' was introduced, firmly from about 2000. Management was felt to be too 'technical' a term to capture the complexity of the social and institutional dimensions of water resources. Again, this reflected developments in the broader development discourse, where 'good governance' had become a core issue in the late 1990s (Jenkins, 2001).

In the global water discourse, the period from 2000 to 2002 seems to have been the period of 'closure' that established governance as a core theme. Three major events took place in that period at which the global water resources community debated the nature of the 'global water crisis'. These were the 2nd World Water Forum in The Hague in 2000, the Bonn Freshwater Conference in 2001 and the Johannesburg Summit on Sustainable Development in 2002. The Executive Summary of the World Water Vision report prepared for the 2nd World Water Forum uses the word 'governance' only twice. It concludes by stating that "there is a water crisis, but it is a crisis of management. We have threatened our water resources with bad institutions, bad governance, bad incentives, and bad allocations of resources." (Cosgrove and Rijsberman, 2000: xxvii)¹⁰ In subsequent discussion this formulation got

¹⁰ In the five chapters that form the main text of the report, 'governance' appears only thrice. Once in the context of transboundary water management (p.53), once while referring to corporate governance (p.62), and once in the context of attracting investment, which requires "good water governance – strong regulations, sound policies, and up-to-date laws." (p.61) In the Ministerial Declaration of The Hague on Water Security in the 21st Century, the political outcome of the 2nd World Water Forum, the word governance appears once where the challenges for achieving water security are listed. One of these is "Governing water wisely: to ensure good governance, so that the involvement of the public and the interests of all stakeholders are included in the management of water resources." In the challenge 'Meeting basic needs' it is stated that that is important also "to empower people, especially women, through a participatory process of water management." In outlining how the challenges are to be met the concept of IWRM (Integrated Water Resources Management) appears prominently. "[IWRM] depends on collaboration and partnerships at all levels, from individual citizens to international organisations, based on a political commitment to, and wider societal awareness of, the need for water security and the sustainable management of water resources. To achieve [IWRM], there is a need for coherent national and, where appropriate,

revised and shortened to a single sentence. Much quoted is the phrase “The world water crisis is a crisis of governance – not one of scarcity” from the No Water No Future speech at the Summit by the Prince of Orange of the Netherlands. Since then ‘governance’ is prominently on the global water resources agenda.

Jenkins (2001) argues that ‘governance’ as used in the mainstream international development discourse of the international development funding agencies tends to become a ‘technical’ issue. It depoliticises public management. Ferguson (1994) and Harriss (2001) have argued that there may be compelling reasons for governments and other actors to depoliticise debates on development. These reasons are located in the way instrumental reason, which actively claims to exclude ‘politics’, assists in reproducing state power and legitimacy, as well as the reproduction of development assistance programmes (also see Scott 1997).

While agreeing with much of Jenkins’ criticism of the global (good) governance agenda, and with the observation that depoliticisation may be an attractive governance strategy, the addition of ‘governance’ to the water resources policy vocabulary may be considered a step forward. Increased use of the term governance signifies a less exclusively sector focused understanding of water resources management. It recognises embeddedness in broader socio-political structures, in parallel to the increased recognition of water resources management’s ecological dimensions following environmental critiques. One example of this expanded scope of the mainstream water resources management discourse¹¹ is the report of the Comprehensive Assessment of Water Management in Agriculture (Molden, 2007). It attempts to incorporate, at the global level, the socio-political and ecological embeddedness perspectives in an approach to water management in the largest freshwater using sub-sector – agriculture. Water governance in this context refers, among other things, to the allocation of rights (rights to water and technology, decision-making rights) and resources (water itself, but also maintenance and investment funds for instance), and thus creates more space for considering issues like ‘interest groups’ and ‘social power’ than the notion of management tended to do.¹²

Till the late 1990s politics and the political were anathema in most water policy circles.¹³ The social engineering paradigm reigned largely unquestioned (Mollinga et al., 2007).¹⁴ From a situation of denial and exclusion of ‘politics’ from the mainstream water resources discourse, the discussion seems to be moving towards consideration of the kind of politics that is found in or desirable for water resources management. What remains to be seen is whether or not explicit discussion of the social relations of power in water resources management will become a recurrent theme in such discussions. It is not unlikely that instrumental and apparently non-political understandings of governance will continue to

regional and international policies to overcome fragmentation, and for transparent and accountable institutions at all levels.”

¹¹ With ‘mainstream’ discourse I refer to the predominant view in international and national water resources policy discussions. With a nice term this has been called the ‘sanctioned discourse’ (Jagerskög, 2002). IWRM is the centrepiece of the present global ‘sanctioned discourse’ (see Allan, 2006).

¹² There are other discursive trajectories leading to acknowledgement of the social relations of power. The most notable one is the participation discourse, which has populist and instrumentalist variants but has also produced the notion of ‘empowerment’ as a more political understanding of ‘involvement of stakeholders’ (cf. Scoones and Thompson, 1994). ‘Participation’ has been a central theme in water policy discussions since the 1970s.

¹³ This statement derives from participation in policy related discussions on water management since the early 1990s. However, in past years the politics word seems to have acquired some acceptability. On 25 February 2004 a double session on ‘Driving the Political Economy of Reform’ took place as part of the World Bank Water Week, the yearly gathering of World Bank staff and partners in Washington DC. On 26 and 27 February 2004 the World Water Council (WWC) launched a ‘Water and Politics’ initiative, though apparently not with much follow up. In the corporate sector, the RWE Thames Water company emphasizes the importance of water politics on its website. The Stockholm World Water Week has given systematic attention to water politics in recent years. Cf. Merrey et al. (2007) for further discussion.

¹⁴ “The term social engineering is used here in a narrow sense to refer to linear models for changing societies or organizations, where blueprints are used to replicate a structure in a new context, that may have worked elsewhere. Application of this model to achieve social change—if x then y follows—is based on a misunderstanding of the complex, nondeterministic, and stochastic nature of social organizations. [The critique of s]ocial engineering as used here does not imply pessimism about the possibility of facilitating and guiding social change, but cautions against oversimple prescriptions.” (Merrey et al. 2007: 197)

dominate the mainstream global water resources discourse, while critical understandings explicating the political dimension will find less resonance. However, the Human Development Report 2006 on water, which pays explicit attention to social power and politics, shows that 'politics' is now actively discussed in the mainstream global water resources debate (HDR 2006; for a review see Mollinga, 2007).

1.4. CONDITIONS OF POSSIBILITY FOR A POLITICAL SOCIOLOGY OF WATER RESOURCES MANAGEMENT

The foregoing means that in terms of knowledge development the space for discussing the 'politics of water' has increased, implying stronger mobilisation of for instance political science approaches into water resources social science research. This process of the expanding scope of 'mainstream' water resources management discussions¹⁵ in response to societal developments has constituted the condition of possibility for the present attempt to consolidate a 'political sociology of water resources management'. This structural condition of possibility has the following components.

- a) The expanded scope of the 'mainstream' water resources management discourse. Though there is a lot of contestation, and much disagreement, the three major challenges that face development policy (ecologically sustainable development, democratic governance, and socio-economic equity in growth and welfare) are on the 'mainstream' water resources policy agenda in many places, if not most – something that has not always been the case.
- b) The globalisation of water policy (debates), and globalisation more generally. The global sharing of knowledge has become easier, not just because of the internet, but by the very emergence of a global water politics since the mid 1990s. Global knowledge sharing has become more important because of the articulation of global water policy processes. Simultaneously, knowledge, knowledge development and knowledge societies have become an important theme in development thinking.
- c) The pertinent nature of water resources conflicts and controversies, meaning that water will stay on the political agenda. It is a safe projection that water issues and conflicts will proliferate, both on the front of water quality (water pollution) and on the front of water quantity (closing basins). One of the effects of this has been increasing investment in water resources related research.
- d) The articulation of different voices and perspectives. Apart from self standing academic work on water resources and policy related work as referred to above, critical reflection and public knowledges have also found stronger, organised articulation and representation.

The agency dimension of this is the following. At ZEF since 2004, located in the department of political and cultural change, I have increasingly found development sociology and political sociology suitable labels for my work on the social dynamics of water resources management – no doubt a reflection of the development just sketched. The theoretical grounding of a 'political sociology of water resources management' presented in this paper has been articulated in the context of ZEF's 'Water, Politics and Development' research programme initiative. The public beginning of this initiative was a roundtable (Rundgespräch) on 'Water, Politics and Development' financially supported by the DFG (Deutsche Forschungsgemeinschaft) in April 2005. The 'Water, Politics and Development' initiative will result in two published collections of papers. These are a collection of papers in the first issue of Water Alternatives (www.water-alternatives.org Vol.1, No.1, June 2008, and a forthcoming volume to be published by LIT Verlag).

2. THE OBJECT: CONTESTED WATER RESOURCES MANAGEMENT

In this section I define and discuss the object of a political sociology of water resources management. A shorthand description is contested water resources management. The focus on contestation first and foremost derives from an empirical assessment of the current dynamics of water resources management at international, national and local levels. In many cases, though not all, water resources management is actively contested, with substantial stakes involved, and with important developmental implications. A

¹⁵ Further expansion of the scope is required as regards the economics of water resources management.

focus on the modes of contestation and ways of engaging with these thus seems justifiable as a defining focus for a field of study. The articulation of such a focus has already taken place at the level of policy discourse and public action, with its calls for and objectives of addressing complex water resources management issues in an integrated and strategic manner.¹⁶ What remains to be done, or rather enhanced and consolidated, is the articulation of a scientific perspective on the same. As will become clear, in order to achieve such enhancement and consolidation, an approach that combines a sociological perspective on the structure and agency dimensions of social interaction, with a development studies interest in the role of natural resources management in societal transformation, is a fruitful avenue.

The clarification moves in four steps. I first discuss the concept of 'water control', the boundary concept that keeps the approach together (section 2.1). The second step presents a sociological angle on the structure-agency theme for the specific case of water resources management. It will be shown that water resources management lends itself very well for Archer's morphogenetic perspective, which is a critique and elaboration of Giddens' structuration perspective (Archer, 1995; Giddens, 1984) (section 2.2). The third step takes the development studies angle. It elaborates on the embeddedness of water resources management as a social practice in the broader process of development. It explains the focus on the social (as against economic and ecological) embeddedness of water control practices in the wider structures of water policy and governance. It is shown how the literature on that embeddedness deals with the three different meanings of 'development' in contemporary development discourse as identified by Thomas (2000) (section 2.3). In the fourth and last step (section 2.4), politics and power are the focus. It is shown that water resources management is an inherently political process, involving the mediation of the social relations of power, thus suggesting the theoretical logic of a focus on contestation.

2.1. WATER CONTROL 3D: THE MULTIDIMENSIONALITY OF WATER RESOURCES MANAGEMENT

The concept that keeps the proposed political sociology of water resources management together is 'water control'. Any human intervention in the hydrological cycle that intentionally affects the time and/or spatial characteristics of water availability and/or its qualities, is a form of water control. It is thus something that humans have done since time immemorial (see for instance Scarborough, 2003), and will necessarily continue to do. Forms of water control are, however, highly variable historically and geographically, and receive their characteristics from their embeddedness in a set of broader dynamics, an issue I will return to (see section 2.3).

Use of the term 'control' in this transhistorical manner has been found problematic by some. In critical perspectives 'control' tends to be a 'bad thing', associated with excessive and arrogant desire of mastery over nature by humankind (cf. Blackburn, 2006 on water management and the conquest of nature in Germany), or is associated with despotic or otherwise undesirable control of human beings (cf. Wittfogel, 1957 on hydraulic societies and oriental despotism). As an actual description of what humans do with water, terms like water guidance, direction or regulation would be better, as intervention in the hydrological cycle is basically that (cf. Benton, 1989; also see Lansing, 1991: 6ff.). However, all three terms are awkward and confusing as general categories. Moreover, 'water control' is a concept actively used in the different domains of irrigation/water resources studies, a reason to stick to it for the time being.

When doing field research on canal irrigation management in South India in the early 1990s, it struck me that the term 'water control' is used in different disciplinary domains, referring to the same object (irrigation water management). It describes three different dimensions of water resources management, as summarised in table 1.¹⁷

TABLE 1: THREE DIMENSIONS OF WATER CONTROL

¹⁶ This is what the 'vision documents' and 'frameworks for action' of the three-yearly World Water Forums are about, as well as the World Commission on Dams process, the plethora of (world) water reports that the United Nations system is producing (cf. HDR 2006), and many comparable policy processes at national levels. Equally, though with different emphases and objectives, NGOs and social movements addressing water issues have produced (alternative) visions and strategies for transforming water resources management policy and practice (cf. Phadke and Patankar, 2006; Mishra, 2002).

¹⁷ Quotations from the different literatures using 'water control' as a concept can be found in Mollinga (2003).

Dimension	Association/meaning	Disciplines	Example references
Technical control	Guiding-manipulating-mastering of physical processes	(Civil) engineering, soil mechanics, hydraulics, hydrology, agronomy, meteorology, agro-ecology	Plusquellec, Burt and Wolter (1994: 35)
Organisational control	Commanding-managing of people's behaviour	Management science, extension science, public administration, organisation sociology	Hunt (1990: 144), Huppert (1989: 35), Lowdermilk (1990: 155)
Socio-economic and political control	Domination of people('s labour) Regulation of social processes	Political economy, economics, rural sociology, political science, social and cultural anthropology, gender studies, agrarian history, law	Stone (1984: 202), Boyce 1987: 198-199, 229, 233), Enge and Whiteford (1989: 5-7)

Source: Adapted from Table 2.1 in Mollinga, 2003: 38.

Technical, organisational and socio-economic/political control are generic categories. Within each category several forms of control can be identified – a true ‘polyphony of meaning’ as Löwy (1992:375) calls it. However, water control as a concept is more than an ensemble or catalogue of meanings referring to the same process. The different dimensions of water control are not independent, but are intimately related (for example, technical design shapes management forms, political regulation shapes organisational practices, etc.). Empirical evidence underpinning this hypothesis was generated through a historical case study of the introduction of the so called block system of irrigation management in the Nira Left Bank Canal in the Bombay Presidency (present Maharashtra), India in the early 20th century (Bolding, Mollinga and van Straaten, 1995). Subsequent studies have confirmed the internal relations¹⁸ between the different dimensions of water control, while refining the concept in the process (see for instance Bolding, 2004 for Zimbabwe; Oorthuizen, 2003 for the Philippines; Boelens, 2008 for the Andean region; Veldwisch, 2008 for Uzbekistan; Mollinga, 2003 and Narain, 2003 for India).

‘Water control’ can be understood as a ‘boundary concept’ that allows capturing of the different dimensions of contested water resources management. The notions of ‘boundary concept’, ‘boundary object’ and other ‘boundary’ terms, originate from the social study of science and technology literature (see Gieryn, 1984), and the literature on interdisciplinarity (see Klein, 1996).¹⁹

Star and Griesemer (1989) is the seminal paper in this field and defines the notion of ‘boundary objects’ as follows.

“Boundary objects are objects which are both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites. They are weakly structured in common use, and become strongly structured in individual use. These objects may be abstract or concrete. They have different meanings in different social worlds but their structure is common enough to more than one world to make them recognisable, a means of translation. The creation and management of boundary objects is a key process in developing and maintaining coherence across intersecting social worlds.” (Star and Griesemer, 1989:393)

This somewhat cryptic description suggests that boundary objects are the things (devices, people, institutions, organisations, procedures) we use to do boundary crossing, to negotiate the different discontinuities in a given scientific/research situation. Boundary concepts are those concepts that allow

¹⁸ For the notion of ‘internally related’ see Sayer (1984).

¹⁹ The theoretical investigation of ‘boundary’ issues in the mentioned literatures was first brought to my notice by Jessika van Kammen, for which I gratefully thank her. Incorporation of boundary notions in the idea of multidimensionality of water control that I had already articulated, allowed me to understand and explain much better that the multiple use of the water control as a concept was indeed no coincidence but of theoretical significance, for water resources management analysis, and for interdisciplinary analysis more generally (see Mollinga, 2008 forthcoming for discussion).

us to travel across disciplinary boundaries, make sense of each other's scientific approaches, and capture several dimensions of the studied phenomenon in a single analysis.

'Water control' illustrates what Löwy (1992) has called 'the strength of loose concepts'. By establishing or recognising a common concept across disciplinary boundaries, a cognitive space is created in which the multiple meanings of it can be elaborated. Multidimensional analysis is, according to Löwy, sometimes better served by not very precisely defined concepts that create space for creative exploration, than by tightly and precisely defined concepts that close off such space.²⁰ In the case of water control an effort at defining the concept precisely would probably amount to one of the perspectives trying to impose its particular reading of it. As these different disciplinary fields have been using the concept largely in isolation from each other, the point is exactly to raise curiosity in the 'foreign' meanings 'across the border', in order to move towards more comprehensive understanding.²¹

From the perspective of critical realism water control is a 'concrete concept' (Sayer, 1984), combining several abstractions in a single concept to capture complexity. Sayer's phrasing is a reference to one of the ontological principles of a founding father of sociology, Karl Marx, who said in his *Grundrisse* "[t]he concrete is concrete because it is the concentration of many determinations, hence unity of the diverse." (Marx, 1973:101). It is this concentration of determinations that boundary concepts help us to capture.

2.2. WATER CONTROL AS MORPHOGENETIC PRACTICE

Anthony Giddens states in his *The Constitution of Society* that "[s]ocial theory has the task of providing conceptions of the nature of human social activity and of the human agent which can be placed in the service of empirical work. The main concern of social theory is the same as that of the social sciences in general: the illumination of concrete processes of social life." (Giddens, 1984:xvii) The sociological approach I seek to develop exactly aims at that – understanding of the concrete social dynamics of (contested) water resources use, management and governance. I situate my effort in the context of Giddens' attempt "to formulate a coherent account of human agency and of structure" (Giddens, 1984:xxi). I base myself particularly on Archer's (1995) elaboration of Giddens' framework. With the proponents of attempts at such a coherent formulation, I believe that understanding structure-agency dynamics is the core formal theoretical challenge in the analysis of social transformation and development.²²

This position derives from an understanding of the specific and special nature of 'society' as an object. Conceptual engagement with the 'vexatious fact of society' needs to deal with society's following three characteristics.

"Firstly, that [society] is inseparable from its human components because the very existence of society depends in some way upon our activities. Secondly, that society is characteristically transformable; it has no

²⁰ Löwy develops her analysis of the 'strength of loose concepts', and their potential value for interdisciplinary analysis through a discussion of the concept of the 'biological self' in the domain of immunology, a concept that was developed at the boundary of clinical practitioners and academic researchers active in this domain.

²¹ There are many such boundary concepts in the analysis of the social dynamics of natural resources management. Some of these are also loose concepts with active reflection ongoing. An example is the concept of scarcity. Some boundary concepts are very well defined, for instance the notion of ecosystem services, as recently codified in the Millennium Ecosystem Assessment. Many exist in multiple meanings experiencing different degrees of contestation and confusion – examples are efficiency, value/valuation, risk, vulnerability, and others. Boundary concepts are of central importance in the policy domain also. Examples are the concepts of IWRM (Integrated Water Resources Management) and human development. In the policy domain boundary concepts can facilitate alignment of perspectives and constituencies, and thereby decision making and concerted action, but they can also facilitate exclusion and normalisation. Struggle over meaning tends to be a power struggle. A third category of boundary concepts are those concepts that do not capture the multiple dimensions of a single object, but a common dimension of a variety of objects. An example is the concept of capital as used in livelihoods analysis frameworks, which makes a statement on the similar function of different capitals in the design of livelihood strategies. Boundary concepts are not generic concepts identifying a class of or a 'family resemblance' of similar phenomena (cf. the discussion on power in section 2.4).

²² In what follows, I succinctly sample a vast debate. The objective is to briefly profile my critical realist bearings as regards the analysis of structure-agency dynamics, and social theory more generally (Bhaskar, 1989; Sayer, 1984; Archer, 1995, 2003).

immutable form or even preferred state. It is like nothing but itself, and what precisely it is like at any time depends upon human doings and their consequences. Thirdly, however, neither are we immutable as social agents, for what we are and what we do as social beings are also affected by the society in which we live and by our very efforts to transform it.

Necessarily then, the problem of the relationship between the individual and society was the central sociological problem from the beginning. The vexatious task of understanding the linkage between 'structure and agency' will always retain this centrality because it derives from what society intrinsically is." (Archer, 1995:1)

This means that we can treat neither agency nor structure as a dependent variable. We have to understand the relationship between the two, and their co-evolution, and not succumb to structuralism or voluntarism, methodological collectivism or individualism, exclusively macroscopic or microscopic explanation, and so forth. In Archer's framework this social ontology is linked to an explanatory methodology that she calls the morphogenetic approach. That methodology is a critique of 'conflationary theorizing', meaning one-dimensional theorising. Structuralists are downward conflationists providing one-dimensional explanations from the perspective of the structure. Methodological individualists are upward conflationists providing one-dimensional explanations from the perspective of individual agents. Archer considers Giddens' approach to structuration as a case of central conflation. In Giddens' framework the "mutual constitution [of agency and structure] precludes examination of their interplay." (Archer, 1995:14) Instead, Archer's morphogenetic approach seeks to conceptualise

"how the interplay between structure and agency can actually be analyzed over time and space. It is based on two basis propositions:

- (i) That structure necessarily pre-dates the reaction(s) leading to its reproduction or transformation;
- (ii) That structural elaboration necessarily post-dates the action sequences which gave rise to it." (Archer, 1995:15)

In Giddens' framework "causation is always the joint and equal responsibility of structure and agency and nothing is ever more attributable to one rather than the other, at any given point in time." (Archer, 1995:64) Because structure is inseparable from agency in Giddens' framework

"there is no sense in which [structure] can be either emergent or autonomous or pre-existent or causally influential. Instead, 'structural properties' (i.e. defined as 'rules and resources') are 'instantiated' in social practices and have no existence outside this instantiation by agency." ((Archer, 1995:97, italics in original)

"In telling us that actors have to invoke rules and resources to engage in action, yet are never determined in how these are invoked since they could 'always have done otherwise', central conflation leaves us with three perennial questions: Wittgenstein's problem, 'where do rules come from', Winch's problem 'how do rules change' and, above all, Weber's pre-occupation with 'why are things so, and not otherwise?'. (...) without any external (structural) spur to action or any internal (psychological) prompting, 'social practices' appear random in origin and kaleidoscopic in result." (Archer, 1995:132)

One way to summarise the basic feature of Archer's morphogenetic approach, and make it a bit less abstract than the presentation above, is to say that it takes time to link agency and structure (Archer, 1995:chapter 3). Archer's central argument is that "[i]t is only through analysing the processes by which structure and agency shape one another over time that we can account for variable social outcomes at different times." (ibid.:64; emphasis in original) Social change happens in three-part cycles of "(a) structural conditioning, (b) social interaction and (c) structural elaboration" (Archer, 1995:89).

It is this cyclic nature of social reproduction and transformation that eminently fits the analysis of water resources management. The cyclic nature of water control immediately follows from the definition given above that it is human intervention in the hydrological cycle. Due to the yearly and seasonal climatic cycles of rainfall, sunshine and temperature, the social interaction that water control involves is necessarily cyclic also. One of an endless series of examples of this is the cyclic occurrence of water distribution conflicts in canal irrigation systems. For a South Indian case Mollinga (2003) describes the distinct periods of the year when major water distribution struggles occur. It is in the periods of the year when demand for water is high due to overlapping crop seasons or due to a combination of certain growth stages with high temperatures and when opening and closure dates (which are related to rainfall and river discharge patterns) interfere with the growth of crops, that the social relations of water distribution are contested and potentially re-negotiated. The fact that these periods are discrete periods separated in time, and that they are recurrent (occur every year or season in stronger or weaker form) shapes the way the contestation takes place. One of the implications of this pattern of occurrence is that irrigation water distribution conflicts have a 'natural' end – the crops mature or die, depending on how

much water arrives, and the issue potentially occurs again only in the next cycle. The general managerial implication of this was that water resources management had an important element of crisis management – rules and resources were mobilised in all force in these ‘high stakes’ periods. Outside these periods, the larger part of the year, a much more routine practice of water resources management was visible, with little active contestation, or even interaction. The regularity and relative predictability of the cyclic occurrence of conflict periods meant that irrigators could respond also in an anticipatory manner, by crop choice, time of sowing, and by other social and physical means.

The same example also illustrates the ‘endurance’ of the structures that shape the social practices of irrigators and managers. Firstly there is the technological structure of the irrigation system as physical infrastructure. Decisions once taken to align the canals along certain routes have created sequences in water distribution, which translate into queues when water is scarce. Apart from the time element the canals also structure the spatial distribution of irrigation water by decisions once taken where canals do run and do not run, and thereby which place is further from the source and which closer to it. Together this constitutes the classical problem of canal irrigation management, that of unequal water distribution between the ‘heads’ and the ‘tails’ of systems and canals.

This technological structure is not immutable – it exhibits change over time. But, indeed in steps and cycles, as the morphogenesis perspective would suggest. One process that links agency and structure is the gradual process of land levelling in the head reaches of the canal system, to make land suitable for irrigated cultivation. In the South Indian case described in Mollinga (2003) the original villages were located in the lower parts of the landscape, close to natural water streams, while the newly introduced canals were located in the higher parts of the landscape to permit gravity irrigation. Villages thus were, by design, located in tail end locations, with agriculture being concentrated in the direct vicinity of the villages. Over time irrigators relocated their land to head end locations, a slow process as it required the acquisition of land and investment in land levelling, which required money, social networks, knowledge, and labour time. Over a period of thirty to forty years a slow concentration of irrigation in head end areas of the irrigation system can be observed. In the process the canal infrastructure itself was adapted by the construction of new outlets and sub-canals, and in some cases the lining of canals, and the introduction of diesel and electrical pumps for mechanically lifting water from canals and drains.

In this irrigation system the constituency-based parliamentary democratic system was an important component of the institutional structure shaping water resources management. This meant that local members of parliament were closely involved in resource allocation in their constituency, including irrigation water as a crucial resource. These members of parliament were also represented in a system-level organisation called the Irrigation Consultative Committee that approved the yearly irrigation schedules and played a role in the mediation of (escalated) conflicts. The irrigation schedules prescribed, survey number (cadastral unit) wise, both the crops farmers were allowed to grow and the timing of their irrigation water supply. Though this system of administrative prescription never functioned as planned, the structure of actual practices associated with it evolved over time, including changing roles of the actors involved in it. Given the crucial importance of irrigation water for crop production, livelihood security and accumulation, farmers were not very inclined to obediently follow government prescriptions and appropriated water as they could. This resulted in the emergence of a variety of irrigation rotation schedules, negotiated between irrigators at the tertiary canal level, between irrigators and managers at the secondary canal level, and within the irrigation bureaucracy between managers at the main canal level, thus showing strong spatial variation of concrete institutional arrangements. These arrangements evolved over time in response to broader societal changes, like changes in market conditions and the rise of competitive populism in the political system. They also changed in response to system internal processes like the already mentioned shifting of holdings, and through settlement of farmer-migrants from other parts of South India. One process that affected the role of the local members of parliament was that many of them developed prosperous rice milling and input provision businesses, which gave them very specific personal stakes in (unequal) water distribution.

The example shows that the technical and institutional structures that exist at a given point in time condition irrigators’, managers’ and other actors’ agency in water control, and shape the form of the social practices of water control, with evident time and space dimensions. These social practices over time transform these technical and institutional structures, in seasonal, yearly, and longer cycles, like the

parliamentary election cycle, and in response to broader societal changes. In large parts of the year the structures of water resources management are invisible, and are not 'instantiated' through social interaction. There may even be years when they hardly come to be expressed, like in years of excessive rainfall (and no water scarcity), or when the canal system is seasonally closed for technical (f.i. canal breaches) or political (f.i. priority allocation to other systems) reasons. Nevertheless, the structures continue to exist over time, in the memory of actors, but also in the form of technical artefacts, the spatial location and properties of agricultural land, organisational forms and institutional arrangements, and cultural norms and dispositions.

It seems to me that this example, though specific in its empirical detail, represents the systemic features of water resources management quite well. It shows the importance of looking at the processes of the interplay of agency and structure over time, as Archer's morphogenetic approach suggests, and the specific importance of the spatial dimension for understanding water control. More generally this shows the importance of history and geography in sociological analysis, as stressed by Giddens (1984:xxi). The example also shows the interplay between technological and institutional, or more generally the material and social, structures of water control and how these evolve through sociotechnical practices, an issue I return to below. Hence, water control can be usefully conceived as morphogenetic practice.

2.3. THE EMBEDDEDNESS OF WATER RESOURCES MANAGEMENT

Section 2.1 stated that water control as a social practice receives its specific characteristics from its embeddedness in a set of broader dynamics. These are, generically speaking, the dynamics of economic relations (market and other exchange relations related to production), the dynamics of socio-political and cultural relations (the institutional arrangements, identities and discourses of/in state and civil and political society), and the dynamics of ecological systems (the hydrological cycle and the landscape in particular). This embeddedness connects water resources management closely with developmental concerns like the patterns of accumulation and social differentiation, modes of governance and regulation, and ecological sustainability conditions and effects.

A fully comprehensive approach to the study of contested water resources management would not only investigate the multidimensionality of water control practices, but also their different forms of embeddedness. The present state of the academic art in this respect is that the three forms of embeddedness are addressed in three different fields of study within development studies.

The ecological embeddedness of contested water resources management is part of political ecology approaches, a currently expanding field of studies (Escobar, 2006). The economic embeddedness of contested water resources management is addressed in political economy approaches. These have a longer history as the earlier phases of development studies were strongly flavoured by it (for the Indian case this literature is reviewed in Mollinga, 2003). The social and cultural embeddedness of water resources management has been analysed by a broad range of approaches looking at 'institutions'. There is a lot of boundary crossing between these fields in approaches that take a combined look at aspects of different forms of embeddedness (as in economic sociology, environmental sociology and economic geography approaches for instance).²³ What potentially unites these fields as a scientific community is the adjective 'political'- the emphasis on contestation through an analysis of the social relations of power (see section 2.4 below on the inherently political nature of water resources management). In all these fields the structure-agency problematic as discussed above in section 2.2 would be relevant. The 'sociological perspective' is thus strongly present in the analysis of each of the forms of embeddedness.

Developing a framework for integrated analysis of contested water resources management across the different forms of embeddedness is still to be accomplished. In that sense the field is still partly caught in the disciplinary mode, and has not yet arrived at Lele and Norgaard's scientific community mode (see section 1). The political sociology of water resources management I develop in this paper has its primary basis in and focus on the social and cultural embeddedness of water control practices. This is a delimitation reflecting my own research emphasis of the past ten years, which has mainly focused on water policy and governance, that is, on the 'institutional' dimensions of water resources management. In this section I thus focus on the link of institutional analyses of water resources management with

²³ The diversity of approaches is considerable as the three forms of embeddedness I identified are generic categories encompassing a wide range of specific types.

development studies analyses of 'context'. The ambition to 'fully' capture complexity is to be pursued with modesty and through slow and painstaking theoretical and empirical work by the emerging epistemic 'water, politics and development' community.²⁴

Alan Thomas identifies three meanings of 'development' that are in use in development studies.²⁵ 'Development' can be understood respectively

"(i) as a vision, description or measure of the state of being of a desirable society; (ii) as an historical process of social change in which societies are transformed over long periods; (iii) as consisting of deliberate efforts aimed at improvement on the part of various agencies, including governments, all kinds of organizations and social movements." (Thomas, 2000: 777; emphases in original)

Each of these meanings associates with different bodies of scholarship on water resources management.

The first meaning, development as a vision, description or state of being of a desirable society, is very prominent in contemporary water policy analysis. As Ken Conca notes "IWRM has become the discursive framework of international water policy – the reference point to which all other arguments end up appealing." (Conca, 2006:126; emphasis in original) Quite a bit of the international and national debates on water resources management's contribution to development focuses on the explicitly normative notion of Integrated Water Resources Management. There are different ways to 'read' the concept. Conca in the first instance analyses it as "an increasingly clearly specified conceptual blueprint and as an increasingly embedded, institutionalized set of transnational relationships." (Conca, 2006:126). Conca's analysis is a critique, questioning the desirability of imposing this concept given the powerful interests associated with it. This critique closely associates with critical analysis of discourses of environmental governance as processes of normalisation, disciplining and dominance (cf. Foucault, 1991; Hajer, 1995; Scott, 1997; Agrawal, 2005). Simultaneously, however, Conca characterises IWRM as having "an all-encompassing character of such great flexibility that it approaches vagueness" (Conca, 2006:126-127) and "a careful reading of IWRM – as both conceptual blueprint and institutionalized norms – reveals an ambiguous, complex, and at times contradictory stance towards territoriality, authority, and knowledge." (ibid.:127) Both of these citations seem to contradict the blueprint and normalising nature of the concept suggested earlier. For South Asia, it can be safely stated that IWRM, while being increasingly used in general (policy) discourse, remains a highly unspecified concept and very poorly institutionalised (see Mollinga et al., 2006 for several contributions supporting this assessment). In the introduction to Mollinga et al. (2006) I argue that IWRM is more usefully seen as a policy boundary concept that has enhanced the discursive and political space for more comprehensive and human development oriented views of water resources management, against the 'hydraulic mission' paradigm referred to earlier in this paper. I suggest that at present it is actively contested by attempted acts of appropriation and specification from very different developmental perspectives, rather than being singularly imposed.

The second meaning of development identified by Thomas, development as long term social change, has been taken up in historical literature where water resources management is analysed in relation to societal change. A significant part of this historical literature analyses social and cultural embeddedness. One example was already referred above, Blackbourn's analysis of the relationship of water resources management and nation building in Germany (Blackbourn, 2006). For South Asia, historical work on water/irrigation governance has been primarily the study of so-called tank (small reservoir) irrigation in relation to pre-colonial statehood and state formation.²⁶ The colonisation of the American West, in which irrigation played a central role, has produced a fascinating historical literature (see Reisner, 1993).

²⁴ My earlier PhD work has a strong accent on the economic embeddedness of water resources management (Mollinga, 2003). Fruitful general starting points for theorising the economic and ecological embeddedness are in my view, for the economic part, the work of Granovetter on the social embeddedness of economic relations (Granovetter, 1985, 2005), and for the ecological and technological part, the work of the social study of science and technology school (Latour, 1992; Bijker and Law, 1992). The analysis of Balinese irrigation comes close to such 'full' capturing of complexity, at least it is to my knowledge the case that comes closest to it. Having become academically famous through Clifford Geertz's ethnographic analysis of this irrigation society, it has attracted a considerable amount of high quality scholarship since (see for instance Lansing, 1991).

²⁵ I thank Henry Bernstein for alerting me to Thomas' paper and the usefulness of this threefold division.

²⁶ For India, there is excellent historical work on the history of colonial canal irrigation in North India with an emphasis on political-economic embeddedness (see Whitcombe, 1972 and Stone, 1984).

The historical development of Indonesian (other than Balinese) water resources management has also been investigated in detail (Ravesteijn, 2002).

Assessing the situation as regards historical analysis I draw the conclusion that the incorporation of historical analysis of water related development processes into contemporary water resources management debates deserves substantial enhancement. The research on basin histories under the Challenge Programme Water & Food (<http://www.waterandfood.org/basins/yellow-river-basin.html>) is a move in this direction, as are the conferences of the IWHA (International Water History Association; www.iwha.net).

The third of Thomas' meanings of development, development as development intervention, has received the bulk of scholarly attention in the water resources management domain. This observation supports Thomas' assessment that this meaning risks to crowd out the other meanings. It is particularly under this rubric that a clear merger is found between water resources management studies and development studies.

The oldest thematic within 'development intervention and water resources management' focuses on economic embeddedness. It is part of the 1980s 'peasant' focus of development studies. It analyses issues of equity and social differentiation, resonating with debates on the impact of the green revolution, unequal development and poverty concerns. Equity and poverty issues have remained prominent themes in water resources studies till today, including a strong current on gender aspects of equity.

Institutional analysis aiming to capture social and cultural embeddedness also finds its origins in the 1980s. It started with exploring the theme of participation, particularly water user and community participation, expanding its scope following trends in development debates. A vast literature has been produced on this, which has followed, reflected and inspired all the trends in debates in this field (see for instance Hinchcliffe et al., 1999; Uphoff, 1991, 1992; Maloney and Raju, 1994; Brewer et al., 1999). An important theme that took off in the 1990s as part of the 'common property resources' focus is the detailed investigation of property rights in water resources management, and in relation to that, forms of collective action. Many strands exist in this literature, including a new institutional economics strand (Ostrom, 1990), a more sociological and legal pluralism strand (Bruns and Meinzen-Dick, 2000), and more 'instrumental' strands focussing on methodologies for achieving user participation and social learning in water resources management. 'Water as a human right' also has a substantial literature behind it. Recent debates have explored the issue of water governance (Conca, 2006; Mosse, 2003).

The preceding paragraphs are a very meagre overview of water resources development studies. Nevertheless, some of the main themes and approaches have been suggested (further, see section 3). In addition, and to conclude, it is worth noting that water resources studies have also made significant contributions to theory formation in development studies. Robert Chambers' work on participation was based on irrigation experiences to an important extent, and has had an impact far beyond the water resources domain. Robert Wade's work on corruption, analysing the system of political and administrative corruption in an irrigation bureaucracy in South India (Wade, 1982) is seminal work, again with an intellectual impact far beyond the water resources domain. Ostrom's work on 'governing the commons' is to an important extent based on the analysis of collective action in farmer managed irrigation systems (Ostrom, 1990). Again this is a grossly incomplete listing, with all three examples based on research in South Asia, but it does show that the relationship between water resources studies and development studies has been reciprocal.

2.4. H₂OP₅: WATER RESOURCES MANAGEMENT AS AN INHERENTLY POLITICAL PROCESS

My colleague and friend Ajaya Dixit once told me that when he had to explain the political dimensions of water management to engineering students, he used to ask them whether they knew the formula of water. To the expected answer 'H₂O' he responded that the correct formula is not H₂O but H₂OP₅, meaning the chemical substance H₂O plus people, pollution, participation, power, and politics. In this section I argue that water resources management is an inherently political process, and outline how power might be investigated in water resources management.

In a dictionary definition, politics is "the art and science of directing and administering states and other political units" (The New Collins Concise English Dictionary 1982: 877).²⁷ Based on understandings of politics of this kind, state governance, or more generally put, the politics of the public sphere, has been the main focus of political science disciplines. Political sociology is a well established discipline that studies political social action, that is, the dynamics of political relations, mostly at the macro level of regions or countries (see for instance Orum, 2001). A recent Indian political sociology textbook (Chakraborty, 2005) discusses topics like nationalism, the role of the bureaucracy, military and civil society in politics, electoral politics, the party system, political culture and socialisation, and the role of different social groups in 'public sphere' politics. From a sociological perspective, the prefix 'political' means that social relations and social action are studied from the perspective of social power.²⁸

'Politics' as a category is not reserved for state and public sphere level processes. In the same lemma in the New Collins dictionary quoted, politics is also defined as "the complex or aggregate of relationships of men [sic!] in society, especially those relationships involving authority or power", "any activity concerned with the acquisition of power" and "manoeuvres or factors leading up to or influencing (something)". Politics in this understanding is a dimension or quality of many forms of social action, that is, of all social processes in which interests of individuals or groups are mediated in one way or the other. Apart from 'formal, state' politics there is also 'everyday' politics. Benedict Kerkvliet defines 'everyday' politics (in the context of natural resources management) as

"the debates, conflicts, decisions, and cooperation among individuals, groups and organisations regarding the control, allocation, and use of resources and the values and ideas underlying these activities." (Kerkvliet 1990: 11)

The study of social processes from a political sociology perspective thus involves studying social (inter)action with a focus on the dimension of power and the forms of contestation associated with that. Contestation is meant as a generic category, referring to a range of interaction patterns in, in the case at hand, water resources management, including negotiation and struggle, and also less explicit and longer term forms of disputation and controversy.

The justification of a focus on contestation lies in the observation that societal issues around water management are proliferating, that these contestations provide important challenges for public policy, and that they provide important opportunities for advancing human development (for an Indian inventory of water resources contestations, see Joy et al., 2008). Further illustrations and references are given in section 3 when the different domains in which the politics of water plays out are mapped. What I do not intend to suggest is that water control can be reduced to its political nature, that is, that water control is only political or that its political aspect determines all other aspects. How and how strongly the mediation of actors' interests and the social relations of power shape the different properties and dimensions of water control processes is an empirical question.²⁹

²⁷ I choose to use a dictionary definition of politics to avoid association with a particular political science school of thought. A classical contribution to the study of politics is Lasswell (1936); Leftwich (1984) is a much referred source in the context of development studies.

²⁸ The Penguin Dictionary of Sociology (2006) describes the scope of political sociology as including the study of politics at four levels: 1) political conflicts and struggles between states, namely the sociology of international relations, 2) the nature and the role of the state within societies, 3) the nature and organisation of political movements and parties, 4) the participation of individuals in politics, as shown, for example, in voting behaviour. Nevertheless several subject specific political sociologies exist. One example is the political sociology of science (Frickel and Moore, 2005), and another the political sociology of education (Popkewitz, 1991). 'Political sociology of water resources management' is, to my knowledge, not an existing label of a research field, study programme, journal, or other academic pursuit. Also the broader term 'political sociology of natural resources management' seems to be a scarcely used term. An exception is West (1982).

²⁹ Arguably, when one considers social power to be an inherent quality of social relations and social interaction, as I will suggest below, contestation would also be inherent, as the exertion of power never goes totally unchallenged, even if the weapons are sometimes hidden forms of resistance (Scott, 1985), or when dominance/compliance work through Bourdieu's bodily embedded dispositions (Bourdieu, 1977). A debate on the exact meaning of the concepts united under 'contestation' (like resistance, struggle, negotiation, subversion, ridicule, (social) learning, (political) participation, compromise, competition, vandalism, isolation/disengagement, and many others) is far from irrelevant, but most appropriate in concrete settings. The understanding of power that is employed is the more

The theoretical challenge of a political sociology of water resources management lies in the understanding of power that it adopts. The analysis of power has made great strides in the past decades. This is visible in Steven Lukes' and Mark Haugaard's readers on power that present and discuss a diverse set of definitions of the concept of power of respectively thirteen and fifteen, partly but not fully the same, social scientists (Lukes, 1986; Haugaard, 2002). These collections very clearly bring home the point that there is no single concept of social power – available or possible. Referring to Wittgenstein, Haugaard observes that power is a concept of the 'family resemblance' type, which, indeed, logically leads to compilation of a collection of concepts rather than to an effort at synthesis.³⁰ Haugaard's observation that concepts of power are usually developed for specific purposes in specific contexts (and language games) seems to me to be a valid point. This does not absolve us from addressing difficult and fundamental theoretical questions associated with the concept of power, but it does suggest that it may practically be most useful to ask these questions in relation to concrete puzzles that research addresses, and treat the theoretical diversity in concepts of power as a resource to be tapped for such concrete analysis.

What seems to me to be a useful entry point for concrete research is to adopt the notion of 'technologies of power', which has been employed by Lansing in the study of Balinese water resources management (Lansing, 1991). When this is expanded beyond the direct Foucauldian reference that it has, to the critical realist morphogenetic perspective outlined above, it can provide a framework for mapping the different sources/locations, and types of social power.

'Technologies of power' is another 'family resemblance' concept. It can be used to refer to the wide array of means and devices by which power is exerted (or through which power relations are 'instantiated' in Giddens' terminology). The examples range from bodily force and other physical force, to legal procedures, to money, to discursive techniques, to lobbying, to modes of education and socialisation, to technologies as artefacts, to institutional arrangements, to spatial arrangements, and many more. Technologies of power are consciously and unconsciously used by actors in social interaction. In this interaction they bring to bear these technologies to solicit the working of certain mechanisms (or forces or causal powers) that derive from the features of the objects on which the technologies are brought to bear.

For example, money can be used as a technology of power through bribing. However, this only works with persons who are susceptible to bribing, either because of greed or poverty, or because they have been instructed by their superiors to collect bribes, or any other characteristic that makes a person to recognise and accept the offer. In societies where money is unknown an effort to bribe in this way would receive no response, and no power could be exerted through it. In other cases people may have moral objections and refuse to accept the offer of a bribe, or they may find it too risky. Again, no power would be exerted through the offering of money.

In this example 'people' are the object of which the features are relevant for technologies of power to have a bearing. Archer (1995) distinguishes three different types of such objects. The first is already mentioned, people, with their capacity of self-consciousness and self-monitoring. The second are systems

important conceptual issue as this importantly determines how the different species of the genus 'contestation' are understood (see below), or even whether it is as generic a term as suggested. My point at this stage is a much simpler one. There are situations of water use where water resources management is quite unproblematic and unimportant, and would not provide a very fruitful entry point for broader social analysis. I believe such situations are getting scarcer for the reasons indicated in this paper, but I do not want to reproduce the aspect of the 'normal professionalism' of water resources professionals and researchers, that is the assumption that the world revolves around water. Water revolves with the world.

³⁰ The Penguin Dictionary of Sociology (2006) summarises on power as follows. "[The different] attempts to define power serve to confirm the difficulty of reconciling agency and structure in sociology. There is little agreement over whether power has to be intentional or whether it is structural or both. Existing definitions also fail to deal systematically with contradictory views of power as repressive and coercive, while also productive and enabling. Power is a contested concept, the use of which inevitably raises critical issues of value and perspective." (p.306)

of ideas and meaning (culture). The third are those social systems in which material resources are implicated (Archer, 1995:175-184).³¹

This abstract formulation can be illustrated with the same example as used in section 2.2, the South Indian canal irrigation system from Mollinga (2003). I present examples of how for the three types of objects and different technologies of power can be brought to bear.

An example of a property of a canal irrigation system relevant for the exertion of social power is its capacity to cause queuing in water supply. This is the product of the material structure of the canal system, something that people (irrigators, managers and politicians in the case of this example) can deal with in different ways, but which exists independent of them (any other group of people would have to deal with the same systemic feature) and which they can only reconfigure over time. Technologies of power connected with this include the division and regulation structures in the canals that shape the exact nature of the water flows, water distribution rotation schedules that provide rules for sequencing of supply, inspection and measurement routines to monitor irrigator behaviour, discourses of equity or difference (as used by the members of parliament for instance) to normatively regulate the relationship between head-enders and tail-enders, and others.

An example of a property of a cultural system of ideas and meanings in this Indian case, is the hierarchy that is part of caste relations. Caste is something that people are born into, and that can only be changed over time.³² Caste hierarchies were a factor in local level water management in this irrigation system. Caste position predefined people's mode of engagement in water management, and agricultural production more generally. The 'force of caste hierarchy' was actively mobilised both by 'upper' castes to exert dominance, and by 'lower' castes to frame resistance, as well as by members of parliament seeking re-election. Technologies of power associated with caste were public discourses and imagery of caste, caste-based social networks and organisations, but also location of drinking water tapping points, seating arrangements for children in schools, and rules for access to temples and other public places.

An example of properties of self-consciousness and self-monitoring people relevant for power relations were the management styles of lower level irrigation managers, the 'street-level bureaucrats' (Lipsky, 1980) of the irrigation department. I identified four styles in responding to water distribution conflicts. The first style was making oneself untraceable in times of escalating water distribution conflicts (management by default or absence). The second style was management by bribe (an attempt to regulate irrigator behaviour through eliciting illegal payments for water). The third style was management by force (an attempt to regulate behaviour by maximum enforcement of formal rules, including legal action). The fourth and last style was management by strategic manoeuvre (regulating behaviour, of irrigators and members of parliament, by playing a political game of facilitating processes of negotiation). The adoption of a certain style seemed to depend primarily on the personality of the manager concerned, and only secondarily on factors like career phase and other socio-cultural attributes. Strategic manoeuvring was rare as it was personally very risky. The different technologies of power that each of these styles mobilised are implicit in the description of the style.

The framework I suggest here for the concrete analysis of power in water resources management is the following.

Identify the practices of contestation that are part of a water resources management situation;

Map the repertoire of technologies of power that are used/present in a given situation, by

³¹ Important for Archer's approach is that the three objects have ontological independence or relative autonomy, which relates to her critique of Giddens' 'central conflationism' discussed above. The issue needs not be pursued here as it does not affect the framework that I seek to develop. Archer's third object, social systems with material resources implicated, can be understood as the sociotechnical or socionatural systems of the social construction of science and technology school referred above.

³² For instance, the community of migrant farmers from a coastal area in South India that settled in the irrigation system from the 1960s, had a history of redefining of their caste identity since the second half of the 19th century, as part of the intensification of irrigated agriculture and economic expansion in their home area.

Detailed investigation of the social dynamics of those practices (actors that are active in it, resources they mobilise, strategies they have, responses that can be observed, discourses that are part of and/or reflect on the practice, et cetera), and thus

Identify and analyse the relevant properties of the systems and persons on which/who the technologies of power are brought to bear.

The fifth element of the analysis of power is assessment of the effects of power (Lukes, 2005). These were not highlighted in the case example. The general context of this case is the analysis of unequal water distribution and the resultant skewed distribution of livelihood opportunities. The primary driver of the research was an equity concern. This suggests that the incorporation of the effects of power into the analysis has two moments. The first is an analytical moment (who exerts power over whom, and what are the effects of that?). The second is a normative or political moment (judging these effects against certain concepts of justice and freedom for instance). As Lukes states, each view or concept of power "arises out of and operates within a particular moral and political perspective. Indeed, I maintain that power is one of those concepts which is ineradicably value-dependent." (Lukes, 2005:29-30)

2.5. SUMMARY

In the preceding four sections I have described the main features of the object of a political sociology of water resources management. These were the following.

A presentation of water resources management as a multidimensional phenomenon, a multidimensionality that can be captured by the boundary concept 'water control'.

A discussion of water control as morphogenetic practice, meaning an analysis of the interplay of structure and agency in water resources management as a cyclic process stretched over time and space.

A description of the embeddedness of water control practices in wider structures, which gives these practices their time and space specific characteristics, a justification of the focus on social and cultural embeddedness, and a classification of water resources management research on that embeddedness in terms of the different meanings of 'development' that these classes have reference to.

A discussion of the inherently political nature of water resources management, underpinning its contested nature, with a framework to analyse the working of social power in water control.

In the next section I proceed to map the field that the political sociology of water resources management seeks to cover.

3. MAPPING THE FIELD: A TOPOLOGY OF THE POLITICS OF WATER³³

In Mollinga and Bhat (2008 forthcoming) and Mollinga (2008) the politics of water as a field of research is mapped by discerning four domains³⁴ and their linkages as a fifth domain. The four domains are the everyday politics of water, the politics of water policy in the context of sovereign states, inter-state hydropolitics and the global politics of water. These domains can be distinguished because they have different space and time scales, are populated by different configurations of main actors, have different types of issues as their subject matter, involve different modes of contestation and take place within different sets of institutional arrangements. The linkages between domains refer to travelling of policy ideas and water contestations across domains.

3.1. THE EVERYDAY POLITICS OF WATER RESOURCES MANAGEMENT

Everyday politics is a phrase coined by Kerkvliet (1990) as already indicated and quoted above. The 'everyday politics' of water resources management in this mapping of the field refers to the contested nature of day-to-day use of water resources. In the domain of everyday water politics actual water use, control, and access is at stake. Many case studies from across the globe are focused upon this domain,

³³ I gratefully acknowledge Anjali Bhat's assistance in preparing the literature review that this section presents.

³⁴ The first formulation of these domains can be found in Mollinga (2001). The units identified can be named as (territorial/jurisdictional) levels, (action) arenas, semi-autonomous fields, domains of interaction etc. depending on one's purpose and focus of analysis. I settled for the general term 'domain of interaction' (cf. Long, 2001:57-60 for discussion of 'social fields', 'domains', and 'arenas').

interested in what inequity and poverty mean and how they occur, what can be done to change conditions, and who has a say in decision-making over water resources. In this literature, the focus upon power is located with operational level³⁵ actors so as to understand their interpretation of policy and rules, how rights are politically translated, how they conduct their day-to-day activities (and how this may vary from existing legal frameworks), the mechanisms by which they are influenced by other levels of governance in their 'everyday' undertakings, and contestations and negotiations existing between those who are marginalized and those with authority for garnering access to water resources within this domain. Normatively, localised and participatory intervention strategies tend to be promoted, and equitable, negotiated outcomes that take into account local knowledge and interests are a central concern. Highly situated, layered, and contextualized approaches to local level water governance, management and use activities are characteristic in this literature. The role of the government tends to be seen as primarily for the provision of resources, technical assistance, and enforcement authority for locally crafted agreements.

There are several strands of literature that fall within the category of 'everyday politics'. Much work has been done to illustrate the complexity and diversity of local water resources norms and customs in the face of neoliberal policy thrusts in hopes that these local systems can be spared and legitimated (Boelens and Zwarteveen, 2005; Perreault, 2005; Boelens, 2008). Within that literature, there is a focus upon local communities' water rights to multiple uses, and upon the plural legal systems within which they might negotiate to obtain fair and productive resolutions. Bruns and Meinzen-Dick's (2000) edited volume on water rights provides very illustrative examples of this strand's concern with local water rights as they are negotiated and carried out on the ground. Equitable and inclusive allocation of water hinges on explicit rights of the marginalized to water. Studies examining gendered water rights (Zwarteveen 1997; Van Koppen 2000), the rights and practices of peasant and indigenous communities (Boelens and Doornbos 2001; Flanagan and Laituri 2004; Boelens, 2008), and means of identifying, maintaining, and improving access among poor and less visible user groups (Vincent 1997; Meinzen-Dick and Bakker 2001) thus belong to this literature.

Another strand of this literature explores how socio-technical systems technologies for managing water inherently reflect the norms and values of those who have crafted them, which has implications for development objectives. In her study of micro-hydel technology in Nepal, Regmi (2004) challenges its assumed democratic, 'community-based' nature by detailing the authoritarian features embedded in and perpetuated through this system given era in which it was designed. Likewise, Mollinga's examination a large-scale canal irrigation system (2003) in India reveals that irrigation design processes have been unconnected from many stakeholders' interests, and that day-to-day water distribution practices reproduce the configurations of spatial and social differentiation. Struggles between farmers, Irrigation Department officials, and politicians, reflect these configurations, impacting prospects for effective reform. Oorthuizen's (2003) look at large-scale irrigation in the Philippines reveals the requisite social embeddedness of supposedly administrative irrigation fieldworkers and engineers in farmer water users' and local politicians' circles to effectively carry out policies of a weak central state. Dubash (2002) finds in his study of two Northern Indian villages that groundwater management strategies they have employed in reaction to larger political, economic, and physical exogenous shocks are inherently constituted in spatially and historically embedded social relations, which has implications that counter assumptions implicit within homogenous groundwater market reforms.

The capacity for communities of interest to collectively act to develop governance systems at the irrigation, watershed, or basin level is another subset of the 'everyday politics' literature. Studies in this area are interested in understanding different means by which cooperation has been effectively organized from the ground-up, in the absence of government intervention, countering Hardin's influential cautionary tale of inevitable resource depletion without centralized control. Ostrom's

³⁵ Ostrom's 'levels of analysis' differentiates operational, collective, and constitutional choice levels. Operational choice refers to the level at which processes that concern appropriation, provision, monitoring, and enforcement. Rules that outline decision-makers and decision-making to be made at the operational level are developed at the collective choice level through policy-making, management, and adjudication. Constitutional choice processes of formulation, governance, adjudication, and modification delineate the rules that in turn govern the collective action level's decisions and decision-making process (Ostrom, 1990).

important contribution to this debate, *Governing the Commons* (1990), describes cases of irrigator communities world-wide who have collectively organized themselves to effectively manage access to and use of shared water supplies for agriculture. Blomquist (1992) has documented the emergence and crafting of institutions among water users to carefully managing groundwater basins in southern California. Blomquist and Schlager (2005) describe the polycentric forms of decision-making in the Western United States that they have arisen due to the political issues inherent in organizing water use. Likewise, Wandschneider (1984) illustrates and evaluates the polycentric means by which basin water user groups have organized water allocation amongst themselves along the Snake River in Colorado. Wieriks (2004) discusses how the intractable problem of pollution control in the Rhine river, was iteratively addressed, starting with the initiative of the city of Rotterdam in the Netherlands – a lower riparian – and a watchdog NGO to measure and identify sources, and eventually ending with consolidated agreements among the riparian states.

In many cases everyday politics is thus a lower scale phenomenon. However, the management of a big reservoir distributing stored water to canals and areas hundreds of kilometres away from the dam is also local in the sense of being a concrete, situated water use and management practice, with an everyday politics associated with it. This may be, for instance, focused on the negotiation of gate settings and discharge monitoring, determining how much is released to whom at what time. Everyday processes at higher scale levels have been documented much less than village, community and small scale water resources management unit level. Usually higher scale level analysis focuses not on operational aspects, but on policy processes, the domain of water politics discussed in the next section.

3.2. THE POLITICS OF WATER POLICY IN THE CONTEXT OF SOVEREIGN STATES

Politics of policy is a phrase coined by Grindle (1977, and subsequent work). It refers to the contested nature of policy processes. In the water resources domain I use it to refer to policy processes at the level of sovereign states, or states within a federal setup. The concept is a critique of linear views of policy formulation and implementation (Hill, 1997), and aims to 'demythologise planned intervention' (Long and van der Ploeg, 1989). The idea is that water policies, like other policies, are negotiated and re-negotiated in all phases or stages and at all levels, and are often transformed on their way from formulation to implementation, if not made only in the implementation process (Rap, 2007). The political contestation of water policies takes place within state apparatuses, but also in the interaction of state institutions with the groups directly and indirectly affected by the policies, and in the context of development assistance strongly or weakly by international development agencies.

In this domain specific policies are at stake as means of achieving particular economic, political, or social outcomes. Within this domain, different sets of actors contest and interact within a policy process to influence policy emergence, institutionalization, and application. Contestation concerning policy content and policy benefits (and beneficiaries) is the primary focus of this domain. The influence of international actors, national level politics, and local dynamics in policy formulation and implementation are often taken into consideration. This domain's title does not necessarily suggest that the nation-state is the source of all policy, but that the sovereign domain of the nation-state is the structuring arena of interaction. Federal and smaller-scale jurisdictions can also have the authority to create policy and directly influence policy processes, and thus be at the centre of analysis. Likewise, a group of nation-states might relinquish some level of sovereignty to a regional regulatory entity, which would serve as the centre of analysis, as in the case of the European Union. Neither does analysis within this domain consider the nation-state to be a unitary actor, but rather as constituting competing interests which can be mapped out to gain insight into policy outcomes. Studies in this domain are focused upon processes within a sovereign jurisdiction, drawing insights regarding the conditions under which policy is developed and carried forward. The success or failure of a policy can be attributed to points in this process, so this level of understanding is important for policy reform. Policy analysis is characteristic of this domain's literature, with an interest to providing recommendations for future.

Consequently, clusters within this literature tend to centre upon state policies and affiliated processes. A number of scholars have taken this approach to analyzing irrigation policy reforms. Mollinga and Bolding's (2004) edited volume is a contribution to this approach, providing insights from global, national, and local arenas to understand the development of irrigation policy in a number of countries. Others who have analyzed irrigation reforms in this manner are Molle (2005) in the Mekong region, and

Mollinga et al. (2001) in China. Irrigation management transfer in Zimbabwe has been studied by Bolding and Manzungu (2004).

Identifying unintended consequences that impact the efficiency and equity of intersectoral water allocation issues is another strand of this literature. (Nunn and Ingram 1988; Molle and Berkoff 2006). Bauer (2004) and Mentor (2001) have looked at the politics of water pricing policy in Chile.

Barreira (2003) and Getches (2003) have examined the politics of the EU Water Framework Directive and its impact upon Spain, the development of water rights, and the development of participatory mechanisms in water resource management schemes. Molle (2004) has analyzed and evaluated formal water rights against flexible water allocation rules as two types of rights, concluding the latter to be more responsive to local needs. Benda-Beckman and Benda-Beckman (2001) also have looked the unexpected impact upon water rights of changes in state, customary, and religious laws. In looking at inter-basin water transfers in Tennessee, USA, Feldman (2001) has taken into consideration the evolution of law, the role of threats from within and outside of the state in the law's passage, and the process through which the policy was passed.

Those who have looked at river basin management in this manner include Sneddon in Thailand (2003), Bhat and Blomquist in Spain (2004), Lemos and de Oliveira (2004) in Brazil, Wester and Warner (2002) in Mexico, Miller and Hirsch (2003) in the Mekong basin.

Beyond the policy-specific clusters of analysis, there is a thematic cluster that examines participatory mechanisms as a national intervention, trying to understand how this has worked on the ground. Many of these are related to river basin management institutions (Heyd and Neef 2004; Sneddon et al., 2002). Schreiner et al. (2004) have evaluated the new water law in South Africa which has instated WUA and catchment management agencies. Welle (2001) evaluated two models of partnership, one belonging to the state promoting efficiency, the other an NGO promoting solidarity.

3.3. HYDROPOLITICS: INTER-STATE WATER DISPUTES

Hydropolitics is a phrase that has been coined in the literature on international water conflicts, notably those in the Middle East (cf. Waterbury 1979; Ohlsson 1995). Elhance (1999) defines hydropolitics as "the systematic study of conflict and cooperation between states over water resources that transcend international borders." It thus refers primarily to conflicts and negotiation processes between sovereign states on water allocation and distribution, particularly in relation to transboundary rivers or aquifers.³⁶ At stake within the domain are conflict and cooperation over water use, control, and access at the level of nation-states, federal-states, etc. The sovereign state, or a domain of decision-making that implies jurisdiction, is the centre of analysis in this domain. Mechanisms underlying conflict and cooperation between riparian territorial sovereignties differently positioned along a river basin are carefully examined within this domain, often using the theoretical construct of the regime. Hydropolitics is the part of water politics that has been well researched and documented, perhaps because it is a very public phenomenon, with sometimes high stakes and geopolitical relevance, and because it is an interesting case for international relations studies (Zeitoun and Warner, 2006). There are a number of helpful literature reviews prepared explaining the elements and dynamics of literature that falls within the 'hydropolitics' category, including Barrett (1994), Ohlsson (1999), and Elhance (1999).

A number of clusters of scholarly focus exist within the 'hydropolitics' domain. A rather significant cluster of the 'hydropolitics' literature centres around the debate over the imminence of 'water wars' – water as a fundamental source of conflict between states driven by their desire to access and control water resources along international basins in water scarce regions of the world that are already fraught with conflict, often pertaining to the Middle East (Starr, 1991; Bulloch and Darwish, 1993). Much research has indicated that cooperation between conflict ridden states located along transboundary basins is water rational and that conflict does not correlate with shared boundaries (Scheumann and Schiffler, 1998; Wolf, 1999; Alam, 2002). Another means by which the notion of 'water wars' has been debated is with the concept of virtual water, the quantity of water embedded in food or other products that require water for their production. Virtual water developed as an explanation for why conflicts over

³⁶ Turton and Henwood (2002) propose to broaden the term to encompass all water politics, but I prefer to use it in its original meaning, including inter-state water conflicts in federal political setups.

water are not as prevalent as would be expected in water-scarce regions, as well as a solution for potential conflicts in regions rendered vulnerable to water scarcity given environmental and demographic change. Allan (1999) suggests that the substitutability of water demand with virtual water and desalination technology makes water scarcity the least difficult political issue to resolve among others in the Middle East.³⁷

Further developing how cooperation between sovereign states is possible, another strand of the 'hydropolitics' domain is concerned with the regional cooperation that results from the sharing of basin resources. Bakker (1999) has examined this through focus upon discursive framing centred on the metaphor of the watershed. Hirsch (2006) has focused on negotiation at multiple scales, with the basin/catchment as the decision-making arena. Turton et al. (2006), however, suggests that in places like Southern Africa, where there are increasing numbers of inter-basin transfers crossing international borders, the notion of the river basin as a fundamental unit of management is challenged, and management of water in transboundary basins is beginning to impact political relations between states.

Researchers in international relations also have an interest in issues of regional cooperation between states. Jägerskog (2001), using the Jordan basin as a case, has looked at how interstate water cooperation is explained through regime theory. International regimes are cooperative arrangements between politically and economically interdependent states (Keohane and Nye, 1989). As Jägerskog suggests, hydrological interdependence may encourage the development of international regimes, though few of such regimes have practically emerged. Hydropolitics is concerned with the role that beliefs, political tensions, and the sanctioned discourse among state actors in how knowledge is incorporated in negotiation processes and outcomes. Domestic sanctioned discourse can explain under what conditions is foreign water policy is adopted domestically (Jägerskog, 2002) and can inform policy innovation and implementation strategies (Kunigk, 1998/99).

Another cluster within the domain of 'hydropolitics' pertains to the politics of scale. Tools from the field of geography are employed within this literature strand to characterize concern with notions of fit of actors' interests along spatial, temporal, jurisdictional, and other scales (Lebel et al. 2005). Power is part and parcel of how scales are constructed, how scale choices are made, and how control over water is represented and carried out within management institutions. That multiple actors in transboundary river basins construct multiple scales indicates the need to take into account multiple scales in analyzing water resource conflicts (Sneddon et al., 2002; Sneddon and Fox, 2006; Visser, 2004). Moss (2003) considers integrated river basin management to be a useful tool for EU water policy to overcome problems of spatial fit and interplay of existing institutions and practices for water and land use.

A final cluster of literature within the hydropolitics domain is interested in applying game theory to predict outcomes in inter-state relations with respect to shared water resources. Bennet et al. (1998) applies an interconnected game approach to understanding international agreements regarding river basin management. Frisvold and Caswell (2000) have similarly used game theory to glean lessons for institutions involved in US-Mexico water management to address environmental concerns over NAFTA (North American Free Trade Agreement).

3.4. THE GLOBAL POLITICS OF WATER

Rather than being a phrase coined for long-existing practices, the global politics of water refers to a relatively new phenomenon: the recently, in the 1990s, invigorated international level of water discourse, policy and tentative regulation. The global politics of water contains several processes. These include the institutions and organisations set up as a follow up of the 1992 Dublin and Rio international conferences on water, environment and development, notably the World Water Forums, the World Water Council (WWC) and the Global Water Partnership (GWP). The GWP has become the international social carrier of the IWRM (Integrated Water Resources Management) concept. The WWC has played an important role in the advocacy in recent years for more investment in water infrastructure. Another component of the global water politics is the World Commission on Dams' process, triggered by large political controversies around the effects of large dam building. A third component is the process related to the World Trade

³⁷ In a dialogue between Allan (2003) and Merrett (2003) in *Water International*, Merrett argues that the notion of virtual water is redundant with the existing concept of 'water requirements' for agricultural commodities, and should be abandoned in the interest of parsimony. The concept nonetheless continues to be used in policy circles.

Organisation negotiations regarding water, notably around the issue of the privatisation of water and water service provision. A fourth relates to global advocacy for access to water as a human right. Conca (2006) provides a comprehensive analysis of the (emergence of) the global politics of water

Global politics is the arena in which at stake is the distribution of governance forms and functions through predominating discourse and interests. Actors involved in this domain tend to be international non-governmental organizations, sovereign states, international financial institutions, and technical experts. At the global politics level, without a sovereign to enforce cooperation, careful examination of the relationships and norms among actors and the activities that constitute international water-policy making is needed.

Within the domain of 'global politics', one cluster of literature are policy reviews prepared to assess/evaluate international programs and policies. These provide a window into the process involved in policy formulation at the international level. For instance Moore and Sklar's (1998) report on water lending programs of the World Bank detail the process and outcome of developing water resources management policy. Likewise, Dubash et al.'s (2001) independent assessment of the World Commission on Dams was prepared as a scholarly contribution to understanding global public policy making.

International relations' regime theory can be useful for studying hydropolitics, but Conca (2006) suggests that there are limits to applying the regime approach to global environmental governance. Regime theory views local environmental problems as subjects of global governance, stressing transnational character of certain physical systems without concurrently accounting for transnational economic, social, and political institutions that impact the local level. He also argues that regimes, as the vehicles of the state, presume state authority and the legitimacy of state action, differentiating the role of non-state actors. Issues involving contestation with the state thus cannot be addressed with the regime approach. Lastly, officially sanctioned knowledge is often created and perpetuated by regime hardliners, as regimes tend not to form when there are longstanding struggles over knowledge. Conca (2006) describes international regimes as a particular institutional outcome of a normative struggle, whereby territorialism, statism, and functional rationalism has succeeded.

As such, Conca (2006) recommends alternative means of analyzing governance at the global level that fully takes into account the contested nature of water resources policy. Identifying and examining the activities and relationships of these non-state actors can provide important insight. 'Epistemic communities' can inform how technical experts encourage governments towards cooperation (Haas, 1990). 'Knowledge entrepreneurs' frame how international problems are understood (Litfin, 1995). 'Transnational advocacy networks' comprise value-driven activists bound by shared values, discursive frames, and information (Keck and Skink, 1998); Transitional environmental organizations globally disseminate ideas, values, and technical assistance (Wapner, 1995). Social movements and coalitions are also important actors in providing critical mass support to issues of policy interest.

3.5. LINKAGES

Some of the most interesting and important questions in water resources management involve the interlinkages between or across domains. The 'linkages' domain looks at how policy issues and water contestations travel across the different domains, to analyze under what circumstances these are generated, and how they are translated in the journey across the domains. Documenting the journeying of policy ideas through these domains can nicely illustrate the relationships between these levels and how it is that policy ideas are generated, transformed, and possibly re-generated throughout that journey in the face of economic, social, and political realities.

For instance, the support provided by multilateral development funding agencies for local restructuring of water and power sectors has had mixed outcomes. Global politics domain ideas like water privatization and water and energy sector restructuring through donor support, have been very differentially translated in the 'policy-making and implementation' domain of developing and transitional countries (Hall and Lobina, 2003; Hall et al., 2004; Hall et al., 2005). Such journeying can take place in a 'bottom-up' manner also, as is evidenced in the work of the World Commission on Dams reports – and is finally iterative and cyclic. High levels of contestation among water user communities at the everyday domain to state policies supporting dam construction led to the eventual development of a global process to question policy assumptions. The World Commission on Dams was an outcome of this

process, and the report it developed in response has sought out and iteratively aggregated the input of user communities for future policy development, which are now being used at different national and local levels.

The mapping of the five domains of water politics together constitutes a topology of contested water resources management. A diversity of literatures and approaches to describe the issues playing out in these domains has been referred. I now return to the specific perspective I seek to develop. In the next section I discuss approach and method of a political sociology of water resources management.

4. FRAMING THE FIELD: STANDPOINT AND METHOD OF A POLITICAL SOCIOLOGY OF WATER RESOURCES MANAGEMENT

After outlining the object and presenting a topology of the field, this section describes the main elements of the standpoint and method of the political sociology of water resources management. The description moves in three steps. In the first step, section 4.1, I use Michael Burawoy's work on (and advocacy for) 'public sociology' to discuss the type of sociology that is envisaged. Burawoy suggests that the basic question to ask in defining one's approach is 'for what and for whom' knowledge generation is undertaken. His description of the division of labour between different types of sociologies provides a useful grid for specifying where and how the political sociology of water resources management as presented here aims to contribute, that is, what its standpoint is. The second step, section 4.2, discusses the unit of investigation of contested water resources management – the basic conception of the nature and boundaries of situations of contestation. It is proposed that the notions of 'problemsheds' and 'issue networks' can do a better job in capturing the complexities and pluralities involved in water resources management than the notions of 'watershed' and 'basin', which are the more popular choices in water resources studies. The section also briefly discusses the relative merits of issue network and actor network as definitions of the unit of investigation. The third step, section 4.3, addresses the fragmented nature of water resources management studies – fragmented in the sense of being a patchwork of regional and sector-specific literatures. Taking its cue from comparative historical sociology, the section proposes that a comparative approach has to be at the heart of the methodological programme of a political sociology of water resources management. The section discusses some of the advantages of the comparative perspective, notably its critical moment of being able to bring to light the theoretical biases of regional and sector specific approaches, and the potential of knowledge accumulation while avoiding the positivist pitfall of generalisation. I conclude in section 4.4 with a brief look at some of the challenges in further developing the political sociology of water resources management framework.

4.1. THE DIVISION OF SOCIOLOGICAL LABOUR: STRENGTHENING CRITICAL AND PUBLIC SOCIOLOGIES

The diversity of approaches to water resources management analysis can be usefully mapped using Burawoy's general classification of the division of sociological labour (see table 2).

TABLE 2: THE DIVISION OF SOCIOLOGICAL LABOUR

	ACADEMIC AUDIENCE	EXTRA-ACADEMIC AUDIENCE
INSTRUMENTAL KNOWLEDGE	Professional Sociology	Policy Sociology
- Knowledge	Theoretical/empirical	Concrete
- Truth	Correspondence	Pragmatic
- Legitimacy	Scientific Norms	Effectiveness
- Accountability	Peers	Clients/Patrons
- Pathology	Self-Referentiality	Servility
- Politics	Professional Self-interest	Policy Intervention
REFLEXIVE KNOWLEDGE	Critical Sociology	Public Sociology
- Knowledge	Foundational	Communicative
- Truth	Normative	Consensus
- Legitimacy	Moral Vision	Relevance
- Accountability	Critical intellectuals	Designated Publics
- Pathology	Dogmatism	Faddishness
- Politics	Internal Debate	Public Dialogue

Source: Burawoy (2005a:16); also in Burawoy (2005b:4)

Burawoy sets up a classification of four approaches along two axes. The first axis is whether the approach aims at instrumental or reflexive knowledge, the second axis what its audience is: academic or extra-academic. This produces the matrix of table 2, the boxes of which he describes as follows.

“Policy knowledge is knowledge in the service of problems defined by clients. This is first and foremost an instrumental relation in which expertise is rendered in exchange for material or symbolic rewards. It depends upon pre-existing scientific knowledge. This professional knowledge involves the expansion of research programs that are based on certain assumptions, questions, methodologies and theories that advance through solving external anomalies or resolving internal contradictions. It is instrumental knowledge because puzzle-solving takes for granted the defining parameters of the research program. Critical knowledge is precisely the examination of the assumptions, often the value assumptions, of research programs, opening them up for discussion and debate within the community of scholars. This is reflexive knowledge in that it involves dialogue about the value relevance of the scientific projects we pursue. Finally, public knowledge is also reflexive – dialogue between the scientist or scholar and publics beyond the academy, dialogue around questions of societal goals but also, as a subsidiary moment, the means for achieving those goals.” (Burawoy, 2006:5)

The matrix can be usefully applied to the sociological study of water also. The production of instrumental knowledge has been predominant in the social study of water. The strong association of water resources management research with water policy formulation and implementation referred to in section 1.1, is the reason for the virtual absence of a focus on contestation processes in such analysis. This comes about through (i) a combination of a pragmatic, problem solving orientation of researchers and research funders, (ii) the scientific schools (paradigms) to which researchers belong, which may or may not incorporate ‘politics’ in their frameworks of analysis, and (iii) self-censorship by researchers and research organisations (following the need to maintain research access to countries; for brief reference to concrete experiences with this, see Mollinga and Bolding, 2004 and Wall and Mollinga, 2008)

The water studies driven by practical and policy concerns that support the ‘mainstream’ water resources management discourse, and intervention oriented, focusing on effectively resolving concrete practical problems, and is often commissioned/contracted research, or research funded by policy making and implementing organisations (like the European Commission for instance). The pathology of servility occurs when the research(ers) bend to the priorities and perspectives of its patrons, and when (self-)censorship goes beyond reasonable ethical principles related to the protection of sources and the modesty of a visiting researcher in a foreign land.

Framing a field called the 'political sociology of water resources management' is giving a name to the critical and public sociologies of water resources management. The reflexivity of the lower row of Burawoy's matrix refers to approaches that self-consciously investigate the (normative/value) standpoints from which water resources knowledge is produced – for whom and for what the research is done. Reflexivity problematises the politics of knowledge rather than adopting a simple neutrality or objectivity standpoint.³⁸ It would also self-consciously relate research to societal 'causes', associating with specific projects of social transformation. Its pathology is directly related to this. Such research can become ideological or sectarian, and revert to what has been called in a nice phrase 'strategic essentialism' (Baviskar, 2003).

Care is required, however, in associating different approaches to research with different views of and approaches to development and social transformation, and assume 'natural linkages' with particular political constituencies. The relationship between politics and method is more complex. Burawoy suggests a big divide between instrumental and reflexive knowledge, associating the first with the state and the private sector, and the latter with civil society.³⁹ Reflexivity is, of course, not foreign to professional and policy sociologies, and neither is instrumentalism alien to critical and public sociologies.

The discipline of development studies is a case in point. Though it emerged from a societal critique of underdevelopment in the 1960s (Corbridge, 2007), it has developed managerial as well as critical variants over time, covering the whole spectrum of the matrix. An attempt to map Alan Thomas' classification of the three meanings of 'development' in development studies discussed above onto Burawoy's matrix, can illustrate this diversity. The first of Thomas' meanings of development, as a vision, description or measure of the state of being of a desirable society, is relevant to all four of Burawoy's sociology boxes, the point being that which vision or set of desirables is implicitly or explicitly projected varies hugely, along the full political spectrum in each box. Thomas summarises his classification of development theories in a table that provides a clear illustration of the diversity of views of development, even within the 'end of history' situation with liberal capitalist democracy as the only available realistic societal model (see table 3).

The study of development as enduring societal transformation, Thomas' second meaning, is primarily of concern to those located in Burawoy's left column of professional and critical academic sociologists. Those in the right column are usually strongly forward looking, without a strong interest in historical trajectories. Development as intervention, Thomas' third meaning, is concentrated as a concern in Burawoy's right column, with the policy and public sociologists. The professional and critical academic sociologists are usually hesitant to engage in intervention processes. Many a professional academic sociologist would argue that it is important to maintain a separation between 'science' and 'politics' from a certain objectivity perspective. Many critical sociologists may be allergic to development intervention programmes and activities given their disciplining character, as is argued in post-development theories (see table 3).

³⁸ See Haraway's (1991) argument that to be able to approach objectivity one has to explicit about one's standpoint. Her perspective neither denies the possibility of biases in scientific theory, or the personal dimension of that, nor does it succumb to a singularly relativist or social constructivist position. It asks us to continue to investigate how knowledge is always 'situated knowledge'.

³⁹ Burawoy tends towards such simplifications for instance when he, somewhat contradicting the within-discipline diversity mapped by the table, states that "the social sciences should be distinguished by their configuration of value stances, or what we might call their standpoint. Economics takes as its standpoint the market and its expansion, political science takes as its standpoint the state and political order, while sociology takes the standpoint of civil society and the resilience of the social. Cultural anthropology and human geography are potential allies in the defense of civil society." (Burawoy, 2006: 7) Even when disciplines have their origins in certain social processes associated with certain social classes and/or interests and/or world views, all these disciplines harbour a diversity of approaches and standpoints. These have developed over time, though some currents may be dominant and others marginal. This is exactly what Burawoy argues further down in the same text, but 'strategic essentialism' apparently slipped into the quoted passage.

TABLE 3. SUMMARY OF THE MAIN VIEWS OF DEVELOPMENT

	Development of capitalism	Development alongside capitalism	Development against capitalism	Rejection of development
	Neo-liberalism	Interventionism 'Market efficiency' 'Governing the market'	Structuralism	'Post-development'
Vision: 'desirable 'developed state'	Liberal capitalism (modern industrial society and liberal democracy)	(plus achieving basic social/ environmental goals)	Modern industrial society (but not capitalist)	All people an groups realise their potential [development' is not desirable]
Theory of social change	Internal dynamic of capitalism	Need to remove 'barriers' to modernization	Struggle between classes (and other interests)	[not clear]
Role of 'development'	Immanent process within capitalism	To 'ameliorate the disordered faults of [capitalist] progress'	Comprehensive planning/ transformation of society	A 'hoax' which strengthened US hegemony
Agents of development	Individual entrepreneurs	Development agencies or 'trustees' of development (states, NGOs; Development organisations)	Collective action (generally through the state)	Development agencies

Source: Thomas, 2000:780

Nevertheless, the reflexive dimension has remained strong in both sociology and development studies.⁴⁰ At the very least Burawoy's matrix problematises the relationship between research, the development

⁴⁰ As the continuing investigation of the meaning of the concept of development in development studies illustrates, and similarly in sociology for instance the ongoing reflection on the meaning of concepts like 'society', 'nation

perspective advanced by that research, and the actors associated with it, or more generally, the relationship between knowledge and power. From such a perspective, strengthening the hand of critical and public sociologies of water resources management amounts to an effort to level the discursive playing field in which the future of water resources management is theoretically and ideologically negotiated.

An important aspect of the levelling of the discursive playing field is acknowledging and claiming/giving space for knowledge developed in other locales than the recognised institutes of science. The public sociologies developed outside the abodes of formal science usually emerge around water related conflicts and controversies. Some NGOs have well established research and publication programmes, like for instance CSE, the Centre for Science and Environment based in New Delhi, India. The controversies around large dams, and the anti-globalisation campaigns related to water have also produced large numbers of publications analysing the present state of water resources management (see for instance International Rivers Network 2006; Mishra 2002). Public sociologies of water exist in many more or less institutionalised and consolidated forms, at different scale levels. They can also take programmatic form. For instance Ajaya Dixit, Imtiaz Ahmed and Ashish Nandy in 1997 published *Water, Power, and People. A South Asian Manifesto on the Politics and Knowledge of Water*, which can be read as a political statement as well as a research programme.⁴¹

A general conclusion that has been drawn in debates on the notion of 'public sociology' is that the four sociologies exist in a state of 'antagonistic interdependence' (Burawoy et al., 2004). They need each other for the overall development of the discipline. They all have a distinct contribution to make and can act as checks on each other's pathologies.

4.2. FROM WATERSHED TO PROBLEMSHED: THE ANALYSIS OF ISSUE-NETWORKS

In mainstream water resources debates the 'basin' or 'watershed' has become the preferred and professed unit of investigation, management and intervention (Svendsen, 2005). This privileging of the basin as the, in the double sense, natural unit has been criticised as being a hydrological reduction, as having definitional complications as regards boundaries (particularly where aquifers and delta areas are involved), as well as supporting a project of centralisation of water resources governance and management (Wester, 2008). As Svendsen (2005:3) notes "[t]here is an unfortunate tendency in some quarters to equate basin management with a unitary basin management organization and to assume that in the absence of such an organization, effective integrated management is not possible. This is most certainly an incorrect assumption." The complications associated with the different and overlapping hydrological, technological, economic, administrative, political and other units in which water resources management issues play out has been discussed in the European context as the problem of 'scale, fit and interplay' (see Moss, 2006 on this question in Germany; also see Wester et al., 2003). Following such critiques of the basin-as-a-unit perspective, the notion of the polycentric governance of water resources has become a focus, particularly in the context of ecological resilience and adaptive management approaches (Lebel et al., 2006) and debates on water rights and collective action (McGinnis, 1999; Bruns and Meinzen-Dick, 2000).

The multidimensionality of water control and the different forms of embeddedness of water resources management a priori makes it unlikely that all relevant processes play out at a single, hydrologically determined, geographical scale or in a single unit. With 'contestation' being the focal point of the political sociology of water resources management, it is proposed that the appropriate unit of investigation is the 'problemshed' rather than the 'watershed', the 'issue network' rather than the 'basin'. In the problemshed perspective (Viessman, 1998: 5) the space, time and social boundaries of the arena of water resources management contestation are treated as an open, empirical question. Problemsheds can be usefully thought of as 'issue networks'. The term is taken from policy studies (see van Waarden, 1992;

state', 'culture', 'structure', 'agency' and 'power' – to name just a few. These concepts both carry different meanings at any point in time, and refer to 'moving targets', that is phenomena and objects that change. A similar observation can be made about environmental studies and gender studies, equally grown out of or on the wave of social movements (cf. Klein, 1996, who associates this kind of historical grounding in a 'social question' with a propensity to interdisciplinary approaches)

⁴¹ Together with two similar documents, the Manifesto is downloadable from <http://www.saciwaters.org/>.

Howlett and Ramesh, 1995; 1998), but is used here in the more generic sense of, as a first approximation, the configuration of different actors involved in a particular water resources contestation. It is a matter of empirical investigation what constitutes the 'issue', including the possibility, even likelihood, of the existence of different understandings of different actors of what the issue is.⁴² Required is a concrete mapping of which actors, processes and mechanisms are part of the contestation, rather than assuming beforehand that the structure of the action arena is given, for example by assuming that the river basin area and the actors directly involved in water use and management are the natural unit of investigation.

This perspective on the unit of investigation for contested water resources management is part of a broader argument emphasising the pluralities that are part of water resources management. These are the plurality of actors and organisations in governance and management (cf. polycentric governance as referred above), the plurality of institutions (as in legal pluralism for instance; Benda Beckmann and Benda-Beckmann, 2001), and the plurality of ecosystem function/services of the water resources system and the values attached to them. Political sociology of water resources management research would take the plurality of practices that constitute an issue network as the object of research, and analyse the morphogenetic structure-agency and power dynamics of this ensemble.

'Issue network' as a concept is not dissimilar to the notion of 'actor network' as developed in actor network theory (Latour, 2005). Like the actor network concept, issue network allows for heterogeneity in composition, relationships and dynamics of a network. For a transdisciplinary sociology (see section 4.4) it, importantly, allows the inclusion of material objects like landscape elements and technological artefacts as active components of the network. My own preference lies with 'issue network' rather than 'actor network' as a descriptor of the unit of investigation. It seems to me that actor network (theory) is predisposed against a balanced analysis of structure-agency dynamics, putting most weight on the actor part. Issue network as a category more easily allows emphasis on the structural dimensions of social change and the adoption of a stratified structure-mechanisms-events ontology and of different scale levels in social reality. The latter constitutes a critique of the 'seamless web' metaphor (Hughes, 1986) that actor network theory likes to employ for describing reality. In the critical realist ontology adopted earlier in this chapter, reality is far from seamless (cf. Sayer, 1984).

4.3. A COMPARATIVE SOCIOLOGY: AVOIDING BIAS AND ACCUMULATING KNOWLEDGE

The bulk of the research on actually existing water resources management investigates regionally and sector specific issues (see section 3), to a large extent based on the practical and policy priorities of regional and sector specific research agendas. To make synergetic use of the richness of these strongly regionalised water studies, strengthening comparative analysis of water resources management in industrialised, developing and transition countries is proposed as a central methodological strategy.

Adopting a comparative approach to research has at least two advantages. Regionalisation of scientific practice can mean that contextual biases in analytical frameworks go unacknowledged. For policy analysis frameworks this has been suggested by Grindle (1999). She argues that most policy analysis frameworks carry several biases by reflecting a 'society centred' policy process. As a result, they are not able to cope very well with 'state centred' policy processes, like exist, for instance, in authoritarian regimes. A bias in society centred frameworks is strong assumptions about societal groups actively contesting government policy and thus being involved in policy formulation. Grindle shows that developing countries may be characterised by state-centred policy processes, where such active public engagement is absent, or much less profiled. In developing and transitional countries policy may be generated primarily in elite (government) circles. Also the institutional setting of developing and transitional countries may be very unstable, and institutional and policy evolution a different process as a result. Another bias is the assumption in society-centred frameworks is the sovereignty of the voter in electoral processes, which does not apply in all situations. This means that frameworks of analysis need to be historically and geographically specific. Grindle ends with a call for more 'grounded' research on actual processes of institutional transformation while "seeking to stretch theoretical models" (1999:21;

⁴² This is a simple way of putting a complex issue, much debated in policy studies, that is the framing of policy problems and policy agendas. On this see for instance, among many others, Stone (2002) and Bacchi (1999). I thank Bettina Bock for the latter reference.

for additional points, see chapter 3). Following a critical realist ontology in which reality consists of the three levels of structures, mechanisms and events (Bhaskar 1989; Sayer 1984; Archer 1995), what is suggested is comparative analysis of specific structures and mechanisms (also called theoretical generalisation), through detailed analysis of the processes they help to generate, and avoid the positivist pitfall of generalisation at the level of events.⁴³

Secondly, comparative analysis is a route to steer between the extreme local/case specificity of ethnographic approaches and the universalism of positivism, and can help to address the question of knowledge accumulation in the social sciences (cf. Mahoney and Rueschemeyer, 2003; Mahoney, 2003). The central aspect of knowledge accumulation is advance in the insight into causal processes at work in the research object (Mahoney, 2003:134-135). Advancement of insight into causal processes makes it possible to make sense of ever accumulating descriptive findings. It is also the point of reflection for advances in methodology in a field of research, and of the meta-theories.⁴⁴ New methodologies advance fastest when they are used in substantive research, and substantive research provides the 'reality check' on meta-theoretical debate.⁴⁵ For Mahoney and Rueschemeyer (2003: 6) comparative historical research "is defined by a concern with causal analysis, an emphasis on processes of over time, and the use of systematic and contextualised comparison." Comparing their focus with other approaches they argue that

"[f]rom the perspective of the comparative historical tradition, the universalizing programs of the past and present – ranging from structural functionalism and systems theory in the 1960s and 1970s to certain strands of game theory in the 1980 and 1990s – have tended to generate ahistorical concepts and propositions that are often too general to be usefully applied in explanation. In viewing cases and processes at a less abstract level, by contrast, comparative historical analysts are frequently able to derive lessons from past experiences that speak to the concerns of the present. Even though their insights remain grounded in the histories examined and cannot be transposed literally to other contexts, comparative historical studies can yield more meaningful advice concerning contemporary choices and possibilities than studies that aim for universal truths but cannot grasp critical historical details." (Mahoney and Rueschemeyer (2003:9)

This perspective neatly fits the morphogenetic approach sketched above, which also puts a strong emphasis on studying processes over time, and shares the causal analysis focus. The added value of the comparative dimension, is that the systematic and contextualised comparison of (typically a small number of) cases allows for a very intensive dialogue between theory and evidence (Mahoney and Rueschemeyer (2003:13).

Lastly, a comparative approach can break down the analytical distinction of developed and developing countries, between North and South, reflecting a broader trend in development studies (Corbridge, 2007). The process of globalisation and changes in the geo-political world order make such distinctions much less analytically relevant than they perhaps once were.

4.4. SOME FUTURE CHALLENGES

To conclude the presentation of standpoint and method of a political sociology of water resources management, I briefly list some of the challenges for future development of the field, referring to

⁴³ In instrumental water resources studies the positivist pitfall of generalising at the level of events translates into a strong emphasis on the identification of 'best practices', 'lessons learnt, and 'models'. This is discussed and critiqued in a Molle (2008), and in Molle and Mollinga (2003). It seems to me that generalisation at the level of events (claiming empirical regularity) was also the main methodological problem with Wittfogel's hydraulic society/oriental despotism thesis. There are no doubt mechanisms linking large scale irrigation infrastructure, bureaucratic organisation, and centralisation of governance, but these take a diversity of empirical forms. Absence of regularity does not necessarily mean absence of causal linkage – a core insight of critical realism (Sayer, 1984).

⁴⁴ Meta theories are "the overarching assumptions and orientations that can be used to formulate empirical puzzles and testable hypotheses, and that help analysts frame more specific research questions" (Mahoney, 2003:136).

⁴⁵ At least in principle, over time, and with effort. Sometimes meta-theoretical constructs or paradigms are very resilient, even in the face of evident (to those adhering to other paradigms) falsification. Nevertheless, the history of science seems to suggest that such hurdles can and mostly are overcome, not 'simply' because of the availability of 'countervailing evidence' but in a much more complex process. The paradigmatic position in this statement is that of critical realism (which maintains the possibility of 'reality checks', while being aware of the epistemological complications attached) – a relativist position would be in strong disagreement with it.

sections 2 and 4. Two of these challenges have already been mentioned in the section on 'embeddedness' (section 2.3): to systematically address the economic embeddedness and the ecological embeddedness of contested water resources management, and incorporate this into the approach. It has been suggested that development sociology has a contribution to make. It requires an economics that incorporates a contestation perspective. Such type of analysis is found in development studies for instance in the analyses of interlocked markets, which has found some application in water resources studies (Prakash, 2006). However, much more needs to be done, for instance around the issue of water pricing (Molle and Berkoff, 2007). The ecological embeddedness perspective has been developed particularly in the context of the management of wetlands, but has found much less application in the context of irrigated agricultural water management, for instance. There is a large literature on the social dimensions of natural resources management that has to be more systematically incorporated into water resources management studies.

A challenge of a different type relates to the discussion in section 4.1 on public sociology. The perspective presented can be usefully conceived as an example of a transdisciplinary approach to research (Pohl and Hirsch Hadorn, 2007), as is being developed in 'sustainability science' for instance. The literature on 'sustainability science' has produced, among other things the insight that apart from being 'good science', that is credible knowledge, knowledge has to be regarded as salient and legitimate also to be put to work and have societal impact (Cash et al., 2003). The challenge of achieving a combination of credibility, salience and legitimacy of knowledge, is the central challenge of transdisciplinary research. Transdisciplinary research attempts to meet this challenge through a focus on engaging with real-life problems, by involving interest groups in all stages of the research, by acknowledging the existence and relevance of different knowledges, and by being explicit about the normative dimension of research (cf. Pohl and Hirsch Hadorn, 2007). These ideas developed in the context of research on sustainable natural resources management, come very close to a combination of the merits of Burawoy's four different sociologies. A transdisciplinary perspective therefore seems to me to be a necessary feature of a political sociology of water resources management that does not only want to produce credible, but also salient and legitimate knowledge.

To be credible, knowledge on the heterogeneous object of water resources management has to be interdisciplinary, looking at both material and social dimensions, as already suggested above. This requires (further) developing of boundary concepts like water control, ecosystem services, risk & vulnerability, efficiency, value & valuation, scarcity, and many others concepts that are able to capture complexity.

To be perceived as salient, a political sociology of water resources management not only has to engage with relevant real-life problems, but also has to produce knowledge and methods that are practically applicable for transforming the situation into a desired direction. Research would need to produce instruments and approaches that facilitate the bringing together and fruitful interaction for decision making and other action of diverse knowledges, interest groups and objectives. Of such 'boundary objects' (Star and Griesemer, 1989) three types are of particular importance in water resources management: different kinds of simulation and scenario building models, a variety of assessment frameworks, and process methodologies for participatory planning and decision making (Mollinga, 2008 forthcoming).

To gain legitimacy knowledge generation processes have to be organised in ways that establish constructive social and cultural relations both within the research team or research community, as well as with the groups and organisations not directly involved in the implementation of the research (the research policy and research-society interfaces). How these institutional and cultural 'boundary settings' are arranged (in terms of governance and communication structures, accountability mechanisms, incentive structures, monitoring and learning processes, public information/access to knowledge strategies, etc.) strongly shapes the legitimacy of the knowledge generated in research.

Water resources management studies have been, and will continue to be closely associated with water policy reform and development intervention as initiated and undertaken by a range of actors: multilateral and national development (funding) agencies, government agencies at different levels, NGOs, companies, religious and other social movements, and different kinds of community groups and organisations. Water resources management practices will equally continue to generate a large number

of conflicts and other contestations, with strong civil society involvement, leading to the emergence of different public sociologies of water resources management. Characteristic of the field will, thus, be strong research-practice interaction – by design and by default. Therefore, the three forms of 'boundary work' (Cash et al., 2003) just sketched are necessary components of a political sociology of water resources management. They need to be done as well as researched, and thus provide a major programmatic challenge in the development of transdisciplinary water resources studies.

This is admittedly a very 'quick and dirty' sketch of some of the challenges ahead. The objective is only to suggest some of the directions for future work and further profiling of the perspective that the political sociology of water resources management outlined in this paper seeks to advance.

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