THE POLITICAL ECOLOGY OF WATER UNCERTAINTY AND INEQUALITY: A SOCIOLOGICAL CONTRIBUTION

JOSÉ ESTEBAN CASTRO
Senior Lecturer in Sociology
School of Geography, Politics and Sociology
5th Floor Claremont Bridge Building
University of Newcastle

INTRODUCTION

The challenges posed by water management activities have become increasingly global in scope since the 1970s. This qualitative change is a reflection among other crucial issues of the worsening situation of the world's aquatic ecosystems and of the rising global awareness about the unsustainability characterizing the prevailing model of development. It is also a reflection of the conflicts arising from the protracted social inequalities affecting the access to water for essential human uses and from the inefficiency, ineffectiveness, and inefficacy affecting water management activities in many regions, not just in the poorer countries. In this regard, since the 1970s the international community has launched significant and far-reaching policy initiatives, which include tackling desertification, controlling water pollution, developing conflict prevention initiatives in the light of ongoing and potential water conflicts, monitoring and preventing water-related threats and hazards (ranging from the impact of floods and other disastrous climatic events to the persistence, revival and emergence of water-related diseases), to overcoming the deficiencies and inequalities in the allocation and distribution of water for essential human use in urban and rural areas affecting particularly less developed countries[1].

Unfortunately, despite the important efforts made in recent decades, there is a growing consensus that in many areas of activity the struggle for reducing ecological unsustainability and limiting the negative impact of water-related threats and hazards is being lost in many countries. As an example, let us consider the goal of guaranteeing universal access to essential water and sanitation services, which continues to be a main target of the international community. The goal of universalizing these services was restated in the late 1970s, when the aspiration to provide essential volumes of safe water to every human being on earth by 1990 was endorsed by the United Nations[2].

---

[1]See "Milestones 1972 - 2003: from Stockholm to Kyoto" at UNESCO's Water Portal (http://www.unesco.org/water/wwap/milestones/index.shtml). Among other landmark initiatives, the Conference on Water and the Environment held in Dublin in January 1992 as a preparation meeting for the 1992 UN Conference on Environment and Development (UNCED) (The Earth Summit), Rio de Janeiro, produced a set of Guiding Principles, the "Dublin Principles", and a 40-page Action Agenda which have provided guidelines for water resources development, management and conservation. The UNCED endorsed Agenda 21, which incorporated the Dublin Principles as part of its Chapter 18, "Protection of the Quality and Supply of Water Resources", and came to constitute the baseline for sustainable development, including water resources. On UNCED and Agenda 21, see the web resources at the United Nations Department of Economic and Social Affairs, Division for Sustainable Development (http://www.un.org/esa/sustdev/documents/agenda21/index.htm).

[2]The 1977 UN Water Conference in Mar del Plata, Argentina, which led to the International Drinking Water Supply and Sanitation Decade (1980-1990), declared that everyone has "the right to have access to drinking water in quantities and of a quality equal to their basic needs". The Decade was officially closed by the Global Consultation held in New Delhi in 1990, which produced the New Delhi Statement calling for "some [water] for all rather than more for some" (UN, 1980; 1990).

Unfortunately, and despite significant progress made in many areas, that goal was not achieved. As a matter of fact, current estimates show that at the beginning of the twentieth first century around 17 per cent of the world population still lacks access to safe water while around 40 per cent has no access to adequate sanitation[3]. Moreover, while the goals for 1990 had been to guarantee universal access to essential volumes of water, the current targets as expressed in the UN Millennium Development Goals (MDGs) adopted in 2000-2002 have been reduced to halving the proportion of the world population without access to these services by 2015 (UN, 2000, 2002). Although from a certain perspective the new goals may be more "realistic", in practice this means that the international community is prepared to accept that a large proportion of human beings will continue to suffer disease and death from preventable water-related infections perhaps for decades to come. Furthermore, a recent evaluation of the progress made in relation to the MDGs shows that even these limited objectives will not be achieved in many of the poorest countries (WHO, 2005: 27).

There is increasing recognition that, to a large extent, the main causes for this unacceptable state of affairs are neither technical nor "natural" but rather have, broadly speaking, a social and political nature. This has important implications for water-related academic and techno-scientific endeavours and highlights the crucial need for meaningful and effective interdisciplinarity in the fields of research and practice related to water management. In this regard, although a high degree of sophistication has been reached in the techno-scientific fields related to water, such as hydrology, engineering, or biotechnology applied to water management, we are still very far from plainly understanding the historical, socio-economic, cultural and political processes underpinning the "water crisis". On the one hand, these are long-term processes, which are often impervious to well-intentioned policy efforts directed at enhancing the sustainable management of water in specific areas of activity. On the other hand, and despite increasing global concerns about the trans-temporal transference of environmental risks such as the progressive depletion of water sources threatening large tracts of the planet, in practice water policies directed at tackling these threats have had a very limited impact so far while the rapid deterioration of aquatic ecosystems continues unabated (EUWATER, 2005). This gap between the techno-scientific and socio-political fields of knowledge, we claim, may contribute to explain why the enormous technological progress made in relation to water in recent decades has not been reflected in more sustainable, efficient, effective and efficacious practices of water management. In this connection, it is increasingly recognised that there is a need for establishing a balance between the technical, socio-economic, and political aspects of water management activities, which remain artificially split in practice, and also in much of the specialised literature. Correspondingly, the development of genuinely interdisciplinary approaches that may help in developing water management practices which are socially, politically, and environmentally sustainable, is one the most urgent challenges facing the international community. The aim of this chapter is to contribute in fostering a much needed debate on these issues.

[3]The estimated figures are that 1.1 billion people have no access to safe drinking water and 2.4 billion people lack basic sanitation services (EC, 2002a,b).

WATER UNCERTAINTY, CONFLICT, AND THE GOVERNANCE DEBATE

One particular area that requires urgent efforts towards inter-disciplinary coordination relates to the uncertainties and conflicts emerging around the management of water and water services. Linking water with uncertainty has become increasingly common. For instance, most examples given in current debates on risk and "manufactured uncertainty" are related to different sorts of environmental hazards among which water-related disasters and threats are paramount (e.g., Beck, 1992; 1995; McGranahan et. al., 2001). Perhaps, the most dramatic expression of this development are the political and ideological struggles that have taken place since the 1980s around the impact of the global warming associated with greenhouse gas emissions which has been blamed for a wide array of environmental threats ranging from the increasingly more frequent and destructive typhoons, floods, hurricanes and man-driven desertification processes to the re-emergence of old (once thought eradicated) and new water-related epidemic diseases, including malaria, dengue, and cholera[4].

International concern on these issues has led to a wide variety of efforts aimed at assessing the dimension and scale of these risks in the search for adequate approaches to limit their negative impacts (Kasperson et. al, 1995; 2001; UNEP-UNICEF-WHO, 2002; WHO, 2003a,b; WHO-Europe, 2003; UNESCO, 2003; UNICEF, 2005). One of the common threads across these diverse initiatives is the widespread recognition of the need for "sound" and "effective water governance" for achieving the objectives of the international community in relation to water and water-related services (ADB, 1995; EC, 2000, 2002b; GWP, 2003; Camdessus, 2003; UNDP, 2004). However, despite the apparent agreement on the crucial importance of "governance", as discussed later this debate is marred by conceptual ambiguity and by the very nature of the process of democratic governance. On the one hand, the concept of governance is subject to underlying confrontations between rival and often incompatible intellectual and political traditions to the point that there is no consensus about what governance means, although this is often blurred by the assertive use of the concept in mainstream public policy documents[5]. On the other hand, governance itself is a political process characterized by the democratic confrontation of rival political projects grounded on antagonistic, often irreconcilable, values and principles. We come back to this problem later on.

---

[4] We cannot address these political and ideological confrontations in this brief chapter, but let us illustrate the question by mentioning the fact that the very existence of a qualitative change in the process of global warming as well as its impacts are rejected by powerful scientific and political sectors. A notorious but by no means unique source of denial of the threats posed by global warming are the publications of the Cato Institute (http://www.cato.org), an influential US think tank. Their position regarding such international initiatives like the Kyoto treaty can be summarised in the words of one of their leading environmental scientists: "Let's save citizens' money. Let's allow them to invest in the future, take the risks, and reap the rewards. Better to do that than to tax them to solve a problem that is not all that imminent and will, in any case, resolve itself faster if we just get out of the way (Michaels, 1998). These words were written before Hurricane Katrina, but the line of analysis has not changed, as illustrated by a recent comment by another senior researcher at the Institute: "The Kyoto accord has nothing to do with Katrina: Kyoto would have a negligible impact on global temperatures even if the Europeans complied with it. Nor have hurricanes become stronger and more frequent in recent decades" (Bandow, 2005).

[5] In general, we often refer in this article to "mainstream" policy documents, authors, or institutions. This makes reference in particular to the prevailing public policies that have been the priority of the international financial institutions (e.g. World Bank), aid agencies (e.g. USAID), and OECD countries, including notoriously the policies of deregulation, liberalization, and privatization implemented worldwide since the 1980s. We are aware that there are different approaches within this overall policy trend, and that there is no monolithic position even inside the institutions that have been at the forefront of these policies. Nevertheless, the evidence shows that despite the complexity of current debates, the directionality of public-policy reform programmes continues to be structured around the same principles and the institutions are largely oblivious to criticism and the experience of failure.

In relation to the problem of risk, it can be argued that the ultimate water uncertainty concerns the availability of freshwater for essential human uses. In particular, water needed for agriculture, which currently accounts for about 70 per cent of the world's freshwater consumption (estimates indicate that in developing countries, and also in some developed countries, irrigation uses up to 85 per cent of freshwater abstracted), poses a crucial challenge (World Bank, 2004: 5, 14). For instance, while food experts argue that maintaining food security will demand an increase of 15 to 20 percent in water withdrawals until the year 2025 (UNESCO, 2003; FAO, 2003), environmentalists claim that to stop desertification and preserve already stressed aquatic ecosystems water abstractions should be significantly reduced[6]. It is difficult, with our current level of knowledge and technology, to foresee how we could possibly achieve food security and environmental sustainability simultaneously. In this regard, one of the initiatives being developed to tackle the challenge is the application of biotechnology to water management, which includes the transference of genetic traits to crops for increasing their tolerance to water stress and therefore fostering water security in agriculture (OECD-WPB, 1996, 1999; MSSRF, 1999; WCW, 1999). The latter is a daring attempt at using biotechnology as a tool for water demand management, and is being developed by multinational companies like Monsanto. As the "father of the Green Revolution" and Nobel Laureate Norman Borlaug put it,

> Scientists are gaining the ability to insert genes (into plants) that give biological defense against diseases and insects...and convey genetic traits that enable crops to better withstand drought conditions. With this powerful new genetic knowledge, scientists have the capability to pack large amounts of technology into a single seed (CBI, 2000).

Clearly, not everyone in the scientific community shares Borlaug's optimistic perspective and even leading pro-biotechnology researchers have warned that given the limited knowledge about the physiological, biochemical or genetic determinants of water stress tolerance in plants and micro-organisms more research is needed before this technology can be used to manipulate water stress resistance (WCW, 1999). These concerns have become widespread as a result of the scientific, political, economic and ethical discussions elicited by recent developments in the field of biotechnology —or genetic engineering as some critics prefer to call it. The debate has come to encompass not only the trans-temporal transference of risk associated with the new technology, but also other trans-dimensional consequences of current and prospective actions similar to those arising from the production of new techno-species through diverse combinations of organic and inorganic material ranging from transgenic animals to DNA-based computer systems (Martins, 1996; 1998; 1998a). An important consequence of this development for our debate concerns the question of social awareness and participation in relation to these processes, which is a central component of the process of democratic governance. How are the risks associated with these technologies communicated to the wider public? How does the public participate in the process? What are the mechanisms in place to protect the current and future generations from these risks? These problems are at the heart of the process of governance, although they may seem to be far removed from the daily experience of most people, particularly in developing countries, where more basic needs like securing access to a few litres of water per day constitute an already daunting task.

---

[6] Dramatic examples of this situation are the Dead Sea in the Middle East (Friends of the Earth, 2006), and the Aral Sea in Central Asia (Altyev, 2006), which are rapidly disappearing as a result of extensive irrigation and water-consuming industrial activities.

In this regard, and moving back to the most basic water needs of human beings, although total freshwater is certainly a crucial and legitimate consideration, a closer examination of the problem shows that availability as such is not (and may not be in the foreseeable future) the most important problem. The evidence suggests that, at least in terms of overall water volumes, there is enough freshwater for every human being[7]. Therefore, it can be argued that the real water uncertainty concerns our capacity to ensure universal access to safe water volumes for basic human needs. In this connection, there is increasing consensus that in most countries the failure to satisfy this basic requirement of life is mainly the result of a crisis in "water governance" (WWF, 2003). Unsurprisingly, this crisis of water governance is being increasingly expressed in the form of intra- and inter-national social and political conflicts around the control and allocation of water and essential water services.

WATER CONFLICTS

The prospect that social and political conflicts over the distribution and allocation of water will increasingly "become a key part of the 21st-century landscape"[8] is regularly restated by international leaders. For instance, in February 2006 the British government issued a dramatic warning about the increased likelihood of "wars over water" and announced that its military forces must be prepared to intervene in "humanitarian disaster relief, peacekeeping and warfare" related to dwindling natural resources, particularly water[9]. This is not entirely surprising given that over the last few decades international security experts have warned that water was becoming more important than oil as a potential source of conflicts around the world (Gleick, 1993, 2000). These authors point to the fact that global freshwater sources are unevenly and irregularly distributed, that some regions of the world are extremely water-short, and that water bodies are often shared by two or more countries. It is estimated that fewer than 10 countries control about 60 percent of the world's freshwater sources, while about 300 river and lake basins and a large number of groundwater aquifers are shared by two or more countries (Ohlsson, 1992; Samson and Charrier, 1997). Understandably, there is agrowing body of literature on "water conflicts", which emphasises the so-called non-military aspects of international security (e.g. elements which can become a target for military action), among which water and water systems rank very high. Likewise, other authors have explored the role of environmental change as a cause of acute conflict, and water issues are a central topic in this literature (Homer-Dixon, 1991).

---

[7] Of course, this situation varies across regions and countries, but we are considering here the minimum volumes of water needed to satisfy basic needs. For a detailed assessment of global water availability see: UNESCO (2003); UN-Habitat (2003); Gleick et. al. (2004). Also check for updated information at UNESCO's World Water Assessment Programme (www.unesco.org/water/wwap).

[8] Hans van Ginkel, UN Under-Secretary general, at the Stockholm Water Symposium, 13 August 2001 (Financial Times, 14 August 2001, p. 6.).

[9] "Armed forces are put on standby to tackle threat of wars over water", The Independent, London, 28 February 2006.

However, most of this scholarship has tended to focus on actual or potential international confrontations arising from the control and management of water, to the relative neglect of the crucially important intra-national dimension of water conflicts. In particular, governments increasingly face the threat of social and political conflicts arising from growing demands for adequate and regular amounts of safe water, which is an essential factor in ensuring the universal human right to "a standard of living adequate for […] health and well-being"[10]. These conflicts range from peaceful demands to the authorities, demonstration, mass parades, and other forms of civic protest including civil disobedience such as non payment of taxes or water bills, to more direct confrontations involving in the extreme the destruction of property (e.g. destruction of water infrastructure) and even the loss of human lives (normally the lives of the protesters). These forms of water conflict have become widespread in many countries, particularly in Latin America, but have also been recorded across the globe[11].

There is a growing body of literature dealing with these problems, including a number of studies focusing on "water security" that highlight the implications and contradictions inherent in how water management activities treat water either as a "natural resource", as a "commodity", or as an "entitlement" (Webb et. al., 1998). These authors are more concerned with the correlation between "poverty", "gender", and "ethnicity", among other factors, and how these social cleavages impinge on water insecurities affecting large sectors of the world's population. Thus, their work has somecommonalities with the "environmental entitlements approach", which draws on Amartya Sen's work on the links between poverty and famines (Sen, 1981; Mearns, 1995; Gasper, 1993; Gore, 1993).

An alternative framework for the study of water conflicts is provided by political ecology,[12] which is concerned with the study of "ecological distribution conflicts" (Guha and Martínez Alier, 1997: 31). Political ecological approaches have inspired an expanding body of water research (Swyngedouw et. al., 2002) on a number of problems ranging from the links between conflicts over the provision of urban water services and the process of global capital accumulation (Swyngedouw, 1999, 2004) to the multidimensional character of water struggles arising from neoliberal water reform policies (Laurie et. al., 2002; Laurie 2006). Within this broad framework, our own work has focused on the interrelations between intra-national water conflicts and the long-term development of citizenship (Castro, 2006), which focuses on the structural processes underpinning social and political water inequality. As mentioned above, although formally the ultimate water uncertainty is if there is enough freshwater in the world to satisfy the needs of every human being, in fact, the most crucial question concerns the fairness in the access and distribution of water. In relation to this, it is a well documented fact that water poverty and

[10] Article 25, Universal Declaration of Human Rights.

[11] Just to mention a few works that deal with the topic: Shiva (2002), Barlow and Clarke (2002), Bouguerra (2003).

[12] I use here a broad definition of "political ecology" but some of the authors considered may not see themselves as political ecologists.

inequality are not the result of "natural" water scarcity[13]. Borrowing Amartya Sen's conclusions about the analogous problem of famine, "scarcity is the characteristic of people not having enough […], it is not the characteristic of there not being enough. While the latter can be the cause of the former, it is one of many causes." (Sen, 1981,: 1) In Sen's perspective, the key for understanding why people starve does not reside in food availability per head given that famines can occur even without any decline in food output or availability per head (Sen, 1990: 37). Rather, he argues that independently of its particular causes (for example droughts, floods, general inflationary pressure, sharp recessionary loss of employment, and so on) a famine reflects widespread failure of entitlements on the part of substantial sections of the population, a situation that can also be the outcome of many different causes (*id*. p. 36.). In short, the main problem is not so much the availability of food, but rather the capacity that individuals and families have to establish command over it, a situation that he termed the "acquirement problem".

Sen's argument about the independence between food output per capita and starvation casts light on the analogous problem of widespread water-related diseases and death caused by the lack of access to essential volumes of safe water. Adequate volumes of water availability (or even water distribution) per head in a given country or region does not ensure that individuals and families have a fair and adequate access to water services. For instance, the average volume of water supplied daily in the Mexico City Metropolitan Area (MCMA) is around 300 litres per capita per day [pcpd], well above the internationally accepted minimum standard of 100 litres and certainly above the minimum daily requirements for human survival. However, while some areas of the city record levels of pcpd water consumption averaging over 1000 litres, millions of metropolitan dwellers located in the poorer neighbourhoods have access to an average of 5-10 litres pcpd during long periods, and the water available to them is often unsafe for personal consumption and much more expensive (Castro, 2006).

Despite the formal categorization of water as a public good that has oriented the provision of public water and sanitation services since the late nineteenth century in the Western world, in practice –and particularly for the large share of the poor in less developed countries– water has become one of the essential commodities that individuals and families need to secure for survival. Unfortunately, the formal recognition of the right to water does notensure access to this vital resource on a regular basis. Formal rights can be bestowed on people, for instance the right to shelter, to health care, or, to safe water services, but this does not guarantee that people will have a sustained provision of these goods and services. Protracted structural processes continue to be the main factor underpinning water poverty and inequality and the ensuing social and political confrontations that take the form of intra-national water struggles.

[13] The evidence shows that water stress and conflict often happen in a context of abundant water resources. For example, Guayaquil, the largest city in Ecuador, is crossed by the fresh waters of the river Guayas, but 35 per cent of the population has no access to safe water, and the city is subject to chronic water shortages. A protracted structure of social inequality, clientelist politics, and collusion between the authorities and private water entrepreneurs are among the main factors that explain the deficiencies of the city's water systems which underpin much social and political unrest. The description can be easily generalized to many cities in less developed countries (see, for instance, Swyngedouw, 1999, 2004; McGranahan et. al, 2001; UN-Habitat, 2003; Castro, 2006).

WATER CONFLICT AS AN OBJECT OF KNOWLEDGE

The production of relevant knowledge about water conflicts requires the interdisciplinary exploration of the interlinks between physical-natural and socio-political processes. Although the evidence shows that water conflicts are largely autonomous from physical-natural and technological conditions, it has been very difficult to achieve interdisciplinary explanations that bring out the interwoven character of the social and "natural" processes involved. In addition to the already mentioned slow progress in the production of knowledge about water in the social sciences, there is a high fragmentation of the existing knowledge along the lines of entrenched "epistemic cultures" that continue to develop largely unconnected from each other (Knorr Cetina, 1999). The study of water conflicts offers both an excellent example of this fragmentation and an opportunity to develop genuine interdisciplinary approaches to the problem.

In this connection, in our studies of water conflicts in Mexico during the 1980s and 1990s we explored how the main *epistemic subjects*[14] involved in water management activities understand and explain water conflicts (Castro, 1995; 2006). For the sake of the analysis we derived from the empirical research the existence of three epistemic subjects: *the water expert*, mainly water engineers and others directly involved in the techno-scientific aspects of water management, *the water functionary*, who are members of the bureaucratic and policy-institutional apparatuses in charge of water management activities, and the *critical social scientist*, referring broadly to the work of social scientists producing knowledge about water from a critical perspective such as contemporary political ecology[15]. The evidence suggests that when these different subjects address the question of "water conflicts" they do so from very distinctive and often unconnected perspectives. Each of these subjects is characterized by a particular approach, a distinctive rationality, and an epistemic structure that underpins their construction of very different observables[16] to identify and explain "water conflicts". Table 1 illustrates schematically the diverse paths of each epistemic subject in their understanding of "water conflicts".

---

[14] Epistemic subjects understood as holders and producers of distinctive bodies of knowledge in relation to "water" as an object of scientific enquiry, who may be embodied in institutions, in working teams as well as in individuals. We borrow the concept of epistemic subject from Jean Piaget (Piaget, 1971: 138-140).

[15] Here "critical" stands in opposition to "mainstream" or "conservative" (conservative of the status quo) social scientists. We come back to this later on in our brief discussion of the governance debate.

[16] The concept of 'observable' encapsulates an epistemological position: the object of knowledge is not given but it is rather the result of the action of knowing carried out by a particular subject. Both the action and its outcome, the observable, are determined by preexisting cognitive structures. See Piaget (1978), pp. 43-6; (1977), pp. 342-6.

Table 1 - Water conflicts and epistemic subjects

Epistemic subject	Rationality	Observables	
Water expert	Techno-scientific	Quantitative variables Physical-natural and technical conditions and drivers	
Water functionary	Policy-administrative	Bureaucratic norms Electoral and party-political considerations	"Water conflicts"
Critical social scientist	Socio-political	Power configurations Structural inequalities	

For instance, when the Mexican water experts elaborating the 1981 National Hydraulic Plan tried to predict "conflicts over water in the main Mexican cities" until the year 2000, they grounded their analysis on quantitative observables (SARH, 1981: 50). They were interested in the interactions between water availability, demand, supply, consumption, cost and population, urban and industrial growth over the next two decades. They tried to predict urban water conflicts from a techno-scientific perspective, whereby conflict was conceptualized as the result of the lack of expected correspondence between quantitative variables. In contrast, when the functionaries think about water conflicts they normally work with very different observables. They work within a rational framework marked by policy-bureaucratic and often (in Mexico at least) party-political interests (e.g. the impact of water conflicts on electoral prospects) and, therefore, their observables are for instance the recurrent events of urban social protest over the poor quality of the water services or the civil disobedience of water users who have decided not to pay their bills in protest for a recent hike in the tariff. A graphical example comes to my mind: in a conference about water problems in Mexico City in December 2003 the former Under-Secretary of Regulation at the Secretariat for Environment and Natural Resources (SEMARNAT) was interrupted at the start of his presentation by an urgent phone call: indigenous

peasants had just taken his office in protest against a water-transfer scheme that threatened to further disrupt water resources in their region[17]. As the example illustrates, the water functionary must deal with processes that fall outside the technical domain of the expert, such as "popular discontent", "the social and economic characteristics of the population" that create conditions for water troubles, or the inherent contradictions between "the economic, social, psychological and environmental values of water" (SARH, 1981: 14).

In turn, as already explained, the critical social scientist is concerned with the daunting task of making observable the intertwining between the social regularities and physical-natural processes that are at the heart of water conflicts. For instance, and remaining with the Mexican example, from the socio-political rationality of this subject one of the key areas of inquiry into the roots of water conflict are the socio-economic mechanisms that drive the process of inclusion/exclusion in relation to the access to safe and adequate water services. In the Mexico City Metropolitan Area two of the key mechanisms have been the status of land tenure and the technical-geographical feasibility for the provision of the services: to gain access to networked water services people must have a legal title to their land, to be "regularized", borrowing from the policy jargon. Regularization also refers to the technical feasibility of bringing the services to the neighbourhood[18]. On the basis of these requirements, the population is categorized into "regularized" and "non-regularized", although the actual outcomes of the inclusion/exclusion process are largely subject to the arbitrariness of the authorities and other power holders within the communities. In the last analysis, though, these socio-economic regularities and their legal-formal facade determine who is and who is not entitled to have formal access to the water services. Thus, a dense weave of social interactions, among which property relations are paramount, operates as the mechanism governing the inclusion or exclusion of individuals and families from accessing water services. However, this fundamental divide is clouded in the undifferentiated, abstract-universal jargon of the water authorities that address people as "water users", "service claimants", "customers", and so on, and if we remain within the framework of water experts and functionaries the social character of water management remains unobservable. More importantly, crucial factors underpinning the emergence of "water conflicts" are overlooked or at best reduced to physical-natural or technical determinations, and the inclusion of the social dimension in mainstream research and policy continues to be little more than whitewashing and lip servicing.

As stated before, there is increasing recognition that the "water crisis", of which intra-national water conflicts are just one expression, is mainly a crisis of water governance. Unfortunately, although the use of the concept of "governance" often assumes a shared understanding, in fact there exist underlying confrontations between rival theoretical bodies of knowledge and political and cultural traditions for which governance has entirely different meanings. Moreover, much of the mainstream debate on the topic has been aimed at depoliticising the processes under discussion and presenting them as mainly (or even merely) "technical" in nature, probably in the belief that depoliticising water management activities would provide opportunities for abating or at least controlling water conflicts. For instance, in specific reference to water management, governance has been defined as the "range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services" (GWP, 2003). This is a useful definition in practical terms,

---

[17] The author was present in that session but I prefer to keep the name of the functionary anonymous. It can be said that his reaction reflected the fact that such event was not entirely unexpected and was certainly not surprising: he smiled and went on with his talk. This is a common feature of Mexican water politics.

[18] It is estimated that about ten million people in the MCMA, especially in the State of Mexico, live in urban areas developed illegally. Most of these settlements are also located in land considered unsuitable for the provision of public services (Rowland *et. al.*, 1996: 191).

but the emphasis here is placed on the institutional arrangements characterizing water management activities, while the relationship between these arrangements and socio-political processes is lost. In this regard, we argue that although the value of overcoming conflict situations and creating an "enabling environment" for achieving the goals set by the international community should not be overlooked, this cannot be achieved by depoliticising the processes encapsulated in the concept of "governance". To this controversial subject we turn next.

THE GOVERNANCE DEBATE

The concept of governance was first developed in economic analysis for the study of corporations and later adopted in political science to address the emergence of new forms of government and regulation beyond traditional state hierarchies and market systems (Hirst, 1994; Held, 1995; Amin, 1997). In relation to environmental issues, a large literature has been developed reflecting the ongoing debate about the transformations undergone in the field of "natural resources management" since the 1980s. Perhaps, one of the key elements in this body of literature —largely inspired by the neoliberal perspective on state reform, although not reducible to the neoliberal framework— has been the acknowledgement of the multi-layered and multi-sector character of management regimes. According to these authors, "governance" systems are composed by the classic forms of vertical authority embodied in the state (principle of hierarchy) in different combinations with the characteristic management regimes of the private sector (driven by market competition) and "civil society" (the voluntary sector driven by reciprocity)[19]. Accordingly, the model of multi-scale governance would be characterised by a combination of hierarchical structures, participatory dynamics, associative action, and market mechanisms, and would be based mainly on a culture of dialogue, negotiation, active citizenship, subsidiarity, and institutional strengthening (EC, 2001).

In this regard, a crucial aspect of the governance debate is the relation between the "manufactured uncertainties" characterising what the German sociologist Ulrich Beck has termed the "risk society" (Beck, 1992; 1992b; 1998) and citizenship. Among other developments characterizing the risk society it is worth highlighting the progressive inflation of citizenship rights and duties, which now include "technological", "ecological", and "environmental" citizenship, just to mention the most relevant for this discussion (Frankenfeld, 1992; Steenbergen, 1994; Newby, 1996; Mehta, 1998). This debate has contributed to further specifying and expanding the traditional categories of citizenship (civil, political and social rights) as laid out by the British sociologist T. H. Marshall (Marshall, 1992). Nevertheless, there are important questions concerning governance and citizenship in the risk society which remain either obscure, unanswered or overlooked in the literature. For instance, who are (would be) the social and political subjects (the citizens) of the risk society? If risk is about awareness of ever more sophisticated and multifarious hazards and dangers, and if the subjects of the risk society are to be defined in terms of their risk consciousness, does not it mean that the risk society also entails more sophisticated and multifarious forms of production and reproduction of social inequality? How could a fair and universal access to participation in the vital information processes required to grasp a "safety" level of risk consciousness be ever reached in the present (and, presumably,

[19] UNDP (1997); Picciotto (1997) See also the concept of "interest governance" proposed by Streeck and Schmitter in relation to what these authors consider a fourth model of social order, the associative model, which would be at work alongside the traditional orders embodied in the state (hierarchy), the community (participatory dynamics) and the market (free competition) (Streeck and Schmitter, 1985).

future) context of increasing quantity and complexity of the information units? And, would not it also mean that, in the foreseeable scenarios, both the actual impact of hazards and dangers and the widening spectrum of possible choice trajectories will follow a (predictably) much skewed pattern of distribution, as already suggested by the actual impact of most large-scale disasters such as floods, droughts, and preventable water-related epidemics? In this regard, the new social divisions characterizing the risk society resemble what Manuel Castells has called the "network society", a new mode of development where "global networks of wealth and power connect nodal points and valued individuals throughout the planet, while disconnecting, and excluding, large segments of societies, regions, and even entire countries" (Castells, 1996: 24-25).

In this perspective, the contribution made by the mainstream governance approach to the analysis of intra-national conflicts —often the result of people's reactions against exclusion and social inequality— has been very modest. In particular, if one remains within the scope of this literature it is very difficult to deepen the analysis of conflicts beyond their techno-bureaucratic dimensions. Moreover, it can also be argued that the main contribution made by this literature has been the lending of a theoretical —perhaps even ideological— framework to the unprecedented expansion of market mechanisms to almost all spheres of human interaction, including environmental management, and water management in particular. Thus, despite the fact that the mainstream governance debate formally acknowledges the increasingly multi-scale and multi-polar character of management regimes, in the last analysis this approach has privileged market mechanisms and their agents, which have been allocated a leading role among the other components of the governance complex. To a large extent, it can be argued that the consensus emerging from this literature has contributed to legitimating the particular socio-economic and political processes that have fostered the pre-eminence of capitalist competition over the other governance realms such as the state or civil society, in the context of a technocratic model of development. Perhaps the best example of this process can be found in the consensus generated by this literature in favour of the privatisation (that is, the sanction of private property rights) and commodification of nature as key instruments for controlling risks such as the depletion of natural resources (water, forests, air, fisheries, etc.). In the particular case of water services, since the 1990s the policies of liberalization, de- and re-regulation and privatisation of water utilities have exacerbated existing intra-national conflicts or even generated new ones around the globe (Castro and Laurie, 2004). In Latin America, Africa, and Asia, for instance, open opposition to these policies has been widespread and has become one of the symbols of what some authors have termed "counter-hegemonic globalization" (Sousa Santos, 2005).

Figure 1 - Protests against water services privatization at the 2003 World Water Forum in Porto Alegre

The mainstream understanding of governance ignores the basic fact that governance is a political process predicated on the ongoing confrontation between rival political projects. Governance results from the interaction between the key power holders, the state, large businesses, political parties, civil and other organizations representing sectoral interests (e.g. workers' unions, religious organizations, peasant movements, etc.), international agencies (e.g. international financial institutions and other agents of the process of "global governance"), and other relevant actors. Although the process of governance has been often presented in the literature as a balanced partnership between equals, in fact there are fundamental asymmetries of power and knowledge between the actors which determine the characteristics and direction of the overall process. Moreover, the large majorities outside the formal process of governance can also exercise a powerful influence, as illustrated precisely in relation to intra-national water conflicts. Such policies as the commodification of essential water and sanitation services are often implemented with almost complete disregard for the opinions, values, and preferences of the population, in the understanding that people must accept the decisions already taken by national and international technocrats. However, this prevailing approach to water policy completely neglects the basic fact that the underlying social processes involve the development of substantive citizenship and democracy, and the struggle for meaningful social participation and control over decision-making processes. In the case of water, this involves for instance social and political confrontations around how water and essential water services are to be governed, by whom, and for whom. These problems are at the heart of the process of counter-hegemonic, truly democratic, water governance, and they underpin to a large extent the worldwide mushrooming of intra-national water conflicts.

CONCLUSION

Our conclusion draws on the perspective of the third epistemic subject, the critical social scientist, which stems from a long-standing tradition in the social sciences concerned with developing the appropriate cognitive structures for making observable such structural regularities as cyclical social conflicts —whether in relation to water or not. However, the task of elaborating adequate explanations of the causes and consequences of water uncertainty and inequality requires the development of further inter-disciplinary coordination between the intellectual domains of, for instance, water engineers, hydrologists, and social scientists, which to date has been a slow and relatively fruitless endeavour. The existing gap between the intellectual domains developed by techno-scientists and critical social scientists concerned with social inequality and struggle remains a major obstacle to achieve this goal. The persistence of this obstacle continues to hamper our full understanding of "water conflicts'', and consequently diminishes the chances we may have to avoid their negative consequences, which almost systematically affect the most vulnerable sectors of the population.

In this connection, there is a need for adopting a critical perspective of the undifferentiated character assigned in the official jargon of the water authorities to the population as claimants, users or consumers, which neglects the existence of fundamental social divisions underpinning water insecurity and inequality. Thus, a truly inter-disciplinary approach to the problem must strive to make observable those processes that create and reproduce the structural socio-economic inequalities that continue to preclude a large sector of the world's population from accessing essential basic services, and subject the most vulnerable to disproportionately unequal negative impacts of water related threats and hazards. This kind of approach requires addressing "water conflicts" as an object of knowledge on its own right, which constitutes a crucial step towards transforming the unacceptable reigning conditions. Our work seeks to make a contribution towards this daunting venture by fostering higher levels of coordination between the different cognitive structures and epistemic cultures involved in the production of knowledge about water.

ACRONYMS

ADB	Asian Development Bank
CBI	Council for Biotech Information
DNA	Deoxyribonucleic acid
EC	European Commission
EUWATER	European Network for a New Water Culture
FAO	Food and Agriculture Organization
GWP	Global Water Partnership
MCMA	Mexico City Metropolitan Area
MDGs	Millennium Development Goals
MSSRF	M.S. Swaminathan Research Foundation
OECD-WPB	Organization for Economic Co-operation and Development – Working Party on Biotechnology
SARH	Secretariat of Agriculture and Hydraulic Resources (Mexico)
SEMARNAT	Secretariat of Environment and Natural Resources (Mexico)
UNCED	United Nations Conference on Environment and Development (The Earth Summit 1992)
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WCW	World Commission on Water for the 21st Century
WHO	World Health Organization
WWF	World Water Forum

REFERENCES

Amin, A. (1997), Beyond Market and Hierarchy: Interactive Governance and Social Complexity, Cheltenham: Elgar.

Altyev, T. (2006), "Address of the Chairman of the Executive Committee of the International Fund on the Aral Sea (http://enrin.grida.no/aral/aralsea/english/obr/obr.htm) (accessed May 2006).

Asian Development Bank (ADB) (1995), "Governance: sound development management", Manila: ADB.

Bandow, D. (2005), "Federal failure in New Orleans", Cato Institute (8 September 2005) (http://www.cato.org/pub_display.php?pub_id=4638).

Barlow, M., and T. Clarke (2002), Blue Gold: The Fight to Stop the Corporate Theft of the World's Water, New York: New Press.

Beck, U. (1992), Risk Society, London: Sage.

Beck, U. (1992b), "From industrial society to risk society", in Theory, Culture and Society, vol. 9, #1, pp. 97-123.

Beck, U. (1995), Ecological Enlightenment, Atlantic Highlands, N. J.: Humanities Press.

Beck, U. (1998), "Politics of risk society", in J. Franklin (ed.) The Politics of Risk Society, Cambridge and Oxford: Polity Press, pp. 9-22.

Bouguerra, M. L. (2003), Les Batailles de l'Eau. Pour un Bien Commun de l'Humanité, Paris : Les Editions de l'Atelier.

Camdessus, M. (Chair) (2003), Financing Water for All. Report of the World Panel on Financing Water Infrastructure, World Water Council, Global Water Partnership, (http://www.worldwatercouncil.org/download/CamdessusReport.pdf).

Castells, M. (1996), The Rise of the Network Society. The Information Age: Economy, Society and Culture, vol. I, Cambridge and Oxford: Blackwell.

Castro, J. E. (2006), Water, Power, and Citizenship. Social Struggles in the Basin of Mexico, Houndmills, Basingstoke and New York: Palgrave-Macmillan.

Castro, J. E. (1995), "Decentralization and modernization in Mexico: the case of water management", Natural Resources Journal, , Vol. 35(3), pp.: 461-487.

Castro, J. E. and N. Laurie (2004), "Cross-comparative report on the Socio-political and Cultural Dimension", PRINWASS Research Project, European Commission, Fifth Framework Programme, INCO-DEV, Contract PL ICA4-2001-10041 (http://users.ox.ac.uk/~prinwass/).

Council for Biotech Information (CBI) (2000), "Biotechnology Can Help Protect The Environment", Reference No.: 3229, 24 April 2000, Council For Biotech Information http://www.biotechknowledge.com/showlib.php3?uid=3229&country=us.

European Commission (2000), "The European Community's Development Policy. Communication from the Commission to the Council and the European Parliament", (http://europa.eu.int/eur-lex/en/com/cnc/2000/com2000_0212en01.pdf).

European Commission (2001), "Achieving sustainable and innovative policies through participatory governance in a multi-level context", Progress Report, Framework V – Programme Project, Brussels: European Commission.

European Commission (2002a), EU Water Initiative: Water for Life. Health, Livelihoods, Economic Development, Peace, and Security, Brussels (http://europa.eu.int/comm/research/water-initiative/index_en.html).

European Commission (2002b) Water Management in Developing Countries: Policy and Priorities for EU Development Cooperation. Communication from the Commission to the Council and the European Parliament, (http://europa.eu.int/eur-lex/en/com/cnc/2002/com2002_0132en01.pdf).

European Network for a New Water Culture (EUWATER) (2005), European Declaration for a New Water Culture, Saragossa: New Water Culture Foundation: EUWATER (http://www.unizar.es/fnca/euwater).

Food and Agriculture Organization (FAO) (2003), Review of World Water Resources by Country (Aquastat), Rome: FAO (http://www.fao.org/waicent/faoinfo/agricult/agl/aglw/aquastat/main/index.stm).

Frankenfeld, Ph. (1992), Technological Citizenship: a Normative Framework for Risk Studies, in Science, Technology and Human Values, Vol. 17, pp. 459-484.

Friends of the Earth (2006), Projects – the Dead Sea (http://www.foeme.org/projects.php?ind=21) (accessed May 2006).

Gasper, D. (1993), "Entitlements analysis: relating concepts and contexts," in Development and Change, Vol. 24: pp. 679-718.

Gleick, P. H., N. L. Cain, D. Haasz, Ch. Henges-Jeck, C. M. Hunt, M. Kiparsky, M. Moench, M. Palaniappan, V. Srinivasan, and G. H. Wolff (2004), World's Water 2004-2005. The Biennial Report on Freshwater Resources, Washington DC: Island Press.

Gleick, P. H. (2000), "Water conflict chronology", Oakland: Pacific Institute for Studies in Development, Environment and Security.

Gleick, P. H. (1993), "Water and conflict: fresh water resources and international security", International Security, Vol. 18, #1, pp. 79-112.

Global Water Partnership (2003), "Effective Water Governance. Learning from the Dialogues", (http://www.gwpforum.org/gwp/library/Effective%20Water%20Governance.pdf), GWP.

Gore, C. (1993), "Entitlement relations and 'unruly' social practices: a comment on the work of Amartya Sen," in Journal of Development Studies, Vol. 29 #3, pp. 429-460.

Guha, R. and J Martínez Alier (1997), Varieties of Environmentalism. Essays North and South, London: Earthscan.

Held, D. (1995), Democracy and the Global Order: from the Modern State to Cosmopolitan Governance, Cambridge: Polity Press.

Hirst, P. (1994), Associative Democracy: New Forms of Economic and Social Governance, Cambridge: Polity Press.

Homer-Dixon, Th. F. (1991), "On the threshold: environmental changes as causes of acute conflict", in International Security, vol. 16, #2, pp. 76-116.

Kasperson, J. X., and R. E. Kasperson (eds.) (2001), Global Environmental Risk, Tokyo, New York and Paris: United Nations University Press & Earthscan.

Kasperson, J. X., R. E. Kasperson, and B. L. Turner II (eds.) (1995), Regions at Risk. Comparison of Threatened Environments, Tokyo, New York, Paris: United Nations University Press.

Knorr Cetina, K. (1999), Epistemic Cultures. How the Sciences Make Knowledge, Cambridge, Mass., and London: Harvard University Press.

Laurie, N., Radcliffe, S. and R. Andolina, R. (2002), "The new excluded 'indigenous'?: The implications of multi-ethnic policies for water reform in Bolivia", in R. Seider (ed.), Multiculturalsim in Latin America. Indigenous Rights, Diversity and Democracy, Houndmills, Basingstoke and New York: Palgrave-Macmillan, pp. 252-276.

Laurie, N. (ed.) (2006), Special Issue on "'Pro-poor' water: past present and future scenarios", in Geoforum, (in press).

Marshall, T.H. [1950] (1992), "Citizenship and social class", in T.H. Marshall and T. Bottomore, Citizenship and Social Class, London and Concord, Mass.: Pluto Perspectives, pp. 3-51.

Martins, H. (1996), Hegel, Texas e Outros Ensaios de Teoria Social, Lisbon: Século XXI.

Martins, H. (1998), "Technology, modernity, politics", in J. Good and I. Velody, The Politics of Postmodernity, Cambridge: Cambridge University Press, pp. 150-181.

Martins, H. (1998a), "Risco, incerteza e escatologia —reflexões sobre o *experimentum mundi* tecnológico em curso", in Episteme, vol. 1, #1, pp. 99-121.

McGranahan, G., P. Jacobi, J. Songsore, Ch. Surjadi, and M. Kjellén (2001), The Citizens at Risk. From Urban Sanitation to Sustainable Cities, London: Earthscan.

Mearns, R. (1995), "Environmental entitlements: towards empowerment for sustainable development," in N. Singh, and V. Titi (eds.), Empowerment: Towards Sustainable Development, London: Zed Books.

Mehta, M. (1998), "Risk and decision making: a theoretical approach to public participation in techno-scientific conflict situations", in Technology and Society, Vol. 20, #1, pp. 87-98.

Michaels, P. J. (1998), "The consequences of Kyoto", in Policy Analysis, No. 307, Cato Institute (http://www.cato.org/pub_display.php?pub_id=1167&full=1).

M.S. Swaminathan Research Foundation (MSSRF) (1999), "Biotechnology and water security", Chennai, Madras, India, http://www.mssrf.org.sg/d99-biotech-water.html.

Newby, H. (1996), "Citizenship in a green world: global commons and human stewardship", in M. Bulmer and A. Rees (eds.), Citizenship Today. The Contemporary relevance of T. H. Marshall, London: UCL Press, pp. 209-221.

Organization for Economic Co-operation and Development (OECD) – Working Party on Biotechnology (WPB) (1999), Health Policy Brief. Molecular Technologies for Safe Drinking Water, http://www.eawag.ch/publications_e/proceedings/oecd/Proceedings.html, Paris: OECD.

Organization for Economic Co-operation and Development (OECD) – Working Party on Biotechnology (WPB) (1996), Biotechnology for Water Use and Conservation. The Mexico '96 Workshop, Paris: OECD.

Ohlsson, L. (ed.) (1992), Regional Case Studies of Water Conflicts, Göteborg: Peace and Development Research Institute (PADRIGU), University of Göteborg.

Piaget, J. (1978), The Development of Thought. Equilibration of Cognitive Structures, Oxford: Basil Blackwell.

Piaget, J. (1977), The Grasp of Conciousness, London: Routledge and Kegan Paul.

Piaget, J. (1971), Structuralism, London: Routledge and Kegan Paul.

Picciotto, R. (1997), "Putting institutional economics to work: from participation to governance" in Ch. K. Clague (ed.), Institutions and Economic Development: Growth and Governance in Less-developed and Post-socialist Countries, Baltimore and London: John Hopkins University Press, pp. 343-67.

Rowland, A. and P. Gordon (1996), "Mexico City: no longer a leviathan?," in A. Gilbert (ed.) The Mega-City in Latin America, Tokyo and New York: United Nations University Press, pp. 173-202.

Samson, P., and B. Charrier (1997), "International freshwater conflict. Issues and prevention strategies", Geneva: Green Cross International.

Secretaría de Agricultura y Recursos Hidráulicos (SARH), Comisión del Plan Nacional Hidráulico (1981), Plan Nacional Hidráulico, Mexico City: SARH.

Sen, A. (1990), "Food, economics, and entitlements," in J. Drèze and A. Sen (eds.), The Political Economy of Hunger, Oxford: Clarendon Press, pp. 34-52.

Sen, A. (1981), Poverty and Famines. An Essay on Entitlement and Deprivation, Oxford: Clarendon Press.

Shiva, V. (2002), Water Wars. Privatization, Pollution, and Profit, Cambridge MA: South End Press.

Sousa Santos, B de, and C. A. Rodríguez-Garavito (2005), "Beyond neoliberal governance: The World Social Forum as subaltern cosmopolitan politics and legality", in B. de Sousa Santos and C. A. Rodríguez-Garavito (eds.), Law and Counter-Hegemonic Globalization: Toward a Subaltern Cosmopolitan Legality (http://www.ces.fe.uc.pt/bss/documentos/chapter2.pdf).

Steenbergen, B. (1994), "Towards a global ecological citizen", in B. Van Steenbergen (ed.), The Condition of Citizenship, London: Sage, pp. 141-152.

Streeck, W. and Ph. Schmitter (1985), Private Interest Government, London: Sage.

Swyngedouw, E. A. (2004), Social Power and the Urbanization of Water: Flows of Power, Oxford: Oxford University Press.

Swyngedouw, E. A. (1999) Flows of Power: Nature, Society and the City, Oxford: Oxford University Press.

Swyngedouw, E. A., Maria Kaïka, and J. E. Castro (2002), "Urban water: a political-ecology perspective", in Built Environment, Vol. 28, #2, pp. 124-137.

United Nations (UN) (2002), "Key Commitments, Targets and Timetables from the Johannesburg Plan of Implementation", World Summit on Sustainable Development, Johannesburg (http://www.johannesburgsummit.org/html/documents/summit_docs/2009_keyoutcomes_commitments.doc).

United Nations (UN) (2000), Millennium Declaration, New York: UN (http://www.un.org/millennium/summit.htm).

United Nations (UN) (1990), "The New Delhi Statement: 'Some for all rather that more for some'", Global Consultation on Safe Water and Sanitation for the 1990s, New Delhi, (10-14 September 1990): UNDP and the Government of India.

United Nations (UN) (1980), International Drinking Water Supply and Sanitation Decade: Report of the Secretary General, New York: UN.

United Nations Children's Fund (UNICEF) (2005), Water, Environment, and Sanitation (http://www.unicef.org/wes/).

United Nations Development Programme (UNDP) (2004), Water Governance for Poverty Reduction. Key Issues and the UNDP Response to Millennium Development Goals, New York: UNDP.

United Nations Development Programme (UNDP) (1997) Governance for Sustainable Human Development, New York: UNDP (http://magnet.undp.org/policy/default.htm).

United Nations Environment Programme (UNEP), United Nations Children's Fund (UNICEF), and World Health Organization (WHO) 2002, Children in the New Millennium: Environmental Impact on Health, (http://www.who.int/water_sanitation_health/hygiene/settings/millennium/en/index.html).

United Nations Educational, Scientific, and Cultural Organization (UNESCO) (2003), World Water Development Report, Paris: UNESCO Publishing.

United Nations - Habitat (2003), Water and Sanitation in the World's Cities: Local Action for Global Goals, London: Earthscan.

Webb, P. and M. Iskandarani (1998), "Water insecurity and the poor", Discussion Papers on Development Policy, Bonn: Center for Development Research.

World Bank (2004), Water Resources Sector Strategy. Strategic Decisions for World Bank Engagement, Washington: The World Bank (http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2004/06/01/000090341_20040601150257/Rendered/PDF/28114.pdf).

World Commission on Water for the 21st Century (WCW), The Biotechnology Panel (1999), "Inter-disciplinary Dialogue on "Climate, Biotechnology and Food and Water Security"", Chennai, Madras, India, February 4-5, 1999.

World Health Organization (WHO) (2005), Health and the Millennium Development Goals, Geneva: WHO (http://www.who.int/mdg/publications/MDG_Report_08_2005.pdf).

World Health Organization (WHO) (2003a), "Emerging Issues in Water and Infectious Disease", Geneva: WHO (http://www.who.int/water_sanitation_health/emerging/en/).

World Health Organization (WHO) (2003b), "Health in Water Resources Development", Geneva: WHO (http://www.who.int/water_sanitation_health/resources/en/).

World Health Organization – Regional Office for Europe (WHO-Europe) (2003), "Dealing with uncertainty: how can the precautionary approach help protect the future of our children?", in Fourth Ministerial Conference on Environment and Health, Stockholm, 26-27 June 2003 (http://www.who.dk/document/eehc/2ndigoprepmeet_11.pdf).

World Water Forum III (2003), Proceedings, Kyoto: WWF.