River basin development and management: Scales, power, discourses[1]

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Paper prepared for the RGS-IBG Annual International Conference 2006, London

Abstract

Interventions on hydro/ecological systems by different categories of stakeholders characterized by different political, decision-making and discursive power, and varied access to resources, tend to generate costs, benefits and risk which are distributed unevenly across spatial and temporal scales and across social groups. This is due to the interconnectedness of users through the hydrologic cycle entailed by their dependence upon the same resource. As pressure over resources increases and basins "close" this interdependence becomes more critical, increasing the frequency and seriousness of water shortages and conflicts.

A political ecology approach seeks to identify and understand these mechanisms to promote governance patterns which enhance equity and the integrity of ecosystems. The historical development of the Chao Phraya river basin, Thailand, is considered here through such a lens. The paper shows how land and water resources have been, and are being, appropriated, identifies the different interest groups and their related discourses and power, examines how they have adapted to socio-environmental changes, and highlights how risks, costs and benefits have been distributed.

Keywords: Thailand, river basin management, political ecology, water resources, allocation, discourse

Introduction

Unlike other resources like minerals, oil or land, water resources are always in a flux, often hidden underground, sometimes changing in quality, always varying in quantity and timing. Because of the nature of the hydrological cycle and of human capacity to store, dike, divert,

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[1] This paper draws on and develops an earlier communication to the 4th Conference of the International Water History Association (Molle 2005) and is partly based on research funded by the Comprehensive Assessment of Water Management in Agriculture.

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drain or pump water, this whimsical resource connects the people who depend on it, for better or for worse. This interconnectedness will manifest itself increasingly as pressure over resources grows and shortages recur. Societies, or particular individuals and interest groups, constantly reshape river basin waterscapes in a way that reflects not only the technology available but also their conception of nature, the labour or the capital they can mobilize, and the distribution of power and agency which defines who can make decisions on how to control, use and share water. Conversely, environmental change brought about by water-related human activities and shaped by particular ecological and physical conditions will impact back onto societies, often in a negative way, affecting particular areas or social groups, as defined by gender, ethnicity, caste or class (Greenberg and Park 1994; Robbins 2004).

Because most of the interactions through the water cycle occur at the river basin level, basins provide, at least initially, a handy spatial unit for looking at interaction between waterscapes and societies. Conventional water management approaches see river basins as rational units where technical ingenuity will strive to ensure that supply is in line with societal demand. Hydrology and hydraulics form the basic knowledge of engineers bent on controlling the unpredictable and changing hydrological regime that human will 'harness' for particular uses and benefits. Mainstream thinking promotes the concept of Integrated Water Resource Management (IWRM) in a way that is frequently ahistorical and apolitical. Suboptimal outcomes are viewed as a lack of capital, knowledge, imperfect institutions or government failure, all things which can be redressed through a proper combination of capital investment, expert knowledge and bureaucratic reform.

A political ecology approach, on the other hand, views river basins as arenas where power circulates and defines the pattern of access to water and the way externalities - water shortages, floods, pollution - are created and travel across scales, space and time to affect particular groups. Focusing on river basins by no means suggests that socio-environmental processes are spatially bounded. Many causes of water-related problems as well as their solutions may indeed lie outside river basin boundaries (Molle et al. 2006).

This paper is divided in two parts. The first section looks at how river basin interconnectedness plays out in hydrological, ecological and social terms. It briefly describes how societies may respond to water problems and how actors use particular social, political, symbolic or discursive power to elicit particular responses. The second section will exemplify these theoretical considerations by using the Chao Phraya river basin, in Thailand, as a case study. The conclusion will call for a richer and wider approach to human-environment interactions.

River basin interconnectedness

Hydrological interconnectedness is typified by the well-known upstream-downstream nexus. Even much before having conceptualized river basins, humans had recognized how actions on the upper reach of a river could affect its downstream part (Molle 2006). Diverting water or storing it to stifle rice production in downstream enemy states, or to release it on cities to destroy enemies was employed as early as the fourth to third century B.C. in China (CHES and CNCID 1991), and by Xerxes in Mesopotamia (Teclaff 1967). Parker (1976) presents an almost continuous record of 'river offences' in England from 1318 until 1698. Large upstream diversions for irrigation typically reduce water flows available to downstream users, but this phenomenon can be progressive and less perceptible when flow reduction is the result of a growing number of small tanks, water harvesting structures, or even pumps tapping shallow aquifers and reducing river baseflows. Other less intuitive interactions occur between surface

water and groundwater. Overdraft of aquifers may revert groundwater flow contribution to the river, with the river eventually contributing to the aquifer. Such stealthy reallocation shows the complexity of defining water rights that account for all hydrological connections, especially in a context of high interannual variability.

Basin interconnectedness has also a socio-political dimension, as individuals and groups that find themselves in interaction do not have the same power. Conflicts typically pit against each other: agriculturalists and urbanites, subsistence-oriented farmers and fishers or commercial enterprises, and off-stream and on-stream uses. For example, pine plantations in the upper Sand catchment in South Africa affect domestic water availability for high-density rural settlements, or Thai golf courses and orchards used and owned by well-off urbanites deplete water available to nearby rice farmers (Both ENDS and Gomukh 2005). Operators who can afford deep wells and powerful pumps will outdo those relying on shallower wells. Industrialists generally have greater political clout and their uses severely affect other uses, notably through pollution of waterways. Fishers are often displaced by water projects and are seldom compensated for the loss of their livelihoods (WCD 2000, chap. 3). Cities and industries generally get preferential allocation which adversely affects agriculture (though the reverse also occurs), and the actions of all three groups adversely affect the environment (Molle and Berkoff 2005).

Externalities can also travel across time over a long period, as in the case of the contamination or exhaustion of aquifers, and the loss of wildlife diversity, which will affect next generations; or in the case of inter-basin transfers, by forgoing future development in the ‘giving’ basin.

Last, interconnectedness has an environmental dimension in that a river basin can be seen as a continuum of nested ecosystems where environmental health in one part is affected by actions in other parts of the basin (Molle et al. 2006). For example, the functions of seasonal and permanent wetlands are controlled by changes in the flow regime as a result of impoundments and diversions elsewhere in the system. Small dams in upper catchments may delay the onset of the wet season and affect biological cues. Dams have often undermined or destroyed elaborate human uses of ecosystems, at the cost of overall economic losses, declining food security, environmental degradation, and loss of ecosystem services (see the case of the Hadejia' Jama'a river in Nigeria, Barbier and Thompson 1998). The systemic and complex nature of river basin ecosystems has often compounded the direct impact of dams, irrigation, and pumping schemes and has led to a series of destructive effects that were not identified at the outset or have frequently been overlooked. These include the loss of springs (overdraft of aquifers in the Azraq Oasis in Jordan) or wetland productivity, as the connectivity between the river and the floodplain is diminished by altered flood regimes. Many of the benefits associated with floods - fertility enhancement, replenishment of aquifers, support of wetlands, ecosystem sustainability, flood recession agriculture, and fecundity of fisheries - have been severely curtailed (WCD 2000).

All the interactions described above increase with human pressure over resources. When basins (or sub-basins) cannot produce the flows necessary to meet human or ecological downstream requirements (control salinity intrusion, dilute pollution, support estuarine ecosystems, etc.) they are said to be closed (or closing if this happens only during some period of the year). In closing basins hydrological and human interactions become paramount. Closing basins usually exhibit a high degree of water reuse because return flows from one particular use are usually re-diverted somewhere downstream.

Conflicts around water interventions are pervasive because they tend to generate externalities that impact on other people, somewhere else and after some time lag. A political ecology approach sees river basins as politicized arenas where different actors who use water and/or are subjected to externalities vie for access to the resource, for protection or compensation, and use their social or political power to elicit or impose regulations and interventions in line with their individual interests (or their wider conception of the common good).

As scale is enlarged, conflict resolution moves from local arrangements between irrigators or the community of one sub-catchment to larger regional or national spheres. With this, the role of the state tends to be more prominent as the solution to conflicts as well as the design of collaborative arrangements often require information that is not available locally. In addition, larger basins tend to have large-scale hydraulic infrastructures which are, in general, managed by the state. While states have gradually acquired a large capacity to regulate and shape water regimes it is only quite recently that their role has come under closer scrutiny. The lack of clear allocation patterns and water rights has left state agencies with a rather large latitude (if not discretion) to manage and allocate water according to criteria open to pressure by various interest groups rather than to those sanctioned by the society at large.

Water problems have no single solution: options to deal with scarcity include supply augmentation, through the mobilization of more resources through capital-intensive projects; efforts to conserve water; or redefining allocating to users. Likewise, flood problems can lead to more dykes and protection structures, better land use practices in upper catchments, or stricter enforcement of land zoning in flood-prone areas. Pollution can be solved by preventing polluting activities, treating wastewater, or just letting health and environmental impacts travel further downstream.

All these options have financial implications. They all come with risks, costs and benefits, private or public, which strongly shape what solutions particular stakeholders are likely to push for. Controlling or influencing the policy discourse that provides overarching justifications of why certain options should be preferred (or not) is therefore paramount. This discourse is influenced not only by ideologies (e.g. market- or community-based solutions), world-views (e.g. production/livelihoods vs. conservation) and global hegemonic concepts (e.g. IWRM, river basin management) but also by political clout (rural vs. urban), the relative clout of the various stakeholders or interest groups, and the relative weight of the state and civil society.

In sum, the interaction between the landscape and its hydrologic regime (with its temporal and spatial variability), and spatially situated actors with varied levels of financial and political power will greatly determine how resources will be used and what the implications in terms of both environmental and socio-economic change will be. These changes, in turn, will continuously work to redefine the power structure and reshape the basin waterscape. The case of the Chao Phraya river basin will be used to exemplify some of these interactions and trends.

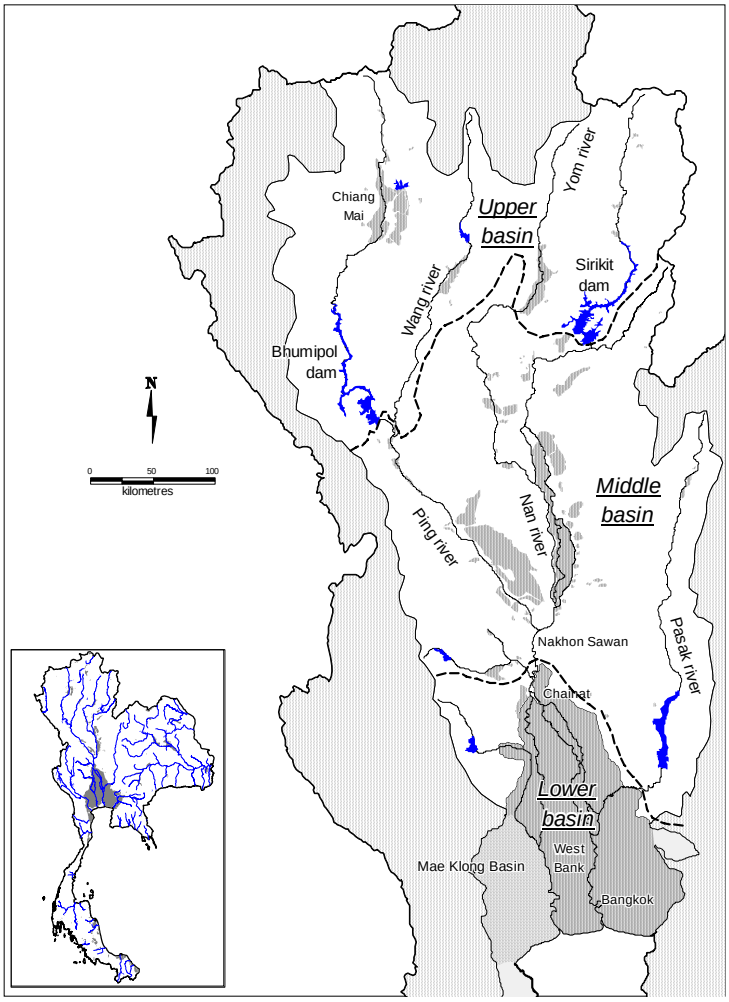
The example of the Chao Phraya river basin, Thailand

The Chao Phraya basin is the largest river basin in Thailand (160,000 km^2, or 30% of the area of the country) and is also the most important in economic terms, as it encompasses the bulk of the irrigated area as well as the Bangkok Metropolitan Area (BMA). During the twentieth century the basin shifted from the status of an uncontrolled basin, where rice cultivation was attuned to the natural hydrologic regime and expanded where allowed by it, to a status of a

highly developed basin, with multi-purpose storage dams, extensive canal infrastructure serving around 2.2 million hectares (ha) of irrigated land, a complex mix of economic activities and sprawling urban areas.

The basin can be divided into three sub-areas: The upper basin comprises the four main tributaries, the Wang and Yom rivers, and the upper Ping and Nan rivers, upstream of the Bhumipol and Sirikit dam built on these two rivers (see Figure 1). The middle basin comprises the lower reaches of these two rivers and of the Chao Phraya main stem down to the apex of the delta. From this point, materialized by a diversion dam sited at Chai Nat, starts the lower basin which includes the delta proper and a few lateral tributaries, notably the Pasak river on the eastern side.

Figure 1. General layout of the Chao Phraya basin.



Water use in early times was mostly confined to irrigated paddy in inter-mountain valleys in the north of the country, home to the flourishing Lanna ("one million paddy fields") kingdom 700 years ago. Paddy cultivation expanded southward as the Thai successively established their capital in Sukothai, Ayutthaya and later Thonburi-Bangkok (1767), until the signature of the Bowring treaty with the British in 1855 (soon followed by other treaties with other western powers) heralded the transition of the rice economy from subsistence to integration into world markets (Ingram 1971; Ishii 1978). The development of the delta between 1860 and 1930 can be seen as the result of a struggle between the king, the nobility and a gradually emancipating peasantry around the transformation of the modes of control of land, capital,

and labour (Pasuk and Baker 1997). The consumption of space and the spatial patterns of settlements will directly reflect not only this struggle but also the ecological diversity of the delta (Molle 2005).

Despite the early excavation of canals in the delta flats and some attempts to establish gravity irrigation schemes (Ishi 1978), the effective development of large-scale irrigation schemes and water control dates from the 1950s. It first consisted in the construction of 400,000 ha of irrigated areas served by a diversion dam located at the apex of the delta (and connected with additional 500,000 ha in the delta flats), later followed by two main storage dams (the Bhumipol dam in 1964 and the Sirikit dam in 1972 (see Figure 1).

After the completion of the Sirikit dam, approximately 12 Bm^3 (or km^3) of total run-off could be captured every year on average. This capacity was later incremented only marginally, with the construction of several dams, each with a capacity of approximately 0.25 Bm^3, but these resources were mostly committed to nearby irrigated areas that were expanded concomitantly. A boost to dry-season cropping in the lower delta was also allowed by the diversion of 70 m^3/s of water from the adjacent Mae Klong basin to the lower west bank (see Figure 1).

Intensification and interactions in the upper basin

Agricultural water use in the upper part of the basin has long been limited to traditional run-of-the-river communal schemes called *muang fai*. Thai farmers would cultivate paddy in the valley bottoms during the wet season, while mountain ridges were exploited by ethnic minorities (Karen, Hmong, Lisu, etc.) often through slash-and-burn techniques. In the 1960s, the region faced an agrarian crisis resulting from high population growth and the limited land and water resources available for irrigation. Intensification, including multiple cropping and the development of cash crops, was promoted by the government to raise rural incomes.

In the last 20 years the region underwent drastic changes. In the agriculture sector, vegetable (cabbage) and fruit cultivation (longan, litchis, etc.) expanded on sloppy uplands and the small streams were diverted to irrigate crops during the dry season. This resulted in conflicts not only with downstream users including Thai farmers in the valley but also with tourist resort owners and other non-agricultural investors.

Resentment against hill tribes can be attributed to several causes. First, stereotypes largely disseminated by the media and officials have long associated hill tribes with communist insurgencies, opium production, and with illicit logging and environmental degradation. At the same time, government or international programmes mostly targeted hill agriculture in order to eradicate poppy cultivation and integrate non-Thai ethnic groups. Successful attempts to grow cash crops contrasted with the lack of opportunity for lowland Thai farmers with limited ability to intensify or expand their land (although some of them also got involved in litchi cultivation). Last, urban-based environmentalism and strands of Buddhism preaching self-sufficiency and nature conservation also contributed to fuel conflicts between highlanders and lowlanders which, at times, included physical violence, road blockades and the cutting of trees.

These conflicts, in general, remain confined to the lateral tributaries of the main rivers. In the upper Ping river basin, for example, approximately twenty such catchments can be identified. Problems in the Ping river itself, one level up to the basin scale, are only partly linked to those occurring in the tributaries. While the latter tend to revolve around low-flow and degraded water quality in the dry season, problems in the main river valleys are more prominently

linked to problems of flood, notably in cities like Chiang Mai, Lamphun, Chiang Rai or Uttaradit. Other aspects of competition for water include the growth of urban use to the detriment of irrigation schemes, modelled on the conflict opposing farmers and resorts in lateral valleys. The neatest example is that of Chiang Mai city, which is gradually appropriating water from the Mae Taeng and Mae Kuang irrigation schemes, the two main schemes of the Chiang Mai valley. The pump recently set up in the main irrigation canal by the gigantic new Night Safari complex illustrates how powerful actors can re-appropriate water.

Interactions between the middle basin and the delta

In the delta, the agrarian crisis of the 1960s and the early 1970s was first diffused by the development of field crops (cassava, corn, cotton, etc.) onto adjacent uplands. This “upland boom” was supported by the promotion of agro-industry by the Thai state and relatively high market prices for crops such as maize, cotton, cassava, sugar cane and pineapple, and by the construction of a network of strategic roads by the Americans, in their fight against communist insurrection (Delang 2002; Pasuk and Baker 1997). Many farmers migrated to this new frontier, some permanently, others for a season or for the harvest period only (Molle and Thippawal 2003).

The closure of the upland frontier and the inability to intensify agriculture led to much tension in the early 1970s. It is only after the emergence of dry-season cropping (facilitated by the construction of the Sirikit dam, which regulates supply in the dry season), the increase of rice prices in 1973 and the drop in the costs of fertilizers that farmers, gradually but massively, adopted the high-yielding varieties of the Green Revolution, which eventually became attractive. Farmers invested substantial outlays in on-farm infrastructures, tractors and individual axial pumps. Double and even triple cropping developed and was only constrained by the insufficient water stocks available in the dry season.

With such a situation and the concomitant growth of its urban needs, the delta set itself on a collision course with the other water users in the basin. Due to the anteriority of the massive development of its irrigation infrastructures and to the *de facto* priority granted to Bangkok, the delta claimed the lion's share of the basin’s surface water and groundwater and appeared as a direct competitor of the current and future development in upstream areas. Indeed, the monopolizing of the basin water resources did not go uncontested from other regions and provinces.

The middle part of the basin also benefited from public investments in irrigation during the 1980s. Claiming a part of this water that they also consider “theirs," since it traverses their land, these provinces have obtained irrigation infrastructures first aimed at securing rice cultivation in the wet season. It is interesting to note that the first feasibility studies admitted that, owing to pre-existing irrigation development in the delta, only a very limited area could be irrigated in the dry season. Fifteen years later, however, these irrigated areas have de facto conquered the implicit right to divert a substantial part of the dry-season flow and now exhibit cropping intensities comparable to those observed in the delta. In the case of the lower Ping, some sizeable areas with even triple-cropping have been observed, showing the limit of Bangkok's centralized control on actual water allocation within the basin.

Projects implemented through the Department of Energy Development and Promotion (DEDP) also allowed groups of farmers to gain access to pumping stations with a 250 l/s capacity which soon dotted the course of the river and its tributaries. The combined

abstraction of all these users (small and large irrigation systems) totalled 38 percent of the amount of water released by the two dams during the dry season of 1998 (Molle et al. 2001a), which gives a measure of the radical process of spatial re-appropriation of water that has taken place.

The politics of regional development are anchored in a rhetoric of equity which allows poorer regions to claim state investments similar to those received by regions with comparatively better advantages. Regions which support the ruling party also expect retributions in the form of preferential investments. The supply-driven logic of international development banks also goes against serious screening of projects. The logic of water resource development thus goes beyond mere economic rationality and frequently leads to overcommitment of water resources, thereby, artificially generating water scarcity. In an internal report, the World Bank, which funded both the projects in the delta and the subsequent projects in the middle basin, acknowledged that the basin was now "overbuilt." This man-made scarcity will prompt more frequent crises which, in turn, will be instrumentalized by interest groups seeking to further particular agendas in response to water problems. Typically, images of cracked soils and withering paddy making the news are convenient poster children for those calling for supply-oriented capital-intensive solutions (new dams, inter-basin transfers, aquifer recharge, etc.).

Another manifestation of the conflict between the delta and the middle basin is the mismatch between irrigation and hydropower needs, which results in some water being released for the latter without possible reuse by the former. NGOs have frequently ascribed part of the responsibility of water shortages to careless or untimely releases aimed at the sole generation of power. However, in contrast to this accusation, or maybe because of it, careful analysis of dam releases in the 1990s shows that managers have improved management and largely operated the two dams based on the schedule of irrigation needs. This shows that public scrutiny may prompt improvements in management by line agencies (although the move was also made possible by the drastic reduction of the importance of hydropower in the national power generation).

Interactions within the agricultural delta: Water as the major production factor

Growing diversions by the middle basin (and by Bangkok) have resulted in declining supply to the irrigated land of the delta itself. Because of diminishing average farm size, the need to intensify and to access water in the dry season became a vital objective for economic sustainability of agriculture. The upper delta is irrigated by five main canals branching off the Chao Phraya river at the Chai Nat diversion dam. The partition of the flow of the river at Chai Nat is thus a crucial question when one considers that only half of the potential users will be served in the dry season. Ensuring an equitable distribution is first faced with technical difficulties: the water level upstream of Chai Nat fluctuates and this reverberates on the discharge of the different canals.[3] Allocation has always been problematic. In the 1990s, a rotation system which contemplated serving half of each irrigation unit on a 2-year basis was experimented with but failed.[4] The analysis of water allocation over a period of 20 years revealed an uneven repartition (Molle et al. 2001a). The west of the delta received a higher supply and could in some places develop a thriving triple-cropping, while other areas were served only exceptionally. The official justification is that the western part has been provided with good on-farm infrastructures and, as a result, has a better control of water and a better economic productivity. Part of the difference may also be explained by direct pumping in the Tha Chin river. These explanations are somewhat circumstantial as it is notorious that the

province concerned (Suphan Buri) owes much of its preferential treatment to the influence of its governor, a former prime minister (Bangkok Post, May 6, 2005, and May 7, 2005).

Farmers are not passive and respond to water scarcity in many ways: they adopt 3-month duration rice varieties, shift cropping calendars, pump from drains and rivers, dig farm ponds, etc. but they also get organized to "attract" water: The first way is the commonplace resort to political representatives, notably MPs. For the higher parts of the floodplains, long confined to growing traditional deep-water rice varieties, the strategy is to develop on-farm infrastructures (levelling, bunding, digging of small farm-level canals and drains) in order to be able to grow dry-season rice crops and to lay claims for a share of water. Others chose to start dry season cropping before the beginning of the official season by using wells or residual water in drains or ponds, thus forcing the Royal Irrigation Department to later allocate water to them to avoid crop losses which would make the news and would trigger political interventions. Yet others organize themselves in Water User Groups to strengthen their claim for dry-season water supply (Molle et al. 2001b).

Another way to secure water is to develop capital-intensive agriculture or aquaculture: for example, shrimp ponds in the Don Chedi area (western fringe of the delta), which require a frequent renewal of water, receive some priority supply because of the investments made and their economic profitability. Similarly, the Damnoen Saduak area, in the south-western part of the delta, receives water from the lower Mae Klong basin and is given priority in times of drought. The Rangsit area, north-east of Bangkok, is located at the upstream part of the lower delta and benefits from better access to water: citruses have been developed there on a large scale (Saha 1993).

The area of Damnoen Saduak provides another telling example of power struggles around water management. The filling up of the Sri Nakarin dam on the upper Mae Klong provoked a drop in the discharge reaching the estuary which justified the construction of control structures at the outlet of various canals connected with the sea. The resulting creation of a zone of freshwater in the lower part of the basin prompted the expansion of vegetable farming, orchards, and aquaculture on a considerable area (totalling almost 20,000 ha), generating an unmatched agricultural wealth in the country. With the boom of brackish shrimp farming (*black tiger prawn*), some landowners (in particular those who had opted for extensive fish farming) are challenging the water regime that gives priority to freshwater and militate for an opening of the regulators and a mixture of sea water and freshwater. They support their claim by borrowing from environmentalist discourses and by stressing the need to "restore the ecology of the river" (Bangkok Post April 2004). A modification of the prevailing regime would only shift benefits from one area to the other, and from some landowners to others.

The hydraulic connectivity of the delta also has an impact at a smaller scale: intensive shrimp farming, which developed in the east and the west of the lower delta, uses the canals/drains also used by rice cultivation and the return flows from rice plots are often loaded with pesticide residues which can trigger high mortality in shrimp populations. Inland brackish water shrimp farming requires addition of sea water shipped by tankers and has, in return, an impact on the surrounding agriculture as well as on the soil quality. The spatial dynamics of this very lucrative - but risky - activity are conditioned not only by ecological factors (water quality) and by the promotion of this activity by large transnational agribusiness groups like Charoen Prokphand (CP) but also by state regulations, which tend to concentrate their action on the areas symbolically valued by environmentalists (mangroves) or the public at large (the delta, symbol of a rice-based nation) (Vandergeest et al. 1999). However, farming techniques

operating at low salinity levels have recently been developed (Szuster 2003), thus weakening the arguments of opponent groups. Abandoned farms in scarified landscapes, remnants of the viruses which undermined shrimp farming in the past (including on the coastal area of the delta in the early 1990s), do not bode well for the future of this activity that brings not only fortune but also bankruptcy, and is based on a short-term mining logic.

Interactions between Bangkok and the irrigated delta

With a population over seven million, the highest concentration of industries and political power in the country, Bangkok appears as the main actor in the delta. The city first developed at the end of the nineteenth century owing to rice exports as the heart of a "mercantile delta" (Kaida 2003), thriving on maritime commerce. During the cold war, Bangkok was a strategic centre of American policy in Asia and benefited from the American presence and financial aid, as well as from the investments of the Sino-Thai community and, more recently, from foreign capital investments (notably Japanese). The growth of the city has shifted the city water demand from 0.46 million m^3/day (Mm^3/d) in 1978 to 7.5 Mm^3/d in 2000, that is, an increase of 16 times over a period of 22 years (Molle et al. 2001a). This demand is principally met by a diversion of 45 m^3/s from the Chao Phraya and also by groundwater: 95 percent of the water used by the 20,000 industries of the metropolitan area comes from the aquifers and the volume abstracted daily is close to 3 Mm^3 (equivalent to 36 m^3/s), as compared with an aquifer recharge estimated at 1 Mm^3/d only (TDRI 1990; Christensen and Boon-Long 1994). The preference of industries for groundwater is because of its cheapness, better quality and reliability.

Through the priority granted to it and its diversions from the Mae Klong river, Bangkok begins to compete with the rest of the delta and with neighbouring river basins. Its impact on the delta is not limited to water quantity but is also manifested by externalities in terms of land subsidence, flood, and water quality and environmental degradation.

The federation of Thai industries has hitherto always succeeded in limiting the increase in the taxation of wells, with which it has been recurrently threatened (Bangkok Post June 2000). The over-exploitation of aquifers continues and translates into dramatic land subsidence, a third of the capital being presently under mean sea level. Externalities in terms of increased sensitivity to floods, costs of raising and strengthening dykes, cost of pumping stations and instability of buildings are massive and distributed over the whole society. Instead of implementing demand management in the industrial sector, plans to go for costly (but at public expense) recharge of the aquifer by injection of water have been floated in the media.

By raising its protections and embankments Bangkok increases the magnitude of floods and shifts the risk on to neighbouring areas. The lower delta is morphologically a water-spreading area and the gradual expansion of the protected area increases the risk and the damages that unprotected areas are to undergo. Dyking by farmers who diversify their production adds to this shrinking and therefore further increases the risk faced by those who cannot afford to protect their plot, generating a typical shift of externalities onto poorer segments of the society. In 1995, the west bank underwent dramatic flooding with major damage to roads and housing.

The lower delta canal system which serves both for supply and drainage is remarkable in terms of efficiency, since all drained volumes can be reused downstream but this canal connectivity also contributes to diffuse the pollution generated in one point to a much wider area. The numerous canals which criss-cross the lower delta and radiate from the city have

been transformed into open sewers. Since the coastal line of the delta is now closed,[5] polluted water tends to stagnate in and around urban areas. This situation not only has a direct impact on public health in a traditionally aquatic urban environment but also impacts on peri-urban agricultural production. The reuse of huge borrow pits as garbage dumps in the vicinity of Bangkok to stockpile - without any control - all types of urban waste also has a predictable (yet, so far, little studied) impact on the contamination of aquifers.

Last, the city and agriculture find themselves in competition with the environment since the control of saline intrusion demands a constant minimum discharge of 50 m^3/s in the river estuary (and of 45 m^3/s in the estuary of the Tha Chin river) (Ruangdej 1994). A decrease of the river flow under this threshold, as observed in some critical years (e.g. 1999), entails the destruction of orchards (citrus, *durian*, etc.) located along the river and a concentration of pollution. The estuary is also heavily contaminated and the river contributes to the pollution of the sea by discharging heavy metals, organic matter, BOD load, and nitrates and potassium originating from agriculture (Wijarn et al. 2000; Pornsook and Ekachai 2003). The position of estuarine and coastal ecosystems as the most downstream part of the basin, and also as the weakest area in political terms, makes them highly vulnerable. A large part of the flux, which controls the intrusion of saline water, is now generated by wastewater released by the city… Impacts of environmental externalities of the cities on human health, agriculture, and coastal/marine ecosystems are considerable but have been, to date, the object of few measures only.

Downstream-upstream connections: The delta and its water sources

In the absence of strict rules regulating the sharing of resources, the legitimization of priorities in allocation is established through debates, representations and dominant discourses, that is, in a symbolic and discursive arena where the stakes are nonetheless paramount. Determining - or pointing to - the causes of both floods and water shortage that bedevil the lower basin and Bangkok is of great significance because it will establish responsibilities, legitimize certain types of intervention, as well as suggest who should pay for them. Creeping of salinity into the Chao Phraya river or restrictions threatening the capital are ascribed to farmers' squandering of water and to their insistence in growing rice instead of less water-demanding crops, to El-Niño or to an exceptionally drought event, and to deforestation of the upper basin: common wisdom strongly associates water shortages with the disappearing of forests, the natural "sponges" which retain water, alleviating floods and sustaining flows in the dry season. The hegemony of such official narratives on the causes of water shortages is created through the press and television, official declarations and a certain amount of academic literature.

Although the causal link between deforestation and run-off at the basin level has been scientifically largely discredited (Alford 1992; Walker 2003), its ubiquity in the media (Bangkok Post May 2001; Bangkok Post August 2001) and the discourse of Bangkok urbanites reveals a propensity to blame ethnic minorities (see above). It also echoes an urban environmentalist ideology for which northern Thailand, and the countryside in general, must be conserved in order to - in parallel with an idealization of a pre-modern past - be consumed by an eco-tourism in full development (Rigg and Ritchie 2002). This ideology is, ironically, also strengthened by the popular concept of integrated soil and water management, which enjoins us to take into consideration the interactions between upstream and downstream parts of a river basin (Bangkok Post April 2004). This ideology is effective: it elicited and legitimized programs of reforestation on a large scale and the design of new "state enclosures," such as forest reserve, national parks and wildlife sanctuaries (Delang 2002; Sato

2003). These projects have often been, and are still, carried out to the direct detriment of populations whose livelihoods are dependent on these resources and gazetted areas already amounted to 51% of the national land in the late 80s, although in practice many of these were encroached or used by local people (Hirsch and Lohmann 1989). The discourse depicting slash-and-burn agriculture as nefarious and backward lends support to the eviction of local communities (often Hmong people in the north) to the benefit of afforestation which is presented as modern and productive, thus sanctioning a transfer of benefits to the timber industry (or to tourists, in case of reservations).

These programs have faced some opposition: NGOs proposed a *Community forest bill* which would recognize the right of communities to manage their own resources. Access to information on legal issues, the support of NGOs and activists, and the Thai citizenship of some ethnic groups have been found to be the main determinant of success in the recognition of community rights on the ground (Johnson and Forsyth 2002). Access to upland resources by local populations is gained through a political struggle pitting against each other agro-industrial interests, activists, rural communities and the state, through its line agencies and local administrative representations. "Weapons" are not only money but also information on rights and laws, media, international NGOs, ethnic stereotypes, and mainstream discourses on the causes of the water crises.

Another fascinating example of the power of the dominant discourse is the ban on logging which followed a heated debate on concessions granted by the government (Lohmann 1995) and the catastrophic inundations of 1988 (Lang 2002). Here again, despite the lack of scientific evidence of a causal link between deforestation and flooding on a large scale (CIFOR 2004), the relative success of this ban (followed by a ban in China in 1998 issued for the same reasons) and the vitality of the illicit logging business have shifted tree felling to other countries with weaker state control such as Laos, Cambodia, Myanmar and Indonesia : this situation provides a striking example of the power of an urban discourse which *de facto* links the increased vulnerability to a flood of investments in Bangkok to the looting of natural resources in poorer neighbouring countries.

Popular discourse on the lack of water is also efficient in justifying the development of more water resources. In this version, farmers are mobilized in a positive fashion and their "needs", stigmatized by dry and parched fields in the dry season, are emphasized in order to legitimize the construction of new dams or inter-basin transfers. Supplying water to farmers becomes an endless mission, where benefits are obvious but whose costs are hardly mentioned.[6]

In contrast to the view of economists, for whom reallocation of water between sectors should simply follow the gradient of economic productivity, the spatial redistribution of a finite resource, or the grabbing of the resources from neighbouring basins, is a process which is highly political and which proceeds along the "path of least resistance" (Molle and Berkoff 2005). The solutions found by cities to meet their growing needs generally minimize political costs and maximize gains to decision makers. It is tempting to impose the environmental and economic costs of a water transfer on regions or categories of population with a lower bargaining power, and the financial costs on the country as a whole, while benefits tend to accrue to elites and urban investors whose profits are linked to the continuous growth of urban metabolism. The weakest parties are in general the next generations (affected by the exhaustion and contamination of aquifers, and the loss of biodiversity) and the environment (basin closure almost invariably provokes severe environmental stress, at least at the beginning).

In the present case, it is interesting to note that a reduction of the allocation to agriculture is not formally considered[7] and that conventional engineering supply-augmentation options are still favoured. Bangkok has first imposed a transfer from the Mae Klong basin, which constituted the less stressing option. In 1999, a new dam with a capacity of 750 Mm^3 was built on the Pasak river, which joins the delta on its eastern side, with the main objective of protecting Bangkok from the floods. By way of compensation to the provinces affected by the impoundment, an irrigation scheme of 25,000 ha has been added downstream of the dam, instead of earmarking the new water stock for alleviating the situation in the lower delta in general and in Bangkok in particular.[8] Each new reservoir comes with a new irrigation area and recurring shortages justify the mobilization of more distant or costly water. The last project under consideration contemplates pumping water from the Salween river[9] to increase the inflow to the Bhumipol dam via a tunnel which is to be excavated through the mountain range.

Supply augmentation projects, a typical preference of private firms and public agencies in the water sector, are both strengthened and potentially threatened by the pervasiveness of the concept of IWRM propelled by international organizations and development banks. While IWRM supports inclusive processes of decision making meant to achieve more socially balanced and environmentally sound outcomes, some consultant firms have embraced the concept to legitimize basin-wide master plans[10] that little differ from earlier planning exercises, although they abundantly resort to the participation rhetoric (Molle 2005): participation is measured by the number of meetings carried out at the village or sub-district level at which people are requested to establish lists of desirable projects. These "local projects" are painted as derived from bottom-up processes and also serve as a fig leaf for the large-scale projects of the plan which, because they are not "local" in scale and too technical, are not submitted for people's approval.

Supply augmentation options have also found support in the view of His Majesty the King, who favor dam construction as a means to control floods and provide irrigation water. The influence of the king in such issues is linked to his sheer interest in rural development and to his personal prestige, but also to the traditional perception of the monarch as the provider of water (Kraisoraphong 1995). Potential opposition to the Pasak dam has been *de facto* silenced by the request of the King to construct the dam.

IWRM has also inspired the setting up of River Basin Organizations (RBOs) by the Ministry of Natural Resources and Environment in the 25 river basins of Thailand. Because RBOs are not sanctioned by law and management responsibilities have not been transferred from line agencies, their achievements remain very modest. However, they might herald future modes of governance in which allocation and resource development might be better controlled by society.

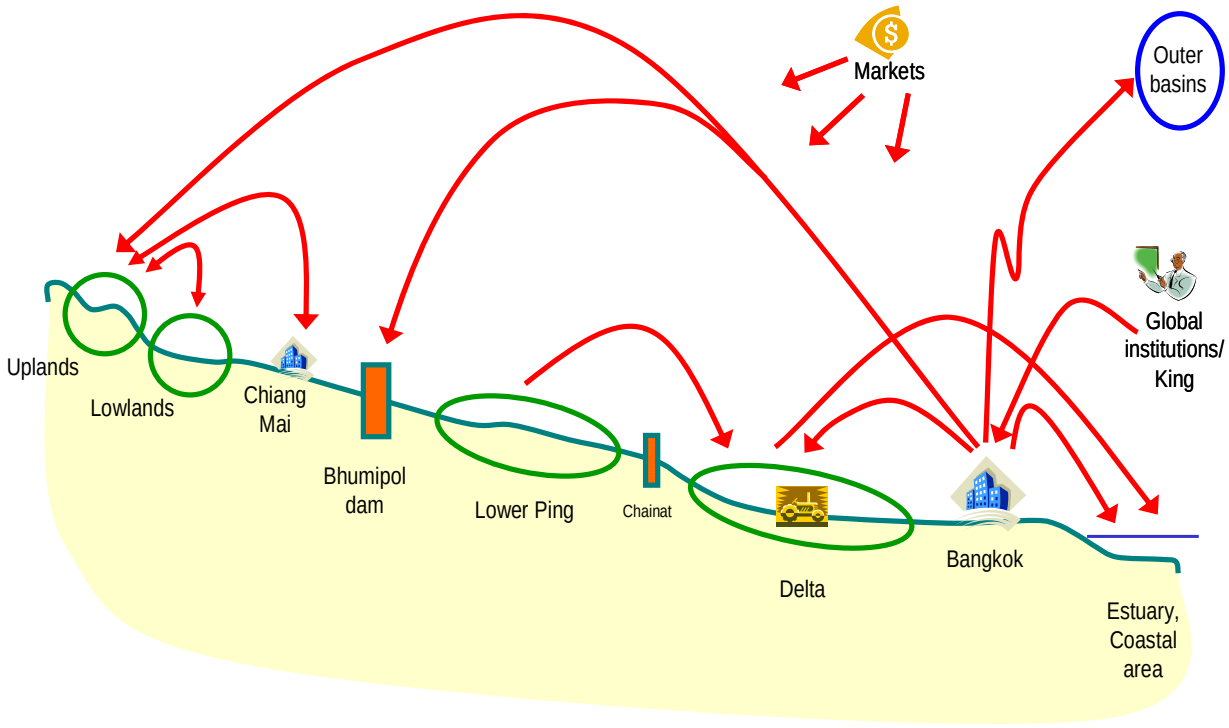
Discussion and conclusions

This paper has examined how the development of the Chao Phraya basin was staged through the competition of actors as varied as farmers of the various subregions, urban and industrial interest groups, provinces in the basin as well as neighbouring ones, the hydropower and agribusiness sectors, politicians, line agencies, grassroots and green NGOs, the media and the academia. Interactions are also spatially hierarchized: Bangkok tends to dominate the delta, the delta tries to maintain (with some difficulties) its privileged access to water in the basin and to impose its logic to ethnic minorities in the north, and the basin tends to expand its

grasp on the resources of neighbouring basins and countries. Some of the scalar interactions are summarized in Figure 2.

Interactions within the basin occur at several scales: in small valleys communal irrigation systems can compete with one another, or with tourism resorts, and all of these may conflict with upland farmers diverting water to their orchards. In the delta, similar conflicts may occur between paddy and shrimp farmers. Such proximate conflicts are often solved by people locally but may also involve outsiders (academics, urban-based NGOs, etc.), or even be exposed to national media (the shrimp vs. rice farming issue, with its environmental implications, created a rift between the Agriculture Department and the Land Development Department).

Figure 2. Scalar interactions in the Chao Phraya river basin



Interactions between sub-parts of the basin, typically the middle and lower parts, are more complex to apprehend and largely removed from public scrutiny: the power of the (agricultural) delta appeared limited since it could not oppose the equity-driven discourse in favour of development of irrigation in the middle basin; the power of Bangkok-based water managers at the Royal Irrigation Department was also challenged by the uncoordinated development of individual and village-based pumping stations and the difficulty to monitor actual diversions to some schemes.

At the basin level, the discretion of the state is high, although attempts to design new dams and inter-basin transfers may be thwarted by opposition from civil society and dam management improved after public outcry in the media. Basin-scale water allocation, however, remains largely under the control of the state.

Peoples' agencies are displayed at various scales: locally they tap alternative sources of water (aquifers, ponds, drains, rivers), adapt crops and cropping techniques, design their own catchment organizations in opposition to top-down government initiatives, resort to a variety

of political channels and elicit interventions, associate with academics, use media or direct demonstrations to project their struggles, and borrow discursive power from wider discourses on environmentalism, grassroots democracy or local knowledge.

Discursive power is also used by a variety of actors, who also strive to adapt to hegemonic global ideas. The so-called IWRM best practices, allegedly sanctioned by international experience, are introduced through the exposure of Thai decision makers to regional networks (e.g., Global Water Partnership), regional organizations (e.g., Mekong River Commission), international conferences, training programmes, field trips, and interaction with international development banks (World Bank, ADB) or UN agencies (FAO, ESCAP). Consultant firms have partly hijacked the concept to further infrastructural development in the guise of integrated master plans. The Ministry of Natural Resources and Environment has drawn some legitimacy from the IWRM concept and developed RBOs in the 25 main river basins but these efforts have been dwarfed by the failure to redistribute power from line agencies. Above all, flawed hydrological knowledge associated with the sponge myth have allowed Bangkok and other downstream players to justify conservationist strategies in the upper catchment in the form of state enclosures (national parks or sanctuaries, forest reservation and afforestation areas), strategies that found common ground with other strategic interests (consumption of nature by urban elites, control of logging, national security concerns on the frontier with Myanmar, control of hill tribe populations, ethnic prejudices, etc…).

In sum, in contrast to the view of water resources development and management as a technical issue requiring more capital, expert knowledge and reformed institutions, the Chao Phraya river basin appears as a much more complex arena where knowledge and power asymmetries shape a particular pattern of access to water resources that is constantly challenged and redefined.

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ENDNOTES

[3] These canals do not have the same sill level and, therefore, are not impacted uniformly.

[4] In dry years, "on" areas would have to be rationed and they did not accept to "pass their turn;" in an excess year, pressure to allocate extra water to "off" areas would rise.

[5] The different streams which connect the delta to the sea are controlled by regulators or dykes which allow the conservation of freshwater inland, avoiding its flow to the sea, together with the intrusion of saline water at high tide.

[6] Refer to this declaration of an official at the Royal Irrigation Department: “water distribution doesn’t completely cover those irrigation areas; we’ve lost a balance between storage and distribution;” comments a high-level officer: “…We know the problem… if water can’t be distributed to people, maximum benefits will not be attained” (Bangkok Post, 28 December 2003).

[7] Much to the contrary, Thailand is considering multiplying its irrigated area by a factor two or three through the "Water Grid" project of the Thaksin administration (see Molle 2005).

[8] The same situation was observed with regard to the ongoing construction of a dam on the Nakon Nayok river, which also contributes to the delta.

[9] This river defines part of the frontier between Myanmar and Thailand. It is planned to divert a total annual volume of 3.8 Bm^3.

[10] Two consultants, for example, recently (2003) drew a Master Plan for the Ping river on behalf of the Ministry of Natural Resources and Environment and claimed that “it was the first time basin management and integrated plans for water resources management were applied to solve the problems of drought, flood and water quality.”