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Place, Nature and the Question of Scale: Interrogating the Production of Nature

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Content

1 The Question of Scale

The question of scale has plagued geographical, political, social and environmental research and policy-making for a long time. While it is trivial to state that geographical scales exist and that they somehow matter, it is rather more difficult and complex to theorize scale and scaling processes. Both natural and social sciences have grappled with the question of scale over the past decades or so. Physicists, biologists, ecologists, geologists and physical geographers have been struggling to incorporate scale into their theoretical endeavours. Consider, for example, how the Large Hadron Collider in Geneva is believed to reveal, through the analysis of the behaviour of sub-atomic particles, the origin and dynamics of the universe or how environmental scientists endeavour to link global climate models with locally or regionally specific variables and processes. Hydrologists or geomorphologists also attempt to model scale-dependent relations between river basin or landforms on the one hand and larger scale atmospheric processes.

The social sciences too have put the theorization of scale high on the academic agenda. While intuitively important in the sense that all humans are acutely aware of the scalar architecture of the world they inhabit – a world composed of cities, regions, nations, supra-national institutions and global configurations – the theorisation of the question of scale has only recently gained momentum, particularly in geography and cognate disciplines. The growing attention to scale and scalar issues coincided with the tremendous geo-political and geo-economic transformations that have radically re-ordered spatial co-ordinates of everyday life over the past few decades. Consider, for example, how as soon as the Westphalian state order was completed by the mid-20th century, it had already begun to transcend itself as national boundaries became more porous and sub-national (regional or local) as well as super-national (like the European Union) scales of governance and political-economic organisation became more prominent (Brenner et al., 2003). This de- and re-construction of spatial scales that were often taken for granted as naturalised units for social existence and analysis (much of which is perpetuated in some of the geographical and international relations literature, which often unproblematically singles out particular scalar forms – such as the local, the regional, the national or the global – as the pivotal terrain for analysis) reshuffles social power relationships in important ways. While political and social geometries were re-arranged, economic processes equally re-scaled as the flows of capital, commodities and, to a lesser extent, labour extended geographically and produced intricate and overlapping, but deeply scaled, networks of interaction and organization. While both globalizaton and localization (or, in other words, 'glocalization') took hold and forced social scientists to consider the relevance of such re-scaling processes, environmental processes – like climate change or biodiversity loss – were also increasingly understood as multi-scalar processes shaped by intricate articulations of processes that operate at a range of interlocking geographical scales.

While the institutional, political and economic architecture was transforming, new policy concepts and arrangements emerged. Indeed, the profound re-articulation of geographical scale in, for example, the European Union is a case in point. Myriad policy domains (environmental, urban, employment, and so on) became organized through multi-level forms of governance in which local, regional, national and European institutional configurations interact and articulate in the policy formulation and implementation process (Gualini, 2004; Murphy, 2008). Multi-level (or multi-scaled) governance was increasingly foreground as the desirable and optimal form of governing, an arrangement that of course changed the parameters of governing and transformed the mechanisms associated with democratic

government (see Swyngedouw, 2005). It is not a surprise, therefore, that the question of scale became a signature theme that required urgent theoretical examination.

2 Theorising Scale: a review

The theorisation of scale has undergone profound changes over the past few decades. Before the 1980s, scale was conceived as either a measuring rule to indicate relative dimensional size or distance (as, for example, in maps), or used to refer to a given absolute space (as, for example, in the scale of the region, the city, the state, the global). These absolute Kantian approaches to scale implied an absolute understanding of space. Space was considered given and fixed and spatial scale was one of the given Cartesian attributes of spatial organization that permitted moving up and down dimensional ladders, depending on the type of enquiry or object of study. Neighbourhoods, ecosystems, cities, regions, river basins and states were considered given or, at best, as evolving very slowly over long periods of time. Scalar configurations such as those exemplified above became as it were naturalized entries that provided a solid foundation for scientific enquiry. Geographical scales provided the contextual backdrop against which non-scale dependent processes were examined. Scale was a given that provided a geographical frame and container in which to situate a set of processes which as such were not scale-dependent or scale-forming.

The tumultuous socio-economic and environmental transformations of the past few decades, however, radically overhauled the above perspective on scale. In particular, the dramatic socio-spatial transformations that are associated with the process of 'globalization' and the emergence of globally significant environmental processes (like climate change or the ozone hole) on the one hand and the recognition that local or regional configurations matter significantly in shaping national, supra-national or global processes (as exemplified in the proliferating literature on industrial districts, networked regional economies and so on) on the other have sparked a lively and politically important debate over scale, re-scaling and the politics of scale.

Peter Taylor was arguable the first political geographer to take the question of scale seriously. Framed in the context of a World Systems Perspective, Taylor showed how global processes shaped by the interaction of regional and localised systems in an overall dynamic of global but uneven geographical development. Following the insights of Ferdinand Braudel and Immanuel Wallerstein, Taylor suggested that the local and regional conditions as well as the relationships between places and regions were shaped by and co-determined the dynamics of global geographical integration. His view conveyed basically a hierarchical model of scale whereby the global scale orchestrated a geography of combined and uneven development that produced territorial configurations which could be defined as core (like the U.S. or North-West Europe), semi-periphery (like the Mediterranean or the then socialist states) and the periphery (the 'underdeveloped' regions). The rigid character and inherently hierarchical structure of his analysis whereby the higher scale was considered of greater importance than lower scales, combined with a historical-geographical dynamic that inexorably moved in the direction of greater global integration, offered a rather structural perspective that disavowed the agency of lower scales and the significance of lower scale conditions and dynamics (see Taylor, 1982). His analysis is ultimately one that operates fully within the contours of framing the world as a configuration of independent and interdependent, but basically given, geographical formations (like states, regions and cities).

Neil Smith (see also below) in his seminal book 'Uneven Development' took the analysis of scale further (Smith, 1984). He argued that 'scale' is not given or fixed, but has to be understood as dynamics and process-based. Scale 'becomes' and territorial configurations stretch and contract as socio-spatial relations change (consider, for example, the geographical expansion (or shrinking) of

cities or the changing boundaries of states). In addition to this stretching and contracting process, Smith also argued that relationships between scales change as new significant scales become formed (like the European Union or NATO at a supra-national level or local institutional configurations at a sub-national level) through a process he defined as 'scale jumping'. This occurs whenever social actors or processes move from one significant scale to another. Consider, for example, how processes of regionalization shifted all manner of policy domains from the national to the regional scale or how the process of European Integration resulted in an up-scaling of all manner of policy domains from the national to the European scale. This process of scale-jumping is of course not neutral in terms of social or political power. As scalar configuration change, modalities of organizing and exercising social power change too (see Swyngedouw, 2000a).

Smith and others conceive of scalar configurations as the outcome of socio-spatial processes that regulate and organise social power relations. As a geographical construction, scales become arenas around which socio-spatial power choreographies are enacted and performed (Swyngedouw, 1997a, b; 2000a). Over the past few years, a plethora of research has been published on the social construction of scale and the deeply contested scalar transformations of the political-economy of advanced capitalist societies (Dicken, et al., 2001; Herod and Wright, 2002; Howitt, 1993; Smith and Dennis, 1987; Swyngedouw, 1992a; 1997a,b; 2000b). Emphasis has been put on the making and re-making of social, political and economic scales of organisation (Brenner, 1998; Collinge, 1999; Cox, 1998; Delaney and Leitner, 1997; MacLeod and Goodwin, 1999; Marston, 2000, Silvern, 1999; Swyngedouw, 1996a), of regulation (Boyle, 2000; Berndt, 2000; Brenner, 1997; Leitner, 1997; Swyngedouw, 1992b), of social and union action (Herod, 2001; Sadler, 2000; Walsh 2000; Waterman and Wills, 2001), and of contestation (Castree, 2000; Miller, 1997; Towers, 2000). In addition, attention has been paid to the significance of differential scalar positionings of social groups and classes in the power geometries of capitalism (Kelly, 1999; MacLeod, 1999; Swyngedouw, 2000a), and on scalar strategies mobilised by both elites and subaltern social groups (Brenner, 1999; Herod, 1991; Swyngedouw, 1996a; Zeller, 2000). Conceiving the current re-ordering of political and economic life from a scalar perspective permits to recast the alleged process of globalisation in ways that is more sensitive to the spatiality of the process, the centrality of the political domain, and the shifting relations and geometries of power.

Moreover, it was increasingly clear that the bounded territorial notion of scale that had dominated so far had to be extended as 'networks' proved to be vital components in shaping the changing geographies of local, regional, national and global assemblages. Flow-based perspectives, whether conceived of as flows of people, materials, commodities or money, showed the porosities of territorial spatial configurations (like states or regions). Such network-based perspectives also indicated scalar properties as networks stretched and contracted over space (see Swyngedouw, 2004).

In recent years, the theorisation of scale has also been extended to include ecological processes as well (see Graigner, 1999; Zimmerer, 2000; Heynen and Swyngedouw, 2003; Neumann, 2009). As environmental and social changes co-determine each other in space and time (Norgaard, 1994), processes of socio-ecological change go to recreate both social and physical environments and generate new socio-ecological settings with spatially and temporally distinct characteristics. This metabolic process, while rooted in specific moments of time and space, is ongoing and continuous. The forms and circumstances that physical and environmental changes take are tied to the specific historical/geographical social, cultural, political, or economic conditions and formal or informal institutions of governance that accompany them (Swyngedouw, 1997b; 1998; 2006; Kaika et al., 2002). Within this process of socio-ecological change it is also important to remember that all socio-spatial processes are invariably also predicated upon the transformation or metabolism of physical, chemical, or biological components. Thus, we must conclude that environments are combined socio-ecological assemblages that are dynamically produced, spatially and temporally, both socially and materially (Latour, 1993).

In sum, the ongoing and continual processes of societal and material arrangements recreating themselves, spatially and temporally, are always already a result, an outcome of the perpetual movement of the flux of socio-spatial and environmental dynamics. These dynamics are embedded within networked or territorial scalar configurations that extend from the local milieu to global relations. The priority, both theoretically and politically, therefore, resides never in a particular social or ecological geographical scale, but instead in the socio-ecological process through which particular social and environmental scales become constituted and subsequently reconstituted. In other words, socio-ecological processes give rise to scalar forms of organisation (such a states, local government, inter-state arrangements and the like) and to a nested set of related and interacting socio-ecological spatial scales. In addition, these territorial scalar arrangements (like states or regions) intersect – often in contradictory and conflicting ways – with the scalar networks of, for example, socio-ecological production and consumption systems (Brenner, 2001). In other words, a complex scalar articulation arises from the molecular processes and dynamics associated with the circulation of materials and capital and its associated socio-ecological metabolic transformation processes on the one hand and the levels or scales of regulation and governance in which these are embedded on the other. These territorial and networked spatial scales are never set, but are perpetually disputed, redefined, reconstituted and restructured in terms of their extent, content, relative importance and interrelations. The continuous reorganisation of spatial scales is an integral part of social strategies to combat and defend control over limited resources and/or a struggle for empowerment. There is constant societal struggle for the command over particular scales in a given socio-spatial conjunctures, and while some of these struggles are of minor consequence, many can be of eminent importance. Consider, for example, how conflicts over the appropriate scale for organising water systems (local, river basin, national, trans-national) each evoke different power geometries and may lead to radically different socio-ecological conditions. In addition, extending scales of networked relations, through ecological conquest and expansion of the networks of capital circulation, for example, generalises and deepens uneven socio-ecological conditions.

In the remainder of the paper, we shall explore the theoretical underpinnings of a socio-ecological theorization of scale in greater detail and illustrate the theoretical argument by means of a case-study.

3 Nature, Place, and Scale: a historical-materialist perspective

There are a proliferating number of 'things' – quasi-objects in Latour's words – populating the world; things that blur the strict demarcations between the physical and the social world. Indeed, the traditional distinction between environment and society, between nature and culture, becomes increasingly contested, ambiguous and problematic. Consider, for example, the contested 'making' of 'Dolly', the cloned sheep, the outbreak of Avian Flue that spread globally, the manufacture of genetically modified organisms, the fabrication of plutonium, recurrent droughts in the Spain and the overexploitation of aquifer water, the built-up of CO_2 in the atmosphere, the circulation of acid-rain. All of these examples show the fusion of physical-environmental metabolisms with socio-cultural and political-economic relations. These all suggest how nature and society are constituted as networks of interwoven processes that are human and natural, real and fictional, mechanical and organic (see Swyngedouw, 2006). They also suggest how the social and physical transformation of the world is inserted in a series of scalar spatialities. 'Dolly', CO_2, or aquifer waters all embody and express physical and social processes, whose drivers operate at a variety of interlocked and nested geographical scales.

We shall address the scalar construction of socio-natural processes and the centrality of a politics of scale in the production of particular geographical configurations. This problematic will be approached from a historical-geographical materialist perspective. First, I examine the question of nature, place and scale. Second, a case-study of the contested construction of spatial scales, in which the social and natural operate in inseparably intertwined manners, is presented. The case study focuses on the tumultuous re-ordering of the scales of hydro-social management and governance in the 20th century. Finally, the importance of a politics of scale in the construction of emancipatory political agendas and strategies is discussed.

3.1 On Nature

In recent years, there has been a resurgence of historical-materialist thought on nature (Benton, 1996; Castree, 1995; Grundman, 1991; Harvey, 1996; Hughes, 2000; Smith, 1984; Swyngedouw, 1999a). Historical-geographical materialism is founded on the ontological principle that living organisms, including humans, need to transform (metabolise) 'nature' and, through that, both humans and 'nature' are changed. This metabolic transformation of nature (environmental change) is always a social and historical process. Put simply, in order to live, humans transform the world they live in, and this takes place in interaction with others; that is under specific 'social relations of production'. This metabolism is necessarily a social process. Both nature and humans, materially and culturally, are profoundly social and historical from the very beginning (Smith, 1996; 1998; Castree, 1995; Haraway, 1997). Although early analyses tended to focus on questions of distribution and power among and between humans and social groups, the inevitable physical transformation of nature and the production of new 'natures' (both materially and socially) remained as a presupposition. The social appropriation and transformation of nature produces historically specific social and physical natures that are infused by a myriad of social power relationships (Swyngedouw, 1996b). Social beings necessarily produce nature; nature becomes a socio-physical process infused with political power and cultural meaning (Haraway 1991; 1997). In addition, the transformation of nature is embedded in a series of social, political, cultural, and economic constellations and procedures (i.e. social relations) that operate within a nested articulation of significant, but intrinsically unstable, geographical scales.

3.2 On Place and Space

The process of perpetual metabolic transformation of social and physical nature and the transformation of social life are part and parcel of the same process. Every day life is necessarily 'placed' or 'situated' by virtue of the need to transform and metabolise (produced) nature. The material and social conditioning of life and of the metabolic transformation of nature are constituted in and through temporal/spatial social relations that operate over a certain scalar extent. Engaging place as 'produced' nature is essential for human existence (Swyngedouw, 1997a). Under capitalism, place as (produced) nature (socially transformed or given) becomes a central element in the forces of production that shape and partly condition capital accumulation trajectories and strategies (Swyngedouw, 1992b). At the same time, place embodies a historical layering of crystallised social relations.

The process of the production of place/nature is inevitably a contradictory one as it necessarily implies a process of 'creative destruction' of nature/society. The conflicting (capitalist) social power relations (along class, gender, or other social cleavages) through which this transformation is organised perpetually destroy or restructure existing conditions and replace them with new configurations and characteristics. Such process of 'Creative Destruction' is always an already social process: the process of metabolic transformation of produced nature takes places in association with others. The thing that is transformed and the thing that arises out of the transformation process is always already part of and embodies the social relations through which nature/society is transformed. The world's historical geography can, consequently, be reconstructed from the vantage point of this perpetual socio-ecological transformation process.

3.3 Scaled Geographies: scaling nature – scaling the social

I insist that social life is process-based, in a state of perpetual change, transformation and reconfiguration (see Harvey, 1996). Starting analysis from a given geographical scale is, therefore, deeply antagonistic to apprehending the world in a dynamic, process-based manner. This has profound implications for what scale means. I conceive scalar configurations as the outcome of socio-spatial processes that regulate and organise social power relations. As a geographical construction, scales become arenas around which socio-spatial power choreographies are enacted and performed (Swyngedouw, 1997a, b; 2000b). With a few notable exceptions, the question of nature has remained largely outside this analysis (Escobar, 2001; Grainger, 1999; Zimmerer, 2000; Heynen and Swyngedouw, 2003; Neumann, 2009). I insist that nature and environmental transformation are also integral parts of the social and material production of scale. More importantly, scalar re-configurations also produce new socio-physical ecological scales that shape in important ways who will have access to what kind of nature, and the particular trajectories of environmental change. The example in the next section attempt to substantiate and elucidate how the 'scaling of nature' is deeply intertwined with the scaling of social life and of the power relations inscribed therein. Before we embark on this, I recapitulate my perspective on the social and material production of scale and scalar gestalts:

1. Scalar configurations, whether ecological or in terms of regulatory order(s), as well as their discursive and theoretical representation, are always already a result, an outcome of the perpetual movement of the flux of socio-spatial and environmental dynamics. The theoretical and political priority, therefore, resides never in a particular geographical scale, but rather in the process through which particular scales become constituted and subsequently transformed.
2. Struggling to command a particular scale in a given socio-spatial conjuncture can be of eminent importance. Spatial scales are never fixed, but are perpetually redefined, contested

and restructured in terms of their extent, content, relative importance and interrelations. The continuous reshuffling and reorganisation of spatial scales are integral to social strategies and an arena for struggles for control and empowerment.

3. A process-based approach to scale focuses attention on the mechanisms of scale transformation through social conflict and political-economic struggle. In many instances, this struggle pivots around the appropriation of nature and control over its metabolism. These socio-spatial processes change the importance and role of certain geographical scales, re-assert the importance of others, and on occasion create entirely new scales. These scale re-definitions in turn alter the geometry of social power by strengthening the power and the control of some while disempowering others (see also Swyngedouw, 1989; 1997b; 2000a).
4. Smith (1984) refers to this process as the 'jumping of scales', a process that signals how politics are spatialized. That is, scalar political strategies are actively mobilised as parts of strategies of empowerment and disempowerment. As the scalar 'gestalt' changes, the social power geometry within and between scales changes.
5. There is a simultaneous, 'nested' (like a Russian doll), yet partially hierarchical, relationship between scales (Jonas, 1994: 261; Smith, 1984; 1993). Clearly, social power along gender, class, ethnic or ecological lines refer to the scale capabilities of individuals and social groups. Engels (1844) already suggested how the power of the labour movement, for example, depends on the scale at which it operates, and labour organisers have always combined strategies of controlling place(s) with building territorial alliances that extend over a certain space.
6. Scale configurations change as power shifts, both in terms of their nesting and interrelations and in terms of their spatial extent. In the process, new significant social and ecological scales become constructed, while others disappear or become transformed.
7. Similarly, ecological scales are transformed as and when the socio-ecological transformation of nature takes new or different forms. For example, the multi-scalar configurations of monoculture cash-cropping agriculture is radically different the socio-ecological scales of peasant subsistence farming.
8. Scale also emerges as the site where co-operation and competition find a (fragile) standoff. For example, national unions are formed through alliances and co-operation from lower scale movements, and a fine balance needs to be perpetually maintained between the promise of power yielded from national organisation and the competitive struggle that derives from local loyalties and inter-local struggle.
9. Processes of scale formation are cut through by all manner of fragmenting, divisive and differentiating processes (nationalism, localism, class differentiation, competition and so forth). Scale mediates between co-operation and competition, between homogenisation and differentiation, between empowerment and disempowerment (Smith, 1984; 1993).
10. The mobilisation of scalar narratives, scalar politics, and scalar practices, then, becomes an integral part of political power struggles and strategies (González, 2006). This propels considerations of scale to the forefront of both ecological and emancipatory politics.

I shall, in the remainder of this contribution, briefly examine one water-related case to illustrate some of the above arguments. Water will be mobilised as the conceptual and material entry into a particular aspect of the social and material production of scale, the making of scalar articulations, and the politics of re-scaling. Life is hardly imaginable without water. The multiple temporalities and interpenetrating circulations of water (the hydrological cycle, canalisation and distribution networks of all kinds, dams, etc.) illustrate its perpetual physical and social metabolism and mobilisation. Water relates all manner of things and subjects in a network, or rhizome, connecting the most intimate of socio-spatial relations; and inserts them in a complex political-economy and –ecology of bodily, local, urban, regional, national and international scales. We can use water as an entry-point to reconstruct, and hence theorise scalar transformations as a political-ecological process (see Swyngedouw, 1999b;

Giglio and Swyngedouw, 2008). Water embodies, simultaneously and inseparably, bio-chemical and physical properties, socio-economic and political characteristics, and cultural and symbolic meanings. These multiple metabolisms of water are structured and organised through relations of power, that is relations of domination and subordination, of access and exclusion, of emancipation and repression. This circulation of water is embedded in and interiorises a series of multiple power relations. These situated power relations, in turn, swirl out and operate at a variety of interrelated geographical scales. The struggle over nature and the uneven access to water turns the issue into a highly contested terrain that captures wider processes of political-ecological change. The example of Spain, developed below, illustrates how the mobilisation of a particular scientific discourse on a specific physical scale (the river basin) becomes an arena for staging political power choreographies that were decisive in shaping processes of modernisation in Spain (Swyngedouw, 1999b; 2007). This shows how 'scales of nature' become incorporated into particular political projects.

4 Modernity, Fascism, Capitalism and the Contested Scaling of H_2O in 20th Century Spain

Spain's history of modernization has been one of altering, redefining, and transforming the physical characteristics of its landscape and, in particular, its waterscape. Today, the country has more than 900 dams, more than 800 of which were constructed during the second half of the 20th century. Every single river basin has been altered, managed, engineered, and transformed. Water has been an obsessive theme in Spain's national life during the last century and the quest for water continues unabated (del Moral Ituarte, 1996; 1998). Understanding the construction of a particular set of nested scales, and the mobilisation of specific spatial scales by particular social groups, is necessary to grasp the choreographies of power and the strategies deployed to push through this modernising project. This process was rife with intense conflict: socio-economic and political disintegration during the first decades of the 20th century, a bloody civil war placing modernisation under the control of a nationalist-fascist dictatorship until 1974, and subsequent rapid transformation into a liberal democracy and associated processes of political re-organization and scalar decentralization. In this example, we shall show how the conflict between modernisers and traditionalists took the form, among others, of a struggle over making and controlling the scale of river basin authorities.

Beginning in the late nineteenth century, the modernising desires of an emerging intellectual elite of 'regeneracionists' crystallised around the transformation of Spain's hydrological structure, in an attempt to harness Spain's waters as the foundation for its economic and political revival (see Swyngedouw, 1999b). Water rapidly became a prime consideration in national political, socio-economic and cultural debates. Spain found itself in a traumatic condition at the turn of the 20th century, having lost its last colonial possessions (Cuba and the Philippines) exactly when other imperial countries were consolidating their empires, and its internal political, economic and social conditions were rapidly deteriorating. Unable to found Spain's modernization on an external geographical project of scale-enlargement through imperial conquest, Spanish modernising elites concentrated on an equally geographical national program, founded on the radical transformation of Spain's internal geography – particularly its water resources (Gómez Mendoza and Ortega Cantero, 1987). As Joaquin Costa, a regeneracionist intellectual, argued in 1880: "[I]f in other countries it is sufficient to for man to help Nature, here it is necessary to do more; it is necessary to create her" (Costa, cited in Driever 1998: 40) [author's emphasis].

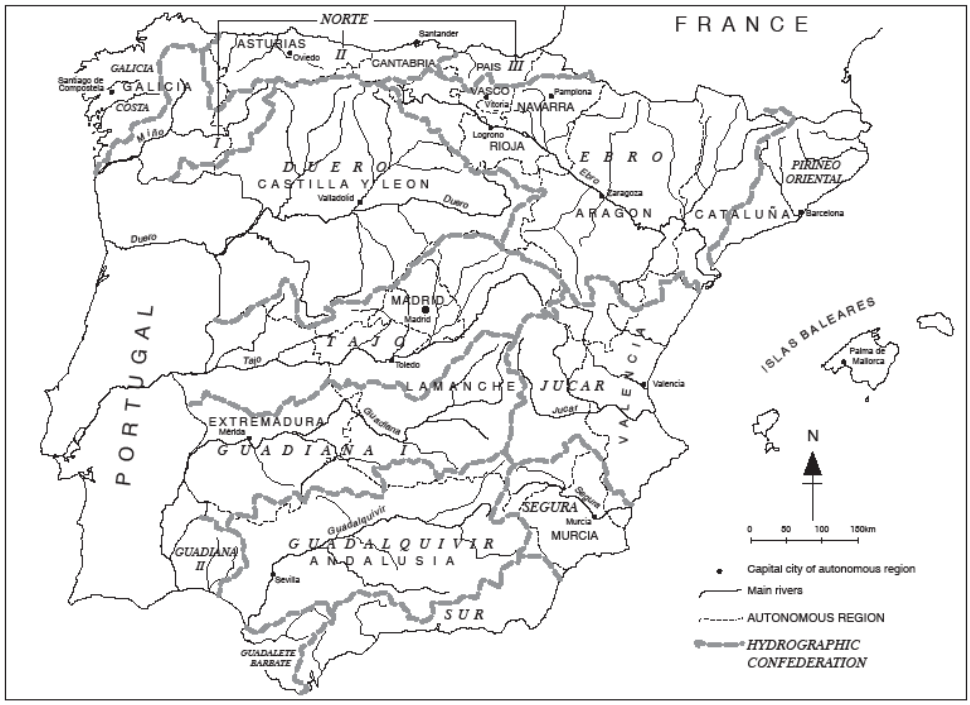
This concern was also voiced by others (like Lucas Mallada (1890) or R. Macías Picavea (1899)). The program of producing a new socio-physical space embodied physical, social, cultural, moral and aesthetic elements, fusing them around the dominant and almost hegemonic ideology of national development, revival, and progress.

The hydraulic intervention to create a waterscape supportive of the modernising desires of the regeneracionists, and of the social and political foundations of the existing class structure and social order, was very much based on a respect for "natural" laws and conditions. The latter were thought to be intrinsically stable, balanced, equitable, and harmonious. The hydraulic engineering mission thus consisted primarily in "restoring" the "perturbed" equilibrium of the erratic hydrological cycles in Spain. Of course, this endeavour required significant scientific and engineering enterprise, in terms of understanding and analysing nature's "laws", and in using these insights to work toward a restoration of the "innate" harmonious development of nature. The moral, economic, and cultural "disorder" and "imbalances" of the country at that time were seen as paralleling the "disorder" in Spain's erratic hydraulic geography, and both needed to be restored and re-balanced.

Two threads need to be woven together in this context: the pivotal position of a particular group of scientists, the Corps of Engineers (Villaneuva Larraya, 1991), and changing visions about the scientific management of the terrestrial part of the hydrological cycle. Both were linked to the rising prominence of hydraulic issues on the socio-political agenda at the turn of the century. The Corps of Engineers, founded in 1799, remains the professional collective responsible for the development and implementation of public works. It is a highly elitist, intellectualist, "high-cultured", male-dominated, and socially homogeneous and exclusive organisation that has taken a leading role in Spanish politics and development (Mateu Bellés, 1995).

In line with the then emerging scientific discourse on orography and river basin structure and dynamics, the engineering community argued for a technical, political, and managerial intervention on the basis of the "natural" integrated water flow of watershed regions, rather than on the basis of historically and socially formed administrative regions (see Map 1). This plea for an orographic regionalization overlaid the traditional political-administrative divisions of the country, forcing a scalar re-ordering of the territory on the basis of its river basin structure. The engineers portrayed the latter as the crucial planning unit and political scale for hydraulic interventions. Cano García (1992: 312) succinctly summarises this scientific perspective:

> "To revert to the great orographical delimitation for organising the division of the land represents a contribution made from within the strict field of our discipline [engineering] and at the same time, at least initially, it shows the abandoning of traditional political divisions and the importance of other perspectives and concepts" [author's translation].



Map 1: Boundaries of Autonomous Regions and the Hydraulic Confederations. Source: Swyngedouw (1999: 459)

As T. Smith (1969: 20) argues, "the identity of the drainage basin seemed to offer a concrete and "natural" unit which could profitably replace political units as the areal context for geographical

study". Brunhes (1920: 93) insisted on the water basin as the foundation for the organisation of the land since "water is the sovereign wealth of the state and its people" (see also Chorley, 1969). Such a view was widely recounted in Spain at the time, and its arguments were rallied in defence of a new orographic-administrative organisation of the territory.

This 'scientific' and 'natural' division, based on the spatial scale of the river basin, provided an apparently enduring and universal scale for territorial organisation in lieu of the historically more recent and 'constructed' political scales associated with politico-administrative boundaries. The history of the delimitation of Hydrological Divisions based on the river basin is infused with the influence of the modernising hydraulic discourse, on the one hand, and the 'scientific' insights gained from hydrology and orography on the other. The attempt to "naturalise" political territorial organisation was part and parcel of a strategy of the modernisers to challenge existing social and political power geometries. The construction of and command over a new territorial scale might permit them to implement their vision and by-pass more traditional and reactionary power configurations. Indeed, the older and historically constructed administrative political scales (municipality, province, and nation-state) were firmly under the hegemonic control of traditional semi-feudal elites who held a tight grip over society and resisted the structural transformations called for by modernisers (Swyngedouw, 2009).

Capturing the scale of the river basin as the geographical basis for exercising control and power over the organisation, planning, and re-construction of the hydraulic sphere was one of the central arenas through which the power of traditionalists (and the scales over which they exercised control) was challenged. River basins became the scale par excellence through which the modernizers tried to erode the powers of the more traditional provincial or national state bodies, while traditional elites held to the existing administrative territorial structure of power. The bumpy history of the hydrological divisions records this struggle (Gómez Mendoza and Ortega Cantero, 1992).

This negotiation of scale and the science/politics debate around the scaling of hydraulic intervention and planning raged for almost a century, before the current structure of river basin institutions was put into place (Cano Carcía, 1992; Mateu Bellés, 1995). The Water Act of 1879 had established that all surface water was common property, managed by the state. This also implied the need to create administrative structures to perform these managerial tasks (Giansante, 1999). The first Hydrological Divisions (ten in total) were established by Royal Decree in 1865, and were considered from the beginning to be major instruments for economic modernisation. Some of these divisions more-or-less coincided with major river basins (Ebro, Tajo, Duero), others (particularly in the South) had a much closer correspondence to provincial boundaries. All were named after the provincial capital city where the head-office was located (Mateu Bellés, 1994). Their basic merit in those early days was to serve as an institutional basis for collecting statistical data to assist research into the hydrological cycle. These surveys could then be used as inputs to the real power holders: provincial head offices for public works, special ad hoc commissions, or private industry (del Moral Ituarte, 1995). The ten Hydrological Divisions were abolished in 1870, partly re-erected a few months later, reduced to seven, abolished again in 1899, and re-established in 1900 when their tasks extended to include the detailed study and planning of, and the formulation of proposals for hydraulic interventions. However, the ultimate decision-making power would remain with the traditional Provincial level, which supervised and executed hydraulic works, and with the central state, for financing and controlling the infrastructure programs (Mateus Bellés, 1994). Control by the conservative local and national state fatally stalled implementation of these projects.

The complex and perpetually changing administrative organisation and power structures associated the successive attempts to establish river basin authorities, and their relative lack of power until the 1930s, reflect the failure of the early modernisers to successfully challenge traditional power lineages and scales (Mateu Bellés, 1994; 1995). Only after 1926 were the current Confederaciones Sindicales Hidrográficas gradually established as quasi-autonomous organizations in charge of managing water,

as stipulated by the 1879 Water Act (Giansante, 1999). The last of these ten Confederaciones was finally established only in 1961 (see Map 1)!

What had proven impossible to achieve during the first decades of the century was finally fully implemented during the Franco dictatorship. Franco's fascist rule permitted the final formation of powerful river basin authorities, and aligned the scale of the national state closer with the interests of the engineering community in re-organising the hydraulic geography of the country. The Confederaciones acquired a certain political status with participation from the State, Banks, Chambers of Commerce, Provincial authorities, etc. At each stage engineers took leading roles and became the activists of the regeneracionist project through a combination of their legitimisation as holders of scientific knowledge and insights, and their privileged position as a political elite corps within the state apparatus.

By the end of Franco's rule, in 1974, Spain's hydroscape had been overhauled profoundly. Every single river basin is now fully managed to the 'last drop' of available water. With the advent of democracy, however, the politics of scale around the water nexus took a new twist, as the ongoing desire to modernise the Spanish economy required ever-greater control over and management of the country's available water resources. As limits to river basin-based water management became evident, the water engineering community and its socio-economic allies 'jumped scales' and began to argue and lobby for the material construction of a national water-grid. The latter would produce a national water system, connecting every river-basin to form a national managerial and material (infra)structure. This would permit significant inter-basin water transfers and a more 'efficient' use of the available water resources. Over the past twenty years, this national water project has become a major domain of political conflict, in what is now a liberal-democratic polity. Various spatial scales, such as regional interests, localist strategies, and national projects, have been mobilised and are staged against each other. Different social groups, such as ecologists, the agricultural lobby, the tourist industry, the energy sector, and regionalists also mobilise different scales in their quest for political clout in a process that once again is remaking the political and ecological landscape of Spain. The attempt to produce a nationally integrated water management system reached its apotheosis in 2001 with the approval of the Second National Water Plan, a plan that envisaged the production of a national water grid, articulated around the interconnection of all mainland river basins into a unified and nationally managed hydro-social scalar order.

However, when on 14 March 2004, just a few days after the 11 March Madrid train massacre, José Luis Rodriguez Zapatero of the socialist PSOE unexpectedly wins the Spanish elections, one of the first measures his new government takes is to scrap the most controversial parts of the Second National Hydraulic Plan that had been approved by José María Aznar's conservative administration. The primary target of the discontent centred around the plan to transfer large quantities of "surplus" water from the Ebro river basin to the "deficit" basins of the semi-arid Southeastern regions of the Levant on the one hand, and to Barcelona on the other. The river diversion schemes were replaced by a new socio-technical logic, centred around desalination and the construction of large number of high volume but decentralised desalination plants to deal with recurrent and endemic 'water scarcity'. A new scalar articulation emerged, predicated upon the mobilisation of the sea into the terrestrial hydro-social cycle, on the one hand and a more locally or regionally organized hydro-social process, albeit articulated with globally organized water and desalination companies.

The originally planned large-scale inter-basin water transfers continued a hydraulic logic pioneered in the early decades of the 20th century and developed further during the long fascist dictatorship. After the restoration of democracy, this model was increasingly challenged by a range of social actors. Demands for regional autonomy, the rise of the environmental movement, concerns about growing water 'scarcity', party-political conflicts, among others, began to challenge the dominant socio-hydraulic regime and demanded radical changes. The latter crystallised in the new plans for

desalination (Sauri and del Moral, 2001; Masjuan, et al., 2008). The political-ecological assemblages through which this desalination project is articulated alters yet again the scalar 'gestalt' of water governance whereby new territorial configurations and an altered geometry of social power relations shapes this emerging new waterscape in Spain.

5 Conclusion: Re-centring scale and the contested politics of re-scaling

The production of spatial configurations as socio-environmental cyborgs, part social part natural, excavated through the analysis of the circulation of hybridised water (water that is simultaneously physical and embodies deep socio-cultural and political-economic meaning) opens up a new arena for thinking and acting. This arena is neither local nor global, but weaves a network that is always simultaneously deeply localised and extends its reach over certain scales, and certain spatial surfaces. The tensions, conflicts, and forces that flow with the water through the body, the city, the region, and the globe shape continuously shifting power geometries, organised in a perpetually shifting and contested scalar configuration.

The example of Spain illustrates how the production of socio-ecological scales is centred on the social transformation of nature and the construction of socio-ecological and political-ecological scalar gestalts. Concrete geographies, with choreographies of uneven and shifting social power relations, are etched into these ecological, social, political or institutional scalar configurations. These processes are infused with contested and contestable strategies of individuals and social groups, who mobilise spatial scales as part of struggles for control and empowerment, and contest the power geometries of extant scalar gestalts. Needless to say, the mobilisation of scale, the occupation of geographical scale, and the production of scale are central moments in such processes of socio-spatial change. Struggling for the command of scale, or strategizing around excluding particular groups from the performative capabilities of certain scales, shapes social processes, defines relative empowerment and disempowerment and gives rise to very specific socio-spatial relations.

The politics of scale, then, although pivotally focused on the mobilisation and appropriation of (metabolised) nature, necessitates a careful negotiation of the tensions, conflicts, and contradictions within and between scalar formations. The up-scaling of Spanish water politics and engineering to the national scale mobilises scalar politics that range from the re-affirmation of regionalist claims for autonomy, and demands from ecologists for a radical transformation of water practices, to the mobilisation of the European Union as possible political ally or financial donor. Forging scalar alliances may be a torturous and extremely difficult process, particularly for subaltern groups, for whom loyalty to and an insertion into a local social and physical ecology is of prime importance, and who are faced with the scalar mobilisations commanded by hegemonic global projects (such as global deregulation and free trade). The historical geography of capitalism is littered with examples of how socio-spatial conflicts prevent the formation of ‘scaled’ alliances, particularly by those that are already disempowered. Yet, a progressive politics of scale and the mobilisation of scale are rapidly becoming key components in strategies to produce the democratic and inclusive social and ecological spaces that many of us dream of inhabiting.

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