Rivers of Diversity: Evolving Water Regulation in California and the European Union

Gabrielle Bouleau (1), Matt Kondolf (2)
(1) UMR G-EAU, Cemagref, 361 rue Jean-François Breton, F-34196 Montpellier, France gabrielle.bouleau@cemagref.fr
(2) LAEP, University of California, Berkeley, kondolf@berkeley.edu

1. Introduction

Aquatic and riparian areas have long been recognized as biodiversity 'hotspots' in the landscape, and thus have been the focus of many environmental regulations. Principal threats to aquatic biodiversity have been water quality degradation from pollution, morphological modifications and reduction in water quantity from diversions for human uses. Adequate flows in rivers are increasingly recognized as essential to maintain or restore aquatic ecosystems (Ward et al. 1997; Poff et al. 2003; Kondolf et al. 2006), and such ecosystem flows must be implemented in the context of water rights. With changes in runoff regimes anticipated from climate change, threats to aquatic biodiversity will be severe if water rights and regulations established in past eras cannot be modified to reflect emerging objectives of biodiversity and ecosystem health (Knox and Scheuring 1991). River and their floodplains support a wide range of conditions (reflecting variations in vegetation, substrate, groundwater levels, frequency and seasonality of inundation, and microclimate), which in turn provide a wide range of habitats and thus supporting many, diverse species. Riparian zones are arguably the most diverse parts of many landscapes (Naiman et al. 2005). From a human perspective, rivers and floodplains have multiple functions besides supporting biodiversity: water supply, flood storage and conveyance, groundwater recharge, improvement of water quality, and corridors for wildlife migration. While focusing primarily on water rights and water quantity issues, this paper also addresses morphological modifications and quality issues. Biodiversity is threatened by the combination of such pressures. Dams were built on watercourses in order to divert water and their fate is linked to corresponding water rights. Changes in water quantity impact its quality because inflows determine saline and pollutants concentration. As we will show regulations targeting water quality issues have also implications on water quantity aspects.

To find inspiring examples of regulatory adaptation, scholars often look to comparisons among developed countries of the European Union (EU) and states of the United States of America (US), notably California (Vogel 2005). Political analysts (Majone 1996; Genschel and Plumper 1997; Vogel 1997; Vogel 2000; Princen 2004; Prakash and Potoski 2006) and environmental historians (Worster 1973; Gottlieb 2005; Walker 2008) have recognized the EU and California as cutting-edge regulators for the environment. Yet, apart from general statements on economic wealth and cultural green awareness, common explanations for their regulatory innovation have not been articulated.

This paper shows that the EU and California have experienced similar challenges in the politics of water that may account for their regulatory innovation. In order to justify the relevance of the comparison, we start by laying out the institutional and political context of our case-studies. We then argue that California's water law pays much attention to the efficiency of water uses, an economic indicator well-accepted by powerful economic actors. We show that competing definitions of efficiency arose as population grew and the relative importance of various economic sectors evolved. We describe the resulting situation today, with spectacular adaptations but shortcomings to address climate change. We then turn

towards the EU using France as an example of a Member State. We show that water allocation in France mainly results from historical governmental choices which efficiency was impossible to assess due to the segmentation of law. Facing strong and conflicting interests in water supported by powerful economic states, the EU's regulation of water is similarly based on efficiency assessment. We conclude with a comparison of the two cases, arguing that diversities faced by the EU and California have had comparably stimulating effects on efficiency-seeking policy. Yet both regulations could learn from each other to better address climate-change and social acceptability.

2. Why is it relevant to compare California and the EU?

Both California and the European Union are considered as places where - despite significant economic and demographic stakes - environmental protection in general and instream flow restoration in particular, benefit from innovative thinking. The following is but a partial list of major elements that contributed to their reputation in this domain.

Only one year after US Congress had approved the first federal environmental protection statute, the National Environmental Policy Act (NEPA) in 1969, California supplemented it through state law. The legislature passed the California Environmental Quality Act (CEQA) in 1970 which expands environmental review requirements to state projects and projects requiring state agencies approval. Whereas NEPA requirements are alleged to be mainly procedural, the significance of substantive evidence in environmental impact reviews under CEQA, especially in water-related projects, has been confirmed by the Supreme Court of California since then. California has also become famous for the dramatic decision of its Supreme Court in the Mono Lake litigation, holding that the public trust doctrine required the reduction of the long-existing water rights of Los Angeles Department of Water and Power (National Audubon society v. Superior Court 1983). The efficiency of Los Angeles's water conservation programs have been acclaimed worldwide, and as described below, the streams of Mono Basin and the Owens Valley, which Los Angeles largely dried up to divert their flow southward through most of the 20th century, are being given back part of their natural flow to restore their aquatic ecosystems. First attempts to re-allocate water through water rights trading occurred initially in California, although observers are still doubtful whether this reallocation may support ecological restoration (Christian-Smith 2006). Finally, California is one of the most active theatres of river restoration in the US, with over 4000 distinct projects identified in a recent survey (Bernhardt et al. 2005; Kondolf et al. 2007). The single most important motivation for river restoration in California is restoration of habitat for native salmon species, whose populations have declined dramatically in response to human impacts. From 1996-2004, the CALFED Bay-Delta Program funded over $500 million USD in restoration projects, many for salmon or other threatened native fish, and a comparable amount again was spent over the same period by the US Bureau of Reclamation and the US Fish and Wildlife Service for salmon-related restoration (Kondolf et al. 2008).

At the time of NEPA and CEQA, the European Economic Community did not play a significant role in the environmental policy. Its competence in that domain dramatically expanded after massive pollution of the Rhine in 1986, which killed fish for 100s of km downstream from Switzerland to the Netherlands, even threatening the Dutch water supply. Attention given to this event made water policy the "jewel in the crown" of the EU environmental policy (Kallis and Nijkamp 2000; Aubin and Varone 2002). Through the 1990s, the European Union gradually developed a set of directives that are heralded as highly integrated water resources policies. Some, such as the Urban Waste Water and Bathing Water

initiatives were not considered very innovative when issued, because most of their provisions had prior US equivalent under the Clean Water Act of 1973 (Bouleau 2008). But the scope of their binding conditions became obvious recently when the EU Court of Justice fined Spain €624,150 per year for every 1% of inshore Spanish bathing waters that continue to fail to meet the quality standards set in the Bathing Water Directive. Similarly several Member States are threatened by pendant litigations for poorly enforcing the UWW or the Nitrate directive (1991). With the Water Framework Directive adopted in 2000, the EU was heralded as the international leader in river basin management. This statute combines institutional settings, economic tools, and biological requirements to foster integrated water management at the river basin scale, in all Member States, with binding and short deadlines (2015).

The State of California and the European Union have developed significant pieces of law that are very demanding in term of ecological standards. Such elements account for the interest of water experts toward California and the EU. Yet no recommendation can be drawn from these examples without in-depth understanding of the conditions that made innovative approaches possible. We propose that drivers for change in favour of aquatic biodiversity in California and the EU are similar, despite many different institutional, legal and political settings, for which we account below.

Scholars in political sciences and law usually apply different categories to describe institutions of the State of California and those of the EU. First, from a governmental point of view, California is one of the fifty states of the Federal Union, whereas the European Union is a non-federal institution gathering twenty five sovereign states, some of them being federations. Thus the comparison seems to overlook a fundamental inconsistency in institutional hierarchy. Second, the role of both entities in the governance of water significantly differs. The state of California has sovereign power to allocate water resources in the public interest whereas the European Union only exerts a non-exclusive competence over water regulation, which scope is restricted to quality; water quantity allocation remains the competence of member states. At first glance, California seems in a better position to rule water uses than the EU. Third, many of the western states of the US rejected the riparian doctrine of water law still prevailing in the Atlantic and Midwestern states. California is the exception in that it adopted the “common law of England” when it entered the Union in 1850 and conformed to the American reasonable rule of the riparian doctrine, but it also adopted the prior appropriation system during the 19th-century gold rush, and is now governed by both (Sax et al. 2006 :328). By contrast, most European countries guarantee the right of riparian owners to receive, without diminution, the natural flow of the stream. Thus basic provisions of water law in California and in the European countries point to opposite directions. With so many structural differences, it is hard to imagine what California and the EU have in common that could account for their innovative practices for governing aquatic biodiversity.

But they do. Firstly, California is comparably diverse in landscapes to Europe, with elevations from 80 m below sea level to over 4000 above, from desert to humid temperate forests. Such diversity of physical features induced comparable biodiversity. In Europe, aquatic biodiversity is the highest around the Mediterranean Sea (which was not glaciated in Pleistocene time). It is also there that aquatic biodiversity is most threatened by water diversion. Similarly most Californian population settled in Mediterranean-climate coastal landscapes where biodiversity is high but seriously threatened by human activity.

Secondly, both regions provide success stories of river restoration after a long period of degradation. Pollution similarly increased in rivers during the nineteenth and the first part of

the twentieth century in the United States and the European Union, as in many industrial countries. But dramatic events largely covered by media in the last part of the century reversed this trend, at least its social perception. In 1952, the Cuyahoga River (Ohio) was so badly polluted by chemical discharges that it caught fire, causing severe damages. This helped to spur the environmental movement nationwide and to support the demand for river restoration. In the same way, in 1986, the Sandoz factory in Switzerland caught fire and resulting waste water was discharged in the Rhine, causing massive fish mortality in all downstream riparian countries down to the Netherlands. Pictures of dead eels shocked the Europeans and stimulated environmental movements. It encouraged public policies in favour of river restoration. Interestingly, in California and in the European Union, salmon were used as flagship species drawing much attention to successful restoration projects. Salmon fishing attracts tourists worldwide whereas other species may only draw attention locally. Yet this smart communicating strategy would not have performed without political power. In California and in the European Union, spurring stemmed from intellectual elite who had few ties with industry. After World War II, Western universities educated more young people than industry could employ. While industrial employees were reluctant to criticize pollution practices bound to their job, the highly educated generation not held by such bonds spoke up (Douglas and Wildavsky 1982; Mendras 1994). Environmental movements succeeded in changing the law and providing funds to restore rivers. Success stories of river restoration on both sides of the Atlantic probably became popular because they took place in democratic and market-oriented countries. They were used to argue that nothing prevented other western countries from combining economic growth and environmental protection.

Last, as they develop rules to protect aquatic biodiversity, the EU and the State of California similarly face powerful reluctant actors. Beyond such success stories, aquatic biodiversity is still threatened in both regions. Many fish species are still endangered. Legal innovations and dramatic jurisprudence must be confronted to implementation and results. The enforcement of courts' decisions and state agencies' policies mainly depend on local stakeholders who enjoy many opportunities to open gates, pump, divert, discharge water without being effectively controlled[1]. Empirical observations reveal that California and the European Union have much in common in this respect.

California and the EU have in common to deal with powerful corps of water engineers who are not under their authority and who traditionally promote economic uses of water. In California and other western states, large irrigation schemes were built and are still operated by the US Bureau of Reclamation, whereas flood control facilities have been the purview of the US Army Corps of Engineers. The power and the relative autonomy of this agency is well described in the literature (Porter 1995; Espeland 1998). Similarly the EU experiences difficulties interacting with corps of water engineers in countries like France and Spain (Swyngedouw 2003; Bouleau 2007). As main spokesmen of their country for water management, they are reluctant to transfer prerogatives obtained from a long tradition of centralised water management, paralleling systems used to develop their former colonies. There is neither such a thing as a Californian State corps of engineers nor a European one.

In both areas, irrigation is responsible for 80% of water consumption and is supported by public policies serving political coalitions stronger than those defending the environment. In California, the cost of water and energy is subsidized in federal irrigation districts. In the EU,

[1] How weak is the law when facing the power of local actors to divert water is a classic source of conflicts. It constitutes the basis of the plot of famous literary and film works in very different legal and cultural contexts (See for example 'Chinatown" and "Manon of the spring").

irrigated corn production is subsidized by the Common Agricultural Policy. But at the same time, urban claims for water supply and leisure activities are increasing in both areas, as agriculture weights less in the overall production and payroll. In both regions, the growing urban water uses try to challenge senior farmers' water rights which activity is largely subsidized.

Environmentalists in California and the EU are influential minorities. Both regions are divided by internal linguistic, social and ethnic heterogeneity. It is well acknowledged by political ecologists that social identities strongly influence how nature is perceived and what biological species people desire to preserve. In the EU, the economic gap between wealthy Northern countries and relatively poorer Southern countries matches both the cultural divide between Latin and Anglo-Saxon countries and between irrigated and non-irrigated lands. Therefore EU's environmental regulation is broadly understood as imposed by Northern countries to the Southern ones. Similarly, the American environmental movement has always been divided and weakened by opposition between middle-class wilderness lovers and working-class environmental justice activists (Gottlieb 2005). Nowhere in the US is this divide more conspicuous than in California where great natural areas adjoin poor neighbourhoods threatened by industrial hazards (Matsuoka 2003). In both regions, cultural diversity weakens the political legitimacy of environmental claims, because different social groups have different priorities. Yet the federal/international scale historically happened to be strategic arenas for Californian or European Member states' environmentalists.

Last, both governmental bodies are reluctant to employ large numbers of civil-servants to enforce the law. The EU has no staff in Member States and most water litigations arose from citizen associations. In California, the staff in charge of water rights deals mainly with issuing permits (with long delay) and has essentially no time to field-check the reality of uses (Benson 2004).

Hence the State of California and the EU experience very similar hurdles when they come to try to restore aquatic biodiversity of their rivers. Neither California nor the European Union has its own corps of engineers to forge a unitary environmental management of rivers. Both governmental bodies experience strong internal opposition of irrigators in their attempt to secure more water for aquatic species. Neither can rely on social cohesion to promote environmental values, because social diversity leads to a diversity of environmental expectations. For all these reasons, the power of enforcement and persuasion of the EU and the State of California is similarly fragile. Climatic and social diversity crumbles their legitimacy. Strong economic and political institutions do not need innovative legal instruments. Weak institutions may be more creative in this domain. To restore aquatic biodiversity, California and the EU have largely counted on law. They have developed more procedural and legal provisions than command-and-control instruments.

3. Evolution of water regulation in California

The Gold Rush and post World War II industrialization were spectacular drivers for water appropriation in California. As the sharp inequities resulting from 19th C water allocations have become apparent, powerful stakeholders tried to challenge existing rules in courts. Although courts mostly confirmed existing water allocation, such cases set the scene for broader public debates and legislative actions to change doctrines. As a result, contrasting to other Western States' clear-cut prior appropriation doctrine, different doctrines govern California's water law fostering piecemeal litigations. Government and legislature hardly had

the legitimacy to favour one water use at the expense of another. Instead they sought support from large coalitions by referring to values shared by powerful actors such as *efficiency*. In this section, we present the evolution of water law in California showing that existing water rights were more challenged in this state than in other Western states. Then, we enlighten the significance of federal environmental laws in California in relation with state additional provisions. Last, we outline the history of the Mono Lake basin to illustrate how the multi-layer water law in California offers room for adaptation to evolving societal preferences.

Historical challenges to water rights in California

As California entered the Federal Union (1850), its legislature adopted the Common Law of England. As a consequence California inherited from the riparian doctrine of water rights, although it was already much debated in the rest of the Union. The riparian doctrine had no consideration for the efficiency of water uses. It held that the landowner of a riparian tract had the right of the natural water flow, unimpaired in quantity nor quality by any upstream use. Today such a doctrine would appear as very protective of the aquatic environment. Ironically, it was adopted in England to protect the interests of the landed gentry. The doctrine suited to an agrarian society requiring little irrigation water. It became much questioned in America as other uses developed.

The idea that water could be better used emerged in Eastern States with industrialization. Industrials claimed that the riparian doctrine poorly performed water allocation since it required streams to flow "unused" through riparian lands. To resolve water conflicts between farmers and mill owners, State courts begun to develop the American doctrine of reasonable use which restricted riparian rights (*Tyler v. Wilkinson* 1827, Rhode Island; *Martin v. Bigelow* 1827, Vermont).

In California, the industrial challenge raised by the Gold Rush was even stronger. Diversion for productive use became the rule. The Gold Rush occurred before the region had been officially transferred to the United States. No rules defined property rights in the gold fields (Fischer and Fischer 1990). Squatters diverted water to mines, often distant from the rivers. These 'Forty-niners' developed their own doctrine of prior appropriation allocating rights by order of precedence among users. Gold seekers risked losing their appropriative water rights if they failed to exercise the beneficial use in due diligence. The only limit to water appropriation was prior appropriation. The doctrine sought to prevent speculation and monopoly, to maximise society's productive use and to secure flexibility in water uses (Neuman 1998:962-6). Californian courts increasingly recognized the prior appropriation doctrine which governed local uses by a matter of fact (Sax et al. 2006 :331). Supporting this evolution the Federal legislature adopted the Mining Act of 1866 which required the protection of water rights acknowledged by local usages.

Yet Californian judges expressed concerns for investments undertaken in reliance on riparian rights and they maintained the riparian doctrine in force. In the *Lux v. Haggin* law case of 1886 the Supreme Court of California held that riparian rights in California were superior to all subsequent appropriations. Such a limitation threatened further settlements on non riparian lands in arid states. As a response, the federal Wright Act of 1887 secured water rights for non-riparian farmers in irrigation districts. Again in 1928, the Supreme Court decided in favour of a riparian farmer whose irrigation practices were poorly effective (*Herminghaus v. Southern California Edison).* Less than two years later, California voters required that riparian owners as well as other water users be more accountable. They limited all water rights (for

surface water and groundwater) to "reasonable and beneficial uses" (Article X section 2 of the California Constitution), combining two industrial claims for a better efficiency of water uses in one state constitutional amendment.

The beneficial use doctrine alone, as it has been implemented and interpreted, is not an efficiency-seeking doctrine (Neuman (1998 :975-8). It relies on a generous and poorly defined concept of waste, and forfeiture was never aggressively enforced. Reasonableness is more challenging since its definition is ever-evolving: "what is a reasonable use or method of use of water is a question of fact to be determined according to the circumstances in each particular case" (*Joslin v. Marin Municipal Water District, 1967*).

Further complicating the picture are the "pueblo rights" of cities, the pueblo's communal rights to water from the river, inherited from Spanish colonial era, and affirmed in legal decisions in California courts the 19th century (Kahrl 1982). In fact, the City of Los Angeles successfully asserted its pueblo rights to shallow groundwater fed by the Los Angeles River (Kahrl 1982). By protecting public access to waters from nearby rivers, pueblo rights (and their support in legal decisions) reflected the value placed by society on water supply for urban populations as taking precedence over other uses.

Since 1914, the State Water Board has been able to restrict water appropriation through permit process (1) to limit harm suffered by other water rights holders (such as subsidence or water table lowering), (2) to secure the public trust (following the case *Audubon National Audubon society v. Superior court, 1983*) and (3) to restore environmental in-stream flow. Efficiency nowadays is assessed in reference to a large set of beneficial uses including economic sectorial uses (aquaculture, power generation, irrigation, mining, …) community water needs (fire protection, recreation, municipal uses, …) and environmental requirements (fish and wildlife, and water quality control). Nevertheless existing water rights often exceed what would be a sustainable use with regards to the preservation of aquatic biodiversity. The "use it or lose it" rule is enough to motivate most farmers to put their water rights in use. In order to transfer, rather to lose, agricultural water rights to increase instream flow, California has experimented two innovative tools (Christian-Smith 2006).

After five years of drought, in 1991, the California Department of Water Resources (DWR) established a Drought Water Bank. As explained by Letey (2005), "DWR offered to purchase water at a price of $125 per acre-foot from any willing seller and then sell water at the price of $175 per acre-foot plus delivery costs. Under this pricing arrangement 820,000 acre-feet of water were purchased but only 555,000 were sold. The excess 265,000 acre-feet were placed in storage for future years". This pricing arrangement convinced some of the farmers to fallow their land. But some others simply compensated for sale of their surface waters by increasing their groundwater uses. Effects were difficult to assess, since increased precipitation in 1992 relieved the drought.

The second innovative instrument is the Water Code section 1707 which permits the transfer or dedication of all or part of existing water right specifically for environmental purposes. The State Water Board reviews such petitions to prevent any injury to third parties, with petitions for one-year permits having priority for expedited review. This process allows farmers to forego diversions, leaving more water in-stream for aquatic organisms, without jeopardising their water rights. However this provision does not prevent riparian rights holders and downstream appropriators with a senior water right to divert the "dedicated" water.

Water allocation in California has always been adjusted in order to satisfy a growing population. To keep their water rights, holders got incentives to use as much water as they were allowed. However competition between sectors challenged obvious ineffective uses and promoted economic considerations to adjudicate water rights. Environmental concerns emerged recently. Despite innovative administrative instruments, environmental uses mostly hold junior rights. A decrease in water diversions would not necessarily benefit fish.

Challenges and opportunities raised by Federal environmental laws in California

The water regulation in force in California is not limited to state law. The Clean Water Act (CWA) and the Endangered Species Act (ESA) are federal command-and-control instruments, confounding the complexities of water law in the state, without solving potential conflicts. Yet, California cannot be considered as a passive state regarding these federal legislations: Its environmental NGOs were instrumental in passage of federal legislation; Californian judges use CWA and ESA as a sword of Damocles over unsustainable water uses; and last, California state legislation forged additional procedures offering environmentalists more room to weigh in on federal processes.

As argued above, the state of California never had the political legitimacy to impose strong command-and-control legislation, but the federal government did. As federal agencies exercised substantial discretion on dam building and land reclamation projects in California, the federal level became strategic for Californian environmentalists. Although events outside California are often cited as the impetus for federal environmental legislation, scholars acknowledge the role of Californian social and environmental activists in opening doors and drawing attention to these issues (Douglas and Wildavsky 1982; Espeland 1998; Gottlieb 2005).

Challenges raised by Clean Water Act (1972) cannot be more obvious than in California. Under CWA, federal agencies set water quality standards supporting ‘designated’ uses in all US waters. Designated uses should include fishing and swimming uses and, if attainable, biological integrity. The federal act requires to limit point sources of pollution by applicable technology-based limits and to implement cost-effective and reasonable best management practices for non-point sources. Designated uses represent a trade-off between biological integrity and attainability. Where requirements to satisfy desired uses would involve substantial environmental damages or widespread social and economic costs, environmental agencies may define less stringent objectives. CWA is not only a command-and-control policy. Since 1989 the Environmental Protection Agency has been providing the Water Pollution Control Revolving Fund, capitalized with federal funds authorized under CWA plus a mandatory 20% state match. Defining water quality standards is the duty of state agencies, but the federal Environmental Protection Agency may promulgate substitutes. In any case, existing uses must be maintained.

CWA conflicts with existing water rights but says little about possible solutions. For example, existing uses include large water diversions from the Delta to Southern California for irrigation and drinking water. Such uses require low salt concentration rates. With greater reservoir storage and upstream diversions, freshwater flow into the delta decreased, and higher salinity water progressed inland from the lower estuary. With climate-change-induced sea-level rise, the salinity problems will worsen, making it more difficult to meet water-quality standards for designated uses in the Delta.

The second federal provision challenging water rights without re-allocating water in California is the Endangered Species Act (1973). Its purpose is to conserve endangered species and the ecosystems on which they depend. It defines listed species and protected species. All federal agencies must avoid taking actions that may cause jeopardy to any 'listed' species. In addition ESA prohibits a "take" of any member of a 'protected' species of fish or wildlife, meaning to harm or to degrade its habitat. ESA is not a pure command-and-control legislation either. Since 1982, habitat conservation plans have been funded to mitigate incidental takes. ESA implementation in California is at least as challenging as CWA. The California's delta for example hosts several endangered species.

Neither CWA nor ESA restrict water uses directly and permanently, but represent on-going threats. When the US Fish and Wildlife Service determined that winter-run Chinook salmon and the Delta smelt were affected by large diversions by the Central Valley Project and the State Water Project, a US District Judge imposed short-term curtailments on water deliveries from both projects. The US Bureau of Reclamation and Fish and Wildlife Service frequently clash over issues in California. The leeway for action between these federal agencies consists of revising permits, expanding the scope of consultation for projects and defining procedures of hearings and negotiation.

The California's Environmental Quality Act (CEQA) of 1970 requires that all public projects (or projects subjected to state agency approval, as confirmed by the Supreme Court of California in *Friends of Mammoth v. Board of Super. of Mono County 1972*) shall be subjected to an environmental impact review. This provision expands the scope of federal laws since it gives biologists opportunities to challenge plans that otherwise may proceed unnoticed. Subjected to changing but nonnegotiable regulations, the State of California multiplies opportunities to revise water allocation.

To address the impasse in Delta policy, California developed an institutional innovation. The 1994 Bay-Delta Accord (signed by federal and state agencies, NGOs, and water contractors) lunched the CALFED Bay-Delta program, which involved both federal and state agencies. CALFED sought to increase reliability of water supply through increased storage but also through an ecosystem restoration program, which undertook physical actions in river and tidal channels with the aim of increasing populations of key fish species so that their survival would no longer be threatened by losses at the large diversions, and thus eliminating the threat of curtailments of pumping. Unfortunately, the CALFED program lost political support in 2005, was unable to reach an agreement on funding commitments (Howitt 2007; Lund et al. 2007), and suffered from fundamental weaknesses in institutional structure (Little Hoover Commission 2005). While still extant, the program is much diminished from its former role, and the efforts to develop solutions to the problems of the Sacramento Delta are now concentrated in the Delta Vision program, led by a Task Force appointed by the governor (Isenberg et al. 2008a; Isenberg et al. 2008b).

Primarily affected by water diversions initiated by development federal agencies, Californian instream flows are ironically protected by environmental federal provisions largely supported by Californian environmentalists. Between the two fires of development and ecology, California requires more expertise than other states, asking for cost-benefit analyses and ecological opinions. There is no clear-cut doctrine establishing water rights once for all in California. Reasonableness and social benefits are much debated. On the one hand, conflicts between strong economic interests entailed enough uncertainty in water rights to favour innovative performing technologies, notably in areas where water conflicts were the sharpest.

On the other hand, general lack of information on stream flow processes and the dearth of monitoring stations weakened enforcement. Courts redefined water efficiency in time. To date two antagonistic principles prevail, the beneficial and reasonable use doctrine and the protection of endangered species. Enforcement is difficult, but California opened doors to civil actions under CEQA.

Evolving Societal Preferences and Law: Case Study of Mono Basin, the Owens Valley

The City of Los Angeles looked to the eastern Sierra Nevada to augment its local water supply early in the 20th century, first obtaining waters of the Owens River by sending agents to secretly purchase lands and their water rights in the Owens Valley (Reisner 1986). By the 1930s, the Owens Valley sources were insufficient, and the city reached northward to take waters in streams tributary to Mono Lake. The story of how Los Angeles got these waters has been told in many accounts, perhaps most famously in the film *Chinatown*. One interesting aspect was that the Owens Valley had been identified by the US Bureau of Reclamation as a site for an irrigation project, but Los Angeles was able to prevail, arguing that urban needs should trump agricultural uses (Kahrl 1982). The northward expansion of the Los Angeles water supply system involved construction of Grant Lake Reservoir on Rush Creek, the largest tributary to Mono Lake, and excavating a tunnel from the reservoir southward to the upper Owens River (the Owens River channel was used to convey water downstream to the beginning of the Los Angeles Aqueduct, below which the river was allowed to dry up). Mono Lake is a saline, terminal lake, whose level in any given year reflects the balance of recent inflows (from freshwater creeks) and evaporation to the dry desert air. Exports from the Mono Basin began in the 1940s, and Rush and Lee Vining Creeks began to dry up as flow was diverted from them. With its two principal tributaries cut off, the level of Mono Lake began to drop (7m by 1980) (National Research Council 1987). It was litigation to save Mono Lake from excessive water level decline and consequent increased salinity that led to the landmark ruling in Audubon case (*National Audubon Society vs Superior Court, 1983*), which affirmed the applicability of the public trust doctrine to protection of ecological values of waters. While it was to save the ecological resources of the saline Mono Lake that the famous *Audubon* decision applied, ironically it was to preserve exotic fish in tributary streams that the first waters deliberately released for ecological benefit actually reached Mono Lake.

Rush Creek was celebrated for its fishing, for introduced rainbow (*Oncorhynchus mykiss*) and brown trout (*Salmo trutta*). When Los Angeles began diverting water from Rush Creek and allowed the stream to dry out, it would seem that the state Fish and Game Code's requirement that operators of a dam or diversion maintaining would be violated. However, in the era of the 1940s, there was little public or institutional support to maintain fish at the expense of public water supply, and the City was allowed to dry up Rush Creek. The years 1982 and 1983 were wet, and the City's water needs (and capacity to convey water southward) were already exceeded by Owens Valley tributaries, so the flows of Rush and Lee Vining Creeks were treated as surplus water and discharged through a so-called « Waste Gate » into Rush Creek, where it flowed downstream to Mono Lake. During that two-year period, trout re-established themselves in Rush Creek. With the end of the wet years in 1984, the City would have shut off the flow of water to Mono Lake, but was prevented from doing so by a lawsuit filed by environmental NGOs arguing that the state Fish and Game Code required the City to release sufficient flow to maintain the trout in good condition. The NGOs prevailed, launching a series of studies of how much water needed to be released maintain the fish in good condition. The same requirements were ultimately applied to other Mono Lake tributaries (Lee Vining, Walker and Parker Creeks). The change from the 1940s to the 1980s largely reflects changes

in public values, with the rise of environmental concerns motivating application of law that existed before, but which had not been enforced.

In a similar story, the Owens River descends steeply from Long Valley to the Owens Valley floor through a steep canyon reach known as the Gorge. In the 1940s, the City constructed a hydroelectric project that diverted the entire flow of the river through penstocks and generating plants, leaving the Gorge (also formerly an excellent fishery) dry. Again, the California Fish and Game Code should have prohibited drying the stream but was not applied. However, in the early 1990s, failure of the hydroelectric system resulted in flows returning to the creek, and once again environmental NGOs demonstrated that fish were present and prevented the creek from being re-desiccated, and triggering a series of studies to determine flows required to maintain the fish populations. Downstream, the Lower Owens River below the intake to the Aqueduct, dry since 1913 (except for discharge of surplus water in wet years), was re-watered as a result of litigation by the County of Inyo and environmental NGOs, and in 2007 was declared by the judge to be once again « a river » (Hill and Platts 2005; Silverstein 2007). As with the Mono Basin tributaries, the re-watering of the Owens River reflects changing societal values, and a balance between diversion for beneficial use and instream flows for ecological benefit. The City still diverts most of the Owens River flow: in the Gorge for hydroelectric generation, in the Lower Owens River for municipal supply. In both cases, a specified instream flow is released to maintain ecological functions. In the latter case, most of the flow remaining in the river channel for ecological functions is subsequently (downstream of the restored reach, above the river's mouth in Owens Lake) diverted and pumped to the Aqueduct.

The study case of the Mono Basin illustrates how changing societal preferences lead to different interpretation of existing water laws in California. California's water laws include ample provisions to modify existing water rights in order to meet new ecological objectives. Nevertheless enforcement mainly relies on public participation.

4. Evolution of water regulation in Europe

Historical State's discretion in French water management

Unlike California, France has a long tradition of centralization. The state gained legitimacy through military, colonial and economic power as it provided the French people with security and welfare. Historically, allocating water helped the State strengthening its power. Resulting water rights have reflected priorities defined by governmental policies for centuries. Efficiency has long been ignored. Water allocation was rather performed to secure independence.

During the Middle Age, water rights were part of the "moral economy". Through wars, lords appropriated lands and waters. Then they contracted with their subjects moral agreements in which vassals pledged allegiance and paid taxes and lords adjudicated rights and promised military security. Vassals in turn contracted with their own subjects. Through allegiance networks sovereigns could raise money and armed forces. In the 16th Century, mercantilists would justify such an economy by considering that only powerful and wealthy sovereigns could secure territorial integrity and peace.

In practice, a "first in place, first in rule" doctrine prevailed. Different political powers claimed property rights and sovereignty on water. These conflicting influences provided

leeway for villages to use water (Caponera 1992; Gazzaniga and Larrouy-Castera 2002). As communities built more mills, canals and ditches, conflicts for competing use increased. Sovereigns successful in reducing disputes between communities strengthened their legitimacy (Ruf 2001). Historical archives shed light on arguments used to contest or defend water rights at that time. Prior to the 16th century, plaintiffs made no reference to water productivity, but generally considered the work communities or individuals had invested to develop water as sufficient justification for keeping water rights. Plaintiffs would protest against the lack of rule enforcement within a community or between communities. They would often contest one feudal authority against another when new developments supported by one party would threaten existing uses. This jurisprudence entrenched community water rights into water management structures through written titles. Only builders or heirs of the builders could be considered as beneficiaries. To date, such water rights "based on titles" ('*fondés en titre'*) are still acknowledged to the owners of water structures built during monarchy. A kind of "prior appropriation doctrine", which only takes into account the date of construction, rules such rights with no consideration to the social benefit of the water use.

European sovereigns started to consider the efficient use of natural resource at the beginning of the 16th century, as a result of the development of colonial empires, market competition and the Reform (Haghe 1998; Morera 2008). However efficiency was more a rhetoric tool than a stringent requirement of justification. As common wetlands traditionally managed by abbeys had been abandoned during religious wars, King Henri IV claimed they were vacant, inefficient, and needed development. He appropriated such "vacant" swamps and leased them to Flemish merchants for reclamation projects. Communities lost their properties and water rights. The king and the capitalists shared the economic risk of such projects deemed to be of public interest. In case of failure, taxes would cover losses. Royal strategy more than comparative effectiveness ruled water allocation.

Before the Revolution, as international markets for grains developed, sovereigns became concerned by domestic yields. Agronomists, political scientists, and economists known as physiocrats supported innovations in agronomy. Their theories became most popular during the second half of the 18th century. Simultaneously throughout Europe, liberals justified private property as the best mean to increase production, in contrast with former multi-use and multi-access rules.

The Revolution replaced the King's discretion by the ideology of "public utility". Lords' privileges and property rights were abolished. Lands were appropriated by the state and redistributed among former tenants. Navigable and floatable waterways previously appropriated by kings for trade and water-logging became state's property. What should happen to other water rights remained an open question for a long time. Napoleon's civil code of 1802 established a riparian doctrine for non-public water-courses in Article 644. But due to the claims of irrigating farmers in the south of France, arguing that their diversions produced more than the riparian doctrine could offer, Article 645 acknowledged former rights to divert water as local custom rights that should be taken into account (Ingold 2008). Interestingly France did not adopt an equivalent to the American "beneficial use" doctrine to restrict inefficient water rights. Instead, the state promoted the concept of "public utility" which restricts private property in the name of the general interest. The expropriation doctrine was wrought from cases of marsh reclamation, first articulated in 1807, in the "loi sur l'assèchement des marais" which later became the rule for urban public works (Legendre 1968:474). Landlords reluctant to invest in reclamation projects deemed to produce higher yields could be expropriated. Since the 19th century, the state has set itself as a master to

define “public utility”, advised by a corps of engineers with a monopoly on public expertise (Cohen Tanugi 1985). Corps of engineers developed an ideology of the public interest which did not rely on a strict cost benefit analysis, but embodied their faith in State intervention and their mistrust of local stakeholders. As Porter put it “"public utility" (…) had no specific meaning and was often construed as wholly non-quantitative. One central mission of the Corps […] aimed to unify and administer the French territory, and even to civilize the French peasantry” (Porter 1995:121). As industrialization progressed, several Corps of engineers came into being to rule different sectors. Saint-Simon (1760-1825) inspired many of them with his ideas on man mastering nature for the population’s well-being. Within the limits of their jurisdiction, they ruled natural resources according to their own priorities and beliefs. Unchallenged by civil society, strongly subjected to internal peer-review processes, each Corps developed its one-best-way to manage water. Two examples may illustrate how the lack of diversity in expertise resulted in biodiversity losses: the state management of fish population in rivers, and the reduction of pollution.

How centralization hampered biodiversity conservation: Case studies of fish depletion and pollution control

The management of aquatic biodiversity had long focused to one species in France: trout. The one-best-way to manage freshwater fish population relied on restocking. Fish depletion in freshwaters was hardly acknowledged and always attributed to poaching. Chronic pollution was tolerated by the administration, not recognized as a structural consequence of industrial activity. The prevailing view held that society’s needs required that some rivers to be used as sewers (Garcier 2007). Catastrophic pollution was not acknowledged. Instead, pollution was viewed as reversible and compensated for by restocking. In case of fish mortality, claimants remained isolated outsiders. They had to provide evidence to pursue effluents dischargers. Samples of suspicious waters were often collected after the toxic discharge stopped, and judges commonly considered such cases to be peculiar cases of poaching (Corbin 1995). However, in the late 1880s, the state promoted fishing as an accessible supply of proteins to the poor. To prevent poaching and to maintain fish populations, regardless of water quality, fishing clubs and governmental authorities agreed to raise a tax on fishermen to increase control and develop hatcheries. Anglers imposed themselves as spokesmen of fishermen in state arenas. Although most fishermen were fishing in public waterways in urban areas, where trout could not reproduce, indigenous trout species were selected in upstream rivers and reared to restock all French rivers. Pollution and habitat degradation continued into the 1970s. As presented in the next paragraph, water quality later improved but irretrievable biodiversity losses had already occurred. The fish protection act (loi pêche 1984) obtained by ecologist votes improved instream flows in the following years, but not in the Rhône and the Rhine rivers where exemptions were justified by the ‘international character’ of both rivers.

Similarly, pollution control in France had long relied on two technologies heralded as universal: combined sewer systems and activated sludge process. Following the World War II, French government planers tackled the problem of pollution. They promoted a “polluter-pays principle” at the scale of the river basin. The 1964 water law established basin agencies and basin committees (Nicolazo 1993), which had to agree on several conventional chemical parameters to make water quality commensurable from upstream to downstream. State engineers negotiated with the most powerful industries of the time, the chemical and food-processing industries. They came up with one single parameter, dissolved oxygen, which combined effects of biological and chemical oxygen demand, on which they determined levies collected by Basin Agencies. To convince reluctant municipalities to contribute,

agencies delivered grants to fund combined sewers systems and activated sludge process, promoted as the universal solutions for sanitation and wastewater treatment. The Corps of engineers of the Ponts et Chaussées and of the Génie Rural implemented these technologies throughout the French territory, with little regard to cost-effectiveness. In small catchments, concentrating wastewater in combined sewers often resulted in higher impacts. But in the same time river quality monitoring in upstream areas declined and related degradations were unnoticed. Although some rivers recovered a satisfactory rate of dissolved oxygen, it is hard to say whether river quality in general improved. A study based on the Seine-Normandie district between 1974 and 1995 concluded that no significant improvement could be measured at the scale of the basin besides the main course of the Seine River (Bouleau and Lunet de Lajonquière 2007). Moreover the French state had little consideration for water quality outside its boundaries. Although Flanders heavily relied on the Scheldt for its drinking water supply, France never acknowledged nor respected this quality objective for the water course it shared with Belgium.

Be it governed by kings or democracy, the French state has long exercised substantial discretion in water allocation. Dramatic changes in land and water uses were mostly initiated or managed by rulers. State politics was never challenged by water problems. Therefore water rights in force do not reflect a shared vision of an optimum allocation, but rather some kind of national heritage social actors must cope with. Were outsiders to assess effectiveness and efficiency of existing water rights and water management, they would lack information. They would also lack political support, since the state overcame domestic contradictions by implementing costly mitigation policies. Despite legal provisions, river quality objectives were never designated. The administration in charge of river quality would deliver pollution permits without consistent rules. Transboundary impacts were hardly addressed. France is located in upstream reaches of international rivers such as the Meuse, the Rhine, and the Scheldt, so its water management may affect downstream countries. The French state did not mitigate impacts outside its borders. Critics arose as the European Community expanded the scope of interdependencies between Member States.

How the EU challenged nation-states' water sovereignty

The history of the creation of the European Union is one of a common market. Environmental issues and health protection came as a second goal in the political agenda of the European Communities (Hildebrand 2005). To impose its legitimacy against sovereign states, the European Commission mostly argued against side-effects of domestic regulations on markets and consumers. The first wave of European law in water quality (between 1972 and 1986) aimed at protecting consumers' health through *negative and reactive* regulation (Howarth 2006) limiting activities recognised as harmful. By introducing reporting requirements, it also empowered the public by opening access to administrative data and fostered progress in monitoring technologies (Kallis and Nijkamp 2000). Comparisons suddenly became possible putting Member States' discretion under scrutiny. In case of crises, individual responsibilities of Member States could be identified and addressed at the European level.

Such a crisis occurred in 1986 when the Rhine was dramatically polluted by a massive chemical spill at the Sandoz plant in Basel, Switzerland. The resulting contamination threatened the Dutch drinking water supply. Across Europe, televised images of the Rhine transporting tons of dead fish shocked the public, and helped to elect environmentalist politicians in riparian countries (Lodge 1989; Vogel 2005). They found the European scene to be a strategic arena where the expertise of national corporations -like Corps of engineers in

France- was weakened by international competition. Ecologists voiced their claims there and influenced positions of the Council of Ministers. At the end of the Frankfurt workshop in 1988, the European Council of Ministers asked the Commission to submit proposals likely to improve the ecological quality of European waters. This was the impetus for *positive environmental* regulations setting water quality standards (Howarth 2006): the urban waste water directive, the directive on nitrates, and the directive controlling industrial pollution, known as IPPC (Aubin and Varone 2002). In effect, the Sandoz catastrophe offered the European Commission a political window of opportunity.

The European Commission's power to impose new legislation was weak but mistrust between Member States was strong. Member states wanted to soften regulations they would have to pay for but they also wanted to make others pay for reducing the pollution they suffered from. New law might lead to new litigations, they argued. They were nevertheless concerned with domestic ecologist contests. As Richardson wrote: "policy making discussions [at European level] are always conducted with an additional but empty seat at the table - representing the threat of individual citizens who regard water quality as of high salience" (Richardson 1994). To prevent "whistle blowing" by ordinary citizens, Member States encouraged environmental legislation. However this perspective overlooked conflicting interests of member states regarding the promotion of domestic law and technology. Standard setting is anything but neutral. For instance, two opposite strategies prevailed in Europe for urban waste water treatment before the corresponding directive was enacted (Barraqué 1995). Denmark, Germany and the Netherlands wanted to set standards according to urban population. Such policy would have reduced leeway for engineering consultancies, prescribing the technology required for each city. This would have favoured the strong and well-organized water industry of these countries. By contrast, southern countries, France, and the United Kingdom had preferences for setting objectives of treatment in order to preserve leeway for private engineering companies. The resulting trade-off is a directive which fostered the "best-available technology". Whereas in domestic politics public corporatism framed water policies, at European level private interests of multinational companies prevailed. The three adopted directives required action plans, restriction on polluting activities, and outcomes evaluation. Between 1993 and 2005, the Urban Waste Water directive itself provided 150 billion euros of works for the water industry (Kallis and Nijkamp 2000).

The last legislation adopted at the European level on water is the Water Framework Directive (WFD, 2000/60/EC). Under the WFD, water bodies are to achieve 'Good Ecological Status' and 'Good Chemical Status'. 'Good status' is achieved when the status of the water complies with all relevant EU water quality standards, and its deviation from the natural status of a comparable water body is only minor. Member states are required to classify their water bodies as to their status reflecting the degree of naturalness, based principally on biological quality expected for such a water body in undisturbed state. The biological condition expected for given water bodies will be quite different in Denmark than in Spain. The WFD provides member states the option of designating certain water bodies as 'highly modified' when the overriding public interest is not served by achieving good status. For highly modified water bodies, the requirement is to achieve 'Good Ecological Potential', i.e., the best ecological conditions possible given the human modifications. The WFD considers two possibilities for aquatic systems: water bodies are either impacted by "acceptable" services, or they should achieve the "good surface status" (i.e. both the ecological status and the chemical status should be good). Under the WFD, services are meant acceptable when cannot be replaced by an alternate solution without disproportionate costs. The impacts that prevent water bodies from achieving the good ecological status must match an economic demand and target the full

pricing (Bouleau 2008). In this perspective, the WFD appears as a third wave of legislation addressing the *ecological* quality for the first time (Howarth 2006). It promoted a systematic planning system with uniform, scientific European-wide river monitoring. This monitoring system is adaptive and aims to distinguish biodiversity modification due to factors such as climate change from degradations due to human impacts.

This landmark legislation considerably limits States' discretion on water management by positing the intrinsic value of undisturbed ecosystems. This progressively gained authority at European level, first through pollution control regulation and secondly through explicit ecological regulation. The nitrates and the urban waste water directives were mainly focused on environmental provisions. Nevertheless they already set ecological requirements since they provided standards for eutrophic waters whether used for human purposes or not. Similarly, the Oslo-Paris Convention (OSPAR) signed in 1993 sought to reduce the concentrations of hazardous substances in the environment to near background values for naturally occurring substances and close to zero for man-made synthetic substances. As Howarth (2006) noticed, "OSPAR implicit environmental quality goal for the marine environment is one where the presence of contamination […] corresponds to a state of minimal anthropogenic impact. The Water Framework Directive takes this approach a step further in applying a comparable strategy to the ecological quality status of waters within its scope". The European Parliament had a key role in setting this ambition.

Until 1999 the Council had veto power on water issues. This changed in 1999 as the co-decision procedure came into force. For the first time, the Parliament was able to maintain the ecological ambition the Council wanted to discard, provided it accepted exemptions based on economic considerations. The European Council of Ministers is known to voice interests of domestic industries. Ecologists are reported to have more influence on the European Parliament (Richardson 1994; Kaika and Page 2003; Steyaert and Ollivier 2007).

5. Fostering comparison between EU and California water laws in regards to future challenges

Verwijderd: 6

Aquatic biodiversity in freshwater is primarily threatened by water diversions and their consequences, most of them legally performed. As snow packs shrink and evaporation increases due to climate change, pressures increase on water resources at river basins level. Minimum instream flows required to secure aquatic species vital cycles. This cannot be achieved by other means than curtailing existing water rights for environmental purposes. In this context, clear-cut legal doctrines assuring water allocation is defined once for all are not the most adapted to the situation. On the contrary, juridical systems with overlapping principles requiring interpretations and negotiations are more likely to perform the re-allocation needed. In this respect, the European Union and the US state of California have much to teach.

Similarly confronted to powerful stakeholders exercising substantial discretion on water allocation, California and the European Union developed parallel strategies to counter their power. Just as the environmental European law benefited from competition and mistrust between member states, instream flows in California benefited from the federal Endangered Species Act and the Clean Water Act both limiting agricultural water rights in irrigation schemes developed by the Bureau of Reclamation.

Despite their institutional differences in level of governance, California and the European Union have much to learn from each other in the area of aquatic biodiversity. To date this institutional gap between California and the EU has limited previous trans-Atlantic exchange to federal agencies (EEA and EPA) with little commitment of the Californian state. As a consequence, such projects have mainly focused on ecoinformatics and have failed to address water rights as a driving force for aquatic biodiversity (See for instance, the Agreement for Scientific and Technological Cooperation between the European Community and the Government of the United States of America of 1998 and the Implementing Arrangement between the European Commission and the United States Environmental Protection Agency to Promote Cooperation on Environmental Research and Ecoinformatics of 2007).

As a conclusion, this section examines what California and the EU developed in common and what they could learn from each other. First we explain the relevance of their common reference to undisturbed conditions in the face of climate change. This leads us to outline the limitations of the public participation under the European regulation and the lack of provisions to address the specificity of Mediterranean conditions. Then we address the weaknesses of US and California's law which could benefit from the EU experience in providing comprehensive economic and ecological data.

Although the EU celebrates traditional agriculture as a main component of its landscape and biodiversity, it is striking that the water framework directive distinguishes between highly modified water bodies and water bodies which shall achieve a good ecological status defined as minor deviations to *undisturbed conditions*. The relevance of such a notion has been questioned by European scholars as ecological science increasingly recognizes instability of ecosystems (Howarth 2006; Steyaert and Ollivier 2007). But Europeans should look at the American experience in this domain. As proved in the US, the reference to pristine conditions acts as a radical critique that may be useful to fulfil new societal preferences. In 1978, the U.S. Supreme Court declared that the ESA requires that species losses must be stopped "whatever the cost" (*TVA v. Hill, 437 U.S. 187*). This extreme standpoint proved to be effective in opening public debates in order to reconsider public expectations in regards to ecological objectives. In the face of climate change, the natural variability of ecosystems is going to change. It is crucial then that the public participates to the definition of new ecological objectives. This requires widening the scope of possible futures while economic interests would rather maintain the status quo. ESA and WFD converge in this respect as they require that radical options such as pristine conditions be considered.

Public debates also require envisioning situations that resonate in the public mind. In this respect, the EU has much to learn from the ecological controversies raised by ESA. The EU provisions are highly technocratic, using complex language and expert criteria. Biological metrics used to define the good ecological status are highly esoteric for lay people. The WFD is largely unknown by the public. The EU spends a tremendous budget to foster public participation in the implementation of the WFD. The EU could learn from Californian NGO's experiences of public participation in watershed restoration the significance of charismatic species for environmental protection. Flagship species and past experiences of recreational uses like bathing, fishing or canoeing resonate much more in the public mind than complex biological metrics.

Although ESA is often heralded as a non-negotiable text, its implementation in practice shows more flexibility. First, land designation requires an impact assessment in which economic considerations are taken into account. The no-surprise policy restricts the possibility of adding new requirements to landowners if provisions first established under ESA happen to be insufficient. Insufficient land designation is similarly restricted by a so-called safe-harbour policy. Wild species protected under ESA and ecological integrity promoted in the Clean Water Act did not prevent California from developing.

In practice, "ESA recovery planning has been ineffective […] because the plans tend to be substantively inadequate, poorly implemented, and largely unenforceable" (Benson 2004). The WFD instead opens doors for trade-offs. In France, ecologists and the state negotiated the WFD objectives so that 66% of water bodies should attain the good ecological status. In the Netherlands 99% of water bodies will go under an exemption process. In any case, objectives become binding and member states subjected to penalties in case of failure. The WFD is not innovative for its ecological dream but for its pragmatic and economic approach to strategic planning (Bouleau 2008).

Facing strong economic interests, California and the European Union likewise developed legal provisions to challenge water uses on the basis of their efficiency. The European WFD may appear as more restricting as it promotes the full cost-recovery of water services. However this provision is not legally binding. Member states shall aim at implementing the full cost-recovery but may postpone this policy for social reasons. Moreover water services under WFD refer to localised water abstraction or discharge and exclude non-point source pollution. More demanding may be the EU requirement to plan cost-effective measures to restore water quality. But only in the long run could the effect of this provision be assessed. Most cases of ecological restoration lack ex-post evaluation. To date, experts cannot provide reliable optimization except for standardized measures such as waste water treatment plants. Presently California and the EU have developed equivalent legal provisions to put water rights holders under the scrutiny of economic criteria.

California laws and European directives empowered civil society as a mean to counter influential developers. By requiring consultation for all projects subjected to state agency's approval, CEQA gave opponents more opportunities to voice their claims. Through mandatory reporting, the EU provided citizens with much more information than their domestic states used to deliver, reducing states' discretion. In both contexts challenging existing water rights or ineffective water allocation means costly litigations not everybody can afford. However in the European Union, information provided through reporting has a cumulative effect that CEQA does not. It forces member states to operate monitoring systems on a regular basis, providing science and expertise with long-term free available data. California could learn from this as it experiences a dearth of monitoring stations and long-term data bases.

Last, in the face of climate change, both regulations relying on species or species assemblages may lose their target as habitats change. In the WFD provisions exist to revise ecological assemblages accordingly, as deviations appearing in biological samples can be related to pure climatic effect. Cross-European monitoring may help to diagnose such a deviation. Experts may be able to change ecological references without major civil oppositions given the existing complexity of the good ecological definition. On the other hand, as EU law progresses, suspicion over the lack of democratic control increases. The technocratic provisions of the WFD weaken the social support for its implementation. A fruitful dialog could take place

between European and Californian experts to address the fate of wilderness references in the context of climate change, especially in regions of Mediterranean climate endowed with a higher rate of endogenous species.

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