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Water Justice and Integrated Water Resources Management: Constitutionality Processes Favoring Sustainable Water Governance in Mexico

Heliodoro Ochoa-García[1] · Stephan Rist[2]

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Abstract
This research analyzes four ongoing water conflicts in Jalisco state, Mexico, through the lens of constitutionality. Constitutionality refers to a bottom-up institution building process based on the activation of emic perceptions of people who are often marginalized in policymaking, as well as on alliances with external actors, with the aim of achieving recognition by the state of self-created institutions. Results show that the constitutionality concept helps to link analysis of local people's resistance movements *against* top-down water policies with an emerging process of institutional innovation that aims *for* more sustainable water governance. Local institutional innovations embody the principles of water justice; these are recognized by the state as being part of its own Integrated Water Resources Management (IWRM) policy, and thus find their way into state policy arenas. This analysis provided the basis for the formulation of a conceptual framework that integrates water conflicts, water justice, and IWRM into the concept of constitutionality.

Keywords Constitutionality · Water justice · Integrated water resources management · Sustainable water governance · Mexico

Introduction

Water conflicts are spreading and intensifying all over the world and existing water governance institutions are increasingly being questioned, resisted, or rejected. The resulting 'global water crisis' is widely acknowledged to be among the top issues of global change, along with, and closely related to, the global food crisis, climate change effects, biodiversity loss, ecosystem collapse, and other man-made environmental catastrophes (World Economic Forum 2016). To address these complex problems, civil society organizations, social movements, and engaged sustainability scientists began to put forward the concept of water justice under the umbrella of environmental justice as a basis for crafting their own institutional frameworks for the reorganization of collective decision-making and action at national to global levels.

By environmental justice, we refer to the concept of Schlosberg (2007) who, based on a powerful critique of liberal theories of justice and their frequent narrow focus on distribution, offers a more inclusive notion of justice that encompasses recognition, capabilities, and participatory democracy. In the context of water governance, this links well with debates around water justice, the human right to water, minimum ecological flow, virtual water, ecological footprint, and ecological debt, among others (Martínez-Alier *et al*. 2016).

The growing importance of these concepts gave rise to new institutions that are being developed from the bottom up, often referring to water justice and integrated water resources management. Scholars and international institutions therefore define the current water crisis as a crisis of governance that is rooted in competing demands on water use, asymmetric power relations, and divergent views among actors regarding the priority of their interests and the specific roles they are playing in collective decision-making and implementation of water policies (WWAP 2015; Zeitoun and Mirumachi 2008; Castro 2007).

A special feature of water justice movements is that they have grown well beyond their initially local social arenas into

✉ Heliodoro Ochoa-García
hochoa@iteso.mx

Stephan Rist
Stephan.Rist@cde.unibe.ch

[1] ITESO Jesuit University of Guadalajara and Centre for Development and Environment (CDE), University of Bern, Periférico Sur 8585, 45604 Tlaquepaque, Jalisco, Mexico

[2] Institute of Geography, University of Bern and Centre for Development and Environment (CDE), Hallerstrasse 10, 3012 Bern, Switzerland

a global policy space in which they operate across broad sectors of society.[1] According to Isch López (2012), water justice approaches and principles can be characterized as follows: a) Water is a disputed resource. Its management implies power relationships and legal issues; conflicts revolve mainly around unfair and unequal access to and distribution of water resources; b) Water governance is an expression of politics. The management and distribution of water cannot be based only on its biophysical nature and engineering, but also requires consideration of disputed economic and socio-political perspectives. c) Striving for water security has become a new source of conflict. Some actors appropriate water as a strategic resource by controlling or diminishing other actors' (individuals', communities', and nations') access to water. d) Conflict and cooperation can complement each other. They play out in history based on changing combinations and interplays of formal and informal institutional mechanisms (Isch López 2012).

Social movements dealing with water conflicts could easily be misinterpreted if they are perceived only as resisting change per se, disregarding that, under certain conditions, they also engage in crafting new institutions aimed at reforming or changing existing forms of water governance. The water justice movement was forged based on cooperation, networking, and participatory practices, in a bottom-up manner and often involving the development of new institutions within and across scales of governance (WWAP 2015).

The concept of Integrated Water Resources Management (IWRM) is a contemporary paradigm (Allan 2003) that acknowledges the importance of the participation and inclusion of society, governments, social movements, and the private sector as relevant stakeholders in water management. In addition, the concept of sustainable water governance stresses the importance of a deliberative process in "developing a joint understanding of water-related problems and potentials; and taking collective action to transform existing institutions…" (Schneider and Rist 2013: 464). However, deliberation might confront the government authority if the new institutions fail to deliver the desired outcome. Such confrontation often occurs in situations where the state favors the private sector over society's needs, constricting the potential for cooperation (Ochoa-García and Rist 2015).

Despite the outlined conceptual progress, empirical research usually analyzes water conflicts and the enhancement of cooperation through IWRM separately (Rodríguez-Labajos and Martínez-Alier 2015; Boelens *et al*. 2012; Scott and Banister 2008; Zeitoun and Mirumachi 2008). A new approach that aims specifically at analyzing the interplay between resistance to existing institutions of top-down natural resource governance and the emergence of new rules, norms, and social networks of actors involved in water conflicts is the concept of constitutionality presented by Haller *et al*. (2015). Constitutionality refers to "[…] an institution-building process that highlights natural resource management initiatives from below, analyzed from a perspective that emphasizes community members' views on participation, the strategies they employ in negotiating such initiatives, and the extent to which they can develop a related sense of ownership in the institution-building process for common pool resource (CPR) management" (Haller *et al*. 2015: 1).[2] From this perspective, constitutionality focuses on cross-cutting socio-political and institutional aspects related to CPRM and goes beyond the formal and constitutional issues of the state.

Constitutionality is at the core of institutional innovations that aim at improving sustainability outcomes of resource governance. Processes of constitutionality can emerge if: (a) local actors are empowered to engage in the institution-building process based on their own perspectives, which can be analyzed emically; (b) these solutions are recognized by the state due to the existence of laws, regulations, and policies that accommodate local action; (c) heterogeneous actors in these contexts, by forming interest groups, can discuss what kinds of institutions, both "traditional" and innovative, they consider important, before negotiating overall regulations; and (d) nongovernmental organizations (NGOs) and state actors, despite never being neutral in the institution-building process, find it appropriate to create a relatively open platform for local debates, thereby reducing transaction costs for organizations and catalyzing communicative action for enhancing social learning processes (Haller *et al*. 2015).

In the present research, we aim to link basic features of resistance to top-down water policies with processes of constitutionality – that is, institutional innovation – arising from the adoption of IWRM as a basis for sustainable water governance. This implies a conceptual shift from analyzing resistance to top-down water management towards a broader view that also looks at the related collective action rising from bottom-up processes of water governance.

We address two objectives. The first is to analyze to what degree the concept of constitutionality helps the study of cross-scale institutional dynamics resulting from the interplay of resistance to existing institutions and the rise of new institutions. This is tested based on four case studies in which key actors promote water justice as a fundamental goal of collective action. The second objective is to examine how the case study results might help to conceptualize the relation of constitutionality to the core concepts of IWRM and water justice.

[1] For instance, the Latin American Water Justice Alliance is a broad network for research, capacity building, and action working on dynamics and mechanisms of water accumulation and conflicts (Zwarteveen and Boelens 2014).

[2] This concept of constitutionality was developed in different contexts by examining institution-building processes for common pool resource management in four countries: Zambia (fisheries in the Kafue flats floodplain), Mali (Tarabe River banks), Indonesia (fisheries at lake Lindu), and Bolivia (forestry in the Ayopaya Andes).

Methods and case studies

The research was conducted in Mexico, particularly in the Santiago River watershed where the presence of water conflicts has led to the creation of manifold grassroots institutions in four cases. Each case featured trajectories and institutional arrangements that matched different features of constitutionality processes. The inclusion of four different case studies made it possible to uncover enabling and hindering factors related to the emergence of bottom-up institutional innovations.

The empirical work was based on the main author's fieldwork from 2008 to 2015. The mid-term perspective allowed for systematize stakeholders' emic perceptions about water related problems; the institutional transformations and the integration of social networks were also witnessed along time. The plurality of actors involved in water management and case studies was simplified to interest groups engaged on constitutionality processes. The methods included participant observation, semi-structured and open interviews, and focus group discussions with local and external key actors affiliated to international networks involved in the water conflicts and related institutional transformations.[3] Additional insights were generated by organizing meetings at which main research results were presented. These meetings provided access to views expressed in internal discussions about agreements and disagreements between social leaders, government representatives, and researchers that were not always shared publicly. Using these methods, we identified perceptions and values related to water governance and water use; moreover, social leaderships and outside agents were encountered playing a role in social movements, assessing people and organizations at different stages during the conflict or institutional innovation. An abundant body of previously published studies on water conflicts and local stakeholders' views, collaborative efforts, and institutional alternatives for water governance was used to cross-check and complement the analysis (Ochoa-García 2015; Ochoa-García *et al*. 2014; Schneider and Rist 2013; Tetreault *et al*. 2012).

Study region and case study localization

From a national point of view, some of the most remarkable elements in the study region are of particular interest. To begin with, Lake Chapala is the largest freshwater reservoir in the country (1147 km^2). The Santiago River carries up to 1090 pollutants, some of them highly toxic (IMTA and CEAJ 2011). It has 18 dams, four of which belong to big hydroelectricity plants. The upper watershed comprises Altos Region, the country's most important livestock production region, and El Zapotillo dam, a highly contested project that has been subject to legal battles since 2005. Guadalajara is the second biggest city in the country, and an 80 km industrial corridor connects Chapala and Guadalajara (Ochoa-García and Rist 2015; Ochoa-García *et al*. 2014; Ochoa-García and Bürkner 2012; Tetreault *et al*. 2012).

So far, water supply has been the top priority in water policy in the Santiago River watershed. The state and federal water authorities keep developing inefficient infrastructure to satisfy ever-increasing urban and agricultural demand (Wester *et al*. 2009). In Guadalajara city, the population has grown by 49% over the last 20 years and has reached 4.4 million; industrial and rural development further amplified the pressure on water resources. The 'green' area the city depends on for its water supply has expanded from local springs and aquifers to include lakes and rivers within a 90-km radius; the regional water balance and the distribution of water rights in the basin is rapidly changing (López-Ramírez and Ochoa-García 2012). In the meantime, wastewater discharges are left untreated, hydro-ecosystems continue to deteriorate, wetlands are drying up, biodiversity is depleting, people living near the rivers are increasingly facing health problems, and water-related socio-cultural practices are disappearing (McCulligh *et al*. 2016; Tetreault *et al*. 2012). Embedded in this context, social conflicts take place at different levels of water governance. Every local conflict has a particular context, dynamics, and spatial scope. In this sense, the case studies are helpful in gaining a better understanding of multi-scale constitutionality processes from local to regional (sub-national) levels. The first case we present is the "Citizen Council for Integrated Sustainable Management of Lake Cajititlán" (CC Cajititlán), which is found in a closed catchment inside one single municipality. The second case is the municipal platform "Polygon of Environmental Fragility El Ahogado" (MP El Ahogado), which covers a catchment encompassing urban and suburban areas. The third case involves the inter-municipal "Association for Environmental Protection and Sustainable Development for Lake Chapala" (IMA Chapala). The fourth case is a regional initiative named "Citizen Observatory for Integrated Water Management" (Citizen Observatory) (Fig. 1).

Highlighting the fast-growing need for water in urban areas, industry, and "modern" agriculture, the government promotes and implements the construction of huge hydraulic infrastructures such as dams, aqueducts, and wastewater treatment plants not always successfully functioning (Ochoa-García *et al*. 2014). However, this policy has resulted in severe levels of water pollution, human rights violations, adverse impacts on human health, economic loss, environmental damage, and destruction of cultural practices (CEDHJ 2009). The situation led to the emergence of internationally renowned social movements and networks in which activists and researchers are struggling to advance agendas of water justice. These movements are also active in legal battles at local to

[3] Some external key actors are representatives of: New Water Culture Foundation (Spain); project on Environmental Justice Organizations, Liabilities and Trade (EJOLT); Waterlat-Gobacit Network (Latin America and other countries); The United Nations Office for Project Services; Latin American Water Tribunal; the "Absent Sons and Daughters" (emigrants) from Temacapulin town living in USA.

Fig. 1 Location of case studies

international scales. The study area is a highly interesting case where water conflicts are addressed by means of new local-level institutions developed from the bottom up, embracing and integrating principles of water justice and IWRM as complementary elements in a cooperative relation with the state.

Water conflicts and the emergence of new institutions in the Santiago River watershed

Major water conflicts have sparked the creation of new institutions mainly dealing with water pollution and opposition against big dams, aqueducts, and water transfers in the Santiago River watershed. For each case, we analyzed the problems associated with water justice and IWRM as expressing new alternative institutions for more sustainable water governance, ranging from a small closed catchment and an inter-municipal basin to a metropolitan area and sub-national level efforts. Finally, we assessed the effectiveness of institution building based on the proposed framework of constitutionality for sustainable water governance.

According to the Mexican water law, IWRM is "a process that promotes the management and coordinated development of water, land, resources related to them and the environment, in order to maximize equitable social and economic welfare without compromising the sustainability of vital ecosystems..." (Semarnat 2004); additionally, river basins and aquifers are matters of public interest. Scott and Banister (2008) argue that IWRM is difficult to achieve because of political and territorial disputes among the stakeholders involved in water management; besides, the required entity demands a complex organization in order to successfully operate beyond the current narrow focus on river basin councils. To date, water users and people living in suburban and rural areas feel excluded from public decisions concerning water management (Ochoa-García *et al.* 2014); further, they have observed the appropriation of collective land and water property rights by the business sector (housing, agribusiness, and industry), enhancing private control over natural resources (Reis 2014).

The misrepresentation of stakeholders' interests has not only generated water-related conflicts, but has also encouraged people to create initiatives and new institutions to meet the

complex challenges of sustainability in a way that is rooted in their emic perception of their problems and needs. The National Water Commission (Conagua) opposes these kinds of initiatives (Scott and Banister 2008); however, some sectors of society are currently aiming to weaken Conagua's monopoly, considered "a unique water authority, the biggest institution in the world according to its functions and power" (Gobierno de México 2012: 18). In Jalisco state, social organizations, scholars, universities, political parties, and some federal representatives are pushing across political lines for alternative solutions to dams, water transfers, and privatization of expensive infrastructure; nevertheless, three governments (2001–2019) have tried to complete the ongoing hydraulic plans and construction for urban supply despite this social opposition. From a wider perspective, it is argued that the private sector had not succeeded in providing water and sanitation services and social protests grew to global proportions intertwined with environmental justice movements (Bakker 2013).

Big infrastructure for water storage and supply has been further expanded, abandoning the IWRM perspective and generating social conflicts all over the country. Consequently, from 2000 onwards, local to national civil-society organizations that had so far strongly engaged in environmental networks increasingly linked up with the emerging water justice discourse, which had become more visible and more organized based on its own social movements (Mcculligh and Tetreault 2017; Toledo *et al*. 2015). Large numbers of groups emerged to fight against contamination of water resources, while at the same time rejecting top-down hydraulic projects.

Water-related problems and social conflicts have attracted public attention while people's judicial claims and associated socio-technical debates are increasingly related to discourses about environmentally-displaced people, IWRM, the human right to a healthy environment, good living (*vivir bien*), peoples' right of access to information and to be consulted to determine their own future, among others. During the fieldwork, these aspects were found as core content of social movements that organized meetings, public forums, and scientific field research (on water quality, environmental issues, public health) looking for alternative solutions from the bottom up.

Along with water conflict, it was observed that an underlying factor is the presence of engaged scientists frequently themselves allied with outside agents for providing scientific support in public debates and judicial claims. For instance, within the study area social groups and scholars have developed joint research on water quality, human health implications, water availability and distribution, and interrelated human rights violations near the Santiago River and El Ahogado stream (McCulligh *et al*. 2016; Ochoa-García *et al*. 2014; Ochoa-García and Bürkner 2012; Tetreault *et al*. 2012). Social platforms for collective knowledge and action are grounded on the concept of environmental justice, notably the National Assembly of Environmentally Affected (ANNA), the Mexican Movement of Peoples Affected by Dams and in Defense of Rivers (MAPDER), the Coalition of Mexican Organizations for the Right to Water (COMDA), and several regional assemblies of environmentally impacted communities. These efforts and networks also have in common an alliance with international networks of non-governmental organizations (NGOs), such as "International Rivers" or the "Permanent Peoples' Tribunal." The Water, Rivers and People Foundation supported and documented local struggles for an international photo project that exhibits similar cases around the world; similarly, the Environmental Justice Atlas registered two of our case studies for worldwide dissemination (www.aguariosypueblos.org; www.ejatlas.org). The lead author has been actively involved in several activities co-organized with these NGOs.

Numerous political initiatives emerged throughout the country that opposed the construction of dams for hydroelectricity and for urban supply, aqueducts for inter-basin transfers, and water treatment plants, as well as water (re)allocation agreements and privatization of water services. Salient examples of the above issues are located in the studied region: the Arcediano, San Nicolás and El Zapotillo projects. Such government projects have been obstructed by communities, social movements, and activist networks (Mcculligh and Tetreault 2017; Toledo *et al*. 2015). El Zapotillo is probably the most contested water project in Mexico, accounting more than a hundred legal and judicial processes in court. Institutional dynamics are intertwined with growing citizen involvement in water governance, including the pricing of water rates, distribution of water volumes within watersheds, and reform of national water law from an integrated and social perspective to regulate private participation in water management and public services related to water policy.

Key features of the case studies and related outcomes and institutional dynamics

The most significant factors triggering bottom-up institutional innovations in the four cases studied were related to (a) environmental degradation and high pressure on water resources with negative effects on livelihoods, (b) top-down hydraulic interventions, (c) the types of water conflict, and (d) social mobilization for collaboration involving all relevant stakeholders on behalf of sustainable water governance (Table 1).

Citizen Council for Integrated Sustainable Management Lake Cajititlán (CC Cajititlán)

A key feature in the case of CC Cajititlán is the election of a new political party with high levels of legitimacy and power to run the municipal government from 2010 to date. The villagers established CC Cajititlán in 2008 with the main goals of achieving a clean lake, protecting forests in the catchment,

Table 1. Key features of case studies regarding geography, water management, and water conflicts

Case study	Geographical and hydrological context	Water management and infrastructure	Problems related to water conflicts
Citizen Council (CC Cajititlán)	Closed catchment; presence of indigenous communities; traditional lifestyles as tourist attraction; pressure on quantity and quality of water and groundwater from increasing urban population, industrial growth, and discharge of polluted water. The municipality has one of the highest urban growth rates in Mexico.	One-third of the lake was drained in 1948; inadequate management of channels; increasing number of wells for agricultural, urban, and industrial uses; deficient water treatment plants. The whole lake has been drained twice to maintain urban supply in dry years (1955, 2001).	Communities living on the shores of Lake Cajititlán see their livelihood options reduced due to pressure on their land, eutrophication, reduction of fish populations, and floods caused by inadequate management in upper catchment areas. Lack of proactive regulation of socio-economic and ecological problems.
Municipal Platform (MP El Ahogado)	Ten municipalities share the El Ahogado basin and environmental degradation is widespread. This is the most polluted stream in the region: it receives untreated water from industry and urban areas, and there is occasional flooding. Confluence with the Santiago River near a waterfall. The whole area is subject to rapid, inappropriate land use changes.	Water rights are shifting from agriculture to more profitable uses; natural areas are under pressure from private interests and urban infrastructure; the aquifers are the most overexploited in the state, lowering the level by 2 meters per year. Mix of several pollutants in water; a waterfall increases negative effects on human health and ecosystems.	People claim that water pollution impacts the health of over 30,000 inhabitants; social groups collect information and evidence for legal actions. Human rights recommendations claim that the Mexican government is failing to effectively enforce its laws related to water resources management. After 2000, a significant increase in support from networks and media.
Intermunicipal Association for Environmental Protection and Sustainable Development for Lake Chapala (IMA Chapala)	Lake Chapala is the largest natural freshwater reservoir in Mexico; its storage level has repeatedly been critically low due to increasing demand and reduced rainfall in the watershed. Indigenous communities depend on the lake for their livelihoods. Presence of thermal springs.	50,000 hectares of lake surface were drained in 1902. Since 1957 the lake provides 60% of water for 4 million inhabitants in Guadalajara city. Rise in dam storage in the upper watershed, overuse of water; export agriculture. Guadalajara city needs more water, but locals have opposed further extraction. Lack of safe drinking water in lakeside towns.	Impact on local communities living on the lakeshores; loss of biodiversity and reduction in fish capture. Land change and soil loss on the hillsides is affecting the livelihoods and traditional practices; land speculation. Variability in tourist activities. Interstate agreements for water distribution and extractions affects the lake ecosystem. High rates of people suffering from renal diseases.
Citizen Observatory (CO) for integrated water management	Jalisco state has few perennial rivers, temporary streams, shallow lakes, and accessible aquifers, all of which depend on summer rainfall. A majority of people in the state (60%) live in Guadalajara city.	Hydraulic projects are for the collective good, but privatization of the administration of infrastructure and water services is underway. The most important hydraulic projects and the biggest investments benefit urban areas.	The environmental conflicts in Jalisco are mainly linked to untreated wastewater discharge, big hydraulic infrastructure, interbasin water transfer, lack of water in some places, and displacement of people by dams. Top-down water policies are contested; legal actions are filed in court.

and strengthening the area as a tourist destination of local natural and socio-cultural beauty and interest to boost the local economy.

The combination of institutional arrangements and implementation of complex and expensive projects focuses on improvement of the lake. This includes ecological lake restoration, development of fishing, hiking trails, organic farming, tourist development, collective land management, environmental education (formal and informal), art and handicrafts, and area land development planning. Because water is under federal regulation, in 2017 CC Cajititlán founded a basin committee as an auxiliary entity for water management, which is now entitled to receive funds from the federal government. Moreover, the municipality innovated governance dynamics by creating the first local prosecution office in the country dealing with environmental protection, water justice, and local punishment of crimes against common resources (air, soil, water, flora and fauna). CC Cajititlán provided key information to this office for development of an action plan in the lake area; it also participated in designing new infrastructure for controlling discharges and storage levels of the lake. These institutional innovations represent a fundamental principle of IWRM by enhancing sustainable water governance in terms of social and institutional coordination in favor of lake restoration and socioeconomic welfare.

Polygon of Environmental Fragility El Ahogado (MP El Ahogado)

Since early 2000s, residents claimed that El Ahogado stream carries industrial pollutants that affect human health and the livelihoods of 30,000 people, especially of those living near a waterfall on the Santiago River. Further, over three decades the area has been a final disposal site for 2500 tons of waste per day; frequently, the badly managed landfill leaches pollutants into the river (Ochoa-García and Bürkner 2012).

The villagers organized resistance and began to expose the environmental problems through various channels, including circulating public statements, distributing informational materials, holding meetings for concerned citizens, and offering free tours of the problem areas. In 2009, after summarizing 127 social complaints the State Commission for Human Rights in Jalisco presented its most extensive, legally reasoned recommendation in history, stating situation represented a violation of water and environmentally related human rights. This attracted more media attention and support from scholars, NGOs, institutes, universities, foundations, and some political representatives.

By 2010 increasing concern and social mobilization led to a government decree declaring the area in a condition of "environmental fragility," requiring that conservation be prioritized for an indefinite period and that strategic planning be coordinated from local to federal level through inclusion of all relevant and interested stakeholders. To comply with the recommendation of the State Commission for Human Rights, an action plan was drawn up incorporating perspectives from integrated watershed management, political considerations, integration of knowledge, and law enforcement, to cover ten municipalities with two million residents (Semadet 2013). Nevertheless, the discourse on IWRM remains oriented towards private concessions for hydraulic infrastructure and services (Ochoa-García and Rist 2015).

Association for Environmental Protection and Sustainable Development for Lake Chapala (IMA Chapala)

Historically, the Lerma-Chapala watershed was characterized by high pressure and overexploitation to meet demands of urban settlements, irrigation, and industry (Wester *et al*. 2009). In early twentieth century, the surface of Lake Chapala was reduced by 30% (50,000 ha) to provide land for agriculture; nevertheless, a dike was constructed to increase the lake storage capacity by almost 50%. From 1957, Lake Chapala has been the main source of water for Guadalajara city (providing 240 million cubic meters annually), and is also important for the livelihoods of several communities on the lakeshore. The level and quality of water varies critically due to high water demands, retention of water for reserves in upstream reservoirs, varying rainfall periods, and changes in land use; this, in turn, affects biodiversity and related economic activities. Guadalajara city now has 4.4 million inhabitants demanding more water, but lakeshore residents have opposed any efforts to increase extraction without taking integrated measures for the watershed.

In 1991 and 2004 the city government and CONAGUA (National Water Commission) signed agreements allowing an increase in social participation in water governance. Several hydraulic management and water security projects have been implemented, involving business organizations (industrialists, farmers, and breeders), Guadalajara city representatives, political parties, scientists, and environmental organizations. In 2011, 16 municipalities working on territorial planning for hydrological protection, updating of environmental regulations, and control of land use change and waste management programs established IMA Chapala. They have a long-term portfolio of projects and have been recognized as a decentralized public organization, making it possible to take on the role of local manager of the long-term UN Program for Reducing Emissions from Deforestation and Degradation (REDD+) project, which aims to create a natural protected area of 190 km^2. The shift from water to forest issues has increased government support for IMA Chapala, and allowed water justice and IWRM to be linked with climate change mitigation and adaptation.

Citizen Observatory (CO) for Integrated Water Management

The Citizen Observatory is arguably the most significant institutional innovation in water governance in the state of Jalisco. It is the country's first citizen constituted institution holding legally binding powers for the enforcement of rules related to water issues in Jalisco state. It emerged from the council formed in 2008 by the water users in the Altos Region for democratic decision-making, and was jointly developed with the Jalisco state government, people affected by the El Zapotillo hydraulic project, and outside supporting institutions specifically to avoid previous failures in water governance (e.g., limited inclusion of grassroots organizations, limited accountability, lack of collective decision making). The Citizen Observatory was launched in 2014, with 20 founding members including representatives from civil society, universities, entrepreneurs' organizations, rural producers' organizations, and the Catholic church (Gobierno de Jalisco 2014).

Processes of constitutionality

In reviewing the institutional processes we follow Haller *et al*.'s (2015) constitutive elements of constitutionality processes, i.e., emic perceptions of the need for new institutions, participatory processes of negotiation, pre-existing institutions as a basis for institution building, outside catalyzing agents, recognition of local knowledge, and a higher level of recognition and support for new institutions (Table 2).

Our analysis of emic perceptions that motivated citizens to intervene in water governance reveals interesting contrasts regarding the topics of dissent, power relations, and governance scales, which range from local action arenas (CC Cajititlán and MP El Ahogado) to the inter-municipal (IMA Chapala) and sub-national level (Citizen Observatory). Emic perceptions at local level focused on health, impacts on livelihoods, and environmental damage (Ochoa-García 2015; Tetreault *et al.* 2012; Velázquez-López *et al.* 2012). Towards broader contexts of water policy, the focus shifts towards a critical review of procedural issues of political participation and the asymmetric appropriation of the benefits of existing and projected water mega-infrastructures by economic and political elites, coupled with the transfer of socio-ecological costs to local actors (Ochoa-García and Rist 2015).

We also observed a scale-related tendency regarding participatory processes and types of power asymmetries. At local levels, problem framing clearly revolves around the distribution of negative health and livelihood impacts among "winners" and "losers" of current water policies (Ochoa-García and Bürkner, 2012). Therefore, institutional innovations in these cases focus on concrete measures that consider the needs of local people and their environment related to sanitation, territorial planning, organic agriculture (e.g., avoidance of pesticides that contribute to pollution of lakes and rivers), or regulation and improvement of tourism activities. A particularly interesting local-level institutional innovation is the establishment of the local prosecution office, which not only enables local actors to formulate new policies, but also empowers them to effectively enforce these policies by means of their own sanctions. The Citizen Observatory is perhaps the most novel institution that considers stakeholder diversity and regional scope. Most significantly, it can take legally binding decisions, which sets it apart from other participatory entities such as basin councils.

In the case of the MP El Ahogado, participation revolves around issues of improving the environmental accountability of various government bodies by creating options for intervention and mobilizing citizens for the evaluation and monitoring of powerful actors' impacts, which are turning this area into a significant source of environmental pollution through industrial and artisanal activities.

At inter-municipal and regional levels, in response to the currently deficient and centralized water governance system, participation directly targets government interventions and policymaking arenas, mainly with regard to planning, construction, and oversight of water-related infrastructure, and attempts to link governmental top-down water governance with the new institutions created from the bottom up.

Regarding pre-existing institutions, there are local and regional instances of water governance from which social mobilization could develop into new forms of collaboration. The claims of local people mainly draw political legitimacy from existing, but not yet enjoyed, rights codified in local, regional, federal, and international laws or agreements. On this basis, social movements also address different political arenas in which these policies play out, such as communities, municipalities, and regional governments. From there, they legitimize the political actions institutionalized for different purposes by enhancing participation.

The roles of outside actors have a strong legitimizing influence in all four cases. Comparing local to regional institutional innovation, we observed that support at the local level focuses on alliances with water justice networks, civil-society organizations, engaged experts, and scientists from regional universities. At broader scales, the local supporting actors serve as catalysts in obtaining support from larger organizations, ranging from regional to national and international levels, e.g., churches, political parties, international courts, including UN bodies such as the UN Office for Project Services and Special Rapporteurs on the rights to food and safe drinking water and sanitation. Mainly at the local level, alliances with outside actors also play an important role in controlling the ever-present threat of repression of key actors and leaders involved in social mobilization.

Exchange, enhancement, and strengthening of local knowledge play an important role in all four case studies, also with scale-related differences. At the local level the exchange of knowledge among local and outside actors is very intense and spontaneous in both formal and informal interactions. Depending on the degree to which the processes of institutional innovation involve broader (inter-municipal or regional) levels of water governance, it has become increasingly important to codify local knowledge, experiences, and visions in formal and more technical or scientific reports, well-organized events, or purposefully managed public campaigns (Ochoa-García 2015).

The official recognition of bottom-up institutional innovations was relevant in all four cases. However, in all four cases it is difficult to separate the process of social mobilization of citizens from the formation of political or social movements and the later stage of recognition by an official entity. From the point of view of constitutionality, the institutional innovations express discontent and negative experiences with Mexico's authoritarian political system and its pre-eminence in water governance (Scott and Banister 2008). The achievement of local actors obtaining access to formerly closed arenas of political decision-making constitutes a highly interesting element of success. The main factor enabling this outcome is the fact that recognized public bodies, such as communities, municipalities, inter-municipal coordination platforms, or in some instances regional governments, nowadays have budgets they can administer according to their own needs and visions. This allows them to fund additional studies and legal assessments, to cover local actors' expenses for

Table 2 Components of constitutionality and institutional innovation in the Santiago River watershed

Components of Constitutionality / Phases for institutional innovation in water governance	Case studies CC Cajititlán = Villagers' organization "Citizen Council for Sustainable Management of Lake Cajititlán" MP El Ahogado = Municipal platform "Polygon of Environmental Fragility El Ahogado" IMA Chapala = Intermunicipal "Association for Environmental Protection and Sustainable Development for Lake Chapala" Citizen Observatory = Citizen Observatory for Integrated Water Management in Jalisco State
Emic perception of factors creating need for new institutions / *Joint understanding of water-related problems*	CC Cajititlán: deterioration of Lake Cajititlán affects the livelihoods; government's irresponsibility. MP El Ahogado: severe pollution of the Santiago River and El Ahogado stream; high level of environmental deterioration causing health issues; industrialists' irresponsibility and ecological debts; round tables for collective definition of the problem. IMA Chapala: Lake Chapala is threatened by hydraulic interventions, water extraction, and a negative water balance; the catchments are wrongly managed and polluted. Unsafe drinking water is related to public health problems in lakeside towns. Citizen Observatory: top-down decisions lead to water conflicts; prevalence of centralized "hydraulic mission" policy; government decisions ignore relevant stakeholders' opinions and knowledge; water resources are in critical condition.
Participatory processes addressing power asymmetries and giving a sense of ownership / *Collective action to challenge existing institutions and policies*	CC Cajititlán: wide representative participation of lakeshore communities in the definition of a work agenda. MP El Ahogado: joint definition of the area (polygon) in which to intervene; participation of all relevant stakeholders in assessment as well as restoration program. IMA Chapala: multilevel participation in debates and basic agreements on water distribution, sanitation, and environmental protection; municipal, regional, and national interest gave rise to novel institutions for water management and forest protection. Citizen Observatory: aim for horizontal dialogue between authorities, users, people interested in water issues, and communities affected by hydraulic infrastructure; creation of the first binding citizen institution for IWRM; representation of all segments of society creating an explicit sense of ownership.
Pre-existing institutions upon which to build / *Tapping existing institutional potentials*	CC Cajititlán: civil-society organization "Por un Lago Limpio"; basin commission acknowledged by the federal water agency. MP El Ahogado: civil-society organizations; formal institutions from the local to the federal level; decree for collaboration among institutions, governments, civil society, and experts. IMA Chapala: interstate initiative; basin council for Lake Chapala and intermunicipal entities. Citizen Observatory: basin commission; civil-society and producers' organizations from Los Altos, Guadalajara city, among others; collaboration among relevant stakeholders working on water conflicts.
Outside catalyzing agents / *Integration and broadening of networks*	CC Cajititlán: regional experts, scholars, supportive environmental justice networks. MP El Ahogado: supportive environmental justice networks (regional to international); co-production of knowledge about the ecological situation; broad participation and media supporting the people's concerns. IMA Chapala: scholars and experts on lake studies and water management; ecological justice networks; social organizations constituted by international and national experts linked to villagers. Citizen Observatory: national and international experts, renowned people, and scholars; environmental and water justice networks; Catholic church; politicians.
Recognition of local knowledge, creativity, and social learning / *Rooting and contextualization of initiatives*	CC Cajititlán: sharing of experiences, knowledge and information exchange among relevant stakeholders and supporters to monitor the lake and water dynamics, historical changes, and assess lessons learned. MP El Ahogado: at the beginning the government denied the problem; then it acknowledged the critical situation based on scientific evidence and people's claims. IMA Chapala: wide-ranging studies incorporate the values people attach to water; different perceptions of the lake lead to contradictory IWRM measures taken by Guadalajara city, Michoacán state, and municipalities. Citizen Observatory: the broad participation and multiple members' experience make it possible to analyze and integrate information for diagnosis and recommendations.
Transition to a new desired institution / *Formalization and assignment of responsibilities*	CC Cajititlán: sharing interests, cooperation, and institutional modifications according to local values.

Table 2 (continued)

Components of Constitutionality / Phases for institutional innovation in water governance	Case studies CC Cajititlán = Villagers' organization "Citizen Council for Sustainable Management of Lake Cajititlán" MP El Ahogado = Municipal platform "Polygon of Environmental Fragility El Ahogado" IMA Chapala = Intermunicipal "Association for Environmental Protection and Sustainable Development for Lake Chapala" Citizen Observatory = Citizen Observatory for Integrated Water Management in Jalisco State
	MP El Ahogado: institutional arrangements due to formal decree, shared work plan. IMA Chapala: shift from water and lake topics to land use and forest issues due to adoption of UN REDD+ program. Citizen Observatory: institutional formalization by decree; the participants defined their own frame and attributions based on the law, focusing on IWRM and water justice recommendations.
Higher-level recognition and support, subsidiarity vs. elite capture / *Engagement in operation and control of compliance of policy processes with rules and regulations*	CC Cajititlán: approval of the citizen initiative by the local government and budgeting for implementation; establishment of the country's first local-level environmental prosecution office. MP El Ahogado: people's claims are supported by official acknowledgement and decree; budget for sanitation infrastructure; failure to address human rights recommendations. IMA Chapala: acknowledgement of IMA Chapala as effort in favor of climate change mitigation and adaptation; budget available for implementation. Increasing support from local government and environmental entities. Citizen Observatory: The observatory's capacity and legitimacy is attracting cases of water conflict occurring in Jalisco state; this novel institution has received recognition for its commitment and active involvement in the process of sustainable water governance.

meetings and exchange with outside actors, and to work towards the realization of development and infrastructure projects based on their direct participation in the concrete functioning of the public administration.

Formalization and assignment of concrete responsibilities as a new feature of constitutionality

Our analysis of the case studies revealed an additional element of constitutionality not addressed explicitly by Haller *et al.* (2015) that concerns the process of co-design and formalization of new institutions, including the transfer or assignation of specific legal, political, and administrative responsibilities that were previously carried out solely by government designated officers. In this sense, collective action also succeeds in promoting sustainable water governance by transforming the interplay between existing and new institutions; it creates space for local agency and deliberative self-governance based on the principles of water justice as an expression of politics (Isch López 2012). In the case of the CC Cajititlán, the new institution assumed coordinating, counselling, and administrative responsibilities related to the planning, implementation, and monitoring of concrete measures to align environmental and livelihood-related activities with the principles of water justice and the organization's own characterization of "development." The creation of a local prosecution office was also a clear move towards the establishment of a formal institution to undertake significant improvement in political accountability of water and environmental governance. In the case of MP El Ahogado, a formal decree defined legal and political responsibilities in a clear work plan for interaction with the municipal government and the related public administration. In the case of the IMA Chapala, the institution became a key actor in broadening water governance by expanding its focus on water issues to include policies addressing land use and forest conservation.

Finally, formalization by the state government defined legal powers of the Citizen Observatory, including the ability to issue public recommendations regarding open access to information, integrated research on hydrological resources, development of proposals for land planning, accountability and transparency, observation of human rights, promotion of best international practices, tracking research of water-related studies, and deliberation about hydraulic projects based on social participation.

This makes the Citizen Observatory an interesting example of a bottom-up institution. Its legitimacy and its ownership by citizens have attracted the attention of social organizations and municipal governments throughout the state who seek support and advice from the organization. However, the state government and formal water agencies still promote mainly technocratic policies that prioritize private investments in hydraulic infrastructure as well as water and sanitation services (McCulligh and Tetreault 2017; Ochoa-García 2015), thus constantly threatening the Citizen Observatory's legitimacy. This might also account for the fact that compared to the other three cases the Citizen Observatory is viewed as less

successful by the people it represents, who express considerable levels of mistrust. This suggests that a high level of control by local people is required for "their" new institutions. Without increased control over such large institutions, feedback mechanisms and local social participation might be too weak to effectively resist the temptation for local representatives concede to the interests of more powerful political and business elites, who are not interested in local input.

Two specific figures of authority in processes of constitutionality for water justice

The constitutionality approach of our analysis of the four cases reveals another as yet unexplored feature of bottom-up institution building processes concerning local recognition of the importance of two different roles in catalyzing social mobilization in water conflicts: "water caretaker" or "water guard" and "water defender." Individuals generally assume these roles spontaneously, and have become figures of authority in collective action without being formally appointed.

'Water caretakers' have a strong affinity with water as an essential element in nature, life, and social practices and a profound awareness of the world's interconnectedness. In this sense, the practice and knowledge of water caretakers transcends material or merely anthropocentric values. These leaders play an important role in attracting and mobilizing support during the initial stages of protests and in consolidating and enhancing social coherence among local citizens engaging in bottom-up institution building. The water caretaker provides organizational and discursive insights to the alliances between local movements and supporting scientific organizations (Rodríguez-Labajos and Martínez-Alier 2015). During fieldwork in the Santiago River watershed, water caretakers were observed calling for the creation of common fronts for tackling water problems from an integrated and long-term perspective.

'Water defenders' play an advocacy role with the aim of promoting improvement in socioeconomic and infrastructure conditions on behalf of poor and marginalized people who require support to increase their well being and thus achieve social justice. However, we observed that the degree of water defenders' engagement might depend on the specific circumstances of each case, and may be defined in temporal terms by social or political context. During the fieldwork and in public meetings, we observed that water defenders conducted scientific research or organized legal suits against the government and public offices promoting top-down initiatives or not fulfilling their responsibilities

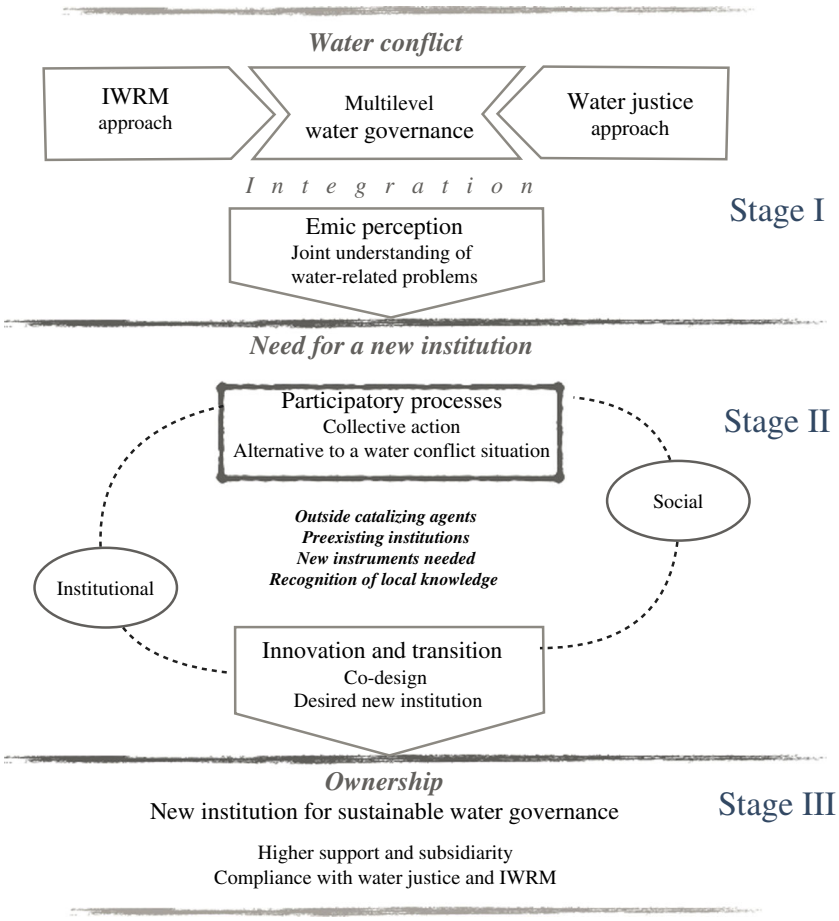

Fig. 2 Links between constitutionality and IWRM, multilevel governance, and water justice

related to dam construction or the deterioration of bodies of water. Water defenders frequently work at higher levels of water governance, for example at the interfaces of local and regional initiatives.

Water caretakers and water defenders take part in shaping new institutions by incorporating the values of water justice and IWRM by drawing attention to ways of making power relations more symmetric. This echoes Wolf (2012), who states that a comprehensive understanding of water conflicts must encompass existential, spiritual, knowing, moral-emotional, and physical dimensions by interacting with different scales of governance beyond hydrological or sociopolitical boundaries.

Linking constitutionality with IWRM and water justice

The constitutionality approach provides a framework for understanding water conflicts triggered by top-down water policies as processes that, besides generating resistance against existing institutions, can also trigger institutional innovations (Fig. 2). A first stage focuses on water conflicts as related to resistance to change, and thus to the implementation of top-down technocratic and infrastructure-oriented projects that are often connected to social engineering aspects of the rigid plans of IWRM. This resistance often coincides with a strong motivation for local actors to develop or strengthen alliances with actors who operate and exert power far beyond local policy arenas, for example in regional, national, or international courts, as well as with transnational social and political movements or NGOs. This first stage usually involves radical questioning of the values and fairness of outcomes associated with top-down water policies, and often leads to the formulation of alternative values based on the principles of water justice.

The interplay between IWRM, multilevel governance, and water justice translates into a situation in which the emic perception of the water conflict leads to a framing of problems that counters the underlying top-down and technocratic approaches to water governance based on local actors' shared understanding of the problems and whose views, values, and interests clearly challenge established power structures. This leads to a second stage in water conflicts: the development of new institutions better suited to meeting the local community's views on sustainable water governance. It is at this stage that outside agents such as NGOs, civil-society organizations, and water defenders or water caretakers usually intervene in the deliberative process. Moreover, this stage also facilitates the integration of discourses and related local knowledge about resources based on acknowledging monetary and non-monetary values related to the ecological and socio-cultural functions of water, and eventually leads to the development of new institutions for sustainable water governance.

In the third stage, these new institutions are linked to existing local, national, and global institutional frameworks, thereby creating a sense of ownership among public as well as private actors, generating higher-level recognition and support, and achieving equity based on effectively operating new institutions.

Discussion and conclusions

The concept of constitutionality provides a useful approach for analyzing institutional innovations emerging from the growing number of water conflicts related to a general crisis in water governance in rural and urban areas of Western Mexico (Castro 2007; WWAP 2015). The processes of institutional innovation triggered by the four cases reported here follow the general principles outlined by Haller *et al*. (2015). We have shown that the strengthening of local people's understandings of water justice links mobilization and resistance *against* top-down water policies with the struggle *for* bottom-up institutional innovation.

The constitutionality approach to water conflicts provides useful insights to civil society's claims and efforts to achieve IWRM through the establishment of participatory democracy as a means for holding established institutions to account in their decisions related to the human right to safe water and sanitation, minimum ecological flow, as well as principles of water justice by means of equitable access to water, recovery of hydro-ecosystems, and sustainable livelihoods. This transformation requires unprecedented levels of political cooperation (Allan 2003; Isch López 2012; Zeitoun and Mirumachi 2008), including transformations of power relations, coalitions, and discourses, as a basis for making water governance more sustainable and equitable.

Although all four case study areas were in the Santiago River watershed, they presented different contexts and trajectories while at the same time showing similar constitutionality processes. In each case, water governance policies were radically reshaped in processes driven by local actors' translation of their emic views of water justice into the crafting of new institutions. The institutional innovations described above are highly specific to their respective contexts and scales. Despite this specificity, constitutionality occurred in quite heterogeneous contexts. In our view, this makes such processes of institutional innovation a promising pathway to sustainable water governance.

Our study revealed that the institutional innovations simultaneously addressed issues of political rights, equitable water distribution, participation in collective decision-making, improvement of livelihoods, and the restoration of hydro-ecosystems. This enabled local people to continuously monitor the outcomes of the procedural innovations resulting from the constitutionality process. The powerful array of real-time knowledge thus generated can be used to further improve

the effectiveness of ongoing institutional development process.

Our analysis showed that processes of constitutionality can also emerge at sub-national levels. However, our findings demonstrate that in such cases, weak mechanisms of social control from below can severely hamper the legitimacy and hence the effectiveness of the new institutions developed to make water governance more sustainable.

A particularly interesting feature of constitutionality processes at local and regional (sub-national) levels is that the newly-built local institutions are not only recognized by the state, but may also benefit from the transfer of administrative and legal functions previously fulfilled by the state, such as monitoring compliance with environmental regulations or prosecuting and sanctioning actors who fail to comply with existing standards of sustainable water governance.

Our study confirms that context-sensitivity is a fundamental feature of collective action that can effectively improve sustainable water governance (Schneider and Rist 2013). Locally emerging 'water caretakers' and 'water defenders' play pivotal roles in helping to make explicit the implicit values of local actors and their notions of water justice. This in turn is a prerequisite for effectively linking resistance to top-down water policies with bottom-up institutional innovation for more sustainable water governance.

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