



Community Organization and Water Sustainability*

Organización comunitaria y sustentabilidad del agua

Organisation communautaire et développement durable de l'eau

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Abstract

This paper analyzes through the qualitative method how community organizations for irrigation and human consumption of water, face the problem of sustainability of this resource in the Lerma-Chapala region of Michoacán, Mexico. The results show, on one hand, that organizations rely on customary agreements, seek equitable distribution of water, and have a control on this function as self-management, with its own resources, skills, knowledge, and community institutional frameworks. On the other hand, there is evidence of wear and pressure on these forms of collective action, due to the production dynamics of the economic model. The contributions of these organizations for water sustainability in the region are mentioned as conclusions.

Keywords: community organization; sustainability; water; Lerma-Chapala

* This researching project: *Sustainable management of hydric resources for the Lerma-Chapala region development*, is directed by the PhD Adriana Sandoval Moreno, researcher from the Academic Unit for Regional Studies, of the Humanities Coordination, National Autonomous University of Mexico. This project has been supported with internal funding since 2012. The studied region comprises 18 municipalities of the north-western of Michoacán state and it has been focused on the study of the water management in the community organizations, irrigators groups, and fishing organizations. This paper shows a part of the results from the investigation.

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Resumen

Mediante el método cualitativo se analiza cómo las organizaciones comunitarias para el riego y para el consumo humano del agua hacen frente a la problemática de la sustentabilidad de este recurso en la región Lerma-Chapala de Michoacán, México. Los resultados muestran, por un lado, que las organizaciones se basan en arreglos consuetudinarios, buscan la distribución equitativa del agua y tienen una función de control sobre esta en forma de autogestión, con recursos propios, capacidades, saberes y marcos institucionales comunitarios. Por otro lado, hay evidencias de desgaste y presión hacia estas formas de acción colectiva, debido a las dinámicas productivas del modelo económico imperante. Como conclusión se anotan los aportes de estas organizaciones para la sustentabilidad del agua en la región.

Palabras clave: organización comunitaria, sustentabilidad, agua, Lerma-Chapala

Résumé

Grâce à la méthode qualitative examine comment les organismes communautaires pour l'irrigation et la consommation humaine d'eau, sont confrontés au problème de la durabilité de cette ressource dans la région Lerma-Chapala de Michoacán, au Mexique. Les résultats montrent d'une part que les organisations se appuient sur les arrangements coutumiers, rechercher la distribution équitable de l'eau et avoir un contrôle sur cette fonction que l'autogestion, avec ses cadres institutionnels ressources propres, les compétences, les connaissances et les communautaires. D'autre part il existe des preuves de l'usure et de la pression sur ces formes d'action collective, en raison de la dynamique du modèle économique de production. Comme conclusion on peut mentionner les contributions de ces organisations pour la durabilité de l'eau dans la région.

Mots-clés: organisme communautaire, développement durable, eau, Lerma-Chapala

Introduction

Water has been exploited intensively to supply irrigation agriculture in the Lerma-Chapala region of Michoacan, Mexico, after the desiccation process of the Chapala wetland (Spanish: *Ciénega de Chapala*) between 1904 and 1910 (Boehm, 2002). From the mid-20th century, an increase on the demand of water has been observed in population centers there, which is accompanied by an inefficient treatment of residual waters, over-exploitation of aquifers, and widespread social inconformity due to the inequality of the water distribution. This scenario reveals a complex dynamic related to water management; it involves mechanisms to get access to good quality-water, its demand by several actors, as well as water management and treatment. All these make it difficult to implement processes of sustainability for a water supply system that assures both quality and equity, while also recognizing the socio-environmental importance of this resource for the region.

However, water management by community organizations in the northwestern Michoacan, Mexico—including indigenous and peasant groups, groups of irrigators, and community water committees—, operate under customary arrangements learned over time that perform a representative function in communities related to the assignation of responsibilities for information, supplying, and the monitoring and control of water. These water management systems have generated alternative results in terms of solving contamination problems and the over-exploitation of water. These management systems could be considered in order to design more equitable processes to access water, and for the use and control of this liquid in the region; through collective work and control mechanisms to ensure the water supply, contrary to the neoliberal economic logic that encourages inequalities and conflicts between users.

The management of water by these social organizations is directly related to the territory and entails the exercise of certain resources, both tangible and intangible (information, materials, uses, customs and legal measures, etc.), and decision-making abilities, all of which are culturally recognized and applied by members and people with whom they interact. Thus, the sociocultural system of these water-management organizations maintains a holistic conception and presents resistance to mercantile styles of management.

This study presents some of the results from the research project: “Sustainable management of hydric resources for the Lerma-Chapala region development”, which seeks to understand water management and explain its relation to the generation of processes of sustainability. The questions formulated to guide this study are: How the sociocultural practices in the water management of these community organizations respond to the water supply problem? and what kind of contribution can they offer for water sustainability? Through collective actions—that refers to relational issues and is understood as the development of joint activities over broad timespans by individuals, through continuous interaction in which they coordinate their efforts, capacities, resources and actions, including rules and frameworks for structured decision-making, all for the purpose of achieving shared goals (Meinzen & Knox, 1999; Ostrom, 2000; Sandoval, 2005)—, the local actors in the water management, which are the community organizations, are studied.

The text consists of three parts: in the first part it is described the methodology and the configuration of the territory where the studied organizations are located. A concise panorama about the concept of sustainability is also set out. In the second part, the results and the discussion of the investigation are presented, which is made of subscripts: hydric problems and community organizations, and its elements of the water sustainability. In the last part the main conclusions are mentioned.

Methodological and conceptual framework

There are two types of community organizations studied. The first type of organization is community committees of water for human consumption, which are present in most of the rural localities in the

region with a population lower than 2,500 people. There were 14 investigated committees of *Purépecha* origin located at the high zone of the basin, in the Chilchota municipality (localities of Huecato, Cuinio, Carapan and Ichán) at the eleven towns glen which is the heart of this ethnic group. Committees of the mid and low part of the basin in the Chapala wetland are also considered; nowadays they are farmers not indigenous peoples: at the mid basin to the Ixtlán municipality (El Limón, Plaza El Limón and El Valenciano), and in the Chapala wetland to the Jiquilpan municipality (Los Remedios, Abadiano Bajo, Los Altos, Los Tábanos, Los Tábanos and La Cantera).

The second type of organization is groups of irrigators located at the mid and low basin of the Duero River and the Chapala wetland, where the agricultural economy develops the production of agricultural companies, cultivating berries (strawberry, blackberry and raspberry), and some vegetables. The possession of the irrigation organizations is the *ejido*¹, which is the most common; however there is also private property. In the Chapala wetland dominates the production of different seeds (corn, sorghum, and wheat) and forage. The interviewed producers belong to irrigation organizations of the IV Irrigation District 061 Zamora (*ejido* La Estanzuela) and from the District 024 Ciénega de Chapala (*ejidos*: Venustiano Carranza, Sahuayo, Villamar and Jiquilpán). These irrigation areas were selected because these are the localities that have been having more problems with water due to contamination and less access to it.

Through a qualitative, sociological and ethnographic approach, we held in-depth, open, and semi-structured interviews with members of the community potable water committees and officials responsible for irrigation groups, due to their location at the basin, their water management characteristics, and their sociocultural identity with the territory and natural resources. The study included several field trips to riverbeds and irrigation zones, water springs, and localities where there are conflicts due to water. It is worth mentioning that the participant and non-participant observation were applied as valuable tools for gathering information in the field trips, working centers, and during the attendance to meetings of the organizations. The results of this study belong to the period of August 2012 to November 2014.

Study area

The Lerma-Chapala region of Michoacán, comprises a surface of 3,829.92 km² and it has a population of 612,257 people (Inegi, 2010), which belong to 18 municipalities: Briseñas, Chavinda, Ixtlán, Jacona, Jiquilpan, Marcos Castellanos, Pajacuarán, Purépero, Cojumatlán de Régules, Sahuayo, Chilchota, Tangamandapio, Tangancícuaro, Tlazazalca, Venustiano Carranza, Vista Hermosa, Villamar, and Zamora² (Seplade, 2006). The region is located into the Transmexican Volcanic Strip, specifically on the western limit of the Michoacán-Guanajuato volcanic field, and is part of the hydrologic administrative VIII Lerma-Santiago-Pacífico (Figure 1). The predominant weather is mild-wet with rain on summer, reaching an annual volume of 900 mm (Seplade, 2006).

- 1 On the *ejido* case, the organization is based on the direction of a president of the *ejidal commissariat*, a secretary, a treasurer, and members are also included. The *ejido* was constituted after the Mexican Revolution, in the late twenties of the last century; it constitutes part of a hereditary regimen of an extra-mercantile appropriation considered as “pre-capitalist” and a conception of tutelary type of the liberal and capitalist State. But since the reforms for the *ejido* in 1992, the formal regulations by law deny the governing rudiments on which there were created. It was delineated in a possession form *ad hoc* to the neoliberalism (Torres, 2012), on such way that nowadays they are alienable lands and propitiate the participation of external actors to the traditional organization of the land and the water usage for the irrigation.
- 2 The Lerma-Chapala region is one of the ten plan regions, in which the Government of Michoacán divided its territory (Seplade, 2006). On this region the Chilchota municipality was not included, but on this study it is included, because hydro logically it is part of the Duero River basin, and it is one of the two basins in the region within the Chapala wetland basin.

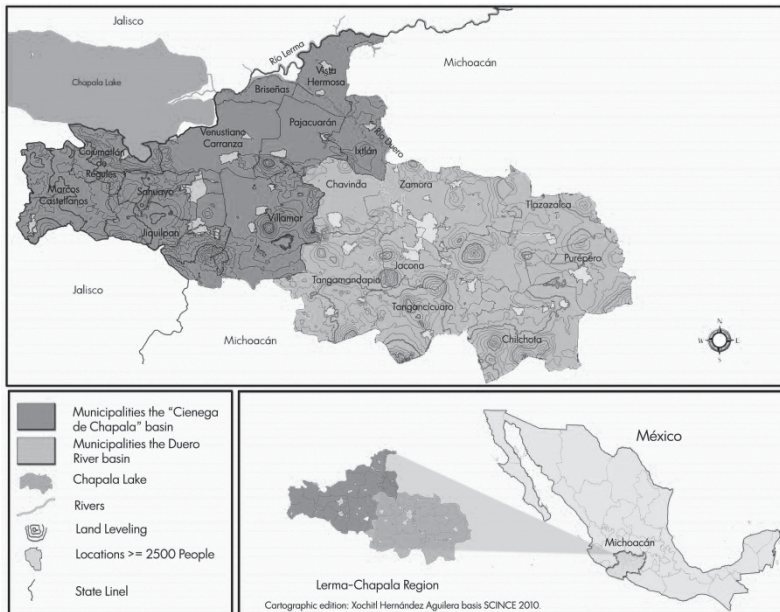


Figure 1. Lerma-Chapala region of Michoacán

Source: elaboration by myself and cartographic edition by Xóchitl Aguilera Hernández.

This region has shown a tendency towards economic specialization since the previous century, with services concentrated in the cities and irrigated agriculture on the plains. Rainfed agriculture and livestock-raising dominate the surrounding hillsides. The two main urban centers (Zamora-Jacona, Sahuayo-Jiquilpan) have almost half of the total population (287,225 inhabitants) (Inegi, 2010)). Small localities can be identified at the outskirts as satellites, which are interconnected among them, and to the large cities, by paths and irregular roadways.

The notion of sustainability

Turning now to the term “sustainable”, we find one of the most oft-used and hackneyed concepts of recent times, especially regarding environmental issues. A vast number of texts propose a diversity of meanings, currents of thoughts, and methodologies, which have contributed to generate ambiguity instead of clarifying this term. One clear example is the role of nongovernmental organizations and international forums on the discursive evolution of what is meant by the word *sustainable* in relation to development, as well as its usage in the public policies in Latin America; even when the meaning is not clear yet, how it operates, and how the diverse contexts should be evaluated.

Arguments surrounding the term sustainable revolve around the concept of environmental consciousness, which evolved from perceptions of the negative effects of industrialization on the environment in the late 1960s and early 1970s. Internationally, it is considered part of the environmental problems, as at the Global Conference on the Human Environment held in Stockholm, Sweden, in 1972, when the United Nations Program for the Environment (UNEP) was created (Pierri, 2005). Since then, international discussions of sustainability have been organized in diverse forums³; each one of

3 Especially important international conferences and forums include the following: 1972, the United Nations Conference on Man and the Environment; 1987, the Brundtland Report that popularized the

them produced declarations that, together, create a scenario that seeks to convince the world that there is an indisputable path that will lead to sustainability under the guiding hand of the neoliberal model. But this approach fails to reach the root of the problems: the desire of big businesses to monopolize and control natural resources, often in collusion with government officials, even at the expense of ecosystems, people, and biocultural knowledge.

Such approach is characterized by its intention to construct an inseparable relation between economy, ecology, and the social, in which the concept of sustainability is represented graphically by an equilateral triangle at the center of which is the zone of equilibrium that will propitiate sustainable development (Artaraz, 2002). This triad presents a conception of development and 'the sustainable' materialized in what has come to be called "sustainable development". This tridimensional relation is simply assumed, as if it were possible to mould the economic model to make it generate institutional frameworks that guarantee social equality, the conservation of ecosystems, and better quality of life when, in fact, the principal characteristic of its genesis is potential for profit. For this reason, it is "genetically" incompatible.

This vision, which is posited as the only viable one, holds that environmental problems can be resolved through purely technical solutions, while concealing social contradictions. But it fails to relate environmental damage to social inequalities, and conceives of society as an ahistorical unit free of contradictions (Foladori, 1999). According to Leff (2005):

This new geopolitics of sustainability is configured in the context of an economic globalization that, while leading to the denaturalization of nature, promotes through its discourse of sustainable development a strategy of appropriation that seeks to "naturalize" the commercialization of nature.

Although initiatives like the one presented by Chambers and Conway (1992) take into account the social component of sustainability as "a human unit (individual, family)", they never question the system of social relations or the inequalities that are generated; rather, their definition stresses the capacity to maintain an adequate and decorous standard of living. Proposals stemming from *ecodevelopment*, in contrast, constitute a critique by non-aligned countries and the Global Latin American Model — elaborated by the *Bariloche Foundation*— that questions the economic and political bases of the existing order and proposes a distinct society. A society founded upon equality on all scales, not consumerism, and the recognition of the fact that needs may have distinct definitions in different cultures (Pierri, 2005). Meanwhile, environmentalist movements and the initiatives of organizations of civil society perform an important role as groups opposed to the neoliberal model.

In an effort to synthesize conceptions and postures concerning 'the sustainable', Foladori and Tommasino (2000, p. 45) grouped together three approaches:

[...] those who hold that *sustainability is exclusively ecological*; those who consider that sustainability is ecological and social, but that the social part is a vehicle for achieving ecological sustainability (*limited social sustainability*); and those who argue that sustainability must be truly social and ecological through co-evolution (*co-evolution of society-nature*).

According to these authors, the concept of *social sustainability* has been plagued by even greater ambiguity because both, the groups that advocate ecological sustainability and those that defend limited social sustainability, agree that environmental problems can be solved through technology ('clean' or 'green' technologies, improved exploitation of residues, higher productivity in the exploitation of

term sustainable development; 1992, the Earth Summit, which established the 'Action Plan' called *Agenda 21* that has led to the implementation of a new international legal framework with a series of juridical instruments that seek to establish norms for economic and social agents that limit and reverse the impacts of economic and technological processes on the environment (Leff, 2005).

natural resources, etc.; Foladori & Tommasino, 2000, p. 46-47). The third group, in contrast, holds that “environmental problematics must be analyzed from both the technical and social perspectives. Social sustainability is deemed a central question, understood [...] through the causes that generate poverty, unemployment, hunger, exploitation, etc.” (Foladori & Tommasino, 2000, p. 47). Although Foladori has developed a solid critique focused on *sustainability*, he has not proposed a clear definition, limiting himself to pointing out the determining aspects of social sustainability: “social participation and the increase in potentialities and qualities of individuals in the construction of a more just future [that emphasizes] social relations of production that generate inequalities” (Foladori, 2002).

Urquijo and Barrera Bassols propose a *monistic stance* in which nature and society are placed inseparably in a shared framework—or as a totality—that stresses the holistic linking of humans to ecological processes, and includes the human mind, religion, ritual and aesthetics. For these authors, the monistic stance in environmental analysis makes it possible to resolve the false dichotomy that characterizes the dualist theses that assume natural and social orders are separate and autonomous systems (Urguijo & Barrera, 2009, p. 229). From a practical perspective, Argueta and Castilleja (2008) present mixed proposals that entail dialogue on knowledge and access to technologies.

Empirical research has shown the importance of historically-constructed social behaviors in a material-natural environment that structures the socioenvironmental practices and interactions that characterize indigenous territories⁴. Here, ‘culture and nature’ are interwoven and inseparable in the systems of meaning of social groups. In contrast, the instrumental economic rationality of the neoliberal model ponders economic interests and conditions access to benefits that are elemental for life. Indeed, access is corrupted as certain interests strive to appropriate the largest amount possible of the highest quality resources at the expense of the quality of life of others. Socioeconomic inequalities are explained by the exclusion of some from benefits that are essential for life, such as clean air and water, healthy food, natural spaces for co-existence, and forms of work for the common good. But this discussion is absent from the legitimizing discourses of sustainable development.

Rural, indigenous and peasant communities in Mexico, as in other areas of the world with similar characteristics, employ modes of access to, and exploitation of, resources for their sustenance based on sociocultural referents, though they also participate in markets to obtain goods they no longer produce. But all these modifications are part of the historical construction of their system of meanings, so water is still perceived integrally as essential to life and the collective identity, as is manifested in everyday practices, rituals and myths. Barkin (2001) argues that the logic behind the sustainable management of rural resources in communities, in the face of increasing individual poverty and environmental degradation, rests on the principles of autonomy, self-sufficiency, and productive diversification. This focus emphasizes strengthening the complex social and productive systems by indigenous and peasant communities in their regions of origin and the construction of their own alternative strategies (Barkin, 2001, p. 69-70).

From the starting point of traditional cultures, Enrique Leff (2005) assumes that:

Territory is the place where sustainability takes root in ecological bases and cultural identities [...] the social space where social actors exercise their power to control environmental degradation and mobilize environmental potentials in self-managed projects generated to satisfy the needs, aspirations and desires of peoples that economic globalization cannot fulfil.

In this perspective, answers to the contradictions of socioenvironmental issues are not found exclusively in the huge corporations of international markets and inter-governmental linkages, but also at the local level where actors are catalyzed symbolically with the natural in a single web of life:

⁴ In Mexico there are published investigations that show these practices and socioenvironmental interactions. As proof of it, the cases of the *Seri* culture in Sonora (Luque and Doode, 2009), the case of the *Purepecha* culture in Michoacan (Barrera-Bassols, *et al*, 2009), in the south the *Mayan* culture (Estrada, 2009) can be consulted.

If the global economy generates the space where the negative synergies of socioenvironmental degradation reveal the limits of growth [then] the local space is where the positive synergies of environmental rationality and a new paradigm of eco-technological productivity emerge. (Leff, 2005)

It is in indigenous and peasant communities that modes of water management are self-directed, integrated into cultural practices learned over generations, and directly related to the natural availability of water and the forms for capturing, extracting, selecting, and storing it. The collective management of water in those communities is achieved through organizations of irrigators and community-based potable water committees. They establish rules and norms for the functioning and internal control of systems of access to water and its distribution and use; all through negotiations among members under a system of sociocultural meanings and collective rights.

Discussions and results

In terms of hydrography, the region is divided in three watersheds; from east to west, the Duero River watershed, the Chapala wetland, and the Pasión River watershed. All are tributaries of Lake Chapala (Spanish: *Lago de Chapala*). The region has two aquifers: one in Zamora that extends eastwards to the municipality of Chilchota, and one in the Chapala wetland (Spanish: *Ciénega de Chapala*), localized in the demarcation of the watershed of the same name that abuts the state border with Jalisco. There are 29 irrigation dams with a capacity of 165.55 Mm³ (Seplade, 2006), but agriculture also draws water from the Duero and Lerma rivers, Lake Chapala and subterranean sources. Population centers are supplied by aquifers and wellsprings.

Other hydric resources are locally-controlled and include reservoirs (*jagüeyes* or wells) built by rural populations to capture rainwater for use in household cleaning activities, animals, and to irrigate gardens. These sources are important when flows diminish in the rivers, pumping systems fail, or where there is no hydraulic infrastructure to carry water to homes. Runoff from several wellsprings located in the higher reaches of the watershed is used for domestic purposes and irrigation.

Evidence of reduced precipitation has been palpable to agricultural producers there, accompanied by longer periods of drought, high rates of evaporation, and increasing temperatures from south to north that average above 20°C (Ramos, in Armas, 2010, p. 25-26).⁵ The long droughts and occurrence of severe, extreme periods of drought in certain months (see the North American Drought Monitor <NADM> Maps⁶), put great pressure on farmers and ranchers who require larger volumes of water for more months, especially for high-demand crops like fruits and vegetables, or *alfalfa*. As a result, levels in the reservoirs, dams, and Lake Chapala are low; a fact that reduces the availability of water for irrigation and increases competition between farmers and cities.

In addition, the region is affected by three significant tendencies regarding water quality and quantity linked directly to anthropogenic interventions. The first is the reduction of recharge zones

5 The availability of pluvial water depends in part on climatic conditions. According to Köppen's classification, modified by García, the area around Carapan, Tlazazalca and much of Valle de Guadalupe in Tancancuaro correspond to type (TO) C (W2) (W) —sub-humid temperate— with abundant summer rains and mean annual precipitation that varies from 1000-to-1200 mm. To the west of the Valle de Guadalupe and in part of the Zamora valley the climate is (TO) C (W1) (W) — sub-humid temperate— with annual summer rains of 800-to-1000 mm; while in Zamora, Jacona, Tangamandapio, Chavinda, the Chapala wetland, and the Pasión River watershed the climate is (TO) C (W0) (W), or semi-hot, sub-humid with summer rains. It is less humid, with annual precipitation that ranges from 800-to-1000 mm (Armas, 2010).

6 The intensity of the drought that affects the Lake Chapala area and surrounding wetlands is classified as *severe-to-extreme* in the months of July and August, impacting agriculture and water availability, though the most critical month is May due to its high evaporation index. Temperatures are highest from May to September, fluctuating between 18.6 and 22.6°C (NADM).

due to the effects of uncontrolled deforestation in the nearby woodlands and the fragmentation of forests due to the intrusion of crops like avocado, that reduce water levels in the springs, and cause soil erosion and the loss of native vegetable species. The second factor is the increased demand for water in the valleys where the main urban centers are situated, and there is a high concentration of wells for urban and agricultural use, especially for strawberry cultivation. The third element is the contamination of bodies of water caused by the dumping of untreated residual urban waters and leachates from agrochemicals. These factors deteriorate freshwater ecosystems and increase the salinization of soils (Hansen & Van, 2001; Silva, Ochoa & Estrada, 2006; Sandoval & Ochoa, 2010; Chávez, Velázquez, Pimentel, Venegas, Montañez & Vázquez, 2011).

Increased demand, low availability, and deficient treatment have generated conflictive relations between agricultural producers who require water for irrigation —especially clean water to grow strawberries—, and the expanding cities of Jacona, Zamora and Sahuayo. In general, the region presents a complex panorama regarding hydric resources: over-exploitation of aquifers, over-exploitation and contamination of surface water, and conflicts among local actors about access to water, uses and control of this vital liquid.

Community organization and water sustainability

In contrast to the problems generated over water use in cities and commercial agriculture, we discovered other logics for water management that, while silently resistant, may produce more promising results in terms of reversing contamination and over-exploitation, while propitiating more equitable forms of access. Although by no means they deny the existing disagreements and conflicts, such community-based arrangements propitiate peaceful means of resolution based on consensus. These alternative forms of water management are rooted in the indigenous and peasant cultures that maintain a significant presence in communities in the sierra and rural areas of the plains. The cultural identity of the indigenous Purépechas is evident in the high Duero watershed, while in other municipalities and in the rural areas of the low basin the presence of peasants predominates.

There is a social experience in water management communities which is expressed in community organizations, strongly permeated by culture, that act within a framework of horizontally-oriented, collective, local-level institutions (Paré and Lazos, 2003, p. 37). This case study found systems for the social management of water characterized by modes of access, use, and control in the hands of local actors; e.g., groups of small irrigators and community water committees that govern domestic usage.

Groups of small irrigators include *ejidal* and smallholder organizations in the valleys; for example, in the Valley of Guadalupe (northeast of Tangancícuaro), in the Zamora-Jacona corridor, around Chavinda, and in the Chapala wetland (east of Lake Chapala). Most of those irrigated fields are of the *ejidal* type, though smallholders have benefitted more from irrigation for their crops of strawberries and alfalfa (Verduzco, 1992, p.121). Both the valleys and wetlands show increased drilling operations to extract subterranean water, a finding that reflects the rationality of expanding opportunities for commercial production:

All of that can be planted (strawberries) but it is not easy, I have participated in some strawberry organizations, this is too complicated, no, not everybody can do it...we would just lower the prices; this is managed by the law of supply and demand. There are four wells to work there and we are updating another two, there will be six, and we have another one which is drilled already, but with this, we are reaching only two millions and seven hundred, another two millions of cubic liters would be missing. (Jesús, Module IV irrigation, District 061 Zamora, Ixtlán, Michoacán, July 31st, 2012)

Today, the region shows contrasting dynamics in the management of irrigation water. The irrigation organization most traditional is the *ejido*⁷, which is constituted by farmers with growing lands. The maximum authority in these organizations is by making decisions in the *ejidal assembly*, where every *ejido* member has the right to participate. The *ejidal* commissary is who represents them at the most general aggregation which is the irrigation district. In a diagnostic about the irrigation problems with 21 *ejidal* commissaries of the “Módulo La Palma de la Ciénega” of District 024 Ciénega de Chapala, 90% of them responded that the *ejidal* organizations are still important. From the total, the 54% responded that they meet when there is an interesting subject to deal with, while 9% meet once a month, 21% every two months, and the rest every six months. In the same way, they said the biggest problem for them is water (35%), the missing maintenance of the irrigation infrastructure (28%), inner organization problems (13%), production problems (9%), problems with the State (8%), and the rest other problems (Sandoval, 2013).

The *ejidal* organization is the collective method to establish agreements regarding the order of watering; but for the production and commercialization of their harvest, the market guides them to decide what to grow and how, and give the prices. In this way, water is highly demanded for commercial crop growing such as alfalfa and strawberry, and potable water for the strawberry, which generates conflicts among the users, because of the differences and inequities on the access to the basin.

Opportunistic water management presents itself on this context, seeking to capture more high-quality water for personal benefit, or as a group, with no regard for the needs and rights of other users and the whole population. The following words from a farmer are illustrative: “There are some times when they are trying to get the water first than the others [...] they argue because of the water, they are investigating how to get the water. Looking how they can put the pump upper, when the water is over they need to wait until they got more” (Juan, farmer, Venustiano Carranza, Michoacán, February 16th, 2013).

The geographical distances and the absence of exchange between the users of the irrigation water located upriver and Those located further down, and between indigenous communities in the sierra and cities, opaque the possibilities of sensitizing certain people to the sociocultural needs and logics related to the water use of other groups, in order to have a regional and integral management.

Growers who remain on the margins of the processes of export agriculture suffer disadvantages regarding access to water and markets. However, the conditions of water scarcity have forced them to implement diverse ways to adapt that include increasing exploitation of surface and subterranean sources, introducing technologies that optimize irrigation, adopting crops that require less water, and, when conditions become more extreme, restricting cultivation to the rainy season.

The agroexport model (strawberries, blackberries, raspberries) has exacerbated the difficulty of coordinating collective action in the region, by offering market advantages to growers who produce larger volumes that meet the quality standards of consumers abroad. Hence, local groups—communities and organizations of small irrigators—find themselves swimming against the tide, as they resist this mercantile model of agricultural production. “The technification, we would like to put tubes to some of irrigation channels which is one of the most important, we would like to have some more machinery, now we are limited maybe because we do not have the needed economy” (Jesús, Módulo I, irrigation, District 061 Zamora, Ixtlán, Michoacán, July 31st, 2012).

Turning now to the water management committees in indigenous Purépecha communities in the high Duero River watershed and rural localities on the plains, we find that water for human consumption

7 The *ejido* is an association of social interest, integrated by Mexican natives farmers with an initial patrimony of lands, forest and waters that the State provides them for free, since the Publication of the presidential resolution on the Official Newspaper of the Federation, due to this, the *ejidal* center is the owner of the lands and proprieties (Licona, 2012, p. 25-26).

is managed through community institutions⁸. The Purépecha people believe that water is an element of nature involved in an ongoing relation with human life. In their towns, seasonal changes (dry *vs.* wet seasons) modulate social life, agricultural work, and ceremonial occasions, including “ritual practices, many of which have a clear propitiatory meaning—for rain, good harvests, continued fertility—and are governed by community prescriptions” (Argueta & Castilleja, 2008, p. 68). In Purépecha mythology, water is related to five rain deities, the *Tirípemencha*, or sisters of the god of celestial fire, *Cwicaeri*, whose name in Purépecha means “divine or precious water” (Corona, 1986, cited in Ávila, 1996, p. 92). Thus, in the worldview of Purépecha culture, water has a sacred connotation that their mythical thought has maintained to modern times⁹.

Based on these antecedents, organizations called ‘community potable water committees’ were formed in the mid-20th century to administer water at the local level, the drilling of artesian wells in the community area, and the construction of hydraulic network with collective work. In some cases, this was fostered by the government, while in others these were purely local initiatives. Due to this, they have water sources at their locality and these were established by the community work, which generates collective rights, such that, the communities began to control water infrastructure and supplies. For example, the President of the Committee in the town of El Limón explained the scope of water distribution in that community: “[...] from nine in the morning to seven in the afternoon, we have water almost all day, the whole area. It’s all distributed; all the sluice dams are controlled to supply everyone” (Juan, committee treasurer, El Limón, Ixtlán, Michoacán, May 23rd, 2013).

In many rural communities, decisions on water management are taken autonomously in community assemblies and then they are operationalized by the committee. Community autonomy in water management is total: “The municipality has nothing to do with us. We do everything” (Pedro, Committee President, Los Tábanos, Jiquilpan, Michoacán, May 22nd, 2012).

The communities assumed control over potable water using local resources. The infrastructure for pumping, storage (elevated tanks), and distribution (valves) is under community control and maintained by collective work. These towns have sought the means to satisfy shared needs by employing resources both tangible—materials, monetary, labor—and intangible, such as their work strategies, meanings, and empirical knowledge related to territory, and the identification of water sources, seasonality, and quality. The main responsibilities of the committee are:

[...] collect [money] house by house. On Sundays every eight days at the ejidal house, from ten o’clock to two p.m. [...] a card is given to people to keep it, when they pay two months they bring it, it is stamped, at the end of the year we do the balance, the costs for potable water, a tube [Hydraulic], all the receipts are presented, receipts of the expenses, what there or and what was missing. (Gabino, committee member, Plaza del Limón, 23 de mayo de 2013)

Hence, thanks to local knowledge and the forms they have learned to manage their natural patrimony, community water management institutions have been proven over the time. Their knowledge about

8 The study of community institutions has been applied to environmental topics, as in the work of Leticia Merino Pérez and Mariana Hernández Apolinar, who understand community institutions as a synonym for local institutions and define them as “rules for use that community members assume in distinct domains of social life” (Merino & Hernández, 2003, p. 277).

9 The significant unity between water and practices of access in time and space form an important dyad that is reflected in myths and legends that in Purépecha communities the real is only diffusely separate from the imaginary. Genaro Zalpa argues that natural forms of distributing water are part of indigenous Purépecha cosmogony. Myths on the origin of water speak of the physical, social, and cultural environments through which Purépecha thought expresses the relation between humans and nature: “Water is god, nature, the gods, the individual, the community, the morning, the evening; life and death interrelate to establish a cosmological harmony, creating, definitively, a world” (Zalpa, 2002, p. 120). And the significance of water extends to the places where it is found, which are cared for and adored, in order to please supernatural forces and assure their continued existence.

wellsprings, rains, and rivers have allowed them to exploit water in their daily lives, take care of the sources where it flows, and maintain the supply under a self-management way.

Community water committees normally consist of up to four individuals¹⁰ who are responsible for supplies. The community as a whole assigns them the right to control this vital liquid, but in the name of the collectivity, and their duties cover everything from extraction to the distribution to households. Thus, they are in charge of pumping, paying any personnel required, collecting payment for service, setting tariffs (with the approval of the community), monitoring supplies, and applying monetary income from water to maintaining and improving the hydric system. These positions are occupied by persons worthy of respect and of good reputation in the community, as was expressed by a member of one committee: “They look for people who aren’t known for being crooked” (Andrés, Committee member, El Valenciano, Ixtlán, Michoacán, 23 May, 2013).

According to members of this committee, it is a privilege to be chosen “to serve one’s town [...] to help the community”. They receive no monetary payment for their work, though there may be the occasional economic incentive, or they may be exempt from paying for water as a form of compensation. Appointments are usually for three years (sometimes more), but depend on the community’s assessment of the person’s performance. Committee members must demonstrate their knowledge, ability, and collective capacity to manage water when they assume control and proprietary rights over the water system of the community.

We draw up the plan for the distribution network and take it to the mayor’s office for approval. And we ask him to send an engineer to measure the force of the water [and] where it is easier to channel it. (Alfonso, Water Committee Treasurer, El Limón, Ixtlán, Michoacán, 23 May 2013)

As representatives of the community, these individuals also interact with external actors—including government, ejidos and individuals—in relation to water management. The role of these committees is vital, for they provide selective information of interests on water and other public policy issues of concern to the community that would otherwise be difficult to obtain. They also work to establish agreements with the local government to satisfy their demand for water. From the perspective of the community, these committees represent the collectivity and defend collective rights to water from source-to-distribution, while managing the economic resources it generates. Hence, the committee is the materialization of the representation of collective interests.

Despite the importance of indigenous and peasant organizations in water management based on self-directed initiatives rooted in territory, holistic meanings, and a whole set of knowledge and capacities for water management, official public policy does not integrate them into the formal institutional structure; indeed, it does not even recognize them as users. Quite to the contrary, it seems that the aim is to eliminate the control that these committees exercise on water sources, and this is what leads to sociocultural resistance on the part of these actors, to continue making decisions about water in a collective way.

Contradictorily to this self-management, there are evidences of wearing among the water organization for the water supply and the community participation. Part of this is because the communities are immersed in contexts of economic pressure due to the lack of employment, and at least one of the family members immigrate to another state of the republic or the United States of America. Others emigrate from the communities to go to school, which causes a division in the family, intermittent or permanent residence out of the locality, the involvement of the new generations in other nonagricultural activities, and the assimilation of other values and behaviors not related to

10 These committees are integrated by the community habitants and are commonly constituted by: a president, a treasurer, and sometimes vocal members. They can hold their position for three years or keep it from the organization of the committee.

the community. This has affected the social cohesion and the collective action on taking community decisions and the execution of labors to benefit others, more than the organization of the parties. As an example: many of the water committee members manifested the low attendance of the population to the water meetings and the renunciation of some of the administrators to avoid their responsibility in the committee; this aspect used to be valuable for the community and it was done with solidarity and voluntarily. One suggestion of one member of the committee is to get an economic incentive on a formal way, as shown in the following testimonies:

People say that it is a service to the community and they also say that it will be better if they get a wage because the way they will do better. (Jefe de Tenencia del Cuinio, Chilchota, Michoacán, August 16th, 2013)

Taking into account all of the above, there is still this question: what contribution can be learned from the communities for a sustainable management of water in the region? Paré and Lazos suggest that it is important to understand the roles of diverse institutions if we are to measure the relations between diverse social actors in the distinct components of the natural environment, and identify the institutions best-suited to construct and foster projects designed to assure sustainability (Paré & Lazos, 2003, p. 34). Constructing processes of sustainability “must take into account people’s lifestyle in order to achieve wellbeing, equality, and social justice with participative and transparent decision-making, governability, and cultural respect, but without endangering the production of the natural base” (Paré & Lazos, 2003, p. 30). We can learn much about the sustainability of water from indigenous and peasant organizations, for their knowledge and capacities contain formulas that are more harmonious for human and natural life. Some of the most important aspects for the sustainability of water are:

- The local actors, with their deep roots in the community and all that comprises their territory; they have knowledge and practices which altogether make them able to face their principal needs, as it is the water supply, using their own resources, through a self-management way.
- The community institutions of water management constitute knowledge interrelated to collective organizations, in ways that have been proven over time, which generate appropriation and maintenance in the water supply. These institutions could become valuable in the public policy, with informed, decisive, and integral participation of the communities in the region.
- The interests of the traditional local actors (farmers and indigenous) on the water, reflect a logic of individual and collective work, which is based on the expectation of common benefits. Nevertheless, they have challenges to overcome, the majority of them related to constant participation and resolution of their internal problems.

Conclusions

The Lerma-Chapala region of Michoacan is characterized by inequalities among local actors in terms of access to water, its use, and control. Problems concerning water result from anthropogenic interventions that obey the prevailing economic rationalities that do nothing to foster local socioenvironmental processes, let alone impel sustainable water management in the region. Linked to this, the problems of limited availability and contamination have differential effects on social groups, so any strategy for sustainable water management must be included in public policies, and the actors involved must be active participants in processes of governance.

Technological solutions make necessary contributions, but these are limited and may even distract attention from social inequalities in access to water, since their objectives do not contemplate effects on social relations or frameworks of cooperation. If the problems of social inequality in the access to clean water are not resolved, then the scenario will become one of heightened conflict over water

among the users. The technologic solutions make needed but limited contributions, which could result in small producers and *ejidatarios* abandoning agricultural activities because they lag behind in terms of modernization. And this, of course, would lead to the monopolization of fields by medium and large producers who have greater possibilities to exploit alternative sources of water for irrigation, including underground deposits. This would mean exclusion from rights to water because, as Garretón has observed, “the demands of the excluded are no longer expressed only in terms of access to minimum levels that are denied to them, but also with respect to quality” (Garretón, 2006, p. 153).

Over-exploitation and contamination of hydric resources manifest the limited ability of the government to enforce laws and regulations in this area, or to monitor and sanction those who infringe them. For this reason, it is important to foster cooperative networks that include government, the public and private sectors, and academia, in order to foment local capacities that have demonstrated their effectiveness in coordinating actions that protect water and assure good water management at the local level.

Indigenous and peasant organizations can contribute many interesting elements related to the sustainability of water: self-directed management of water that uses collective labor as a means of mobilizing resources to resolve common problems independently of other actors; knowledge and ability based on experience and a holistic vision of water; the search for equity in access; local organization; and the implementation of strategies and technologies to guarantee water supplies for collectivities.

Social participation in the integrated management of hydric resources through local institutions is still a challenge. The tendency should be towards forging stronger, more robust, and durable institutions to construct sustainable strategies based on co-responsibility at the regional level. It is for this reason that sociocultural resistance in water management draws our attention, for it is based on community control of water management with local resources and collective work, conceived on the basis of cultural-historical referents to territory that are more harmonious with ecosystems and equitable schemes of access.

References

- Ávila, P. (2006). *Escasez de agua en una región indígena de Michoacán*. México: El Colegio de Michoacán.
- Artaraz, M. (2002). *Teoría de las tres dimensiones de desarrollo sostenible*. Retrieved from <http://www.aet.org/ecosistemas/022/informe1.htm>.
- Argueta, A. & Castilleja, A. (2008). El agua entre los Púrhépecha de Michoacán. *Revista Cultura y Representaciones Sociales*, 2 (4), 64-87.
- Armas Vargas, F. (2010). *Modelación y simulación hidrodinámica del sistema acuífero Zamora, en Michoacán México* (M.Sc. thesis in Earth Sciences), UNAM, Mexico. Retrieved from <http://www.geologia-fflow.unam.mx/documentos/tesis%20modelo%20de%20zamora.pdf>
- Barrera-Bassols, N., Astier, M., Orozco, Q. & Boege, E. (2009). Saberes locales y defensa de la agro-diversidad: maíces nativos contra maíces transgénicos en México. *Papeles*, 107, 77-92. Retrieved from http://www.fuhem.es/media/ecosocial/File/revista-papeles/107/Saberes_locales_defensa_agrodiversidad.pdf
- Barkin, D. (2001). Participación comunitaria para el manejo sustentable de recursos rurales. *Revista Sociedades Rurales, Producción y Medio Ambiente*, 2 (2), 61-71.
- Boehm Schoendube, B. (Coord.) (2002). *Cartografía histórica del lago de Chapala* [CD version]. México: El Colegio de Michoacán, A.C., Centro Universitario de Ciencias Sociales y Humanidades, Universidad de Guadalajara.

- Chambers, R. & Conway, G. (1992). *Sustainable Rural Livelihoods: Practical Concepts for the 21st. Century*, IDS Discussion Paper 296, Brighton.
- Chávez Alcántar, A., Velázquez Machuca, M., Pimentel Equihua, J. L., Venegas-González, J., Montañez-Soto, J. L. & Vázquez-Gálvez, G. (2011). **Hidroquímica de las aguas superficiales de la Ciénega de Chapala e índice de calidad de agua**. *Revista Terra Latinoamericana*, 29 (1), 83-94.
- Estrada Ochoa, A. C. (2009). Naturaleza, cultura e identidad. Reflexiones desde la tradición oral maya contemporánea. *Estudios de Cultura Maya*, 34, 181-201. Retrieved from http://www.scielo.org.mx/scielo.php?script=sci_arttext&cpid=S0185-25742009000200007&lng=es&tlng=es.
- Foladori, G. (1999). Sustentabilidad ambiental y contradicciones sociales. *Revista Ambiente & Sociedad*, 2, (5), 19-34.
- Foladori, G. (2002). Avances y límites de la sustentabilidad social. *Revista Economía, Sociedad y Territorio*, 3 (12), 621-637.
- Foladori, G. & Tommasino, H. (2000). El concepto de desarrollo sustentable treinta años después. *Revista Desarrollo e Meio Ambiente*, (1), 41-56.
- Garretón M., M. A. (2006). Sociedad civil y ciudadanía en la actual problemática latinoamericana. En I. Cheresky, (Comp.), *Ciudadanía, sociedad civil y participación política* (pp. 145-159). Buenos Aires: Miño y Dávila.
- Hansen, A. & Van Afferden, M. (2001). Toxic Substances. Sources, Accumulation and Dynamics, En A. Hansen & M. Van Afferden (Eds.), *The Lerma-Chapala Watershed: Evaluation and management*. New York: Academic Publishers.
- Instituto Nacional de Estadística y Geografía (Inegi) (2010). *Censo general de población y vivienda 2010*. Mexico: Inegi.
- Leff, E. (2005). *La geopolítica de la biodiversidad y el desarrollo sustentable*. OSAL, 6 (17). Retrieved from <http://osal.clacso.org/espanol/html/frevista.html>
- Licona Vite, J. (2012). *Características del ejido*, número 137, División de Ciencias Sociales, UNAM. Retrieved from http://issuu.com/fesaragon/docs/ejido_licona?e=2763965/3477450#
- Luque Agraz, D. & Doode Matsumoto, S. (2009). Los comcáac (seri): hacia una diversidad biocultural del Golfo de California y estado de Sonora, México. *Estudios Sociales (Hermosillo, Son.)*, 17 (spe), 273-301. Retrieved from http://www.scielo.org.mx/scielo.php?script=sci_arttext&cpid=S0188-45572009000300012&lng=es&tlng=es
- Meinzen-Dick, R. & Knox, A. (1999). *Collective Action, Property Rights, and Devolution of Natural Resource Management: A Conceptual Framework*. Workshop draft, 07/15/99.
- Merino Pérez, L. & Hernández Apolinar, M. (2004). Destrucción de instituciones comunitarias y deterioro de los bosques en la Reserva de la Biosfera Mariposa Monarca, Michoacán, México. *Revista Mexicana de Sociología*, 66 (2), 261-309.
- North American Drought Monitor (NADM) *Maps*. Retrieved from <http://www.ncdc.noaa.gov/temp-and-precip/drought/nadm/nadm-maps.php?lang=sp&year=2012&month=5>
- Ostrom, E. (2000). *El gobierno de los comunes. La evolución de las instituciones de acción colectiva*. Mexico: CRIM-FCE.
- Paré, Luisa & Lazos, E. (2003). *Escuela rural y organización comunitaria. Instituciones locales para el desarrollo y el manejo ambiental*. Mexico: UNAM-Plaza y Valdés.
- Pierri, N. (2005). Historia del concepto de desarrollo sustentable. In G. Foladori & N. Pierri (Coords.), ¿Sustentabilidad? Desacuerdos sobre el desarrollo sustentable (pp. 27-81). Colección América Latina y El Nuevo Orden Mundial. Mexico: Miguel Ángel Porrúa, UAZ, Cámara de Diputados LIX Legislatura.

- Sandoval Moreno, A. (2011). Entre el manejo comunitario y gubernamental del agua en la Ciénega de Chapala, Michoacán, México. *Revista Agricultura, Sociedad y Desarrollo*, 8 (3), 367-385. Mexico: Colegio de Postgraduados.
- Sandoval Moreno, A. (2013). *Diagnóstico participativo Módulo 1 "La Palma de La Ciénega", Asociación Civil. Distrito de Riego 024 Ciénega de Chapala Michoacán*, reporte técnico.
- Sandoval Moreno, A. & Ochoa Ocaña, M. A. (2010). Grupos locales, acceso al agua y contaminación en la Ciénega de Chapala, Michoacán. *Revista Economía, Sociedad y Territorio*, 10 (34), 683-719.
- Sandoval Moreno, A. & Günther, M. G. (2013). La gestión comunitaria del agua en México y Ecuador: Otros acercamientos a la sustentabilidad. *Revista Ra Ximhai*, 9 (2), 165-179.
- Secretaría de Planeación y Desarrollo Estatal (Seplade) (2006). *Caracterización de la región 1 Lerma Chapala, Gobierno del Estado de Michoacán*. Retrieved from www.cplade.michoacan.gob.mx/.../Reg-I/CARACTERIZACION%20REGION%201%20LERMA-CHAPALA.ppt
- Silva, G. J. T., Ochoa, E. S., Cristóbal, A. D. & Estrada, G. F. (2006). Calidad química del agua subterránea de la Ciénega de Chapala, como factor de degradación de sus suelos. *Revista Terra Latinoamericana*, 24 (24), 503-513.
- Torres Mazuera, G. (2012). El ejido posrevolucionario: de forma de tenencia *sui generis* a forma de tenencia *ad hoc*". *Península*, 7 (2), 69-94.
- Urguijo, P. S. & Barrera, N. (2009). Historia y paisaje. Explorando un concepto geográfico monista. *Revista Andamios*, 5 (10), 227-252.
- Verduzco, G. (1992). *Una ciudad agrícola, Zamora: del Porfiriato a la agricultura de exportación*. Mexico: El Colegio de México-El Colegio de Michoacán.
- Zalpa Ramírez, G. (2002). La mitología del agua en la Meseta purépecha (Michoacán). *Revista de Literaturas Populares*, 2 (1). Retrieved from <http://www.rlp.culturaspopulares.org/textos/3/06-Zalpa.pdf>