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Articles

The social perception of drinking water quality and management in the Municipality of Las Vueltas, Chalatenango, El Salvador

La percepción social de la calidad y gestión del agua potable en el municipio de Las Vueltas, Chalatenango, El Salvador

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Abstract

Water management in El Salvador is a social territory of dispute between neoliberal norms and the self-management dynamics of the communities. In this context, water quality is defined as a social construct determined by the time and societal space of consumers, that is why the appropriation and monitoring of its quality is a space for citizens' formation. The comparative analysis of the data gathered in 2008 and 2017, in Las Vueltas, Chalatenango, made it possible to understand the evolution of a self-managed water system based on the

direct perception of the population which is the user of the quality of this system. The results state that the increase in the quality of water service coverage is proportional to the perception of increase in public investment for improving water systems, however, the quality of the liquid distributed, both in urban and rural centers, has been decreasing. These findings match the national trend which state that in spite of improvement in coverage, the problems of access and water quality differently impact the population, which are worse in rural areas.

Keywords: Community, organization, water management, quality, vulnerability, natural resources, community perception, governance

Resumen

La gestión del agua en El Salvador es un territorio social de disputa entre la normativa neoliberal y la dinámica autogestiva de las comunidades. En este contexto, la calidad del agua se define como una construcción social determinada por el tiempo y ámbito social de los consumidores, por lo que la apropiación y monitoreo de su calidad es un espacio de conformación de ciudadanía. El análisis comparativo de los datos obtenidos en los años 2008 y 2017 en Las Vueltas, Chalatenango, en El Salvador, permitió comprender la evolución de un sistema de agua autogestionado a partir de la percepción directa de la población usuaria de la calidad de dicho sistema. Los resultados indican que el aumento en la calidad de la cobertura del servicio de agua es proporcional a la percepción del aumento de la inversión pública en el mejoramiento de los sistemas de agua; sin embargo, la calidad del líquido distribuido tanto en centros urbanos como rurales ha ido mermando. Estos hallazgos coinciden con la tendencia nacional que indica que pese a la mejoría en la cobertura, los problemas de acceso y calidad del agua impactan diferencialmente a la población, agudizándose en las áreas rurales.

Palabras clave: comunidad, organización, gestión del agua, calidad, vulnerabilidad, recursos naturales, percepción comunitaria, gobernanza.

Introduction

Through the consumption of water, populations satisfy countless immediate needs, so the degree of access to this resource determines their standard of living. In this sense, limited access to and inadequate management of water sources have a direct impact on the state of health of the populations, as well as on their socio-economic strength; and this is a global phenomenon. According to the United Nations Development Programme (UNDP) (2006a:2), approximately "1.1 billion people in developing countries lack adequate access to water..." And the origin of this deficit lies not in the lack of availability, but in the institutional and policy structure of each country/region. In this context, Padilla (2012) points out the need to differentiate between drought, as a natural process, and scarcity, as a social construction expressed through inequality in access to water and a series of disasters for populations. These disasters are explained by the social construction of scenarios that combine natural and anthropogenic aspects (Garza, 2004; Meli, 2001:7). In this case, disasters related to water scarcity must be understood from this perspective.

Latin America is a region that possesses abundant water resources (with 15% of the planet's surface, captures almost 30% of precipitation and generates 33% of global runoff) and, according to its population and distribution (less than 10% of the world's population), could offer a quantity of water per inhabitant (28 000 m³/habitant/year) higher than the general average (8 000 m³/habitant/year) (Ávila, 2002 cited in Guzmán & Calvo, 2013:6), however, access to these resources is extremely different (socially, geographically and environmentally) from one another regions, generating one of the regions with the greatest socio-environmental tensions, especially along offshore Pacific Ocean (Temper, Bene, & Martínez, 2017).

According to the Food and Agriculture Organization of the United Nations (FAO) (2000), the regions that makeup Latin America, Central America and the Caribbean (including Mexico) comprise countries that are below or close to the water scarcity limit set by Haiti, 1 759 m³/hab/year. In this group, we can include Dominican Republic (2 593 m³/hab/año), Cuba (3 444 m³/hab/año), El Salvador (4 259 m³/hab/año), and México (4 850m³/hab/año), among others.

In this context, El Salvador is a country with the lowest values in terms of availability of internal renewable water resources (IRWR), 18

km³/year, and availability of total renewable water resources (TRWR), 25 km³/year (FAO, 2000: 182). Although it is part of a tropical zone, it is the second country (after Belize) with the lowest average annual rainfall in the region, 1 784 mm³ (FAO, 2016). This is expressed in the disposition of the liquid per capita. In the mid-1990s, water availability was 3 500 m³ per year, the lowest in Central America (UNDP, 2006b: 11).

On the other hand, according to the Water Scarcity Index (which contemplates the variables: existing water resources, access to said resources, access capacity, use of the resource, impact on the environment) (Lawrence, Meigh, & Sullivan, 2002), El Salvador is among the group of countries characterized by a high level of water scarcity (according to the United Nations World Water Assessment Programme (WWAP, 2016:16), three levels of water stress are distinguished: When drinking water supplies are less than 1 700 m³ per capita per year, the degree of stress is considered regular; when these supplies fall below 1 000 m³, the degree of scarcity is considered chronic; absolute scarcity is when these drinking water supplies are below 500 m³ per capita, so by the year 2050, according to the United Nations Educational, Scientific and Cultural Organization and the International Hydrological Program (UNESCO-IHP), this country will be experiencing an significant water stress (UNESCO-PHI, 2006: 9).

According to Quiñónez (2017: 50), the total projected consumption for water use in El Salvador, taking into account its use for irrigation, industrial, thermoelectric, livestock, aquaculture, hotel and tourism, between 2005 and 2050, will be 188.45%. On the other hand, human consumption of water will increase, in the same period, around 320%, which will generate new pressures on the management of the liquid.

In this context, El Salvador has been a country that, in its social and historical development, has presented low levels of development; however, there have been important changes in terms of access to public services. For example, in the third decade of the 20th century, access to public services, such as electric lighting and sanitary services, visibly improved, with the number of households electrified increasing from 60% to 86%, and in the case of sanitary services from 29% to 62%. This improvement was also observed in the number of households with piped drinking water, rising from 57% to 69 % (UNDP, 2013: 83).

This situation was aggravated by the Civil War, which reduced access, to those services, approximately 40%. However, once the war was over

(1979-1992), and through different scenarios of social decomposition (socioeconomic marginalization, delinquency, and concentration of wealth) derived from post-war processes (Córdova, 1996), the "new" social mobilization was characterized by a reivindicative struggle for social rights and the environment for human life, against mining, against dams, against deforestation, for water and for the conservation of native seeds (Menjívar, 2009:8). One of the results of these processes was that between 1991 and 2012, the number of households with access to drinking water, by home connection, increased to 83% (UNDP, 2013: 96).

El Salvador does not have long historical statistical series on access to public services, but dividing access to piped drinking water in urban and rural areas shows an increase in service access from 57% to 91% in urban households between 1961 and 2012. In the same period, this access was from 1% to 70 % in rural households (UNDP, 2013: 100). This access, between 2005 and 2012, was more than 21% (see Table 1).

Table 1. Access to piped water services (%) in El Salvador (2005-2012) (UNDP, 2013: 298-299).

Options	2005	2006	2007	2008	2009	2010	2011	2012
National	75	75.5	78.2	78.3	78.7	82.9	83.8	85.4
Urban	90.4	90.5	90	89.9	90	92.9	93.1	93.5
Rural	48.5	50	55.3	54.9	56.7	63.9	66.4	69.8

Despite this increase in the number of Salvadoran households with access to public services such as drinking water, the development models applied to countries such as El Salvador have not managed to build human development processes that generate an improvement in the standard of living of the population, so there are still large sectors that lack adequate public services, such as the service of distribution of drinking water through pipes, a service that has begun to face difficulties due to the quality of the liquid available. In relation to the above, although access to public services, such as water and drainage, has increased in recent years in El Salvador, water resources have decreased increasing pressure due to two determining variables:

- a) The country's demographic process has generated one of the highest population densities in Latin America (300 hab/km²) (Ortiz, Cea, & Sánchez, 2003; Flores, 2014), therefore, according to the World Wildlife Fund (WWF) (1999), it registers one of the highest rates of water extraction by domestic sector in Central America (245%) (WWF, 1999),
- b) A growing deterioration of the resource due to its contamination, mainly because a large part of the sewage discharges is made it directly into the environment without any type of treatment (according to Dimas, 2005, only 2% or 3% of the generated sewage gets to receive some treatment before being discharged to the drainage channels), to such an extent that "in general all the evaluated surface waters ... do not comply with the aptitude of use to make potable by conventional methods by the high Phenols levels ... 77% of surface water are polluted to some degree..." (UNESCO-PHI, 2006:82).

Since the late 1980s, more than 90% of surface and groundwater sources have moderate to high levels of pollution by organic, industrial and agrochemical wastes (Ibarra, Campos, & Rivera, 2002:31), with a wide range of pollutants: fecal coliforms and *Escherichia coli*, among others (see Table 2), which has caused gastrointestinal diseases such as gastroenteritis, dysentery, cholera, and typhoid (Sanfeliú, 2001). According to UNDP (2003:95-96), in 2002, among the main causes of morbidity were intestinal parasitism, diarrhea, and gastroenteritis of infectious origin. Also, the main sources of organic pollution come from the food and beverage industry (UNESCO, 2006: 281).

Table 2. Pollutants in drinking water in rural households in El Salvador. (Sanfeliú, 2001).

Agent	Samples (%)	Agent	Samples (%)
Fecal coliforms	61.4	Cadmium	92.2
<i>Escherichia coli</i>	51.8	Chromium	73.8
Compound 2, 4D	18.1	Arsenic	42.7
Atrazine	11.5	Lead	36.5
Nitrates	88.1	Copper	18.7
Nitrites	16.8	Selenium	11.5

According to the 2002 Multipurpose Survey (EHPM) of the General Directorate of Statistics and Censuses of the Ministry of Economy of El Salvador (DIGESTYC), 34% of Salvadoran houses were supplied with water through pipes, wells, water eyes, among others. In turn, 18% of households in the country were supplied with water from unreliable sources and did not carry out any type of purification; this situation is aggravated in the case of rural households since 26% doubt that it is a safe liquid to drink and 41% of rural households drink water from unreliable sources without purifying it (UNDP, 2003: 96). The latter highlights a differentiating dynamic in the supply of drinking water, and a possible cause of this would be, rather than the provision of water, how the institutional system responsible for its management is structured.

Institutional Governance: A reconfiguration of the social territory of water in El Salvador

The issue of access to drinking water in El Salvador is a process that has evolved historically, socially and environmentally in a complex way, so water scarcity in the country is a problem of anthropogenic rather than natural nature. In this context, the problem of access to water is due to a social system of water resources management plenty full of technical, organizational, institutional and financial problems (UNDP, 2006b: 11) which has as a background what Murillo and Soares (2013) indicate as water governance (regulated by international financial institutions). This implies a mechanism of thinning of the State and the delegation of responsibilities to the private sector, generating processes of concentration and derivation of natural resources (such as water) towards areas with a higher profit margin. This mechanism was revealed as the means through which neoliberal policies were implemented, creating oligarchies that control water uses in El Salvador (and Latin America), but under purely economic and not social criteria.

The privatization of the drinking water distribution service in El Salvador has as a background the reforms to the legal frameworks of the sector produced in the late 90's; with the purpose of modernizing the water

resources sector in the country (Gómez & Flores, 2006), amendments were made to the Law for the Creation of the National Water and Sewerage Administration (ANDA), in order to open the participation of the system to other operators and give way to the decentralization of the service. To achieve this, a "Pilot Plan for Decentralization of Drinking Water Systems" was implemented in 20 municipalities. In 2001, following the earthquake in the region, the Presidency of the Republic and the Legislative Assembly redirected funds from the Inter-American Development Bank (IDB) for the reconstruction of damaged infrastructure to increase the number of municipalities with decentralized systems to 63 (Gómez & Flores, 2006).

According to the Local Development Network (RDL) (2006), this process of deconcentration/delegation was a transfer of the problems and challenges of the water system to the communities, but a transfer of the economic gains to the private sector, privileging the interests of hegemonic economic groups and considering the conservation and protection measures of natural resources, in particular the environmental ordering of the territory, the energy policy and the protection and rational use of water, as "obstacles that hinder development" (Ibarra *et al.*, 2002:37).

According to Artiga and Rosa (1999), this process of water resources management was distinguished by its dispersion, with serious overlaps of jurisdiction and institutional responsibilities, since most institutions ended up developing activities aimed at satisfying uses that are opposed and generate competition for this resource. This made possible a system of multiple interests around the privatization of water; the winning groups were the bottlers and tanker companies who made the liquid more expensive for the rural population.

This generated countless social dramas at the population level. "Milagros... lives on the second most important aquifer in the country but did not have water at home until a year ago. On the other hand, Coca-Cola uses water from the aquifer to produce a third of soda that Central Americans drink. To produce each liter of coca cola drink...two liters of water are used. In 2015 the company announced that it would increase its production while 40% of the inhabitants of that same population...did not have potable water" (Siscar & Coll, 2017).

According to García (2003), this privatization was characterized by a legislative process in which attributions and powers over water sources and distribution at different organizational levels (community,

municipality and department) were granted to local, national and international institutions, generating a conflict of roles among the same actors. This has made the structure of the sector characterized by "...a centralized public monopoly, with a growing informal private sector without any regulation and several independent programs, not very well coordinated and of external financing... in the country currently there are neither the norms nor the instruments to regulate the supply of drinking water." (García, 2003).

In 2007, ANDA provided potable water services to 56.9% of municipalities, "decentralized" systems and municipalities to 42.7%, and the remaining 0.4% lacked potable water services (ANDA, 2005). This opened up an offer of drinking water distribution services to a diversity of suppliers, which, according to UNDP and the Salvadoran Foundation for Integral Support (FUSAI) included: "a) municipalities that never delivered their systems; b) municipalities and local companies that have delegation agreements, in experiences that were initially presented as 'pilots' for decentralization; c) private 'self-sufficient' systems built by investors for their own housing and urban development; d) Micro, small and medium-sized water companies, and e) Water Suppliers Associations" (UNDP/Fusai, 2011:35-36). All of the above generated a complex framework around the quality of the drinking water distribution system, so, "Even in those areas where the connection to pipes is generalized, the supply service tends to be irregular and intermittent... Frequently, complaints are reported from communities where water is lacking for weeks or even months, but ANDA receipts arrive punctually..." (UNDP, 2006b:11-12). This decentralization process generated a public debate on the issue of water, linking diverse actors (national and international: the United States Agency for International Development, IDB, local organizations, etc.) and provoking the emergence of diverse models of administration of drinking water systems, based on local participation (García, 2003), therefore, different scenarios of confrontation and social, economic, political and territorial linkage, that is, the conformation of a complex and dynamic territory in El Salvador. In this context, the notion of territory is understood from a connotation of extension of power since it implies a strategic game on the management of local resources, according to asymmetric criteria established by local, regional and global market hierarchies (Padilla, 2012), which has led to financial capitals, together with corporations, having achieved such a capacity of control over the populations that have been allowed to establish, in the territories where they operate,

lifestyles limited to predetermined processes of consumption, without leaving aside their dynamics of maximizing profits, transmigrate and socializing losses. This, regardless of the cost in jobs, labor abuses, pollution of the environment and a greater disdain of the corporations towards the populations (Klein, 2002), which generates a decrease in the quality of the goods and services offered by the market and the State, to the detriment of the standard of living of the populations.

Defining quality

In increasingly critical and consciousness population, about the State and the market, there is growing concern about the quality of services received, both for their origin and for the conditions in which they were generated, mainly in agrifood systems and access to drinking water. In this way, quality begins to be an objective of current social movements and has become the space of competition and reformulation of social relations between society, State and market (Hatanaka & Busch, 2008, taken from Hernández & Villaseñor, 2014). In this sense, quality is defined as a social construction determined by the time and space of the economic, political and social relations of reproduction of the communities, and its common denominator is to exceed the expectations of the consumer as to goods and services received and/or needs it has (Reeves & Bednar, 1994). In this connection, it is correct to assume that quality is a concept that functions according to the level of empowerment of local supply chains; therefore, a low quality in the provision of public services will mean a certain social responsibility. In this way, the access, appropriation and monitoring of the quality of public services is shown as a space for the conformation of citizenship since it is through these actions that the integration and cohesion of the communities is made possible, achieving community denunciations of arbitrariness in the provision of services and, consequently, modifying policies related to such public benefits (Ramírez, 2015). In this regard, the notion of access to drinking water and its quality is supported, as a space of confluence and social confrontation between communities, governments and companies, as that is currently the case in El

Salvador, where access to water is a scenario of power, social inequality and gender (Siscar & Coll, 2017).

According to Padilla (2012), the way to face this phenomenon depends, mainly, on taking into account the notion of quality that the population has concerning the distribution of drinking water. This is important because the quality of the water received (linked to hygiene and good living) will be directly proportional to the quality of life of the population, thus influencing their degree of vulnerability (Hernández, Sánchez, & Vázquez, 2013).

On the basis of the aforementioned, this research was proposed to: 1) Analyze the perception that users have of the water management system quality in the Municipality of Las Vueltas, Chalatenango, El Salvador; 2) understand the socioeconomic factors that determine water quality and the current state of this management; in order to, 3) understand this management as a system that can be modified from citizen participation.

Materials and methods

This research was carried out on an ethnographic basis, that is, it described and reconstructed, analytically, the forms of life and social structure of a certain social group, making a "portrait" of its way of life (Rodríguez, Gil, & García, 1999: 44). For this purpose, qualitative and quantitative information was collected in 2008 and 2017. The instruments used to collect the information were bibliographic search, questionnaires and interviews with key informants. The items that allowed to construct the discussion were the following: a) perception about costs and benefits of the processes, b) decentralization of the water management system; c) infrastructure (drinking water network); d) identification of water supply sources; e) conflicts over water; f) characterization of water management practices; g) perception of drinking water users about the costs and benefits that water management practices have for their quality of life. The information was collected in the following cantons and hamlets: Sicaquite, La Ceiba, La

Laguna, Las Vueltas, Los Naranjos and San José de la Montaña. The method used for sample selection was simple random without replacement. 10% of households in the municipality were surveyed. In 2017, the population surveyed comprised a larger universe (537 people) than in 2008 (351 people). The sample for the first year was 170 people and for the second year 126 people. The formula used was as follows:

$$n = \frac{Z^2 pqN}{(N - 1)E^2 + Z^2 pq}$$

Where Z is area under the curve related to the confidence level; p , probability of occurrence of the analyzed variables; q , probability of **no** occurrence of the analyzed variables; E , predicted error; n , sample size. The parameters of the formula are as follows: Z , 95%; p , 90%; q , 10%; E , 3.25 % (3.75% by 2017).

Results and discussion

The department of Chalatenango is located to the north of the country, border with Honduras, has a territorial extension of 2017 km², distributed in 33 municipalities (one of which is Las Vueltas) (Figure 1).



Figure 1. Apartments in El Salvador. Source: Geographical viewer of El Salvador. Retrieved from <http://www.cnr.gov.sv/geoportal-cnr/>

According to UNDP (2005a: 469), in 2004, Chalatenango had a total population of 202 300 inhabitants, of whom 41.9 % were in total poverty, which represents 7.4 % above the national average. The Human Development Index calculated for El Salvador is 0.732; however, in the case of Chalatenango, said index is much lower (0.680), situation that is expressed in other indicators, such as life expectancy at birth, which, at departmental level, is 67.2 years (3.7 years below the corresponding national estimate); the percentage of adult literacy is 76.3 % (6.7 % below the national estimate) and the GDP per capita is \$4045 (\$1.046 less than the national estimate) (UNDP, 2005a: 467). According to Gómez, García and Kandel (2002), historically, the department of Chalatenango has been marginalized from public programs and policies, as well as from the country's economic trends, making it one of the areas that expels workforce, mainly agricultural, and promotes social mobilization. According to Lara (2003), Gómez *et al.* (2002), this region stands out for its organizational history. Since the 1970s, the political activity of religious organizations, the support of the guerrilla movement and the emergence of the peasant movement (a response to the high levels of poverty) have made this department one of the areas with the greatest capacity for social organization in the country, capacity that has extended to issues such as the defense of land against the extractive industry of the mining companies (Spalding, 2011) or against the privatization of the health sector (Almeida, 2010). One of the results of this organizing process was that 86.08% of the

Chalateca population had access to an improved water source. In urban areas, this access amounts to 98.34% and in rural areas to 78.22% (UNDP, 2005b).

Las Vueltas

The municipality of Las Vueltas has a territorial extension of 36.26 km². It is located to the east of the department and delimited, to the North by Ojos de Agua, to the East by Las Flores, to the South by Chalatenango, and to the Northwest by Concepción Quezaltepeque. It has a population of about a thousand inhabitants and it is 826 meters above sea level (Wikipedia, 2017; Benítez, 2016). The environmental characteristics of the micro-region, where it is located, indicate a certain degree of decomposition generated mainly by agricultural practices, such as subsistence farming on hillsides (production for family consumption of corn, beans and *maicillo*, real melons, *tecomates*, *pipianes*, *ayotes*, among others) and extensive cattle ranching on pastures. This situation is aggravated by the limited access of the majority of the peasant population to the natural resource base, notwithstanding the land redistribution programs carried out by the State in the region.

On the other hand, according to the Salvadoran Program of Research on Development and Environment (PRISMA), economic changes in the country during the 1980s led to the destructuring of traditional rural livelihoods, reinforcing migration to the United States as an alternative for survival (PRISMA, 2006). According to UNDP (2005b:167), the municipality of Las Vueltas has one of the highest rates of extreme poverty in El Salvador (45.7% of households). In some of the human development indicators, the municipality is well below the indicators at the national level (see Table 3).

Table 3. Human Development Indicators of the Municipality of Las Vueltas, Department of Chalatenango, El Salvador. 2005. (UNDP, 2005b).

Options	Life expectancy	Combined registration	Adult Literacy	GDP per capita	Human Development
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		fee		PPP	Index
National	70.9	66.6	82.9	4.986	0.731
Las Vueltas	65.4	65.4	66.1	1.607	0.599

In spite of the above, according to UNDP (2005b: 46), in Las Vueltas, 85.3% of households have access to an improved water source, placing it in the 13th place among the municipalities with the best access to this type of sources. This is supported by a strong organizational tendency, a solid link with left-wing movements and an extremely diverse social background, but which is mainly nuanced by a gender composition. In this context, Las Vueltas is one of the municipalities with the highest rates of women's participation in municipal councils (35.7%), ranking twentieth nationally (UNDP, 2005b:39). Women's leadership have been key to organizing the community water system in the municipality. In fact, since 1987, most of the presidencies of the municipality's Community Development Associations (ADESCOS) have been led by women (Gladys Alas, personal communication, February 11, 2017) and the organization of new community water systems has been due to women's participation (Antonia Ramirez, personal communication, February 11, 2017). This gender relationship with the organizational dynamics of the drinking water supply system in Las Vueltas is not a fortuitous subject but rather an issue of social and economic vulnerability since, on the basis of a generic division of domestic work, women and girls are responsible for providing water to their respective homes, which means working days (not valued neither economically nor socially) dedicated almost exclusively to obtaining water for the family. This means that women (adults and girls) will devote large amounts of energy, time (which could be used for other productive, recreational, leisure or school activities), and health (carrying water causes health problems such as back and neck pain) to this activity (UNDP, 2004).

About this, water shortage will always affect any family; however, women are the main affected by this shortage. In this context, based on the 2002 EHPM (Digestyc, 2002), UNDP (2004: 96) established that the main household water supply problems directly affect 87 % of women (mainly mothers and daughters over the age of 15).

Nevertheless, the homes of women heads of household in rural areas in conditions of extreme poverty are the ones that have most problems, since although 46.4% have access to water, 53.6% do not. This

increases for households headed by women from rural areas in conditions of relative poverty, where 54.6% do not have access and 45.5% have access to drinking water. These percentages contrast with 94.8 % of urban households headed by non-poor women who have access to drinking water.

This degree of social and economic vulnerability has logically led to women being the main social actors in the structuring of drinking water management systems in the region. In this regard, García (2003) points out that "communal organization has proven to be a powerful axis from which many actions for local development can be gestated. The formation of leaders capable of administering the system and managing new and diverse resources for their community increases and makes more effective citizen participation, environmental co-responsibility and the integral management of water resources". In this regard, Guillén (2014) points out: "Throughout the twentieth century, women of popular classes in El Salvador have been subjected to the imperatives of the socio-metabolic system of capital and its unstoppable impulse of expansion and accumulation, whose cultural dimension is translated into patriarchy, a fact that has brought them a double oppression and exploitation. They have endured the worst levels of poverty, violence, working conditions and unemployment, but at the same time they have been able to organize themselves and fight for their rights to change their living conditions" (Guillén, 2014).

In this way, analyzing the social perception of the quality of the water management system in the municipality of Las Vueltas indirectly implies verifying the work done by women in El Salvador to build water distribution systems in the homes of their communities. Systems that must be reviewed in the light of the quality of the service they provide.

The social perception of the quality of drinking water in the municipality of Las Vueltas, Chalatenango, El Salvador

The population of the municipality of Las Vueltas, in the Department of Chalatenango, lives under constant pressure from various angles of its

development. One of these concerns the issue of access to drinking water. In Las Vueltas, this access to the liquid is done in several ways. The majority of households use their pipes, which has increased from 85.9% to 92.1% in the period studied. It is worth pointing out that, in the same period, other forms of access to water were registered as the use of the neighbor's pipe (5.9% to 4.0%), river or spring (4.1% to 3.2%). Regarding the differences, in the access to drinking water, in the two years analyzed (2008 and 2017), between urban and rural areas, said access has been, for the most part, through own pipe (90.7% and 77.4%, as well as 97.6% and 89.3%, respectively) observing a considerable increase in the use of own pipe in rural areas. It is worth noting the decrease, for rural communities, of the use of water from rivers or springs (from 9.7% to 3.6%), as well as the use of neighbors pipe (from 11.3% to 6%).

The provider of this service has varied although most of the service has been provided by the organized community (through ADESCOS), with a small decrease in this service between 2008 and 2017 (86.5 % and 85.2 %); in second place it has been the mayor's office (10.9% and 10.7%) followed by other suppliers. At the level of urban and rural communities, the main supplier has been ADESCOS, although a qualitative change is observed since said supplier is indicated, in 2008, mainly for rural communities (90.9%) and in second place, for urban areas (84.2%), which changes for 2017, being ADESCOS the main supplier for urban areas (95.1%) and in second place for rural areas (80.2%). The inverse process occurs in the case of the mayor's office, as the second provider: in 2008, it is indicated by 12.9% as urban provider and 7.3% as rural provider; in 2017, 4.9% for urban and 13.6% for rural.

This was due to the process of decentralization of the water distribution service and the repopulation and urbanization of the municipality of Las Vueltas, which made it necessary to organize a general assembly, which resulted in a water committee. Subsequently, in each locality of the municipality (cantons and urban area), ADESCOS was formed as organizing agent of local water boards. For its part, the mayor's office entered as a regulating agent of these boards by proposing to regulate them. This organizational process, as the main service provider, was derived into a process managed by the ADESCOS and water boards; for its part, the municipality became, from being the regulator, an observer of the process.

According to the families interviewed, for the most part, the quality of the water received was rated as good, although this opinion decreased between 2008 and 2017 (from 52.6% to 49.2%). The general reasons for considering the liquid to be of good quality (in 2008 and 2017) were mainly because it comes from a spring and/or because it receives some type of treatment (filtration, chlorination, etc.). On the other hand, families who indicated that this quality had been inadequate rose from 32.7% in 2008 to 46.7% in 2017. The reasons for considering it inadequate were because it was muddy, and it had wastes, and garbage; yellow, stained, *pushca*, zarca, tanned, cloudy, dark, dirty rain. According to the perception of users, water quality has remained more or less the same in the period indicated (57.7% to 59.0%), although for a part of those interviewed, this quality has improved, going from 24.4% to 32.8% between 2008 and 2017.

About the opinion of the population analyzed, at the level of urban and rural areas, in 2008, 48.5% and 60%, respectively, indicated that the water consumed was adequate, because it received treatment (filtered, chlorinated, container washing) and was abundant; not so for 36.6 % and 25.5 % that, in the same year, pointed out the opposite because it was dirty and did not give maintenance to the pipe or tanks, nor received treatment. By 2017, this opinion changed significantly as, in urban and rural settings, 53.7% and 46.9% of the population felt that quality was adequate because it came from the spring, was being treated and was abundant. Concerning the population that qualified, in that year, the water received as inadequate, (41.5% and 49.4% for urban and rural areas) indicated that this was due to that it was dirty, polluted and the infrastructure (piping and receiver tanks) did not receive any type of treatment.

It is quite particular to observe that in 2008, 53.2 % of people gave a treatment to the water they drank; this percentage decreased in 2017 to 30.3%, which was reflected in the population that indicated the opposite. In 2008, 42.9% reported not treating their water, in 2017, this percentage increased to 68.9%. The potabilization treatments, given to water, were diverse, as can be seen in Table 4.

Table 4. Treatments of potabilization practiced to the water consumed in Las Vueltas, Chalatenango, El Salvador.

Options	2008	2017
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	Frec.	%	Frec.	%
Sun (solar disinfection)	27	32.5 %	8	21.6 %
Filter	5	6.0 %	6	16.2 %
Boils it before consuming it.	19	22.9 %	15	40.5 %
Treats it with bleach or another product	32	38.6 %	8	21.6 %

These procedures changed according to the type of inhabited area and available resources. In 2008, the forms of potabilization, for urban areas, were treating the liquid with bleach or other products (44.0%), sun it (34.0%), boiling it before consuming it (16.0%), and filtering it (6.0%). At the rural level, in that same year, these methods were boiling (33.3%), sunbathing (30.3%) and treating it with bleach or other products (30.3%). By 2017, the main water treatments at the urban level were: giving it some type of treatment with bleach or other type of product (50.0%), boiling it before consuming it (30.0%) and filtering it (10.0%) as well as sun it (10.0%). At the rural level, the procedures were boil it (44.4%), sun it (25.9%), filter it (18.5%) and treat it with bleach or some other product (11.1%).

According to the answers given about whether any family member became ill from drinking the water provided by the drinking water distribution service, in 2008, at urban areas, 91.1% indicated that they did not and 96.4% gave the same answer for rural areas. In 2017, these responses were more or less equivalent for urban areas (97.6%), but not for rural areas (82.7%). In fact, unlike 2008 in which only 2% of the urban population and 3.6% of the rural population indicated that there were relatives who became ill from consuming water distributed through pipes, in 2017, these percentages increased for the urban (2.4%) and rural population (16.0%), indicating a process of decomposition of the quality of the liquid consumed.

In general terms, the perception of two thirds of the population interviewed, in 2008 and 2017, is that the drinking water supply service has remained the same, although there is a sector that believes that this service has improved (26.3% in 2008 and 30.5% in 2017) mainly due to the fact that the water received is more abundant (36.6% in 2008 and 51.3% in 2017) and because the infrastructure was improved. The opposite view was 7.1% and 5.1% respectively.

On the other hand, the perception of improvements (in coverage), in the water distribution service, varies according to the scope of the populations; in 2008, the urban and rural communities indicated that said service had improved (35.6% and 9.1%, respectively), perception that increased, for both scopes, in 2017 (40.0% and 25.6%), although in the rural scope, said perception increased significantly. Concerning the maintenance that the drinking water pipe receives, the perception has varied slightly, since in 2008, 89.1% indicated that it did receive maintenance; in 2017, this perception decreased to 84.3%. For its part, the population that indicated otherwise was 10.9% in the first year, and 15.7% in the second year of the information survey. The maintenance time given to the pipe varied considerably, but the majority (38.13% in 2008 and 27.0% by 2017) considered that maintenance was given when necessary; on the other hand, 13.67% in 2008 indicated that said maintenance was given more than once per month, which indicated 18% in 2017. The perception that maintenance was given each month was shared by 12.23% in 2008 and 12.0% in 2017. In general terms, most of the people interviewed indicated, in 2008 (67.6%) and in 2017 (72.1%), that the maintenance tasks were adequate, not so for 15.1%, in 2008, and 10.8%, in 2017, which indicated the opposite. In both years, 17% did not respond.

The opinion on the adequacy of the maintenance activities received by the water distribution facilities, for the environment in which the population lives, improved significantly. For example, between 2008 and 2017, for the urban setting, the perception that such activities were appropriate increased from 70.7% to 76.9%. In the case of rural communities, this opinion was from 62.7% to 69.4%, respectively. The urban population that indicated the opposite, in 2008 and 2017, was from 18.5% to 2.6%; however, at the level of rural communities, the opinion was from 8.5% to 15.3%. This is an indirect reflection of people's perception of public investment in infrastructure maintenance. On the other hand, the majority of those interviewed indicated that the cost of the service was adequate (71.1% in 2008 and 81.0% in 2017), mainly because it is economic (60% in 2008 and 63.2% in 2017) and necessary (10.7% in 2008 and 18.9% in 2017). In this sense, the perception that the cost of the water distribution service is adequate, in urban and rural communities, remains more or less the same as at the general level, since in 2008, around 70% (for both spheres) think that the cost is adequate; these percentages increase significantly, in 2017, for the urban (92.3%) and rural (75.3%) spheres. The reasons why the

cost of the service is considered adequate are two-fold: it is economic and necessary for the maintenance of the service.

Considering that the cost of the service was inadequate was sustained by 13.2% in 2008 and 16.4% in 2017, showing an unfavorable trend. In this context, although at the urban level the opinion that the cost of the service is not adequate decreases from 14.9% (2008) to 7.7% (2017); at the level of rural communities, this negative perception of the cost increases significantly from 8.8% in 2008 to 20.8% in 2017. On the other hand, regarding the opinion of people on the adequacy of the water supply service, a significant improvement can be observed in this perception since in 2008, 63.5% indicate that this is adequate, and in 2017, this percentage increases to 86.9%. The reasons given for considering that the supply service was adequate are basically centred on the fact that the service is timely and the water is abundant and sufficient (77.8% in 2008 and 91.5% in 2017). At urban and rural level, in the two years analyzed, similar increases were observed in said opinion (from 68.3% to 90.2% and from 54.5% to 85.2%, respectively).

On the other hand, 8.3%, in 2008, and 9.0%, in 2017, considered said service inadequate. It is worth noting that in 2008 28.2% did not respond and in 2017 only 4.1%. Currently, according to those who responded on the process of organization for obtaining water service, at the community level, this necessarily passes through one of the following dynamics: a) by organization and community work (22.22%); b) by urban growth, which forces the mayor's office to manage this service with national or international agencies (13.49%); c) with coordination between the community (labor) and the mayor's office (management service) (10.32 %), or d) with direct purchase (or by donation) of a water spring (4.76 %). The problems they had to solve to obtain this service were diverse, mainly due to lack of knowledge of the process to obtain this service or the lack of support from owners to facilitate the installation of the infrastructure, as well as the lack of economic resources, among others.

The main proposals to strengthen the water service in the municipality of Las Vueltas are based on the following: maintaining and improving the distribution system, as well as acquiring more water sources (springs) and carrying out more campaigns to take care of the water and not waste it, among others (see Table 5).

Table 5. Challenges and proposals to improve water service in Las Vueltas, Chalatenango, El Salvador.

Options	Frec	%
Maintain and improve system maintenance	16	12.70
Acquire more springs (purchase, donation)	15	11.90
Take care of it, not to cut trees and take care of aquifers.	11	8.73
As it is, it's fine.	10	7.94
Improve infrastructure (more tanks and filters)	7	5.56
There's no room for improvement.	5	3.97
You don't know how	5	3.97
Restructure committee or committee needs to work more	3	2.38
Maintain Community Water Boards	2	1.59
Use water collection alternatives	2	1.59
More community collaboration	1	0.79
Manage resources to improve infrastructure and system maintenance	0	0.00
Improve water quality	0	0.00
No answer	49	38.89

Conclusions

The drinking water distribution system in the municipality of Las Vueltas was distinguished by evolving in the shadow of three processes: decentralization, repopulation and urbanization of the municipality. This generated different levels of organization. At first, management was in the hands of the mayor's office; later, this process became the responsibility of the communities through ADESCOS and local water boards. Although the mayors are still the main providers in rural areas and the ones regulated by the local water boards, ADESCOS determines the community organizational processes. This led to different levels of decision-making about the drinking water distribution system. Part of

this situation was generated by an issue of corporate governance, which meant a thinning of the state, and a transfer of responsibilities to the private sector, causing processes of concentration and diversion of water resources to areas with a higher profit margin, which affected rural areas and marginal urban areas.

On the other hand, the drinking water management system in Las Vueltas was set up based on immediate needs generated by population growth. To this end, pipe networks that had existed since the civil war were repaired. This allowed to have an infrastructure in operation and to be provided with the necessary liquid but generated, in the long term, more problems by a continuous need of maintenance to the infrastructure as mentioned earlier.

However, it was in rural areas where there was greater growth in access to water through their pipes, which reduced the use of water from other sources (river, spring, etc.). On the other hand, water quality, in particular terms (depending on its origin, treatment and consistency, and for almost half of those surveyed) is considered inadequate. In 2008, the urban population is more critical concerning the water consumed, not so much in rural areas. This changed by 2017, since in urban populations the percentage of population indicating adequate water increased relatively; however, in rural populations, it has a significant decline. This correlates with the number of people who became ill from consuming the water distributed by pipes, which increases, for urban areas, in the period analyzed, 0.4%; however, for rural areas, the increase was 13.6%, indicating a process of decomposition of the system analyzed.

A certain diversity of methods of treatment of the consumed water was observed, this indicates, in a direct way: a) a certain distrust with respect to the quality of the water received in house; b) a lack of unified methods with respect to the potabilization of the water, determined by the diverse situations of each household, but also c) the lack of knowledge, on the part of the users, of specific practices of health on the liquid to consume. Because of the above, it is necessary to generate public policies and a permanent community culture on the notion of prevention. A large part of the population interviewed pointed out that the water supply service, in its infrastructure components, service coverage and quantity of water received, has improved, although it has not been the same in terms of maintenance, since the percentage that indicated that the infrastructure did receive maintenance had a negative

behavior (mainly in rural communities), indirectly reflecting people's perception of the public investment made in infrastructure maintenance. On the other hand, the general perception of the cost of the water distribution service indicates that it is adequate, although, particularly at the level of urban and rural spaces, this perception changes. At the level of the former, there is a growing opinion about the adequacy of the cost of the service, but not in the latter, where the perception that the cost is inadequate visibly increases from 8.8% in 2008 to 20.8% in 2017.

The history of El Salvador, like many Latin American countries, on policies and models of human development, has been ambiguous; however, the historical events of recent years lead to a review of these issues, since the probable expulsion of 200 000 Salvadorans from the United States to El Salvador (Jordan, 2018), will imply an addition of about 3% of the total population, therefore, greater and more complex challenges in the management of resources such as water.

Given this, it is recommended to strengthen citizen participation (through organizational processes) and public participation (in administrative processes) to improve the water management system in the communities of El Salvador. That is, the creation and implementation of participatory community monitoring models (with universities, community groups and government institutions) for the continuous evaluation of the water management and distribution system in the areas distinguished as labor expelling zones in El Salvador. This, in itself, would be a valuable lesson for Latin American countries that will be facing, in the future, unprecedented problems in the access and management of water resources.

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References

- Alas G. (11 de febrero de 2017). Carta dirigida a Ana Silvia Ortíz Gómez [comunicación personal]. En posesión de Ana Silvia Ortíz Gómez.
- Almeida, P. (2010). El Salvador: Elections and Popular Movements. *Revista de Ciencia Política*, 30(2), 319-334. Recuperado de <https://scielo.conicyt.cl/pdf/revcipol/v30n2/art08.pdf>

- ANDA, Administración Nacional de Acueductos y Alcantarillados. (2005). *Boletín Estadístico*, (27), 37-44.
- Artiga, R., & Rosa, H. (1999). La reforma del sector hídrico en El Salvador: oportunidad para avanzar hacia la gestión integrada del agua. *Boletín PRISMA*, (38), 8. Recuperado de <https://prisma.org.sv/la-reforma-del-sector-hidrico-en-el-salvador-oportunidades-para-avanzar-hacia-la-gestion-integrada-del-agua>
- Ávila, G. (2002). *Cambio global y recursos hídricos en México: hidropolítica y conflictos contemporáneos por el agua*. Recuperado de <https://agua.org.mx/biblioteca/cambio-global-y-recursos-hidricos-en-mexico-hidropolitica-y-conflictos-contemporaneos-por-el-agua/>
- Benítez, F. (2016). Estatus de los límites político administrativos de los municipios de El Salvador. *ArcGIS*. Recuperado de <http://www.arcgis.com/home/webmap/viewer.html?webmap=662fefebd4e747c582efae7a2eec2feb>
- Córdova, M. R. (1996). El Salvador. Nueva agenda de posguerra. *Nueva Sociedad*, (145), 9-15. Recuperado de http://nuso.org/media/articles/downloads/2527_1.pdf
- Digestyc, Dirección General de Estadísticas y Censos del Ministerio de Economía de El Salvador. (2002). *Encuesta de Hogares de Propósitos Múltiples 2002*. Recuperado de <http://www.digestyc.gob.sv/biblioteca/ENCUESTAS/EHPM2002.pdf>
- Dimas, L. (2005). Contaminación de agua en El Salvador. *Boletín Económico y Social*, (237), 1-8. Recuperado de http://fusades.org/sites/default/files/investigaciones/boletin_economico_y_social_no_237_contaminacion_del_agua_en_el_salvador.pdf
- FAO, Organización de las Naciones Unidas para la Alimentación y la Agricultura. (2000). *El riego en América Latina y el Caribe en cifras*. Recuperado de <https://agua.org.mx/wp-content/uploads/2017/08/El-riego-en-america-latina-y-el-caribe-en-cifras.pdf>
- FAO, Organización de las Naciones Unidas para la Alimentación y la Agricultura. (2016). *Water resources. Global Water Information System (AQUASTAT). Regional analysis section. América del Sur*,

- Centroamérica y Caribe (database)*. Recuperado de http://www.fao.org/nr/water/aquastat/water_res/index.stm
- Flores, M. A. (2014). El bono demográfico en los países centroamericanos. *Revista Población y Desarrollo: Argonautas y Caminantes*, 10, 105-118. Recuperado de <https://www.lamjol.info/index.php/PDAC/article/download/1742/1538>
- García, S. I. (2003). *Análisis de la descentralización del agua en El Salvador. Modelo Comunitario de Sostenibilidad de Sistemas Rurales de Agua Potable: Caso El Cerrito-El Salvador*. Recuperado de http://www.cvirtual1.uaem.mx/observatorio/cen_documento/casos/ces_rekurs_01-2003_2.pdf
- Garza, M. (2004). Marco conceptual para el estudio de los desastres. En: Piñero, J. L. (coord.). *La seguridad nacional de México, debate actual* (pp. 107-120). México, DF, México: Universidad Autónoma Metropolitana, Azcapotzalco.
- Gómez, A. E., & Flores, A. (2006). El derecho humano al agua en El Salvador. En: Esch, S., Delgado, M., Helfrich, S., Salazar, H., Torregrosa, M., & Zúñiga, I. (eds.). *La gota de vida: hacia una gestión sustentable y democrática del agua* (pp. 109-124). México, DF, México: Ediciones Böll.
- Gómez, I., García, M., & Kandel, S. (2002). *La gestión ambiental participativa en el norte de El Salvador: el Caso del Comité Ambiental de Chalatenango (CACH)*. Recuperado de <http://www.bvsde.paho.org/bvsacd/cd27/chalatenango.pdf>
- Guillén, M. G. (2014). Mujeres, lucha armada y crisis estructural del capital: de los Acuerdos de Paz al neoliberalismo En: Juárez, J. (coord.). *Historia y debate sobre el conflicto armado salvadoreño y sus secuelas* (pp. 113-127). San Salvador, El Salvador: Instituto de Estudios Históricos, Antropológicos y Arqueológicos, Universidad de El Salvador-Fundación Friedrich Ebert.
- Guzmán, I., & Calvo, J. (2013). Planificación del recurso hídrico en América Latina y el Caribe. *Tecnología en Marcha*, 6(1), 3-18. Recuperado de http://revistas.tec.ac.cr/index.php/tec_marcha/article/viewFile/1117/1030

- Hatanaka, M., & Busch, L. (2008). Third-party certification in the global agrifood system: An objective or social mediated governance mechanism? *Sociologia Ruralis*, 48(1), 73-91. DOI: 10.1111/j.1467-9523.2008.00453.x
- Hernández, M. C., & Villaseñor, A. (2014). La calidad en el sistema agroalimentario globalizado. *Revista Mexicana de Sociología*, 76(4), 557-582. Recuperado de <http://www.revistas.unam.mx/index.php/rms/article/view/46453/41717>
- Hernández, M. L., Sánchez, M. L., & Vázquez, J. D. (2013). Agua y desequilibrio geográfico: estudio sobre vulnerabilidad hídrica en la región tlaxcalteca de la Matlalcueye. *Tecnología y ciencias del agua*, 4(1), 107-116. Recuperado de <http://revistatyca.org.mx/ojs/index.php/tyca/articleCms/view/341/302>
- Ibarra, Á. M., Campos, J., & Rivera, F. J. (2002). Hacia la gestión sustentable del agua. *Propuesta básica para elaborar una política nacional hídrica*. Recuperado de <http://www.unes.org.sv/wp-content/uploads/2017/01/Propuestas-politica-nacional-hidrica.pdf>
- Jordan, M. (January 8, 2018). Trump Administration says that nearly 200,000 Salvadorans Must Leave. *New York Times*. Recuperado de <https://www.nytimes.com/2018/01/08/us/salvadorans-tps-end.html>
- Klein, N. (2002). *No logo: el poder de las marcas*. Barcelona, España: Paidós Ibérica, S. A.
- Lara, C. (2003). Religión y conciencia revolucionaria: formación y desarrollo del movimiento campesino en Chalatenango. *Primer Encuentro de Historia de El Salvador*, 22-25 de julio, Universidad de El Salvador, San Salvador, El Salvador. Recuperado de <http://www.cedema.org/uploads/carloslara.pdf>
- Lawrence, P., Meigh, J., & Sullivan, C. (2002). The Water Poverty Index: An international comparison. *Keele Economics Research Papers* (19), 1-16. Recuperado de: <http://econwpa.repec.org/eps/dev/papers/0211/0211003.pdf>
- Meli, R. (2001). Conceptos básicos del desastre. En: Zepeda, O., & González, S. (eds.). *Diagnóstico de peligros e identificación de riesgos de desastres en México. Atlas Nacional de Riesgos de la*

- República Mexicana* (pp. 2-30). México, DF, México: Secretaría de Gobernación, Centro Nacional de Prevención de Desastres.
Recuperado de
<http://www.cenapred.unam.mx/es/DocumentosPublicos/PDF/SerieEspecial/diagnostico.pdf>
- Menjívar, U. J. (2009). Los nuevos movimientos sociales en El Salvador. Orígenes y movilización. *XXVII Congreso de la Asociación Latinoamericana de Sociología. VIII Jornadas de Sociología de la Universidad de Buenos Aires*, del 31 de agosto al 4 de septiembre, Buenos Aires, Argentina. Recuperado de
<http://cdsa.academica.org/000-062/1681>
- Murillo, L. D., & Soares, M. D. (2013). El péndulo de la gobernabilidad y la gobernanza del agua en México. *Tecnología y Ciencias del Agua*, 4(3), 149-163.
- Ortiz, M. I., Cea, M. E., & Sánchez, J. (2003). Escenarios demográficos en América Latina y el Caribe. *Investigaciones Geográficas. Boletín Instituto de Geografía*, (51), 107-124.
- Padilla, E. (2012). La construcción social de la escasez del agua. Una perspectiva teórica anclada en la construcción territorial. *Región y Sociedad*, 24(spe3), 91-116. Recuperado de
http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S1870-39252012000600004
- PNUD, Programa de las Naciones Unidas para el Desarrollo. (2003). *Informe sobre Desarrollo Humano El Salvador 2003. Desafíos y opciones en tiempos de globalización*. Recuperado de http://hdr.undp.org/sites/default/files/el_salvador_2003_sp.pdf
- PNUD, Programa de las Naciones Unidas para el Desarrollo. (2004). *Cuadernos sobre Desarrollo Humano N° 3. La equidad de género en El Salvador*. Recuperado de
http://www.sv.undp.org/content/el_salvador/es/home/library/womens_empowerment/cuadernos-sobre-desarrollo-humano-n-3--la-equidad-de-genero-en-e.html
- PNUD, Programa de las Naciones Unidas para el Desarrollo. (2005a). *Informe sobre Desarrollo Humano El Salvador 2005. Una mirada al nuevo nosotros. El impacto de las migraciones*. Recuperado de
http://www.sv.undp.org/content/el_salvador/es/home/library/hiv_aids/informe-sobre-desarrollo-humano-el-salvador-2005.html

- PNUD, Programa de las Naciones Unidas para el Desarrollo. (2005b). *Indicadores municipales sobre el desarrollo humano y objetivos de desarrollo del milenio. El Salvador 2005*. Recuperado de http://www.sv.undp.org/content/el_salvador/es/home/library/hiv_aids/informe-262--indicadores-municipales-sobre-desarrollo-humano-y-o.html
- PNUD, Programa de las Naciones Unidas para el Desarrollo. (2006a). *Informe sobre desarrollo humano. Más allá de la escasez: poder, pobreza y la crisis mundial del agua*. Recuperado http://hdr.undp.org/sites/default/files/hdr_2006_es_completo.pdf
- PNUD, Programa de las Naciones Unidas para el Desarrollo. (2006b). *El agua. Una valoración económica de los recursos hídricos en El Salvador. Cuadernos sobre desarrollo humano N° 5*. Recuperado de http://forodelagua.org.sv/sites/default/files/documentos/2013/01/cuardeno_agua_pnud.pdf
- PNUD, Programa de las Naciones Unidas para el Desarrollo. (2013). *Informe sobre Desarrollo Humano El Salvador 2013. Imaginar un nuevo país. Hacerlo posible. Diagnóstico y propuesta*. Recuperado de http://www.sv.undp.org/content/el_salvador/es/home/library/hiv_aids/informe-sobre-desarrollo-humano-el-salvador-2013.html
- PNUD-Fusai, Programa de las Naciones Unidas para el Desarrollo, Fundación Salvadoreña de Apoyo Integral. (2011). *Los mercados frente al desafío de la inclusión: agua y microseguros de salud en El Salvador*. Recuperado de http://www.undp.org/content/dam/el_salvador/docs/povred/UNDP_SV_INFORME_AGUA_GIM_2011.pdf
- PRISMA, Programa Salvadoreño de Investigación sobre Desarrollo y Medio Ambiente. (2006). *Democratizando la institucionalidad para la gestión del agua: lecciones de la mancomunidad La Montañona, El Salvador*. Recuperado de <http://www.bvsde.paho.org/bvsacd/cd57/AparaDagua.pdf>
- Quiñónez, J. C. (2017). Situación de los recursos hídricos El Salvador (pp. 45-56). En: Tábora, F. (coord.). *La situación de los recursos hídricos en Centroamérica. Hacia una gestión integrada. Global Water Partnership (GWP) Central América*. Recuperado de

- http://www.gwp.org/globalassets/global/gwp-cam_files/situacion-de-los-recursos-hidricos_fin.pdf
- Ramírez, A. (11 de febrero de 2017). Carta dirigida a Ana Silvia Ortíz Gómez [comunicación personal]. En posesión de Ana Silvia Ortíz Gómez
- Ramírez, K. P. (2015). Espacio público, ¿espacio de todos? Reflexiones desde la ciudad de México. *Revista Mexicana de Sociología*, 77(1), 7-36. Recuperado de <http://www.scielo.org.mx/pdf/rms/v77n1/v77n1a1.pdf>
- RDL, Red para el Desarrollo Local. (2006). *El Salvador, desarrollo local y descentralización del Estado: situación actual y desafíos. Informe 2003-2005*. Recuperado de <http://sacdel.org.sv/phocadownload/publicaciones/Informe%20Red%20para%20el%20Desarrollo%20Local.pdf>
- Reeves, C., & Bednar, D. (1994). Defining quality: Alternatives and implications. *The Academy of Management Review*, 19(3), 419-445.
- Rodríguez, G., Gil, F., & García, J. (1999). *Metodología de la investigación cualitativa*. Málaga, España: Ed. Aljibe.
- Sanfeliú, M. (2001). *Determinación de la calidad del agua de consumo humano de las familias rurales: estudio socioeconómico*. Recuperado de http://fusades.org/sites/default/files/investigaciones/serie_de_investigacion_2-2001__determinacion_de_la_calidad_del_agua_de_consumo_humano_de_las_familias_rurales__estudio_socioeconomico.pdf
- Siscar, M., & Coll, P. (21 de septiembre 2017). Las defensoras del agua en el país de la lluvia. *eldiario.es*. Recuperado de http://www.eldiario.es/desalambre/defensoras-agua-pais-lluvia_0_688731938.html
- Spalding, R. J. (2011). *Transnational activism and national action: El Salvador's anti-mining movement. The Domestic Effects of Transnational Activism*. Simposio llevado a cabo por la Tulane University, 11-12 abril, New Orleans. Recuperado de http://stonecenter.tulane.edu/uploads/Spalding,_Domestic_Effects_April_2011-1308324600.pdf

Temper, L., Bene, D., & Martínez, J. (2015). Mapping the frontiers and front lines of global environmental justice: The EJAtlas. *Journal of Political Ecology*, 22, 255-278. Recuperado de http://jpe.library.arizona.edu/volume_22/Temper.pdf

UNESCO, United Nations Educational, Scientific and Cultural Organization. (2006). *El agua, una responsabilidad compartida. Segundo informe de las Naciones Unidas sobre el Desarrollo de los Recursos Hídricos en el mundo*. Recuperado de <http://unesdoc.unesco.org/images/0014/001444/144409S.pdf>

UNESCO-PHI, United Nations Educational, Scientific and Cultural Organization, Programa Hidrológico Internacional. (2006). *Balance hídrico dinámico e integrado de El Salvador. Componente de evaluación de recursos hídricos*. Recuperado de <http://unesdoc.unesco.org/images/0022/002281/228142s.pdf>

Wikipedia. (2017). *Municipio Las Vueltas* (página web). Recuperado de https://es.wikipedia.org/wiki/Las_Vueltas

WWAP, Programa Mundial de Evaluación de los Recursos Hídricos de las Naciones Unidas. (2016). *Informe de las Naciones Unidas sobre el desarrollo de los recursos hídricos en el mundo 2016: agua y empleo*. Recuperado de <http://unesdoc.unesco.org/images/0024/002441/244103s.pdf>

WWF, World Wildlife Fund. (1999). *La problemática del agua en Centroamérica*. Recuperado de http://awsassets.panda.org/downloads/wwfca_revista_4_es.pdf