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TOWARDS CIRCULAR ECONOMY IN THE LAGO DE GUADALUPE SUB-BASIN

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ABSTRACT
The use of water and energy for industrial purposes is increasing (UNESCO, 2015). Water is one of the most important resources for production. The lack of water treatment in these industries generates negative externalities to society and the environment, creating conflicts among the different sectors of society.
In Mexico, only 19.3% of industrial water is treated (Green Peace, 2014:3-4), while municipal treatment levels are about 50% (CONAGUA, 2014). If Mexico wants to move towards a circular economy model and if the government wants to enforce sustainable development principles, water sanitation is a challenge that must be addressed.
The research analyses provided in this paper focuses on how the institutional water governance context at the Lake of Guadalupe sub-basin is limiting the implementation of the water treatment policy. Data was collected via semi-structured in-depth interviews with institutions that are members of the Lake of Guadalupe Commission. This case provides an example of the complexity and challenges that implementation of “innovative” water management practices such as integrated water management or circular economy, face when they are transferred to contexts where high centralisation and low social participation are still present.
The theoretical basis for this analysis is the Contextual Interaction Theory (CIT) (Bressers 2009, De Boer and Bressers 2011). The findings show that the governance context hinders the implementation of the sanitation policy and the circular economy model. A top-down perspective, short-term achievements, lack of enforcement of the “polluter pays” principle and a linear model are still the main policy drivers.
1. Research context

Interest in circular economy model is increasing as more industries have shown their interest in this model. Its main objective is to eliminate waste “systematically, throughout the life cycles and uses of products and their components” (Zils, 2015). It is perceived as a model that helps to generate more durable products, facilitate disassembly and refurbishment and, where appropriate, consider product/service shifts” (Ellen MacArthur Foundation, 2013). “A circular economy will create value for local communities and municipalities, which must seize their opportunity to organize local closed loops for water, material and energy recovery” (Veolia, 2014:2).

The principle of circular economy is a zero-waste imperative and it is based on three rules:

- All durables, which are products with a long or infinite life span, must retain their value and be reused but never discarded or down cycled (broken down into parts and repurposed into new products of lesser value).
- All consumables, which are products with a short life span, should be used as often as possible before safely returning to the biosphere.
- Natural resources may only be used to the extent that they can be regenerated (Stuchtey, 2015).

Water has called the attention of circular economy since it is one of the most important resources for production. Sectors such as agriculture or aquaculture depend almost entirely on it. For this reason, analyses about the role of water in a circular economy have been made. “Many experts have claimed that wasteful treatment of water results from dysfunctional political or economic systems and ill-defined markets. But the real issue is that water has been pushed into a linear model in which it becomes successively more polluted as it travels through the system, rendering future use impossible” (Stuchtey, 2015). The linear model is based on “take-make-dispose” (Veolia, 2014).

[…] [W]ater as part of a circular economy, […] [must] retains full value after each use and eventually returns to the system. And rather than focus solely on purification, we should attempt to prevent contamination or create a system in which water circulates in closed loops, allowing repeated use. [When water is used for industrial purposes] […] the major goal is not to keep water free of contaminants but to manage the integrity of the closed-loop cycle. Situations that favor the durable view include those in which it would be too costly to dispose of the solvents and re-create them […] Whenever possible, energy and nutrients should be extracted from consumable water […] (Stuchtey, 2015).

Technically speaking there is the capacity to:

- to extract energy
- extract nutrients
- reuse water

Only “[r]eusing wastewater increases the productivity of the abstracted water, typically in agriculture, enabling to grow ‘more crops per drop’. Reusing water may also mean mining waste and turning it into a new source of materials or energy as is the case with the methane production with waste and wastewater streams from the food & beverage industry, or the material recovery out of mining industry wastewater” (Veolia, 2014:3). In The Netherlands,
they found that the “reuse of ground calcite as seeding material in pellet softening is technologically possible, reduces the operational costs by €38,000 (1%) and reduces the environmental impact by 5%. Therefore, at the drinking water facility, Weesperkarspel of Waternet, the transition from garnet sand to ground calcite will be made at full scale, based on [the] pilot plant research” (Schetters et al., 2015). Another related opportunity in the near future comes from the promising results that prove “technical feasibility of producing value-added biopolymers […] as a by-product to essential services of wastewater treatment and environmental protection” (Arcos-Hernandez et al., 2015).

But water treatment and water treatment plants (essentials for water in a circular economy) are a complex issue. Despite developments and efforts, big challenges are still being faced. “[…] [R]anging from integrated water resource management to wastewater reuse: Only less than 5% of all water is reused globally, but recycled wastewater is the only resource that grows with the needs” (Veolia, 2014:3).

In the Mexican case the last three federal administrations have made important efforts to increase water sanitation. “The 2001-2006 National Hydric Plan had the goal of achieving 65% of waste-water being treated; however, only 36.1%. was achieved. The 2007-2012 federal hydric plan, set 60%, but the current capacity is only 47.5% (Casiano & Bressers, 2015:14) The current 2014-2018 National Water Plan has a sanitation goal of 63% (CONAGUA, 2014:137). In order to achieve waste water sanitation, the federal government works with the state and municipal level. Before, water related issues were only managed at the national level. In November 1980, the Mexican president sent an agreement to transfer the water utilities operation to the state and municipal government. (Rodriguez, 2008:33). The municipalisation process of water services started in the federal administration of 1982-1988, when reforms in Article 115 of the Constitution took place (Rodriguez, 2008:29). On February 5, 1983 the reform was approved and stated that water related services were to be an exclusive function of the municipalities. It also established the state government as transitional entities. In most of the cases the state government transferred the new obligation to the municipalities immediately (Jardines, 2008:84). However, Article 115 also mentioned that municipalities could coordinate and associate their efforts with other municipalities or the state level to provide the water services (IMCO, 2014:17).

The policy of delegating water related services to water utilities at the municipal level has been criticised during the last years. Two important characteristics of the municipal government are that it is the closest level of government to the population and that it is a short-term government (3 years). Therefore, long-term planning is complicated and is very sensitive to political and social factors (Rodriguez, 2008:37). To these factors we have to add that water utilities do not have the money to operate the water treatment plants and they complain about the high cost of electricity. Water in a circular economy model can be made to be much more attractive, it involves:

a) Product –design partnership,
b) Waste water treatment plants becoming energy positive,
c) Management for yield,
d) Basin management to reduce risk of flooding or freshwater pollution,
e) Local organic nutrient cycles for agriculture (Stuchtey, 2015).
These achievements require synergies between municipalities, industries and users with a high level of communication (Veolia, 2014:4). Unfortunately, Guadalupe Lake sub-basin is an example of an institutional arrangement that is hindering the development towards circular economy for water and as we will see below reinforcing a linear model.

**Case description**

“The Guadalupe river basin is located in the northern part of Mexico City, though it belongs to the State of Mexico […] Guadalupe lake itself is located in the Cuautitlán Izcalli municipality, but the whole river basin consists of five municipalities: Atizapán de Zaragoza, Cuautitlán Izcalli, Isidro Fabela, Jilotzingo and Nicolás Romero (GRAVAMEX-SC, 2004)” (Franco-Garcia *et al.*, 2013:191). Figure 1. shows the location of the study:

![Figure 1. Location of the Guadalupe River Basin](image)

Between 2004 and 2005 there were multiple occasions of fish kills in the Guadalupe reservoir as a consequence of pollution problems. The main factors were: lack of treatment of the waste water, uncontrolled urban growth, land use change, deforestation and inadequate management of solid waste. This tragedy showed the necessity of coordination across the different governmental levels (Desarrollo y Sistemas, 2008:2).

“In May 2005, one year after the first massive occurrence of fish deaths, the main stakeholders from different sectors decided to establish a river basin commission under the call of the Cuautitlán Izcalli representatives and supported by the diagnosis of the Guadalupe’s river basin problem. The official ‘Guadalupe River Basin Commission’ (CCPG) was created in January 2006 under the framework of the National Water Law […]” (Franco-Garcia *et al.*, 2013:192). This basin “was initiated in a bottom-up fashion” (Franco-Garcia *et
which is remarkable since most of the Commissions are created by the National Commission of Water (CONAGUA).

The [...] National Water Law include[s] the obligation for CONAGUA to generate participation amongst water users in the administration of the system and services. This same regulation obliges CONAGUA to consult the different actors involved, through the MBCs [Management Basin Councils], in order to register their opinions and proposals in terms of planning, identifying problems and developing strategy for management, as well as evaluating the supply sources in terms of sustainable development. There are guidelines for public participation described in the Rules of Organization and Operation of the MBCs (Comisión Nacional del Agua, 2004) (Franco-Garcia et al., 2013:189).

Mexico’s river basin governance is characterised by an important apparatus of organisations, councils and auxiliary bodies. Since 1992, in addition to the 13 river basin organisations implementing CONAGUA’s policies in each hydrographic region, 26 river basin councils have been created as consultative bodies, working closely with 32 river basin commissions and 41 river basin committees, 82 COTAS, 38 local clean beach committees, 85 irrigation districts and 23 technified rainfed districts (OECD, 2013:107).

Nonetheless, “[d]ecision-making power is still centralised within the hands of CONAGUA and its regional/local offices” (OECD, 2013: 17). The process of creation of Basin Organisations has been described as a mere offices’ decentralisation instead of a decentralisation of the policy since the regional and local offices and their directors are directly subordinated to the CONAGUA’s director (Jardines, 2008:91).

The River Basin Commissions such as Guadalupe River Basin Commission, are auxiliary bodies of CONAGUA, and they “[…] are expected to facilitate i) the implementation of river basin councils’ strategy; ii) inter-governmental co-ordination; and iii) social participation at the sub-basin level” (OECD, 2013: 111).

The Guadalupe River Basin Commission is composed of the following actors:
The Commission’s main goal is to coordinate the actions among the different actors at the sub-basin levels (Centro para la Sustentabilidad Incalli Ixcahuicopa, 2009:145) and it has the following objectives:

- Promote water sanitation and monitor the water quality
- Improve the distribution and use of water
- Promote an efficient use of water
- Promote the environmental, social and economic value of water
- Promote conservation and improvement of ecosystems (CCPG, 2015)

Nine years after the creation of the Commission, the different stakeholders agree that pollution problems have not been solved and things are pretty much similar in the sub-basin. A study published in 2013 confirmed that the main source of pollution is anthropogenic as well as the inadequate management of the reservoir. It contains high levels of nitrogen, phosphorus, carbon compounds and a high amount of bacterial pathogens (Sepulveda-Jauregui et al., 2013). “It is estimated by CONAGUA that a volume of 14,924,455 m$^3$ per year of untreated wastewater is originated from Nicolás Romero (90.7 per cent), Atizapán de Zaragoza (6.6 per cent) and Cuautitlán Ixcalli (2.7 per cent), through the rivers Cuautitlán, San Pedro, Xinté and Tecuane” (Franco-Garcia et al., 2013:193). The creation of a Commission, such as Guadalupe River Basin seems to be a promising approach to create integral management but important contextual limitations must be overcome as explained in
the following sections.

2. Methodology and theoretical framework

In order to understand the contextual factors that limit circular economy policy for water in the sub-basin, twenty in-depth interviews were carried out and a questionnaire was send to the Guadalupe River Basin Commission stakeholders. The first round consisted of three interviews (the president of the commission, one social actor and one governmental actor) in January 2015 and the rest of the interviews took place during the second round, between July and August 2015. The questions asked are derived from the Contextual Interaction Theory framework and its elements of governance (Bressers and Kuks, 2003). Interviews lasted an average of one hour per actor. The results were considered reliable, because the majority of the stakeholders consistently reported in similar ways. The interviews included the following institutions:

![Figure 3. Institutions to which the interviewed stakeholders belong](image)

This study has been preceded by studies in 2010 (Hendrawati 2010) and 2012 (Franco-Garcia et al., 2013). This enables comparisons over a somewhat longer period. There are five elements of governance in the Contextual Interaction Theory (Bressers & Kuks, 2003). “They [Bressers and Kuks] do not use governance as a normative concept or as a hypothesis of developments in government-society relationships (Howlett, 2011:7-10), but as a neutral, yet enlarged understanding of the scope of policy” (De Boer, 2012:30). The elements can be summarized as follows:

1. Multiple administrative levels and problem scales (multi-level)
2. Multiple actors in the policy networks (multi-actor)
3. A multiplicity of problem definitions and other policy beliefs (multi-faceted)
4. Multiple instruments in the policy strategy (multi-instrumental)
5. Multiple responsibilities and resources for implementation (multi-resource based) (Bressers & Kuks, 2003)

3. Results

The following section presents the findings organized by the five elements of governance as defined in the Contextual Interaction Theory.

3.1 Multilevel

From the three governmental levels, it is between the state and federal level where the
planning and construction of water sanitation infrastructure takes place and it is the municipal level that operates the infrastructure. The lack of involvement of the municipal level, has resulted in the constructed water treatment plants not being operated. They do not meet the needs as defined in the strategy of the commission and the municipal capacity to operate them was not considered. As a result they have become an economic burden. The Guadalupe River Basin Commission and its developed strategy is not taken into account. The policy is implemented through the CONAGUA’s Rules of Operation, which emphasize the participation of the state and federal level. Some municipalities consider that since they know and experience the problems they should be in charge of the tenders instead of the state government. Sometimes the water utilities complain during the construction but the answer from the constructor is that they are following instructions from the state. Another problem they see, is that in many occasions the winner of the tender is the company with the lowest costs but the quality is very poor. In other occasions the material agreed during the project presentation is changed for another of lower quality during the construction. For the municipal level, CONAGUA and the state government seem to accept these low quality projects.

Currently there are no water treatment plants in the Guadalupe sub-basin, not even in the municipality that pollutes the most (Nicolas Romero). There are 18 water treatment plants in the municipalities that make up the sub-basin, but these are not relevant for the sub-basis that is only part of the combined area of the municipalities (CONAGUA, 2013).

- 7 plants in Atizapan
- 11 Cuautitlan
- 1 Jilotzingo
- 0 Nicolas Romero
- 0 Isidro Fabela

But even so, most of the plants listed do not operate or if they do, it is with a very low capacity. One water treatment plant is being built in the sub-basin area, and talks about its operationalization have started. The plant is located in the municipality of Cuautitlán Izcalli, but it is going to receive water from other municipalities as well, so the actors are negotiating in order to create an inter-municipal operation.

### 3.2 Multi-actor

Participation from different stakeholders is found within the Guadalupe River Basin Commission. Among them are, the three governmental levels and users of water. The user organisations still face limitations as it was stated in a previous research in 2012:

The actors in the aquaculture sector feel that they are overlooked as an economic sector and consequently do not obtain support for their plans. Forestry representatives have a similar feeling. Both attribute this partially to the under-coverage of their sectors in the media. An interviewee stated as an example that news programmes prefer to pay attention to 10,000 new trees planted near one of the big population centres than to the 60,000 that are yearly planted by the people in the forest of the high-basin region by their own initiative. This situation has had
some demotivating effects for some of the CCPG stakeholders. The support given by the governance regime does not include these sectors while they are in fact quite important for the status of the water basin (Franco-Garcia et al., 2013:200).

The CONAGUA has not granted the permits to the aquaculture sector, therefore they are still operating without permits for production and they cannot apply to governmental programs for support of measures to improve water quality. There was a project with CONAGUA and SAGARPA (Ministry of Agriculture, Fishery and Rural Development) that would allow them to improve the quality of their discharges. They were going to receive settling tanks and water meters but at the end nothing happened due to differences within the federal government. The lack of water treatment also makes some actors hesitate about improving water quality upstream in the basin because they think that one way or another the water will be polluted downstream anyhow. They have heard that water used in aquaculture can be used as fertilizer but they do not know anything about that. This possibility for circular economy has not been explored. They have had bad experiences with projects where they should have received economic support. According to them, payment for environmental services was used in a political manner. When they receive some economic support they are asked to buy the products in specific stores or to give the money back and the governmental employees will provide them the materials and in some cases, the materials are not the same as those that were agreed upon. However, these actors are still attending the Guadalupe River Basin Commission meetings. The participation of the aquaculture group is highly recognized. The industry sector has a very limited participation in the Commission. This can be explained in part, because most of the industrial areas of the municipalities are not located within the sub-basin. There are also some social groups interested in the problem and they have made proposals to improve the lake, but their proposals have not been implemented.

3.3 Multi-faceted

The commission has helped to bring different perspectives together, the actors agree that the main challenges faced are: uncontrolled urban growth, deforestation and lack of water treatment. The actors consider that one of the most important contributions of the Commission is bringing all the different perspectives together. Education has also been an important aspect. For example, the agricultural sector used to think that they did not pollute the water. Some trust has been developed because the actors know each other. In the words of one of the interviewees: “The commission helps to keep communication, coordination, awareness; there is some follow up and the pollution problem might be worse without it”. One of the most common concerns, in institutional terms, is the short-term of the municipal administration. This situation causes processes and staff to be re-initiated every three years. The Commission has played an important role in training governmental employees about the situation, taking actions and requiring other actions within the sub-basin, as well as coordinating activities in some cases, such as garbage picking campaigns. The most recent was in July 2015 and the five municipalities have participated for the last three years in a row (Velazquez, 2015). The actions with higher impacts such as reforestation or creation and operation of sanitation infrastructure are out of its hands. Thus the development of a joint strategy is a successful process, but the decoupling from investment decisions and operation makes the Commission’s strategy extremely dependent on other powerful actors. There are
no stakeholder talks about circular economy or actions in this regards.

3.4 Multi-instrument:

Due to the institutional arrangement, there are two Commissions from which actions are implemented at the sub-basin level. One is the Guadalupe River Basin Commission and the other is the CORESE (Commission of Regulation and Follow up). The research found that in general terms the governance context for the Guadalupe Commission has not changed from the studies done in 2012. The governance context “[…] is only in principle supportive. It does not adequately equip organizations like the basin commission with sufficient support for its integrated ambitions for the basin nor does it give them the legal rights to collect those resources themselves. Instead, the commission depends on mid-level governments that view each project from the perspective of how it can address their own policies and are themselves only to some extent committed to the process” (Franco-Garcia et al., 2013:202). Some interviewees said: “People without real capacity to act participate in the Commission”. “The Commission must evolve before we expect it to have more impact”.

The Commission where the sanitation policy is really taking place is the CORESE. The creation of a CORESE is required by CONAGUA for the implementation of its programs. The CORESE is established between the federal government through CONAGUA and the state government. This allows the latter to present proposals to the programs and actions established with the federation (Secretaria de Gobernacion, 2013). In this sense, it is through the CORESE that the programs such as water treatment plants and collectors’ construction are discussed, followed and agreed upon. The policy is still far from a circular economy perspective in water management. All instruments work in a separated manner without any integration. Sometimes the state government does not provide a complete picture of the problems during infrastructure building, until the federal government detects them and brings them to the table.

The monitoring instrument is very weak at the three governmental levels. Water utilities’ inspections normally take only place if there is a complaint from the citizens. In the case of CONAGUA and CAEM (Water State Commission) few inspections take place to monitor construction or operation of infrastructure. CONAGUA is financing more projects than it can monitor. There is also a lack of training of the auditing employees. People from CONAGUA commented that auditors pay attention to things that are not important and that “they are not trained to see how inflated the costs are and there are no audits during the construction process but only after it is finished”.

In order to have a proper operation of the municipal water treatment plants, the construction company is asked to train the municipal employees. However, the employees complain because they receive a poor training. The water utilities think the construction company should operate the plant for a long period because normally many problems start soon and quick capacitation is an easy way to overcome them.
3.5 Multi-resource based

The governmental level with the responsibility to implement the sanitation programs is the municipality. As mentioned before they are not considered in the planning or the construction of the projects. The municipal level considers that if they were taken into account then costs of the infrastructure could be lower because they have knowledge about both the area and surrounding infrastructure, that can support the new projects.

The upper governmental levels as well as some actors from the Guadalupe River Basin Commission perceive that the municipalities are the governmental level with the lowest interest in the sanitation of the basin. One of the main challenges the actors perceive is the short-term jurisdiction of the municipal administrations. The water utilities have very limited resources. They depend on the support of the state and federal level of government to build their infrastructure. When the water utilities staff was interviewed they mentioned that the resources are so limited that their laboratories are very basic and in some occasions they have to decide between operating the water treatment plant or delivering water. This situation occurs because they do not receive enough money from the services they provide. In some occasions this is so because the tariff is not at real cost recovery level and in other cases because people do not pay for the service.

The problem of the tariffs is beyond the control of the water utilities. Since they are sensitive to political factors, politicians are not interested in taking decisions that might impact them in the short term, such as increasing tariff or enforcing payments. The low municipal capacity might be one of the reasons why the CONAGUA “is the biggest spender in the water sector [...] representing in 2012 close to 55% of the estimated total sector expenditures” (OECD, 2013:27). They normally contribute with at least 50% of the construction budget. However, there are occasions when CONAGUA loses credibility because they agree to provide some economic support but they depend on the Ministry of Finance and sometimes the process takes longer than expected.

The actions of the social sectors are isolated and social capital is not created. For example, no important actions for reforestation from a basin perspective have been made with all the actors included. The actors do not work together within a common vision, no further actions have been made for sanitation of the aquaculture production and no water treatment plant is operating within the basin. Actors in the upstream part of the basin, reforest with the support of CONAFOR (National Forest Commission) programs. “There are works upstream where the people are cleaning and reforesting”. But considering the many aspects that the circular economy takes into account, none of them are really being covered.

The state and federal government have a very low capacity for monitoring the projects, the CAEM and CONAGUA have assigned only one person per institution for approving projects and inspection of the infrastructure building such as the water treatment plants. This happens in a state with a population of more than 15 million people according to the last census (INEGI, 2010) with a land surface of 22,351 km². Most of the economic resources are used for the infrastructural building. Such infrastructure construction is performed without a coherent plan. It ignores the plan that was developed by the Guadalupe Commission and it generates a situation where an important budget is poorly spent. Neither CONAGUA nor the
municipalities have certified laboratories that provide legally valid analysis that can be used for sanctions.

Corruption also has an impact due to the poor inspection. “Corruption has decreased trust” among the actors. Examples of these are the experiences mentioned above about the behaviour of governmental employees such as: allowing overpricing the materials used or changing quality of construction supplies from the planning to the building stage.

The inter-municipal water treatment plant that the state and federal government are building to improve the water quality in the sub-basin, presents an important challenge for its operation. One involved actor in the process commented “If the state government wants to charge the municipalities for the operation’ process, it is legally and politically complicated. The problem is how to charge the municipalities”. A common problem with the federal programs is their inflexibility. One common complaint is that the state government cannot use the incentives they receive for one plant to improve another, even when this would make more sense for the goal of improving water quality in the area.

4. Conclusion

A circular economy perspective for water management is not limited to the efficiency of water treatment plants. Specifically,

[y]ou cannot be more circular than managing the water balance of a river basin in a rigorous and integrated fashion. Investing in strategies that promote the vitality of a watershed are also circular, including those that involve better forest management (protection, reforestation, and forest-fuel-reduction programs that help control or eliminate wildfires), improved agricultural practices (such as no-tillage farming), and restoration of wetlands (Stuchey et al., 2015).

The responsibilities of the Commission mentioned above: Promote water sanitation and monitor the water quality, Improve the distribution and use of water, Promote an efficient use of water, Promote the environmental, social and economic value of water, and Promote conservation and improvement of ecosystems (CCPG, 2015), are clearly relevant for the concept of circular economy. However, the institutional arrangement hinders the role of the Guadalupe River Basin Commission to achieve those objectives and the CORESE is limited to CONAGUA’s programs.

Opportunities to introduce circular economy principles exist. The water from aquaculture can be used for agriculture. A hydrological balance study showed the positive water quantity status of the sub-basin. There is a good capacity of the water catchment system in the basin. Therefore, the surplus water can be used by the industrial sector or be provided to the municipality of Romero Vargas and to decrease the water scarcity problems they are facing. Unfortunately, “[t]he availability of water [continues being] […] affected by […] deforestation that is caused by changes in land use. Forest is turned into agricultural land and agricultural areas are developed into urban spaces, which has been happening at an accelerated pace to allow more settlements” (Franco-Garcia et al, 2013:193) If the government wants to support the transfer to a circular economy, it must avoid end-of-
pipe solutions. Water treatment plant projects such as the Atotonilco case, must be re-evaluated. As one of the state level actors said: “The Atotonilco water treatment plant will not change things in the state”. The pollution in the state water bodies will remain the same since sanitation actions will not take place in situ. Also the government requires negotiations and agreements with the industrial sector. Unfortunately, this sector has a low level of trust in the political sphere (Franco-Garcia & Bressers, 2010). They also consider that the implementation of environmental policy is insufficient and the instrumentation is inept (Franco-Garcia & Bressers, 2010), thus they feel no need to negotiate seriously.

Long-term planning is required for a more integrated management. The state and federal government complain about the municipal changes every three years but similar cases happen every six years after the state or federal elections because new plans or programs are created without a long-time perspective and when they do, they are not followed by the next administration, as happened with the 2030 Water Agenda. The Guadalupe case is an example of a linear model with a governance arrangement that hinders both circular economy and integrated water resource management.

Important institutional changes are required to create a supportive context for a circular economy. On one hand, CONAGUA should improve its Rules of Operation, to allow direct participation of the municipal level and even the social sector, like the water users. CONAGUA should strengthen its monitoring capacity. They always define themselves as a normative responsibility oriented organization so they should act as such. Money should be spend wiser, instead of financing new infrastructure without guaranteeing proper operation. They should increase the personnel for monitoring, in order to create a situation where the plants built are really meet the standards required for a correct operation. A higher level of monitoring could help to decrease corruption and the “polluter pays” principle must be enforced to the water utilities and the productive sectors. Water utilities complain about the electricity cost for the operations, so new markets must be created for residual water and the promotion of green technologies should be part of the actions considered in the water treatment plants construction. In the case of the Guadalupe River Basin Commission also important changes are important. The Commission is the indicated institution to promote circular economy but the members require training in this regard and many institutional challenges need to be addressed in order to allow the commission to have more resources and a direct impact on the sanitation of the sub-basin. In this sense, the previous analysis about the relation of the Guadalupe Lake Commission with the governmental and social actors is still valid. The Commission “can only encourage others to take measures and their own capacity to act is very limited” (Franco-Garcia et al., 2013:197).

When summarizing the five elements of governance we can state that the multi-level arrangement is top-down, where the leader is CONAGUA through its programs and they are followed by the state and municipal government. The multi-actor participation is very limited in the CORESE and more open in the Guadalupe River Basin Commission. This Commission has aligned multiple perspectives, but the impact has not gone further because they do not have been given sufficient legal and financial resources. The main instruments come from CONAGUA’s programs that emphasize infrastructure building over inspections without any integrated water system perspective or circular economy vision. The resources are not well aligned with the responsibilities, because the tariffs are sensitive to the political atmosphere
and unfortunately as one interviewed actors said: “Politicians have their own interests and agenda” and their agenda is a short-term agenda that will prefer short-term results. The path towards circular economy implies the creation of synergy among the stakeholders, but the Mexican governance system as it is today, it is an obstacle on this path.

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