

Fustec, K. 2019. A sociopolitical analysis of drinking water governance in French Polynesia: The case of the Tuamotu Archipelago. *Water Alternatives* 12(3): 975-992



---

# A Sociopolitical Analysis of Drinking Water Governance in French Polynesia: The Case of the Tuamotu Archipelago

**Klervi Fustec**

Independent researcher, France; [klervi.fustec@gmail.com](mailto:klervi.fustec@gmail.com)

---

**ABSTRACT:** The assertion that only a small percentage of the French Polynesian population has access to drinking water is found in press reports and in reports by the French Senate and the French Polynesian Centre for Hygiene and Public Health, reports that were prepared in the context of implementing a new water law. In reality, however, inhabitants do have access to drinking water. How can we explain this discrepancy? This article analyses the sociopolitical dimensions of multilevel formal water governance in Tuamotu, one of the five French Polynesian archipelagos. Tuamotu's inhabitants use household rainwater harvesting cisterns for their drinking water provision. The analysis demonstrates that the current formal governance system is incapable of generating locally relevant and specific policies, and continues to struggle with inappropriate policy ideas derived from French Polynesia's experience as a French State.

**KEYWORDS:** Drinking water, cisterns, multilevel formal governance, French Polynesia, Tuamotu

---

## INTRODUCTION

French Polynesia is a French territory in the Pacific Ocean consisting of 48 municipalities. Since the 2004 reforms, it has enjoyed a degree of autonomy from the French State.<sup>1</sup> While the French Polynesian government is responsible for general planning and water quality issues, it is the local authorities which have responsibility for access to drinking water and implementation of water. Municipalities are French State local authorities. They were supposed to ensure access to drinking water for all inhabitants of French Polynesia by 31 December 2015,<sup>2</sup> but due to impediments that have caused delays this deadline has been extended to 31 December 2024.<sup>3</sup> 'Access' in this context means a "service providing all or part of the production by capture or pumping, protection of the point of collection, treatment, transport, storage and distribution of water intended for human consumption".<sup>4</sup>

The interactions between water issues and power relationships have been highlighted by researchers in the broad field of political ecology and science and technology studies. They advocate more research into the natural and sociopolitical nature of water problems (Linton, 2010; Barnes, 2012; Carroll, 2012; Zwartveen et al., 2014; Aubriot et al., 2018). Such research is crucial because "(i)n many environmental conflicts, expert knowledge is challenged on the grounds that it is out of touch and politically compromised" (Sneddon et al., 2017). Similarly, it can be said of laws or norms that they are the result of

---

<sup>1</sup> On the status of the autonomy of French Polynesia, see Organic Law No. 2004-192(27/02/2004), completed by Law No. 2004-193 in which French Polynesia is designated as a pays (country). In the paper, 'French Polynesia' refers to the French Polynesian government.

<sup>2</sup> The 5 October 2007 ordinance of *Le Code général des collectivités territoriales* (General code of local and regional authorities).

<sup>3</sup> See Law No. 2015-991 (07/08/2015) on the new territorial organisation of the Republic.

<sup>4</sup> *Haut-Commissariat de la République en Polynésie française*: [www.polynesie-francaise.pref.gouv.fr/Communes-de-Polynesie-francaise/Competences-communales/Environnement-et-developpement-durable/Eau-potable](http://www.polynesie-francaise.pref.gouv.fr/Communes-de-Polynesie-francaise/Competences-communales/Environnement-et-developpement-durable/Eau-potable) (accessed on 08/06/2017).

political struggles, and they are thus challenged at the grassroots level. Scholarship that takes a critical geography approach particularly underlines the importance of scale within water governance (Norman et al., 2012), and acknowledges the need for empirical studies that integrate the multilevel nature of water governance issues (Hoogesteger et al., 2016; Ioris, 2016). Researchers also recognise that territorial struggles are not only battles for natural resources but can also imply conflicts "over meaning, norms, knowledge, identity, authority and discourses" (Boelens et al., 2016).

Territorialisation can be defined as the way people appropriate space (Lefebvre, 1974; Di Méo, 1994) through controlling natural resources (Vandergeest and Peluso, 1995) and excluding groups or individuals. Power relations influence even the circulation and implementation of knowledge about management of environmental issues (Goldman et al., 2011; Fustec, 2014). For instance, technical elites, knowledge and practices concerning water that were circulating between France and North Africa during the colonization reproduced unequal power relations (Marié, 1984; Trottier and Fernandez, 2010; Pritchard, 2012).

French law promotes universal access to drinking water, a goal that is considered desirable in water policy communities. Water infrastructures, however, are socially, politically, culturally and economically constructed, and they shape societies (Bijker, 2007; Barnes, 2012). The distribution network system has been developed in the context of a specific space and time, and the choice of a model or a technology is not neutral – it shapes access to water and its control (Aubriot, 2004). The introduction of a new technology such as a pump, for example, may constitute a new source of revenue for some farmers by providing new arable land (Barnes, 2012). Indicators concerning the quality of rivers (Bouleau et al., 2017) minimum flow requirements (Fernandez, 2014), the polychlorinated biphenyls acceptable to release into a river (Gramaglia and Babut, 2014) such as the concept of water scarcity (Alatout, 2008, 2009; Trottier, 2008) are the results of compromises between science and politics. The way in which such issues are addressed reflects and reproduces power relations between individuals or groups. In the case of French Polynesia, characterised by a "more or less persistent" colonial context (Regnault, 2010), access to drinking water remains a French State responsibility through municipalities. Institutional drinking water governance is multilevel: it involves the EU, the French State, French Polynesia and municipalities.

Insufficient attention has been devoted to the issue of water governance and access in France's overseas territories, however residents of these territories are interested in exploring this problematic. Addressing water issues here must include metropolitan and regional sites and networks, and must consider the significant variability in budgets, knowledge and legal context. My research<sup>5</sup> yielded no papers in the humanities or social science fields that focused specifically on water issues in French Polynesia. This article hopes to help fill this knowledge gap.

This article analyses the history and sociopolitical dimensions of the multilevel formal water governance of Tuamotu, one of the five French Polynesian archipelagos. My case study is an illustration of the difference between formal governance and everyday governance – the latter described as "the governance of daily life" by Blundo and Le Meur (2009). Formal governance refers to institutional governance, in this case the EU, the French State, the French Polynesian government and municipalities. The governance of daily life, on the other hand, refers to "an exploration of how men and women deal with the governance of mundane issues in their daily life (...), how they collectively and individually govern themselves in their daily lives" (Blundo and Le Meur, 2009: IX). In Tuamotu, as a case in point, inhabitants use individual rainwater harvesting cisterns. This paper explores how formal governance renders individual water management and means of access invisible, attributes a market value to water, and defines drinking water according to normative standards.

This article specifically explores how statistics can be used to influence water policies, and how they can be a tool for the control of natural resources, territories and populations. Statistics often have a long

---

<sup>5</sup> I conducted research on bibliographic databases in English (Scopus and Web of Science) and in French (Cairn), the latter including French scientific literature.

history marked by "hesitations, retractions and conflicts of interpretation" (Desrosières, 2000: 8). They are used to "describe economic situations, denounce social injustices and justify political actions" (ibid: 7). For instance, statistical models, graphs and maps produced by 19th century Italian mining engineers enabled the central state to redefine certain territories such as their populations were eligible to access watercourses and use them (Ingold, 2011).

In French Polynesia, reports from the French Senate, from the French Polynesian Centre d'Hygiène et de Salubrité Publique (Centre for Hygiene and Public Health), and in the press usually stress that only a small percentage of the French Polynesian population has access to drinking water:

Mr Bernard Frimat, co-rapporteur, pointed out that five out of the 48 municipalities were able to distribute water of relatively good quality, so that only 10% of the population had access to drinking water (Cointat and Frimat, 2008)<sup>6</sup>.

On the ground, however, inhabitants do have access to drinking water. How can we explain the invisibility of these water management systems? What accounts for the inability or unwillingness of formal governance to 'see' these on-the-ground management systems? What is the role of policy in rendering on-the-ground systems visible or invisible? The analysis below aims to illustrate how the assumptions and approaches of formal water governance structures in French Polynesia produce this invisibility.

The circulation of the national law on drinking water and its implementation raises questions about its adaptation to the French Polynesian context and about the power relations between the French State, French Polynesia, municipalities and inhabitants. Access to drinking water as a universal right ensured by public authorities is a laudable goal. In Tuamotu, however, access to drinking water is largely achieved via individual rainwater harvesting cisterns – a practical reality which the law does not take into account. The implementation of a public water management service may result in profound changes in the relationship to water of the Tuamotu inhabitants – the Paumotu. In some municipalities desalination is being undertaken, which may expand and will likely involve private companies. (Desalination by private companies will not be a focus of this study as it remains poorly developed.)

The research for this paper was conducted between August 2014 and April 2016 in the Society and Tuamotu Archipelagos of French Polynesia. Qualitative research methods were used. First, institutional reports and press articles about drinking water in French Polynesia were gathered and then analysed through an analysis grid. This helped to understand formal water governance: Who are the main actors involved? Which policy do they promote? Which representations of water services do they convey? How do they describe drinking water access in Tuamotu? Second, in order to compare the results of this analysis with the actual situation semi-structured interviews with inhabitants were conducted and fieldwork was done to identify water networks or cisterns.<sup>7</sup> This helped to understand the effect of formal water governance on "daily life governance": what was made invisible, and what were the main discrepancies between laws and local practices? This article first explores the formal multilevel sociopolitical dimensions of drinking water governance in the context of the territorial fragmentation of French Polynesian context of territorial fragmentation then analyses the consequences of this institutional governance.

---

<sup>6</sup> All reports are in French, English translations are the author's. There are other examples of documents referring to poor access to drinking water in French Polynesia: "In 2016, municipalities in French Polynesia will be required by law to provide drinking water to their inhabitants. However, one and a half years ahead this deadline, only 9 out the 48 Polynesian municipalities have achieved this objective" (Loubet, 2014); "(...) tap water is drinkable in nine Polynesian municipalities" (Thomas, 2017); "Between 2014 and 2015, there was a slight increase in the number of municipalities (from seven to nine) distributing drinking water" (Centre d'Hygiène et de Salubrité Publique, 2015).

<sup>7</sup> In May and July 2015, I did fieldwork on two atolls in the Tuamotu Archipelago, Fakarava and Tikehau.

**DRINKING WATER IN FRENCH POLYNESIA: FORMAL MULTILEVEL GOVERNANCE IN THE CONTEXT OF TERRITORIAL FRAGMENTATION**

**Drinking water in the French Polynesian archipelagos: A myriad of configurations**

French Polynesia comprises five archipelagos: Society, Austral, Marquesas, Tuamotu and Gambier. A total of 118 high islands and atolls – all of volcanic origin – are scattered over 2,500,000 square kilometres (Figure 1), an area as large as Europe. The vast majority of the atolls are situated in the Tuamotu Archipelago. The Windward Group, in the Society Archipelago, are home to 200,714 (75%) of the total French Polynesian population of 268,207, according to a 2012 census. On Tahiti and Moorea, the two main Windward islands, the population is concentrated in the capital Pape’ete, and in the eastern part of Moorea which is linked to Pape’ete by means of fast shuttles. The Tuamotu and Gambier Archipelagos combined account for only 6.3% of the total population of French Polynesia.<sup>8</sup>

Figure 1. French Polynesian archipelagos.



Source: CartoGIS, College of Asia and the Pacific, The Australian National University.

<sup>8</sup> Institut de la statistique de Polynésie française: <https://bit.ly/2iQ42im> (accessed on 23/05/2017).

In terms of water resources, a contrasting typology of high islands and atolls can be drawn. High islands are volcanic with high summits, while atolls are coral rings that rise a few metres above sea level. On high islands, water resources consist of surface and ground water (Direction de l'Environnement, 2015), with water volume in rivers varying considerably depending on rainfall and cyclonic activity. On atolls, rainwater is the primary water source, with fresh water (lens) being found on only about ten atolls. Rainfall varies from archipelago to archipelago and depending on season, and even on a single island there can be significant variability according to wind patterns. Seventy percent of rainfall occurs between November and April. Atolls receive less rainfall than do high islands that occupy the same latitudes. The highest average rainfall is on the high islands of the Marquesas Archipelago (up to 6000 mm was recorded at the Toovii station in 1983) and on the high islands of the Society Archipelago (up to 4200 mm was recorded in 1960 at the Fare station); on the Society Archipelago in general, rainfall can reach 2000 mm per year (1964 mm on Bora Bora, for instance); in central Tuamotu, the Gambier Archipelago and the eastern part of the Austral Islands rainfall can exceed 2000 mm per year (over 2500 mm per year on Rapa); rainfall is lower in other parts of the Marquesas Archipelago (for example, 1240 mm per year on Nuku Hiva) and in North and East Tuamotu (1592 mm per year on Takaroa).<sup>9</sup>

In French Polynesia, freshwater resources vary a lot from one island to another depending on climate parameters and island geomorphology. Drinking water access and distribution – including catchment and potabilisation – also vary from island to island. The three main water access modalities in French Polynesia are public taps, water networks and cisterns. On high islands, water resources consist of varying proportions of surface water and groundwater. Water resources are mainly exploited through borewells (40%), water catchment from rivers and other sources (25%), and drainage galleries in alluvial aquifers (8%) (Direction de l'Environnement, 2015). Water resources are used for consumption but also for hydropower and agriculture.

On atolls, water is most often privately collected by installing eavestroughing on buildings and storing the collected water in tanks. Eighty percent of households on the Tuamotu Archipelago have tanks, most of which were installed after 2003 during an extensive programme to promote public and private collection systems (ibid). This was a tripartite programme which included the French State, the French Polynesian government and residents of French Polynesia (CHSP, 2015: 94).<sup>10</sup> The first policy to promote and install individual cistern equipment was launched in 1985, in the course of which 135 cisterns were installed in Faaite, Fangatau, Hereheretue, Tatakoto and Tureia (Gay and Laidet, 1993). Between 1998 and 2004, a total of 4556 tanks were installed in Tuamotu (Direction de l'Environnement, 2015). Until then, residents of Tuamotu had mainly stored and accessed water through wells or cisterns installed under their houses; however, through this campaign inhabitants were equipped with black plastic cisterns (Figure 2). The use of the water lens – extracted by borewells (Figure 3) – is often reserved for agricultural or for non-drinking-water domestic use. In the case of overpumping, freshwater lenses quickly turn into brackish water.

Drinking water is managed and distributed through various institutional arrangements. In principle, the municipality has the power to distribute water but it can delegate drinking water management to intercommunal trade unions or private companies. For instance, in 2012, the Polynésienne des Eaux company is in charge of water distribution networks in Pape'ete, Faa'a and Arue, as well as on Moorea and on Bora Bora (Viatge, 2012). Some private housing estates have their own borewells and manage their own water distribution networks. Private companies also deliver bottled drinking water to clients' homes.

---

<sup>9</sup> Data is from Direction de l'Environnement (2015) and Météo France in French Polynesia: available at <http://www.meteo.pf/climat.php?lien=pf> (accessed on 12/06/2017).

<sup>10</sup> I did not find any complementary information on the progress of this programme.

Figure 2. Household rainwater plastic cistern in Tikehau (Tuamotu), May 2015.



Source: Klervi Fustec.

Figure 3. Private well pumping water from the water lens in Tikehau (Tuamotu), May 2015.



Source: Klervi Fustec.

Another modality for developing water resources is desalination. Bora Bora, a high island in the Society Archipelago, is always presented as setting the example. The municipality has distributed drinking water for 20 years, using desalination (via reverse osmosis) since the 2000s. Because of the energy required for desalination its cost is very high, however luxury tourism provides the island with a substantial income. According to Gaston Tong Sang, former president and mayor of Bora Bora,<sup>11</sup> residents consume 70% of the distributed water but pay for only 40% of it, whereas hotels consume 30% of the water and pay for 60% of it (Cointat and Frimat, 2008: 25). Although Bora Bora is often presented as a model for water management, this model cannot be replicated in the Tuamotu atolls because of their different biophysical, sociopolitical and economic contexts; nevertheless, to comply with the law on access to drinking water, some atoll municipalities are developing desalination programmes. Thanks to the 2008-2014 contract between the French State and French Polynesia, 11 municipalities (in the atolls of Tatakoto, Anaa and Faaite) have launched desalination programmes (CHSP, 2015) but, as will be explained later in this paper, this solution raises difficulties.

### **Multilevel drinking water governance in a postcolonial context**

#### *Water management in a postcolonial context*

The relationship between France and French Polynesia is rooted in their colonial history.<sup>12</sup> In 1946, the Empire Français (French Empire) became L'Union française (French Union) and Les Etablissements français d'Océanie (French Establishments in Oceania) became Les Territoires d'outre-mer (Overseas Territories). In 1956, a *loi-cadre* Defferre (a framework or enabling law, referred to as the Reform Act) gave more autonomy to French Polynesia through the establishment of a local executive power, as well as a territorial assembly that is elected by universal suffrage and designates the government council. The French Establishments in Oceania in French Polynesia was transformed by the 26 July 1957 law, and following from the 28 September 1958 referendum French Polynesia became an Overseas Territory. The status of French Polynesia evolved further in 1977 when it assumed 'managerial autonomy'; in 1984 it adopted 'internal autonomy'; in 1996 it moved into a phase of 'reinforced autonomy'; in 2003 it assumed the status of an 'overseas authority'; finally, according to the 27 February 2004<sup>13</sup> organic law, French Polynesia became a '*pays*' (country) and was granted yet more autonomy. French Polynesia at that point faced a period of political instability that was rooted in the ending of the 'nuclear rent',<sup>14</sup> the shrinking economy, and widespread political clientelism (Poirine, 2011). This, in turn, led to further modifications of its status in 2007 and 2011. French Polynesia also belongs to the Overseas Countries and Territories Association of the European Union, according to which French Polynesia is not an integral part of the European Union but can nevertheless access funds such as the European Development Fund.

There are significant rivalries between the president and the mayors of French Polynesia, all of whom vie for the status of "the one who provides funding" (Audras et al., 2017: 12), and the relationships between the French State and the municipalities are also rather complex. Before the creation of the French territorial administration in French Polynesia, local authorities or chiefdoms held positions of authority. Municipalities were created in 1971, and with their creation the French State extended control

<sup>11</sup> Gaston Tong Sang was the President of French Polynesia between December 2006 and August 2007 and between April 2008 and February 2009. He has been the mayor of Bora Bora since 1989 and the President of the Union for the Promotion of Municipalities in French Polynesia between 1989 and 2008.

<sup>12</sup> See, for instance, Saura, 2015a, 2015b.

<sup>13</sup> This law reinforced the power of the Assembly of French Polynesia, the Government of French Polynesia and the Economic, Social and Cultural Council, and created the Presidency of French Polynesia and the High Council (later deleted).

<sup>14</sup> Nuclear tests were conducted by the French State between 1966 and 1996 on the atolls of Mururoa and Fangataufa. Since the end of the tests in 1996, a 'rent' (the global endowment of autonomy) is granted each year by the French State to French Polynesia.

to the local level – an act which can be interpreted as the French State's wariness of local actors' support for the former chiefdoms (Gay, 2008). Municipalities remain under direct French State control to this day.

Water networks often symbolise state power (Bakker, 2004). Implementation of a new public service to supply drinking water – in this case through a new law – is not a neutral act, nor is the choice of technology. Networks can predominate over individual existences and can influence the structuring of power (Gariépy and Marié, 1997). Implementation of such a law thus is shaped by, and shapes, power relationships. Private household equipment is not under the control of public authorities. The 2015 Urvoas report, an information report by the French National Assembly, emphasises the role that the French State should play in French Polynesia:

This information report (...) is also a means to better understand what the role of the [French] State can be, which, even in the context of the autonomy of this territory, cannot be a passive actor. "The State is back", had declared in front of the Assembly of French Polynesia on 29 November 2013, Mr. Victorin Lurel, the then Minister of Foreign Affairs. "This is desirable. The French State particularly assists French Polynesia in financial terms, as is the case with the project contract which has just been signed".

This quote illustrates the tension between the autonomy of French Polynesia and the idea of French State control over this territory. Recently, the French State has reaffirmed its willingness to be present in the Pacific (Bessard, 2015), especially in the context of post-2004 political instability. It would like to control what it considers to be "excesses of autonomy" (Al Wardi, 2008), meaning "cronyism, corruption, authoritarianism and nepotism" (Regnault, 2010). Paradoxically, the existing situation is a result of French State-sponsored clientelism, with French Polynesia's economy dependent on the French State and based on protectionism (Poirine, 2011). On the other hand, according to municipalities some decisions of the French State are taken unilaterally and without consultation; the municipalities claim that the powers conferred on them were not accompanied by a transfer of the financial resources needed to carry them out. The French State is also often criticised for dealing only with Tahiti and the Windward Islands and forgetting the other archipelagos (Audras et al., 2017). It is in this postcolonial context that the difficulties of the implementation of the law resulting from the 2004 reform take place.

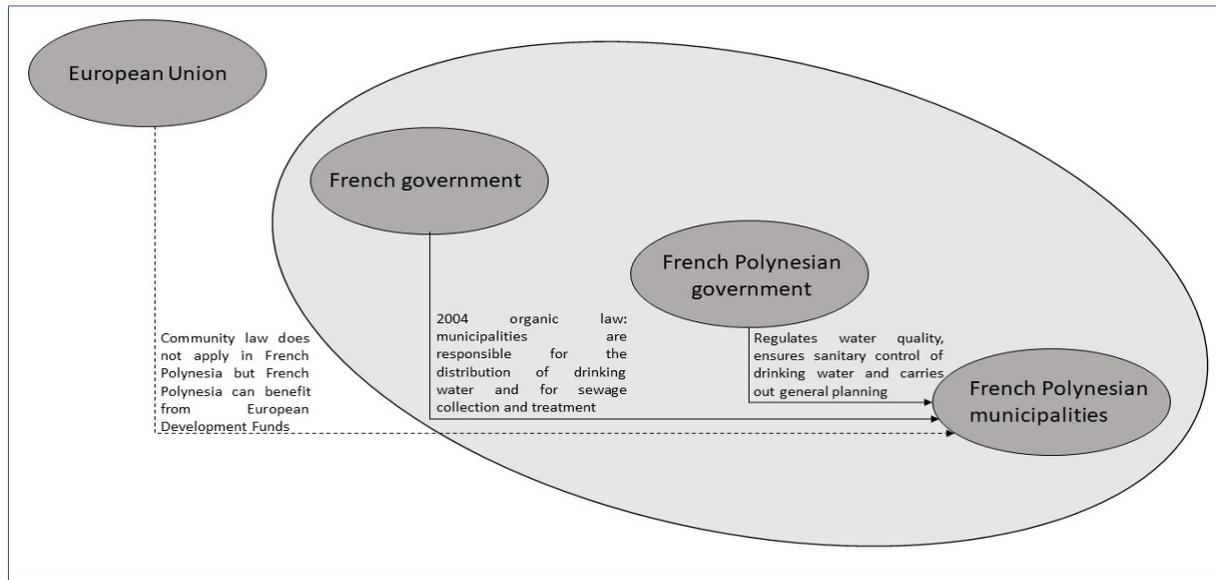
#### *Formal governance of drinking water in French Polynesia*

The formal governance of drinking water in French Polynesia is multilevel, involving the EU, the French State, French Polynesia and municipalities. According to the 2004 organic law issued by the French State, municipalities are responsible for implementing and operating the distribution of drinking water, and the French Polynesian government is responsible for general planning and defining norms and standards.

European Union law does not apply in French Polynesia but French Polynesia can benefit from European Development Funds. With regard to water, these funds have contributed to sanitation networks on the main islands (Tahiti and Moorea) but not to drinking water on the Tuamotu Archipelago. Since this article focuses on the Tuamotu and formal water governance there, it concentrates on the interactions between the French State, French Polynesia and the municipalities.

French State action in French Polynesia is limited to sovereign issues such as nationality, civil rights, electoral rights, foreign policy, defence, currency (Article 14 of Organic Law No. 2004-192, which addresses the autonomy status of French Polynesia). French Polynesia is in charge of all issues not listed in Article 14 and not attributed to municipalities, which it does not control. The French State is in charge of all rules that apply to the administration, the organisation and the competences of municipalities. According to Article 43 of French Polynesia's autonomy status, municipalities are responsible for the distribution of drinking water and for sewage collection and treatment.

Figure 4. Formal drinking water governance in French Polynesia, 2015.



Source: Klervi Fustec.

According to French Polynesian Law No. 2012-17 (13/08/2012), French Polynesia is in charge of territorial planning, and of amending the country’s planning code according to the general development plan for French Polynesia. This plan must oversee the development of each archipelago’s infrastructure in terms of education, culture, health, information and communication, transport of goods and people, energy and sport. It can also address the development of services such as drinking water distribution,<sup>15</sup> and is in charge, through the Centre for Hygiene and Public Health, of regulating water quality and ensuring sanitary control of drinking water.

In France, municipalities are in charge of supplying drinking water to inhabitants (as per the water law of 3 January 1992);<sup>16</sup> municipalities in French Polynesia are responsible for water distribution as well (as per the 2004 law). There are 48 municipalities comprised of 98 associated municipalities. Associated municipalities are formed through a transfer of authority from the mayor to the associated mayor (*maire délégué*). In the Tuamotu Archipelago, municipal associations bring the municipal institutions closer to citizens in an effort to reduce insularity. Hereheretue, for example, reports to Hao which is more than 350 km away. French Polynesian municipalities are required to set up a public service for the supply of drinking water that meets the sanitary standards set by the French Polynesian government. Municipalities are in charge of monitoring the quality of the water produced and distributed, as well as informing the public about water quality (CHSP, 2015 : 106). A 31 December 2015 deadline for beginning the delivery of drinking water had to be postponed because of impediments that caused delays. According to Law No. 2015-991 (07/08/2015) on the new territorial organisation of the republic, the deadline is now 31 December 2024.<sup>17</sup>

<sup>15</sup> Code d’aménagement de la Polynésie française (Planning Code).

<sup>16</sup> In France, municipalities played an important role in the development of the water networks but, after 1945, the expansion of the network to the whole territory was the result of the proactive planning of the state (Pezon and Canneva, 2009). As expanding the network was very expensive, in 1945 a tax proportional to consumption was levied on the served urban population in order to fund the development of the network in rural areas.

<sup>17</sup> Legifrance: [www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000030985460&categorieLien=id](http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000030985460&categorieLien=id) (accessed on 12/06/2017)

### *Access to funds*

Funding for drinking water projects may be ensured by the EU, the French State and French Polynesia but operating costs must be covered by the municipalities – costs which generally are too high for them as they do not have their own fiscal resources and remain largely dependent on financial transfers (Audras et al., 2017). In addition to financial difficulties, small municipalities are hampered by human and legal competences. Municipalities join the Union for the Promotion of Municipalities in French Polynesia, an agency which provides technical assistance and helps municipalities develop their master plans, thereby contributing to the professionalisation of municipalities' public service for the supply and management of drinking water.

Money transfers contribute to French State control over French Polynesia, an arrangement that also persists because French Polynesian politicians are looking for funds (rent-seeking). Since 1945, however, due to French State policies on the overseas territories and the preferences of French Polynesian politicians, there have been fluctuations in French State influence and in French Polynesian autonomy. This rent economy has a long history which started with the American military base in Bora Bora during World War II, continued with the copra and phosphate exploitation, and was followed in turn by the shooting of the film entitled *Mutiny on the Bounty* in 1961, the building of the airport, the nuclear tests, pearl culture and tax exemption (Bessard, 2015). The leadership in French Polynesia emerged on the basis of this rent economy, and it contributes to social inequalities there (Al Wardi and Regnault, 2011). 'Nuclear rent' is still part of the political economy of French Polynesia (Bessard, 2015) through its legal claims for compensation for the health impacts of nuclear testing on its citizens. The French State's current expenditures in French Polynesia (€1.52 billion in 2015) are divided between exercising its power (43%), funding French Polynesia as an authority (50%), and funding municipalities (7%).<sup>18</sup>

The three characteristics of French Polynesia's formal governance over water management are the importance of financial transfers from the French State, the authority of French Polynesia over water quality, and the difficulties of municipalities in complying with the law. Drinking water networks are much more developed on the high islands and populated areas of the Society Archipelago, while on the Tuamotu Archipelago, which is composed of atolls, 80% of the population has access to drinking water through household rainwater collecting cisterns – a different approach to water provision which multilevel formal governance systems tend to overlook.

### **IMPLEMENTING THE LAW: WHEN DRINKING WATER DISTRIBUTION AND QUALITY MEASUREMENTS OVERLOOK INDIVIDUAL ACCESS TO WATER AND ITS MANAGEMENT**

Implementing the law would mean not only extracting, treating and distributing water but also guaranteeing the quality of distributed water as well as ensuring the financing and maintenance of networks and installations. Municipalities vary greatly with regard to abundance of local resources and access to services and external goods (Audras et al., 2017). While conditions on the islands of the Tuamotu Archipelago differ in certain ways, they also share commonalities: first, these islands have the highest rate of individual water collection cisterns; second, freshwater resources on the islands of Tuamotu and Gambier are less substantial than on the other archipelagos of French Polynesia; third, most of these atolls are not adequately connected to Tahiti, the centre of French Polynesia (some atolls such

<sup>18</sup> Haut-Commissariat de la République en Polynésie française: [www.polynesie-francaise.pref.gouv.fr/L-Etat-en-chiffres/Les-dependances-de-l-Etat-en-PF](http://www.polynesie-francaise.pref.gouv.fr/L-Etat-en-chiffres/Les-dependances-de-l-Etat-en-PF) (accessed on 23/05/2017). The 7% of the French State's funding to French Polynesia (€103.11 million) that is dedicated to municipalities was distributed as follows: €71.11 million for the Collective Operating Endowment, €9.05 million for the Territorial Cohesion Endowment for Investment by Local Authorities, €7.99 million for the Intermunicipalities Equalisation Fund, €3.80 million for the Endowment for Public Works in Rural Areas, and €6.17 million for the 2008-2014 project contract. The financing from the French State (including salaries for civil servants, operating and capital expenditures, pensions and transfers to local and regional authorities) represents about 20% of the GDP of French Polynesia (Institut d'Emission d'Outre-Mer, 2016).

as Hereheretue and Marokau have neither a landing strip nor a harbour). Under these conditions, implementation of the law – developing infrastructure and instituting management – may be costly, and the cost of water may thus be high. The next section discusses the transformations that may result from the new law; it goes on to explain the complexities of implementation: the way in which household water collection systems are rendered invisible when not connected to a network, the assigning of a market value to water, and the question of how drinking water is defined.

### **Municipal distribution versus individual access to water**

The Tuamotu Archipelago has the lowest population of the French Polynesian archipelagos, totalling – together with the Gambier Archipelago – 6.3%, but it also has the highest rate of individual cistern equipment, with 80% of households using such collection systems. Against this environment, the new water law proposes that municipalities either implement a network, install public taps or public cisterns, and institute a system of tanker truck water delivery.

#### *The water network as a universal model*

This situation on the ground questions two important assumptions about water management in France: the network as a universally appropriate model and the idea of a public water service. In France, the network is considered to be the preferred model of water management and distribution and it is intended that the network cover the entire French territory. The practice of rainwater harvesting by householders questions the efficacy of large public networks and casts doubt on the manner in which planning policies are adapted (Hellier, 2015). In France, rainwater management is developed by individuals and builders and lacks real coordination with water planners and managers (Gouvello and Deutsch, 2009). Two important issues are at stake here. First, individual rainwater harvesting collects water that might otherwise take other directions such as feeding the aquifer. Second, after use rainwater is carried by a network of pipes to the sewage station, meaning that householders do not pay for the water consumed but use the sanitation services. On the Tuamotu Archipelago there are mostly no aquifers (a freshwater lens can be found on only about ten atolls) and most of the municipalities do not have sanitation services, thus household water collection systems do not result in a higher cost for sewage treatment services but the issue of pollution remains, indeed. Clearly, there are significant differences between metropolitan France and the Tuamotu Archipelago in terms of the issues to be confronted.

In the context of a household-level decentralised system managed by lay people, the proposed introduction of a water network managed by experts does not match the situation on the ground; covering the whole territory is also a challenge (Féré and Scherrer, 2010; Petitet, 2011). The French Polynesian context highlights the paradox of attempting to implement a network in conditions of territorial fragmentation. This network model emerged, in fact, in the specific context of 19th century industrial development, at a time when urban networks for water, energy and sewage were being put in place with the aim of reducing costs through rationalising the organisation of services. It was a system which obviously contributed to the improvement of hygiene and sanitation conditions; however, the assumption that it is the only valid system is problematic. Developed in a context of economic growth and consumption, the installation of such a system is now not sustainable (Petitet, 2011), and would constitute the most expensive option for the islands of the Tuamotu Archipelago.

#### *Recognising the specificities of the French Polynesian context*

The specificities of the Polynesian context are acknowledged in the Urvoas report as well as the by the Centre for Hygiene and Public Health. On one hand, the Urvoas report asserts that "the State must also be attentive to the standards it enforces and which are applicable locally, especially in municipalities. These standards must be adapted to Polynesian specificities – and they are numerous – without, however, 'selling off' the rules" (Urvoas, 2015: 11). There is a tension between the resolve to implement

French State norms and the need to adapt them to local contexts. This report also describes the law as a tool for the development of French Polynesia (ibid). French Polynesia's specificities concerning law and culture imply that it is more than a "distant extension of France" (Regnault, 2010). The geography of French Polynesia – dispersion of habitat and differences between high islands and atolls – is described as an obstacle to policy implementation in terms of financing and time (Urvoas, 2015: 100). The limits of the French State's 'development' of French Polynesia and the need to take into consideration the specificities of French Polynesians' sense of time, space and nature are pointed out (Ghasarian et al., 2004) and are still on the agenda. The transfer of water management models based on public services dates back to colonisation (Bouquet, 2012) while, on the other hand, municipalities generally consider policies to be not only unsuited to local contexts and societies but indeed sometimes threats to their cultural values (Audras et al., 2017). The tavana (mayor) often hybridises norms while French Polynesian politicians are used to balancing uniformity with local specificities (Regnault, 2010); Audras et al. (2017) remark that French Polynesian municipalities are a mix of republican rules and traditional practices.

The unsuitability of water networks for atolls is underlined by many actors, including the Environmental Directorate, the Union for the Promotion of Municipalities, and the Centre for Hygiene and Public Health. Hao is the only atoll that has a distribution network. It distributes desalinated water but, because its network is obsolete, does so only occasionally (CHSP, 2015 : 94). The development of the network was linked to the increased need for water due to the implementation of the air base and logistics base for Mururoa and the Pacific Experimental Centre (1966-2000). The development of distribution infrastructure and water production units (desalination) (Gay and Laidet, 1993) is thus related to French State military activities. After the army left in 2000, however, the municipality had difficulties in maintaining the system (CHSP, 2012, 2013, 2014, 2015; Urvoas, 2015). An example of this is the water supply problem faced by the Hao high school (their osmosis system failed) when school resumed after the 2013 summer holidays, requiring the intervention of the army to distribute drinking water.<sup>19</sup> Since 2016, the municipality has been developing a new water policy that involves the construction of new rainwater treatment and distribution points.<sup>20</sup> The drinking water network model is thus not the best in the context of atolls because of the costs involved and the skills needed to implement and maintain the system. Awareness campaigns on chlorination and maintenance of household cisterns were organised in 2007 by the Centre for Hygiene and Public Health, a French Polynesian government organisation, and there is a call for more such campaigns (CHSP, 2015 : 94); state attention to such beneficial campaigns, however, may be reduced by a focus on implementation of the new water law.

### *Installing public water taps and/or distributing water with tanker trucks: an alternative?*

The Union for the Promotion of Municipalities and the Environmental Directorate recommend installing public water taps and/or distributing water with tanker trucks to individual households; however, public water taps alone do not meet the legal obligation to distribute water to every inhabitant (Urvoas, 2015: 102). As the Urvoas report states, "The use of these systems of public drinking water distributors seems a solution adapted to the needs of the inhabitants of these atolls. However, it does not strictly meet the requirements of the general Code of local and regional authorities" (Urvoas, 2015: 103-104). This report advises postponing the application of the law again or its adaptation to local contexts. Until now, however, only the first postponement has been approved and the reference to 'adaptation' in this report emphasises French Polynesia's obligation to implement French laws (ibid: 103-104, 128), despite the difficulties that municipalities would face in complying with them. The three main challenges are the

---

<sup>19</sup> French Ministry of the Armed Forces: available at <https://www.defense.gouv.fr/english/operations/prepositionnees/forces-de-souverainete/polynesie-francaise/actualites/polynesie-francaise-de-l-eau-pour-le-college-de-hao> (accessed on 08/06/2017).

<sup>20</sup> Syndicat pour la promotion des communes de Polynésie française: available at <https://spc.pf/actualites/hao-definir-points-distribution-deau-potable> (accessed on 08/06/2017).

costs of desalination and networks, the absence of skilled local workers who could maintain the system, and the inability of most inhabitants to pay for the distributed water.<sup>21</sup>

The majority of these atolls have chosen to collect and treat rain water (CHSP, 2019). As already mentioned, so far only one atoll in the Tuamotu Archipelago (Hao) has a water network; however, as of 2018, 35 atolls (of 76) have installed drinking water production plants. This does not mean, however, that municipalities are distributing water to inhabitants.

### **Transforming water into a consumer good**

One principle of water management in France is that running costs should be covered through consumer fees, which means that implementing a public water service will profoundly affect its cost. French Polynesians currently either do not pay for water, pay a flat fee, or pay for the water they consume (depending of the configurations presented earlier in this paper). On the islands of the Tuamotu Archipelago water is almost free of cost, since 80% of households use individual rainwater collecting cisterns that were originally subsidised. The Urvoas report argues that it is difficult to make people understand that they should pay for water even if doing so would contribute to their own well-being. The report states that

(i)f technical difficulties are obstacles to overcome, it is also necessary to deal with local mentalities. For example, your rapporteur was told several times that Polynesians considered water to be "a gift from God" and that it was difficult to convince them to pay for a service to provide drinking water. Levying royalties is essential for municipalities, for obvious financial reasons, but also because of the pedagogical virtue of such a payment. It helps people understand how much this resource needs to be preserved (Urvoas, 2015 : 102).

Attributing a monetary value to water as a way to teach the need for water conservation is problematic, as it is based on an assumption that the Paumotu do not know how to manage water.<sup>22</sup> It also assumes that putting a price on water will help keep inhabitants aware of how important water is and that they will therefore not waste it. But nowhere in the report it is demonstrated that French Polynesians need to learn how to 'conserve' water.

While tourist facilities might benefit from this type of water policy, the vast majority of inhabitants have access to drinking water through trusted individual systems. In these circumstances, why would citizens buy water? In a particularly dry season they may do so, but a 2018 report confirms that on the atolls of Tuamotu there is low usage of the public water taps supplying water from drinking water production plants (CHSP, 2019). The current policy process is thus shown to be unproductive.

The choice of water production infrastructure also influences water prices. Depending on whether a municipality chooses to collect rainwater or desalinate seawater, the cost of water will change. Installing a desalination facility for the production of public drinking water constitutes the "conversion of water from an artisanal to an industrial product" (Bakker, 2004: 42). Territorial fragmentation and low population densities may increase the cost of water distribution to municipalities as may the need to consult outside experts, and there are various technologies for the desalination of seawater that require different competences and come at a range of costs. In the case of Anaa and Faite, the municipality chose to desalinate, and to buy water tankers to deliver water to homes that need it, opting for a prepayment system; difficulties arose, however, due to the poor quality of the distributed water (Audras et al., 2017). Inhabitants refusal to buy stem from the poor quality and shows the weaknesses of the policy. The Union for the Promotion of Municipalities is currently developing a solar evaporator which may prove to be

<sup>21</sup> Law No. 2015-991 (07/08/2015) on the new territorial organisation of the Republic.

<sup>22</sup> For instance, Torrente (2010) has demonstrated that in ancient times the Paumotu knew how to manage freshwater for cultivation. Even if these practices have been partially forgotten (Audras et al., 2017: 146), contemporary Paumotu are still able to manage freshwater on atolls.

cheaper and more ecologically friendly than reverse osmosis,<sup>23</sup> but this is still at the prototype stage. The Bora Bora municipality, as explained earlier, has been distributing desalinated drinking water which has resulted in water being more expensive there than elsewhere in French Polynesia. There is no one-size-fits-all solution, there are only courses of action that depend on biophysical, sociopolitical and economic contexts. However, implementing a drinking water service that transforms water into a consumer good will have an impact on the Paumoto's relationship to water. People's representations of water must be taken into account. First, water is considered to be a gift from God. Second, the Paumoto make a distinction between freshwater and seawater: seawater is not water you may drink (even if it is desalinated) as this goes against the grain of their representations and therefore may not be called drinking water (Audras et al., 2017). More generally, inhabitants distrust the quality of the water that is distributed through the network (Roger, 2008), and are suspicious of the way that desalination technology is implemented. For all these reasons, therefore, desalinating water is a strategy that ignores the culture and preferences of the Paumoto.

### Defining and measuring drinking water

In French Polynesia, water quality standards are defined by French Polynesian authorities, with the Centre for Hygiene and Public Health in charge of monitoring drinking water quality.<sup>24</sup> Decree No. 1639 CM (17/11/1999) sets the standards for drinking water that is intended for human consumption. Owners and operators of distribution systems producing water for human consumption must deliver water in compliance with drinking water standards. They must implement a self-monitoring programme that ensures water quality and must inform the public about the quality of the water they distribute. Installation operators that do not deliver drinking water that is in compliance with drinking water standards may be penalised. In short, authorities determine the nature and frequency of analyses of supply networks, and insist on compliance with standards on drinking water supply, monitoring quality and providing information about it.

But how can drinking water be defined? According to the 1999 decree, 'drinking water' is water that is "in accordance with the standards of potability" and "is not likely to harm the health of those who consume it" (CHSP, 2015: 13). In fact, microbiological, physico-chemical and chemical criteria must be analysed. A simpler definition is that drinking water is water you can drink without getting sick in the short or long term. The Urvoas report points out that on Tikehau (Tuamotu) drinking water – rainwater collected in individual cisterns or the water pumped up from the freshwater lens – "(...) is not drinkable in the sanitary sense, but it is drunk by the local populations whose organisms seem suited for its consumption, as has been indicated several times to your rapporteur" (Urvoas, 2015: 102).<sup>25</sup> So, in fact, the report recognises that water is drinkable in most atolls even if it is not 'drinking water' according to certain specific standards.

The Centre for Hygiene and Public Health is in charge of monitoring water quality, and has explained that household and public cisterns contain water unfit for drinking (CHSP, 2015 : 94). The main problem, however, hinges on the process for collection of the water samples to be measured, and most of the water declared undrinkable has in fact not been tested. On some islands there is no Centre for Hygiene and Public Health officer and there is no airport, which is problematic because samples meant for bacteriological analysis must be tested within 24 hours (CHSP, 2015 : 15), either by the Centre for Hygiene and Public Health or the municipalities. Municipalities that have not, or have only partially, conducted their water quality controls are said to be delivering undrinkable water (CHSP, 2015, 2019), and in 2015 only 23 municipalities were included in the programme (CHSP, 2015 : 103). Again, on the Tuamotu

---

<sup>23</sup> World Water Day, Pape'ete, 22 March 2015.

<sup>24</sup> Drinking water standards are defined in Resolution No. 99-178 APF (14/10/1999), modified by Law No. 1639 CM (17/11/1999) and by Law No. 1640 CM (17/11/1999).

<sup>25</sup> Usually, the water from the fresh water lens is not used for drinking purposes.

Archipelago, territorial fragmentation, the cost of transporting samples, and the lack of human resources are obstacles to policy implementation (ibid).

Water quality measurements are indeed required for public infrastructure; however, the majority of the Tuamotu population accesses water through household cisterns, which the authorities do not integrate into their annual measurement campaigns. In order to avoid stored water contamination, maintenance of household cisterns is carried out by the inhabitants themselves, including maintaining and repairing all pipes, gutters, roofs, cisterns and associated networks, and chlorination. While according to the Centre for Hygiene and Public Health, cisterns are not in a good state of repair (ibid: 94), a French Development Agency report asserts that "[a]lthough these two types of tanks [from the fresh water lens and from rain harvesting] risk being contaminated, the people on the atolls are well aware of it and few accidents or pathologies have been reported" (Audras et al., 2017: 168). Putting forward arguments around water quality is therefore a way to claim that the Tuamotu is a place where people do not have access to drinking water, when in fact water delivered by public utilities is not monitored and authorities do not take into account household access to drinking water.

## CONCLUSION

In institutional reports from the French Senate, from the French Polynesian Centre for Hygiene and Public Health or in the press, when it is claimed that "[o]nly 10% of the population of French Polynesia has access to drinking water", it both denounces an injustice regarding the right to water and justifies the implementation of the law. However, this paper demonstrates that the implementation of the water law (stating that municipalities must distribute water to every inhabitant) would modify water access, price and representations. On the Tuamotu Archipelago, inhabitants already have access to drinking water through individual rainwater harvesting cisterns. The law concerning drinking water distribution, and the plan for its implementation, have emerged in a formal multilevel governance framework that involves mainly the French State, French Polynesia and the municipalities. This formal governance origin has three main consequences: 1) it ignores the situation on the ground and makes individual rainwater harvesting cisterns invisible; 2) it potentially transforms water into a consumer good; and 3) it defines what can be considered to be drinking water. By implementing a public water service, a price would be put on water which inhabitants would barely be able to afford, and the representations of the Tuamotu islands concerning water would be ignored. Statistics and norms are part of the government's relationship to water and to its citizens, while the actual conditions of inhabitants and the 'the governance of daily life' are ignored and even rendered invisible. In a postcolonial context, this confirms the disconnect between municipalities, French State bodies, and the French Polynesian government, and tends to perpetuate clientelism and the rent economy. The formal governance system is incapable of generating locally relevant and specific policies and continues to struggle with policy ideas that are derived from the French State experience and that do not match the reality on the ground. Effective implementation of the water law is thus still not at all certain.

## ACKNOWLEDGEMENTS

I would like to thank the French National Research Agency (for funding the 'Of Lands and Water' project, ANR-12-AGRO-0002-01) and the University of French Polynesia. I also wish to thank the anonymous reviewers for their valuable comments and suggestions.

## REFERENCES

- Al Wardi, S. 2008. *Tahiti Nui ou les dérives de l'autonomie*. L'Harmattan.
- Al Wardi, S. and Regnault, J.-M. 2011. *Tahiti en crise durable: un lourd héritage : Une analyse lucide par deux sceptiques enthousiastes*. Mooréa, Polynésie française, Polynésie française: Éd. de Tahiti.

- Alatout, S. 2008. 'States' of scarcity: Water, space, and identity politics in Israel, 1948-59. *Environment and Planning D: Society and Space* 26(6): 959-982.
- Alatout, S. 2009. Bringing abundance back into environmental politics: Constructing a Zionist network of abundance, immigration, and colonization, 1918-1948. *Social Studies of Science* 39(3): 363-394.
- Aubriot, O. 2004. *L'eau, miroir d'une société: Irrigation paysanne au Népal central*. Paris: CNRS éditions.
- Aubriot, O.; Fernandez, S.; Trottier, J. and Fustec, K. 2018. Water technology, knowledge and power. Addressing them simultaneously. *Wiley Interdisciplinary Reviews: Water* 5(1).
- Audras, F.; Bambridge, T.; Gaulme, F.; D'Iribarne, P. and Torrente, F. 2017. La République, le Pays et le Tavane. Des politiques publiques à l'échelle communale en Polynésie française : Regards socio-anthropologiques. *Etudes de l'AFD* 5. Paris: AFD.
- Bakker, K.J. 2004. *An uncooperative commodity: Privatizing water in England and Wales*. Oxford ; New York: Oxford University Press.
- Barnes, J. 2012. Pumping possibility: Agricultural expansion through desert reclamation in Egypt. *Social Studies of Science* 42(4): 517-538.
- Bessard, R. 2015. Les transformations du politique : Leaderships et question environnementale en Polynésie française. *Le Journal de la Société des Océanistes* (140): 89-104.
- Bijker, W.E. 2007. Dikes and dams, thick with politics. *Isis* 98(1): 109-123.
- Blundo G. and Le Meur P.-Y. (Eds). 2009. *The governance of daily life in Africa: Ethnographic explorations of public and collective services*. Leiden; Brill.
- Boelens, R.; Hoogesteger, J.; Swyngedouw, E.; Vos, J. and Wester, P. 2016. Hydrosocial territories: A political ecology perspective. *Water International* 41(1): 1-14.
- Bouleau, G.; Marchal, P.-L.; Meybeck, M. and Lestel, L. 2017. La construction politique de la commune mesure de la qualité des eaux superficielles en France : De l'équivalent-habitant au bon état (1959-2013). *Développement durable et territoires. Économie, géographie, politique, droit, sociologie* (Vol. 8, n°1).
- Bouquet, C. 2012. La GIRE : Un modèle difficile à transférer en Afrique subsaharienne. In Julien F. (Ed), *La gestion intégrée des ressources en eau en Afrique subsaharienne : Paradigme occidental, pratiques africaines*, pp: 65-74. Québec. Presses Universitaires du Québec.
- Carroll, P. 2012. Water and technoscientific state formation in California. *Social Studies of Science* 42(4): 489-516.
- CHSP (Centre d'Hygiène et de Salubrité Publique). 2012. *Qualité des eaux destinées à la consommation humaine à Tahiti et dans les îles*. Papeete: Ministère de la Santé.
- CHSP. 2013. *Qualité des eaux destinées à la consommation humaine à Tahiti et dans les îles*. Papeete: Ministère de la Santé.
- CHSP. 2014. *Qualité des eaux destinées à la consommation humaine à Tahiti et dans les îles*. Papeete: Ministère de la Santé.
- CHSP. 2015. *Qualité des eaux destinées à la consommation humaine à Tahiti et dans les îles*. Papeete: Ministère de la Santé.
- CHSP. 2019. *Qualité des eaux destinées à la consommation humaine à Tahiti et dans les îles*. Papeete: Ministère de la Santé.
- Cointat, C. and Frimat, B. 2008. Droits et libertés des communes de Polynésie française : De l'illusion à la réalité. Rapport d'information 130. Paris: Commission des Lois, Sénat.
- Desrosières, A. 2000. *La politique des grands nombres: Histoire de la raison statistique*. 2nd ed. Paris: La Découverte.
- Di Méo, G. 1994. Patrimoine et territoire, une parenté conceptuelle. *Espaces et sociétés* 4(78): 15-34.
- Féré, C. and Scherrer, F. 2010. L'eau urbaine après le réseau? Villes du Liban et des nouveaux Länders allemands. In Schneier-Madanes, G. (Ed), *L'eau mondialisée. La gouvernance en question*, pp. 403-417. Paris: La Découverte.
- Fernandez, S. 2014. Much ado about minimum flows... Unpacking indicators to reveal water politics. *Geoforum* 57: 258-271.
- Fustec, K. 2014. Processus multi-échelle, enjeux environnementaux et construction étatique. Le cas de l'Autorité palestinienne, des politiques de gestion de l'eau et du changement climatique. PhD thesis, Université Paul-Valéry, Montpellier, 584 p.

- Gariépy, M. and Marié, M. (Eds). 1997. *Ces réseaux qui nous gouvernent?* Paris: L'Harmattan.
- Gay, J.-C. 2008. *L'outre-mer français : Un espace singulier*. 2e édition revue et augmentée. Paris: Belin.
- Gay, J.-C. and Laidet, D. 1993. L'alimentation en eau de la Polynésie Française : planche 99. In Dupon, J.-F.; Bonvallot, J.; Vigneron, E.; Gay, J.C.; Morhange, C.; Ollier, C.; Peugniez, G.; Reitel, B.; Yon-Cassat, F. and Danard, M. (Eds), *Atlas de la Polynésie Française*, Paris: ORSTOM.
- Ghasarian, C.; Bambridge, T. and Geslin, P. 2004. Le développement en question en Polynésie française. *Le Journal de la Société des Océanistes* 119: 211-222.
- Goldman, M.; Nadasdy, P. and Turner, M. (Eds). 2011. *Knowing nature: Conversations at the Intersection of political ecology and science studies*. Chicago ; London: University of Chicago Press.
- Gouvello, B. de and Deutsch, J.-C. 2009. La récupération et l'utilisation de l'eau de pluie en ville : Vers une modification de la gestion urbaine de l'eau ? *Flux* (76-77): 14-25.
- Gramaglia, C. and Babut, M. 2014. L'expertise à l'épreuve d'une controverse environnementale et sanitaire : La production des savoirs et des ignorances à propos des PCB du Rhône (France). *Vertigo-la revue électronique en sciences de l'environnement* 14(2).
- Hellier, E. 2015. La récupération domestique des eaux de pluie comme mode alternatif de gestion de l'eau : Dimensions territoriales et enjeux urbanistiques actuels. *Territoire en mouvement Revue de géographie et aménagement* (25-26).
- Hoogesteger, J.; Boelens, R. and Baud, M. 2016. Territorial pluralism: Water users' multi-scalar struggles against state ordering in Ecuador's highlands. *Water International* 41(1): 91-106.
- Ingold, A. 2011. Cartographier pour naturaliser au XIXe siècle. Les ingénieurs des mines et la carte hydrographique d'Italie. In Laborier, P.; Audren, F.; Napoli, P. and Vogel, J. (Eds), *Les sciences camérales : Activités pratiques et historique des dispositifs publics*, pp. 539-568. Paris: Presses Universitaires de France.
- Institut d'Emission d'Outre-Mer. 2016. 2015 Polynésie française. Paris: Institut d'Emission d'Outre-Mer.
- Ioris, A.A.R. 2016. Water scarcity and the exclusionary city: The struggle for water justice in Lima, Peru. *Water International* 41(1): 125-139.
- Lefebvre, H. 1974. *La production de l'espace*. Economica.
- Direction de l'Environnement (Polynésie française), 2015, L'état de l'environnement en Polynésie française.
- Linton, J. 2010. *What Is water? The history of a modern abstraction*. Vancouver: University of British Columbia Press.
- Loubet, M. 2014. En Polynésie, l'eau potable ne coule pas de source. 20 August 2014, [www.tahiti-infos.com/En-Polynesie-l-eau-potable-ne-coule-pas-de-source\\_a107749.html](http://www.tahiti-infos.com/En-Polynesie-l-eau-potable-ne-coule-pas-de-source_a107749.html)
- Marié, M. 1984. Pour une anthropologie des grands ouvrages. Le canal de Provence. *Les Annales de la recherche urbaine* 21(1): 5-35.
- Norman, E.S.; Bakker, K. and Cook, C. 2012. Introduction to the themed section: Water governance and the politics of scale. *Water Alternatives* 5(1): 52-61.
- Petit, S. 2011. Eau, assainissement, énergie, déchets : Vers une ville sans réseaux? *Métropolitiques* En ligne.
- Pezon, C. and Canneva, G. 2009. Petites communes et opérateurs privés : Généalogie du modèle français de gestion des services d'eau potable. *Espaces et sociétés* 4(139): 21-38.
- Poirine, B. 2011. *Tahiti : Une économie sous serre*. Paris: L'Harmattan.
- Pritchard, S.B. 2012. From hydroimperialism to hydrocapitalism: "French" hydraulics in France, North Africa, and beyond. *Social Studies of Science* 42(4): 591-615.
- Regnault, J.-M. 2010. La France en Polynésie française : Quelle volonté de rester présente ? *EchoGéo* (11). <https://journals.openedition.org/echogeo/11506>
- Roger, G. 2008. L'eau potable dans 6 communes de Polynésie françaises: Entre pertes, gaspillage et déficits. Paris: AFD.
- Saura, B. 2015a. Remembrance of the colonial past in the French Islands of the Pacific: Speeches, representations, and commemorations. *The Contemporary Pacific* 27(2): 337-368.
- Saura, B. 2015b. *Histoire et mémoire des temps coloniaux en Polynésie française*. Tahiti: Aux vents des îles Editions.

- Sneddon, C.; Magilligan, F.J. and Fox, C.A. 2017. Science of the dammed: Expertise and knowledge claims in contested dam removals. *Water Alternatives* 10(3): 677-696.
- Thomas, M. 2017. L'eau du robinet est potable dans neuf communes polynésiennes. 15 March 2017, [www.tahiti-infos.com/L-eau-du-robinet-est-potable-dans-neuf-communes-polynesiennes\\_a158929.html](http://www.tahiti-infos.com/L-eau-du-robinet-est-potable-dans-neuf-communes-polynesiennes_a158929.html)
- Torrente, F. 2010. *Buveurs de mers, mangeurs de terres : Histoire des guerriers d'Anaa, atoll des Tuamotu*. Te Pito o te Fenua.
- Trottier, J. 2008. Water crises: Political construction or physical reality? *Contemporary Politics* 14: 197-214.
- Trottier, J. and Fernandez, S. 2010. Canals spawn dams? Exploring the filiation of hydraulic infrastructure. *Environment and History* 16(1): 97-123.
- Urvoas, J.-J. 2015. Rapport d'information de M. Jean-Jacques Urvoas déposé en application de l'article 145 du règlement, par la commission des lois constitutionnelles, de la législation et de l'administration générale de la République sur la Polynésie française. Rapport d'information 2950. Paris: Commission des Lois, Assemblée Nationale.
- Vandergeest, P. and Peluso, N.L. 1995. Territorialization and state power in Thailand. *Theory and Society* 24(3): 385-426.
- Viatge, J.-P. 2012. La SPEA devient Polynésienne des eaux. 28 March 2012, [www.tahiti-infos.com/La-SPEA-devient-Polynesienne-des-eaux\\_a44556.html](http://www.tahiti-infos.com/La-SPEA-devient-Polynesienne-des-eaux_a44556.html).
- Zwarteveen, M.; Roth, D. and Boelens, R. 2014. Defining, researching and struggling for water justice: Some conceptual building blocks for research and action. *Water International* 39(2): 143-158.

THIS ARTICLE IS DISTRIBUTED UNDER THE TERMS OF THE CREATIVE COMMONS *ATTRIBUTION-NONCOMMERCIAL-SHAREALIKE* LICENSE WHICH PERMITS ANY NON COMMERCIAL USE, DISTRIBUTION, AND REPRODUCTION IN ANY MEDIUM, PROVIDED THE ORIGINAL AUTHOR(S) AND SOURCE ARE CREDITED. SEE [HTTPS://CREATIVECOMMONS.ORG/LICENSES/BY-NC-SA/3.0/FR/DEED.EN](https://creativecommons.org/licenses/by-nc-sa/3.0/fr/deed.en)

