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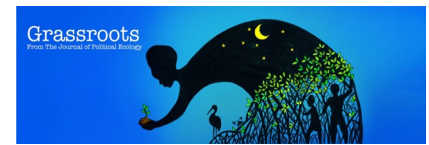
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## Freshwater supply as sociotechnical tinkering: the co-creation of water knowledge and assemblages in New Caledonia

Olga Peytavi<sup>1</sup>, Séverine Bouard<sup>2</sup>, Pierre-Yves Le Meur<sup>3</sup>, Caroline Lejars<sup>4</sup>

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### Abstract

This article aims to show that in-depth ethnography of processes and acts of sociotechnical tinkering provide a useful starting point for understanding how water knowledge co-creation works. This is even more relevant in countries with a strong legacy of settler colonization and continued power asymmetries between holders of different water-related knowledges and ontologies. Analyzing infrastructural and sociotechnical forms of tinkering helps understand how various water assemblages interact with official norms, strategies and laws. Drawing on the study of this tinkering practice, this article looks at how the people of Touho, in New Caledonia, assemble different forms of knowledge to understand, access and drink water.

### Key-words

Freshwater supply, New Caledonia, tinkering, assemblages, Touho, indigenous knowledge

### Résumé

À partir d'une ethnographie approfondie des processus et des pratiques de bricolage sociotechnique, cet article éclaire la manière dont se produit la co-création des savoirs sur l'eau. Cette approche revêt une importance accrue dans les pays marqués par un passé colonial, une histoire de peuplement et des inégalités persistantes entre les porteurs de différentes connaissances liées à l'eau et à ses ontologies. L'analyse des formes de bricolage infrastructural et sociotechnique permet de comprendre comment les divers assemblages liés à l'eau interagissent avec les normes officielles, les stratégies et les lois en vigueur. A travers l'étude fine de ces pratiques de bricolage, cet article explore la façon dont les habitants de Touho, en Nouvelle-Calédonie, mobilisent différentes formes de savoirs pour comprendre, accéder et consommer de l'eau.

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## 1. Introduction

This article looks at the co-creation of water knowledges in New Caledonia, a country with a strong colonial history and continued power asymmetries between various water knowledges holders. It is also a contribution to New Caledonia's history and anthropology, showing how a multi-layered state system (constituted by the central State, the New Caledonian government, and Provinces) has failed to fully reach indigenous populations who remain socially and spatially marginalized.

A duality is visible among the local population between the tribal regions and the urban centres of the country. This duality is shown by the co-existence of two major life-worlds: the indigenous Kanak people living in tribes<sup>5</sup> on customary land (mostly in the Northern Province of the country, which is on the largest island of Grande Terre), and the population of the wealthy South Province and the capital city Nouméa, where the New Caledonian institutions and economic centres are concentrated. The marginalisation of the Kanak people has been reduced since the Matignon Accords and the implementation of proactive policies to promote a new balance between the territories and communities. Today, the majority of Kanak people live in the South province (Rivoillan 2020), but their way of life and standards of living on customary land are very different than across the urban agglomeration of Nouméa (Molina & Makhzoum, 2023). Above all, political rebalancing has advanced in recent decades: the Presidents of the New Caledonian government and Congress are both Kanak, and the North Province is also governed by pro-independence (and mostly Kanak) political parties.

The separation of these two worlds is legally reinforced by the dual legal status of people and of land. Land has been a key issue in the politics of settler colonization and nationalist/indigenous claims in New Caledonia. New Caledonia became a French colony in 1853, a penal colony from 1864-1898, and a nickel producer and exporter from 1873. Indigenous Kanak people were excluded from the French-led economy and from mining work, and were ultimately confined to reservations. Between 1976 and 1988, conflicts between the French government, the settlers' descendants and the Kanak independence movement saw periods of serious violence and disorder culminating with the political 'events' of 1984-88 combining element of civil war and anti-colonial struggle. A limited land reform was launched in 1978, following a sinuous path, but ultimately leading to a phase of extended land restitutions/redistributions from the 1990s and 2000s, mostly in the form of management by "Groupements de Droit Particulier Local" or GDPL (Le Meur, 2022). As part of this process, "Customary lands" were given legal recognition in 1999, and now include former colonial land reserves, their later extensions and the different forms of land attributions resulting from the land reform. The land reform process is thus a matter of recognition and sovereignty beyond the sole redistribution of property rights.

Drawing from this colonial history and the tribal/urban duality that it has created, this article analyses how the Kanak interact with water. The legal arrangements concerning land governance in New Caledonia are connected to the way in which water is governed. New Caledonia's current land tenure situation is characterized by the co-existence of a public domain, private landownership and customary land, with different rules regarding water property rights and management. For instance, rivers flowing on customary lands are not part of the New Caledonian River public domain (Loi organique n° 99-209 du 19 mars 1999 relative à la Nouvelle-Calédonie (1), 2009). This is a significant characteristic taking into consideration that customary lands represent 27% of the New Caledonian land surface area and contain 52% of the water catchments.

However, the New Caledonian government also has some responsibility for water management through two New Caledonian government agencies: The Direction des Affaires Vétérinaire et Rurales (DAVAR) and the Direction des Affaires Sanitaires et Sociales (DASS). The DAVAR deals with "raw water," or untreated water and resources management. For instance, if someone wants to build a bridge, they

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<sup>5</sup> The term "tribe" comes from New Caledonia's colonization which regrouped the indigenous (Kanak) people in land reserves scattered all over the country, mostly in remote places based on the historical and colonial approach of land dispossession and spatial and racial segregation. The tribe is thus an administrative entity bringing together various Kanak clans, some of which were displaced by colonial settlers (mining and livestock) or military repression.

have to get permission from DAVAR. The agency also regularly controls the "raw water" quality and quantity. Municipalities are responsible for water supply networks and drinking water. However, responsibility for water quality surveillance is shared with the DASS. The DASS checks on the quality of water flowing into the water management system.

Paying attention to the different actors involved in New Caledonia water governance, we attempt to shed light on the everyday micro-arrangements related to water circulation and use. For this purpose, we engage in the ethnographic analysis of two cases of water management, specifically focusing on the region of Touho located on the east coast of the Northern Province.<sup>6</sup> Our first example analyses the personal use of an old water catchment restored through tinkering by a Kongouma tribe family. The second example looks at the relationships between the Northern Province and the Tiwae, Poyes and Vieux-Touho tribes in the preservation of water through reforestation projects. The analysis of these cases serves to illustrate the convergences and divergences between different life-worlds that are constituted around water management and use in New Caledonia (Kemerink-Seyoum *et al.*, 2019a).

This article is based on ethnographic fieldwork conducted between April and August 2022 in the Touho region.<sup>7</sup> Primary data was collected through interviews, participant observation and life stories, especially with members of the Vieux-Touho, Kongouma and Tiwae tribes. During our fieldwork, we also regularly spent time with the four municipal officials who run the general water supply system. Three of them are Kanak people from Touho living in tribes. Before starting the fieldwork in Touho, we conducted interviews in Nouméa (March 2022) with the different institutions and research projects that deal with water in order to get an overall view of the various policies and strategies concerning the use and distribution of freshwater in New Caledonia.

## 2. Conceptual framework: Tinkering

Because of New Caledonia's colonial history and strong customary law and traditions, we started with the opposition between the Kanak population and the Western white colonial administration. This duality is reinforced by the popular narrative of the Western opposed to the customary way of life. In the words of a tribal chief from a Touho tribe:<sup>8</sup>

We really have two sides, modern and traditional. The shift created by incoming water pipes reflects the introduction of modernity into Kanak life. There is conflict in our minds. We're caught between modern and old ways, in the middle of a confusion between what we know and what we're taught at school. We live constantly with these two lives, these two characters.

These feelings emphasizing the divide between Kanak and Western society were expressed on multiple occasions by several actors. However, given that colonial segregation is a political construct, in this article we have tried to move beyond this divide to show complexities exist in practice.<sup>9</sup> The concept of sociotechnical tinkering shifts our attention from an opposition of worldviews towards distributed agency

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<sup>6</sup> This region is sparsely populated with 2,380 inhabitants across 283 km<sup>2</sup>, either living in the village or in one of the 11 tribes (ISEE, 2019).

<sup>7</sup> The ethnographic fieldwork in Touho was carried out by one the authors (Olga Peytavi). The other authors participated in interviews with administrative and customary actors mainly in Nouméa.

<sup>8</sup> Please note that names have been deleted or changed to protect people's identity.

<sup>9</sup> Although in this article we try to detach ourselves from this duality, it remains very present in people's discourses. While residents show themselves as belonging to several worlds, this colonial heritage is reactivated when they talk about Caledonian society. We note that it appears in discourses of colonial heritage, but also in political discussion of indigenous identity affirmation. More commonly, they are found in Caledonian songs of the current *kaneka* style, like the song: Kanak d'appartement (Hyarison <https://youtu.be/TgxXLvsq6TM>). One may then ask "Why, when reality is much more complex, do people maintain a dualistic discourse?" In this article we chose to put this question aside and focus on assemblages that show a complex reality, however this question deserves to be explored in greater depth in a future article.

(Archidiacono, 2019; Benouniche *et al.*, 2014; Kemerink-Seyoum *et al.*, 2019b), which is manifested in multiple ways through different actors working together (Bersaglio & Cleaver, 2018).

The term tinkering corresponds to the French term 'bricolage' (also used in English), which implies the creative use of currently available materials (Cleaver, 2012). Improvisation often goes hand in hand with tinkering because it also involves diverting material and objects from their original use.<sup>10</sup> Today bricolage has been adopted within social science research. One of the first authors to use it was Lévi-Strauss in *La Pensée Sauvage*:

Now, the distinctive characteristic of mythical thought is to express itself with the help of a set of heterogeneous elements, one that, even if extensive, still remains limited; and it must make use of this set, no matter what task it is carrying out, since it has nothing else at hand. It thus appears as a sort of intellectual bricolage, which explains the relationship that can be observed between the two. (Lévi-Strauss, 1972, p. 20)

The term tinkering allows for the observation of heterogeneous assemblages that reflect the complexity of reality. Therefore, in this article, we also engage with the notion of assemblages (Dodier & Stavrianakis, 2018; Latour, 2005) that is closely associated with tinkering, as well as the term "distributed agency" to refer to the tinkering processes and their application in the real world. Assemblages enables us to look at objects and people in their mutual relations and constitution (Bennett, 2010). Looking at the water assemblages through tinkering enables us to understand water use across time and its implications in today's new Caledonian water governance (Kemerink-Seyoum *et al.*, 2019a; Reyes Escate *et al.*, 2022).

The term tinkering, as explored by different authors (Benouniche *et al.*, 2014; Kemerink-Seyoum *et al.*, 2019a; Venot *et al.*, 2017), focuses on the distribution of agency across different actors, enabling multiple realities and ways of relating to water. Tinkering sheds light on the cracks and discontinuities between ideal norms and daily practice. These cracks are historically embedded, and through tinkering the different actors modify and adapt everyday norms. The concept of tinkering allows us to look at technical processes not as linear processes but as creative ones, paving the way for a multiplicity of emerging assemblages (Benouniche *et al.*, 2014; Kemerink-Seyoum *et al.*, 2019b).

Tinkering stresses the materiality of relationships to water involving humans and non-humans (Ingold, 2018) and the key role played by tools and objects in water practices. To illustrate this, we draw on the use of the concept by Tim Ingold: a process of going back and forth between materiality and ideas which cannot be dissociated (Ingold *et al.*, 2017). Tinkering in this sense highlights the process and not the product: the fluidity of the construction rather than the final achievement.<sup>11</sup> The concept allows us to meticulously document the materiality associated with different freshwater uses.

In contrast to examples in the literature on water governance, where tinkering can be seen as a form of contestation (Venot *et al.*, 2017) (or as necessary resistance), we see the concept in terms of a constant negotiation between actors. We chose the term negotiation to also link to the negotiated decolonization process in New Caledonia. Indeed, the land reallocation that took place from 1978, with customary land being recognised in 1999, was based on a series of negotiations that are still ongoing, between ADRAF (Agence de développement rural et d'aménagement foncier) – the government agency in charge of the land reform – the Kanak groups, and the authorities involved in the current situation (Le Meur, 2011). This negotiation process reaffirms ties to the land and connections between the past and the present. This is important because it takes into account the history of people who were displaced during colonization. On a case-by-case basis, these redistributions of land combine "a 'logic of proof', anchored in history, with a 'logic

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<sup>10</sup> We can take the example the *sagaie* – an ancient fishing object – today, the Kanak population uses old bicycle spokes, attaching them to the end of a *sagaie* to prick the shrimps when fishing in the river.

<sup>11</sup> Tim Ingold does not talk about final achievements resulting from tinkering. Rather, "The idea of completion of construction is at best a legal fiction. In reality, as Brand observes with a certain amount of frustration, 'we never finish finishing.'" (Ingold *et al.*, 2017: 113).

of negotiation', taking into account the current land and demographic situation as well as the political commitments of the various groups concerned" (Le Meur, 2011: 170). In this article we use the term negotiation both metaphorically and as a concrete process in place, to explain the constant tinkering by the various actors. We also see negotiation as a way for actors to maintain some level of autonomy from the state while acknowledging its importance in the water system.

### 3. Case study of Touho: Negotiating through tinkering

Today, a 175 km long water network crosses the whole Touho region (Thésée Ingénierie, 2014) and is maintained by municipal officials.

Touho's first water network was built in the 1930s, just in the village, and was reserved for the colonial administration. In the national archives, it is only from the 1970s that we find signs of the New Caledonian government financing projects to include the tribes via a centralized water supply system.<sup>12</sup> As evidence of the situation before these projects, we have people's narratives, perhaps variable, and the ruins of multiple small water catchments in each tribe connected first through bamboo pipes and then through steel ones to different households. Generally, each household had access to a freshwater source like a spring, a creek or river. We also have stories of remote taps installed by the municipality, but these were used on an ad-hoc basis by the population who also relied on their own systems. From the late 1970s onwards, instead of multiple small water catchments for each tribe, the municipality and private companies built six water catchments in the municipality of Touho, serving three to four tribes each. The Kokingone catchment dates back to 1984, serving the Kokingone, Pouiou and Tiwaka tribes. All water catchments are on customary land.

Nowadays, there are still many water shortages, especially during rainy periods (which are common throughout the year). The water catchments or the pipes get blocked by leaves and gravel which causes water outages or dirty undrinkable water. The inhabitants then have to use other methods like collecting rainwater or spring water instead of using the collective water network.

#### *Uniin's Spring*

As we became more involved in the life of the tribes, we came across an interesting example of tinkering as negotiation between humans and non-humans:

Kongouma is located on the coastline and most of the dwellings aren't close to the river. Before the water catchments, people used springs or small creeks to access water. Irène, a relative of the family I am staying with, takes me to meet her cousin, Uniin, who looks after a water spring on his land. He is currently building a new house in the valley that is not connected to the general water system. He agrees to take us to his spring water source (Figure 1). As we go up into the forest, the vegetation becomes dense, and we follow a small path through the bamboo groves. He tells us that there used to be three springs, but two of them have dried up. Irène remembers how when she was still a child, at the time of the "events"<sup>13</sup>, they built little water catchments around these three springs which supplied the whole Kongouma tribe. This was before the tribe was connected to the Poyes water catchment in the 1990s and then the Tiwae catchment in the 2010s. As we arrive at the spring, I notice a pink flowing form. As we

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<sup>12</sup> Archives territoriales de Nouvelle-Calédonie, Boîte 65W-290 Commune de Touho: AEP de Tembouathi « Vieux Touho » which discusses the preliminary project phase and discussions, 1977-1978. Archives territoriales de Nouvelle-Calédonie, Boîte 65W-300 AEP de Tembouathi « Vieux Touho »: Touho *commune*. Archives territoriales de Nouvelle-Calédonie, Boîte 65W-173 AEP de Tiouande: (commune de Touho): preliminary project, consultations described in the minutes of a meeting with the Paola tribe (Poyes) on 19 October 1979 on bringing drinking water to the *tribu*.

<sup>13</sup> Irène is referring to the political events that happened in the 1980s, a mix of civil war and anti-colonial struggle, when the Kanak population stood up for their rights against the French colonial State. The repression of Kanak was particularly strong in the region of Touho. The French State treated the period as a state of war and many Kanak people fled into the valley to protect themselves.

get closer, I realise that Uniin's has hung a pink mosquito net around the spring to protect it. He lifts it to show me water from the spring coming directly out of a stone and forming a little stream. He had protected the creek with a thicker black net on the ground. Before, he tells me, his ancestors used coconut leaves, but a net is more durable. The water streams down the no longer used old water catchment chambers into the old cast iron pipes. In some areas where the iron has broken, he's replaced it with PVC or polyethylene pipes. White roots wave in the water, Irène tells me that bacteria in the roots filter the water by eating the little bits of sediment. Uniin tells us that the spring is guarded by a red eel who cleans it in the afternoon, while he and his wife clean the spring in the morning. They have seen the eel on multiple occasions. He warns us that you should never catch it, but leave it in the spring. Otherwise, the spring will dry up. In the morning, he explains that they remove the leaves floating on the surface, replace the stones and check the net. In the afternoon, the red eel swims along the bottom part, eating the small amount of dirt that has accumulated. (Notebook extract, July 2022, Olga Peytavi)



Figure 1: Uniin's spring. Source: author

Through this interviewee's explanation, the spring's social relationships with different entities come to light. The materiality of the water assemblages also provides insight into social, technical and spiritual aspects. It is a matter of task division: in the mornings Uniin and his wife take care of the surface and the eel takes care of the bottom in the afternoons. When Uniin talks, the separation between humans and nature disappears. Beings are working together for a common good: to keep the spring alive. This is a level playing field, with no one being exerting control over another. Uniin describes how he looks after the spring, he "takes care" of it, based on his knowledge of the surrounding environment.

Uniin tinkers between different sources of knowledge, negotiating his place as one actor among the human and non-human ones that constitute the environment. Focusing on tinkering allows us to comprehend the fluidity of his construction, understand that he is not the main actor. Tinkering highlights the materiality of the water catchment viewed as a complex assemblage of humans and non-humans. All the actors are connected and work together to support each other.

#### *Reforestation of the Haccinem water catchment*

The Northern Province implemented a reforestation project with a focus on freshwater in Touho in conjunction with the Kokingone, Tiwae, Vieux-Touho and Poyes tribes. The Northern Province started to take an interest in the problem of drinking water in 2010-2011 when they launched the first water catchment restoration project. The Province, in partnership with research institutions, identified fires and wild animals (deer and wild pigs) as two threats to the freshwater supply. Both deplete the soil by diminishing the root mass that retain water during floods. Fewer roots channelling water into groundwater tables makes the creeks, springs and rivers dry up faster during droughts as there are less water reserves (Tramier, 2021). In order to compensate for this effect, the Province suggested the reforestation of catchment areas (Figure 2) in order to protect them. It started at the provincial level with the Gohapin tribe, linked to the presence of the NGO WWF that was working in the area (Toussaint, 2018). The idea was to support the local actors and tribes in the preservation of their water catchment. After the work in Gohapin, they soon moved on to Bakuna in Hienghène, responding to concerns raised by that tribe related to its drinking water supply.



Figure 2: Haccinem water catchment. Source: author

In 2015 work started in Touho with the RESCCUE (Résilience des Ecosystèmes et des Sociétés face au Changement Climatique) project from 2015 to 2018 and then the INTEGRE (Initiative des Territoires pour la Gestion Régionale de l'Environnement) project from 2018 to 2020. Both were financed by AFD (the French development agency), and the EU, hosted by the South Pacific Community (SPC) which has its offices in Nouméa, and supported by the Northern Province. The latest project in the area was the PROTEGE (Projet régional Océanien des Territoires pour la Gestion durable des Ecosystèmes) project financed by the EU (2018-2022) which aimed primarily at increasing biodiversity in New Caledonia. In Touho, the Northern



Province works with multiple partners (OFB, GIE Oceanide, CEN, ONFI, etc...) <sup>14</sup> and with the Kanak population. To do so, they held an initial meeting with the four selected tribes of Touho; Kokingone, Tiwae, Vieux Touho and Poyes to jointly establish which areas they would like to reforest. They decided to reforest places around freshwater like creeks, springs, water catchments and rivers. These areas were defined by the tribal Councils themselves, through participatory, not directive actions, in partnership with the tribes. The Northern Province gave them a list of possible actions suggesting what they could do in their tribe. Then the tribes chose what they wanted to see carried out in their own areas. The Northern Province also told them that they could add as many actions as they wanted.

To facilitate the reforestation actions, the Northern Province and the PROTEGE project fund finance a community organization called CAAM (Cèmi Acuut A Mulip, which means "one tree for one life" in Cèmuhi) to work with them. It is composed mainly of women from the Tiwae, Poyes and Vieux-touho tribes. The majority of its members produce seedlings. When reforestation actions are started, the organization uses the funds from the Province to buy seedlings for the members and pays them for the reforestation days (between 5,000 and 6,000 XPF [around €50/US\$50] per day of work).

On several occasions, we accompanied the association's members and the Northern Province to reforest the chosen plots in Touho. The project manager is sometimes joined by two North Province officials from the East Coast services and land resources division. On the planting days we left early in the morning. The project manager, in the North Province's staff vehicle, starts by picking up the association's members from their houses and then drives them to the top of the Haccinem water catchment. As the condition of the road is too bad, we leave the two cars and continue on foot to the catchment. The heavy rains of the last few months have damaged the road and the town hall has not yet resurfaced it. The 10-person team plants about 600 seedlings a day. Foresters and tribal women work together, exchanging techniques with each other: one official showed us how to cut the bottom half of plastic bags in which the seedling is placed to plant it more efficiently. Very quickly the women told him to stop cutting the bags because they need them to grow the next cuttings. On other days, the team (Northern Province officials and the CAAM organization) laid Niaouli (*Melaleuca quinquenervia*) trunks in an area of degraded undergrowth to prevent stones from rolling down the path during heavy rains and falling into the water catchment. The team regularly came to maintain the plants by clearing the bush. The team experimented with plastic netting around the plants to help identify them after the weeds had grown, but the plastic disintegrated and scattered all over the surrounding scrub.

## 5. Discussion and conclusion

As the two examples demonstrate, tinkering sheds light on the discontinuities and continuities of the different assemblages around water uses and access. In the case of Uniin's spring, we can trace back the historical water process and see that tribes and institutions have kept working together in different assemblages through time and across space. Each one draws on the knowledge of the others. The first water catchments were built with the help of the Town Hall in places known and chosen by the customary elders, bringing different knowledges and techniques together. Today Uniin picks from the different assemblages to create his own, adding another layer.

In the reforestation examples, the water assemblages shed light on the actors' multiple roles and reveal a complex institutional patchwork. The concept of tinkering allows us to look at the distribution of agency between the different actors and unveils the multiplicity of assemblages, and also how they are embedded together. There are negotiations between the different tribes, between the Province and the tribes, between the Province, the tribes and the Town Hall, visible through the tinkering processes unfolding around the water catchment. Assemblages are made and unmade in relation to the interests of each actor. For example, during the reforestation actions with the members of the association, they expressed their anger against the Town Hall for not rebuilding the road that leads to the catchment area and forcing them to leave their cars one kilometre away from it, making reforestation actions more difficult and tedious, as they have to carry the

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<sup>14</sup> Office Français de la Biodiversité, Groupement d'Intérêt Economique Océanide, Conservatoire d'Espaces Naturels, Office National des Forêts International.

seedlings all the way up to the catchment. The Town Hall is governed by separatist officials and is mainly made up of elected Kanak, including the mayor. Each actor plays multiple social, political and customary roles. The elected officials and the municipal workers are all inhabitants of the village or the tribes of Touho. However, they are often criticized by the tribal communities as being incompetent. This pervasive reality shifts our perspective away from a duality between the Kanak worldview, on the one hand, and the institutional or 'white' side, on the other hand. The roles are more often intertwined than opposed.

Looking at tinkering processes enables us to draw on the materiality of water, and the humans and non-humans who interact with it. The plants meticulously chosen to protect the catchment from erosion in the reforestation actions, the mosquito net that protects Uniin spring, as well as the eel that cleans it, are elements of tinkering that gravitate around water and make it visible. Through the experience of reality, in this case water and its environment, human and non-human actors adapt and rethink their relationship to the land. What is interesting is that water keeps traces that allow us to observe these comings and goings. This is true of the Uniin spring where we have the traces of the old catchments mixed with the new installation that Uniin has built.

The concept of tinkering highlights the continuous and evolving process of these assemblages based around water. People negotiate their place on the land between themselves, but also with the non-human environment, according to their personal interests, the interests of the clan, the tribe and the town hall. This is what we observe when we look at the materiality of water through the lens of the materiality of relationships and social networks.

### *Negotiation*

This leads us to the negotiation aspect of tinkering. Negotiation through tinkering is present in the way Uniin uses different sources of freshwater. As mentioned in the interview excerpt, Uniin relied on the water network system for his first house. The acts of tinkering between the old water catchment, the current water networks, the eel and his ancestor's knowledge of the spring stresses how Uniin negotiates between different actors. By tinkering, he emphasizes his capacity to mobilize different forms of knowledge around water and to assert his local and social position.

The process of reforestation in the Haccinem catchment is a constant negotiation too. For example, the tribes wanted to create a track for the fire brigade in case of a fire outbreak, but this idea was considered dangerous and counter-productive by the Northern Province. According to them, this could actually increase the number of fires because it makes access to the area easier. The Northern Province's argument is simultaneously financial and environmental. "It then raises questions about its direct environmental impact, of course, and its maintenance. Who is responsible for it and who will maintain it?", said one of the Northern Province officials.

Another form of negotiation through tinkering can be observed in the relationships between the Province and each Council of Clans. Normally, the Province has to go through the president of the clan chiefs to hold meetings, make assessments, and request access to land for reforestation. This process works well in the Poyes tribe, but not at all in the Vieux-Touho tribe, where the chieftainship is weaker. In Vieux-Touho, the Province works with two tribal inhabitants who are active in the reforestation association. The different actors bend and tinker with the different frameworks: the environmental framework of the Province's project, and their own norms, the customary framework and the municipality's agenda. Peoples juggle between these different frameworks, and negotiate and tinker according to their different interests. This tinkering highlights the pragmatic improvisation of the different actors, through the support for pre-existing structures and their subsequent reorganization.

The negotiation aspect is reinforced by the fact that, as we said in the Introduction, the land on which these actions take place is customary land. This means that it functions according to a different land tenure regime than the public estate and privately-owned land. Negotiation occurs between the power of the land in the hands of the Kanak clans who are the landowners – they can, for example, accept or prohibit access to or from certain institutions – and the economic power of the official bodies that hold the subsidies and control

funding. Negotiation takes place between various actors, who sometimes wear several hats. For example, one of the Town Hall's water officials is also a clan chief of the Vieux-Touho tribe. The actors possess multiple knowledges and play different roles to navigate between assemblages, negotiating their way through them.

To conclude, tinkering practices give us an insight into the different water perspectives in Touho. They illustrate that even if they highlight different techniques, skills and knowledges, they cannot be understood as separate from each other. A critical examination of tinkering by actors allows us to shift from a perspective that recognizes two opposing worlds, to identification of the distributed agency and interconnectedness that structures water assemblages. It also leaves room for a more realistic view of water policy impacts, successes and failures.

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