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Institutional bricolage and the application of the No Net Loss policy in Quebec: can we really engender 'social fit' for more sustainable land use planning?

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ABSTRACT

Offsetting and, more broadly speaking, the mitigation hierarchy have been widely studied in terms of decreasing the impacts of economic activities on biodiversity. There has been considerable tendency to anchor these mechanisms in science, promoting the idea that they are scientifically constructed. Building on Quebec's recent regulatory changes concerning the introduction of offsetting and the mitigation hierarchy for wetlands and streams, we argue that their implementation relies strongly on political and social constructs. Using institutional bricolage, we highlight the implication of power relations, dominant views and path dependency in this new institutional setting. Indeed, the No Net Loss principle seems to raise historical tensions in water management policies, especially those between strong centralized governance and fragmented territorial management. But No Net Loss application also confronts powerful traditional land use planning with a long history of promoting development interests. To overcome these tensions, No Net Loss can be viewed as an opportunity for innovation towards more sustainable land use planning that acknowledges collective values. To investigate the potential for a novel social fit for wetland offsetting, we call upon Actor-Network Theory to rethink land use planning for a collective vision of the territory.

KEYWORDS

Biodiversity offset; water resource management; land use planning; institutions

1. Introduction

Wetlands provide numerous ecosystem services including flood control, water purification, recreation and climate change mitigation while acting as habitats for a wide range of species (TEEB, 2010). Between 1990 and 2011, wetland surface area decreased by 19% (567 km²) in the Saint-Lawrence Lowlands (Quebec, Canada) (Pellerin & Poulin, 2013) and over 30 000 km of streams were straightened and rechannelled. This trend is characteristic of a worldwide tendency to manage wetlands and waterways for agricultural production and development. According to the IPBES (2019), more than 85% of wetlands present in 1700 had been lost by 2000 and the loss of wetlands is currently three times faster, in relative terms, than forest loss. In Europe, 60% of all wetlands have disappeared since 1900 (EEA, 2010), as have 54% of wetlands in the United-States since the eighteenth century (Dahl, 1990).

In this context of global drivers of land use change, the negative consequences of economic activities on wetlands and streams are treated as negative externalities. A proposed solution has been to internalize impacts through the use of environmental public policies. For example, the No Net Loss (NNL) principle, which emerged at the end of the 1980s in the United States, ensures that the impacts on biodiversity caused by a development project are outweighed by measures taken to avoid and minimize the project's impacts, to restore the site and, finally, to offset residual impacts, so that no loss remains (BBOP, 2012). This mechanism has been

developed worldwide (Bull & Strange, 2018; Global Inventory of Biodiversity Offset Policies – GIBOP; Rainey et al., 2015)¹ in line with the sustainable development principles that have been promoted since the 1980s. Countries that call upon the ‘mitigation hierarchy’ (i.e. avoiding, reducing, restoring, offsetting) developed their own systems around the following elements: regulatory texts mentioning the use of offsetting, regulatory processes enabling their application (e.g. Environmental Impact Assessments), methods to assess the equivalence between biodiversity losses and gains, as well as measures to ensure their implementation, financing and sustainability (Jacob et al., 2015).

To date, extensive literature has been published on biodiversity offsetting, trying to anchor mitigation hierarchy and offsetting in science while promoting the idea that these concepts are scientifically constructed. The literature is mainly ecological in nature (44%), as social sciences are often underrepresented (16%; Calvet et al., 2015). Economic studies have become more prevalent since 2007 along with a growing interest in ecosystem services and market-based devices, though they only comprise 6% of the literature (Calvet et al., 2015). In ecology, research focuses on restoration and the effectiveness of offsetting (Bull et al., 2013; Curran et al., 2014; Maron et al., 2012; Moreno-Mateos et al., 2012; Quétier & Lavorel, 2011), with a particular attention paid to wetlands. The field of economics has taken up this issue through institutional economics, examining offsetting banks (Boisvert, 2015; Scemama & Levrel, 2014; Vaissiere & Levrel, 2015) and assessment methodologies (Dumax & Rozan, 2011; Gastineau & Taugourdeau, 2014). Thus, most scholars studying these institutions have focused on their optimization, and were concerned by their immediate functionality. Calling upon Mainstream Institutional Thinking involving common property theories as well as New Institutional Economics (North, 1990; Ostrom, 1990), they are usually interested in ‘design principles’. They rely strictly on bounded rationality assumptions about human behaviour, describing the formal and functional nature of institutions.

Although widely adopted by institutions and thoroughly reviewed in the literature, offsetting instruments have had a limited impact in terms of ecological outcomes. In a recent meta-analysis of peer-reviewed literature (around 15,000 papers were analysed) and 32 reports detailing ecological outcomes from No Net Loss policies, zu Ermgassen et al. (2019) found that only one-third of NNL policies and biodiversity offsets reported achieving NNL. Our hypothesis is that approaches emphasising efficiency and optimization are missing key social and political elements that impede progressive change (Cleaver & Whaley, 2018). In particular, we argue that the development of offsetting instruments relies on political and social constructs. One of the core principle of No Net Loss is the search for equivalence: offsets need to be comparable and represent a fair exchange for the biodiversity lost. But equivalence can be defined in different ways and open to interpretation. As mentioned by Jacob et al. (2016), ‘The principle of offsetting according to the goal of No Net Loss can be applied differently depending on what is at stake – habitat/species, ecosystem functions or ecosystem services’. Moreover, among the different offsetting activities used to achieve biodiversity equivalence (BBOP, 2012) emerge positive management interventions such as the restoration of degraded habitat. Restoration refers to the process of assisting the recovery of a damaged ecosystem so that the latter can be self-supporting, resilient to future disturbance without further assistance and retains its baseline structure, functioning and biological composition (SER Primer, 2004). Restoration can initiate or accelerate an ecological trajectory through time towards a reference state, whose definition could refer to cultural elements (Clewell & Aronson, 2010).

We call upon the notion of institutional bricolage² developed by Cleaver (2017) within the broader field of Critical Institutionalism to study offsetting implementation. This field, contrary to Mainstream Institutionalism, stresses the incomparability of various ‘messy’ contexts, the interrelatedness of global and local factors and the importance of social and economic changes through time (Mehta et al., 2001; Steins, 2001). Institutions³ are seen as both formal and informal and the result of people’s actions. Critical Institutionalists tend to focus on the broader social, cultural, and political context. Institutional bricolage is viewed as ‘a process in which people consciously and non-consciously draw on existing social formulae (styles of thinking, models of cause and effect, social norms and sanctioned social roles and relationships) to patch or piece together institutions in response to changing situations’ (Cleaver, 2017). Institutions are thus viewed as a mix of modern, traditional, formal and informal elements. As mentioned by Cleaver and De Koning (2015), the objective is to track ‘just how much room for manoeuvre specific institutions offer to different actors, and the extent to which institutions formed through bricolage can be transformatory’.

To investigate the current opportunity for innovation/transformation towards more sustainable land use planning within this regulatory framework, we implement the Actor-Network Theory (ANT) as developed by Callon (1986) and Latour (1987). According to ANT, when analysing the emergence of new ‘knowledge’, here the integration of the mitigation hierarchy within stakeholders’ everyday practices, its internal rationale is treated as just one element in a more complex picture. It is equally crucial to understand ‘how knowledge claims become incorporated into the actions, values, and projects of others’ (Cowell & Lennon, 2014). Certain individuals have the ability to forge links between key stakeholders and are able to explain the potential value of a given tool to others (Jacob et al., 2018). These facilitators are crucial, as the adoption of a tool must ‘driv[e] forward particular conceptions of sustainability across a range of governmental sectors, each with their own forms of knowledge and expertise, normative criteria, and policy territories’ (In: Collins et al., 2009).

Building on a Quebec case study in which an offsetting scheme and the mitigation hierarchy were recently introduced for wetlands and streams, we analyse how the development of such systems strongly relies on political and social constructs. In Section 2, we present the institutional context of recent regulatory changes related to the introduction of No Net Loss in Quebec. Section 3 details the methodology employed to study the conceptualization of mitigation and offsetting schemes. Section 4 examines the processes related to No Net Loss implementation and the adaptation of governance arrangements. In Section 5, we discuss how the application of NNL can play a transformatory role towards a more sustainable land use planning.

2. The institutional context: the introduction of No Net Loss in Quebec legislation

Wetland loss and the disappearance of natural streams prompted the province of Quebec to modernize the legal framework related to the management of natural areas. In 2017, the national assembly adopted a new law concerning wetland and stream conservation (*Loi Concernant la Conservation des Milieux Humides et Hydrique – LCMHH*) to reduce the loss of these ecosystems through the application of the No Net Loss principle. LCMHH is based on four principles: (i) implementing NNL, (ii) tackling climate change, (iii) ensuring the conservation, sustainable use and restoration of wetlands and streams and (iv) promoting sustainable planning of agricultural lands and forests.

The offset system in Quebec is mainly based on financial contributions paid by developers that contribute to a fund for the restoration and the creation of similar ecosystems. The set of regulations detailing how to implement offsetting policies was released in September 2018. It defines parameters used to establish the amount of financial contributions, identifies activities exempt from offsetting and determines situations where financial contributions could be replaced by direct restoration or creation projects.

In June 2019, a restoration and creation program aiming at implementing NNL was established to redirect amounts received through the fund to watersheds and Regional County Municipalities (RCM) or regional municipalities thereafter, where ecosystem loss has occurred.

Quebec chose to implement the mitigation hierarchy at a territorial level as opposed to the scale of a single project through the use of five mechanisms (Figure 1; Appendix 1):

- Avoidance through (i) the protection of wetlands and streams of exceptional value, (ii) the conception of regional conservation plans and (iii) Environmental Impact Assessments of development projects.
- Reduction through the Environmental Impact Assessments of development projects.
- Offset through schemes calling upon the restoration and creation program financed by the offsetting fund.

3. Methodology

To understand how mitigation and offsetting schemes are politically and socially constructed in Quebec’s evolving regulatory framework, we conducted 28 semi-structured interviews with representatives from municipalities, regional municipalities, watershed organizations, Regional Centres for the Environment (RCE), environmental consultancies and the Agriculture Union. We focused on two regional municipalities that

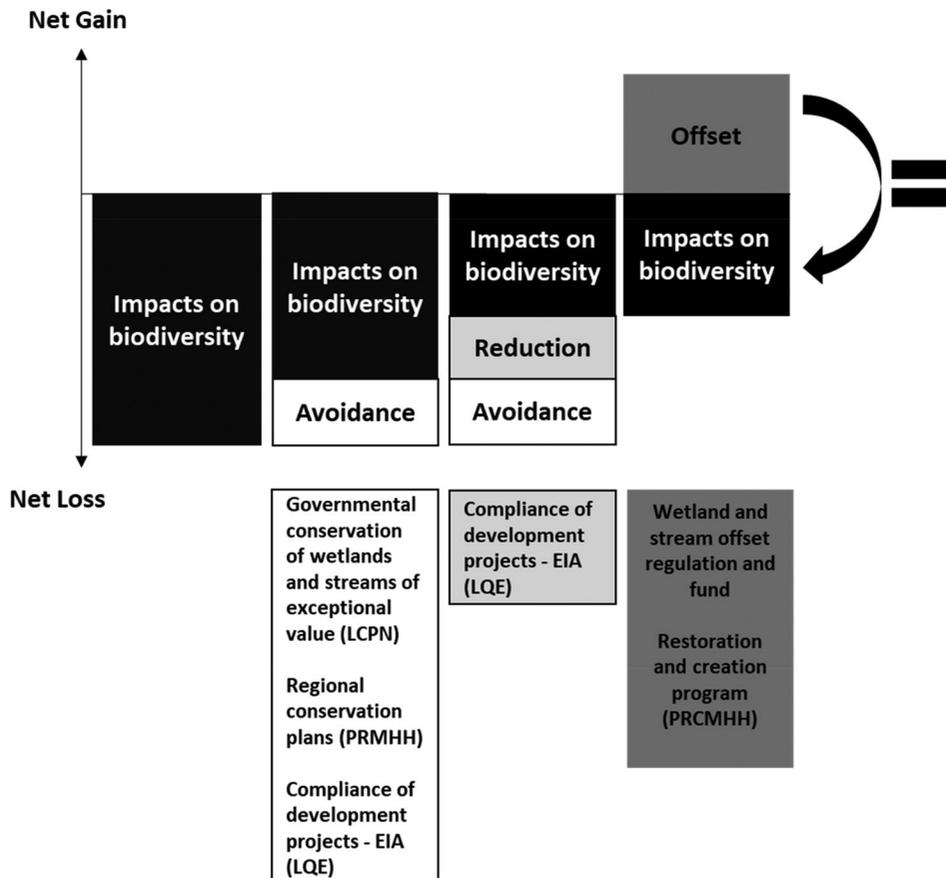


Figure 1. The implementation of the mitigation hierarchy through the use of five mechanisms.

were well-advanced in the process, namely Argenteuil and Drummondville, as well as representatives from the Ministry of the Environment and the Quebec Watershed Organization Network. We used a snowball sampling method to identify additional stakeholders. This involved recruiting future subjects from previous interviews, starting with the network of contacts accessible through the Quebec Watershed Organization Network. Interviews proceeded until no new information was acquired or no new interviewees were identified, and were otherwise constrained by time and resource limitations (Small, 2009).

Interviews centred on the following themes:

- The role of institutions regarding mitigation and offsetting schemes,
- Perceptions concerning the roles of the other stakeholders within these schemes,
- Understanding of current land use planning systems,
- Opportunities and constraints for the inclusion of new environmental norms,
- Strategies that could be developed to adopt new environmental norms,
- Ecological restoration priorities within their territories.

Notes taken during interviews supplemented with audio recordings of the interviews were then used in a modelling software, *Mental Modeler*⁴, which helps capture socio-ecological systems in a standardized format (this results in the development of Figure 2). The initial aim was to construct a Fuzzy Cognitive map, meaning

a ‘qualitative model[s] of a system, consisting of variables and the causal relationships between those variables’ (Özesmi & Özesmi, 2004). This approach has its origin in graph theory, analysing pairwise structural relationships between the concepts included in a model. A model was initiated including the different components of the system (stakeholders, conservation and planning documents, opportunities and constraints for the inclusion of new environmental norms identified by interviewees) and the positive or negative relationships between components. Owing to the complexity of this system, the degree of influence (qualitative weightings) that one component can have on another was not parameterised. Stakeholder roles were defined regarding their mandates and responsibilities as prescribed by relevant regulations. Key documents (e.g. pieces of legislation, policy documents, guidance documents related to conservation and land use planning) were examined providing the technical elements necessary to inform the analysis. The interviews enabled us to better understand the position of each stakeholder and the stakes of the different institutions that do not appear in the reports consulted.

A bricolage-based approach is very useful when exploring evolving processes focusing on institutional realities. Thus, we analysed the adaptation of stakeholder roles and the implications of power relations, historical dependencies and worldviews within this complex socio-ecological system. Our objective was to characterize dynamic, multi-scale, multi-stakeholder decision-making processes shaping wetland and stream management. Although regulatory changes impact both wetlands and streams, this article focuses on wetland management as participants in our sample pool were generally less knowledgeable of policies relating to stream management.

4. An analysis of the processes related to No Net Loss implementation and the adaptation of governance arrangements

4.1. Tensions between two dominant models: integrated water resources management and land use planning

Offset policy and more broadly the mitigation hierarchy is at the core of a regulation body aiming at moderating land use planning in Quebec. The objective is to promote ecosystem-based management that considers wetlands and streams *a priori* in development planning. Concerns can be expressed regarding the opportunities offered by these regulatory advancements to rethink development planning. The role of epistemic communities might have been underestimated, defined as ‘a network of professionals with a shared set of causal and principled (analytical and normative) beliefs, a consensual knowledge base and a common policy enterprise (common interests), in shaping policy decisions’ (Haas, 1992). Dynamics in these communities can be self-reinforcing, where negotiations are shaped by boundaries with some outcomes preferred and others excluded (Haas, 1992). Models dominate because ‘certain bricoleurs and their worldviews exercise considerably more authoritative weight than others’ (Cleaver, 2017). The application of these regulations depends on two sets of stakeholders coming together from different backgrounds and with divergent perspectives: those in charge of water resource management and those responsible for land use planning.

Two institutions play a prominent role within this evolving regulatory framework: regional municipalities and the Ministry of the Environment (Figure 2). Regional municipalities are perceived by some interviewees as ‘judge, jury and executioner’ regarding wetland and stream conservation and land use policies. They design land use and development plans (*Schéma d’aménagement et de développement*), devise and implement regional wetland and stream conservation plans (Avoidance step) and are involved in the designation of restoration projects (Offset step) (Dy et al., 2018). Ensuring that development does not conflict with conservation objectives depends on the transparency of the process of defining conservation priorities through monitoring and evaluation tools. To this end, a need for more deliberation and participatory mechanisms between regional municipalities and watershed organizations has been expressed in the LCMHH. For the moment, the only safeguard is the evaluation of land use and development plans by the Ministry of the Environment following consultation with the ministries responsible for home affairs, agriculture, fauna, energy and natural resources (*Article 15.4 de la Loi sur l’eau, chapitre C-6.2*). Regional municipalities ensure the compatibility of land use and development plans with conservation plans. Uncertainties remain concerning the regulatory value of these conservation

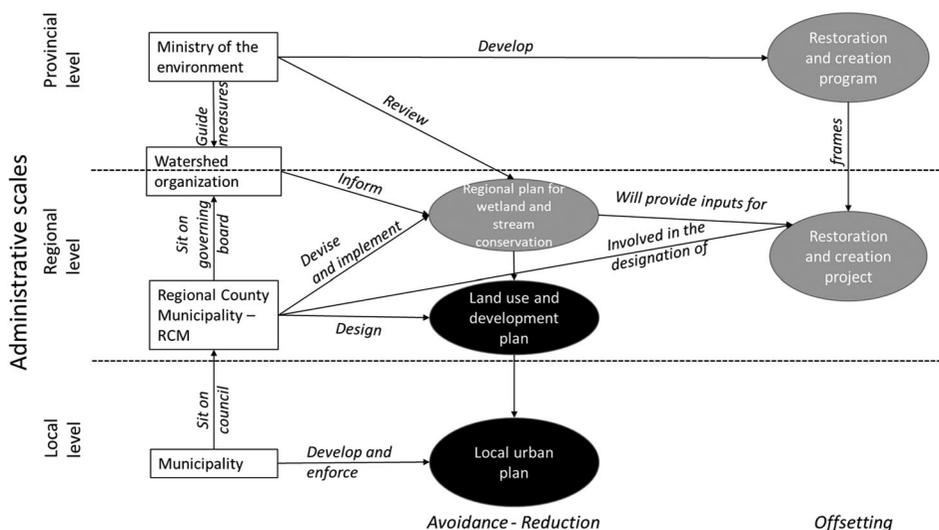


Figure 2. Summary of stakeholder interactions and influences on conservation and planning documents (squares represent stakeholders, circles documents and arrows interactions).

plans, their integration in regional land use plans and the objectives of local urban plans. Regional land use plans are required to display compatibility with conservation plans but not conformity. This distinction allows some flexibility in how regional municipalities operationalize conservation plans, a process influenced by political will. Some heterogeneity should be expected amongst the different regional municipalities depending on their sensitivity to environmental issues.

The Ministry of the Environment has played a crucial role in developing regional plans for wetland and stream conservation (Avoidance step) as well as the first provincial restoration program (Offset step). In 2027, the Ministry of the Environment will be tasked with showing that No Net Loss has been achieved. Arguably, Quebec offset policies are primarily coordinated at the provincial level even if support from regional and local municipalities is needed for a project to be eligible. Regional offices for the Ministry of the Environment do not play a role in the restoration program and watershed organizations are not directly involved in the application of offsetting schemes. As these regional offices are responsible for issuing development permits, they only participate actively in the Reduction step.

To understand the strong involvement of the Ministry of the Environment and regional municipalities in wetland and stream mitigation policy, we must examine how water management has been historically implemented in Quebec and outline its relationship with land use planning. This represents a historical trajectory of institutional development that was initiated with the implementation of Integrated Water Resources Management (IWRM). Building on Critical Institutionalism's school of thought, we study 'the complexity of institutions entwined in everyday social life, their historical formation and the interplay between the traditional and the modern, formal and informal arrangements' (Cleaver, 2001; Lund, 2006; Mosse, 1997 in Cleaver, 2017).

4.2. No net loss historical dependence on top-down integrated water resources management

In Quebec, although water management is decentralized and based on biogeographic watershed units, as directed by watershed organizations, the Ministry of the Environment retains a prominent role. Existing literature shows that Integrated Water Resources Management was established in Quebec as a policy based on top-down collaborative governance with low enforcement, be it through low impact on other sectorial policies or weak control and monitoring (Medema et al., 2015; Orr et al., 2016; Milot In: Chaloux, 2017).

Following the Quebec Water Policy in 2002, the Water Law adopted in 2009 was the first step towards the implementation of Integrated Water Resources Management (*Gestion Intégrée des Ressources en eau* – GIRE) in Quebec. The same year, 40 GIRE zones were created in Southern Quebec. This initiated water management at a watershed scale through the development of non-profit organizations called watershed organizations (*Organisme de Bassin Versant* – OBV). Similar organizations were created for the integrated management of the Saint Lawrence with the federal government, known as Regional Round Tables (*Table de Concertation Régionale* – TCR). TCRs and OBVs are concertation organizations ensuring that the different stakeholders concerned with resource and water use management work together and develop a shared vision (MEDDEFP, 2012). Their mandate focuses on promoting concertation amongst the different stakeholders working on water issues for a specific territory; informing, mobilizing, consulting and raising awareness in the population on these issues; and developing a planning document for the GIRE (either the Water Master Plan for watershed organizations or the Regional Integrated Management Plan for Regional Concertation Tables) (MEDDEFP, 2012). But these plans are not legally binding, as ‘governmental stakeholders have no legal recourse for not implementing the plan’ (Orr et al., 2016). The governing boards of these two types of organizations gather the representatives of the different watershed stakeholders such as regional and local municipalities, users, environmental groups and citizens. Government representatives are also present but they have no voting power. Thus, watershed organizations aim to ensure sustainable use of water resources through deliberative processes. They are quite heterogeneous at least in terms of expertise, and some strive for greater legitimacy to extend their power (Medema et al., 2015). Concerning the environmental management of streams, in each regional municipalities, there are usually one or two agents devoted to this objective. They represent the only environmental agents in regional municipalities even if those working within the land use planning department might also be sensitive to environmental issues.

Relations between the Ministry of the Environment and watershed organizations are governed by conventions that involve updating Water Master Plans. Unlike regional municipalities, watershed organizations do not have any jurisdiction or decision-making power over land use planning. They generally lack funding, largely due to the absence of tax, tariff, or transfer (e.g. from the hydro-electricity sector) mechanisms in Quebec. Watershed organizations have received yearly contributions of \$240,000 to \$245,000 CAD from the Ministry since 2018 and twice as much in total when other sources of funding are included. Ministerial subsidies were doubled in 2018 and 2019. Though promising, funding totals still remain low. Watershed organizations do not correspond directly with the regional offices of the Ministry of the Environment, but deal with their head office.

Regarding wetland and stream conservation policies, the Ministry of the Environment retains an important role, as the functioning of regional offices remains rather procedural with limited resources and is not grounded in the planning of the territory. These regional offices issue permits to developers under the condition that projects comply with norms governing wetland and stream management, but they have not been involved yet in discussions concerning the regional plans for wetland and stream conservation. Regional municipalities must address concerns directly with the Ministry regarding any inquiries related to these regional plans.

Historically, water has been at the centre of municipal responsibilities, first through drinking-water and wastewater management and then through land use and development planning. This has led to mixed results regarding compliance with flood zone regulations in residential areas and the implementation of riparian buffers in agricultural zones to reduce nutrient runoff and erosion (Milot in: Chaloux, 2017). At first, the Quebec Federation of Municipalities expressed concern over Watershed organizations overstepping their role in water and stream management. But municipalities usually lack in-house expertise and resources regarding environmental issues. Thus, their actions are limited to the application of regulatory frameworks, especially as it concerns local urban planning.

Additional stakeholders intervene in water resources management provincially, including Regional Environmental Councils, which have been present in Quebec for 35 years. As autonomous institutions, they are the product of multiple environmental groups merging together and are not directly linked to the government. They work to protect and improve the environment at the regional scale, promoting action, cooperation and education. Their approach is democratic and participative; they organize roundtable sessions on environmental issues. Since 1995, they have been supported in part by the government, with each Regional Environmental Council receiving a subsidy of \$40,000 CAD per year in 1998. This was then doubled in 2000–2001 and, by

2016–2017, yearly funding amounted to \$95,000 CAD. Like watershed organizations, there is considerable variability in the involvement of Regional Environmental Councils in environmental management across the province. Perhaps one of the more influential is that of the Centre-du-Québec, which developed a prioritization tool for wetlands in 2012 that has since been adopted by the Ministry. The Centre-du-Québec Environmental Council now acts as a spokesperson for other RECs on this issue.

4.3. Two opposing worldviews: wetlands conservation vs traditional land use sectors

As mentioned above, the design of regional plans for wetland and stream conservation has been handed over to and implemented at the scale of regional municipalities. This is considered by some interviewees as a missed opportunity to empower watershed organizations. These conservation plans are regarded in the same way as any other sectorial plan, but as promoting environmental objectives. Regional municipalities will devise land use plans by examining and reaching a compromise amongst various interests in development, agriculture, public security and the environment. Certain interviewees think that these conservation plans should be regarded more as development plans.

To do so, regional municipalities take into account data collated from water management plans as well as other available sources. These include development plans for agricultural zones, metropolitan plans for planning and development, regional development plans, natural area inventories of interest and sectorial data. In accessing these data, regional municipalities work in connection with watershed organizations⁵, Regional Round Tables, Regional Environmental Councils and neighbouring regional municipalities. The scale chosen to devise these conservation plans reflects that of the regional municipalities (a finer administrative unit) as opposed to the larger biogeographic watershed units adopted in previous Water Master Plans.

The integration of conservation objectives will invariably be confronted by invisible power dynamics. It is crucial to understand ‘the ways in which ideologies, beliefs and norms shape the very nature of decision-making’ and ‘the direct and indirect ways in which power is maintained’ (Osei-Kufuor, 2010). This requires analysing how social structures, ideologies and ‘ways of seeing’ shape human relationships in particularly inequitable ways, as well as, ‘how much room for manoeuvre there is within dominant policy models’ (Clever, 2017).

In our context, the municipal focus (regional and local) plays an important role in the implementation of these policies; this scale, however, has a long history of promoting strictly urban and economic development interests. Regional municipalities’ councils consist of mayors from local municipalities and are thus strongly influenced by municipal politics. These regional municipalities lack fiscal power, relying instead on contributions from local municipalities or transfer payments (Meloche et al., 2016). Municipalities have long justified development and urban sprawl by appealing to the necessity of maintaining a local tax base. Another risk mentioned by interviewees is the institutional proximity within municipalities between administrators who implement environmental policies (e.g. riparian buffers in crop fields) and citizens. In some cases, this proximity hinders sanctions and favors clientelism (c.f. Bissonnette et al., 2018 in relation with the implementation of green infrastructures). Clever (2017) underlines the dangers of localism and warns against the view promoted in natural resource management that ‘small is beautiful’. Community-based natural resource management can reinforce local power structures. In rural municipalities, violations observed by municipal planners are discussed during city council meetings. The final decision will be made by the council and risks becoming a political issue.

The agricultural sector is also a strong player in these regulatory changes. In agricultural areas, offsetting measures through ecological restoration often require rezoning and, thus, approval by the Quebec agricultural land protection commission (*Commission de protection du territoire agricole* – CPTAQ). The goal of the CPTAQ is to maintain the total surface area dedicated to agricultural land in Quebec. Although exempt from environmental approval, projects are still subject to permits required by other ministries. So far, the CPTAQ has refused all permit requests, but negotiations are underway with the Ministry of the Environment to change their position on this matter. This situation is far from new; Quebec’s Act Respecting the Preservation of Agricultural Land and Agricultural Activities has already restricted measures aimed at ensuring sustainable water use. From our interviews, repurposing agricultural land infringes on the ‘productive’ nature of cultivable

land as ‘a farmer cannot leave a land unworked’, as well as private property rights. Farmers are reluctant to lose agricultural land, even if former wetlands are not usually exploitable.

Broadly speaking, implementing the offset policy appears to oppose economic interests. In the context of growing environmental norms and the introduction of new constraints on economic activities, different stakeholders claim for compensation for the loss of land, loss of land use practices as well as imposed changes to those practices that are undergone directly or indirectly. Wetland restoration and creation projects can affect agricultural productivity, forestry and private landowners. This issue is particularly contentious in a culture where the right to private property is sacred. Promoters will also have to adapt their business models to municipal demands for densification rather than urban sprawl. However, stakeholders consider these new environmental norms as constraints imposed externally. As they have not yet internalized these constraints in their practice, they claim compensation for their losses. Some interviewees from environmental organizations recognized that a system in which all ‘perceived losses’ are compensated would not be sustainable. Moreover, they describe how, ‘collectively, we are not wealthy enough to compensate everybody’. The question that remains is: who will bear the costs of this transition? Land owners and promoters are both likely candidates as both will have difficulties developing wetland-featuring land, as are farmers since agricultural land appears most amenable to development. Alternatively, municipalities refraining from urban development might also bear the cost, as will government institutions compensating for imposed losses (Vivre en Ville, 2018). Current land planning systems rely mainly on individual benefits and thus environmental constraints are perceived as generating individual losses (Kolinjivadi et al., 2019). These environmental regulatory changes shed light on the inconsistencies between the values of current land use planning system and environmental policy.

5. Does No Net Loss implementation play a transformatory role towards a more sustainable land use planning?

Applying No Net Loss can be viewed as an opportunity for innovation towards more sustainable land use planning. Building on a sound understanding of stakeholder strategies, a transition to more sustainable land use planning could be initiated by recognizing, assessing and promoting collective gains. Institutions are the result of everyday practices, necessarily calling upon improvisation and innovation. There is a strong path-dependency element to the extent that ‘something different must appear familiar, it must work on a routinely accepted logic, it must socially fit’ (Clever, 2017). It is then crucial to study how ideologies, beliefs and norms ‘shape the nature of decision-making and involve understanding the direct and indirect ways in which power is maintained’ (Osei-Kufuor, 2010). Outcomes rely on conscious and unconscious action, moral rationality, and authoritative processes. We thus studied how stakeholders perceive restoration gains and the equivalence principle promoted through the application of No Net Loss in Quebec to understand the rationale behind their decision-making. As mentioned earlier, one of the key features of biodiversity offsets is compliance with the equivalence principle, meaning that restoration gains should compensate for losses generated by development projects. The equivalence can be defined in different ways allowing a certain level of freedom concerning the application of offsetting. Among the three options available for implementing biodiversity offsetting⁶, Quebec has chosen to focus on the use of restoration techniques to favour the recovery of degraded wetlands and streams and to create new ecosystems representative of those being lost.

5.1. Can No Net Loss implementation gain meaning and legitimacy? A territorial perspective of the equivalence principle

The approach advocated for by Quebec relies on an understanding of equivalence defined in terms of an ecosystem’s area and function⁷, as well as a consideration of broader environmental issues at the scale of the region. Equivalence is assessed through the amounts available in the restoration fund. These amounts are then reallocated to the regional municipalities in proportion to the money collected through development permits issued regionally. These amounts will also be divided amongst all watersheds concerned.

The first restoration projects will be selected using data currently available within a regional municipalities and will not initially take into account the regional plans for wetland and stream conservation in progress. Their conclusions will be gradually integrated. In these conservation plans, the approach taken promotes biodiversity by selecting areas of interest and conducting a multi-criteria analysis (including habitats, hydrological and biogeochemical characteristics, see Saint Lawrence Lowlands atlas 2019)⁸, which will then go through a public participation process with stakeholders. This assessment methodology is in line with the Wetland Rapid Assessment Methods (RAM), that is to say, multi-criteria assessments that appeared in the United States at the beginning of the 1990s in accordance with the Clean Water Act (Fennessy et al., 2007). RAMs were originally designed at the state level to assess functions delivered by terrestrial and coastal wetlands and have also been used in size offset projects (Bas et al., 2016).

Meanwhile, the approach will rely on stakeholder knowledge of the territory and the expertise they have developed. Stakeholders involved in wetland and stream management were interviewed prior to the release of the restoration and creation program to ascertain their views. Even if they mentioned different aspects that were important to them, they all underlined that they would strongly rely on the recommendations released in the Ministry's restoration program to refine their strategy. Stakeholders referred to a biodiversity-based perspective and described criteria related to ecosystem services when selecting restoration sites (e.g. flood and drought control, invasive species' control, soil decontamination, recreational activities, landscape aesthetics, mental and physical health), adopting a more utilitarian vision of ecological restoration. Interestingly, even if water quality was acknowledged as an important issue, some stakeholders feared that its less tangible and its diffuse nature would prevent others stakeholders from adhering to certain projects, except in situations where recreational activities require good water quality. According to the interviewees, restoration actions should yield visible results. Site accessibility for nearby populations was also an important issue. These elements highlight the importance of stakeholder support for restoration projects.

The restoration and creation program confirmed these observations. The approach promoted relies on a loose notion of equivalence regarding biophysical features⁹ (e.g. gains and losses are not strictly equivalent) and functional proximity (e.g. there is no requirement for restoration projects to be in the same watershed as the impacted site). The program will select projects that benefit the territory. The latter is commonly named 'out-of-kind' offset where lost ecosystems and functions are replaced by different ones with a higher value. They may also be replaced by those identified as priority on the territory even if the restored site is smaller in surface area or of a different type than the one affected. However, there must be a correspondence between the types of wetlands and streams restored or created and those lost at the watershed or regional municipalities' scales. Moreover, functional gains are required, in particular regarding filtration, water regulation, erosion reduction, biodiversity, carbon sequestration, climate change adaptation and regional, agricultural and conservation issues should also be taken into account. Political and social factors are thus non-negligible, reinforcing the territorial aspect of offsetting. We could thus elaborate on this understanding to innovate towards a novel social fit.

5.2. The bricolage of environmental stakeholders: is a new social fit for wetland offsetting feasible?

As seen in Section 4.1, responsibilities concerning the implementation of water management objectives are fractured at both regional and local levels among administrative bodies, including regional offices for the Ministry of the Environment, regional and local municipalities and autonomous agencies such as watershed organizations and Regional Environmental Councils. Environmental advocates – at least at regional and local scales – remain absent. Regional offices for the Ministry of the Environment are seldom involved in wetland policy making. Regional and local municipalities will often forgo offsetting for the benefit of planning requirements when forced to choose between the two. Power and funding associated with the Regional Environmental Councils and watershed organizations are limited. In addition, an increase in conservation regulations is currently observed without assuring additional means to finance the implementation and enforcement of such regulations. However, as pointed out by Cleaver (2017), 'the need to respond to topical political priorities, the influence of particular actors, time and resource availability can also prompt innovations and novel reconfigurations

of policy'. Indeed, 'identities and politics have the potential to be transformative – for example, 'new' collective identities of environmental stewardship can be created from disparate interests' (Cleaver, 2017). The difficulty consists in assessing 'the balance between constraint and opportunity in particular institutional configurations' (Cleaver, 2017). Institutions have great path dependency as they call upon the same solutions in response to their aspiration towards stability, potentially reproducing the same problems.

Here, we observe some momentum in the rethinking of urban planning based on a shared vision of the territory. A new social fit of this nature could be built on the acknowledgement and appreciation of collective needs and interests. To initiate this transition, environmental stakeholders or conservation advocates present in some institutions (e.g. watershed organizations, Regional Environmental Councils or even regional municipalities) call upon processes that have been described by Callon (1986) and Latour (1987) as the Actor-Network Theory (ANT) concerning the use of knowledge. ANT (or translation theory) goes against linear models of knowledge transmission and suggests that knowledge generation is not only influenced by intrinsic qualities of the message but requires the integration of the strategies of people that have yet to be convinced: 'receptors'. The message must be translated in terms of issues for the 'receptors' to recruit them and to make them evolve. To do so, they can refer to positive (consolidating) or negative (contesting) modalities (arguments that move the debate away from the contestable conditions in which knowledge was produced). Cowell and Lennon (2014) refer to these stakeholders as 'skilled intermediaries' or 'policy entrepreneurs', as they have the ability to convince, forge links between key stakeholders and explain the potential value of innovation. Institutional bricolage also acknowledges inequalities in people's ability to influence decision-making.

In Quebec, some representatives of watershed organizations, Regional Environmental Councils or regional municipalities are able to 'consider all perspectives', 'find a convergence point', 'use pedagogy to initiate a culture change', and 'overcome psychological barriers'. They mentioned that 'most people are not ready to see ambitious environmental objectives' thus they must rely on concertation process as they recognize that 'through concertation, you move forward more effectively but more slowly than through confrontation'. They mention that they can also rely on some stakeholders that have a role in influencing others and are viewed as 'environmental champions' within their sector. For instance, we can cite the knock-on effect of some 'green' municipalities that have chosen to densify their urban cores or provide less environmentally impacting modes of transport. They have also 'informed' promoters capable of improving their business models and opt for more densified housing that satisfies environmental criteria listed in calls for tender.

As expressed by an interviewee, it is necessary to « be able to understand the needs of target organizations and to try to answer them while meeting personal objectives, thus referring to consolidation modalities. As mentioned by Cleaver (2017), people 'frame their actions within certain understandings of the world and [their] place in it, of cause-relationships and accepted ideas of order, proper behaviour and what is fair or right'. She then insists on the fact that 'understanding of moral-ecological rationality is important because it is one of the ways in which people make sense of change and bring order to uncertainty'. In our context, 'skilled intermediaries' encourage stakeholder adhesion to new restoration solutions through the use of argumentation often founded in utilitarian considerations (e.g. security, health, economics) as opposed to biodiversity. For people adverse to uncertainty and disruption, 'skilled intermediaries' insist on the importance of co-creation and innovation processes inspired by 'champions'. When dealing with farmers, they will underline the benefits of restoration projects for their activities through flood and drought control, or erosion regulation. When discussing with municipalities, they will refer to the economic impacts of restoration for tourism, or their contribution to green infrastructure and climate change mitigation. On the contrary, they will emphasize the collective costs of infrastructure maintenance and individual transportation costs generated by urban sprawl. 'Skilled intermediaries' think that the use of this strategy, when dealing with offsetting implementation, will initiate a transition towards more sustainable land use planning incorporating conservation objectives for wetlands and streams. They consider this as 'a learning curve, where this will be hard at the beginning but it will become more acceptable after some years'. Room for manoeuvring could be possible within the current politically and socially constructed mitigation and offset scheme to rethink land use planning.

6. Conclusion

Biodiversity offsetting has been promoted in environmental policy as a way of reconciling economic development and the conservation of biodiversity by internalizing the negative impacts of development. To date, most studies have focused on efficiency and optimization of this approach but have missed key elements that hinder progressive change. Our study shows that the Quebec offsetting system for wetlands and streams strongly relies on political and social constructs. Institutional bricolage allowed us to understand the implications of power relations, path dependency and dominant views in this new institutional setting. The introduction of No Net Loss seems to spark historical tensions in water management policies, in particular the ones between strong centralized governance and fragmented territorial management. But the implementation of NNL also confronts traditional land use planning with a long history of promoting strictly urban and economic development interests. To overcome these tensions, NNL can be viewed as an opportunity for innovation towards more sustainable land use planning goals that acknowledge collective values. To investigate the potential for a novel social fit for wetland offsetting, we called upon the Actor-Network Theory. Rethinking land use planning could be based on a collective vision of the territory promoted by some 'skilled intermediaries'. These individuals have the ability to move decision-makers towards a more sustainable transition. As mentioned by Cleaver and De Koning (2015), 'the drawback of critical approaches is that they propose fewer valuable guidelines for natural resources management than the institutional design principles.' Here, we propose a few recommendations to support this regulatory change.

6.1. Working on social norms

First, a new social fit could be built around a regional perspective of the equivalence principle using an ecosystem service approach, namely by linking human activities and amenities to affected or restored ecosystems (Baker et al., 2013; Jax et al., 2013) with the indirect consequence of promoting social justice. Careful attention should be paid to the drawbacks of encouraging a narrow view of wetlands solely in terms of ecosystem service provisioning. Drawbacks are linked to (i) promoting utilitarian view around nature conservation (Laurans et al., 2013); (ii) obscuring certain types of value (Jax et al., 2013), (iii) weakening the equivalence principle, as 'several species/habitats may deliver the same [e]cosystem [s]ervices, substitution between very different habitats would be allowed' (Jacob et al., 2016); (iv) substituting natural capital by human-made capital, thus facilitating the commodification of natural areas (Gómez-Baggethun et al., 2010). This could lead to, for instance, restoring certain functions of wetlands such as flood regulation or the provision of recreational activities at the expense of habitat diversity. This could also lead to a standardization of restored ecosystems that would reduce their diversity and the resilience of wetlands in the context of global environmental change.

Second, to reverse current positions of municipalities and the agriculture sector advocating for a business-as-usual scenario, raising awareness of the benefits arising from ecosystem conservation and restoration is necessary but insufficient in itself. Reforms of local taxation systems encouraging development will be needed to slow down urban sprawl. Changes made to agricultural practices towards alternatives with lower environmental impact will also require compensation. This could be based on existing mechanisms such as Payment for Ecosystem Services calling upon the beneficiaries pay principle. But as highlighted by Rode et al. (2015), this should take into account 'motivation crowding effects arising from economic incentives' to ensure sustainable change.

6.2. Reducing power asymmetries

Creative bricolage of No Net Loss relies mainly on watershed organizations and Regional Environmental Councils. These actors have not benefited from either empowerment through regulatory changes or additional funding, a situation that perpetuates power imbalances.

Real political will is needed to strengthen the role of these actors but also the role of regional offices of the Ministry of Environment. This goes hand in hand with the sustainable funding of their actions through the introduction of financial mechanisms such as tax, tariff or transfer. In a *status quo* situation, we fear that, in

some cases, offsetting sites would not be selected as a function of their ecological potential but for the benefit of a subset of powerful sectors of the economy. This could include, for instance, protecting a wetland that maximises erosion reduction for agriculture, a measure already required by agricultural policy and thus not additional.¹⁰ Moreover, certain offsetting sites might be prioritized if they have little impact on local business or development plans, such as an area with low development potential. If regional municipalities are willing to take an active part in the transition towards more sustainable land use planning, they should equip themselves with in-house expertise and sufficient funding to ensure the success of wetland offsetting projects.

Without a reconfiguration of governance, wetland and stream offsetting and conservation will be limited to placing a ‘bandage’ on an existing system that does not promote the environmental underpinnings of sustainable development. Uncertainties remain concerning the potential for system change given the strong influence of power relations and path dependency. A close examination of NNL implementation will confirm the transition to a more environmental ethos observed in the early stages of regulatory changes.

Notes

1. <https://portals.iucn.org/offsetpolicy/>
2. Bricolage is from the French ‘fiddle’ or ‘tinker’ or to do-it-yourself, a word meaning to “make creative and resourceful use of whatever materials are at hand, regardless of their original purpose” (Cleaver, 2017). Although used in cultural studies, visual arts, architecture and management studies in relation to innovation and entrepreneurship, Cleaver adapted the concept from its use in anthropology. Claude Levi-Strauss referred to ‘intellectual bricolage’ to describe the ways in which people thought in ‘primitive’ societies.
3. Regarding the definition of institutions, we refer to Merrey et al. (2007) who identifies institutions as “social arrangements that shape and regulate human behaviour and have some degree of permanency and purpose transcending individual lives and intentions”.
4. <http://www.mentalmodeler.org/#download>
5. In some cases, regional municipalities call upon watershed organizations to help them developing their regional plans, thus ultimately endorsing the role of private consultancies.
6. Biodiversity offsetting is commonly implemented through (i) averted loss offsets (the protection of natural areas that are considered threatened) or (ii) actions promoting a change of practice within a sector for positive biodiversity outcomes (funding of agro-environmental measures for farmers, e.g. reducing fertilizers) or (iii) restoration actions of formerly degraded ecosystems (using ecological restoration practices).
7. Ecological functions are here considered as functions or processes carried out or enabled by an ecosystem that are necessary for the self-maintenance of that ecosystem, such as primary production, reproduction area, etc. (BBOP, 2012).
8. The BTSL atlas relies on a twofold approach:
 - The selection of sites with high conservation value considering (i) their proximity to Protected Areas, (ii) the presence of exceptional forest ecosystems, (iii) the presence of flora with high conservation value, (iv) the presence of fauna with high conservation value, (v) their irreplaceability.
 - Their prioritization is based on a multi-criteria analysis of habitat (plant diversity, primary productivity, surface area, degree of disturbance in the buffer zone, proximity to other wetlands), hydrological and biogeochemical criteria (water retention, erosion control, groundwater recharge, water purification, carbon sequestration).
9. Biophysical indicators are related to both biotic and abiotic components of an ecosystem as well as the functioning of the ecosystem.
10. Offsets must be additional, that is to say over and above what would have happened without the offset.

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Appendix 1

The LCMHH modified 5 laws:

- The law on water quality (*Loi sur la Qualité de l'Eau* – LQE) regulating the environmental authorization scheme introducing a definition of wetlands and streams and an offset policy system for these ecosystems.
- The law affirming the collective nature of water resources (Water Law): promoting the different benefits resulting from the presence of wetlands and streams and their ecological functions. Moreover, it introduces a new level of territorial planning at the RCM level for wetland and stream conservation. This relies on the design of regional plans by the RCM to identify wetlands and streams, the issues and the ecosystems that should be protected, restored, used in a sustainable way or developed. This also involves the restoration and creation program and a ministerial evaluation of the achievement of No Net Loss by 2027.
- The law on the conservation of natural heritage (*Loi sur la Conservation du Patrimoine Naturel* – LCPN) ensuring the protection of exceptional wetlands and streams and the ones that have been restored in the framework of the offset policy, indicating which activities are not compatible with these ecosystems.
- The law on land use planning (*Loi sur l'Aménagement et l'Urbanisme* – LAU): RCM and municipalities can define areas with specific constraints due to the protection of wetlands and streams.
- The law defining the mandate of the ministry in charge of environment.