

New Business Models for Biodiversity and Ecosystem Management Services: An Action Research With a Large Environmental Sector Company

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Abstract

Businesses are increasingly called upon to contribute to efforts to protect biodiversity and natural capital. Our article presents the results of an action research conducted with a major company in the environmental sector that has been experimenting with innovative services dedicated to ecosystem management. We show the specific organizational and social challenges the company faced in upscaling this strategy due to its path dependency to its historical value creation model, and to the collective action issues that characterize biodiversity management. We introduce a new interdisciplinary theoretical framework for the development of what we refer to as “business models for ecosystem management services,” defined by the very central place they give to the achievement of measurable biodiversity performances. We then propose four such new business models designed through participatory methods that combine in a unique way a corporate value creation model with an ecological value cocreation model at the ecosystem level.

Keywords

sustainable business models, ecosystem management, biodiversity, natural capital, water services, strategic management, ecological accounting, action research, environmental sector

Introduction

The cross-sectorial challenge of reducing firms’ social and environmental impacts, to gradually depart from current business-as-usual unsustainable development pathways and shift toward a cleaner economy is a question now widely addressed in the management literature. Increasingly, new frameworks and tools are introduced to help businesses better manage, measure, and reduce their impacts on climate change, air, soil, water quality, and more

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recently biodiversity and natural capital (Green et al., 2017; Natural Capital Coalition [NCC], 2016; Reale et al., 2019). Contributing to this agenda, a growing number of researchers and companies have recently been looking at business model change and innovation as a promising perspective to improve business sustainability (Stubbs & Cocklin, 2008). The sustainable business model literature adopts an extended view of value creation that integrates ecological concerns alongside economic and social concerns (Lüdeke-Freund & Dembek, 2017). Delivering environmental results is thus essentially conceived as a crucial part of a company's overall mission (Stubbs & Cocklin, 2008; Upward & Jones, 2016) and as an imperative criterion that has to guide the company's definition and choices of "the way business is done" (i.e., its modes of production, industrial processes, resource use, relations with other stakeholders, etc.; Bocken et al., 2019).

In this article, we will explore the potentialities of a specific perspective of sustainable business model innovation, consistent with recent debates on the development of "business models for sustainability" (Schaltegger, Hansen, & Lüdeke-Freund, 2016; Schaltegger, Lüdeke-Freund, & Hansen, 2016), where obtaining environmental results would not be regarded as a positive cobenefit of a given business's efforts to make its main activities "greener," but would in fact be the very primary service that the business seeks to offer and sell to its customers. In such a perspective the challenge is not so much to improve or change currently unsustainable business models or to design new business models that rest on sustainable principles, but rather to imagine, design, and implement business models whose core value proposition (i.e., what is being sold) *is by essence* a contribution to the management of a given environmental problem and to the achievement of given environmental performance goals.

Our main objective is to focus on this specific perspective of business model innovation on biodiversity, ecosystem, and natural capital conservation issues,¹ to which the sustainable business model literature has so far paid only limited attention. The existing literature discussing the "business case for biodiversity" essentially focuses on three main types of business–biodiversity relations: reducing business impacts on biodiversity, better managing business dependence on biodiversity and ecosystem services, making good biodiversity management an opportunity to add value to core business activities (Bishop, 2012; Bishop et al., 2008, 2009; Houdet et al., 2012; Schaltegger & Beständig, 2012; van den Burg & Bogaardt, 2014; Winn & Pogutz, 2013). A fourth perspective on business–biodiversity relations is emerging however, that places ecosystems conservation and restoration at the core of business activities, purpose, and value proposition (see, for instance, recent research on "regenerative" entrepreneurship and organizations: Branzei et al., 2017; Quarshie et al., 2019; Slawinski et al., 2019; Vlasov, 2019; see Table 1).

In our view, this fourth perspective, on which this article focuses, requires to pay particular attention to companies experimenting with what we will refer here to as "ecosystem management services," that is, a wide range of technical innovations and commercial services specifically developed to contribute directly (e.g., through direct action on the ecosystem) or indirectly (e.g., by helping others change their course of action; through the production of new ecological information, etc.) to the conservation and maintenance of ecosystems, the restoration of degraded ecosystems, or the reduction of harm caused to ecosystems by other economic actors. The development and commercialization of such "ecosystem management services" is of particular relevance to environmental sector firms that already specialize in activities that are valuable because they reduce society's negative impacts on the natural environment or because they improve its quality, such as wastewater treatment or ecological engineering companies (e.g., river restoration, land rehabilitation, etc.). For them, sustainable business model innovation is not only a question of increasing their own corporate eco-efficiency or becoming a better social and environmental steward (Bocken et al., 2014; Bocken et al., 2019). It is also about finding new opportunities to contribute to solving society's sustainability challenges and

Table 1. Synthesis of the Four Business–Biodiversity Relations Identified and Their Business Model Implications (Items Are Illustrative Only).

Business–ecosystem relation	Examples of sectors concerned	Achievement of biodiversity and ecosystem performances as . . .	Business model implications
Business activities impact ecosystems	Extracting industries, infrastructures, large-scale fisheries, agribusiness	A regulatory obligation; a corporate social responsibility commitment; a way to improve reputation	Reduce negative environmental externalities induced by existing business models (e.g., application of the biodiversity impact mitigation hierarchy)
Business activities depend on ecosystems	Forestry, cosmetics, pharmaceuticals, agriculture, drinking water services	A necessary aspect of the long-term existence and development of the firm; risk reduction	Integrate sustainable use of necessary ecosystems' goods and services into existing business models (e.g., through sustainable forestry certification mechanisms)
Ecosystems as an opportunity to add value to core business activities	Organic food, biodiversity-friendly fabrics, ecotourism	A coproduct that is synergic with the core activity	Create new business models reflecting the added value of <i>also</i> delivering positive biodiversity and natural capital results
Business activities designed for ecosystems protection/management/restoration	Environmental sector, ecological engineering, wastewater treatment	The main product and service being sold	Develop new “business models <i>for</i> ecosystem management services”

developing original commercial offerings, remunerated precisely because they create ecological value, that is, achieve environmental results (Boons, 2009). In this article, by “creation of ecological value,” we refer more specifically to the achievement of biodiversity and ecosystem performance goals (in terms of restoration, preservation, or impact mitigation), measured strictly in ecological and biophysical terms (e.g., higher biodiversity richness, better freshwater, and soil quality, etc.), and established on the basis of the best available conservation science, existing regulatory frameworks, and associated indicators, as well as informed negotiations between concerned actors.

This article explores questions and challenges related to the development of what we will refer to as “business models *for* ecosystem management services,” that is, business models designed to support the development of services and commercial offerings whose main purpose is to contribute to the creation of ecological value (as defined above). What are possible motives driving the development of ecosystem management services by environmental sector companies, and what do such activities concretely consist of? What internal and external challenges do managers engaged on this path face in their attempts to develop and scale-up such activities? What kind of business models would be relevant for ecosystem management services, and on what theoretical framework can such business models be founded? To address these questions, we draw on the case of Lyonnaise des Eaux, a leading French company delivering sanitation and drinking water services (currently SUEZ Eaux France since March 2015), which at the time of research was actively engaged in the experimentation of such “ecosystem management services.”

We start by describing the action research methodology we used that combined field-based analysis and participatory methods involving the company's managers. We then present the interdisciplinary theoretical framework we elaborated along the course of this research and that articulates insights from business model, sustainable entrepreneurship, and ecosystem management literatures. In the third section, we show how and why Lyonnaise des Eaux developed a diversification strategy on ecosystems at a moment when their core value creation model on water services was being challenged and we discuss the key limitations it faced in its attempt to scale up this strategy. As a next step and as a response to these observed challenges, we introduce the four original "business models *for* ecosystem management services" that were designed through participatory methods and that are grounded in our theoretical framework. These models define four visions of possible strategic and value creation pathways on ecosystems. The final section will discuss ways forward to further develop and experiment a "business model *for* ecosystem management services" research and practice agenda and underline some of the contributions of our research.

Method

This article is based on a 3-year long action research (David, 2008) conducted at the heart of Lyonnaise des Eaux between 2012 and 2015 (Feger, 2016).² The company adopted in 2009 an explicit strategy of developing new technical and commercial services to contribute to the collective management of freshwater quality and the protection and restoration of biodiversity (e.g., freshwater monitoring services; river banks restoration; artificial wetland creation, etc.). Our action research aimed primarily at complementing the firm's already existing technical and commercial innovation dynamic with a reflection on the social, organizational, and accounting dimensions of such endeavor, a necessary step in our view to address the specific challenges related to ecosystem management. As it is most often the case in action research, we have gradually defined and detailed our methodological choices over the 3 years as we understood in more and more depth, along with the managers involved in our research, the issues and challenges that the company was facing in its attempts to develop and scale up its new commercial activities for ecosystem management.

Our first objective was to study and analyze the company's diversification strategy on ecosystems, its origins, its implications, and the hopes and challenges it raised. We have thus used methods of participant observations and immersion in the company, allowing us to capture the complexity of situation logics (Arnaud, 1996). The first author of this article was attached for 3 years to the Sustainable Development Division of Lyonnaise des Eaux as a research associate, with a permanent office at the headquarters of the company in Paris. The Sustainable Development Division supported this research and was involved in facilitating its implementation. It gave us unique access to internal documentations, strategic meetings, corridor discussions and formal and informal discussions with high-level managers, and internal working groups and events on biodiversity and environmental management issues. We combined this approach with the conduct of three series of semidirective interviews along the course of the action research ($n = 61$ of 1 hour 30 minutes on average) that are summarized in Table 2, as well as detailed case studies.

During the entire time of this study, we persistently observed a rich and heterogeneous dynamic of experimentation and distributed innovation for biodiversity and ecosystem management services, made of small steps and supported by the top-management. However, we also contemplated the multiple challenges, both internal (e.g., path dependency to the historical business model) and external (e.g., diversity of ecosystem management contexts; difficulties to identify potential customers, etc.) that were keeping this strategy from mushrooming and scaling-up as quickly and as highly as expected at the start.

Table 2. Synthesis of Interviews Conducted During the Action Research (From 2012 to 2015).

	People interviewed	Number	Purpose
First series	Managers from different divisions at the headquarters (Sustainable Development, Environmental Engineering, Marketing, Commercial, Innovation, etc.)	11	Recent history of the diversification strategy on ecosystem management, and hopes and challenges associated with it
Second series	Managers from headquarters and French regional branches (Bordeaux, Lille, Lyon, Marseillan, etc.)	13	Case studies of diverse initiatives of the company in the collective management of ecosystems located in different sites in France, and perception by other stakeholders (clients, partners, public actors, etc.)
	External stakeholders and clients of the company (municipality's civil servants, environmental NGOs, farmers, etc.)	16	
Third series	Managers from headquarters and French regional branches	21	Study of partnerships and commercial negotiations dynamics around different ecosystem management initiatives and services. Roles played by the assessment of ecological performances

To go further, we combined this inductive approach with participatory methods developed specifically to inform the design of new business models *for* ecosystem management services. After 1 year of study of Lyonnaise des Eaux's diversification strategy, we created a working group bringing together 20 managers attached to different divisions of the company and who were, in one way or another, involved in the new strategy of development of ecosystem management services. Ongoing research findings were regularly written down in briefing notes, presented orally and discussed with the working group. We proceeded in three main steps.

Step 1 consisted in preparing and facilitating a participatory workshop based on future studies methodologies that have been developed and applied both in the field of environmental management (Mermet, 2005; Mermet & Poux, 2002; van der Helm, 2009) and in the domain of business strategy development (Schwartz, 1998; Wilkinson & Kupers, 2013). This choice was motivated by the need to avoid linear ways of reasoning and to stimulate the imagination of participants by creating a space of collaborative exchange different from their everyday frame. We imagined and wrote down three "settings," that is, fictional images of what the situation of Lyonnaise des Eaux could be in the year 2027 in contrasted social, political, economic, and ecological contexts. Settings were based on our analysis of the hopes and challenges identified through the interviews (see Table 3), on case studies of the firm's ongoing ecosystem management interventions (see Box 1 for examples), and on various hypotheses made on the potential evolutions of water and ecosystem management policies and regulations in France. In each setting, participants were invited to reflect on the opportunity offered by the situation as well as on the most appropriate intervention strategy for the firm. They were then asked to provide some details about its implications in terms of mission statement, primary customer relationship, organizational modalities, partnerships with other stakeholders, resources required, ecosystem management services that could be offered, challenges to overcome, as well as corporate values to adopt and changes in

corporate governance it might imply. The proposals produced by participants were formalized in three contrasted “scenarios” that were written down on paperboards, presented orally, and discussed with all the participants.

Step 2 consisted of an in-depth analysis by the research team of the three scenarios produced by participants. The goal was to clarify the fundamental differences between them and to formulate on their basis contrasted models of intervention; while simultaneously elaborating at a more general level a shared “grammar” and architecture to structure these models, and thus, reinforce their consistency and comparability. To do this, we looked for theoretical insights in two main directions. First, the business model literature provided us with key conceptual resources to better organize information in each scenario related to the firm’s own value creation strategies (e.g., value proposition, value creation and delivery, value capture, etc.). Second, we built on former work and experience from members of the research team in mobilizing social science theories and frameworks for the analysis of collective organized action challenges in the realm of ecosystem management (e.g., Mermet, 2011; Mermet et al., 2005; Mermet et al., 2013; Mermet et al., 2014; Narcy, 2004). This helped clarify how each scenario offered a unique perspective on how an environmental sector company, through its business offerings, could act as an agent of change to effectively address ecosystem management issues. Coupling the analysis of the scenarios based on these two distinct domains of research allowed us to progress toward a first formulation of four contrasted business models *for* ecosystem management services, while elaborating their common conceptual architecture and theoretical foundations.

Step 3 consisted in preparing and facilitating a second workshop based on a strategic simulation game methodology. For this we developed an imaginary local setting at present time (a given landscape with multiple stakeholders having different interests, various ecosystem management issues at hand, etc.) inspired by the diverse real-world cases documented during our field work on different sites of interventions of the company. This material was used to test the usefulness of the four business models in guiding managers in the development of contrasted value creation strategies in collective ecosystem management situations. Workshop participants’ feedbacks helped to further refine the design of the four business models.

The next section presents the theoretical framework elaborated in the course of this research and deepened during the preparation and writing of this article as we went back to the literature, which provides important conceptual foundations for business models *for* ecosystem management services.

Theoretical Framework

Foundations in Sustainable Business Model and Entrepreneurship Literatures

The business model concept has gained an increasing popularity both in academic and practice management communities (Wirtz et al., 2016). This is a young phenomenon, notably due to the rise of internet business in the mid-1990s that challenged existing prevalent business logics (Alt & Zimmermann, 2014). It has so far been used to address research questions in different management areas such as e-business design, value creation and capture strategy design and analysis, technology and innovation management, and more recently corporate sustainability (Osterwalder et al., 2005; Zott et al., 2011). The concept is still emerging and competing approaches and definitions coexist (see, for instance, Jonker, 2012; Osterwalder, 2004; Teece, 2010; Zott et al., 2011). In essence, as Magretta (2002, p. 4) puts it, “business models are stories that explain how enterprises work.” A business model can thus be thought of as a conceptual tool that describes the principles by which an organization creates, delivers, and captures value, and expresses a company’s fundamental business logic by which it generates profitable and sustainable revenue streams (Osterwalder & Pigneur, 2010).

Business models are generally structured in a series of “building blocks” or “elements” combined in a coherent manner (Osterwalder & Pigneur, 2010). In this article, we follow Bocken et al. (2014) and Richardson (2008) and adopt a consolidated view of business models around three core building blocks: (1) the *value proposition* refers to the value(s) embedded in the products and services a firm offers (“what?”) to a target customer segment willing to pay for it (“for whom?”); (2) the *value creation and delivery* refers to the configuration of key activities, resources, channels, patterns, technology (“how do we organize?”) as well as the network of external partners and stakeholders (“with whom?”) that the firm puts in place to create value and deliver it to its customers; (3) the *value capture* concerns the costs and revenue streams, that is, the way by which the firm ultimately earns revenues from the provision of goods, services, or information to users and customers and turns it into profit (“how do we earn money?”; Teece, 2010, in Bocken et al., 2014, p. 43).

Across all industrial sectors, business model innovation is increasingly seen as a key factor of success, profit, and competitive advantage for a firm, alongside the more conventional process, product, and technology innovations (Amit & Zott, 2012; Chesbrough, 2007, 2010; Markides, 2006; Teece, 2010). Business model innovation is about rethinking regularly value proposition, value creation, and value capture, and in that sense, it has to be regarded not only as a vehicle for technological innovations but as an innovation in itself (Chesbrough, 2010; Teece, 2010). As we will see in the case of Lyonnaise des Eaux, important barriers to business model innovation exist that are often due to path dependencies and resistances to change created by dominant business logics at a given time (Chesbrough, 2002). A growing body of literature looks more specifically at how business model innovation is to contribute to both corporate and society’s sustainability goals (Bocken et al., 2014; Bocken et al., 2019; Boons & Lüdeke-Freund, 2013; Evans et al., 2017; Johnson & Suskewicz, 2009; Lüdeke-Freund et al., 2018; Schaltegger et al., 2012).

Efforts have been made to conceptualize and refine the definition and ontology of such “sustainable business models” (Stubbs & Cocklin, 2008; Upward & Jones, 2016), and most recently of so-called “business models for sustainability” (Abdelkafi & Täuscher, 2016; Evans et al., 2017; Gauthier & Gilomen, 2016; Lüdeke-Freund, 2010; Rauter et al., 2017; Roome & Louche, 2016; Schaltegger, Hansen, & Lüdeke-Freund, 2016; Schaltegger, Lüdeke-Freund, & Hansen, 2016; Täuscher & Abdelkafi, 2018). Emphasizing their transformational potential at an organizational, market, and societal level (beyond only the improvement of business sustainability), Schaltegger, Hansen, and Lüdeke-Freund (2016, p. 6) define the latter as models that

help describing, analyzing, managing and communicating (i) a company’s sustainable value proposition to its customers, and all other stakeholders, (ii) how it creates and delivers this value, (iii) how it captures economic value while maintaining or regenerating natural, social and economic capital beyond its organizational boundaries.

In our study, we explore a specific perspective of business model *for* sustainability where creating significant positive contributions to biodiversity and natural capital is not something that happens (purposefully or not) while delivering some other kind of goods and services, but is in fact what lies *at the heart* of the value proposition and the services being sold (see Table 1). In the recent literature proposing classifications to navigate the diversity of business models innovations for sustainability, such a perspective corresponds most to the “repurpose for society/the environment” archetype (Bocken et al., 2014; Bocken et al., 2019; Ritala et al., 2018) that notably encompasses social enterprises and “B Corps” types of innovations (Stubbs, 2017). Indeed, it concerns “for profit” enterprises primarily driven by the delivery of positive environmental value (for customers, other stakeholders groups, and society) while generating economic revenue.

Theoretical foundations for the development of business models *for* ecosystem management services thus also need to build on the ecopreneurship and sustainable entrepreneurship literature that focuses precisely on studying how and under what conditions the pursuit of profitable (but not profit maximizing) business ventures can successfully contribute to solving society's socio-environmental problems (Belz & Binder, 2017; Hall et al., 2010; Hockerts & Wüstenhagen, 2010; Hoogendoorn et al., 2019; Hörisch, 2015; Muñoz & Cohen, 2017, 2018; Schaltegger & Wagner, 2011; Stubbs, 2017). Recent works in "entrepreneurship *for* sustainability" (Schaltegger et al., 2018a) exploring how entrepreneurship could contribute to the respect of planetary boundaries or to the achievement of U.N. Sustainability Development Goals are of particular relevance to our article (Horne et al., 2020; Schaltegger et al., 2018a, 2018b; Schaltegger et al., 2020). Central to this overall academic field is the study of how entrepreneurs discover, create, and exploit "opportunities" to develop future goods and services contributing to the generation of social and environmental gains for others in society (Hoogendoorn et al., 2019, p. 1135; Pinkse & Groot, 2015, p. 634; Shane & Venkataraman, 2000). In line with our focus on how environmental sector companies can act as "creative problem-solvers" for the preservation of ecological entities, we will follow Stål and Bonnedahl's (2016, p. 78) conceptualization of this key notion of "opportunity" as "situations in which new means to sustain and enhance critical natural capital [i.e. that has intrinsic value and cannot be substituted by other types of capitals] are created." This approach provides an alternative to the dependence of entrepreneurs on the discovery of market failures or the existence of market-based solutions (e.g., that would involve for instance pricing or allocating and exchanging property rights on ecosystems) by insisting rather on the proactive role entrepreneurs can play in facilitating the emergence and inventing new types of collective and institutional arrangements to sustain biodiversity and ecosystems (Stål & Bonnedahl, 2016).

Foundations in Strategic and Collective Ecosystem Management Literatures

While the sustainable entrepreneurship and business model literatures provide many insights regarding roles business can play in solving sustainability issues in various domains (e.g., transportation: Bohnsack et al., 2014; urban energy efficiency: Gauthier & Gilomen, 2016), in our view the development of business models *for* ecosystem management services however raises very unique social, organizational, and strategic issues that stem from the fact that biodiversity and natural capital, in the great majority of situations, fall under the category of common goods (Ostrom, 1990; Ostrom et al., 1994; Winn & Pogutz, 2013). As a consequence, effectively protecting, restoring, and managing ecological entities (e.g., wetlands, ecological corridors, lakes, bird populations, etc.) requires addressing complex collective action challenges in which public and private actors use or impact the ecosystem in different ways, hold diverging priorities and interests, and act in fragmented and sometimes conflictual ways.

This demands to pay great attention to the serious agency questions that underlie the collective management of any ecosystem, for example, in a given situation, who do we expect to initiate action, with whom, in what relevant perimeter and on what aspects of the ecosystem? What privileged forms of action could be envisaged and with what equipment or formal/informal arrangements and institutions? Who defines the key ecological performance goals and through what kind of process (regulation, negotiation, dialogic approaches, etc.)? Who is in a position to hold others accountable on such goals? This in turn requires to mobilize key theoretical and conceptual resources specifically relevant for the analysis of different fundamental dimensions of the collective management of ecosystems and natural resources, that is, underlying models of organized action for conservation to reflect on the diverse possible answers to the question "who should act on whom to create environmental changes?" (Mermet, 2018a;

Mermet et al., 2013; Mermet et al., 2014): Strategic environmental management analysis to reflect on resistance to change, sectorial logics, and power dynamics between actors affecting the potential to reach environmental performances in diverse ecosystem management settings (Mermet, 2011, 2018b; Mermet et al., 2005); common-pool resources theory to analyze coordination challenges in socio-ecosystem users' communities (Ostrom, 1990; Ostrom et al., 1994); the "Economies of worth" to analyze the potential value systems conflicts and compromises between actors in situations of environmental disputes (Boltanski & Thévenot, 2006; Chiapello & Boltanski, 2005; Thévenot et al., 2000).

Hence, to make a decisive contribution in maintaining or restoring ecosystems, an environmental sector company that seeks to develop new ecosystem management services will need to have a clear vision of the way it intends to intervene in diverse multi-actor contexts to change the social and collective action dynamics at play, in such a way that its activities can effectively contribute to long-term positive impacts for biodiversity and natural capital. In other words, the core theoretical proposal of this article is that in order to design business models *for* ecosystem management services, one needs to couple two complementary and overlapping types of strategic, organizational, and value-creation models. On one hand, company-centered *intra*-organizational value creation models, building on sustainable business model and entrepreneurship research, describing and reasoning the links between business strategy, opportunities, value propositions, primary customers, key activities and services offered, resources and costs, revenue streams, conditions for success and legitimacy, corporate governance, and so on; and on the other hand, ecosystem-centered *inter*-organizational value cocreation models, founded on theories addressing various dimensions of collective ecosystem management, and clarifying the possible strategic roles that an environmental company can play with other public and private actors at the ecosystem level in order to actively organize the collective creation of ecological value (i.e., achieving biodiversity and ecosystem protection, restoration, or harm reduction goals; Figure 1, which was elaborated after the action research had ended, provides a schematic representation of the key concepts articulated in this section).

The next section presents our analysis of the case of Lyonnaise des Eaux and how it gradually developed a diversification strategy on ecosystems to move beyond its historical "small water cycle" value-creation model.

Analysis of the Case of Lyonnaise des Eaux's Diversification Strategy on Ecosystems

An Erosion of the Firm's Historical "Small Water Cycle" Business Model

Lyonnaise des Eaux has a long history closely related to the invention of original forms of value creation. The firm was created by the Crédit Lyonnais in 1880 and for more than a century, it developed production and distribution services for drinking water, wastewater treatment, as well as gas and electricity. Strongly connected to the economic and demographic growth of cities, its activities initially responded to public authorities' needs for the construction and management of large technical networks essential to modern urban centers' functioning and public hygiene (Barraqué, 1995; Souriau, 2014). Between 1946 and 1997, Lyonnaise des Eaux intensified its water services activities and the company grew from a small business distributing water to 160,000 subscribers to an international firm with robust technical engineering, commercial, managerial, and financial capacities (de Méritens & Fabry, 2001). Since 1997, the company gradually evolved within the new global "SUEZ Environnement" group to become the business unit specialized in drinking water distribution and wastewater treatment in France ("small water cycle" activities; Lorrain, 2005). At the time of writing, it delivers water to more than 12 million people in France and it is organized in 15 Regional Units ("Entreprises Régionales") across France with its headquarters in Paris.

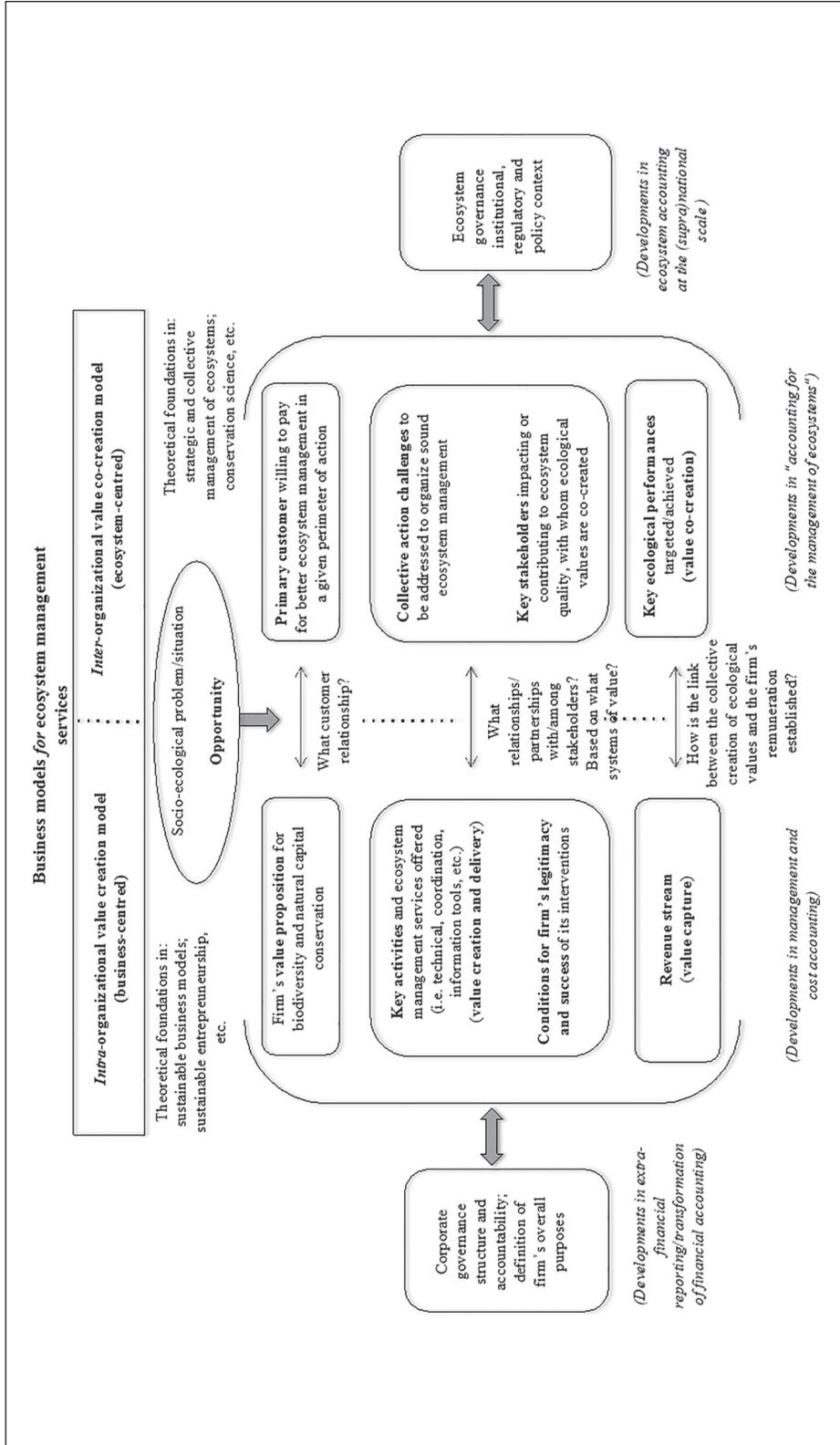


Figure 1. Schematic representation of the theoretical framework for the development of business models for ecosystem management services. Key concepts are presented in the “Theoretical Framework” section. The central part shows the shared architecture of the four models (see Table 4). Aspects related to accounting are pointed at in the “Discussion” section of this article.

The success and wealth of Lyonnaise des Eaux mostly rested on the specificities of the French model of public services concessions that was gradually institutionalized in the 19th century. In this model, a public authority (typically a municipality) can delegate the financing, construction, and management of public services and utilities to a private operator. The municipality remains the political organizing and decision-making authority (definition of objectives, price, investments, monitoring means, etc.) as well as the full owner of the investments once the contract ends. It benefits from the flexibility, the technical and innovation capacities of private companies, as well as their legal, financial, and economic expertise. Long-term concession contracts (*Délégations de Services Publics*) create Public Private Partnerships based on a compromise between common good values that characterize the delivery of public services and market and industrial values that characterize the private sector (Barraqué, 1995; Batisse, 2015). The model of public services concessions, that constitutes the DNA of Lyonnaise des Eaux and other big French concessionaires, has allowed them to gradually diversify their activities beyond water management into a multiplicity of other urban services (waste, urban heating, construction industry, communication, funeral services, etc.). As Normann and Ramirez (1993, p. 77) show in their seminal article introducing the notion of “value constellation,” thanks to their strong and long-term anchorage to a large customer base and to specific locations and cities, such firms are pioneers in inventing new modes of value creations, and more specifically in

[. . .] the design and management of inter-connected, co-productive offerings. They have learned how to mobilize value creation in their customers and partners by reconfiguring roles, relationships and structure. And they have learned the art of perpetually reinventing value in a dialogue between competencies and customers.

As soon as the 1990s, and mostly in the 2000s, several factors have nevertheless strongly challenged the viability of Lyonnaise des Eaux’s historical mode of value creation on the “small water cycle.” First, the 2000s decade is marked by a rise in the critics against the concession model, accused of accelerating the privatization and commodification of common goods, and fueled by several public scandals involving the company in France and abroad. This created a climate of distrust between the firm, public authorities, and citizens-water users that led to higher levels of competition between utility firms for the attribution of concession contracts, as well as in an increase in the number of municipalities choosing to go back to fully public management of water services (Batisse, 2015). This situation has tended to give a privilege to firms offering the lowest contractual price of water to the detriment of an enrichment of concession offerings with additional and innovative services. Second, emerging environmental and water resources preservation issues, both in quantitative terms (i.e., decrease in the amount of available water due to climate change and demographic growth) and qualitative terms (i.e., new water pollutions by micropollutants, farming pollutions such as pesticides and nitrates, etc.), have led to the rise of water services management costs often internalized by utility firms (Souriau, 2014). Third, there has been an almost continuous downward trend in the volumes of water sold since the 1990s (an average of 1% per year in France), while water public services and private concessionaires still base their revenues on the volumes of water billed to service users (Barraqué et al., 2011; Souriau, 2014).

The combination of these three phenomena disrupted the historical economic balance and the value-creation process of Lyonnaise des Eaux, based on a logic of a continuous growth of the volume of water consumed and treated for sanitation (Batisse, 2015; Souriau, 2014). At the end of the 2000s decade, confronted with an erosion of the profitability of its water concession contracts, the firm looked in new directions as expressed publicly by P. Maillard (ex-CEO) to the firm’s senior staff soon after his appointment³: “Our business base is degrading faster than

we had anticipated. We need to limit the erosion of the base and invent new trades and business activities.”

An Innovation Strategy for the Management of the “Extended Water Cycle” Ecosystems

This context led the firm to develop new business activities, explore new strategies and reflect on the transformation of its mode of value creation and remuneration to move “from volume to value” (Sempels & Hoffmann, 2012, p. 169). First, a series of steps were taken by the company to transform its historical business model by better taking into account the new social, governance, and environmental challenges arising in the perimeter of its core small water cycle activities (i.e., drinking water; sanitation). These efforts which included the creation of a Sustainable Development division (2005) as well as the development of a Corporate Social Responsibility Agenda, culminated in the creation in 2011 of the Contract for Water Health that aimed at redefining the terms and goals of the concessionary contracts and renewing the relationship between the firm, municipalities, local stakeholders, and water service users (Batisse, 2015; Feger, 2016). Part of these efforts also addressed biodiversity protection concerns, for instance by promoting new management techniques on the company’s operation sites that favored better protection of species richness while improving reputation and reducing costs (in line with “business case for sustainability” drivers, Schaltegger et al., 2012; Schaltegger & Beständig, 2012).

Second, Lyonnaise des Eaux’s top managers increasingly expressed their will to go further by transforming the company into a “services business” and by opening it to a diversity of new value creation modes beyond the prevalent small water cycle concession model (i.e., developing new contractual models, finding new public and private customers, offering new services and technological, societal and environmental innovations, etc.). This transformation relied on a commercial diversification strategy in two main domains of innovation: “the Smart” (new digital technologies, remote reading and data management, dynamic management of water networks, etc.), and more interestingly for our research the “extended water cycle.”

Used in opposition to “the small water cycle” activities that focus on water treatment plants, pipes, and other man-made infrastructures, the notion of the “extended water cycle” refers to water-related ecosystem management issues such as flood risks mitigation; green infrastructures for rainwater management; watershed, surface and ground water protection; wetland and ecosystem services maintenance and restoration; biodiversity protection; climate change adaptation, and so on (Amigues & Chevassus-au-louis, 2011; Narcy, 2004). By envisaging such ecosystem management issues *not only* as a corporate social responsibility agenda or a “business case for sustainability” concern (Schaltegger et al., 2019), but *also* as a real opportunity to develop new commercial services, new professions, and new modes of value creation, the firm opened a path toward the development of new business models *for* ecosystem management services. As I. Kocher (ex-CEO) claimed publicly as soon as 2008: “The water cycle lies at the heart of sustainable development. It opens incredible perspectives to give value to our business activities” (Lyonnaise des Eaux, 2010).

The development of the “extended water cycle” diversification strategy began around 2008 with the creation of a Resources Delegation within a wider Technical Division of Innovation and Diversification. Its mission was to provide support to technical regional centers in France that were starting to experiment locally with new aquatic ecosystems management activities in response to punctual emerging demands from their clients (catchments protection plans, improvement of bathing waters, R&D on the purification potential of artificial wetlands, collection of floating objects, rehabilitation of rivers’ dried branches, harbors’ water quality management, etc.). A member of the Resources Delegation commented the atmosphere that

Box 1. Three Contrasted Examples of Ecosystem Management Interventions.

Example 1: In Montagny-les-Beaune in Burgundy, Lyonnaise des Eaux won a contract for the management of an inland water body owned by the municipality, the main client. The firm's mission was both to develop a natural bathing pool equipped with an innovative natural filtration system for touristic and recreational activities, and to develop aquatic and terrestrial biodiversity natural habitats monitoring and management services in more restricted areas of the site in partnership with other ecosystem users (a fishing association, the local birds' protection NGO, the natural areas conservatory, etc.). The company was paid with an annual subsidy provided by the municipality, and negotiated on the basis of a hypothetical volume of visitors on the site. This example shows the possible emergence of new types of concessionary contracts that are dedicated or include ecosystem management activities (see following section, Model 2).

Example 2: In the Flins-Aubergenville area, where Lyonnaise des Eaux historically owns some of the water catchments that supply western parts of Paris, the company initiated a diffuse pollutions reduction plan (nitrogen, pesticides, etc.) to protect groundwater quality, increasingly threatened by nearby intensive agriculture practices and urban pressures. In partnership with local farmers' associations, the plan consisted essentially in offering information as well as technical (e.g., economic and scientific assessments and measurement tools) and administrative support services to farmers who would like to turn to less intensive and impactful agricultural practices. Funded at 80% by public funds and 20% by Lyonnaise des Eaux's own funds, this project was not a source of profitability for the firm. Its legitimacy as a for-profit actor to lead such action plan was also regularly questioned by some of the local stakeholders. However, the company thereby experimented new forms of public and private strategic alliances and developed innovative activities aimed at reaching quantifiable ecological goals by mobilizing public funds (see following section, Model 1).

Example 3: In the South of France, the firm supported an industrial operator in the management of its potential ecological impacts on water streams and their fish populations in the context of the A9 highway extension works. Lyonnaise des Eaux made a technical services proposal for the installation and operation of a river water quality monitoring and alert system during the 4 years of the works. If the ecological quality alert thresholds were exceeded and that a risk existed for fish populations, the client was immediately informed and actions could be taken to mitigate and stop the impacts. Lyonnaise des Eaux also played a role of intermediation and guarantor, as it provided monthly assessments to its client and the public agencies in charge of the control of the industrial's legal obligations. This example points to the possibility of selling ecosystem management services directly to other for-profit actors who want to mitigate their impacts, ensure good working relations with other public or private stakeholders, and avoid reputational risks and additional costs (see following section, Model 3).

prevailed at this time, as efforts were made to identify and integrate these different experiments at the firm level:

It was very sensitive, almost secret. The regional centers were afraid and did not know this new sector of activity well. They did not know how to speak about it and were not ready to establish relationships with new stakeholders and clients.

In 2009, the Environmental Protection Division (that became in 2011 the Environmental Engineering Division) was created to organize at a larger scale the development of these new activities around five orientations: aquatic environment monitoring, wetland restoration, quantitative water management, urban waters, biodiversity protection.

The diversity of cases that we documented during our research shows how the firm then gradually ventured in new multi-stakeholder contexts, engaged with new customers, developed new types of partnerships with environmental NGOs, and tested new forms of ecosystem and natural capital assessments tools (for the latter, see for instance, Feger et al., 2015; Levrel et al., 2017; see Box 1 for illustrations).

Attempts to Scale Up the Development of Ecosystem Management Services Are Met With Serious Limitations

Despite the strong experimentation and innovation dynamic, the difficulties in scaling-up the development of the new ecosystem management activities and offerings outside of the historical business model boundaries however gradually appeared. They point to various challenges and barriers discussed in sustainable entrepreneurship research (Hockerts & Wüstenhagen, 2010; Hoogendoorn et al., 2019; Hörisch, 2015; Muñoz & Cohen, 2018) as well as the intrapreneurship literature (Salarzahi & Forouharfar, 2011; see Table 3).

The first set of challenges pertained to the fact that in the current institutional context, there is no predefined role for a for-profit actor in ecosystem management. This makes the identification of relevant customers who could benefit from the firm's innovative ecosystem management services and ultimately buy them particularly difficult. Up to the 1990s, Lyonnaise des Eaux was often referred to as an *ensemblieur* or *aménageur des villes* (roughly translated in "urban-systems designers and outfitters"), since beyond its core small water cycle services, it also offered multiple other urban services (Normann & Ramirez, 1993). This was made possible by the fact that in the realm of water and urban management, there are well-identified public actors (i.e., municipalities) with sufficient political authority on a well-defined perimeter to delegate the technical implementation of their public services responsibilities to a private actor. The temptation to simply transpose such role and posture to the realm of ecosystem management was strongly and explicitly stated by one Lyonnaise des Eaux's manager of the Environmental Engineering Division: "What we wanted, was to be an '*ensemblieur* [designer and outfitter]' of the aquatic environment, to manage a river from upstream to downstream . . ." However, it quickly appeared that to the exception of a few rare cases (see Box 1, Example 1), when it comes to ecosystem management there is no single decision-maker who has sufficient political authority over the management of a well-bounded and clearly defined ecological entity (e.g., a river, a wetland, a lake, etc.) and who can simply delegate to the company the technical implementation of long-term ecosystem management activities and responsibilities (same manager as above): ". . . It never happened. It is not possible in the current context (. . .), nothing is organized for it to happen. There is no place for an '*ensemblieur*' [of ecosystems]."

Second, we observed that the commercial team in charge of the extended water cycle diversification was facing a triple challenge when promoting their activities internally: (1) the development of new ecosystem management services stand-alone offerings always required from them additional efforts when compared with their usual small water cycle commercial activities, as they had to identify and reach out to potential clients and partners that they had often not been trained to discuss and negotiate with; (2) the outcomes of these negotiations were always much more uncertain than on small water cycle services, the returns on investments generally slower, and the financial order of magnitude of the offerings much less important than the small water cycle concessionary deals; and (3) the team was often confronted with resistance from colleagues still strongly attached to the firm's prevalent small water cycle "culture of pipes."

Finally, while the place and legitimacy of the company to intervene in the small water cycle management is historically and legally well-founded, the fragmented characteristics of ecosystem management and land-use governance (public actors' responsibility and jurisdiction perimeters are compartmentalized; there is a lack of funding dedicated to ecological restoration, etc.), and the prevailing suspicion expressed by local actors from public institutions or environmental NGOs regarding the intervention of a for-profit actor in common goods' management forced the company in each situation: to reinvent and renegotiate its relationships with other actors interacting with the ecosystem, to redefine the foundations of its legitimacy and license to operate, to provide the measurable evidence of its added value to biodiversity and natural capital restoration through innovative ecosystem assessment methods. The great diversity of local contexts and social, economic, and ecological situations in which the company got involved thus made it

challenging to capitalize on these experiments. As another manager from the Environmental Engineering Division told us: “That is what is weird: all these bricks that we have [i.e. innovative ecosystem management services], they could all stick with one another. But we fail to have one comprehensive vision that would allow them to hold together.”

Table 3. Key Findings on Challenges to Scale Up Ecosystem Management Activities Outside of the Historical Small Water Cycle Business Model.

Challenges due to . . .	Key findings
Deep differences with historical business model institutional context	<ul style="list-style-type: none"> • No predefined role for a for-profit actor on ecosystems, no predefined customer • No single decision-maker that has authority over a given ecosystem • No place for the firm to become an ecosystem “designer and outfitter”
Critical internal management capabilities	<ul style="list-style-type: none"> • Not knowing potential and diverse customers and partners • Uncertain outcomes of reaching out to/negotiating with them • Much smaller and slower paybacks than small water cycle activities • Resistance from other managers strongly attached to the small water cycle culture
Diversity of ecosystem management contexts, stakeholders, ecological entities at hand	<ul style="list-style-type: none"> • Fragmentation of ecosystem and land-use governance • Unearned/contested legitimacy to intervene in biodiversity management • Need to reinvent relationships with stakeholders in each ecosystem intervention • No single metric to demonstrate ecological performances on diverse ecological entities • Difficulty to capitalize on always new and unique interventions on ecosystems • Impossibility to develop a one-size-fits-all ecosystem value creation model

Recognizing that looking for a single generic strategic and legitimate form of value creation model on ecosystems alongside the already well-established water concessionary model was very likely to be a deadlock, our action research thus focused on the development of four clearer but differentiated visions of how ecosystem management services could be integrated into stand-alone business models allowing the firm to scale-up its activities in this new domain.

Results From the Participatory Design Process

Four New “Business Models for Ecosystem Management Services”

This section introduces the four business models *for* ecosystem management services designed during our action research. Each of the four models is structured according to the same general architecture (see “Theoretical Framework” section, Figure 1), but represents a distinct strategic and negotiation pathway for an environmental sector firm that seeks to develop activities and ecosystem management services aimed both at creating ecological value with other stakeholders in diverse ecosystem management situations and at earning a corporate revenue recognized as legitimate (see Table 4).

Table 4. Synthesis of the Four Business Models for Ecosystem Management Services' Main Characteristics.^a

	Opportunity	Value proposition	Primary customer	Key stakeholders	Collective action challenge	Key activities	Key ecological performances	Revenue stream	Conditions for legitimacy/success
1. The ecological consortium	Strong policy and public investment dynamics around the achievement of large-scale biodiversity and natural capital restoration objectives	The operationalization in multiple projects at the local/regional scale of public authorities' large-scale biodiversity and natural capital commitments	A public institution that selects and funds the best natural capital restoration projects	A consortium carefully composed of members from a partnership network and competitive in obtaining given projects	Developing and maintaining a strategic alliance network with multiple actors from the environmental sector having complementary skills	Multiple organizational/project management skills; environmental expertise; technical innovations for natural capital restoration and monitoring	Large-scale biodiversity and natural capital targets set by public institutions, and translated in regional/local contexts	Linked to the overall contribution of the consortium to the large-scale ecological targets; and to the ability of the firm to demonstrate to other consortium's members the value of its specific contributions	Clearly adhering to the environmental sector's values, missions, and commitments; environmental accountability
2. The ecological concession	Development of new types of concessions dedicated to the restoration and management of ecosystems	The socio-ecological management of a site	A public actor that exercises sovereignty over a given site	A community of ecosystem users who benefit or impact the ecological quality of the site	Implementing a concerted governance of the site to take into account every user's practices and relation with the ecosystem	Ecological engineering services; ecological monitoring of the site; consultation and multi-stakeholders' coordination	Main ecological goals contractually agreed on with the primary customer (potentially enriched by other users' goals/needs if not in contradiction)	Linked to the achievement of the mandated ecological performance goals and the regulation of the diverse uses of the site's ecosystems	Developing shared representations, proximity, and trust with the community of users
3. The ecological B2B	The bad management of an ecosystem generates costs for a diverse set of actors, in a context of absence/ineffectiveness of public authorities' interventions	The development and equipment of a local and autonomous collective management system of the shared ecological entity	A private actor that already suffers from or anticipates future (social, reputational, economic, etc.) costs related to the bad ecological performances of its own or others' activities	An emerging community of local actors connected by their shared concern with/ responsibility in the degradation of a given ecological entity	Overcoming the initial confrontational relations or the absence of dialogue between actors, to gradually build trust and negotiate ecological commitments	Ecosystem assessments/ accounting services to build a shared diagnosis and manage actor's commitments; mediation services to build dialogue and trust; ecological engineering services	Negotiated and agreed on among actors (on the basis of a shared science-based diagnosis of the ecological entity and situation)	Linked to the gradual improvement of the ecological situation and the related gradual social integration of the primary customer	Building accountability, reciprocity and trust between actors through regular sharing of information; ensure the firm's own transparency and demonstrate absence of conflicts of interest
4. The ecological collaborative	Created by the firm actively acting as the main promoter and organizer of ecosystem restoration in a given ecologically degraded situation	The coordination of actors and resources around the management of local ecological issues	A collaborative community engaged for the conservation of the ecological quality of a given ecosystem, where everyone can exchange resources and services that contribute to ecological value creation	Enrolling and engaging multiple and scattered actors in a collaborative dynamic for ecosystems	Ecological assessment and alert; coordination services and devices; ecological auditing and accounting services; ecological engineering services	Collectively defined by contributors to the collaborative community (on the basis of best available scientific knowledge)	Linked to the operation of the coordination devices and platforms, through which the firm can also sell other services (e.g., restoration works, etc.)	Establishing shared requirements and rules for community's access, transparency and control of ecological performances; firm's strong local environmental engagement	

^aThese models can be used in combination with Figure 1.

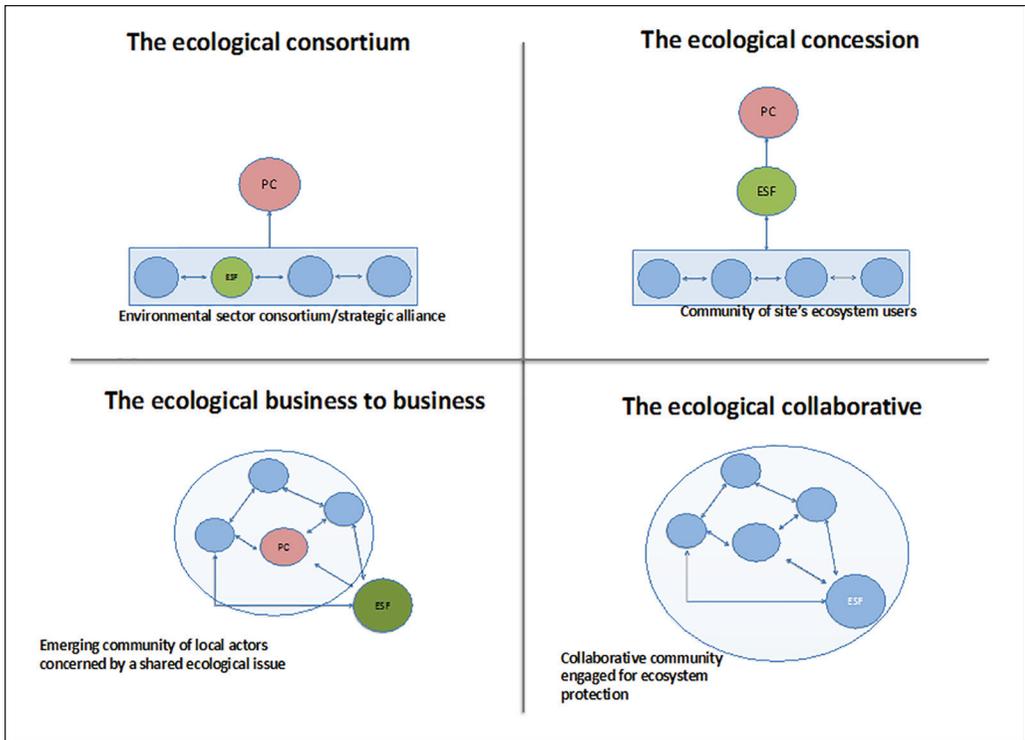


Figure 2. Schematic representation of the relations between the environmental sector firm (ESF), the primary customer (PC), and other stakeholders in the four business models for ecosystem management services introduced.

Differences between the four models are shaped by contrasted public ecosystem governance and policy contexts (Lüdeke-Freund & Dembek, 2017; Muñoz & Cohen, 2018): While in the first two models (“the ecological consortium” and “the ecological concession”) public initiatives, stable institutions, as well as environmental regulation and funding have an important role in structuring business opportunities, the two others (the “ecological B2B” and the “ecological collaborative”) are on the contrary adapted to situations where public actors mostly fail to act and be accountable for environmental issues and where opportunity is thus rather created by private actors and the firms’ own initiatives for environmental change. This has important implications on the types of primary customers as well as on the collective of stakeholders with whom the firm needs to compose to protect or restore ecosystems in each model, and on the fundamental structure of their accountability relationships and the value compromises on which they rest⁴ (see Figure 2).

This also has consequences on the firm’s strategic capabilities and governance structures that would be best adapted to the pursuit of these four distinct approaches: While the first two models rather call for prioritizing large-scale stability and long-term projection capacity, and the development of technical, managerial, and R&D skills that can be transferred from one project to another (in Model 1) or from one site to another (in Model 2); the last two models rather require to prioritize strong regional or local territorial embeddedness necessary for building trust-based relationships with other local actors (Dufays, 2016; Kibler et al., 2015; Shrivastava & Kennelly, 2013; Slawinski et al., 2019), and to accept the slow and uncertain temporal dynamic that characterizes the identification, collective exploration, and incremental treatment of ecological issues (Latour, 2004).

The Ecological Consortium (1)

In this business model, the opportunity is generated by the emergence of strong political dynamics around the achievement of large-scale biodiversity and natural capital restoration key performance targets, gradually normalized by the public power (e.g., good ecological and chemical quality of water bodies under the European Water Framework Directive; coastal and marine biodiversity, etc.; see, for instance, Jackson, 2009; ten Brink, 2011). The primary customers are institutions in charge of public investment channels, and of assessing, choosing, and allocating funds to projects that will effectively contribute to achieving these ecological goals. Public or private actors with various competences in ecosystem management are in strong competition to attract and mobilize these funds.

The environmental sector company's value proposition consists in operationalizing the public authorities' biodiversity and natural capital large-scale commitments in a diversity of ecosystem multi-stakeholders' conservation and restoration projects at the regional and local scales, by leading the constitution of (or getting actively involved in) competitive consortiums. To this end, the key activities offered by the firm include not only its environmental expertise as well as innovative technical services for ecological restoration and monitoring but also its multiple and adaptable organizational competences in project development and management that can be applied to different contexts and places (financial skills, communication, R&D and innovation capacities, business intelligence activities, etc.) and that makes it rapidly indispensable to other members of the consortium. The firm's revenue stream is to be negotiated with other members of a given consortium based on the level of contribution of the firm's key activities to the consortium's functioning and to the consortium's overall achievement of ecological results, which ultimately condition the amount of public funds it receives. Ecological accounting systems can be developed to support such negotiations between the consortium and the funders, and among the members of the consortium themselves.

In this model, the collective action challenge is to develop and maintain over time strong strategic alliances with key stakeholders from the environmental sector that complement the firm's own technical expertise and geographic localizations (e.g., a nature conservation NGO that has offices in different regions, a small consultancy specialized in a specific ecological engineering technic, well-respected public research centers in ecology who can give credibility to biodiversity and natural capital performance assessments procedures, etc.). The firm can then carefully choose among the members of its diversified local, regional, and national partnerships network the relevant allies with whom to develop in an opportunistic way ecological consortiums in capacity of generating the biodiversity and natural capital gains expected by various funders. One critical condition for success is for the firm to be recognized as a legitimate environmental sector player by others, by clearly claiming its adhesion to its core values and mission and its willingness to demonstrate environmental accountability.

The Ecological Concession (2)

In this business model, an opportunity is created by the development of regulations allowing for the emergence of new types of concessionary contracts dedicated to the restoration and management of biodiversity and natural capital in sites of particular socio-ecological value (e.g., the management of peri-urban wetlands useful in the prevention of flooding; of abandoned gravel pits that have become a rich fauna and flora habitat; of a local natural reserve, a privileged access due to direct proximity to a built infrastructure such as a dam, etc.). The primary customer is typically a public actor (e.g., a municipality) that exercises sovereignty over an area whose perimeter is well defined (e.g., by property or land-use rights, etc.), and that chooses to delegate its management to an environmental sector firm.

The environmental sector company's value proposition consists in offering key activities to ensure a delivery: the socio-ecological management of the site. The firm's legitimacy and revenue stream is primarily correlated to its ability to demonstrate the ecological value created (or maintained) on the site over long-term periods. It thus primarily offers technical and ecological engineering services in order to achieve the site's key ecological performances negotiated and contractually agreed on with the client (e.g., maintaining a wetland system's water treatment functionality while restoring migratory birds' habitats) as well as biodiversity and natural capital information systems to assess and monitor the site's quality.

In addition, the client also expects the firm to mediate conflicts over the use or overuse and degradation of the site's natural common goods by other key stakeholders who have access to the site and benefit from its biodiversity and natural capital through various activities (e.g., farmers who practice extensive breeding on the peri-urban wetlands; NGOs who organize birdwatching activities in biodiversity rich sites such as the gravel pits; aquaculture and recreational fishing, etc.). To address this collective action challenge, the firm needs to implement a concerted governance of the site where every user's practices and specific relationship to the site's ecosystems as well as social traditions are taken into account, collectively discussed and assessed on the basis of a shared ecological representation and accountability system. To this aim, it can offer specific consultation and multi-stakeholders' coordination services. Ultimately, the condition for success depends on the firm's ability to be accepted by this diversified community of users as a legitimate actor by creating proximity and trust based on noncommercial partnerships and by addressing some of their needs (as long as they do not threaten the key ecological performance goals expected by the primary customer).

The Ecological Business to Business (3)

In this business model, an opportunity emerges from the social and economic costs borne by a number of actors as a result of the bad or ineffective management of a given ecological entity (e.g., an industry, a group of shellfish farmers, and a local environmental NGO suffering from the bad management of the water quality of an estuary, respectively, in terms of reputation, ecological losses, and biodiversity degradation). However, despite the conflict-ridden climate likely arising from this situation, this group of actors cannot or does not want to reach out for help by a public authority to resolve the issue for one reason or another (e.g., trust has been lost between the actors and the local municipality officials, local institutions prioritize public funds for more urgent social issues, etc.). The primary customer is one of these private actors (e.g., an industry that has impact on the river water quality and ecological continuity; a mining company that cares about its reputation; a group of farmers gathered in a cooperative, etc.) willing to take action to anticipate or to remediate this situation that they judge to be too costly for them.

The environmental sector company's value proposition is to assist the client's efforts in improving its relationships with other actors and with the environment in this controversial context, by gradually developing and equipping a local and autonomous collective management system of the shared ecological issue. The firm's revenue stream is linked to the implementation of the different steps necessary for this, for which key activities are offered. First, the firm can offer ecological assessment and accounting services (e.g., water quality monitoring tools; biodiversity inventories; impact assessments, etc.) to help the client and other local actors to objectify the situation, build trust and reciprocity by supporting their ability to understand and assess the environmental effects of each other's actions, and assemble them around a shared diagnosis of the ecological issue at stake. By offering mediation and coordination services (e.g., organization of informal meetings to build trust, etc.) the firm can then help actors to negotiate and agree on key ecological performance goals, identify potential synergies between everyone's demands and opportunities for cost reduction, elaborate an action plan, negotiate the allocation of

resources for everyone's action, and so on. The company can finally offer ecological engineering services to the primary customer and potentially other stakeholders to address part of the ecological issue at stake and reach ecological targets (e.g., works for the ecological restoration of the river banks, etc.).

Here, the collective action challenge is the initial conflictual relationships or the absence of dialogue between key stakeholders concerned by the ecological issue. To overcome this, the company plays an active mediating role, and so doing, gets involved in the definition of the ends and means of this emerging community of actors. A condition for success is thus for the firm to prove on a regular basis that there is no conflict of interests with the client or any of the other stakeholders, and to establish proximity and reciprocity with every actor. The firm can achieve this by publicly reporting information on its own ecological performance and be accountable to others on the contributions of its activities to the agreed-upon ecological goals.

The Ecological Collaborative (4)

In this business model, the firm itself creates the opportunity, by acting as the main promoter and organizer of collective action in favor of ecosystems in contexts where the fragmentation of environmental responsibilities leads to biodiversity and natural capital degradation. In this model, contrary to the three previous ones, there is no public or private primary customer who would be ready to take initiative to address such ecological degradation in one way or another, and who would be in capacity of paying the environmental sector firm for its ecosystem management services. The firm's value proposition consists in offering its strong environmental engagement for environmental change and its ability to enroll and connect other actors in a collaborative community to favor the emergence of multiple local projects in favor of biodiversity. This model is notably inspired by the development of the "sharing economy," where services and goods are exchanged directly between users that form a community, and operate aside from the dominant socioeconomic system (Rifkin, 2014).

In terms of key activities in such a case, the firm can first identify, assess, and alert on local ecological issues that would benefit from collective efforts. As the main capacities and resources for biodiversity conservation action (i.e., funding, land, etc.) are dispersed between a diversity of actors (i.e., individual citizens, NGOs, companies, municipalities, etc.), the firm can take the initiative through coordination and facilitation activities to develop and consolidate a collaborative community of actors concerned by these issues and motivated to contribute to their mitigation. Each member of this community thus becomes at the same time a client and a seller of resources and contributions to cocreate ecological value (e.g., a private farmer can agree to open part of his land for biodiversity restoration project while a voluntary group of young people can commit to working on this restoration site for a given period of time and a local research center experiments new species surveys tools). To operationalize this effort, the company can develop and operate local and original coordination devices such as collaborative funding mechanisms inspired from crowdfunding, collaborative platforms for members to meet each other, exchange resources, and carry out collective projects. It can additionally propose ecological auditing and accounting services to assess actions and projects supported by the platform and quantify their contributions to the achievement of diverse key ecosystem conservation performance goals. The environmental sector firm can also offer its own ecological engineering and restoration services through the platform as technical contributions to various projects.

To be seen as a legitimate player and take its fair share of the funds available through the platform as a revenue stream for its various coordination services or as a remuneration of its ecological engineering services, the firm faces the same challenges as in the ecological Business to Business (reciprocity, trust, transparency, no conflict of interest, etc.). However, in this case, a

condition for success is that all participants of the collaborative community (including the firm) are subject to the same requirements and rules regarding transparency on performances and contributions to ecological value creation, under collectively agreed-upon conditions of evaluation and control. The firm must not only hold and demonstrate strong ecological values but would also gain in involving other members of the community in its corporate decisions.

Discussion

Contributions for Theory and Practice

In the past two decades, we have observed a gradual increase in calls by national and international public institutions for companies to participate more in the collective efforts required to protect global biodiversity. A lot of focus and hope has been put on the development of new economic instruments (payment for environmental services; biodiversity offsets, etc.) as well as hypothetical “ecosystem services markets” based on the economic valuation and pricing of biodiversity, that would enable companies from diverse sectors to engage in conservation efforts and adapt their business models accordingly (Bishop, 2012; Bishop et al., 2008, 2009; Houdet et al., 2012; ten Brink, 2011). Such approaches and framing discourses have raised strong criticism and fears of commodification of nature (e.g., MacDonald, 2010; McCauley, 2006), and so far their effectiveness in influencing business choices and in creating substantial changes for biodiversity conservation remains to be proven (Mermet et al., 2014; van den Burg & Bogaardt, 2014).

In contrast, our article looks at the issue from the other end. It provides an insider’s view of the concrete questions, hopes, and difficulties faced by an environmental sector company that actively develops a commercial strategy for ecosystem management activities, and in doing so struggles to find its right place in the collective governance of these diverse and complex issues. It results in an alternative interdisciplinary theoretical framework for the development business models for biodiversity, coupling a business-centered value creation model with an ecosystem-centered value cocreation model, and founded primarily on the negotiation and remuneration of measurable contributions to the collective achievement of ecological performances at the ecosystem level. Four contrasted business models *for* ecosystem management services in this perspective were developed through participatory methods, providing four main consistent visions of the roles an environmental sector company can play in collective efforts to protect ecosystems.

These four proposed models remain limited in that they were produced in the context of a specific action research with one large firm evolving primarily in the institutional context of water management in France. Further research and experimentation is now needed to demonstrate the transferability to other business and ecosystem management contexts and to develop concrete devices to operationalize them (e.g., new types of firm–customer contractual arrangements based on ecological performance, accounting innovations as described below, etc.). However, we think these results can already be useful as conceptual tools for management scholars and managers working with organizations that seek to (or already) develop ecosystem management services. The schematic representation of the theoretical framework (Figure 1) combined with the specific features of each model (Table 4) can be mobilized as a practical and heuristic visual tool for analysis, design, and strategic thinking. It can be used to (1) discuss, compare, and classify in a more systematic way past or current interventions of a given business in ecosystem management; (2) identify opportunities and possible strategic pathways for developing compelling ecosystem management services offerings; and (3) reflect and explore how the four proposed visions could translate into more specific business, social, political, and regulatory realities in which they could then be further detailed. Our results could also inspire the development of educational tools (e.g., through case study methods or simulation games) to train managers or students in reflecting on issues lying at the intersection of business and interorganizational ecosystem management challenges.

Future Research Directions

One crucial aspect for the development of these business models, and a necessary condition for their operationalization as well as for the firm's legitimacy, is related to the development of ecological accounting innovations (Russell et al., 2017). Although present as a watermark in the description of the four business models, this issue would deserve a much more substantial development that we could not adequately address in the scope of this article. Let us just say here that in each of the business models *for* ecosystem management services presented, the systematic assessment of ecological contributions and performances holds a central place not only as a basis of negotiation and accountability to the client who expects and pays for obtaining measurable results in the improvement of biodiversity and natural capital but also as a basis of shared representation, dialogue, and trust building with the partners and other actors with whom the firm cocreates this ecological value. All these points are closely linked to the emerging "accounting for the management of ecosystems" approach, at the crossroads of accounting scholarship and conservation science, and the development of new ecosystem-centered accounting models aimed precisely at equipping such interorganizational initiatives at the scale of ecosystems (Feger, 2016; Feger et al., 2018; Feger & Mermet, 2017, 2018, in press).

Future research should also push further the theoretical framework introduced in this article by studying in more depth the profound linkages between changes in ecosystem policy and regulatory contexts, the development of business models *for* ecosystem management services, and changes in corporate governance and accountability. In our views indeed, environmental sector firms who engage in the development of such business models have a unique opportunity of leveraging the transformative potential of such links. First, they are likely to have a strong interest in the development of policy and regulatory changes in favor of ecosystem preservation at the (supra)national scale, institutionalizing clear commitments and biodiversity targets (e.g., through the development of national ecosystem accounting, Hein et al., 2020; or the normalization of science-based targets consistent with planetary boundaries, Whiteman et al., 2013; Steffen et al., 2015), as this could become a source of business opportunities for them. Second, such business models are inconsistent with profit-maximizing logics, if only because ecosystem management activities paybacks are necessarily slower and smaller than in many other sectors (see Table 3). Third, environmental sector firms developing these new activities have every interest in making the multiple contributions they bring to biodiversity and natural capital preservation (beyond their business perimeter) visible and recognized by their stakeholders, society, as well as "green" public and private investors.

This gives these companies particular incentives and a unique opportunity to be pioneers in redefining business purposes and what business value(s) creation actually means (beyond solely monetary values, Busch et al., 2018), in taking into account the preservation of natural capitals in their financial accounting systems and experimenting new ways of calculating profit on this basis (see the comprehensive accounting in respect of ecology model, Rambaud & Richard, 2015; Rambaud & Feger, 2020), and in opening their governance structure to multiple stakeholders (beyond just shareholders) and developing fruitful alliances with other environmental players (companies, environmental NGOs, institutions, research centers, etc.).

This could open the path toward building a strong environmental sector pushing for ambitious ecosystem governance policies and at the forefront of the emergence of new models of corporations, up to the difficult and urgent challenges of the Anthropocene (Shrivastava et al., 2019).

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Notes

1. Biodiversity refers to the variety of life on Earth; ecosystems refer to communities of organisms in interaction with their nonliving environment at a systemic level; and natural capital, defined here in a strictly biophysical way, draws a particular attention to ecosystems functioning and the benefits derived from them by society, usually called “ecosystem services.” The latter should not be mistaken with the term *ecosystem management services* that we introduce in this article and that refers on the contrary to services and contributions *brought to* nature. Although we are aware of the definitional differences, the scientific controversies, and the complex interrelations between these notions (e.g., Mace et al., 2012; Winn & Pogutz, 2013; NCC, 2016), here we will use these terms in a wide sense and interchangeably, as a way to refer to a diversity of ecological entities to be preserved, managed, or restored and that can only be precisely defined in the specific context of their management (e.g., a given species and its habitat, a forest and its ecosystem services, a given river or soil’s quality, a given ecological corridor, etc.).
2. From the beginning and during the 3 years of the action research, the research team was composed of the two authors of this article (at the time, a PhD student whose research was funded partly by the firm and partly through public funds; and his external senior researcher supervisor) as well as two external consultant-researchers specialized in strategic environmental management. The methodology and the workshop materials are described in detail in Feger (2016).
3. At the annual greetings meeting on the January 24, 2012. This quote and all the following quotes have all been translated from French by the authors.
4. Each business model builds on and can be explicitly linked to different (1) underlying models of organized action for conservation (see Mermet et al., 2013; Mermet et al., 2014; Mermet, 2018a; i.e., the “minority-actor-for-change model” for the ecological consortium, the “governance-process” model for the ecological concession, the “coordination-as-resolution” model for the ecological B2B and ecological collaborative); (2) compromises between contradictory value systems (or “orders of worth”) and forms of justification (Boltanski & Thévenot, 2006; Chiapello & Boltanski, 2005; Thévenot et al., 2000; i.e., industrial–civic–domestic for the ecological concession; industrial–market–project for the ecological consortium; industrial–market–domestic for the ecological B2B and industrial–domestic–market for the ecological collaborative). In addition, Strategic Environmental Management Analysis (Mermet, 2011, 2018b; Mermet et al., 2005) was particularly useful in reflecting on the strategic and sectorial dimensions that prevail in the ecological concession; while Common-Pool Resources theory helped us reflect on diverse types of community logics that underlie the three other models. These aspects are discussed in more depth in Feger (2016).

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