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**New business models for biodiversity and ecosystem
management services:
An action research with a large environmental sector
company**

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New business models for biodiversity and ecosystem management services:

An action research with a large environmental sector company

Abstract: Businesses are increasingly called upon to contribute to efforts to protect biodiversity and natural capital. Our paper 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 up-scaling 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 co-creation model at the ecosystem level.

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 towards 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 recently biodiversity and natural capital (Green et al., 2017; 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

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3 business sustainability (Schaltegger et al., 2016; Stubbs & Cocklin, 2008). The sustainable
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5 business model literature adopts an extended view of value creation that integrates ecological
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7 concerns alongside economic and social concerns (Lüdeke-Freund & Dembek, 2017).
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9 Delivering environmental results is thus essentially conceived as a crucial part of a company's
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11 overall mission (Stubbs & Cocklin, 2008; Upward & Jones, 2016) and as an imperative criteria
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13 that has to guide the company's definition and choices of "the way business is done" (i.e. its
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15 modes of production, industrial processes, resource use, relations with other stakeholders, etc.)
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18 (Bocken, Boons, & Baldassarre, 2019).

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22 In this paper we will explore the potentialities of a specific perspective of sustainable
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24 business model innovation, where obtaining environmental results would not be regarded as a
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26 positive co-benefit of a given business' efforts to make its main activities "greener", but would
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28 in fact be the very primary service that the business seeks to offer and sell to its customers. In
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30 such a perspective the challenge is not so much to improve or change currently unsustainable
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32 business models or to design new business models that rest on sustainable principles, but rather
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34 to imagine, design and implement business models whose core value proposition (i.e. what is
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36 being sold) *is by essence* a contribution to the management of a given environmental problem
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38 and to the achievement of given environmental performance goals.

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42 Our main objective is to focus on this specific perspective of business model innovation
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44 on biodiversity, ecosystem and natural capital conservation issues,¹ to which the sustainable
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46 business model literature has so far paid only limited attention. The existing literature
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48 discussing the "business case for biodiversity" essentially focuses on three main types of
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50 business-biodiversity relations: reducing business impacts on biodiversity; better managing
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52 business dependence on biodiversity and ecosystem services; making good biodiversity
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54 management an opportunity to add value to core business activities (Bishop et al., 2008, 2009;
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56 Houdet et al., 2012; Schaltegger & Beständig, 2012; TEEB, 2012; van den Burg & Bogaardt,
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3 2014; Winn & Pogutz, 2013). A fourth perspective on business-biodiversity relations is
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5 emerging however, that places ecosystems conservation and restoration at the core of business
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7 activities and purpose (see for instance recent research on “regenerative” entrepreneurship and
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9 organizations: Branzei et al., 2017; Quarshie et al., 2019; Slawinski et al., 2019; Vlasov, 2019)
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11 (see Table 1).
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15 In our view, this fourth perspective, on which this paper focuses, requires to pay
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17 particular attention to companies experimenting with what we will refer here to as “ecosystem
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19 management services”, i.e. a wide range of technical innovations and commercial services
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21 specifically developed to contribute directly (e.g. through direct action on the ecosystem) or
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23 indirectly (e.g. by helping others change their course of action; through the production of new
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25 ecological information, etc.) to the conservation and maintenance of ecosystems, the restoration
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27 of degraded ecosystems, or the reduction of harm caused to ecosystems by other economic
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29 actors. The development and commercialization of such “ecosystem management services” is
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31 of particular relevance to environmental sector firms that already specialize in activities that are
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33 valuable because they reduce society’s negative impacts on the natural environment or improve
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35 its quality, such as wastewater treatment or ecological engineering companies (e.g. river
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37 restoration, land rehabilitation, etc.). For them, sustainable business model innovation is not
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39 only a question of increasing their own corporate eco-efficiency or becoming a better social
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41 and environmental steward (Bocken et al., 2014, 2019). It is also about finding new
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43 opportunities to contribute to solving society’s sustainability challenges and developing
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45 original commercial offerings, remunerated precisely because they create ecological value, i.e.
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47 achieve environmental results (Boons, 2009). In this paper, by “creation of ecological value”,
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49 we refer more specifically to the achievement of biodiversity and ecosystem performance goals
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51 (in terms of restoration, preservation or impact mitigation), measured strictly in ecological and
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53 biophysical terms (e.g. higher biodiversity richness, better freshwater and soil quality, etc.), and
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established on the basis of the best available conservation science, existing regulatory frameworks and associated indicators, as well as informed negotiations between concerned actors.

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, eco-tourism	A co-product 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"

This paper explores questions and challenges related to the development of what we will refer to as "business models *for* ecosystem management services", i.e. 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 in? 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

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3 2015), which at the time of research was actively engaged in the experimentation of such
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5 “ecosystem management services”.

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

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44 This paper is based on a three years long action research (David, 2008) conducted at the
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46 heart of Lyonnaise des Eaux between 2012 and 2015 (Feger, 2016)². The company adopted in
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48 2009 an explicit strategy of developing new technical and commercial services to contribute to
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50 the collective management of freshwater quality and the protection and restoration of
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52 biodiversity (e.g. freshwater monitoring services; river banks restoration; artificial wetland
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54 creation, etc.). Our action research aimed primarily at complementing the firm’s already
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56 existing technical and commercial innovation dynamic with a reflection on the social,
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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 paper 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 semi-directive interviews along the course of the action research (n=61 of 1h30 in average) that are summarized in Table 2, as well as detailed case studies.

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.) External stakeholders and clients of the company (municipality's civil servants,	13 16	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

	environmental NGOs, farmers, etc.)		actors, etc.)
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.

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.

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 one 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. On-going research findings were regularly written down in briefing notes, presented orally and discussed with the working group. We proceeded in three main steps.

Step one 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

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3 frame. We imagined and wrote down three “settings”, i.e. fictional images of what the situation
4 of Lyonnaise des Eaux could be in the year 2027 in contrasted social, political, economic and
5 ecological contexts. Settings were based on our analysis of the hopes and challenges identified
6 through the interviews (see Table 3), on case studies of the firm’s on-going ecosystem
7 management interventions (see Box 1 for examples), and on various hypotheses made on the
8 potential evolutions of water and ecosystem management policies and regulations in France. In
9 each setting, participants were invited to reflect on the opportunity offered by the situation as
10 well as on the most appropriate intervention strategy for the firm. They were then asked to
11 provide some details about its implications in terms of mission statement, primary customer
12 relationship, organizational modalities, partnerships with other stakeholders, resources
13 required, ecosystem management services that could be offered, challenges to overcome as well
14 as on corporate values to adopt and changes in corporate governance it might imply. The
15 proposals produced by participants were formalized in three contrasted “scenarios” that were
16 written down on paperboards, presented orally and discussed with all the participants.

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Step two consisted in 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. Firstly, 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.). Secondly, 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;

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3 Mermet et al., 2013, 2014; Narcy, 2004). This helped clarify how each scenario offered a unique
4 perspective on how an environmental sector company, through its business offerings, could act
5 as an agent of change to effectively address ecosystem management issues. Coupling the
6 analysis of the scenarios based on these two distinct domains of research allowed us to progress
7 towards a first formulation of four contrasted business models *for* ecosystem management
8 services, while elaborating their common conceptual architecture and theoretical foundations.
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17 Step three consisted in preparing and facilitating a second workshop based on a strategic
18 simulation game methodology. For this we developed an imaginary local setting at present time
19 (a given landscape with multiple stakeholders having different interests, various ecosystem
20 management issues at hand, etc.) inspired by the diverse real-world cases documented during
21 our field work on different sites of interventions of the company. This material was used to test
22 the usefulness of the four business models in guiding managers in the development of
23 contrasted value creation strategies in collective ecosystem management situations. Workshop
24 participants' feedbacks helped to further refine the design of the four business models.
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36 The next section presents the theoretical framework elaborated in the course of this
37 research and deepened during the preparation and writing of this paper as we went back to the
38 literature, which provides important conceptual foundations for business models *for* ecosystem
39 management services.
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47 **Theoretical framework**

48 *Foundations in sustainable business model and entrepreneurship literatures*

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51 The business model concept has gained an increasing popularity both in academic and
52 practice management communities (Wirtz et al., 2016). This is a young phenomenon, notably
53 due to the rise of internet business in the mid-1990s that challenged existing prevalent business
54 logics (Alt & Zimmermann, 2014). It has so far been used to address research questions in
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3 different management areas such as e-business design, value creation and capture strategy
4 design and analysis, technology and innovation management, and more recently corporate
5 sustainability (Osterwalder, Pigneur, & Tucci, 2005; Zott, Amit, & Massa, 2011). The concept
6 is still emerging and competing approaches and definitions co-exist (see for instance Jonker,
7 2012; Osterwalder, 2004; Teece, 2010; Zott et al., 2011). In essence, as Magretta (Magretta,
8 2002, pp. 4) puts it, “business models are stories that explain how enterprises work”. A business
9 model can thus be thought of as a conceptual tool that describes the principles by which an
10 organization creates, delivers and captures value, and expresses a company’s fundamental
11 business logic by which it generates profitable and sustainable revenue streams (Osterwalder
12 & Pigneur, 2010).

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Business models are generally structured in a series of “building blocks” or “elements”
combined in a coherent manner (*Ibid*). In this paper, 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, i.e. 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, pp.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;

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3 Markides, 2006; Teece, 2010). Business model innovation is about rethinking regularly value
4 proposition, value creation and value capture, and in that sense, it has to be regarded not only
5 as a vehicle for technological innovations but as an innovation in itself (Chesbrough, 2010;
6 Teece, 2010). As we will see in the case of Lyonnaise des Eaux, important barriers to business
7 model innovation exist that are often due to path dependencies and resistances to change created
8 by dominant business logics at a given time (Chesbrough, 2002). A growing body of literature
9 looks more specifically at how business model innovation is to contribute to both corporate and
10 society's sustainability goals (Bocken, Boons, & Baldassarre, 2019; Bocken, Short, Rana, &
11 Evans, 2014; Boons & Lüdeke-Freund, 2013; Evans et al., 2017; Johnson & Suskewicz, 2009;
12 Lüdeke-Freund, Carroux, Joyce, Massa, & Breuer, 2018; Schaltegger, Freund, & Hansen,
13 2012).

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28 Recently, efforts have been made to conceptualize and refine the definition and ontology of
29 "sustainable business models" (Stubbs & Cocklin, 2008; Upward & Jones, 2016) or "business
30 models *for* sustainability" (Lüdeke-Freund, 2010; Schaltegger et al., 2016). Schaltegger et al.
31 (2016, pp.6) define them as models that "help describing, analyzing, managing and
32 communicating (i) a company's sustainable value proposition to its customers, and all other
33 stakeholders, (ii) how it creates and delivers this value, (iii) how it captures economic value
34 while maintaining or regenerating natural, social and economic capital beyond its
35 organizational boundaries". In our study, we explore a specific perspective of business model
36 *for* sustainability where creating significant positive contributions to natural capital is not
37 something that happens (purposefully or not) while delivering some other kind of goods and
38 services, but is in fact what lies *at the heart* of the value proposition and the services being sold.
39 In the recent literature proposing classifications to navigate the diversity of business models
40 innovations for sustainability, such a perspective corresponds most to the "repurpose for
41 society/the environment" archetype (Bocken et al., 2014; 2019; Ritala et al., 2018) that notably
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3 encompasses social enterprises and “B Corps” types of innovations (Stubbs, 2017). Indeed, it
4 concerns “for profit” enterprises primarily driven by the delivery of positive environmental
5 value (for customers, other stakeholders groups and society) while generating economic
6 revenue.
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12 Theoretical foundations for the development of business models *for* ecosystem
13 management services thus also need to build on the ecopreneurship and sustainable
14 entrepreneurship literature that focuses precisely on studying how and under what conditions
15 the pursuit of profitable (but not profit maximizing) business ventures can successfully
16 contribute to solving society’s socio-environmental problems (Belz & Binder, 2017; Hall et al.,
17 2010; Hockerts & Wüstenhagen, 2010; Hoogendoorn et al., 2019; Hörisch, 2015; Muñoz &
18 Cohen, 2017, 2018; Schaltegger & Wagner, 2011; Stubbs, 2017). Central to this academic field
19 is the study of how entrepreneurs discover, create and exploit “opportunities” to create future
20 goods and services contributing to the generation of social and environmental gains for others
21 in society (Hoogendoorn et al., 2019, p. 1135; Pinkse & Groot, 2015, p. 634; Shane &
22 Venkataraman, 2000). In line with our focus on how environmental sector companies can act
23 as “creative problem-solvers” for the preservation of ecological entities, we will follow Stål &
24 Bonnedahl (2016, p. 78) conceptualization of the key notion of “opportunity” as “situations in
25 which new means to sustain and enhance critical natural capital [i.e. that has intrinsic value and
26 cannot be substituted by other types of capitals] are created”. This approach provides an
27 alternative to the dependence of entrepreneurs upon the discovery of market failures or the
28 existence of market-based solutions (e.g. that would involve for instance pricing or allocating
29 and exchanging property rights on ecosystems) by insisting rather on the proactive role
30 entrepreneurs can play in facilitating the emergence and inventing new types of collective and
31 institutional arrangements to sustain biodiversity and ecosystems (*Ibid*).
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3 *Foundations in strategic and collective ecosystem management literatures*
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5 While the sustainable business model literature provides many insights regarding roles
6 business can play in solving sustainability issues in various domains (e.g. transportation:
7 Bohnsack, Pinkse, & Kolk, 2014; urban energy efficiency: Gauthier & Gilomen, 2016), in our
8 view the development of business models *for* ecosystem management services however raises
9 very unique social, organizational and strategic issues that stem from the fact that biodiversity
10 and natural capital, in the great majority of situations, fall under the category of common goods
11 (Ostrom, 1990; Ostrom et al., 1994; Winn & Pogutz, 2013). As a consequence, effectively
12 protecting, restoring and managing ecological entities (e.g. wetlands, ecological corridors,
13 lakes, bird populations, etc.) requires addressing complex collective action challenges in which
14 public and private actors use or impact the ecosystem in different ways, hold diverging priorities
15 and interests, and act in fragmented and sometimes conflictual ways.
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30 This demands to pay great attention to the serious agency questions that underlie the
31 collective management of any ecosystem, e.g. in a given situation, who do we expect to initiate
32 action, with whom, in what relevant perimeter and on what aspects of the ecosystem? What
33 privileged forms of action could be envisaged and with what equipment or formal/informal
34 arrangements and institutions? Who defines the key ecological performance goals and through
35 what kind of process (regulation, negotiation, dialogic approaches, etc.)? Who is in a position
36 to hold others accountable on such goals? This in turn requires to mobilize key theoretical and
37 conceptual resources specifically relevant for the analysis of different fundamental dimensions
38 of the collective management of ecosystems and natural resources, i.e. underlying models of
39 organized action for conservation to reflect on the diverse possible answers to the question
40 “who should act on whom to create environmental changes?” (Mermet, 2018a; Mermet et al.,
41 2013, 2014); Strategic Environmental Management Analysis to reflect on resistance to change,
42 sectorial logics and power dynamics between actors affecting the potential to reach
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3 environmental performances in diverse ecosystem management settings (Mermet, 2011;
4 2018b); common-pool resources theory to analyze coordination challenges in socio-ecosystem
5 users' communities (Ostrom, 1990; Ostrom et al., 1994); the "Economies of worth" to analyze
6 the potential value systems conflicts and compromises between actors in situations of
7 environmental disputes (Boltanski & Thévenot, 2006; Chiapello & Boltanski, 2005; Thévenot
8 et al., 2000).

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

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[Insert Figure 1]

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.

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3 The success and wealth of Lyonnaise des Eaux mostly rested on the specificities of the
4 French model of public services concessions that was gradually institutionalized in the 19th
5 century. In this model, a public authority (typically a municipality) can delegate the financing,
6 construction and management of public services and utilities to a private operator. The
7 municipality remains the political organizing and decision-making authority (definition of
8 objectives, price, investments, monitoring means, etc.) as well as the full owner of the
9 investments once the contract ends. It benefits from the flexibility, the technical and innovation
10 capacities of private companies, as well as their legal, financial and economic expertise. Long-
11 term concession contracts (*Délégations de Services Publics*) create Public Private Partnerships
12 based on a compromise between common good values that characterize the delivery of public
13 services and market and industrial values that characterize the private sector (Barraqué, 1995;
14 Batisse, 2015, pp. 59–62). The model of public services concessions, that constitutes the DNA
15 of Lyonnaise des Eaux and other big French concessionaires, has allowed them to gradually
16 diversify their activities beyond water management into a multiplicity of other urban services
17 (waste, urban heating, construction industry, communication, funeral services, etc.). As
18 Normann & Ramirez (1993, pp. 77) show in their seminal article introducing the notion of
19 “value constellation”, thanks to their strong and long-term anchorage to a large customer base
20 and to specific locations and cities, such firms are pioneers in inventing new modes of value
21 creations, and more specifically in: “[...] the design and management of inter-connected, co-
22 productive offerings. They have learned how to mobilize value creation in their customers and
23 partners by reconfiguring roles, relationships and structure. And they have learned the art of
24 perpetually reinventing value in a dialogue between competencies and customers”.

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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”. Firstly, the 2000s decade is marked by a rise in the critics against the concession

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3 model, accused of accelerating the privatization and commodification of common goods and
4
5 fueled by several public scandals involving the company in France and abroad. This created a
6
7 climate of distrust between the firm, public authorities and citizens-water users that led to higher
8
9 levels of competition between utility firms for the attribution of concession contracts, as well
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11 as in an increase in the number of municipalities choosing to go back to fully public
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13 management of water services (Batisse, 2015, pp. 64–70). This situation has tended to give a
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15 privilege to firms offering the lowest contractual price of water to the detriment of an
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17 enrichment of concession offerings with additional and innovative services. Secondly,
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19 emerging environmental and water resources preservation issues, both in quantitative terms (i.e.
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21 decrease in the amount of available water due to climate change and demographic growth) and
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23 qualitative terms (i.e. new water pollutions by micro-pollutants, farming pollutions such as
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25 pesticides and nitrates, etc.), have led to the rise of water services management costs often
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27 internalized by utility firms (Souriau, 2014). Thirdly, there has been an almost continuous
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29 downward trend in the volumes of water sold since the 1990s (an average of 1% per year in
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31 France), while water public services and private concessionaires still base their revenues on the
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33 volumes of water billed to service users (Barraqué, Isnard, Montignoul, Rinaudo, & Souriau,
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35 2011; Souriau, 2014, pp. 175, 186–187).

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

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5 *An innovation strategy for the management of the “extended water cycle” ecosystems*
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8 This context led the firm to develop new business activities, explore new strategies and
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10 reflect on the transformation of its mode of value creation and remuneration to move “from
11
12 volume to value” (Sempels & Hoffmann, 2012, p. 169). First, a series of steps were taken by
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14 the company to transform its historical business model by better taking into account the new
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16 social, governance and environmental challenges arising in the perimeter of its core small water
17
18 cycle activities (i.e. drinking water; sanitation). These efforts which included the creation of a
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20 Sustainable Development division (2005) as well as the development of a Corporate Social
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22 Responsibility Agenda, culminated in the creation in 2011 of the Contract for Water Health that
23
24 aimed at redefining the terms and goals of the concessionary contracts and renewing the
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26 relationship between the firm, municipalities, local stakeholders and water service users
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28 (Batisse, 2015; Feger, 2016, pp. 225–230). Part of these efforts also addressed biodiversity
29
30 protection concerns, for instance by promoting new management techniques on the company’s
31
32 operation sites that favored better protection of species richness while improving reputation and
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34 reducing costs (in line with “business case for sustainability” drivers, Schaltegger et al., 2012;
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36 Schaltegger & Beständig, 2012). Secondly, Lyonnaise des Eaux’s top managers increasingly
37
38 expressed their will to go further by transforming the company into a “services business” and
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40 by opening it to a diversity of new value creation modes beyond the prevalent small water cycle
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42 concession model (i.e. developing new contractual models, finding new public and private
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44 customers, offering new services and technological, societal and environmental innovations,
45
46 etc.). This transformation relied on a commercial diversification strategy in two main domains
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48 of innovation: “the Smart” (new digital technologies, remote reading and data management,
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50 dynamic management of water networks, etc.); and more interestingly for our research the
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52 “extended water cycle”.
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3 Used in opposition to “the small water cycle” activities that focus on water treatment
4 plants, pipes and other man-made infrastructures, the notion of the “extended water cycle”
5 refers to water-related ecosystem management issues such as: flood risks mitigation; green
6 infrastructures for rainwater management; watershed, surface and ground water protection;
7 wetland and ecosystem services maintenance and restoration; biodiversity protection; climate
8 change adaptation, etc. (Amigues & Chevassus-au-louis, 2011; Narcy, 2004). By envisaging
9 such ecosystem management issues not only as a corporate social responsibility agenda or a
10 “business case for sustainability” concern, but also as a real opportunity to develop new
11 commercial services, new professions and new modes of value creation, the firm opened a path
12 towards the development of new business models *for* ecosystem management services. As
13 I.Kocher (ex-CEO) claimed publicly as soon as 2008: “The water cycle lies at the heart of
14 sustainable development. It opens incredible perspectives to give value to our business
15 activities” (LDE, 2010).
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33 The development of the “extended water cycle” diversification strategy began around 2008
34 with the creation of a Resources Delegation within a wider Technical Division of Innovation
35 and Diversification. Its mission was to provide support to technical regional centers in France
36 that were starting to experiment locally with new aquatic ecosystems management activities in
37 response to punctual emerging demands from their clients (catchments protection plans,
38 improvement of bathing waters, R&D on the purification potential of artificial wetlands,
39 collection of floating objects, rehabilitation of rivers’ dried branches, harbors’ water quality
40 management, etc.). A member of the Resources Delegation commented the atmosphere that
41 prevailed at this time, as efforts were made to identify and integrate these different experiments
42 at the firm level: “It was very sensitive, almost secret. The regional centers were afraid and did
43 not know this new sector of activity well. They did not know how to speak about it and were
44 not ready to establish relationships with new stakeholders and clients”. In 2009, the
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3 Environmental Protection Division (that became in 2011 the Environmental Engineering
4 Division) was created to organize at a larger scale the development of these new activities
5 around five orientations: aquatic environment monitoring, wetland restoration, quantitative
6 water management, urban waters, biodiversity protection.
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12 The diversity of cases that we documented during our research shows how the firm then
13 gradually ventured in new multi-stakeholder contexts, engaged with new customers, developed
14 new types of partnerships with environmental NGOs, and tested new forms of ecosystem and
15 natural capital assessments tools (for the latter, see for instance Feger, Cabral, Basque, Levrel,
16 & Chambolle, 2015; Levrel, Cabral, Feger, Chambolle, & Basque, 2017) (see box 1 for
17 illustrations).
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29 **Box 1: Three contrasted examples of ecosystem management interventions**

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31 *Example 1:* In Montagny-les-Beaune in Burgundy, Lyonnaise des Eaux won a contract for
32 the management of an inland water body owned by the municipality, the main client. The firm's
33 mission was both to develop a natural bathing pool equipped with an innovative natural
34 filtration system for touristic and recreational activities, and to develop aquatic and terrestrial
35 biodiversity natural habitats monitoring and management services in more restricted areas of
36 the site in partnership with other ecosystem users (a fishing association, the local birds'
37 protection NGO, the natural areas conservatory, etc.). The company was paid with an annual
38 subsidy provided by the municipality, and negotiated on the basis of a hypothetical volume of
39 visitors on the site. This example shows the possible emergence of new types of concessionary
40 contracts that are dedicated or include ecosystem management activities (see section 4, model
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56 *Example 2:* In the Flins-Aubergenville area, where Lyonnaise des Eaux historically owns
57 some of the water catchments that supply western parts of Paris, the company initiated a diffuse
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3 pollutions reduction plan (nitrogen, pesticides, etc.) to protect groundwater quality, increasingly
4 threatened by nearby intensive agriculture practices and urban pressures. In partnership with
5 local farmers' associations, the plan consisted essentially in offering information as well as
6 technical (e.g. economic and scientific assessments and measurement tools) and administrative
7 support services to farmers who would like to turn to less intensive and impactful agricultural
8 practices. Funded at 80% by public funds and 20% by Lyonnaise des Eaux's own funds, this
9 project was not a source of profitability for the firm. Its legitimacy as a for-profit actor to lead
10 such action plan was also regularly questioned by some of the local stakeholders. However, the
11 company thereby experimented new forms of public and private strategic alliances and
12 developed innovative activities aimed at reaching quantifiable ecological goals by mobilizing
13 public funds (see section 4, model 1).

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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 section 4, model 3).

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 pre-defined 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 '*ensemblier*' 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 managers of the Environmental Engineering Division: "What we wanted, was to be an '*ensemblier* [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

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3 implementation of long-term ecosystem management activities and responsibilities (same
4 manager as above): "...It never happened. It is not possible in the current context (...), nothing
5 is organized for it to happen. There is no place for an '*ensemblier*' [of ecosystems]".
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10 Secondly, we observed that the commercial team in charge of the extended water cycle
11 diversification was facing a triple challenge when promoting their activities internally: (1) the
12 development of new ecosystem management services stand-alone offerings always required
13 from them additional efforts when compared to their usual small water cycle commercial
14 activities, as they had to identify and reach out to potential clients and partners that they had
15 often not been trained to discuss and negotiate with; (2) the outcomes of these negotiations were
16 always much more uncertain than on small water cycle services; the returns on investments
17 generally slower; and the financial order of magnitude of the offerings much less important
18 than the small water cycle concessionary deals; (3) the team was often confronted to resistance
19 from colleagues still strongly attached to the firm's prevalent small water cycle "culture of
20 pipes".
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35 Finally, while the place and legitimacy of the company to intervene in the small water cycle
36 management is historically and legally well-founded, the fragmented characteristics of
37 ecosystem management and land use governance (public actors' responsibility and jurisdiction
38 perimeters are compartmentalized; there is a lack of funding dedicated to ecological restoration,
39 etc.) and the prevailing suspicion expressed by local actors from public institutions or
40 environmental NGOs regarding the intervention of a for-profit actor in common goods'
41 management forced the company in each situation: to re-invent and re-negotiate its
42 relationships with other actors interacting with the ecosystem; to redefine the foundations of its
43 legitimacy and license to operate; to provide the measurable evidence of its added value to
44 biodiversity and natural capital restoration through innovative ecosystem assessment methods.
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60 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.”

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.

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 pre-defined role for a for profit actor on ecosystems, no pre-defined 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 re-invent 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

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

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3 strategic and negotiation pathway for an environmental sector firm that seeks to develop
4 activities and ecosystem management services aimed both at creating ecological value with
5 other stakeholders in diverse ecosystem management situations and at earning a corporate
6 revenue recognized as legitimate (see Table 4).
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12 Differences between the four models are shaped by contrasted public ecosystem governance
13 and policies contexts (Lüdeke-Freund & Dembek, 2017; Muñoz & Cohen, 2018): while in the
14 first two models (“the ecological consortium” and “the ecological concession”) public
15 initiatives, stable institutions, as well as environmental regulation and funding have an
16 important role in structuring business opportunities, the two others (the “ecological B2B” and
17 the “ecological collaborative”) are on the contrary adapted to situations where public actors
18 mostly fail to act and be accountable for environmental issues and where opportunity is thus
19 rather created by private actors and the firms’ own initiatives for environmental change. This
20 has important implications on the types of primary customers as well as on the collective of
21 stakeholders with whom the firm needs to compose to protect or restore ecosystems in each
22 model, and on the fundamental structure of their accountability relationships and the value
23 compromises on which they rest⁴ (see Figure 2).
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40 This also has consequences on the firm’s strategic capabilities and governance structures
41 that would be best adapted to the pursuit of these four distinct approaches: while the first two
42 models rather call for prioritizing large scale stability and long-term projection capacity, and
43 the development of technical, managerial and R&D skills that can be transferred from one
44 project to another (in model 1) or from one site to another (in model 2); the last two models
45 rather require to prioritize strong regional or local territorial embeddedness necessary for
46 building trust-based relationships with other local actors (Dufays, 2016; Kibler et al., 2015;
47 Shrivastava & Kennelly, 2013; Slawinski et al., 2019), and to accept the slow and uncertain
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3 temporal dynamic that characterizes the identification, collective exploration and incremental
4 treatment of ecological issues (Latour, 2004).
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10 *The ecological consortium (1)*

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12 In this business model, the opportunity is generated by the emergence of strong political
13 dynamics around the achievement of large-scale biodiversity and natural capital restoration key
14 performance targets, gradually normalized by the public power (e.g. good ecological and
15 chemical quality of water bodies under the European Water Framework Directive; coastal and
16 marine biodiversity, etc.) (see for instance Jackson, 2009; TEEB, 2010). The primary customers
17 are institutions in charge of public investment channels, and of assessing, choosing and
18 allocating funds to projects that will effectively contribute to achieving these ecological goals.
19 Public or private actors with various competences in ecosystem management are in strong
20 competition to attract and mobilize these funds.
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33 The environmental sector company's value proposition consists in operationalizing the
34 public authorities' biodiversity and natural capital large-scale commitments in a diversity of
35 ecosystem multi-stakeholders conservation and restoration projects at the regional and local
36 scale, by leading the constitution of (or getting actively involved in) competitive consortiums.
37 To this end, the key activities offered by the firm include its environmental expertise as well as
38 innovative technical services for ecological restoration and monitoring, but also its multiple and
39 adaptable organizational competences in project development and management that can be
40 applied to different contexts and places (financial skills; communication; R&D and innovation
41 capacities, business intelligence activities, etc.) and that makes it rapidly indispensable to other
42 members of the consortium. The firm's revenue stream is to be negotiated with other members
43 of a given consortium based on the level of contribution of the firm's key activities to the
44 consortium's functioning and to the consortium's overall achievement of ecological results, that
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3 ultimately condition the amount of public funds it receives. Ecological accounting systems can
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5 be developed to support such negotiations between the consortium and the funders, and among
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7 the members of the consortium themselves.
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10 In this model, the collective action challenge is to develop and maintain over time strong
11
12 strategic alliances with key stakeholders from the environmental sector that complement the
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14 firm's own technical expertise and geographic localizations (e.g. a nature conservation NGO
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16 that have offices in different regions, a small consultancy specialized in a specific ecological
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18 engineering technic, well respected public research centers in ecology who can give credibility
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20 to biodiversity and natural capital performance assessments procedures, etc.). The firm can then
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22 carefully chose among the members of its diversified local, regional and national partnerships
23
24 network the relevant allies with whom to develop in an opportunistic way ecological
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26 consortiums in capacity of generating the biodiversity and natural capital gains expected by
27
28 various funders. One critical condition for success is for the firm to be recognized as a legitimate
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30 environmental sector player by others, by clearly claiming its adhesion to its core values and
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32 mission and its willingness to demonstrate environmental accountability.
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40 *The ecological concession (2)*

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42 In this business model, an opportunity is created by the development of regulations allowing
43
44 for the emergence of new types of concessionary contracts dedicated to the restoration and
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46 management of biodiversity and natural capital in sites of particular socio-ecological value (e.g.
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48 the management of peri-urban wetlands useful in the prevention of flooding; of abandoned
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50 gravel pits that have become a rich fauna and flora habitat; of a local natural reserve, a
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52 privileged access due to direct proximity to a built infrastructure such as a dam, etc.). The
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54 primary customer is typically a public actor (e.g. a municipality) that exercises sovereignty over
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3 an area whose perimeter is well defined (e.g. by property or land-use rights; etc.), and that
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5 chooses to delegate its management to an environmental sector firm.
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8 The environmental sector company's value proposition consists in offering key activities to
9
10 ensure a delivery: the socio-ecological management of the site. The firm's legitimacy and
11
12 revenue stream is primarily correlated to its ability to demonstrate the ecological value created
13
14 (or maintained) on the site over long-term periods. It thus primarily offers technical and
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16 ecological engineering services in order to achieve the site's key ecological performances
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18 negotiated and contractually agreed on with the client (e.g. maintaining a wetland system's
19
20 water treatment functionality while restoring migratory birds' habitats) as well as biodiversity
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22 and natural capital information systems to assess and monitor the site's quality.
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26 In addition, the client also expects the firm to mediate conflicts over the use or overuse and
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28 degradation of the site's natural common goods by other key stakeholders who have access to
29
30 the site and benefit from its biodiversity and natural capital through various activities (e.g.
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32 farmers who practice extensive breeding on the peri-urban wetlands; NGOs who organize
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34 birdwatching activities in biodiversity rich sites such as the gravel pits; aquaculture and
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36 recreational fishing, etc.). To address this collective action challenge, the firm needs to
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38 implement a concerted governance of the site where every user's practices and specific
39
40 relationship to the site's ecosystems as well as social traditions are taken into account,
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42 collectively discussed and assessed on the basis of a shared ecological representation and
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44 accountability system. To this aim, it can offer specific consultation and multi-stakeholders'
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46 coordination services. Ultimately, the condition for success depends on the firm's ability to be
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48 accepted by this diversified community of users as a legitimate actor by creating proximity and
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50 trust based on non-commercial partnerships and by addressing some of their needs (as long as
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52 they do not threaten the key performance goals expected by the primary customer).
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3 *The ecological Business to Business (3)*
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5 In this business model, an opportunity emerges from the social and economic costs born
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7 by a number of actors as a result of the bad or ineffective management of a given ecological
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9 entity (e.g. an industry, a group of shellfish farmers and a local environmental NGO suffering
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11 from the bad management of the water quality of an estuary respectively in terms of reputation,
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13 ecological losses and biodiversity degradation). However, despite the conflict-ridden climate
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15 likely arising from this situation, this group of actors cannot or does not want to reach out for
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17 help by a public authority to resolve the issue for one reason or another (e.g. trust has been lost
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19 between the actors and the local municipality officials; local institutions prioritize public funds
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21 for more urgent social issues, etc.). The primary customer is one of these private actors (e.g. an
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23 industry that has impact on the river water quality and ecological continuity; a mining company
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25 that cares about its reputation; a group of farmers gathered in a cooperative, etc.) willing to take
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27 action to anticipate or to remediate to this situation that he judges to be too costly for him.
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33 The environmental sector company's value proposition is to assist the client's efforts in
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35 improving its relationships with other actors and with the environment in this controversial
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37 context, by gradually developing and equipping a local and autonomous collective management
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39 system of the shared ecological issue. The firm's revenue stream is linked to the implementation
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41 of the different steps necessary for this, for which key activities are offered. First, the firm can
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43 offer ecological assessment and accounting services (e.g. water quality monitoring tools;
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45 biodiversity inventories; impact assessments, etc.) to help the client and other local actors to
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47 objectify the situation, build trust and reciprocity by supporting their ability to understand and
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49 assess the environmental effects of each other's actions, and assemble them around a shared
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51 diagnosis of the ecological issue at stake. By offering mediation and coordination services (e.g.
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53 organization of informal meetings to build trust, etc.) the firm can then help actors to negotiate
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55 and agree on key ecological performance goals, identify potential synergies between everyone's
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3 demands and opportunities for cost reduction, elaborate an action plan, negotiate the allocation
4 of resources for everyone's action, etc. The company can finally offer ecological engineering
5 services to the primary customer and potentially other stakeholders to address part of the
6 ecological issue at stake and reach ecological targets (e.g. works for the ecological restoration
7 of the river banks, etc.).
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14 Here, the collective action challenge is the initial conflictual relationships or the absence of
15 dialogue between key stakeholders concerned by the ecological issue. To overcome this, the
16 company plays an active mediating role, and so doing, gets involved in the definition of the
17 ends and means of this emerging community of actors. A condition for success is thus for the
18 firm to prove on a regular basis that there is no conflict of interests with the client or any of the
19 other stakeholders, and to establish proximity and reciprocity with every actor. The firm can
20 achieve this by publicly reporting information on its own ecological performance and be
21 accountable to others on the contributions of its activities to the agreed on ecological goals.
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35 *The ecological collaborative (4)* 36

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38 In this business model, the firm itself creates the opportunity, by acting as the main
39 promoter and organizer of collective action in favor of ecosystems in contexts where the
40 fragmentation of environmental responsibilities leads to biodiversity and natural capital
41 degradation. In this model, contrary to the three previous ones, there is no public or private
42 primary customer who would be ready to take initiative to address such ecological degradation
43 in one way or another, and who would be in capacity of paying the environmental sector firm
44 for its ecosystem management services. The firm's value proposition consists in offering its
45 strong environmental engagement for environmental change and its ability to enroll and connect
46 other actors in a collaborative community to favor the emergence of multiple local projects in
47 favor of biodiversity. This model is notably inspired by the development of the "sharing
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3 economy”, where services and goods are exchanged directly between users that form a
4 community, and operate aside from the dominant socio-economic system (Rifkin, 2014).
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8 In terms of key activities in such a case, the firm can first identify, assess and alert on
9 local ecological issues that would benefit from collective efforts. As the main capacities and
10 resources for biodiversity conservation action (i.e. funding, land, etc.) are dispersed between a
11 diversity of actors (i.e. individual citizens, NGOs, companies, municipalities, etc.), the firm can
12 take the initiative through coordination and facilitation activities to develop and consolidate a
13 collaborative community of actors concerned by these issues and motivated to contribute to
14 their mitigation. Each member of this community thus becomes at the same time a client and a
15 seller of resources and contributions to co-create ecological value (e.g. a private farmer can
16 agree to open part of his land for biodiversity restoration project while a voluntary group of
17 young people can commit to working on this restoration site for a given period of time and a
18 local research center experiments new species surveys tools). To operationalize this effort, the
19 company can develop and operate local and original coordination devices such as collaborative
20 funding mechanisms inspired from crowdfunding, collaborative platforms for members to meet
21 each other, exchange resources and carry out collective projects. It can additionally propose
22 ecological auditing and accounting services to assess actions and projects supported by the
23 platform and quantify their contributions to the achievement of diverse key ecosystem
24 conservation performance goals. The environmental sector firm can also offer its own
25 ecological engineering and restoration services through the platform as technical contributions
26 to various projects.
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51 To be seen as a legitimate player and take its fair share of the funds available through
52 the platform as a revenue stream for its various coordination services or as a remuneration of
53 its ecological engineering services, the firm faces the same challenges as in the ecological
54 Business to Business (reciprocity, trust, transparency, no conflict of interest, etc.). However, in
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3 this case, a condition for success is that all participants of the collaborative community
4 (including the firm) are subject to the same requirements and rules regarding transparency on
5 performances and contributions to ecological value creation, under collectively agreed upon
6 conditions of evaluation and control. The firm must not only hold and demonstrate strong
7 ecological values but would also gain in involving other members of the community in its
8 corporate decisions.
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17 **[Insert Figure 2]**

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26 **Discussion**

27 *Contributions for theory and practice*

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30 In the last two decades, we have observed a gradual increase in calls by national and
31 international public institutions for companies to participate more in the collective efforts
32 required to protect global biodiversity. A lot of focus and hope has been put on the development
33 of new economic instruments (payment for environmental services; biodiversity offsets, etc.)
34 as well as hypothetical “ecosystem services markets” based on the economic valuation and
35 pricing of biodiversity, that would enable companies from diverse sectors to engage in
36 conservation efforts and adapt their business models accordingly (Bishop et al., 2008, 2009;
37 Houdet et al., 2012; TEEB, 2010, 2012). Such approaches and framing discourses have raised
38 strong criticism and fears of commodification of nature (e.g. MacDonald, 2010; McCauley,
39 2006), and so far their effectiveness in influencing business choices and in creating substantial
40 changes for biodiversity conservation remains to be proven (Mermet et al., 2014; van den Burg
41 & Bogaardt, 2014).
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3 In contrast, our paper looks at the issue from the other end. It provides an insider's view
4 of the concrete questions, hopes and difficulties faced by an environmental sector company that
5 actively develops a commercial strategy for ecosystem management activities, and in doing so
6 struggles to find its right place in the collective governance of these diverse and complex issues.
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8 It results in the development of an alternative interdisciplinary theoretical framework for the
9 development of business models for biodiversity, coupling a business-centred value creation
10 model with an ecosystem-centred value co-creation model, and founded primarily on the
11 negotiation and remuneration of measurable contributions to the collective achievement of
12 ecological performances at the ecosystem level. Four contrasted business models *for* ecosystem
13 management services in this perspective were developed through participatory methods,
14 providing four main consistent visions of the roles an environmental sector company can play
15 in collective efforts to protect ecosystem.
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30 These four proposed models remain limited in that they were produced in the context of
31 a specific action research with one large firm evolving primarily in the institutional context of
32 water management in France. Further research and experimentation is now needed to
33 demonstrate the transferability to other business and ecosystem management contexts and to
34 develop concrete devices to operationalize them (e.g. new types of firm-customer contractual
35 arrangements based on ecological performance, accounting innovations as described below,
36 etc.). However, we think these results can already be useful as conceptual tools for management
37 scholars and managers working with organizations that seek to (or already) develop ecosystem
38 management services. The schematic representation of the theoretical framework (Figure 1)
39 combined with the specific features of each model (Table 4) can be mobilized as a practical and
40 heuristic visual tool for analysis, design and strategic thinking. It can be used to (1) discuss,
41 compare and classify in a more systematic way past or current interventions of a given business
42 in ecosystem management; (2) identify opportunities and possible strategic pathways for
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3 developing compelling ecosystem management services offerings; (3) reflect and explore how
4 the four proposed visions could translate into more specific business, social, political and
5 regulatory realities in which they could then be further detailed. Our results could also inspire
6 the development of educational tools (e.g. through case study methods or simulation games) to
7 train managers or students in reflecting on issues lying at the intersection of business and inter-
8 organizational ecosystem management challenges.
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19 *Future research directions*

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21 One crucial aspect for the development of these business models, and a necessary condition
22 for their operationalization, is related to the development of ecological accounting innovations
23 (Russell et al., 2017). Although present as a watermark in the description of the four business
24 models, this issue would deserve a much more substantial development that we could not
25 adequately address in the scope of this paper. Let us just say here that in each of the business
26 models *for* ecosystem management services presented, the systematic assessment of ecological
27 contributions and performances holds a central place both as a basis of negotiation and
28 accountability to the client who expects and pays for obtaining measurable results in the
29 improvement of biodiversity and natural capital; but also as a basis of shared representation,
30 dialogue and trust-building with the partners and other actors with whom the firm co-creates
31 this ecological value. All these points are closely linked to the emerging "accounting for the
32 management of ecosystems" approach, at the crossroads of accounting scholarship and
33 conservation science, and the development of new ecosystem-centred accounting models aimed
34 precisely at equipping such inter-organizational initiatives at the scale of ecosystems (Feger,
35 2016; Feger et al., 2018; Feger & Mermet, 2018, 2017, 2020).
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55 Future research should also push further the theoretical framework introduced in this paper
56 by studying in more depth the profound linkages between changes in ecosystem policy and
57 regulatory contexts; the development of business models *for* ecosystem management services;
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3 and changes in corporate governance and accountability. In our views indeed, environmental
4 sector firms who engage in the development of such business models have a unique opportunity
5 of leveraging the transformative potential of such links. Firstly, they are likely to have a strong
6 interest in the development of policy and regulatory changes in favor of ecosystem preservation
7 at the (supra)national scale, institutionalizing clear commitments and biodiversity targets (e.g.
8 through the development of national ecosystem accounting), as this could become a source of
9 business opportunities for them. Secondly, such business models are inconsistent with profit
10 maximizing logics, if only because ecosystem management activities paybacks are necessarily
11 slower and smaller than in many other sectors (see Table 3). In addition, environmental sector
12 firms developing these new activities have every interest in making the multiple contributions
13 they bring to biodiversity and natural capital preservation (beyond their business perimeter)
14 visible and recognized by its stakeholders, society, as well as “green” public and private
15 investors. This gives these companies particular incentives and a unique opportunity to be
16 pioneers in redefining business purposes and what business value(s) creation actually means
17 (beyond solely monetary values, Busch et al., 2018); in taking into account the preservation of
18 natural capitals in their financial accounting systems and experimenting new ways of
19 calculating profit on this basis (see the Comprehensive Accounting in Respect of Ecology
20 model, Rambaud & Richard, 2015; Rambaud & Feger, 2020); and in opening their governance
21 structure to multiple stakeholders (beyond just shareholders) and developing fruitful alliances
22 with other environmental players (companies, environmental NGOs, institutions, research
23 centers, etc.).

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51 This could open the path towards building a strong environmental sector pushing for
52 ambitious ecosystem governance policies and at the forefront of the emergence of new models
53 of corporations, up to the difficult and urgent challenges of the Anthropocene.
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Notes

¹Biodiversity refers to the variety of life on Earth; ecosystems refer to communities of organisms in interaction with their non-living 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 paper 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 paper (at the time, a PhD student whose research was funded partly by the firm; 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 details in Feger, 2016.

³ At the annual greetings meeting on the 24th of January 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, 2015; 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) 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 underly the three other models. These aspects are discussed in more depth in Feger, 2016, chap 4, chap 8.

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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 paper.

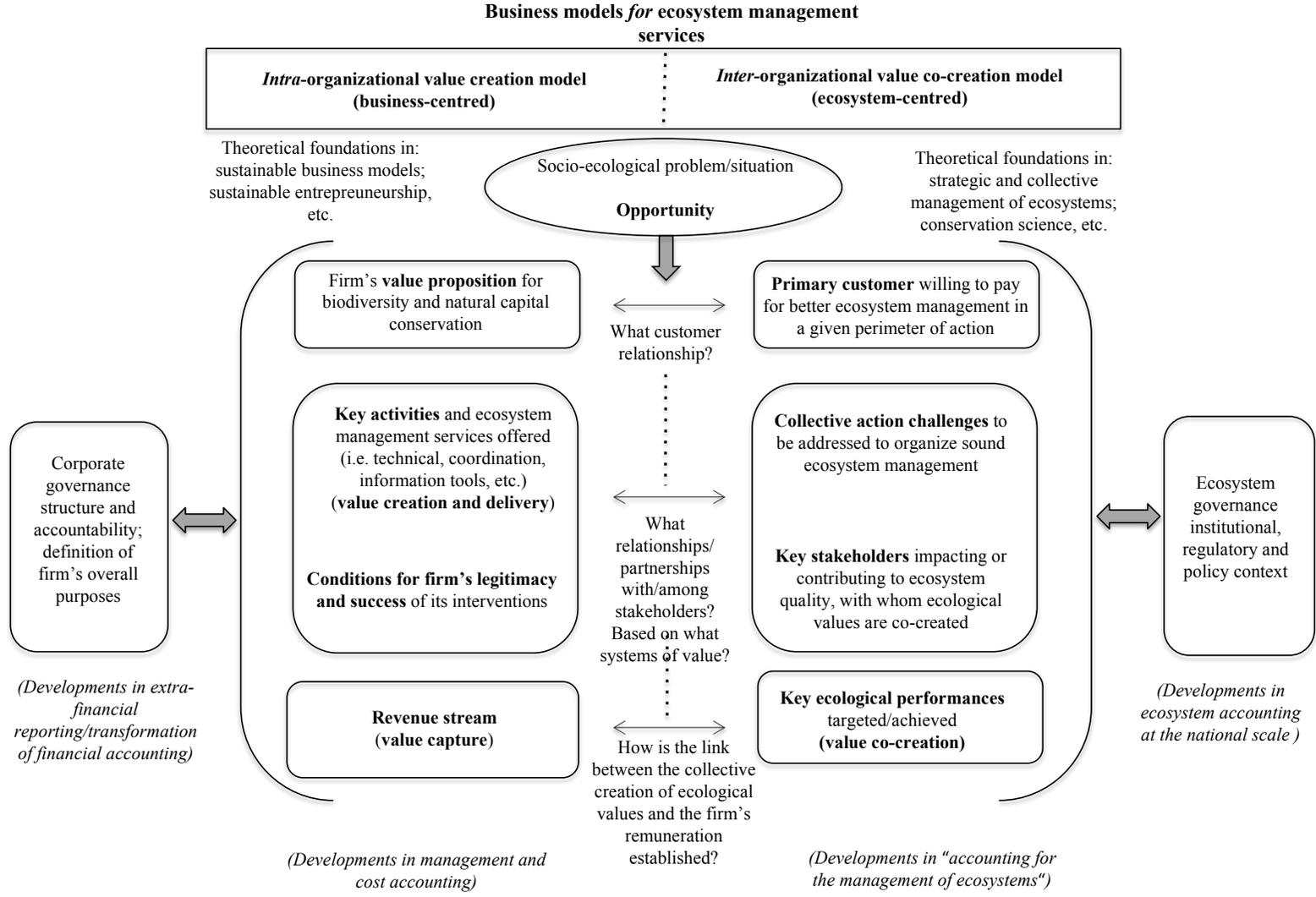


Table 4. Synthesis of the four business models *for* ecosystem management services’ main characteristics. These can be used in combination with Figure 1.

	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 his 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 negotiate 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

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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.

