

CASE STUDY

Accounting for nature contributions to people in corporate sustainability: The case of a waste management company in Portugal

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Abstract

Nature's contributions to people (NCP) are contributions of natural capital to people's quality of life, being at the center of political and societal concern. There is an increasing recognition of businesses' responsibility toward conservation and responsible use of natural capital. In this exploratory study, we identified gains of corporate investments on natural capital, focusing on LIPOR, a waste management company that closed and converted a dumpsite into a multifunctional Urban Green Space. We gathered and reviewed available data and concluded that there are €113,020,478 in NCP benefits, from €7,760,032 business investments by LIPOR, roughly representing a positive cost–benefit ratio of 14, over 2 decades. Results suggest that well-targeted business investments in natural capital can provide high rates of return associated with people's benefits. Our case study contributes to fulfilling a gap in business literature by deliberately linking rates of investment on natural capital with the valuation of NCP benefits.

KEYWORDS

biodiversity, ecosystem services, monetary valuation, nature contributions to people, participatory approach, waste management

1 | INTRODUCTION

The notion of nature's contributions to people (NCP) has been at the center of political concern worldwide (MEA, 2005; Roxburgh et al., 2020). Broadly speaking, NCPs have emerged from the concept of ecosystem services (ESs), with definitions and views that have been evolving in both the ecological and economic agenda (Braat & de Groot, 2012). Overall, and similar to ESs, NCPs refer to the contributions of living nature to the quality of life of people (Díaz et al., 2018). The recent global assessment on biodiversity and ESs has evidenced the unprecedented decline on ESs and NCPs as a result of multiple human drivers (IPBES, 2019). With an increasing awareness of nature's degradation, the recent 2022 United Nations Biodiversity Conference of the Parties to the UN Convention on Biological Diversity has set new goals to guide global action through 2030 to halt and

reverse nature loss. Also, the European Union, for instance, has been setting challenging strategic policies, for example, the European Green Deal for 2050 (European Commission, 2019) and the EU Biodiversity Strategy for 2030 (European Commission, 2020), to secure the sustainable flow of NCPs as well as the protection of natural capital and biodiversity.

Pressures to be sustainable are gaining importance in the business agenda as well, particularly in increasing conditions of limited natural resources, growing social perceptions, and ESG (environmental-social-governance) risk awareness (Ziolo et al., 2023). Beyond social and governance issues, there is increasing support for the particular view that businesses and society share a joint responsibility for the conservation of biodiversity and for the sustainable use of natural capital. Emblematic initiatives such as The Economics of Ecosystems and Biodiversity (TEEB), the System of Environmental-Economic Accounting

(SEEA) or the Capital's Coalition (e.g., through the Natural Capital Protocol), all draw attention to the role of the business sector, policy-makers and society in biodiversity and ecosystem maintenance (Braat & de Groot, 2012).

Particularly, the business sector has been increasingly motivated to report on their impacts on ecosystems and biodiversity, so that environmental issues have become key factors for their business strategy (Cho & Patten, 2007; Houdet et al., 2012). Companies are also increasingly required to provide a natural capital accounting, not only to guarantee an appropriate management of their environmental impacts and opportunities, but also to ensure investors are fully informed about the sustainability of their investments (European Commission, 2019). Both nature accounting and reporting are increasingly recognized in the business arena, particularly with the recent popularity of international initiatives such as TNFD (Working Group on Nature-related Financial Disclosures), CSRD (Corporate Sustainability Reporting Directive), GRI (Global Reporting Initiative), SbTN (Science-Based Targets for Nature), SDGs (Sustainable Development Goals) and the Kunming-Montreal Global Biodiversity Framework, among many others.

At the very center of nature accounting and reporting is finding ways of implementing NCP valuation. NCP values have been popularly accounted for based on neoclassical economic approaches focused on marginal values (or prices), such as the Total Economic Value (TEV) (Liu et al., 2010). Therefore, valuation, and especially monetary valuation, is sometimes understood as implying that biodiversity and nature benefits must be privatized and commodified (Braat & de Groot, 2012). Nevertheless, biodiversity and natural capital valuation can be depicted as a form of “regulatory adaptation by serving as a mechanism to provide feedback in an economic system” (TEEB, 2010). From this perspective, the economic valuation of NCPs becomes a logical element for the strategic development of the business sector in the light of sustainability, fairness and efficiency goals (Braat & de Groot, 2012; Costanza, 2020). The accounting of business investments and their return values in terms of NCPs can serve as a vehicle to overcome the traditional view of business's dependencies and impacts on nature (Waage, 2014).

There is an increasing agreement on the need to create and report on NCP value, however studies and evidence in this topic are still needed (Roberts et al., 2023; Ziofo et al., 2023). Additionally, despite its relevance for business viability and risk mitigation, studies and approaches incorporating financial issues with environmental information in corporate sustainability reporting are in their infancy, particularly when it comes to natural capital and nature's contributions (Xie et al., 2023). In this context, here we present a case study focused on the valuation of NCP derived from the investments of a public company from Northern Portugal: LIPOR – Municipalities Association for Sustainable Waste Management of Greater Porto. As highlighted by previous evidence from multiple firms, the integration and disclosure of environmental sustainability commitments associated with waste management can drive financial performance (Benjamin et al., 2020; Gull et al., 2022). Therefore, LIPOR's strategy relies on the triple bottom line (People, Planet, and Prosperity), where nature and nature

contributions to people are a matter of corporate responsibility included in the company's materiality matrix from 2018 (LIPOR, 2023). Nonetheless, materiality needs to be supported by other principles and actions to be effectively enacted (Aprile et al., 2023).

Over the last decades, LIPOR has converted a dumpsite into a closed landfill, followed by investments to convert the landfill into a multifunctional Urban Green Space. After 20 years of promoting and implementing these and other initiatives, actions and projects in favor of nature protection and biodiversity promotion, it became relevant to translate the impact of these investments into social, ecological, and socio-ecological benefits for the community. In this case study, we apply an exploratory return on investment analysis to identify the gains of investments on nature by an intermunicipal corporate business in terms of NCPs and the welfare of local communities. Considering the investment efforts made by LIPOR over the last two decades, we hypothesize that the benefits generated by such efforts have outperformed the investment costs. Our hypothesis is tested based on the following questions: (1) What have been the main NCPs and related benefits promoted by LIPOR? (2) How much do those NCPs and corresponding benefits add to the economy of local communities? and (3) Are LIPOR's investments in natural capital compensated by NCP values? The results of this exploratory study suggest that from the €7,760,032 business investments assumed by LIPOR over the last two decades, €113,020,478 were generated in terms of NCP benefits, roughly representing a positive cost–benefit ratio of 14. Our results are discussed in the wider context of natural capital accounting and the corporate business strategy for environmentally sustainable development.

2 | METHODS

2.1 | Case study description

Our study was focused on the Municipalities Association for Sustainable Waste Management of Greater Porto (LIPOR), located in Northern Portugal (Figure 1). LIPOR was founded in 1982 as a Municipalities Association to manage, recover, and treat the municipal waste from eight municipalities of the Greater Porto, which covers an area of ca. 646.11 km² with an average population density of 1885.61 inhabitants/km². To mitigate its negative environmental impacts at the beginning of its operations, LIPOR converted a dumpsite into a closed landfill, confining over 2.500.000 tons of municipal waste. The restoration of the landfill was concluded in 2009, with the establishment of a multifunctional Urban Green Space (UGS) offering educational, leisure and recreational opportunities (Machado et al., 2018). Additional investments were also adopted to foster environmental awareness, as well as bioeconomy and sustainable waste management along the supply chain. Examples include the development of environmental education initiatives for the public, the implementation of a recyclable waste sorting plant and the deployment of an in-vessel composting facility that delivers raw materials for local and national businesses.

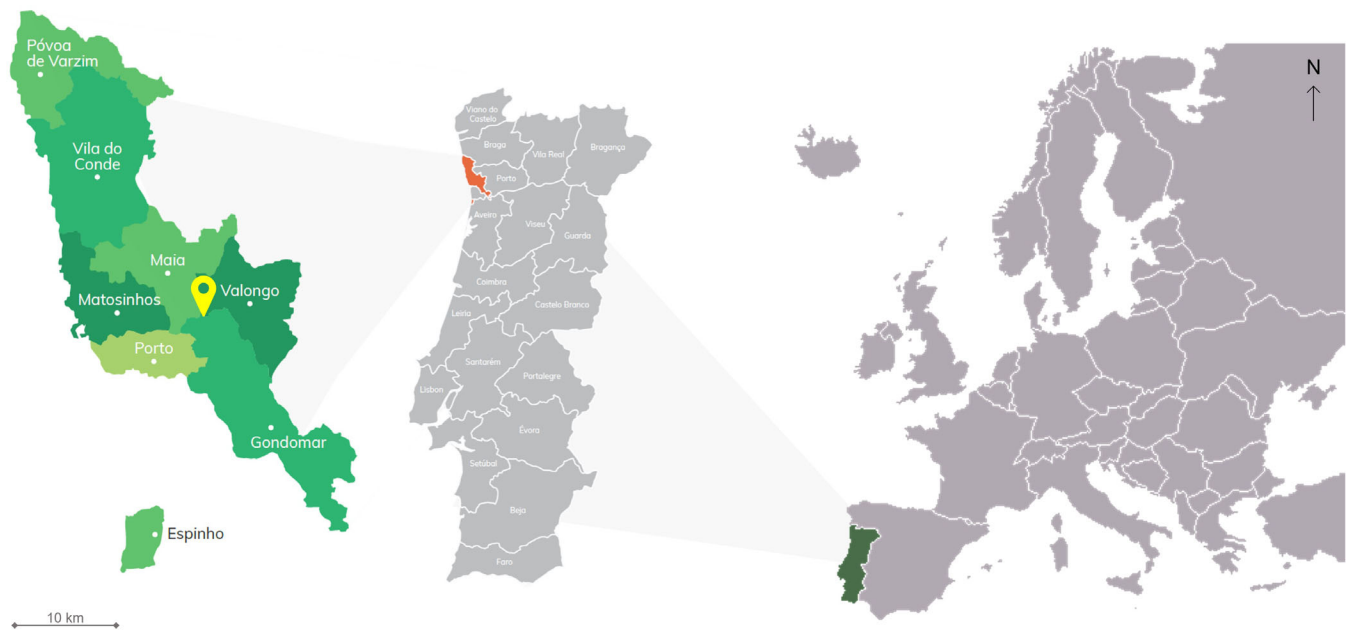


FIGURE 1 Geographic location of the eight municipalities managed by LIPOR in the Greater Porto, Portugal. The map shows the location of the municipalities at the local (on the left), Portuguese (at the center) and European (on the right) contexts.

2.2 | Methodological approach

To answer our three main questions, we followed a three-step methodological approach. The first step focused on the identification of the main NCPs and related benefits promoted by LIPOR's investments (Step 1). The second step focused on the collection of the necessary data to account for economic investments and corresponding benefits from NCPs (Step 2). In the third step, we proceeded with NCP accounting and monetary valuation to understand whether LIPOR's investments in natural capital have exceeded NCP values (Step 3). To do so, we organized a couple of focus groups with the company's stakeholders to trace an historical overview of the main conservation and environmental initiatives supported by LIPOR, from its beginning, in 1982, to 2019. We further identified the most perceivably relevant NCPs delivered by those initiatives (Section 2.3). Then, we gathered and reviewed all available data (e.g., company reports) to identify the economic investments of those initiatives as well as the performance-based benefits resulting from these initiatives in terms of NCPs (Section 2.4). Finally, we inferred the potential monetary value of such NCPs, based on the Total Economic Value (TEV) approach (Section 2.5).

2.3 | Step 1: Identification of key NCPs and biodiversity management initiatives

We conducted two focus group sessions with 12 stakeholders with responsibilities at the operational, tactical, and strategic levels related to biodiversity and ecosystem management at LIPOR, over the last 20 years. The organization of the first focus group session comprised

three main moments. The first moment consisted of a brief presentation by the research team, aiming to introduce the objectives of the focus group, key concepts, and definitions in NCP thinking and assessment. In a second moment the participants were invited to identify the NCPs most promoted by LIPOR's activities. A pre-existent list of NCPs (following Díaz et al., 2018) was first presented to the group (Appendix 1); then, the group engaged in a deliberative ranking exercise to assign a score value between 0 (not promoted) and 5 (highly promoted) to each NCP. In the third moment, participants were invited to identify all investments taken by LIPOR on natural capital and biodiversity management between the years 2000 and 2019. We defined investment on natural capital as "any activity that integrates investment in and replenishment of natural capital stocks to improve the flow of ecosystem goods and services, while enhancing all aspects of human well-being" (Aronson et al., 2007). To do so, a temporal mapping exercise was promoted to allow the identification of the start and end years of such initiatives (Appendix 2).

The main goal of the second focus group session was the selection and validation of NCPs. As such, all the information regarding the ranking of pre-existent NCPs collected in the first focus group session was organized into 6 main NCPs: (1) Food and feed (material NCP); (2) Habitat creation and maintenance (regulating NCP); (3) Regulation of climate (regulating NCP); (4) Formation of soil (regulating NCP); (5) Learning (non-material NCP); and (6) Physical and psychological experiences (non-material NCP; Table 1). This second focus group session also allowed the validation of a temporal map that condensed the information obtained in the first focus group session. The temporal map produced identified four key temporal moments in the history of biodiversity management at LIPOR: (1) 2000–2004: coincident with the start of the landfill conversion and the launch of the

TABLE 1 Material, regulating and cultural nature contributions to people (NCPs) considered in this study given its relevance for LIPOR's actions, with brief description. The table also shows a description of actions which were adopted over the last 2 decades to improve NCPs, as well as the indicators used to measure the progress of NCPs benefits. Finally, the table shows the proxy for the economic value used in the valuation of NCPs benefits (according to the considered indicators).

NCPs	NCP description	LIPOR actions	Measurement indicators	Economic value proxy
<i>Material NCP</i>				
Food and feed	Production of food from wild, managed, or domesticated organisms, such as fish, bushmeat and edible invertebrates, beef, poultry, game, dairy products, edible crops, wild plants, mushrooms, honey	Creation and expansion of new vegetable gardens used by local people	Number of family meals provided by vegetable gardens (no.)	Average national value of a family meal
<i>Regulating NCP</i>				
Regulation of climate	Climate regulation by ecosystems (including regulation of global warming), including effects on emissions of greenhouse gases (e.g., biological carbon storage and sequestration)	Restoration of vegetated areas	Amount of carbon stored in vegetation (t)	Economic value of the damage costs from carbon emissions
		Recycling of domestic materials by local people	Avoided carbon emissions (t)	Annual averages of monthly prices for secondary recyclable products in the European Union
Formation of soil	Formation and long-term maintenance of soil structure and processes by plants and soil organisms, including supply of organic matter and nutrients, processes that underlie the continued fertility of soils important to humans	Provision of residential composters	Amount of organic matter (biowaste) deviated by compost (L)	Savings on the collection of domestic wastes
		Organization of composting activities with local people	Amount of soil compost generated by composter (t)	Market value of a compost bag
Habitat creation and maintenance	The formation and continued production, by ecosystems or organisms within them, of ecological conditions necessary or favorable for living beings of direct or indirect importance to humans	Tree nursery for the afforestation of public areas	Number of trees used in land afforestation (no.)	Price of nursery plant species sold in market catalogs
<i>Non-material NCP</i>				
Learning	Provision, by landscapes, seascapes, habitats for organisms, of opportunities for the development of the capabilities that allow humans to prosper through education, acquisition of knowledge and development of skills for well-being and information	Organization of environmental education activities	Number of people attending education activities (no.)	Average cost of an extra-curricular or academic activity
		Number of online publications for the public	Number of publications visualization (no.)	Average price of an online public magazine
Physical experiences	Provision, by landscapes, seascapes, habitats for organisms, of opportunities for physically and psychologically beneficial activities, healing, relaxation, recreation, leisure, tourism and esthetic enjoyment based on the close contact with nature	Organization of recreational activities in the wild	Number of participants in recreational activities (no.)	Average price of a sport class
		Visits to the urban green space	Number of visits or visitors (no.)	Average price of entrance in a nature attraction site

environmental education office; (2) 2005–2009: coincident with the highest activity of environmental education actions and the launch of the first sustainability report; (3) 2010–2014: coincident with the opening of the Urban Green Space (UGS) to the public; and (4) 2015–2019: coincident with an increasing investment in UGS facilities and environmental sustainability projects.

2.4 | Step 2: Collection of data on nature investments and returns

In this step, we collected the necessary data to account for economic investments and corresponding benefits from NCPs for the projects and initiatives identified in step 1. Specifically, we reviewed all available documents to quantify the investments and outcomes generated by the set of initiatives and projects previously identified in step 1. Documents included statistics, cartography, reports, presentations, scientific articles, media news, and academic reports and theses. The quantification of investments was done by considering all monetary inputs allocated to each project/initiative per year, including costs with human resources (e.g., salaries), external services (e.g., consultancy), or materials (e.g., equipment).

From the set of available documents from LIPOR, we also gathered information on the outcomes derived from those projects/initiatives in terms of their contribution to NCPs (see Table 1).

For food and feed, we focused on household food provisioning by public vegetable gardens created and maintained by LIPOR (Gonçalves, 2013; Nova, 2017). From the size of vegetable gardens used by local families, we estimated the number of meals supported by these gardens, assuming an average of 21 family meals by m² of vegetable gardens in a year (following Glavan et al., 2018).

For the regulation of climate, we estimated the soil carbon stocks, below-ground, and above-ground, on the natural areas managed and restored by LIPOR (de Abreu Machado, 2019; Honrado et al., 2017). Concurrently, we gathered information on the weight of domestic materials (as a ton equivalent of paper, plastic and glass per year; see Appendix 3, Table S4) delivered by local people as part of LIPOR's initiatives to promote reuse and recycling.

Regarding the contribution to soil, we collected information on the amount of compost produced by LIPOR's composters in a year. Additionally, we estimated the amount of organic matter deviated by using all the composters freely provided by LIPOR, considering that each composter holds an average capacity of 409 kg of biowaste.

For the service of habitat creation and maintenance, a part of LIPOR's facilities is dedicated to the nursery of native plant species to be used in the reforestation of public areas. We gathered information on the amount of nursery plants used for reforestation purposes as a general proxy for habitat creation.

For learning, we gathered the number of participants attending the several environmental educational activities organized by LIPOR through the target years. Also, we gathered the number of accesses to online publications with environmental content produced by LIPOR for the general public.

To quantify the outcome from the physical experiences NCP, we gathered information on the number of participants in leisure and recreational activities LIPOR promoted (e.g., Sport activities) and the number of visitors to the Urban Green Space. We further considered the number of annual memberships to participate in several recreational activities organized by and at LIPOR. Details on data collection for the indicators of NCP benefits are provided in Appendix 3.

2.5 | Step 3: NCP accounting and monetary valuation

We followed the Total Economic Value Framework to estimate the value of use for each NCP benefit. We applied either the market price or the avoided cost methods. In the market price method, the value (or price) of the NCP is transferred based on the observable market price for similar goods and services. The avoided cost method considers the economic value of benefits that would not exist without the NCP in place, and therefore, would represent an added cost to society, if the NCP did not exist. Monetary estimates are shown in euro and consider the average discount rate for Portugal in each year between 2000 and 2019, following the [Portuguese] National Statistical Institute (INE).

In order to estimate the value of each family's meal, as a proxy benefit for food and feed, we used the average expenses with food products, as declared by domestic families in northern Portugal (data for 2011, according to INE). This value corresponded to €4.10, which was then multiplied by the total number of meals provided, according to the size of all vegetable gardens managed by LIPOR.

In the case of regulation of climate, the valuation of carbon sequestration in the restored areas was estimated assuming the economic cost caused by each additional ton of carbon dioxide emissions equivalent, according to the revised DICE model (Dynamic Integrated model of Climate and the Economy) for the year 2016, with a 3% discount rate (Nordhaus, 2017), ranging from €20.08, in 2010, and €26.21, in 2019. The valuation of avoided carbon emissions was done considering the secondary material price indicators from the Eurostat reference database for international trade in goods, for the period 2000–2019 (<https://ec.europa.eu/eurostat/>).

Regarding the production of soil, we assumed an average economic value of €57.00 for a standard commercialized 500 kg of compost (big-bag). For the monetization of the deviated organic matter, we used the PAYT fee (pay-as-you-throw) associated with the municipal collection of mixed solid waste, as practiced by LIPOR's municipalities (€0.0163/L).

For the estimation of values for the service of habitat creation and maintenance, we contacted, in 2019, three Portuguese horticulture companies (by phone and email) to obtain the average market price of native nursery plants used for reforestation purposes.

Considering learning, we used the average cost of an extra-curricular or academic activity per participant (i.e., €5.00) to infer the value of environmental education activities. This average cost was calculated using the prices obtained from multiple contacts made by

phone and email with different educational institutions, such as schools, in the geographical context of LIPOR.

For the valuation of physical activity, we adopted the price of a sports class per participant to infer the value of recreational and leisure activities in the wild promoted by LIPOR. As previously calculated for the learning NCP, a series of contacts were made to different sports institutions, such as gymnasiums and yoga studios in the geographical context of LIPOR, obtaining an average value of €5.00. For the valuation of the number of sporadic visits to the Urban Green Space, we considered the symbolic price of an entrance in a walk-in nature attraction (corresponding to €1.50). For the annual memberships of the visits, we considered the annual cost of a scout registration, as provided by email and phone contacts (corresponding to €25.00). Details on the economic investments and the monetary accounting of NCP benefits are shown in Appendix 3.

3 | RESULTS

Over the last two decades, LIPOR investments on natural capital and biodiversity management totaled €7,760,032. The vast majority (ca. 72%) pertained to expenses related with initiatives focused on environmental awareness and education, followed by management costs with the restoration and maintenance of public areas with vegetation (ca. 9%), including public gardens and green spaces, and the

creation of the Urban Green Space (Adventure Park; ca. 7%). These investment values were closely followed by costs related with composting actions and materials for the general public (ca. 6%) and recreational activities in the wild (such as outdoors sports initiatives; ca. 5%; see Figure 2a).

From 2000 to 2009, there was a general decline in investment costs (Figure 2b). Overall, we could observe five main peaks of investment, which correspond with the key temporal moments highlighted by the corporate team during the focus group sessions: (1) the beginning of the 2000s, coincident with the start of the landfill conversion and the launch of the environmental education office, (2) the mid-2000s, coincident with a high activity of environmental education actions and the launch of the first sustainability report; (3) the beginning of the 2010s, coincident with the opening of the Urban Green Space (UGS) to the public; and (4) from 2015: coincident with an increasing investment in UGS facilities and environmental sustainability projects.

In contrast to LIPOR investments, the value of NCPs generated by the company increased from 2000 to 2019 (Table 2). We could account for €113,020,478 in NCP benefits. Most of these benefits were found associated with indicator benefits for food and feed, through the value of family meals produced by vegetable gardens (€99,836,738), and soil production and regulation, comprising compost production and savings with domestic waste collection (€6,643,343). The regulation of climate, for which valuation focused

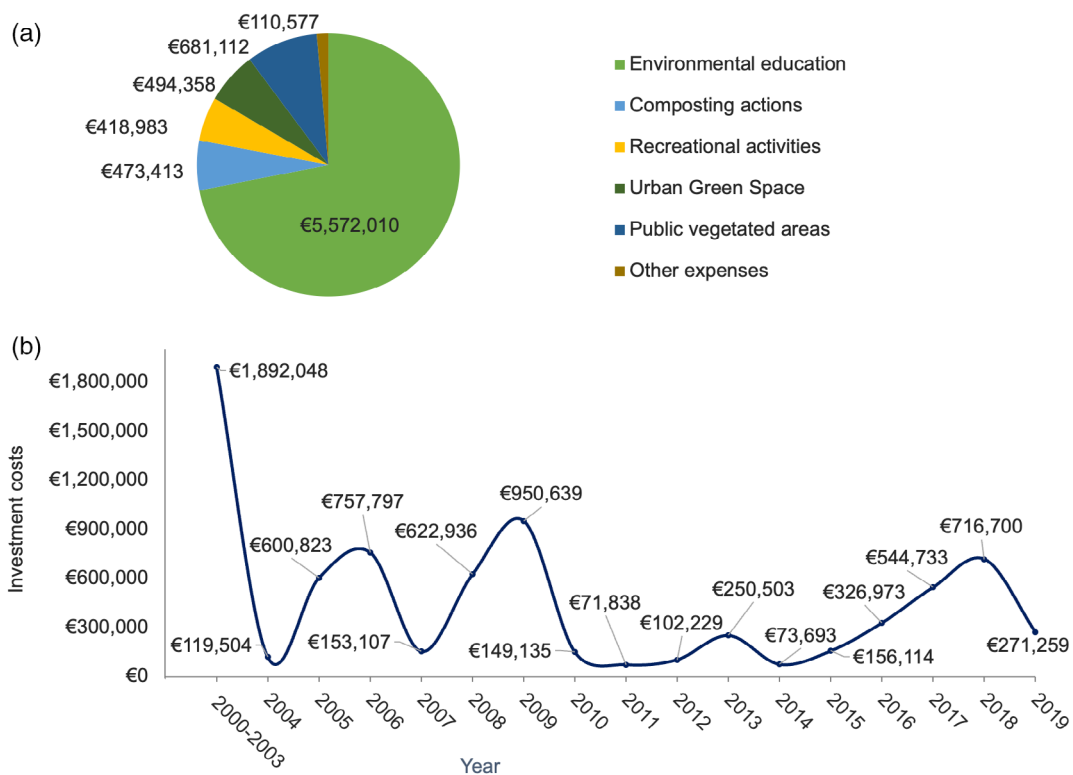


FIGURE 2 Investment made by LIPOR for the management of natural capital and biodiversity associated with distinct business strategic areas: environmental education, composting, recreation, urban green space, public vegetated areas and others (a). The figure also shows the variation of such investment costs throughout the period between 2000 and 2019 (b). Note that for the years 2000–2003, investment costs are reported as a whole, due to lack of yearly accounts.

TABLE 2 Accounting results expressed as the economic value of the benefits generated by each type of Nature Contributions to People (NCP) promoted by LIPOR actions during the period from 2000 to 2019.

NCP	Benefit indicators	2000–2004	2005–2009	2010–2014	2015–2019	Total
Food and feed	Domestic meals	€946,583	€12,570,083	€18,546,887	€67,773,185	€99,836,738
Climate regulation	Stored CO ₂ in vegetation	NA	NA	€1110	€1287	€2397
	Avoided CO ₂ emissions	NA	NA	€5229	€11,486	€16,715
Soil regulation	Organic matter	NA	NA	€48,913	€351,346	€682,755
	Domestic compost	NA	€19,053	€182,465	€5,560,328	€5,761,846
Habitat creation	Nursery trees	€134,505				€134,505
Learning	Education actions	€1,737,915		€2,195,005		€3,932,920
Recreation	Annual memberships	€2500		NA	NA	€2500
	Recreational actions	NA	NA	€1,909,820		€1,909,820
	Sporadic visits	NA	NA	€541,541		€541,541
Total						€113,020,478

on carbon stocks in restored vegetated areas, and the avoidance of carbon equivalent emissions through recycling actions with the public, accounted for €19,112. For learning, we could account for €3,932,920, when estimating the value of people's interactions with nature through several environment-targeted actions. When valuing the participation of people in recreational activities and their visits to the Urban Green Space, we estimate a total of €2,453,860. Finally, habitat creation, valued through counting the number of nursery trees used for reforestation purposes, provided a contribution of €2500.

4 | DISCUSSION

Despite human dependence on nature, natural capital is still largely undervalued, much because its benefits are seldom realized beyond the notion of market prices. Comprehensive accounts for businesses and governments that include positive contributions to nature (beyond negative impacts on ecosystems) can be very helpful to make decisions considering the basis of sustainability, fairness and efficiency (after Costanza, 2020; Costanza et al., 2017). As such, an understanding of the links between investment options on natural capital and their benefits return is inevitable. Our exploratory case study contributes to filling the gap in business literature by deliberately linking rates of investment through an NCP and ecosystem service perspective (after van den Belt & Blake, 2015). Our results demonstrate how corporate investments by a Municipalities Association for Sustainable Waste Management (LIPOR) in natural capital provided high rates of return in terms of co-benefits. This is also aligned with evidence showing the financial benefits of (environmental) sustainability disclosure and commitments associated with waste management (Benjamin et al., 2020; Gull et al., 2022).

From our cost–benefit analysis, we could account for a monetary expression of €113,020,478 in nature's contributions to people (NCP benefits), returned from €7,760,032 of business investments by LIPOR, roughly representing a positive cost–benefit ratio of at least 14 over 2 decades. This result naturally converges with

previous assumptions that well-targeted business investments in natural capital can provide high rates of return associated with people's benefits (Bishop, 2012). We also observed that despite some low investments in natural capital, returns in NCP benefits increased over time. This pattern emphasizes the important role that temporal factors play in the way investments in natural capital are prioritized and valued, bringing implications at the time of considering business investment strategies, on the long-term, to achieve maintenance (and even enhancement) of natural capital (Silvennoinen et al., 2017; van den Belt & Blake, 2015; Wood, 2005).

Nonetheless, caution should be granted to the results from our exploratory study, considering the already known limitations associated with the monetary expression of NCP values and benefits (e.g., Braat & de Groot, 2012; Farley, 2012). First, there is no current market without flaws and, consequently, no flawless market-based approach for expressing the value of NCPs, particularly when assuming the existence of ecological thresholds, or in the face of unclear ownership and beneficiaries of natural capital (Farley, 2012). Second, the value of nature or biodiversity extends beyond the utilitarian perspective of the Total Economic Value adopted in this study (Attenborough, 2019). A range of nature values, including intrinsic, option, existence, and bequest values, could not be captured by our exploratory valuation of NCPs. Third, although expressing nature contributions in a monetary way is useful to understand financial risks (Xie et al., 2023), it also poses several ethical challenges, for instance, the way nature resources can be (over)exploited to feed economic growth, or even used in corporate communication strategies to justify business-as-usual and questionable actions (e.g., Greenwashing; Roberts et al., 2023).

On the other hand, when achieved responsibly, expressing NCP values in monetary units can provide guidance toward the standards of sustainability, fairness and efficiency (after Costanza, 2020). An explicit acknowledgment of the value of natural capital and ecosystems allows the recognition that protection, regeneration and restoration is economically important and can be less costly and effortless than other alternatives (e.g., commodity exploitation; Braat & de



Groot, 2012). Also, demonstrating the value of nature in economic terms motivates businesses in reaching decisions on environmental investments (and other mechanisms) that leverage societal and corporate benefits, beyond direct business revenues, focused on natural resources (TEEB, 2011). Finally, even if under an exploratory perspective, capturing the value of nature's benefits as returns from business investments and actions, brings an additional defense of nature conservation and restoration against the costs of nature depletion through inaction (Braat & ten Brink, 2008; Costanza, 2020; Hashida & Fenichel, 2021).

In fact, the United Nations' Natural Capital Declaration commits businesses (including banks, investors, and insurance companies) to integrate natural capital into their accounting, disclosure and reporting frameworks. Concurrently, there is an increasing pressure for businesses to be aligned with global sustainability initiatives, including the Working Group on Nature-related Financial Disclosures (TNFD), Science Based Targets for Nature (SbTN), Global Reporting Initiative (GRI), Sustainable Development Goals (SDGs) from the United Nations Agenda, among others. Such an alignment needs to move from the business-as-usual understanding of businesses (negative) impacts on nature and ecosystems, toward a business-as-natural perspective of capturing and creating nature values (Zioto et al., 2023). Such is possible by displaying that the rate of investment on natural capital at a given place can ensure benefits to people at multiple scales, and that the business sector can take a crucial role in creating and promoting nature's values through time (Mariani et al., 2021; van den Belt & Blake, 2015).

At LIPOR, the identification, recognition and monetary expression of NCP supports the corporate sustainability strategy by justifying the continuity of natural capital investments in the times to come. In agreement to the global multi-stakeholder organization, Natural Capital Coalition, additional opportunities are created when businesses incorporate ecosystem services and values into their activities at different levels, including: operational (such as improving use-efficiency of natural resources from which businesses depend on; Mariani et al., 2021), regulatory and legal (new fines, new user fees, government regulations, or lawsuits by local communities), reputational (gaining advantage through a positive differentiation of corporate brands), production (participating in emerging markets for carbon and biodiversity credits; Krause & Matzdorf, 2019; Thompson, 2021), communication and reporting (reflecting the company's performance), and even financial (e.g., investors taking more favorable positions in sustainable companies that improve natural capital efficiency or restore degraded ecosystems; Waage, 2014).

Considering LIPOR is a public company, some practical and political implications can also be highlighted from our results. Accounting for NCP values and internalizing such values into the company's activities demonstrates that public investment is not simply a cost nor a risk, but an investment into benefits and opportunities to society. Also, it allows for mitigating business risks and creating market opportunities, for instance, by placing LIPOR as an Empower Brands Community, with a brand image ranking of 4.55 in 2022 (out of 5) among

its clients (LIPOR, 2023). Results from our exploratory approach also allow for governance opportunities, namely serving to promote awareness from the operational to the top-management structure, on the relevance of investing on human and other infrastructure resources to go beyond simply "no-harm" regulatory commitments related with nature-based values, and actually seek a "net-positive" nature outcome, as envisioned by the European Green Deal for 2050 (European Commission, 2019).

Nevertheless, we are aware that the approach conducted at LIPOR is limited, for instance, lacking consideration of a broader range of equally relevant NCPs (e.g., water-related) and values, business operations (e.g., at the upstream and downstream supply chain) and impacts, or the uncertainty associated with the appraisal of the considered indicators and units for the quantification of natural capital accounting (Braat & de Groot, 2012). Still, it is our expectation that our exploratory study contributes to an increasing awareness on the role that businesses, and particularly public companies, can take in the integration of different types of capitals to deliver a more sustainable use of natural resources and ecosystem services. This includes the recognition of moral and responsibility issues of businesses in the conservation and regeneration of natural assets, aligned with common strategic and political views of sustainability.

5 | CONCLUSION

In this case study, we applied an exploratory return on investment analysis to identify the gains associated with investments on nature by an intermunicipal corporate business, LIPOR, in terms of Nature's Contributions to People (NCPs). Considering the investment efforts from LIPOR over two decades, we hypothesize that the benefits generated by such efforts have outperformed the investment costs. The results of our case study suggest that from the €7,760,032 business investments assumed by LIPOR, €113,020,478 were generated in terms of NCP benefits, roughly representing a cost-benefit ratio of 14. Our results suggest that well-targeted business investments in natural capital can provide high rates of return associated with people's benefits. Even though our approach holds limitations to overcome in future assessment efforts, we are confident that our case study contributes to fulfilling a gap in business literature, by deliberately linking rates of investment on natural capital with the valuation of NCP benefits.

ACKNOWLEDGEMENTS

Ana Sofia Vaz acknowledges support from the Portuguese Foundation for Science and Technology through the program Stimulus for Scientific Employment - Individual Support (<https://doi.org/10.54499/2020.01175.CEECIND/CP1601/CP1649/CT0006>). The authors thank Dr. Helena Santos for English revision and proofreading. Authors' thanks also go to the three anonymous reviewers for their stimulating suggestions that improved the paper. This work contributes to the GEOBON Working Group on Ecosystem Services.

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How to cite this article: Pinto, T., Machado, T., Nicolau, D., Oliveira, N. G., & Vaz, A. S. (2024). Accounting for nature contributions to people in corporate sustainability: The case of a waste management company in Portugal. *Corporate Social Responsibility and Environmental Management*, 1–10. <https://doi.org/10.1002/csr.2706>