

POLICY PERSPECTIVE

EU's Conservation Efforts Need More Strategic Investment to Meet Continental Commitments

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Abstract

The European Union (EU) has made significant conservation efforts in the last two decades, guided by the Birds and Habitats Directives, currently under evaluation. Despite these efforts a large proportion of priority species are still in unfavorable condition and continue declining. For this reason, a thoughtful review of the implementation of conservation efforts in Europe is needed to identify potential causes behind this poor effectiveness. We compiled information on the distribution of all conservation funds under the LIFE-Nature, the main financial tool for conservation in Europe. We found that LIFE-Nature has not adequately covered continental conservation needs. The majority of funds have been directed toward nonthreatened species or regions of low conservation priority. Given the limited resources available, two key aspects are in urgent need for revision and improvement. First, the distribution of funds should be guided by continental and global conservation needs and planned at the EU scale. Second, new mechanisms are required to set conservation priorities in a dynamic fashion, rather than relying on fixed lists (i.e., the Directives' Annexes) that may rapidly become outdated. These improvements would require new mechanisms to set priorities and redistribution of conservation efforts, supported by adequate policy and a more effective top-down control on investment.

Fitness check to the European Union (EU)'s conservation policy

The EU is currently carrying out a fitness check of its conservation policy, as part of a broader Regulatory Fitness and Performance Program (REFIT; EC 2014a). The aim of the fitness check is to evaluate to which extent the EU policy is "fit for purpose" and adequate to face the challenges of a rapidly changing world. This process recalls attention on the Birds (79/409/EEC) and Habitats (92/43/EEC) Directives, which are the cornerstone of the EU's conservation policy and guide the implementation of conservation efforts in Europe. These Directives define clear conservation objectives and priorities aimed at achieving the EU 2020 Biodiversity target of halting

and reversing the loss of biodiversity at the continental and global (*target 1* and *target 6*, respectively) scales (EC 2011a). The Directives also translate into the EU's policy conservation commitments from other international conventions that the EU has subscribed, such as the Convention on Biological Diversity. In order to guide conservation efforts, the Directives provide Annexes listing priority species and habitats that should be the focus of conservation management. Following these guidelines, the EU has made a significant conservation effort in the last two decades, which has involved the declaration of the Natura 2000 Network, the world's largest network of protected areas. In order to provide financial support to these conservation efforts, the EU founded in 1992 the LIFE program, which has become the main

financial instrument of the EU conservation policies (EC 2011b). There were four successive LIFE programs in the period 1992–2013 fully completed to date. Each of these programs had specific objectives but with the common priority of demonstrating how to implement the Birds and Habitats Directives and reinforce the role of the Natura 2000 network at preserving the EU's biodiversity. Within all the different subprograms included in LIFE, LIFE-Nature is the most relevant from a conservation perspective because it is the most directly related to the implementation of on the ground conservation actions for priority species and habitats. It has also attracted a significant proportion of all LIFE funds, making it the most important subprogram within LIFE. In 2014, a new extension of LIFE was approved for the period 2014–2020, with an overall budget of €2.7 billion under the subprogram for Environment, which includes previous LIFE-Nature, and €0.9 billion under the subprogram for Climate Action.

However, despite these efforts, more than half of the species legally protected by the Directives were considered in unfavorable status in the last State of nature in the EU (European Environment Agency 2015). For this reason, assessments on whether efforts have covered continental conservation needs and promoted the achievement of targets are timely and urgently needed under the umbrella of the review process opened by REFIT. Here, we evaluate how conservation funds under the LIFE-Nature subprogram have been invested. With an accumulated experience of more than 20 years, this program represents a critical milestone for assessing whether conservation efforts made by the EU have targeted species and areas with higher continental conservation needs and have hence been relevant toward achieving the EU's conservation goals.

Assessing more than 20 years of LIFE-Nature investment

In order to get a complete picture of the implementation of the LIFE-Nature program, we reviewed information on the investment made, spatial distribution and species benefited under each of the 1,448 projects funded in the period 1992–2013 (Supporting Information Appendix 1). We then brought LIFE-Nature into the context of conservation needs in the EU by comparing the investment made across different IUCN conservation status categories. We use the IUCN assessments as estimates of conservation needs because they are the result of standardized evaluations of the conservation status of species and the threats affecting them at the European and global levels. National and regional-level IUCN assessments are

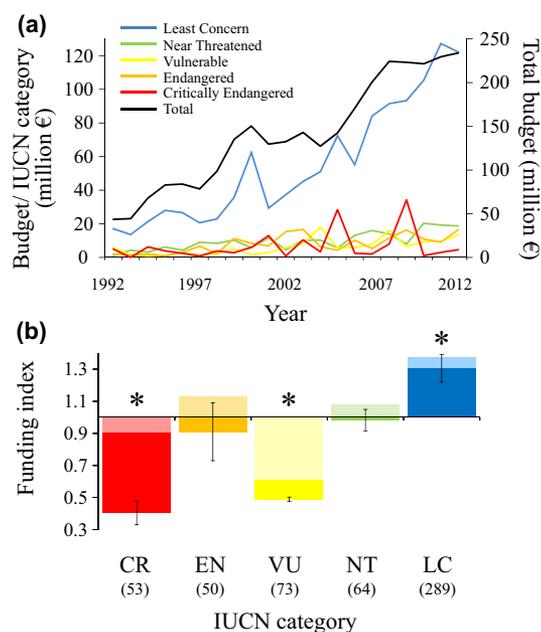


Figure 1 (a) Temporal distribution of LIFE-Nature funds in the period 1992–2013, split by IUCN classes. (b) Funding index (Average \pm SE) for all threatened species listed under different IUCN classes. The funding index represents the ratio between the total budget received by each species and the budget that the species would have received if funds had been randomly distributed. Values close to 1 indicate that the species have received a similar budget than expected by random distribution of funds. Values above and below 1 indicate species that have received more or less budget than expected by random distribution of funds, respectively. To avoid the influence of species that have received large investment (see peaks in A due to a single species—Iberian Lynx, *Lynx pardinus*), we deleted from each category the species with the highest budget in B (*Lynx pardinus*, *Margaritifera margaritifera*, *Ottis tarda*, *Gypaetus barbatus*, and *Ursus arctos* for the CR, EN, VU, NT, and LC categories, respectively). *indicates IUCN classes for which significant differences from random distribution of funds were found. The average values including all species are also shown for each class in faded colors. The number of species that have received LIFE-Nature funds in the studied period is also shown in parentheses.

also available, but continental assessments better convey the global extinction risk and then suit the EU's conservation commitments. Furthermore, these assessments are commonly used by the EU in the periodic revisions of the status of Europe's biodiversity and evaluation of conservation targets achievement (European Environment Agency 2015), which aligns our results with these other assessments.

The EU contributed with €1,625 million, of the total of €2,964 million invested into LIFE projects when including Member State contributions. These funds have been continuously increasing at an average annual rate of 7% from the beginning of the program (Figure 1a). About two-thirds of the LIFE-Nature investment has

been spent on the implementation of on the ground conservation programs for European priority species and habitats. Some funds have also been invested in creating and consolidating Natura 2000 national networks, implementing environmental monitoring or improving waste management, among others. Regarding to projects focused on implementation of species conservation, a total of 666 species (203 species from the Birds Directive, 451 from the Habitats Directive, and 12 not listed in either of them) have benefited from LIFE-Nature. This represents 33% of all priority species listed in the Annexes of the Directives although only 10% of globally threatened species present in Europe according to IUCN (IUCN 2015).

Despite the significant financial contribution made by the EU, the distribution of LIFE-Nature funds has not covered continental conservation needs. The majority of funds have been directed toward species of low global/continental conservation concern (75% of all funds spent on Least Concern species; Figure 1a). This has resulted in overfunding of nonthreatened species even in relation to a random distribution of funds, which is far from an ideal funding schedule (Figure 1b). On the other hand, globally threatened species have been clearly underfunded. The 53 critically endangered (CR) species and the 73 vulnerable (VU) that benefited from LIFE-Nature funds have received, respectively, only 40% and 50% of the expected budget if funds had been distributed randomly (Figure 1b; excluding the Iberian lynx—*Lynx pardinus*—and great bustard—*Ottis tarda*—which received 30 and 6 times the average investment spent on CR and VU species, respectively, and then overinflated the funding index for their IUCN categories). As a result, only three of the 10 species with the largest LIFE-Nature investment (22% of the total budget) were globally threatened (IUCN 2015). Note that the estimates of under/over funding presented here are constrained to the pool of species that were cited as beneficiary of at least one LIFE-Nature project, most of them listed as priority species in the Directives' Annexes. Our assessment focuses then on analyzing whether funds have been distributed according to conservation needs within the pool of benefited species and not on assessing whether all continental conservation needs in the EU have been addressed.

The distribution of LIFE-Nature funds also shows poor spatial relation with continental conservation needs. The annual average investment by LIFE-Nature projects in EU regions was positively related to the proportion of their territory protected under Natura 2000, the number of species listed in the Directives' Annexes and the regional wealth, measured as their GDP. All these variables showed significant effects on the regional average

investment in a General Linear Model (Appendix 1). The number of threatened vertebrates was the only variable in the model that did not show significant effects on that GLM model (Table S1). These modeling results reflect the spatial mismatch between conservation investment and the distribution of threatened vertebrate species, which we used as a surrogate for the spatial variation of continental conservation needs (Figures 2b and c). While some regions, especially in Northern and Central Europe, have received large proportions of LIFE-Nature funds despite having scarcely threatened biotas, several regions in Southern and Eastern Europe that hold high numbers of threatened species have been notably underfunded (Figure 2c). These spatial analyses were constrained to vertebrate species given the lack of full coverage by IUCN assessments and distribution for other taxonomic groups like invertebrates, plants, or fungi present in Europe. However, the spatial patterns of funds reported in this study are a good representation of the whole conservation effort done under LIFE-Nature, given that vertebrate species attracted 80% of all funds.

The LIFE-Nature experience and future policy in Europe

As recently acknowledged on a public consultation process carried out within REFIT, where more than half million European individuals and NGOs participated, the objectives established in the Birds and Habitats Directives are still sound from a conservation point of view (Frießter et al. 2015). The overall target of halting biodiversity loss is still recognized as critical because of the important services that European societies receive from it, contributing to the added value of conservation policies. However, we have shown that the financial mechanisms used to guide conservation efforts have failed to target the species and regions most in need of conservation action at the continental scale. LIFE-Nature proved an effective conservation tool in some cases when enough funds were available, as demonstrated by the recent reclassification of the Iberian lynx from CR to EN (Rodríguez & Calzada 2015). However, apart from some exceptional cases, the actual distribution of conservation funds that we report here could undermine the EU's capacity to achieve its 2020 biodiversity targets and compromises the EU's contribution to the conservation of biodiversity at the global level, and then compromise the effectiveness and efficiency of the EU's conservation efforts.

There are different nonexclusive reasons behind the poor coverage of continental conservation needs by LIFE-Nature funds. First, given that LIFE-Nature projects must focus on species listed in the Annexes of EU's Birds

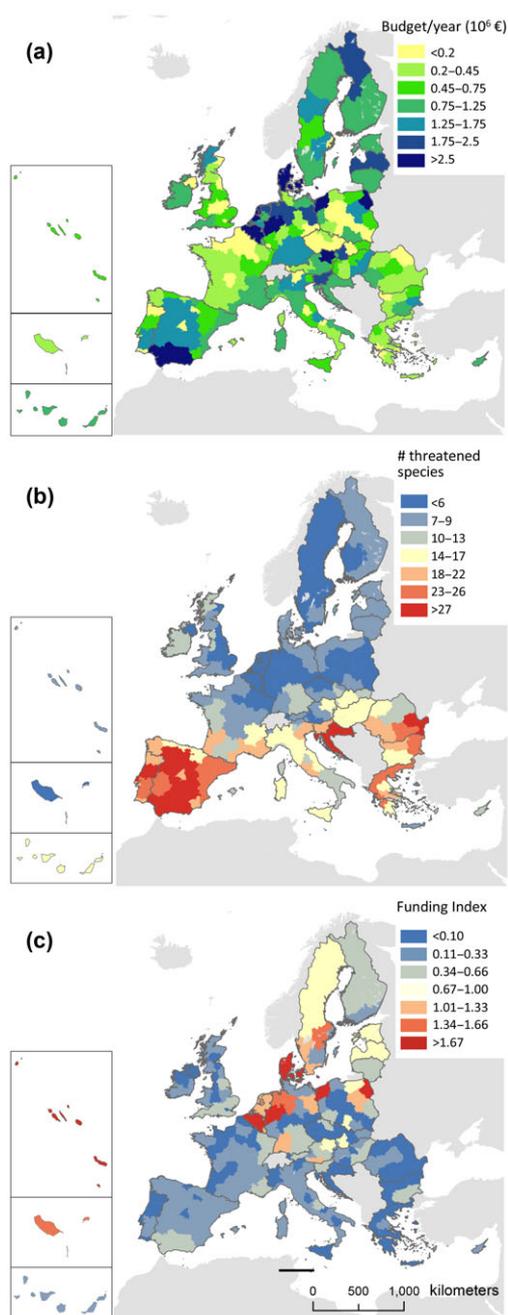


Figure 2 Distribution of LIFE-Nature funds and richness of threatened species (CR, EN, and VU) across NUTS regions in the EU (see Appendix 1 for more detail). (a) Average budget/year received by each region. (b) Number of threatened vertebrates in each region. Further details can be found in the Materials and Methods section. (c) Regional funding index, assessed as the ratio between the annual budget received by each region for conservation of vertebrate species and the annual budget that the region would have received if funds had been randomly distributed across all vertebrate species. Analyses were restricted to vertebrate species because these were the only for which spatial distribution data were available. Values above and below 1 indicate regions that have received more or less budget than expected by random distribution of funds, respectively.

and Habitat Directives, the poor funding coverage of threatened species might be due to the inconsistencies between the priorities set in the Directives' Annexes and global assessments of conservation status. A large proportion of the species listed in the Directives' Annexes are not globally threatened (72% of the 1,864 species listed), while many other threatened ones are not listed (e.g., Cardoso 2012; Hochkirch *et al.* 2012). This could have biased conservation funds toward nonthreatened species. However, this does not seem to be the only driver, given that even within the list of priority species funds were preferentially directed toward nonthreatened species (Figure 1). Second, the focus of conservation efforts might have been biased toward species that involve feasible actions from a logistic and economic point of view or toward species of highest social impact (e.g., investing in birds or mammals over fish or invertebrates). Finally, the pure bottom-up approach to project selection followed when distributing LIFE-Nature funds, might also constrain the capacity of different European regions from gaining access to them. In this sense, only those with the capacity to apply and co-fund projects would access LIFE funds. This bottom-up approach was recently highlighted as one of the main factors limiting the LIFE program's policy impact (EC 2011a) due to the restricted capacity of strategic investment subject to project applications received.

Where to from here?

Continental conservation objectives such as those aimed in the EU's Biodiversity Strategy need continental plans and commitments. Given the limited resources available for pursuing biodiversity conservation targets and the limited coverage of continental conservation needs that we report, some key aspects are in urgent need for revision and improvement. These should help increase the effectiveness, efficiency, and coherence of the application of the Directives, some of the key criteria under assessment in the REFIT process (EC 2014a). First, conservation efforts should focus on those species and areas most in need, as the most effective way forward toward halting biodiversity loss. This entails that continental conservation needs should prevail over socioeconomic or governance factors when deciding where to invest conservation funds. This investment should be guided by adequate planning at the continental scale as well. The Directives already set the internal mechanisms to ensure that conservation priorities are sound and based on the most up to date scientific knowledge and to reinforce the periodic revision of the biodiversity's status. For example, articles 10 and 18 in the Birds Directive and

Habitats Directives, respectively, establish that Member States and the Commission shall encourage the necessary research and scientific work to guide the achievement of the EU's conservation goals. Furthermore, they state that appropriate amendments as necessary for adapting Annexes to technical and scientific progress should be considered (articles 15 and 19 in the Birds and Habitats Directives, respectively). Some advances have been made in this direction under the current LIFE program, specifically under the Multiannual working program 2014–2017 (CE 2014b), where a window of opportunity has been opened to funding conservation projects for Endangered and Critically Endangered species not included in the Annexes. This would help overcome some of the gaps in the Annexes recently highlighted (e.g., Cardoso 2012; Hochkirch *et al.* 2012) by providing conservation opportunities to highly threatened species. However, this would not solve the problem alone if not accompanied by additional measures to ensure more strategic planning of investment.

Second, the distribution of conservation funds should be planned at the EU scale, overriding particular interests of national governments or limited capacity that may compromise the efficiency of conservation efforts (Donald *et al.* 2007; Kark *et al.* 2009). More strategic funding guidelines set by the EU would enhance the impact of the LIFE-Nature program and help overcome the current dependency of this program on project proposals highly biased by local/regional capacity. A whole-EU spatially explicit planning of conservation investment would require new mechanisms to triage conservation priorities. Some voices claim that more funds are urgently required to increase the relevance and effectiveness of conservation efforts in the EU (e.g., Rands *et al.* 2010; Hodge *et al.* 2015; Kati *et al.* 2015). We believe that larger funds would help address more species and habitats but that it will be more beneficial if it is accompanied by better guidance and central planning. Future planning could take advantage of the extensive development of systematic planning approaches based on cost-effective analyses that have become common practice to help decision making in conservation problems (Margules & Pressey 2000; Moilanen *et al.* 2009). These methods pose an objective and transparent approach for setting priorities, which could then be used to guide strategic investment under the LIFE-Nature program. For example, by applying these planning methods, the EU could identify priority species and regions where to focus LIFE-Nature investment that should be covered by project proposals (a more top-down control). These priorities should be periodically revised to account for achieved goals (and avoid recursive funding of some species/regions) and new ones expected to appear in this rapidly changing world. This would make LIFE-

Nature investment more effective and able to respond to changing continental conservation needs, although it would imply a more top-down control on investment.

Moreover, both the new priorities and distribution of conservation efforts should address the traditional bias toward some groups of vertebrates (e.g., 80% of LIFE-Nature funds in the period 1992–2013) and more effectively target other underrepresented taxa, such as invertebrates and/or regions. In order to address this bias, it would be also needed to improve the poor knowledge on the conservation status of other taxonomic groups (e.g., invertebrates) to help better evaluate their conservation needs and act accordingly.

Further efforts are finally required to overcome the potential biases in funding derived from lack of local capacity to access and acquire LIFE-Nature funds and focus on vertebrates. In this regard, the “capacity building” projects recently created in the framework of the current LIFE program (EC 2011b) will provide financial support to enhancing local capacity to address conservation problems and getting access to LIFE funds (e.g., recruitment and training of personnel). All these measures should ideally drive a better distribution of conservation funds and more effective achievement of EU's conservation goals and enhance the added value of the Directives, one of the specific criteria under assessment in REFIT (EC 2014a). Finally, one of the aims of LIFE project is to serve as demonstration for future implementation of conservation actions in similar situations. This can only be done by securing a solid monitoring of implemented actions, which is not always the case (Henle *et al.* 2013). Without this critical piece of information, it will be difficult to learn from previous on successful and unsuccessful experiences.

Strengthening the EU for better conservation outcomes

Many of the challenges for the conservation of biodiversity highlighted here fit in a broader debate on the need for “more Europe versus less Europe.” In an admittedly simplistic overview, the contrasting positions advocate either moving toward stronger European institutions and common policies or toward a more decentralized Europe where national governments would get back some of the governance capacity once entrusted to Brussels. We argue that from a conservation point of view, the “more Europe” option, i.e., common planning at the continental scale, is the only way forward for achieving continental conservation goals in an efficient way. Common goals and stronger collaboration across EU has been highlighted as the best strategy to face other environmental problems such as the ecological and socioeconomic

impacts of invasive species (Hulme *et al.* 2009) or climate change (Lung *et al.* 2014). A common conservation strategy could also help tackle the poor effectiveness of the Directives at protecting biodiversity already listed as priority, such as long migratory birds (Sanderson *et al.* 2015), which might require of pan European (and even beyond) planning of conservation efforts. As our assessment shows, the European Directives are useful instruments for guiding the implementation of conservation efforts on the ground. As we demonstrate, conservation funds have been directed mainly toward areas with higher numbers of listed vertebrates and exclusively to Natura 2000 sites. However, this technically accurate implementation of the Directives has been constrained by the limited success at attending continental and global conservation priorities. We believe that most of the mechanisms that we propose here are already into place in the Directives (e.g., periodic review of priorities set in the Annexes) or derived policy, such as the LIFE Multiannual working program (e.g., consideration of threatened but not listed species within LIFE). There is also a growing debate on the suitability of a more top-down approach to distributing LIFE-Nature funds (EC 2011b) to reinforce the impact of this program. The REFIT process opens a window of opportunity to discuss the need for more strategic implementation of existing policy or introducing changes to enhance conservation practice in Europe that we should not miss. Leveraging this opportunity could allow the EU to embrace continental conservation needs and lead to more robust and efficient continental-scale conservation of biodiversity.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's web site:

Table S1. Results from GLM analyses.

Appendix 1. Material and methods.

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