Capacity development challenges and solutions for Natura 2000: an approach through blended learning

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Abstract Capacity development is essential for the effective management of protected areas and for achieving successful biodiversity conservation. European Natura 2000 sites form an extensive network of protected areas and developing the capacity of staff at all levels is a priority that will positively influence the appropriate implementation of conservation actions. In this study we identify the main challenges and potential solutions to developing the skills, knowledge and tools required for effective Natura 2000 site management. Our findings are based on a case study of the European project LIFE e-Natura2000.edu, which focuses on capacity development in practical biodiversity conservation and management through integrated and blended learning experiences (i.e. a combination of face-to-face and virtual teaching). We illustrate the main elements for successfully building capacity within a variety of knowledge and experience backgrounds and operating levels related to the management of Natura 2000 sites. Multifaceted, blended learning approaches are key to tackling the various needs of Natura 2000 managers in terms of skills, knowledge and tools.

Keywords Capacity building, communication, e-learning, Habitats Directive, learning evaluation, Natura 2000, protected area

Introduction

One of the most significant challenges facing biodiversity conservation is developing and building practical capacities for addressing the increasing number of pressures and threats to the environment (Elliott et al., 2018; O'Connell & Burton, 2018; Porzecanski et al., 2022). The term 'capacity' indicates the ability to execute functions, solve problems and set and achieve biodiversity conservation goals: it includes the knowledge, skills, performance, motivation and leadership of individuals, as well as groups of individuals forming organizations and societies (Appleton, 2015; Müller et al., 2015). Tackling gaps and identifying needs in capacity are crucial actions for biodiversity conservation (UNEP-WCMC, 2020). For example, in the working programme to 2030 of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, capacity development is one of the six objectives (Bridgewater et al., 2019). Amongst a number of such cross-cutting issues are the requirement for and development of tools, the consideration of environmental specificities, the development of evaluation methods and the identification of best practices (O'Connell & Burton, 2018).

Professional capacity development in conservation has been overlooked, although the availability of human resources, and people's capacities, is at the core of effective decisions and implementation of management to achieve priority biodiversity goals (Rodríguez et al., 2006; Grantham et al., 2010). Training and learning for managers help to increase the professionalization of conservation (Appleton et al., 2021) and can help in disseminating new approaches, tools and skills that, in turn, will improve conservation success (Fien et al., 2001). Conservation projects and programmes in which relevant stakeholders participate often achieve improvements in capacities linked to effective conservation management (Evely et al., 2011). However, the lack of specific training courses prevents the participation of conservation practitioners, including protected area managers, in such learning experiences and the accrual of related benefits (Robinson et al., 2019).

A recent review highlighted that amongst 650 capacity development projects and initiatives concerning conservation, nearly 75% were academic initiatives: of these a large portion were in Europe, targeting mostly scientists and policymakers (Elliott et al., 2018). Managers of protected areas, however, are an important group to be considered when aiming to generate improvements in conservation conditions and management practices (Nielsen, 2012). Despite the acknowledged importance of increasing capacity for managers of protected areas, local institutions only rarely offer training opportunities (Holzer et al., 2019), and there is a lack of assessment of the knowledge and experiences of conservation practitioners (Bennett et al., 2018).

There is a need for change in how conservation is taught and learnt (Maas et al., 2019). Novel and low-cost approaches to capacity development and assessment are crucial (O'Connell et al., 2019). Blended learning (the combination of traditional face-to-face instruction with

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online computer-mediated instruction; Graham, 2006) has been used increasingly in education. Such a combination has been reported to improve learning (Spanjers et al., 2015) and can enhance the learning experience (Garrison & Vaughan, 2008). The most important reasons for the adoption of a blended approach are its value for learning and its cost effectiveness, as well as increased access and learner satisfaction (Osguthorpe & Graham, 2003; Graham, 2006). Experiences from such courses on topics related to biodiversity conservation show that blended learning can produce results that are not delivered with traditional face-to-face approaches or field practicals (Virtanen & Rikkinen, 2010). Nevertheless, blended learning is a challenging approach because, for example, of the need to stimulate interactions and incorporate flexibility (Boelens et al., 2017). Assessment of such training experiences is crucial for understanding their effectiveness and whether the intended aims have been achieved. Interviews and questionnaires are the most common tools used to evaluate capacity development, although these approaches seldom include both pre- and post-training interviews (Sterling et al., 2021). Before-and-after comparisons of training and learning programmes could deepen our understanding of the benefits of applying specific approaches to capacity development.

The Natura 2000 network is a system of protected areas extending across all 27 countries of the EU. The experience gained in the development and application of this coordinated network of sites, together with the two Nature Directives (79/409/EEC, repealed by 2009/147/EC, and 92/43/EEC), provide significant lessons regarding the successful elements for biodiversity conservation (Campagnaro et al., 2019). At present, 26,918 Natura 2000 sites cover 1,204,987 km^2, corresponding to 18% of EU land and 9% of its marine territory (Sundseth, 2020). Nevertheless, much work remains to be done to achieve the conservation results required by the Directives. Many gaps and failures in implementing the Natura 2000 network and the two Directives are related to the lack of important capacities (Kati et al., 2015; Milieu Ltd et al., 2016). Some of these problems, such as the need to improve capacities in communication, are shared with many other global conservation projects. A lack of these skills can jeopardize conservation efforts (Eben, 2006). Other capacity issues are connected to specific aspects of Natura 2000 management, such as limited expertise, insufficient staff resources and inconsistent standards of the environmental procedures and quality of impact assessments required under the Directives (Milieu Ltd et al., 2016). Additional attention needs to be given to enhancing the qualifications of administrators and improving the training and technical education of Natura 2000 site managers (Vokou et al., 2014). Other relevant needs related to technical capacities have been reported for European protected areas, including the quality of biodiversity monitoring schemes, the importance of informing local stakeholders appropriately (Kati et al., 2015), the successful preparation and implementation of projects, policy development for invasive non-native species management, and the setting of climate change adaptation actions (Mattsson & Vacik, 2018).

In this study we use the experience gained from an EU-wide blended learning project (LIFE e-Natura2000.edu) for developing the capacity of Natura 2000 managers. To assess the project's approach and related challenges and recommendations, we describe the framework of the project and analyse data gathered through ad hoc questionnaires and interviews with Natura 2000 managers who participated in the project. We illustrate the main elements for building capacity successfully across a variety of knowledge and experience backgrounds related to the management of Natura 2000 sites.

The LIFE e-Natura2000.edu project

Here we describe the LIFE e-Natura2000.edu project 'Supporting e-learning and capacity building for Natura 2000 Managers' (hereafter LIFE e-Natura2000.edu), its framework and its main components, to demonstrate the cases and opportunities derived from its implementation. The name of the project includes the terms 'LIFE' because it is financed under the LIFE Programme of the European Union, 'e-' because it focuses on online electronic tools, 'Natura 2000' because it relates to the managers of these sites and '.edu' because it aims to develop capacity through learning activities. It was a 40-month project (2018–2021) and involved six European project partners. It explored the potential to construct new approaches and integrates a flexible mix of learning tools and methods to develop knowledge and capacity amongst Natura 2000 managers of both public and private land across the European Union.

The training framework had five main components (Fig. 1): (1) identification and assessment of competences for the management of Natura 2000, (2) development of modular blended learning courses for specific competences, (3) development and evaluation of training needs, (4) development of a digital platform (a mobile app) to support the networking of Natura 2000 managers, and (5) establishment of an evaluation system for the training framework. This approach was based on the analysis, design, development, implementation and evaluation (ADDIE) instructional systems design model (Allen, 2006).

(1) Identification and assessment of competences

The project identified the competences (i.e. the combination of knowledge, skills and attitude) that are relevant for Natura 2000 site managers across Europe. The management responsibilities in Natura 2000 sites are often shared by a

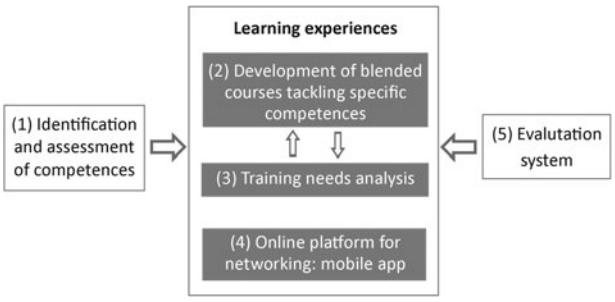

FIG. 1 The LIFE e-Natura2000.edu training framework and its five main components. After (1) identifying and assessing the competences relevant for Natura 2000 managers, the learning experiences were developed (2–4), and then evaluated (5). The training needs analysis is part of the learning experience process and serves to determine the baseline of participants.

large number of actors at different levels, and therefore their capacity requirements could be diverse. The project achieved this identification by analysing the IUCN Global Register of Competences for Protected Area Practitioners (Appleton, 2016), which includes 15 competence categories that contain a total of 300 skills and related knowledge requirements.

A technical workshop (conducted in Brussels, Belgium on 27–28 June 2018) was held with the aim of identifying and assessing the competences of Natura 2000 managers. Representatives of project partners and external experts identified the technical activities and functional areas of expertise required by Natura 2000 site managers. The area-based coordination and site-based management competences were those indicated as important for Natura 2000 site managers. Similarly to other initiatives (De Urioste-Stone et al., 2006), LIFE e-Natura2000.edu identified the capacity development needs for protected area management on the basis of expert opinion and by applying scoring systems.

As a final step, the project identified the competences required by Natura 2000 site managers using a scoring system assigned for each competence, coupled with an analysis to categorize competence areas identified as often being required and essential and/or desirable for Natura 2000 managers. The competence categorization and scoring system was: 5 points, linked directly to management requirements; 3 points, dependent on specific job requirements or on-site conditions; 1 point, not strictly essential nor required in a broad sense.

(2) Development of blended learning courses for specific competences

LIFE e-Natura2000.edu aimed to develop three core courses tackling gaps in the competences of Natura 2000 managers and focusing on competences that are frequently required

TABLE 1 Overall score (considering both area-based coordination and site-based management competences) assigned in the LIFE e-Natura2000.edu project to various competence categories (Appleton, 2016) for the Natura 2000 managers (summarized from Ioniță & Stanciu, 2019).

Competence category	Overall score
Administrative documentation & reporting	6
Advanced personal competences	10
Awareness & education[1]	10
Biodiversity conservation[1]	10
Communication & collaboration[1]	10
Field/water craft & site maintenance	4
Financial & operational resource management	4
Foundational personal competences	10
Human resource management	4
Local communities & cultures[1]	10
Organizational leadership & development	4
Protected area policy, planning & projects	8
Technology	6
Tourism, recreation & public use	6
Upholding laws & regulations	6

[1]Categories selected to be developed in the LIFE e-Natura2000.edu core courses.

(Table 1). Each core competence course addresses two priority competence categories.

The core courses were: applied conservation biology, which includes the biodiversity conservation and policy, planning and projects competences; building alliances for Natura 2000 management, which includes the communication and collaboration with local communities and cultures competences; and competent inclusive communication, which includes the communication and collaboration and awareness raising and education competences. These courses were organized and delivered by three project partners, in three languages.

A call for applicants to the three courses was launched during the EUROPARC Federation conference (in Jurmala, Latvia, on September 2019) and advertised using various means (e.g. social media). Large numbers of Natura 2000 sites are owned and managed privately; therefore, during the process of selecting participants, 10% of available spaces were reserved for private landowners. A total of 181 individuals applied and 75 were selected.

All three courses were meant to be delivered using a blended learning approach. E-learning approaches have been shown to be low cost, accessible, strategic, effective and efficient for capacity development for biodiversity conservation (O'Connell et al., 2019). Most of the online activities were run via the digital, open source platform *Moodle* because of its optimal features, capabilities and technical suitability for this purpose (Al-Ajlan & Zedan, 2008). The three courses feature various tools (e.g. demonstration videos) combined with online webinars (which were open

to a wider public). Materials and practical assignments also featured in the courses, as well as reporting and sharing the experiences of the trainers, both success and failures (Catalano et al., 2019). The workshops were designed to be face-to-face but because of the Covid-19 pandemic they did not take place (except for one event). An additional summer school was planned as a complementary face-to-face event, scheduled for April 2020, but because of the Covid-19 pandemic, a virtual event was organized instead, in June 2021.

(3) Development and evaluation of training needs

A training needs analysis was identified as a useful tool to gather information on the capacity gaps of the participants. Analyses of training needs are traditionally used to guide the design of training programmes for managers of protected areas (Fish & Walton, 2013). However, training needs analyses can also be applied to self-assess capacity needs. The online training needs analysis tool developed during the project helps individuals to assess and learn about their own capacity development and to indicate their priorities. The competence list used in the online training needs analysis tool was derived from Appleton (2016) and the screening approach described above.

Commonly, training needs analysis employs survey methodology and questionnaires (Gould et al., 2004). The LIFE e-Natura2000.edu training needs analysis is an online questionnaire comprising three main parts. In the general information section, the tool and data treatment are explained. The self-assessment section enables users to indicate their level for c. 220 selected competences. The third part gives the user feedback on their answers and provides a prioritized list of capacity development needs. All the reports generated by using the online tool and the data analysis are anonymous and confidential.

(4) Digital networking platform

Mobile apps are increasingly being used for training and learning, allowing learners to become involved in various informal learning activities and to obtain more personalized and autonomous peer-to-peer information and sharing of experiences by being digitally connected (West & Vosloo, 2013). In conservation management, mobile apps are being used increasingly to monitor species and visitors, engage citizens and, in general, improve knowledge (Kress et al., 2018; Tormey, 2019; Merrill et al., 2020). In LIFE e-Natura2000.edu, a free mobile app (called 'eNatura2000') served as a platform for managers of Natura 2000 sites (and is also open to other stakeholders) to enable discussions and the sharing of knowledge, experiences, information and perspectives. Users can link with other app users and connect through a specific chat service and conduct searches (e.g. of Natura 2000 sites) regarding experiences that will help them to find content such as scientific and technical documents.

(5) Evaluation system

Evaluation of training in conservation is fundamental for assessing the overall outcomes of learning (Sawrey et al., 2019). The design of effective evaluation requires the consideration of many factors, such as the type of assessment, the data to be collected (Garrison & Vaughan, 2008) and multiple sources of evidence (Berk, 2018). The use of online teaching requires novel approaches for evaluating its effectiveness (Rodrigues et al., 2018). For the evaluation of this project it was important to consider the hybrid conditions of the learning experiences.

The evaluation assessment aimed to consider the learning experiences of users with the online tools and their application of the competences gained during the course. The evaluation focuses on four groups of individuals involved in the project: participants, other users (e.g. of the webinars), tutors and experts, and project partners. Ex ante and ex post information were collected from these four groups. Three approaches were used during this evaluation (Sawrey et al., 2019): in-depth online questionnaires to assess ex ante and ex post conditions, online questionnaires focusing on specific topics, and phone interviews. To guarantee unbiased evaluation of LIFE e-Natura2000.edu, an external private company conducted the assessment and collected the data.

Methods

We used data gathered from the participants of the three core courses to examine the performance of the framework adopted in the LIFE e-Natura2000.edu project. These data were obtained through questionnaires (application forms, ex ante and ex post questionnaires), with a particular focus on the backgrounds and expectations of the participants. The questionnaires were administered using the online tool *Google Forms* (Google, Mountain View, USA).

For the questionnaire content and results (Laghetto et al., 2021), we focused on a group of questions and results related to the initial learning expectations, the ex ante and ex post comparisons of the ease of using specific tools, the overall evaluation of the three core courses, and the factors that affected the participants' experience of the core courses. A total of 66, 61 and 50 participants replied to the initial, ex ante and ex post questionnaires, respectively. Table 2 summarizes the topics and questions analysed.

Results

The largest proportion of participants worked for a national public authority (44%), followed by individuals involved in

TABLE 2 Responses by LIFE e-Natura2000.edu participants to questions related to various topic categories as part of the ex ante (expectations, training needs analysis) and ex post questionnaires (overall evaluation of the learning experience, impact of the Covid-19 pandemic) (Figs 2, 3, 4 & 5). Ease of using specific tools was part of both ex ante and ex post questionnaires.

Topic category	Topic or question	Possible responses
Ex ante questionnaire		
Expectations	Improving overall knowledge of the Natura 2000 network Improving knowledge of Natura 2000 management practices Improving technical knowledge through using online tools Networking with other Natura 2000 managers Increasing job/employment opportunities	Very low, low, moderate, high, very high
Training needs analysis	How useful was the online training needs assessment for highlighting the priorities for your capacity-building competences? Would you recommend the online Natura 2000 training needs analysis tool to someone who works in Natura 2000 management?	Not very useful, a confirmation (I already knew my competences), useful, very useful No, maybe, yes
Ex post questionnaire		
Overall evaluation of the learning experience	Improved overall knowledge of the Natura 2000 network Improved knowledge of Natura 2000 management practices Improved technical knowledge through using online tools Improved communication skills Improved stakeholder-engagement techniques & participation strategies Networked with other Natura 2000 managers Increased job/employment opportunities	Very low, low, moderate, high, very high
Impact of the Covid-19 pandemic	Impact significance Impact type	1–2: none; 3–4: low; 5–6: medium; 7–8: high; 9–10: very high Open-ended answers grouped into the following categories: managing daily work, family duties, health implications, technical learning issues
Ex ante and ex post questionnaires		
Ease of using specific tools	Webinars, e-learning platforms such as *Moodle*, demonstration videos/video tutorials, smartphone applications & social media such as *Facebook*	Cannot say, not at all, quite difficult, relatively easy, very easy

NGOs (28%) and those working for local public authorities (17%). Individuals working for natural resource management bodies (6%) and regional public authorities (5%) were also represented.

Responses to the ex ante questionnaire indicated there were high or very high expectations of the possibility of improving knowledge of the Natura 2000 network, related management practices and the use of online tools (> 65% of replies; Fig. 2). Participants also expected to increase the extent of their network with other managers (high or very high expectations: 75% of replies). However, there were lower expectations of the possibility of increased job/employment opportunities (high or very high expectations: 37% of replies).

In the ex post questionnaire, c. 75% of respondents reported that the training needs analysis tool was useful or very useful, indicating the importance of training needs analysis in this framework regardless of the core course the participants attended (Fig. 3a). No participants from the applied conservation biology course reported the tool to be not very useful. Confirming this positive perspective, 60% of the respondents indicated they would recommend this tool to other managers (Fig. 3b). However, 18% of respondents who reported the tool to be useful indicated they were uncertain about whether they would recommend the tool to others.

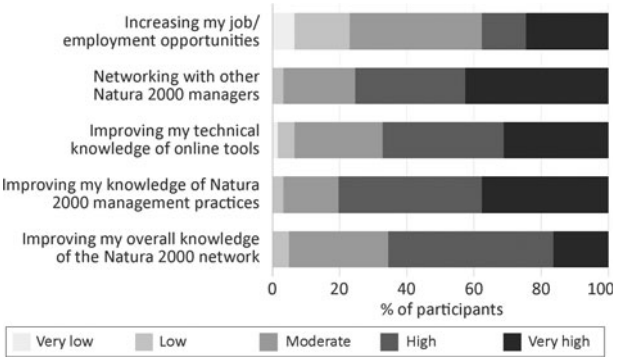

FIG. 2 Learning expectations of the participants of the three LIFE e-Natura2000.edu core courses regarding five topics in the LIFE e-Natura2000.edu project (from the ex ante questionnaire; Table 2).

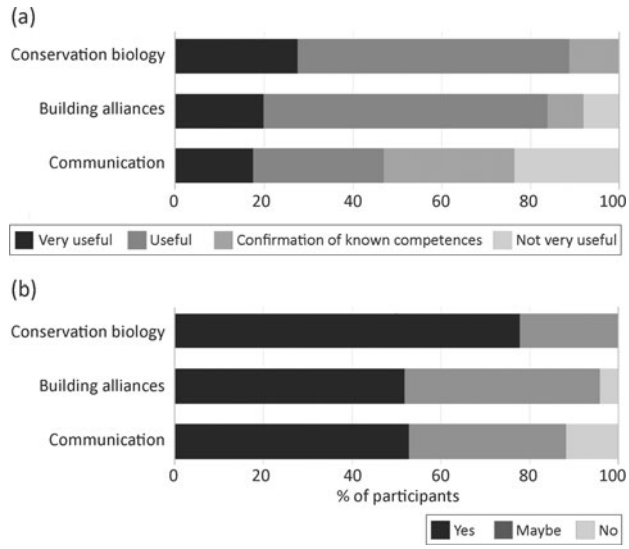

FIG. 3 Responses of participants of the three LIFE e-Natura2000.edu core courses (Applied conservation biology, Building alliances for Natura 2000 management, Competent inclusive communication) to the questions (a) How useful was the training needs analysis for identifying your capacity-building priorities and (b)Would you recommend the training needs analysis? (Table 2).

Comparisons of the ex post with the ex ante questionnaire responses indicated the main outcomes of the training. Most of the respondents highlighted the ease of using the various tools (webinars, e-learning platforms, demonstration videos/video tutorials, smartphone applications, and social media): the per cent of positive responses (relatively easy and very easy) increased from 76% ex ante to 85% ex post (Fig. 4). No responses indicating significant difficulty in the use of these tools were reported in the ex post answers. The videos were the easiest tool to use according to the ex post assessment (73% indicated very easy). Webinars, other tools and e-learning tools had the most substantial increases in responses of very easy (32, 16 and 12%, respectively) between the ex ante and ex post questionnaires.

In the ex post questionnaire, respondents reported a high degree of satisfaction with the training overall (68% of high or very high responses; Fig. 5). The aspect most appreciated was related to improving the knowledge of participants regarding Natura 2000 management practices (82% of high or very high responses). Respondents reported less satisfaction with the training related to it increasing their job/employment opportunities (51% of high or very high responses).

In the ex post evaluation, 36% of the respondents indicated the Covid-19 pandemic had a high or very high impact on the courses, and 34% of participants reported the pandemic did not have an impact on the courses. Amongst those reporting an effect, 43% indicated this was related to technical and/or learning issues, followed by increased family duties (29%).

Discussion

The framework of the LIFE e-Natura2000.edu project formed a complex, integrated system of tools applying various learning approaches to implement a capacity development system. This approach addresses capacity development in the management of Natura 2000 sites as a fundamental priority, as well as the need to develop training courses using scientific, technical and practical guidance (Appleton, 2015). We believe this capacity development system and its framework are good candidates to join the list of short-term projects that provide valuable experience and training for professionals (Grove & Pickett, 2019) and significant findings regarding capacity development for Natura 2000 (Table 3). The results of this project could be used as a baseline for future projects and research, particularly that focusing on the perception and use of various tools (Bennett et al., 2018).

The interest of the participants in capacity development was high and they had a broad variety of expectations. This suggests employers and decision makers should give more attention to training opportunities, with the possibility of integrating capacity development formally into work and as part of a blended learning pathway. The role of specific tools such as the training needs assessment was valued and was believed to benefit capacity development.

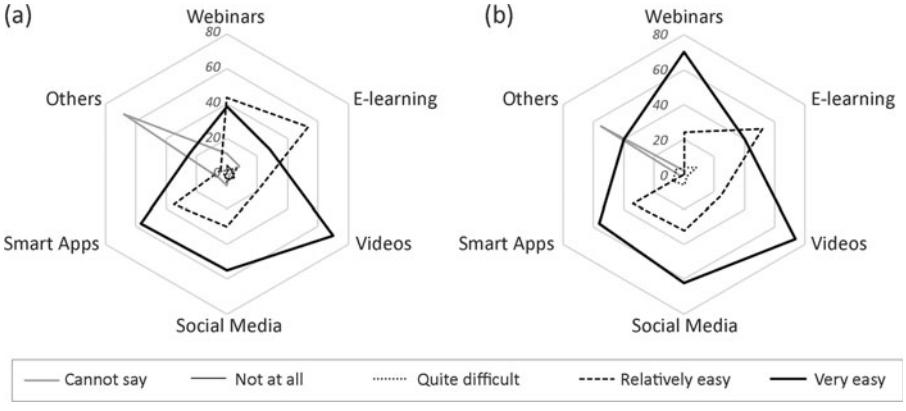

FIG. 4 From the (a) ex ante and (b) ex post questionnaires (Table 2), the per cent of responses by participants in the LIFE e-Natura2000.edu project regarding the ease of use of various tools (webinars, e-learning platforms such as *Moodle*, demonstration videos/video tutorials, social media, smartphone apps, and others).

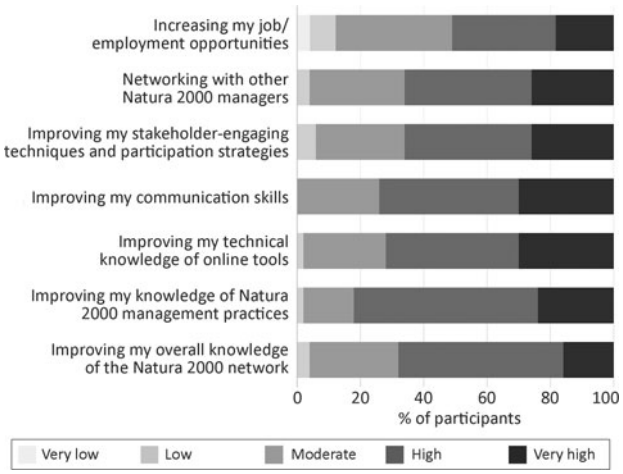

FIG. 5 Overall satisfaction of the participants of the three LIFE e-Natura2000.edu core courses with respect to the courses' seven focal aspects.

The approach of the project supported dialogue between Natura 2000 management actors and the various experts involved in the project. Such dialogue will help to strengthen science–practice linkages (Bertuol-Garcia et al., 2018). The array of different tools selected and used during the project, including case studies and group working, stimulated the sharing of knowledge regarding specific Natura 2000 management experiences.

The project developed and integrated competences that are known to be lacking (Milieu Ltd et al., 2016). Our study confirms the importance of increasing capacity on a number of Natura 2000 topics. The use of different methods in the project reflects capacity development priorities. The project was important for developing those capacities linked to the effective implementation of management practices, and tackled competences linked to communication, collaboration, awareness raising, education and local communities and cultures. These groups of competences have been

TABLE 3 Key challenges and recommendations related to the aims of the main thematic areas of the training framework of the LIFE e-Natura2000.edu project.

Main thematic area	Aim	Challenges	Recommendations
Creating a common framework	Define the main components of the framework	Integration of different components	Identify target audience; identify the main activities; adopt a blended learning system combining traditional & novel approaches & tools; apply multidisciplinary & transdisciplinary approaches
Identification & assessment of competences	Rank competences based on priorities	A wide range of competences is needed to manage Natura 2000	Identify actors; use accepted competence classifications (e.g. Appleton, 2016); include experts; use assessment techniques to identify priorities
Development of courses	Construct courses tackling specific competences	Learning & teaching contain a variety of complex factors making it difficult to differentiate between variables; intensity & time availability; flexibility is required to satisfy participants	Develop course for the selected competences; develop a call for applicants (& a selection system); involve & include important stakeholders; use blended learning (online & face-to-face approaches); include a diversity of tools to ensure interest & engagement
Evaluation of training needs	Understand gaps in the knowledge of participants	Ensure usability; enable analysis of data	Construct an online tool; facilitate a self-assessment; analyse data, ensuring confidentiality & anonymity, to assess & adjust training
Establishing an evaluation system	Assess the outcomes of teaching & learning	Identification of the type of assessments to be performed & data to be collected	Use multiple sources; have clear learning objectives; include a range of target groups; collect ex ante & ex post data; use combinations of assessment methods; ensure third-party involvement in the process & data analysis; acknowledge limitations of the system
Online platform	Facilitate sharing between peers	Appealing structure; ensure usability	Offer platform free of charge; target current & future managers but also open the platform to stakeholders with an interest in management; enable sharing of documents & experiences

reported to be key for improving biodiversity conservation (e.g. communication and marketing; Robinson et al., 2019). However, our approach has highlighted the importance of the knowledge, skills and attitudes related to foundational and advanced personal competences, such as working effectively under pressure, which were integrated within the various learning actions. Foundation level competences have been reported to be of high priority for any capacity development initiative in biodiversity conservation, regardless of the actors involved (Elliott et al., 2018).

The use of blended learning provides several benefits, such as more effective pedagogy, low cost, low carbon footprint and increased flexibility (Osguthorpe & Graham, 2003; Graham, 2006). The importance of flexibility has become evident during the Covid-19 pandemic, which had an impact on participation in the courses. The ability to move to online activities ensured that the project could continue. The project has integrated various tools and, based on the responses of participants, their capacity to use them improved after attending the core courses. The use of a range of tools benefits the learning offered and enables trainers to increase their knowledge and skills, particularly those related to the use of digital technologies, which facilitates self-directed learning activities and an individual's educational path and learning pace (Castro, 2019). Using a range of tools has been shown to increase engagement, and high levels of engagement are often achieved when there is active participation from the start of a project (Evely et al., 2011). We will continue to monitor whether the mobile app, which is an addition to traditional training solutions (Andrachuk et al., 2019), will continue to be used consistently by Natura 2000 managers.

The LIFE e-Natura2000.edu project contributed to meeting the need for evaluations of learning programmes (Rajeev et al., 2009). The evaluation system includes a variety of learning tools, considers the main learning experiences and is a multifaceted system that considers all main actors in the project. One outstanding issue is the difficulty of addressing the impacts of the learning experience; direct outcomes are difficult to observe in the short term and require long-term assessments. Identifying the relationships between any changes arising after a training course is considered to be difficult (James, 2001). Nevertheless, future studies should use data derived from various assessments to assess the quality of the learning provided and to guide future Natura 2000 learning programmes. This will enable the identification of the most appropriate tools and teaching improvements that, in turn, will help decision-making (Toomey et al., 2017). If applied as a monitoring framework, this complex evaluation system could support adaptation of this learning system (Ansong et al., 2020), making the LIFE e-Natura2000.edu project a reference for future capacity development projects.

Although the variety of approaches and tools in this project form a complex training system, it could be repeated, replicated and reproduced and/or it could form the basis from which EU-wide training systems for Natura 2000 could be developed. LIFE e-Natura2000.edu is mentioned in the guidelines for applicants and evaluation guide to preparatory LIFE projects (European Commission, 2020) as a base from which to build future training projects. From this perspective, support from institutions, regional and national governments and entities involved in the organization of the capacity development experience could be increased (Rao et al., 2014).

From the experience gained in this project regarding capacity development for the management of Natura 2000 sites, we recommend that: (1) ex ante and ex post questionnaires are used to provide an understanding of the learning requirements and main achievements of training; (2) a multidisciplinary approach is adopted, without overlooking foundation level and personal competences; (3) both blended learning and a range of tools are used; (4) there is a focus on enhancing the possibility for and ability of participants to share Natura 2000 management experiences; and (5) integrated evaluation of the learning experiences, contents and competences contained within projects is included.

In conclusion, capacity development projects for Natura 2000 managers will need to consider both general competences for protected area management and specific requirements linked to the Natura 2000 framework. Future research should focus on identifying those competences that remain to be addressed through learning programmes. In this context, research should aim to assess the evidence regarding the use of blended learning approaches and on how to evaluate their effective implementation.

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Ethical standards This research abided by the *Oryx* guidelines on ethical standards. Participation in the online questionnaires and interviews was voluntary and was part of the LIFE e-Natura2000.edu project.

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