



Final socio-economic and ecosystem services assessment of the LIFE SAFE-CROSSING (LIFE17NAT/IT/464) project

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Introduction

The primary goal of the LIFE SAFE-CROSSING (LIFE17NAT/IT/464) project was to address the detrimental effects of road infrastructure on specific priority species that are majorly impacted by road infrastructures and consequent habitat fragmentation. To counteract these negative effects, project measures took place in 2018-2023 in four European countries focusing especially on the Marsican brown bear (*Ursus arctos marsicanus*) and the wolf (*Canis lupus*) in Italy, the Iberian lynx (*Lynx pardinus*) in Spain, and the brown bear (*Ursus arctos*) in Greece and Romania. To reach its objective, the LIFE SAFE-CROSSING project incorporated targets of reducing traffic collision risks by raising drivers' awareness and using innovative tools, as well as enhancing connectivity for target species. The project was implemented in a wide-stakeholder partnership of 13 NGOs, companies and public organisations.

In order to measure the socio-economic (Action D3) and ecosystem services impacts (Action D4) of the five-year-project, various methods were deployed to collect data on a number of indicators (Table 1). Beneficiaries were surveyed to provide values of the project's Key Performance Indicators (KPIs)¹ and additional socio-economic and ecosystem services indicators along with their views of the overall project impacts. Similar data on the project impacts were collected through a stakeholder survey filled in by the participants of the project's final conference and other events. Tourism relevant information was provided by two national parks (Abruzzo National Park and Maiella National Park) participating in the project. Effectiveness of road panels was also measured by a dedicated survey distributed to drivers. The project's communication activities data were provided by the project management team. For the assessment of this array of information, we first provide an overview of each method followed by the details of the results obtained from each method. Drawing on the data, we elaborate the impacts in the discussion and conclusion sections from the socio-economic and ecosystem services aspects' point of view.

¹ The project's KPIs were provided by the project team.



In the project proposal it was foreseen to have two separate actions D3 – *Assessment of the socio-economic impact of the project on the local economy and population* and D4 – *Assessment of impact on ecosystem functions*, and two reports as separate deliverables. However, since the two actions are intrinsically connected, both in terms of assessment and results, it was then considered that it makes more sense to merge the results of the two assessments into one single report. This was also acknowledged by CINEA in the letter of 10.05.2023.

Main type of impacts	Impact	Indicator	Method used
Socio-economic impacts (Action D3)	Attitude/behaviour changed	Number of persons influenced by the project	KPI table
		Effectiveness of road panels	Road panel survey
		Expert views on changes	Project beneficiaries, stakeholders and national parks surveys
	Awareness raised	Number of people reached	Communications data and KPI table
		Number of communication elements	Communications data and KPI table
		Number of awareness raising events	Communications data and KPI table
	Collaboration created	Number of entities cooperated with	Project beneficiaries, stakeholders and national parks surveys, KPI table
		Number of replication events	Communications data and KPI table
	Improved knowledge, innovation and practices	Expert views on improvement	Project beneficiaries survey
		Number of conferences attended	Communications data
Improved capacities	Expert views on improvement: - financial, - human resources - networking capacities)	Project beneficiaries survey	
	Number of jobs created by the project	KPI table	



	Economic benefits	Amount created by the project	KPI table
		Future opportunities for funding possibility	Project beneficiaries, stakeholder and national parks surveys, KPI table
		Amount of cost avoided	Project beneficiaries survey and KPI table
	Improved road safety	Changes in collision trend	KPI table
		Changes in the number of dead animals	KPI table
		Changes in the number of potential risk situations	KPI table
Ecosystem services and ecological impacts (Action D4)	Maintaining nursery populations and habitats	Changes in <i>Canis lupus</i> population trends	KPI table
		Changes in <i>Ursus arctos</i> population trends	KPI table
		Changes in <i>Lynx pardinus</i> populations trends	KPI table
		Changes in other species population trends	Project beneficiaries survey
		Connectivity changes	Project beneficiaries survey and KPI table
	Cultural ecosystem services	Changes in tourism	Project beneficiaries survey and national parks surveys
		Changes in cultural heritage	Project beneficiaries, stakeholders and national parks surveys
		Changes in educational and scientific services	Project beneficiaries, stakeholders and national parks surveys

Table 1. Summary of the indicators of the socio-economic impacts (Action D3) and ecosystem services and ecological impacts (Action D4) and their data collection methods

Methods

A combination of data collection methods was employed to gather information concerning both the socio-economic aspects (Action D3) and the impacts on ecosystem services (Action D4). Indicators to measure impacts were jointly selected with the project management team to ensure the assessment is fulfilled for the most relevant elements. The socio-economic aspects were based on both the project's pre-determined KPIs and additional direct and indirect socio-economic indicators (jobs created, funding opportunities, collaboration, improved capacities) the project potentially contributed to. Ecosystem



services were selected according to the Common International Classification of Ecosystem Services (CICES)² framework. Based on the direct project's influence on connectivity and species populations, biodiversity and habitat provision (maintaining nursery populations and habitats) were selected as a regulation and maintenance ecosystem service. It was deduced that the project also added to certain cultural ecosystem services (more specifically, tourism, cultural heritage, educational and scientific services). Incorporating questions into a diverse set of data collection methods (surveys, secondary data collection) aimed at a broad spectrum of stakeholders ensured that the data were obtained from multiple sources, providing a comprehensive and robust conclusion.

Key Performance Indicator table for project beneficiaries

To understand simple numeric or in some cases, qualitative changes in the specific pre-set KPIs of the project and other relevant indicators directly related to socio-economic impacts or ecosystem services, a table on these variants was set up (Annex 1). This table aimed to measure the baseline values of the KPIs (either before or in the initial years of the project's start) and the values at the end of the project (2023) to detect changes and trends. Each beneficiary was provided with this table to fill out online covering their own activities and relevant trends on the sites they worked on.

Surveys for project beneficiaries, stakeholders and national parks

We deployed three sets of surveys for various target groups, including the project beneficiaries (Annex 1), relevant stakeholders (Annex 2) and the two national park partners (specifically about tourism) (Annex 3). Regarding the National Parks, we decided to collect tourism data only in these areas because they already regularly monitor these data, whereas in the other "unprotected" areas it is not possible to directly relate this information to the project implementation. We applied a mix of open-ended questions to allow more context and content assessment along with close-ended, multiple-choice and Likert scale questions. Information of the purpose of the surveys and the project was provided. Consent from the responders to use the relevant data was also ensured.

Our primary aim with the project beneficiaries survey was to assess the project's impacts from the beneficiaries' point of view and based on the feedback they directly or indirectly received from stakeholders. We were particularly curious about the most impactful elements of the project as well as the general impact on reducing road accidents, raising awareness, developing knowledge and innovation, enhancing road authorities' practices, organisational development, capacities and policy along with changes in the target species, habitats and connectivity. We also targeted questions to explore specific collaborations made, changes in cost, financial and non-financial benefits, and willingness to participate in future projects. The survey link was distributed among the beneficiaries by the contractor and the project management team between April and July 2023 using the SurveyMonkey platform.

Concerning the stakeholders' survey, the aim was to evaluate the consideration of impacts of road kills and connectivity, and in light of this, the importance and success of the project. A specific question on the importance of various LIFE SAFE-CROSSING project elements (e.g., monitoring activities or the

² <https://cices.eu/>



installation of virtual fences) was formulated to set up a rating of relevant actions, while another question was directed at identifying which specific action may be considered being deployed elsewhere. The survey also aimed to reveal obstacles and further actions to improve the impact of roads on biodiversity. The survey was disseminated in various project events and the final project conference in Italy in May 2023 among the project stakeholders (researchers, tourism actors, NGOs, local and road authorities, national park employees, companies, etc.).

The national park survey specifically screened the tourism attributes of the project targeted at the two national parks, which were also beneficiaries of the project (Maiella and Abruzzo Lazio e Molise National Parks). Here, our objective was to receive information and expert opinions about changes in tourism due to the project, namely changes in the visitors' number, plausible reasons behind these changes, fluctuations in tourism expenditure and related benefits derived from the project. This survey was sent directly to the two national park representatives who provided their responses in a word format.

Survey on road panel effectiveness

The project developed new road panels based on research about how road signs could be improved using applied neuroscience (Actions A7/C3). Out of four possible road panel designs, two were selected (depicting road crossing bears/lynx and bear/lynx accident with a car (Image 1) and installed in the project countries where the relevant animals occur.



Image 1. New road panels with bears

The effectiveness of the chosen road panels was measured by a survey (Annex 4), which was developed by the project team and was distributed in Romania, Spain, Greece and in two national parks in Italy (Maiella National Park-PNM and Abruzzo National Park-PNALM). The surveys contained similar questions, however, some of the questions differed due to different national conditions. Predominantly close-ended questions (multiple choice, likert scale, yes-no questions) were included in the surveys, supplemented by several open-ended questions. We received the filled-out questionnaires through the project team and combined the country results into one single table to analyse the responses to the similar questions together. We also assessed the differences between the countries, where it was applicable.



Communications data

We received communication data from the project management team, who collated data in a table format from all beneficiaries on their media activities, awareness raising events and people reached, conferences, networking activities and activities to encourage replication.

Limitations of the methodology

Concerning the stakeholders and beneficiaries surveys (including the survey provided by the two national parks), it has to be emphasised that respondents have certain biases. They are more inclined to perceive the project's scope important due to their inherent involvement and interest. Therefore, they probably deem the project and its impacts more positively. To counteract subjective opinions, we consequently aimed to collect additional quantitative data on progress, as well (e.g., through the KPI table) and consider third parties' views (e.g., stakeholder survey). However, it became evident that to showcase impacts of habitat and population trends, on one hand, a longer period needs to take place, on the other hand additional impacts on animal populations beside detrimental road effects must be taken into account. In relation to the survey about the new road panels' effectiveness, it is worth noting that people tend to consider themselves as responsible, rule-abiding individuals (in this case, driving carefully, within speed limits and taking care of wildlife). This self-perception may cause certain biases in their response choices.³ For certain questions, there were variations in the answer choices provided in surveys in different countries. Consequently, comprehensive comparisons and overall average values could not be provided in such instances. However, for these questions, the comparable answer choices were examined, and any disparities in the responses were documented in the report.

Results

Key Performance Indicator table for project beneficiaries

The specific pressures/threats affecting the spatial extent of the project decreased on 500 km in total, whereas for the local communication activities we can consider that they impact persons on 30.000 km³. Regarding the priority species, the number of *Canis lupus* shows an increasing trend in the Romanian project area, while the population is stable in Terni Province (20 individuals), in the Maiella National Park (with 100 individuals in the beginning and at the end of the project) and in the Abruzzo Lazio e Molise National Park (60 individuals). The area covered by the population also remains stable in the two national parks (altogether 203,000 ha). The number of *Lynx pardinus* as well as the area inhabited by the animal are increasing in case of the Andalusian population according to one of the project beneficiaries in Spain. The *Ursus arctos* population also displays an upward trajectory in Romania. The number of bear appearances reached its highest number in Maiella National Park (from 2-5 to 1-12) along with the estimated habitat expansion and in Abruzzo Lazio e Molise National Park it seems to be slightly increasing, although the last comprehensive population assessment was done 10

³ Vesely, S., & Klöckner, C. A. (2020). Social desirability in environmental psychology research: Three meta-analyses. *Frontiers in psychology, 11*, 1395. <https://doi.org/10.3389/fpsyg.2020.01395>



years ago. The most recent number of *Ursus arctos* individuals in Greece was provided from 2021 equally demonstrating an increasing tendency (160 compared to 154 individuals from 2017).⁴

According to the beneficiaries provided data, over 6 million persons may have been influenced by the project activities. This number contains social media followers, website views, estimated number of drivers on the roads, where the new road panels were installed, school students, stakeholders, survey respondents, participants in workshops, etc.. There were several media items broadcasted and distributed during the project, altogether 227 by eight beneficiaries. This contains articles, project videos, news items in newspapers and in the radio, leaflets, posters, press conferences, etc.

Regarding the involvement of the different types of stakeholders, 12 NGOs, 36 public bodies, 92 local communities and authorities and 264 other stakeholders, all together 404 stakeholders were involved in the project. Municipalities, road authorities and many driving schools (77) were engaged in the project, just to mention a few.⁵ With networking activities, the project reached approximately 5,699 persons, including 150 individual members of interest groups, 417 professionals (outside from the beneficiaries), 3,033 pupils and 1,165 other stakeholders.⁶

Approximately 4,8 FTE of jobs were created including opportunities within temporary jobs and contract work. Reduction of cost is expected in all target countries due to the reduction of the costs incurred by collisions with wildlife.

A significant reduction of costs can be expected, calculated in 3.936.000 €. Based on figures from the previous LIFE STRADE project (LIFE11BIO/IT/072) for each AVC PS there is a potential reduction of at least 12 collisions/year and one collision per km per year. According to literature an average cost of 8.000 € can be calculated for the consequences of collision including injuries, fatalities and related costs (Camps et al. 2016).

Survey for project beneficiaries

Main impacts and key impactful project elements

Concerning the primary impact of the project, beneficiaries highlighted the following key aspects of reducing risk of animal-vehicle collision and improving habitat connectivity in the project areas. Additionally, the project successfully raised awareness among various target audiences, including technical staff in road administration, natural park authorities and the general public. The project's actions included installing virtual fences, improving underpasses and implementing efficient measures to mitigate collisions. Additionally, the project enhanced stakeholders' involvement, promoted

⁴ (Abruzzo National Park only has data from 2014 counting approximately 50 individuals).

⁵ We deleted the duplicates, when one stakeholder was mentioned more than one time by a different beneficiary, or if the stakeholder was mentioned more times by the same beneficiary (e.g. in the public body section and also in the local authority section).

⁶ There were overlaps in the “networking” and in the “stakeholders involved in the projects”. Where clear distinction could be made to avoid duplication, we moved the values to another section or did not include them into the total calculation. E.g., driving schools were mentioned by one partner in the “networking” section, while other stakeholders included driving schools in the “stakeholders involved in the project section”. In such cases we moved the number of driving schools from networking to the other section. Also, Maiella National Park recorded 88,000 inhabitants as stakeholders - we did not consider this number in this section, rather in the “human influenced” section.



technological innovation, and increased citizens' awareness of biodiversity protection and road safety issues.

Concerning the most impactful element of the project, survey respondents noted that the project focused on reducing animal-vehicle collisions using innovative tools such as the AVC-PS (Animal-Vehicle Collision Prevention Systems) and virtual fence⁷, while also improving road infrastructure and habitat connectivity. The virtual fence proved to be a cost-effective alternative to physical barriers, putting pressure on governments to consider mitigation measures. The end-to-end monitoring solution offered numerous advantages, including automated processes for identifying and categorising passing wildlife. Other impactful measures included the installation of road panels to raise awareness among drivers and the involvement of driving schools.

Socio-economic impacts

In the first set of questions, we aimed to measure the level of agreement with certain statements from a scale of 1 to 10, where 1 is “fully disagree” and 10 is “fully agree”. The values received represent an average score derived from all respondents' ratings. Beneficiaries indicated the extent of their agreement with 7.35 for reduced road risks and accidents in the project area since the project started. In terms of increased awareness of the vehicles impact on wildlife, respondents marked an even higher score, 8.18. Since the project commenced, ecological connectivity had also improved along with large carnivores and other species' populations (7.59 for both questions) in the beneficiaries' opinion. Beneficiaries were also in universal agreement with the statement about the project's contribution to improved knowledge and innovation (8.53). To a lesser extent, respondents were in accordance with the statement about local communities being more aware of large carnivores and related road risks (7.24). In the beneficiaries' view, road authorities started using safety practices in relation to road risks thanks to the project (8.12). Respondents also agreed that they had somewhat limited financial resources to understand and to take measures against road impacts on biodiversity, which improved due to the project (7.35) along with manpower to tackle the same issues (7.18). Thanks to the project, time and resources dedicated for networking and transferring knowledge at international level were also seemingly enhanced (8.06) along with more opportunities to work with other sectors (7.76). There was a lesser agreement with the statement about increasing interest from local communities, municipalities, schools about the roads and wildlife (6.94) and decision-makers to integrate biodiversity consideration into relevant policies (6.65). Considering time and resources to provide scientific and practical training for colleagues, respondents showed more dispersed views with an average score of 7.24 (Fig. 1). In terms of whether projects like the LIFE SAFE-CROSSING provide motivation to colleagues of participating entities to carry out their work, respondents provided a 7.35 score.

⁷ Read more about these innovative technologies here <https://life.safe-crossing.eu/techniques>



Q17 We now have sufficient time and resources to provide scientific/practical training and development opportunities for our colleagues due to the project.

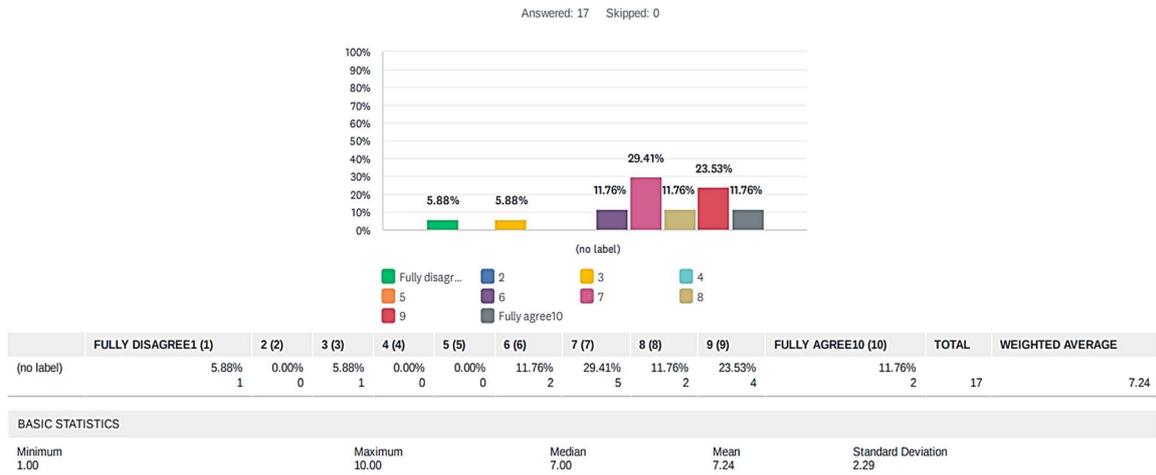


Fig. 1. Responses indicating agreement to the question of sufficient time and resources to provide training for colleagues

Beneficiaries highlighted several sectors whom they established cooperation with (Fig. 2). Fourteen respondents highlighted road authorities, 12 local and regional authorities, 6 national authorities, 5 railway authorities and 2 spatial planners. Seven respondents highlighted other entities, including NGOs, forest administration, nature authorities, auto clubs, schools and youth organisations, and the general public. Tech companies were additionally underlined.



Q19 Chose which of the below sectors/partners you could cooperate with due to the project (please choose as many as relevant).

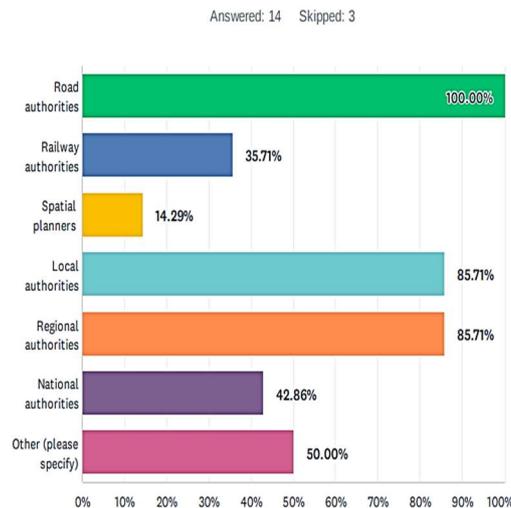


Fig. 2. Responses indicating cooperating partners and sectors within the frame of the project

Respondents named a number of specific collaborating partners including certain municipal authorities, transport authorities, police, schools, NGOs, national parks, research and other associations. Respondents added that collaborating entities provided assistance in co-organisation of workshops and replication activities, and other activities involving multiple participants. The road management authorities for national roads played a crucial role in granting permissions and offering cooperation being the owner of several roads where work was carried out. Additionally, co-operating partners also provided technological assistance. Cooperating entities benefitted through valuable knowledge and funding and enabling the implementation of mitigation measures in other regions. Capacity building and networking were crucial benefits of the project, as well. Overall, collaboration with other partners helped achieve decreased road accidents with wild fauna, increased public awareness, and the promotion of good practices and advanced tools, while contributing to research and innovation as well as corporate responsibility.

The project's efforts resulted in the reduction of damages on vehicles and decreased costs for recovering injured passengers due to fewer accidents involving wild fauna. Drivers' compensation costs also decreased as a result of the project's success in reducing road accidents.

The survey also highlighted the reduced cost of road fences by replacing physical fences with a virtual one. Other indirect financial benefits were foreseen by eight respondents. The project beneficiaries expressed that the project created opportunities for future cooperation in developing projects related to managing road traffic accidents. Cooperating entities expressed willingness to invest in road safety and



collaborate on new special projects in the future. The project also led to the promotion of COSMOTE's brand name and innovative technological profile, with the possibility of commercialising the wildlife monitoring and species categorisation solution developed by COSMOTE. Regarding impacts on stakeholders affected by LIFE SAFE-CROSSING, it was noted that the project resulted in more secure communication infrastructures. The implementation of concrete solutions to threats to humans and wildlife brought satisfaction and pride. The knowledge and good practices gained from the project are being spread to other projects within the contributing entities. Cooperation among Southern European countries has been positive and productive, laying the foundation for future collaboration even outside the project's reach. A number of further benefits were highlighted by the respondents and summarised in the table below (Table 2).

Beneficiaries also highlighted some challenges in terms of the project's implementation. The project faced time-consuming traffic permit procedures and unforeseen cost increases due to implementing innovative solutions like Animal-Vehicle Collision Prevention System (AVC-PS). Whereas these innovative tools indicate promising results, the concrete effectiveness of the installed devices can only be fully assessed in the next few years. Funding remains a major challenge, and more support for such projects should be addressed in the future.

Impacts on biodiversity, ecosystem services and the environment

In terms of the project's impact on biodiversity, including improving habitats and connectivity, the project adapted crossing structures (e.g., underpasses) to increase the likelihood of wildlife using them within the project intervention area. By enhancing structures and increasing wildlife safety, animals can now cross main roads at spots that were previously inaccessible. Improved habitat connectivity was achieved through these interventions, monitoring activities, and contacts with road management authorities, allowing for potential replication. Reducing the risk of wildlife being hit positively impacted population survival and dispersal chances. Achieving "safe permeability" along crucial roads for e.g., bears amended connectivity. The success of animals crossing roads safely demonstrates that roads do not need to be barriers for them if careful planning is applied. Though there is still work to be pursued, networking with road authorities started to address connectivity issues and employ successful practices.



ANSWER CHOICES	RESPONSES	
None of the above	0.00%	0
Reduced costs (1)	14.29%	2
Increased income due to the project (2)	14.29%	2
Reduced conflicts with other sectors (3)	35.71%	5
Increased capacities (e.g. new colleagues, volunteers) (4)	57.14%	8
Enhanced knowledge (5)	92.86%	13
Enhanced skills benefitting the entity through trainings and education (6)	57.14%	8
Increased supporters' number (7)	14.29%	2
Increased visibility of your organization among stakeholders (8)	64.29%	9
Enhanced cooperation with the private sector (9)	35.71%	5
Enhanced cooperation with other sectors (10)	57.14%	8
Opportunity for networking, transferring and receiving knowledge and international experience (11)	100.00%	14
Increased scientific information and participation in research (12)	64.29%	9
Development of innovative solutions and technology (13)	78.57%	11
Increased communication about your organization in the media (14)	42.86%	6
Increased satisfaction among colleagues due to project work and results (15)	42.86%	6
Increased acceptance and support from local stakeholders (16)	50.00%	7
Product development (17)	14.29%	2
More funding opportunities due to enhanced network of your entity (18)	21.43%	3
More funding opportunities due to increased public or private support (19)	14.29%	2
Increased awareness about the issue (20)	92.86%	13
Attitude change of the general public towards supporting nature conservation (21)	50.00%	7

Table 2. Benefits provided by the project according to survey respondents

Other impacts on biodiversity were additionally added by the beneficiaries. The conservation status of the target species and the overall biodiversity in the project area were positively impacted. The project's innovative signals and actions successfully reduced roadkill risks not only for the target species but also for other wildlife species, including deer and wild boar contributing to nature conservation in general. Wild animals' routes improved, benefiting all species in the area, not just the ones specifically addressed by the project. Furthermore, other species relying on large mammals for seed dispersal also benefited from improved safe crossings. The project's actions, such as garbage removal and removal of food attractants along roads, also contributed to reducing the risk of wildlife being run over.

The project further led to reduced CO₂ emissions by decreasing vehicle speed. It also resulted in minimised site visits due to automated camera content uploading, which in turn meant economic and environmental benefits thanks to limited use of vehicles for checking sites.



Survey for stakeholders

Altogether 97 project stakeholders (researchers, tourism actors, NGOs, local and road authorities, national park employees, companies, etc.) from nine countries (Belgium, Croatia, France, Greece, Ireland, Italy, Netherlands, Romania, and Slovakia) provided responses to the survey distributed at various key project events. For the likert scale questions, respondents could select a value on a scale from 1 to 5 (where 1 was “not at all important” and 5 was “very important”). Respondents deemed the importance of the problem of the roadkill of animals significantly high providing a 4.8 average value. Fragmentation of the habitats was also similarly important for the responding stakeholders (4.6) along with the significance of the LIFE SAFE-CROSSING project (4.6). To rank the success of the various measures of the LIFE SAFE-CROSSING project, respondents considered the monitoring activities (4.5) as the most successful element, followed by the installation of the Animal-Vehicle Collision Prevention System (4.4) and the adaptation of underpasses (4.4). The success of the awareness raising activities was ranked as third (4.3), followed by installation of road panels (4.1) and virtual fences (4). To the question how respondents consider the success of the LIFE SAFE-CROSSING project’s impact on reducing road effects on wildlife, an average score of 4.1 was provided.

Several respondents (71) provided insight and expanded on the project elements they find most important. Respondents highlighted the importance of methods and initiatives being employed, including awareness raising, road panels, virtual fences and underpasses to address issues related to road accidents and wildlife. Another important project element noted was the focus on sharing good practices. The project’s contributions to a cohesive policy framework to reduce mortality and anthropogenic impact was additionally highlighted. Collaboration with the local population and education were deemed crucial in promoting coexistence between humans and animals.

Respondents were also requested to select among the various project elements concerning which actions of the LIFE SAFE-CROSSING project they would consider useful in their own respective area. The respondents’ 72% selected the adaptation of underpasses, 67% awareness raising activities, 62%-62% respectively the monitoring activities and the application of the Animal-Vehicle Collision Prevention System, 52% the installation of road panels, and 32% of them selected the installation of virtual fences to be considered in their area.

Concerning the selection of the main obstacles for implementing the activities of the LIFE SAFE-CROSSING project, 50% of the respondents marked the lack of financial resources as the most relevant hindering factors, followed by lack of political willingness (23%), difficulties in permit processes (17%) and inapt staff (12%). A number of respondents (13%) additionally noted lack of awareness, lack of involvement, lack of complex planning approaches and lack of communication actions as the main obstacles.

In terms of actions to reduce the impact of roads on biodiversity, respondents underscored the need for a variety of approaches to be applied to address the challenges posed by road accidents involving wildlife. These strategies should encompass a range of measures, including speed control methods and the construction of over- and underpasses, which provide safe pathways for animals crossing. A notable proposal was to integrate biodiversity considerations into the requirements of public tendering processes, obligating a percentage of tenders to be dedicated to biodiversity-related initiatives.



Additionally, there was an emphasis on advancing the understanding of animal behaviour when crossing roads and monitoring the influence of underpasses on predator-prey interactions. In the broader context, the development of wildlife corridors and the engagement of the public through consultation and educational activities emerged as pivotal strategies for successful conservation endeavours. According to the respondents, collaborative efforts and cooperation between different stakeholders, including schools, should play a vital role in raising awareness and ultimately preventing accidents involving wildlife. Enhancing public transport systems, adjusting speed limits, and maintaining the perimeters of roads were identified as crucial steps to improving road safety along with the enhancement of shared mobility options to decrease the overall number of vehicles on the road. Effective collaboration, vigilance, and the enforcement of regulations were also highlighted for accident prevention and enhanced safety. A consistent theme throughout the above noted efforts was the importance of persistence and long-term commitment. Based on respondents' opinion, efforts to engage communities, raise awareness, and effectively manage road networks need sustained attention and dedication to achieve meaningful and lasting results in mitigating conflicts between wildlife and road infrastructure.

Survey for national parks

Reliable data about tourism was collected only from the two Italian National Parks (Abruzzo Lazio e Molise NP and Maiella NP). This is the case because National Parks have a simple and transparent way to measure tourism numbers (e.g. in visitor centres, tourist infrastructures etc.), whereas this type of data is not available for the unprotected territories in the other project areas. Therefore the data from the Parks was considered the most reliable and accurate one and this analysis was restricted to these areas.

National parks experienced a notable surge in tourism during the period from 2018 to 2023, with Abruzzo Lazio e Molise National Park witnessing an approximate 18% increase in visitors' number. This boost in tourism can be attributed to several factors, as explained by park authorities, including coordinated promotion of the parks, growing interest in outdoors experiences, decreased life quality in cities and the post-pandemic effect. National parks also stated that tourism expenditure slightly/significantly increased in the given period.

Representatives of national parks believe that the LIFE SAFE-CROSSING project had a noticeable impact on tourism. While Maiella National Park did not provide specific numerical data on the variation in tourism numbers during the mentioned period, they estimated that the direct impact of the project on tourism increase fell between 0% and 5%. Abruzzo Lazio e Molise National Park reported the estimate of the project being responsible for a 1% increase in tourism.

Survey on road panel effectiveness

Altogether 1,319 respondents filled out the questionnaires from the four project countries, (Table 3). It is important to note that not all respondents answered every question, which was expected due to the variations in questionnaires distributed across different countries, as explained in the methodology section. Each question was analysed based on the corresponding number of responses.



Project location	Number of respondents
Greece	18
PNALM	163
PNM	798
Romania	77
Spain	263
Total	1 319

Table 3. Number of survey respondents by project location

Concerning all respondents from each location, most of the respondents (92%) heard about traffic accidents with wildlife, 5% of them did not hear about it, while 3% of the respondents had direct experience. Respondents indicated that mainly small mammals (57%) and wild boars (23%) are the victims of the collisions. In most respondents' view, the main reason for the accidents is "*High speed and low attention*" since on average 61% of them selected this option. There are clear country differences nevertheless: While in Italy a high number of the respondents (82%) chose the latter option, in Romania a significant portion of respondents identified "*Lack of intervention by the authorities*" (38%) and "*Failure to signal properly*" (25%) as the main cause of accidents.

On average approximately half of all respondents (55%) think that the currently broadly used wild animal caution sign is an effective way to draw attention to the risk of accidents. Greek respondents, however, tend to disagree since only 33% of them found the sign effective. In response to the following questions, which aimed to assess measures to reduce risks of wildlife accidents, we received different answers from each location, however, not all response choices were provided in all surveys. In Greece, 33% of the respondents believe that installing roadside fences could reduce the risk. In Italy, careful driving was the most important element to reduce collisions, according to the respondents. In Abruzzo Lazio e Molise National Park, 44% of the respondents opted for the choice "*Driving carefully*", while in Maiella National Park, an equivalent 44% selected "*Promote information campaigns to make people aware of driving carefully*". Spanish respondents consider that the most effective measure for reducing accidents is the lowering of speed limits in risk areas. On average 37% of all respondents selected the option "*Building underpasses and overpasses*" (except in Spain where this option was not included) being particularly favoured by the Romanian respondents (Table 4).



Answer choices	Greece	PNALM	PNM	Romania	Spain
Build underpasses and overpasses	28%	25%	20%	40%	-
Change road signs	11%	3%	3%	4%	12%
Driving carefully	6%	44%	-	16%	27%
Install roadside fences	33%	3%	13%	27%	24%
Lower the speed limits in risk areas	11%	20%	16%	9%	37%
Promote information campaigns to make people aware of driving carefully	-	-	44%	-	-
Reduce the number of animals near roads	6%	1%	2%	4%	0%
Other	6%	4%	3%	0%	0%

Table 4. Distribution of the given answer choices regarding what could be done to reduce the risk of wildlife accident, by project areas

The next question aimed to find out whether the selected solution indicated in the previous reply has already been applied. On average, more than half of the respondents (58%) answered “No” to this question. According to them, the main reason for non-application was the lack of funding, sensitivity and interest towards the problem. However, there are national differences here, as well. In Romania, 92% of the respondents think that the chosen solution has already been implemented, while in PNALM only 13%, and in Greece, 22% of the respondents are in the same opinion. The question “*In your opinion, on a scale of 1 to 5, how much do roads and vehicular traffic pose a threat to the conservation of the Marsican brown bear*” was asked from the respondents from Maiella National Park.⁸ Here, respondents consider that roads and vehicular traffic pose a high threat to the Apennine brown bear with an average value of 3.7 (on a 1 to 5 scale). Regarding new, project-developed road panels, on average 74% of the respondents indicated seeing at least one of the two panels. The panels were most widely seen in Italy, where an average 81% of the respondents had encountered at least one of the panels, and approximately half of them observed both. Conversely, in Romania, less than half of the respondents (45%) reported sighting these panels. After exposure to the panels, on average, 77% of all respondents altered their driving behaviour, predominantly by slowing down and driving more attentively. The most remarkable effect of the panels was on the Romanian drivers, where 90% of the drivers adapted their driving behaviour. Panels had a relatively more moderate impact in Spain, which nevertheless still prompted 63% of the drivers to change their behaviour. The respondents perceived the new road panels effective in encouraging responsible driving, assigning a 3.7 value (on a scale of 1 to 5 (where 1-ineffective; 5-very effective)) (Fig. 3).

⁸ Because of the Marsican brown bear’s occurrence being limited to these sites.

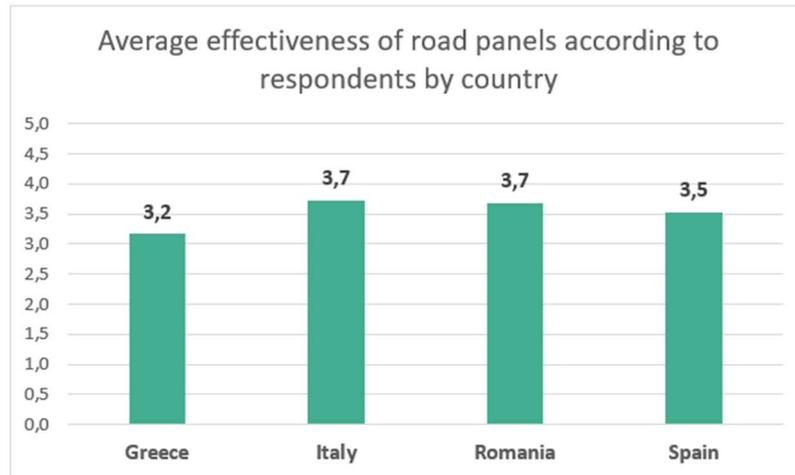


Fig. 3. Average effectiveness of road panels (on a scale of 1 to 5, where 1-ineffective; 5-very effective) according to respondents by country

Half of the respondents believe that both signs (depicting road crossing bears/lynx and bear/lynx accident with a car) are equally effective. They indicated that installing the new road panels would be beneficial to protect bears and lynxes, as reflected by the average score of 3.9 on a scale of 1 to 5 (where 1-not useful; 5-very useful).

Regarding socio-demographic backgrounds of the respondents, an equal distribution of male and female participants was observed. Concerning age distribution, 40% and 39% of respondents were in the 21-40 and 41-60 age groups, respectively (Fig. 4 and Fig. 5).

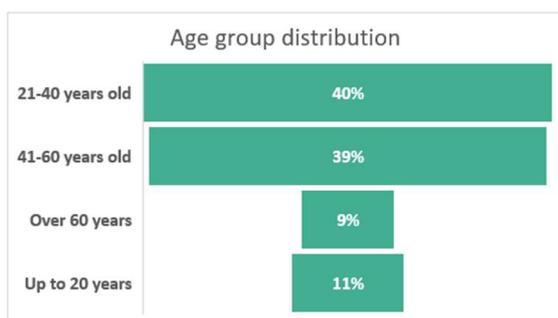


Fig. 4. Respondents' age group distribution

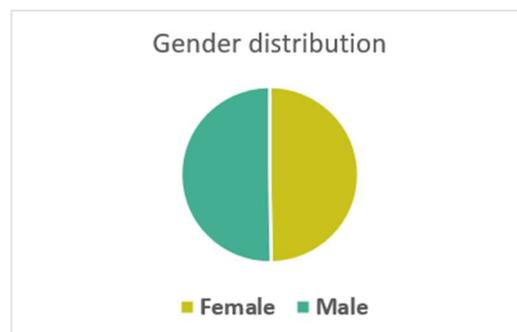


Fig. 5. Respondents' gender distribution

Communications data

Various relevant communication and dissemination activities took place within the project. Twenty-nine press releases and press releases were made in the four project countries. Sixty-seven regional and



local press appearances were reported by partners with 18 internet news, 21 TV or radio news featuring the project along with nine TV or radio documentaries presenting the project in four countries. There were 43 website releases/news covering the project. Fifteen Twitter posts were published reaching over 35,000 users. Concerning dissemination events, 178 awareness raising events were held in project countries reaching an audience of over 400,000 people. Over 3,000 students were engaged school events. Thirty-nine networking events were held in all project countries involving over 2,600 individuals. Topics covered included concrete conservation actions to improve connectivity and reduce road mortality, highway construction safety, wildlife connectivity, and environmental safeguards. Methods such as prevention, crossing structures, data collection and monitoring were also in focus of these events. The use of technology like the LIFE SAFE-CROSSING app was discussed for collecting data on road crashes. Green mobility and the use of virtual fences and AVC-PS were also touched upon during the networking events as part of the project's efforts. Presentations and information requests about the project activities were made to spread awareness and gain support for wildlife conservation in the regions. Eighteen conferences in all of the project countries showcased the elements of the project reaching over 1,500 stakeholders. Concerning replication activities, 32 events took place to demonstrate the project and its results in all project countries reaching over 580 members of the relevant stakeholder groups.

Discussion

Drawing from input provided by beneficiaries and stakeholders, the matter of road safety and its implications for biodiversity is widely acknowledged as a main concern. Both stakeholders and beneficiaries deem the project and its overall contribution to reducing road risks and animal casualties effective and successful. Based on the collected and assessed data, we can conclude that the key socio-economic impacts of the project included affected attitude and behaviour concerning driving practices, reduced animal-vehicle collisions and heightened awareness among road administration, park authorities, and other stakeholders applying strategies such as virtual fences and underpass improvements. Stakeholder engagement, technological innovation and knowledge dissemination as well as public awareness also improved. Participating organisations could also experience increased knowledge, networking and financial capacities. Additionally, the project achieved significant outcomes concerning ecosystem services and ecological impacts contributing to improved habitats and connectivity, enhanced cultural ecosystem services (tourism, cultural heritage, education) and additional environmental benefits. A summary of key indicator values is displayed in table 6.

Socio-economic impacts (Action D3)

Impacts on changing attitude and behaviour

One of the key objectives of the project was to reduce traffic collision risks through changing drivers' behaviour with the help of awareness raising of the potential dangers to wildlife. Project beneficiaries and stakeholders considered this impact significant along with increased knowledge about the issues of road safety and wildlife. The incorporation of innovative Animal-Vehicle Collision Prevention Tools, including the development of new road panels based on applied neuroscience, demonstrated the



project's commitment to finding effective solutions. The survey on the new road panel effectiveness revealed varying responses across countries, yet certain commonalities emerged. Many respondents, notably in Italy, identified "*High speed and low attention*" as a major cause of accidents. "*Animal behaviour*" was also flagged as a risk in Greece, Romania, and Spain. New road panels enjoyed broad visibility in the project areas, with about 74% of the respondents encountering them. Following exposure, 77% of drivers adjusted their behaviour to drive cautiously. While opinions on existing wild animal caution signs differed, respondents generally saw the new panels as effective tools for responsible driving promotion. They suggested expanding panel use on other roads to safeguard bears and lynxes. Though few favoured changing road signs (7%), most found the new panels effective, resulting in heightened road awareness and slower speeds.

The above was corroborated with information received from the national parks, where experts noticed a decline in collisions majorly attributed to improved driving practices. Over fifty percent of the stakeholders also considered application of the road panels as a replication action on their respective area. Involving over 80 driving schools and a diverse array of additional stakeholders resulted in further behaviour impacts through improved knowledge about threats for drivers. The combination of innovative approaches and engagement of stakeholders led to certain changes in driving behaviour, and undoubtedly increased knowledge about the potential danger roads can pose to both animals and humans.

Improved road safety

Both beneficiaries and project stakeholders considered that the activities of the project resulted in improved road safety, including reduced number of collisions and dead animals and an increase of ecological connectivity. Innovative and cost-effective practices such as the installation of 26 AVC-PS and 36,5 Km of virtual fence determined a reduction of road kills up to 100%. In the case of the AVC-PS it's important to underline not only the actual reduction of road kills after the installation of the systems, but also the data about the risk situations, meaning the presence of an animal near the road and the passage of vehicles proceeding ≥ 50 Km/h within 3 minutes after animal's detection. Pooling together the data from all the countries, in more than 10.000 risk situations only 13 road kills were recorded. In PNM, where a specific study was carried out with camera traps, in 7 months (February-August 2022) 996 individuals (mostly represented by wolves, foxes and wild boars) were detected to cross the road where the AVC-PS Majella 4 was installed. In 240 times (99 times for wolves, 75 times for foxes, 17 times for wild boars and the rest for porcupines, roe deer, red deer, badgers, wild cats), when the acoustic deterrence of the AVC-PS was active due to the passage of vehicles, no AVCs happened. Important results came out also from the results related to the installation of virtual fences. For example, along 2 Km of a road segment in Romania where 14 brown bears were killed AVCs in 42 months (4 Brown bear road killed/year), in the 17 months following the installation of VF no brown bear was killed. Similar results were obtained in Spain after the installation of VF along 4,5 Km of a road segment where in the period before the installation the number of Iberian lynx road killed was 1,38/year (6 animals in 52 months), whereas in 12 months after the installation the number of kills was 0. All these results clearly show the effectiveness of the mitigation tools implemented in the frame of the project, not only in terms of species conservation but also in terms of improved safety for drivers.



At the same time an important role was played by the awareness raising campaigns carried out with driving schools and the general public, in order to favour a more responsible driving behaviour.

Increased awareness

One of the primary impacts of the project involved heightened awareness among both the general public and stakeholders regarding the influence of linear infrastructure and relevant risks on biodiversity and wildlife. Communication and dissemination activities played a pivotal role in spreading awareness about the project's objectives and outcomes reaching over five million individuals. Over 160 media items including press releases, press conferences, media appearances and 105 awareness raising events, 32 replication initiatives and 18 conferences reached diverse audiences, contributing to the project's visibility and impact. The use of various communication channels, including traditional media and digital platforms, helped in engaging stakeholders and the general public. Furthermore, the project has reached several persons and different kinds of stakeholders through using different types of media items.

Enhanced cooperation and networking

Collaboration between various sectors and entities was a notable outcome, resulting in improved networking opportunities and partnerships made. Over the course of the project, spanning from 2018 to 2023, collaborative efforts involving 13 NGOs, companies, 43 public organisations, 92 local communities and local authorities, 81 driving schools and additional schools working with hundreds of stakeholders were instrumental in implementing a range of measures across multiple European countries. Strengthened cooperation among Southern European countries, various actors and stakeholders all contributed to the wide-spread application of the project results. This work paved the way for the possibility of further dissemination and enhanced innovation practices to effectively address threats to wildlife and road safety.

Boosted capacities and knowledge

Cooperation and outreach to a broad array of stakeholders, including 144 individual members of interest groups, 2,500 professionals (outside from the beneficiary) and 3,033 pupils resulted in enhanced knowledge about road risks and wildlife. The project introduced innovative strategies to address wildlife-related road accidents and gained further knowledge on population dynamics as well as animal behaviour. The virtual fence proved to be a cost-effective alternative to traditional barriers, while the comprehensive monitoring solution brought several benefits, including automated wildlife identification processes. The installation of road panels using neuroscience and the application of the AVC-PS all resulted in improved knowledge and capacities among a wide range of stakeholders to use advanced science and technology to mitigate detrimental effects. Improved safety practices infiltrated the work of road and railway authorities, national and local authorities, spatial planners, NGOs and tech companies ensuring the replication effect of the project and the wide uptake of innovative methods to tackle road risks and negative impacts on wildlife.



Improved financial and non-financial benefits

Concerning direct economic benefits, 4,8 FTE jobs were directly created by the project including new employment, temporary jobs and contractor assignments, while operational income also increased for the beneficiaries due to the LIFE funding. Reduced costs (almost 4 million EUR) were estimated thanks to the reduction of collisions with wildlife as well to improved infrastructure in the form of virtual fences replacing physical structures. Due to the project, further national sources are envisioned in the amount of over 50.000 EUR.

Concerning indirect financial benefits, a number of further elements were highlighted. The project resulted in creating opportunities for future cooperation in developing joint projects for reducing wildlife risks. Promotion of innovative technologies and hence, marketing of relevant companies also participating in the project could further serve as a benefit to be manifested in the future. As an indirect financial benefit, more stable communication infrastructure was noted along with improved practices and knowledge, enhanced cooperation with a range of different stakeholders and refined public image.

Ecosystem services and environmental impacts (Action D4)

Impacts on regulation and maintenance ecosystem services

The LIFE SAFE-CROSSING (LIFE17NAT/IT/464) project has made significant strides in mitigating the impacts of road infrastructure on priority species across Europe improving connectivity and biodiversity. By focusing on species such as the Apennine brown bear (*Ursus arctos marsicanus*), wolf (*Canis lupus*), Iberian lynx (*Lynx pardinus*), and brown bear (*Ursus arctos*), the project aimed to address the challenges of road-related habitat fragmentation. Based on the collected data, we can conclude that the population of *Canis lupus* and *Ursus arctos* exhibited an upward trend in the Romanian project area. In Spain, the number of *Lynx pardinus* also experienced an increase in terms of number of individuals and distribution range. Notably, the Maiella National Park observed the highest number of bear sightings compared to the beginning of the project and a growth in their habitat coverage. Collectively, the area where pressures and threats leading to elevated road risks for biodiversity were mitigated grew by over sixfold. In addition to the reduced risk and actual number of animal vehicle collisions, already mentioned in the previous paragraph, it is very important to underline the effort and the results related to the actions aimed at improve ecological connectivity

The interventions made by EOSA, in Greece, were very impressive because they implement different kind of solutions to favour the use on 55 existing crossing structures by bears and the other wildlife species. This is one of the first cases in Europe in which, in the frame of a LIFE programme, a company responsible for the management of a Highway realized such a large number of interventions on the existing crossing structures to improve biodiversity conservation. The added value of this action is the potential replicability in Greece as well as in other European country.

According to the monitoring with the end-to-end prototype developed by COSMOTE, brown bears showed a statistically significant higher use of the improved crossing structures. In fact, after the improvements, 464 bears crossings were recorded compared to 189 before the improvements, in a comparable time span. the improvements. One of the most important results was that in 5 structures, located in crucial area for the ecological connectivity, where we registered clear signs of bears,



unsuccessful attempts to cross through have been used by wildlife species and especially by brown bears after the construction of special ramps with stairs which facilitate their permeability.

In Romania the adaptation of the 30 crossing structures were very important because they were carried out on critical structures for the ecological connectivity of the target species, especially those ones located on DN1 road the main communication road between Brasov and Bucharest. The involvement and the collaboration with the road management authority will ensure the continuity of the interventions after the end of the project.

The interventions realized by PNM and PNALM on the road SS17 are of crucial importance, because this road represented the main barrier between PNALM and PNM. One of the principal threats for the conservation of the Apennine brown bear is habitat fragmentation caused by linear infrastructures that prevent the expansion of the species, therefore making the SS 17 road safe is an important step in this direction.

All these results highlight the importance of implementing effective tools to transform roads into less obstructive barriers to habitat connectivity. Thanks to these interventions to enhance wildlife safety and accessibility of habitats in total, all four species populations showed increasing trends, while their habitats experienced less fragmentation.

The positive impacts of the project extended beyond the target species and habitats. The decrease in roadkill incidents had a positive impact on various other species populations, including wild boars and deer, leading to an overall improvement in biodiversity. The enhancement of wildlife routes and landscape permeability benefited a wide range of additional species. Moreover, species that rely on large mammals for seed dispersal also experienced benefits from the improved safe crossings. The project's efforts to remove garbage and food attractants along roads further contributed to minimising the risk of wildlife being hit by vehicles.

Impacts on cultural ecosystem services

Concerning cultural ecosystem services, national parks partners reported a direct linkage between the project, increased tourism and more biodiversity-aware local communities. The involvement of national parks and their subsequent increase in tourism numbers demonstrated the broader societal engagement fostered by the project. Although the rise in tourism was chiefly attributed to coordinated promotional efforts, a growing interest in outdoor experiences, and the post-pandemic effect, the project's impact on tourism was reported as a noticeable factor. Heightened awareness of wildlife reported among local communities and tourists is likely to have contributed to the enhancement of both the sense of place and cultural heritage ecosystem services. The increased and shared knowledge about the animals' behaviour and how to safeguard them led to the enrichment of the education ecosystem services among the national park experts, the project beneficiaries, the local communities, the schools and other visitors or drivers. Moreover, the project's emphasis on collaboration, networking, and communication activities fostered stronger social relations, serving as a cultural ecosystem service that has been positively impacted.



Additional environmental benefits

The project yielded additional direct environmental impacts. Notably, the reduction in vehicle speed led to a decrease in CO₂ emissions. Moreover, the implementation of automated camera content uploading resulted in fewer site visits reducing the need for vehicle transportation.

Lessons learnt

Despite the successes achieved within the frame of the project, for a wider and future perspective, a number of challenges remain evident. Beneficiaries identified challenges in the project's implementation, including time-consuming permit procedures and unforeseen cost increases due to innovative solutions. The project's focus on innovative technologies and practices, such as virtual fences and the prevention systems, faced hurdles related to implementation costs and authorities' response for the permitting processes. Insufficient funding and political willingness, particularly in implementing certain, complex solutions pose further threat on road risks and their impacts on biodiversity. Persistence, collaboration, and regulation enforcement were highlighted for accident prevention, where long-term dedication is deemed crucial for achieving lasting results in addressing wildlife-road conflicts. Therefore, it is important to continue financing relevant projects and measures aimed to tackle biodiversity loss and road safety through similar approaches and actions, and to further increase awareness especially among stakeholders and key decision-makers to also elevate biodiversity in policy-making agendas.

Main type of impacts	Impact	Indicator	Result
Socio-economic impacts (D3)	Attitude/behaviour changed	Number of persons influenced by the project	2 280 000
		Effectiveness of road panels	77% changing driving practices 3.7 effectiveness (on a scale of 1 to 5, where 1-ineffective, 5-very effective)
		Expert views on changes	Improved driving practices considering wildlife
	Awareness raised	Number of people reached	6 000 000
		Number of communication elements	167
		Number of awareness raising events	105

	Collaboration created	Number of entities cooperated with	404
		Number of replication events	32
	Improved knowledge, innovation and practices	Expert views on improvement	8.53 (on a scale of 1 to 10)
		Number of conferences attended	18
	Improved capacities	Expert views on improvement:	
		- financial,	7.35
		- human resources	7.18
		- networking capacities)	8.06 (on a scale of 1 to 10)
	Economic benefits	Number of jobs created by the project	4,8 FTE
		Future opportunities for funding possibility	€ 78.000
		Amount of cost avoided	€ 3 936 000
	Improved road safety	Changes in collision trend	reduced from 11 to 1
Changes in the number of dead animals		reduced from 20 to 17	
Changes in the number of potential risk situations		reduced from 11 to 1	
Ecosystem services and ecological impacts (D4)	Maintaining nursery populations and habitats	Changes in <i>Canis lupus</i> population trends	Stable
		Changes in <i>Ursus arctos</i> population trends	increasing, from 578-584 individuals
		Changes in <i>Lynx pardinus</i> populations trends	increasing between 2017 and 2022 from 459-463 to 624
		Changes in other species population trends	Reduced collisions with other species e.g., deer



			and wild boar
		Connectivity changes	"Brown bear habitat connectivity along EOSA A29 motorway improved as indicated by an increase of 33% of use of improved underpasses by bears" Extended and maintained wildlife routes
	Cultural ecosystem services	Changes in tourism	Approx. 1%-5% increase in tourism due to the project, more awareness of tourists among wildlife and road risks
		Changes in cultural heritage	Local communities heightened awareness about the species and risks threatening them
		Changes in educational and scientific services	Increased knowledge about the species and road risks among stakeholders

Table 6. Summary table of the results of the socio-economic and ecosystem services and ecological impact indicators.

Conclusion

In conclusion, the LIFE SAFE-CROSSING project demonstrated the potential of collaborative efforts to address the complex issues of road-related impacts on wildlife. The reduction of animal-vehicle collisions, increased awareness among drivers, improved habitats and connectivity, and the positive influence on local economies are noteworthy accomplishments. The integration of various stakeholders, combined with effective communication strategies, showcased the importance of public and stakeholder engagement in successful conservation initiatives. As the project's impact continues to unfold, its innovative measures and collaborative approach could serve as a model for future efforts in mitigating the adverse effects of road infrastructure on biodiversity and safety.



Annexes

Annex 1 - Key Performance Indicator table for project beneficiaries

KPIs	Related project KPI/Socio-economic/Ecosystem services indicator	Description of indicator	Value before project's start/beginning of the project (2017-2020)	Value at the end of the project (2023)
	Project area/length	Partial reduction of specific pressures/threats affecting the spatial extent of the project in comparison to the present level - Sum of relevant project areas in ha/km		
	Humans influenced by the project	Number of persons who may have been influenced via road signs, awareness raising campaigns, posters, etc. on topics relevant to the project (please add methodology of calculating this sum in the comment section)		
	Target species populations and populations trends	Canis lupus - number of individuals		
		Ursus arctos - number of individuals		
		Lynx pardinus - number of individuals		
		Canis lupus - area covered by population (ha)		
		Ursus arctos - area covered by population (ha)		
		Lynx pardinus - area covered by population (ha)		
	Involvement of NGOs and other stakeholders	Number of public bodies involved in the project (please add specific names of entities and other further information in the comments section)		
		<u>Number of local communities or authorities</u> involved in the project (please add specific names of entities and other further information in the comments section)		
		<u>Number of other stakeholders (e.g. businesses, research organisations)</u> involved in the project (please add specific names of entities and other further information in the comments section)		
		<u>Number of NGOs</u> involved in the project (please add specific names of entities and other further information in the comments section)		

	Other tools for raising awareness of the general public	<u>Number of media items</u> (video/broadcast/leaflets) in relevant topics (please add specific types of media items in the comments section; please add new lines if you want to add various types of media separately)		
	Networking	<u>Number of individual members of interest groups</u> (e.g. scientific research organisations) involved in the project outside from the beneficiary (please add further details of these groups in the comment section)		
		<u>Number of professionals</u> (outside from the beneficiary) involved in the project (please add further details of these groups in the comment section)		
		<u>Number of pupils</u> (of school age) involved/reached by the project (please add further details of these groups in the comments section)		
		<u>Number of other stakeholders</u> reached by the project (please add further details of these groups in the comments section)		
	Jobs created	<u>Number of jobs created</u> directly linked to the project at the beneficiary		
	Contribution to Economic Growth	<u>Amount of annual running cost and operation cost of the beneficiary (EUR)</u>		
		<u>Amount of annual cost reduction</u> expected at the beneficiary in case of continuation/ replication/transfer after the project end (EUR)		0
	Future funding	<u>Amount of future or current funding</u> expected due to the project (from EU Structural Funds (ESIF) or other EU sources) (please add funding source specifics in the comments section) (EUR)		
		<u>Amount of future or current funding</u> expected due to the project from other international organisation (please add name of the organisation in the comments section) (EUR)		
<u>Other amount of future or current grants, subsidies (e.g. from national sources)</u> expected due to the project (please add specifics in the comments section) (EUR)				

Socio-economic aspects	Other socio-economic benefits	<i>Number of collisions annually or monthly</i> (please add in the comments section the date of the data, if data is annual or monthly or other and other relevant information)		
		<i>Number of dead animals resulted from road collision/relevant events annually or monthly</i> (please add if data is annual or monthly or other and any further information in the comments section)		
		<i>Number of potential risk situations reported from road collision/relevant event annually or monthly</i> (please add if data is annual or monthly or other and any further information in the comments section)		
		<i>Amount of damages derived from collisions/relevant events annually or monthly</i> (in the region or relevant area) (please add if data is annual or monthly or other and any further information in the comments section) (EUR)		
		<i>Cost of public authorities due to collision/additional damages annually or monthly</i> (please add if data is annual or monthly or other and any further information in the comments section) (EUR)		
Ecological improvement and ecosystem services	Connectivity	<i>Protected species habitats/Area connected (ha)</i> (please add separately if you want to distinguish between specific species' habitats connectivity)		

Annex 2 - Project beneficiaries survey template

Survey for project beneficiaries participating in the LIFE SAFE-CROSSING project

This survey aims to collect data for the LIFE SAFE-CROSSING project's impact assessment study about results, socio-economic impacts, ecosystem services and other potential benefits.

Data policy: The collected data will only be used for research purposes for the impact assessment within the frame of the LIFE SAFE-CROSSING project. For using this data, we will ask for your



1. 2. 3. 4. 5. 6. 7. 8. 9. 10.
Fully disagree Fully agree

7. We think that thanks to the project, we contributed to the improvement of large carnivores and other species populations.

1. 2. 3. 4. 5. 6. 7. 8. 9. 10.
Fully disagree Fully agree

8. We feel the project contributed to improved knowledge and innovation.

1. 2. 3. 4. 5. 6. 7. 8. 9. 10.
Fully disagree Fully agree

9. Due to the project, local communities now are more aware of large carnivores related road risks.

1. 2. 3. 4. 5. 6. 7. 8. 9. 10.
Fully disagree Fully agree

10. Relevant road authorities have safety practices in relation to road risks thanks to the project.

1. 2. 3. 4. 5. 6. 7. 8. 9. 10.
Fully disagree Fully agree

11. Before the project, we had limited financial resources to understand and take measures against the impacts of roads on biodiversity.

1. 2. 3. 4. 5. 6. 7. 8. 9. 10.
Fully disagree Fully agree

12. Sufficient manpower was lacking to work on the biodiversity impacts of roads before the project.



1. 2. 3. 4. 5. 6. 7. 8. 9. 10.
Fully disagree Fully agree

13. Thanks to the project, we could dedicate time and resources for networking and transferring knowledge at international level.

1. 2. 3. 4. 5. 6. 7. 8. 9. 10.
Fully disagree Fully agree

14. After the project started, we had more opportunities to work with entities from other sectors.

1. 2. 3. 4. 5. 6. 7. 8. 9. 10.
Fully disagree Fully agree

15. We have noticed increasing interest from local communities, municipalities, schools, etc. towards wildlife and road impacts since the project started.

1. 2. 3. 4. 5. 6. 7. 8. 9. 10.
Fully disagree Fully agree

16. We see increasing interest from decision-makers to incorporate biodiversity consideration into relevant policies thanks to the project.

1. 2. 3. 4. 5. 6. 7. 8. 9. 10.
Fully disagree Fully agree

17. We now have sufficient time and resources to provide scientific/practical training and development opportunities for our colleagues due to the project.

1. 2. 3. 4. 5. 6. 7. 8. 9. 10.
Fully disagree Fully agree



18. With projects like the LIFE SAFE-CROSSING, our colleagues feel more motivated to work.

1. Fully disagree 2. 3. 4. 5. 6. 7. 8. 9. 10. Fully agree

19. Chose which of the below sectors/partners you could cooperate with due to the project:

- Road authorities
- Railway authorities
- Spatial planners
- Local authorities
- Regional authorities
- National authorities
- Other (please specify):.....

20. If you had cooperation with any partners noted above, please add specific names, their roles in the project and the benefit they derived from the project:

- Name of entity you cooperated with:....
- Their role in the project:.....
- Benefit they got from the project:.....

21. In case your organization has direct costs in relation to road accidents - Please choose which statement is the most relevant for you concerning road accident costs as a direct impact of the project:

- Significantly reduced costs
- Somewhat reduced costs
- No change



Somewhat increased costs

Significantly increased costs

We do not have direct costs relevant to road accidents

22. Beside the LIFE funding to your organization, do you foresee any other direct financial benefits derived from the project?

Yes

No

23. If yes, please list these benefits:

.....

24. Do you foresee any other indirect financial or other benefits derived from the project?

Yes

No

25. If yes, please list these benefits:

.....

26. Do you consider that any of the following may have benefited your organization because of the project (please choose as many as relevant)?

Reduced costs



- Increased income due to the project
- Reduced conflicts with other sectors
- Increased capacities (e.g. new colleagues, volunteers)
- Enhanced knowledge
- Enhanced skills benefitting the entity through trainings and education
- Increased supporters' number
- Increased visibility of your organization among stakeholders
- Enhanced cooperation with the private sector
- Enhanced cooperation with other sectors
- Opportunity for networking, transferring and receiving knowledge and international experience
- Increased scientific information and participation in research
- Development of innovative solutions and technology
- Increased communication about your organization in the media
- Increased satisfaction among colleagues due to project work and results
- Increased acceptance and support from local stakeholders
- Product development
- More funding opportunities due to enhanced network of your entity
- More funding opportunities due to increased public or private support
- Increased awareness about the issue
- Attitude change of the general public towards supporting nature conservation
- Other (please specify):



None of the above

27. Please describe any additional benefits of the partners/stakeholders involved:

28. Please describe briefly how you think connectivity was improved due to the project:

29. Please add below any additional ecological benefits that the project contributed to:

30. Would you participate in similar projects in the future?

Yes

No

31. Please share any other comments you may have:

Consent

The information derived from this survey is purely used for the impact assessment study of the project. The data will only be available in a cumulative format, however, in some cases information per country/organization will be demonstrated in which case you/your organization responses may be identifiable. In case you do not consent, data however will not be displayed in the assessment study in this format. Identifiable data will be safely stored in password protected storage/devices until it is purged until the end of the project. In case you would like to withdraw your survey responses (you can do so before 31 July 2023) or have any questions or concerns in terms of using the data or displaying it, please contact us [here](#).

Please check the boxes of the below statements if you agree with them.

25. I understand the purpose of the survey and its data usage (solely for the project's impact assessment purpose).

Yes



26. If you provided your organization - I understand that by filling out the organization information, I may be identifiable (if understood, please tick the box below).

Yes

27. If you provided your organization - I consent this data to be used in the impact assessment study by listing the organization (if agreed, please tick the box below).

Yes

Thank you for your contribution!

[Annex 3 - Project stakeholder survey template](#)

Dear participant,

we would like to ask you to fill in this brief questionnaire regarding the evaluation of the actions carried out in the frame of the LIFE SAFE-CROSSING project. Your replies will be very useful and important for us.

The survey should take maximum 5 minutes to fill out.

Once you filled in the questionnaire you can deliver it at the registration desk.

Thank you for your help and contribution!

Data policy: All relevant data will only be displayed in a cumulative form. The collected data will only be used for research purposes within the LIFE SAFE-CROSSING project.

Survey for the evaluation of the LIFE SAFE-CROSSING project



1. How important do you think is the problem of animals getting killed on roads? (1 is not at all important and 5 is very important)

- 1 2 3 4 5

2. How important do you think is the fragmentation of habitats caused by roads is? (1 is not at all important and 5 is very important)

- 1 2 3 4 5

3. How important do you think the LIFE SAFE-CROSSING project is to face the issue of the impact of roads on biodiversity? (1 is not at all important and 5 is very important)

- 1 2 3 4 5

4. Please rate the importance of the following actions of the LIFE SAFE-CROSSING project for reducing the impact of roads on wildlife (rating: 1 – not at all important; 5 – very important)

	1	2	3	4	5
Monitoring activities (e.g road mortality, crossing structures)					
Installation of Animal-Vehicle Collision prevention Systems					
Installation of virtual fence					
Adaptation of underpasses					
Installation of road panels					
Awareness raising activities (production of info materials, public meetings, activity with driving schools, etc.)					



5. How successful do you consider the LIFE SAFE-CROSSING project to reduce the impact of roads on wildlife? (1 is not at all successful and 5 is very successful)

- 1
 2
 3
 4
 5

6. What aspects of the project do you consider important?

7. Which actions of the LIFE SAFE-CROSSING project would you consider useful implementing in your territory?

- Monitoring activities (e.g road mortality, crossing structures)
 Installation of Animal-Vehicle Collision prevention Systems
 Installation of virtual fence
 Adaptation of underpasses
 Installation of road panels
 Awareness raising activities (production of info materials, public meetings, activity with driving schools, etc.)

8. Which are the main obstacles for implementing the activities of the LIFE SAFE-CROSSING project you consider useful? (you can tick more than one option)

- Lack of financial availability - 49
 Lack of competent staff – 12
 Difficulty to achieve relevant permits - 17
 Lack of political willingness inside your organization 23



Other: _____

9. What other actions do you think should be done to face the issue of the impact of roads on biodiversity?

10. Your organization:

11. Your country:

Annex 4 - National parks survey template

Survey on tourism changes in relevant national parks within the frame of the LIFE SAFE CROSSING project

We are conducting a survey about the socio-economic impact of the **LIFE SAFE CROSSING project** and we would like to ask for your contribution to this research. Our aim is to establish any change in the number of tourists and the volume of tourism due to the project activities targeting large carnivores and awareness raising.

The survey should only take 10 minutes to fill out.

*Data policy: All relevant data will only be displayed in a cumulative form, and you will not be able to be identified. The collected data will only be used for research purposes within the **LIFE SAFE CROSSING project**. Should you have any questions about the research and data collection, please contact us on info@ecosystemevaluation.com.*

Please send back the filled out form to agnes.zolyomi@ecosystemevaluation.com.

Thank you for your help and contribution!

- 1) Name of the National Park you work:.....
- 2) How would you rate the impact of the LIFE SAFE CROSSING project on tourism related to the National Park?
 - a) Significant
 - b) Slight impact



- c) No impact
d) Do not know
- 3) Based on your opinion, how did the number of tourists change during the project period (between 2018-2022)?
- It has been significantly increased.
 - It has increased slightly.
 - It has not changed.
 - It has significantly decreased.
 - It has decreased slightly.
 - Do not know.
- 4) If there was any change in the number of tourists, what do you think the reason behind this change could be?
- 5) Could you provide the approximate number of tourists based on the sold tickets/entry statistics **in 2018**, when the project started?
- Yes, it is:
 - No
 - Do not know
- 6) Could you provide the approximate number of tourists based on the sold tickets/entry statistics **in 2022**?
- Yes, it is:
 - No
 - Do not know
- 7) In your view what percentage of the tourists visited the National Park due to the LIFE SAFE CROSSING project in 2022?%
- 8) What is your opinion in regards to the change in expenditure of tourists in and around the National Park (e.g. souvenirs, food and beverage, accommodation, entrance fees, etc.) between 2018-2022?
- It has been significantly increased
 - It has been slightly increased
 - It has been significantly decreased
 - It has been slightly decreased
 - No change
 - Do not know
- 9) Would you add any other benefits or impacts you experienced in the National Park because of the LIFE SAFE CROSSING project?.....

Thank you for your help and contribution!
Please send back the filled out form to info@ecosystemevaluation.com.



Annex 5 - Road panel survey (distributed in Spain) developed by the project team

1. Have you ever heard of traffic accidents with wildlife?

c Yes c No c I have had a direct experience

Potential comments: _____

2. According to you which are the wildlife species mostly killed on roads

3. What do you think is the main cause of road accidents with wildlife? (tick the most important cause)

c Excessive speed and scarce attention c Animal behaviour

c Lack of interventions by authorities c Scarce road signs

c Other _____



4. Regarding the wildlife crossing alert sign, do you think it is an effective way to signalize the risk of incurring in road accidents with wildlife?

5. What do you think should be done to reduce the number of road accidents with wildlife? (tick the option you think is the most important)

Drive carefully

Improve the road signs

Install fences

Reduce the number of animals in the nearby of roads

Reduce speed limits in risk areas

Other _____

6. Have you ever seen once of these panels on the roads? (the ones developed in the project)

7. In which roads?

8. On a scale of 1 to 5 how effective do you consider these panels in encouraging a responsible driving behaviour? (1 – scarcely effective, 5 – very effective)

1 2 3 4 5

9. Have you changed your driving behaviour (e.g. speed, level of attention) after you have seen the panels?

Yes

No



10. Brief explanation:

11. On a scale of 1 to 5, do you think it would be useful to install these panels on other roads to safeguard bears/lynx (CHOOSE)? (1 - scarcely useful; 5 – very useful)

1 2 3 4 5

Age: c Up to 20

 c 21 – 40

 c 41 – 60

 c Over 60

Sex: c M

 c F

Municipality/province of Residence: