LIFE Project Number

LIFE14 NAT/PT/001081 Mid-term Report

Covering the project activities from 01/08/2015 to 30/04/2018

Reporting Date[1]

30/04/2018

LIFE PROJECT NAME or Acronym

LIFE LINES - Linear Infrastructure Networks with Ecological Solutions

Data Project

Project location:	Alentejo (Évora, Montemor-o-Novo, Arraiolos, Estremoz, Vendas Novas) - Portugal
Project start date:	01/08/2015
Project end date:	31/07/2020
Total budget:	5,540,485 €
EU contribution:	3,324,303€
(%) of eligible costs:	60%

Data Beneficiary

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[1] Include the reporting date as foreseen in part C2 of Annex II of the Grant Agreement

1. Table of contents

2. List of key-words and abbreviations

AB – Beneficiário Associado (Associated Beneficiary)
ANSR – Autoridade Nacional de Segurança Rodoviária
BACI – Before-After-Control-Impact
CA – Comissão de Acompanhamento (Scientific Monitoring Committee)
CB – Beneficiário Coordenador (Coordinating Beneficiary)
CCDRA – Comissão de Coordenação e Desenvolvimento da Região Alentejo
CG – Comissão de Gestão (Management Committee)
CIMAC – Comunidade Intermunicipal do Alentejo Central
CME – Câmara Municipal de Évora (Municipality of Évora)
CMMN – Câmara Municipal de Montemor-o-Novo (Municipality of Montemor-o-Novo)
CP – Coordenação do Projeto (Project Coordination)
CTAG – Comissão Técnica de Apoio à Gestão (Technical Committee to Support Project Management)
EASME – Agência de Execução para as Pequenas e Médias Empresas (Executive Agency for Small and Medium-sized Enterprises)
EC – Comissão Europeia (European Comission)
EDP-Distribuição – Energias de Portugal, SA - Distribuição
EGI – Infraestrutura Verde Europeia (European Green Infrastructure)
EGSP – Energia e Sistemas de Potência, Lda
FCUL – Faculdade de Ciências da Universidade de Lisboa
FCUP – Universidade do Porto - Faculdade de Ciências (University of Oporto - Faculty of Sciences)
GA – Contrato de Subvenção (LIFE Grant Agreement)
GESAMB - Gestão Ambiental e de Resíduos, E.E.I.M.
GI – Infraestrutura Verde (Green Infrastructure)
HRLI - Habitats Related to Linear Infrastructures (Habitats Relacionados com Infraestruturas Lineares)
IA – Área de Intervenção (Intervention Area)
IAP – Invasive Alien Plants (Plantas exóticas invasoras)
ICNF – Instituto da Conservação da Natureza e das Florestas
IGeoE - Instituto Geográfico do Exército
IP – Infraestruturas de Portugal, SA (Infrastructures of Portugal, SA)
LI – Linear Infrastructures (Infraestruturas Lineares)
LINES – (Redes de Infraestruturas Lineares com Soluções Ecológicas (Linear Infrastructure Networks with Ecological Solutions)
LPN – Liga para a Proteção da Natureza
MARCA – Marca, Associação de Desenvolvimento Local (Marca, Local Development Association)
NIA – Núcleo de Interpretação Ambiental de Montemor-o-Novo
PA – Acordo de Parceria (Partnership Agreement)
pA1E – Programa “Adota um Estrada”.
QUERCUS – QUERCUS, Associação Nacional de Conservação da Natureza
REN - Redes Energéticas Nacionais
SA – Área de estudo (Study Area)
UA – Universidade de Aveiro (University of Aveiro)
UEVORA – Universidade de Évora (University of Évora)

KEYWORDS: Green infrastructure, Roads, Powerlines, Deactivated railways, Invasive plants control, Biodiversity refuges, Fauna database

3. Executive Summary

LIFE LINES essays and disseminates solutions that increase the sustainability of different types of linear infrastructures, including them in a large European Green Infrastructure, that is, a network of habitats managed to deliver a wide range of ecosystem services and protect biodiversity in both rural and urban settings. In the context of our project, usual functions of transportation and energy delivery are complemented with different kinds of ecological functions and we expect that this may be replicated by most linear infrastructure operators, worldwide.

Specifically, the project main goals are: (i) promote landscape connectivity; (ii) reduce fauna mortality by electrocution, collision and roadkills; (iii) create biodiversity corridors and refuges, (iv) detect and control invasive alien vegetation; (v) implement a national database on wildlife mortality; (vi) inform and raise public awareness to the impacts of linear infrastructures on biodiversity.

To accomplish its targets, the project will focus on a set of formerly identified problems including those of connectivity, mortality and barrier effects of transport infrastructures, mortality in power lines, absence of refuges and corridors, scarcity of publicly available decision support data and control of exotic flora.

The project has 35 actions included in five main groups: A - preparatory (7), C -conservation (10), D - monitoring (3), E - public awareness and dissemination (11) and F - management (4). Conservation actions are mostly based on implementation of demonstrative and development and testing of innovative solutions. Monitoring work is extended and aims to evaluate the effects of measures implemented on the biodiversity, in the ecosystem functions and at socioeconomic level. A large part of the project is dedicated to dissemination of the results to other potential users (mostly professionals associated with the area), both national and international and awareness of the citizens in general.

Three A actions are completed with the main goals achieved: A.1 “Completing and updating of baseline characterization”, A.3 “Project implementation, licensing, procurement of permits and contracting procedures necessary to actions C” and A.5 “Installation of autochthonous plant nursery for conservation actions”. Actions A.2 and A.4 are almost finished. A.2 – “Compilation, structuring and implementation of a national database and multi-user web platform” has already more than 70000 roadkill records distributed nationwide and will be closed until the end of 2018 after the inclusion of data from GNR. The prototypes predicted in Action A.4 “Development, testing and evaluation of automated systems of monitoring and/or deterrence” were already developed, and are being tested and trained with data. Several adaptions are being done to the original versions to improve their performance and this is the reason why we didn’t close this action yet. Action A.6 “Development of prototypes for deterring avifauna in medium voltage lines” was changed to “Development of prototypes for deterring avifauna in medium voltage lines”. due to the withdraw of one of the initially proposed beneficiaries. The new version is now waiting for and answer of EASME to the amendment request completed in May 2018. Action A.7 “Elaboration and approval of Internal

Standards of guidance to support management in post-project." will start only in July 2019, as predicted.

Regarding conservation actions (C), Action C.3 "Development and installation of vertical road traffic signs" was concluded in June 2018. Beside the reporting date 30th of April we decide to add this information since the action is concluded by the time we finish written the report.
All other actions are in progress, with the exception of C.5 "Testing devices for deterring avifauna landing in medium voltage lines" which due to original beneficiary withdrawal was reformulated to "Assay of devices to minimize bird mortality in medium voltage lines", and is waiting for the answer to the amendment request. Actions C.1 and C.2 are delayed, mostly due administrative reasons. Despite this, regarding C.1, dry ledges and fence installation/ on culverts; nets covering the slopes to avoid rabbits have already been done Repair/replacement of the existing fences at IP2 and implementation of a complementary net set in "L" has been partially done. Electronic prototypes to avoid owls and small mammals near the roads have been installed and they performance is being tested. In what concerns C.2 action, the strawberry tree barrier was implemented; the micro-reserves location has been decided and plantation will occur in the next autumn; the first stage of invasive plants control with traditional techniques have been done. Invasive control with have with improve techniques will start as soon as the administrative constrains will be solved. The APP predicted to be developed in C.4 is in the final phase of tests and will be launched next autumn. Most of the construction work associated with Actions C.7 and C.8, have been concluded except for the owl elevated flight barrier, that will be putted in place till the end of 2018. Seed mixtures were already developed and essayed (action C.6) and are being used to promote biodiversity in the framework of other conservation actions. The plant nursery is installed and is raising plants used in conservation actions. A larger number and a larger area of biodiversity islands was installed under the poles of very high-tension power lines (C.10).

The actions D. "Monitoring of the impact of the project actions" are all in progress with the exception of D.2 "Monitoring / evaluation effects of the project on ecosystem functions" which will start in June 2018. Socio-economic indicators predicted in Action D.1 have been harder to select and to fill than initially thought. Regarding D.3, the delay in the conclusion of parts of the C actions have delayed the begin of monitoring their efficacy. However as soon as each task of each C action is concluded, the monitoring starts. We envisage to have at least two monitoring seasons (mainly spring) for monitoring the efficacy of each conservation action.

The actions E. "Public awareness and dissemination of results" are all in progress with the exception of action E.6 "Training / Dissemination with the stakeholders" that start in September 2018 with the first workshop and action E.11" Layman report" which is proposed to start only in 2020. The website (action E.1) is online since October 2015 and large updates have been done to keep actualized and more user friendly. Until now 18 outdoors have been placed near locations where conservation actions are taking place and at least 33 more will be installed as soon as each conservation task have been finished (E.2). A Communication Strategy have been approved and a Communication Committee has been established to help the project dissemination in the media, which is below the expectations (E.3). At least three important milestones of the project (roadkill app launching; documentary broadcast in national television; LIFE LINES final Seminar associated with the 2020 IENE Conference) are expected to be largely disseminated and covered by the media. Eight teasers and seven thematic videos have been produced until now in the framework of action E.4. Two master theses done in the framework of the LIFE LINES project have been concluded and a PhD is ongoing. The project has been included / presented in classes of Universities of Évora and Lisbon (E.5).

Networking have been established with at least five LIFE and non LIFE projects (E.7). About 830 participants have been in involved more than activities organized in the framework of the Volunteer Program for young people (E.8). LIFE LINES have already organized 3 thematic seminars and a formal proposal to organize the 2020 IENE Conference was already sent to the IENE Steering Committee. The proposal was welcome and it is expected that the LIFE LINES final seminar will occur at this occasion, as a side event (E.9). More than 400 students from the first and second cycles have participated in different activities organized through the "Adopt a road program" (E.10).

Management actions (F) are proceeding globally as predicted. Meetings among part of the beneficiaries more directly involved in the implementation of each task occur whenever necessary, sometimes more than once a week. This is the main explanation why the number of formal number meetings among all beneficiaries is lower than predict in the proposal.

Chapter 6.1 includes a description of the current development of each action. In chapter 6.2 we present the main problems detected in the implementation of LIFE LINES project including administrative procedures and superior authorizations needed and other justifications for some delays in some actions.

Chapter 6.3 contains a table comparing the results achieved against the objectives and expected results foreseen in the proposal. This table is a summary of all the actions results and expectations of LIFE LINES.

In the end of the report are the financial part, with the budget summary and their implementation by action and type of expense, and the timetable summary of the foreseen and actual progress of each action.

4. Introduction

The project aims to essay, evaluate and disseminate practices directed to mitigation of negative effects of transport/energy infrastructures on biodiversity and promote the creation, along them, of a demonstrative Green Infrastructure, based in corridors and stepping stones that can increment connectivity and improve conservation of local/regional biodiversity. LIFE LINES is a Biodiversity (rather than a Nature) Project and thus does not focus specifically on Natura 2000 sites or threaten species/habitats listed in Birds (79/409/CEE; 2009/147/CE) or Habitats (92/43/CEE) Directives. However, the Intervention Area (IA) is located on the main transport corridor linking Lisbon to Madrid in a region lying between the Natura 2000 sites of Monfurado (PTCON0031) and Cabeção (PTCON0029). The area is dominated by sclerophyllous grazed forests (montados) of *Quercus suber* and *Q. rotundifolia* (habitat 6310, annex I Habitats Directive) which comprise a very high biodiversity including well-preserved communities of mammal carnivores, owls, amphibians, passerines, small mammals and butterflies. These groups are threatened by the high density of linear infrastructures in the region and are the main target of the LIFE LINES project.

Specifically, the project includes measures to limit the effects of habitat fragmentation and improve landscape connectivity as required in the "Technical Information on Green Infrastructure" (EC, 2013). This will have positive effects on biodiversity conservation and human well-being through the enhancement of ecosystem's services and functions. As

recommended by the European GI Working Group, the project will provide best practices experience and guidance at a regional level on increasing sustainability of linear infrastructures and will promote multifunctionality of many constructions associated with linear infrastructures (powerlines poles, culverts, verges), assigning them a biodiversity conservation value. The main road and railway operator in Portugal (IP), managing over 15.000 km of national roads and 2.500 km of railways throughout the entire country, is a project beneficiary, as well as two municipalities (CME and CMMN) which together are responsible for hundreds of kilometres of municipal roads. The two main operators of powerlines in Portugal (EDP-Distribuição and REN) have signed protocols of collaboration with the project. Thus, the conservation actions implemented by LIFE LINES have the potential, in a first phase, to be replicated and transferred to all the territory and, later, to abroad through the connections that these entities have with their European counterparts. Moreover, part of the team and several members of the Scientific Monitoring Committee, are affiliated of the IENE – Infra Eco Network Europe, a group of European experts in transportation ecology and planning, which includes ecology researchers, linear infrastructures designers and managers (see www.iene.info). The LIFE LINES final Seminar is intended to be part of the 2020 IENE International Conference, which has already been proposed to take place in Évora. This link in particular, will be a strong support to an international dissemination of the essayed techniques and results to the most significant targeted audience and stakeholders.

Linear infrastructures are spread through the landscape and because of their nature and shape, have a high potential to act as biodiversity refuges and corridors linking areas of natural and semi-natural habitats, including Natura 2000 sites, which are the backbone of the European Green Infrastructure (EGI). In this sense, if properly managed, linear infrastructures can be multifunctional and act as key-structures in the EGI. Nevertheless, they also pose serious risks to wildlife (e.g. mortality), being the challenge to improve their role in biodiversity conservation while minimizing these risks. Many marginal areas of linear infrastructures in the IA, including road verges, are among the most biodiverse in Europe, as recognized by members of the Scientific Monitoring Committee. LIFE LINES address this challenge by testing and demonstrating new devices and management actions that, if successful, could be easily exported to other areas and infrastructures. Additionally, and also important at an European level, the project will contribute to the control of alien invasive species and conservation and dissemination of autochthonous of flora (C.2, C.6, C.7, C.8, C.9 and C.10).

Citizen and stakeholders awareness for the impacts of linear infrastructures and to the concept and importance of the GI will be achieved through actions E and C.4.

Socio-ecological effects will be subject of analysis and quantification by means of action D.1. We are contributing to dissemination, replication and for a higher visibility of LIFE support to the work. Above all, we aim to demonstrate that investments in nature conservation and biodiversity such as those proposed, may contribute to generate many other economic and social benefits, both local and external, beyond the specific effects in species and habitats targeted by the conservation actions. We expect that a major part of project investments will be spent in the target region (Central Alentejo), including the direct creation of 11 new jobs, which in the context of a depressed and a higher unemployment region is very significant. In addition, we have involved a group of smaller local companies in the implementation of management measures, with indirect positive impacts on the local economy. We also foresee that the attractiveness of the territory will increase for visitation and interpretation, through the promotion of biodiversity associated with leisure facilities (actions C.7 and C.8), or

professional visitation, associated to the knowledge and dissemination of the implemented measures.
We expect to fulfill the following targets:

- A wildlife roadkill reduction of at least 20% in the specific areas of intervention and of 10% in the project area, through the adaptation of culverts, installation of fences and barriers in national and municipal roads;
- Implementing 85 new safe bird landing devices on 13 km of medium tension powerlines with an efficiency in reducing bird electrocution and collision of 80% (if amendment request is approved by EASME);
- Creation of ecological corridors and micro-reserves networks in road verges and under high voltage power lines poles, with the implementation of at least 9,3 ha of new habitats for small fauna, particularly small mammals and butterflies;
- Promotion of practices for rapid detection and control of invasive alien flora allowing a reduction of 50% in the area intervened until the end of the project;
- Creation of a nursery with 0,5 ha and development of mixtures of seeds with at least 10 native species, intended for recovery of areas occupied by invasive flora and creation of micro-reserves;
- Creation and operation of a national wildlife mortality database for use by infrastructure operators and nature conservation entities, with at least 50,000 records;
- Increase citizen awareness for the issues of the project and the involvement of civil society;
- Involve at least 600 voluntaries in the data collection, using the mobile application developed in the project;
- Develop and test of automatic devices for roadkill monitoring of small fauna, with better efficacy than non-automated methods

5. Administrative part

Figure 1 presents an updated organogram of the project management structure including the composition of the CP, CTAG and CG.

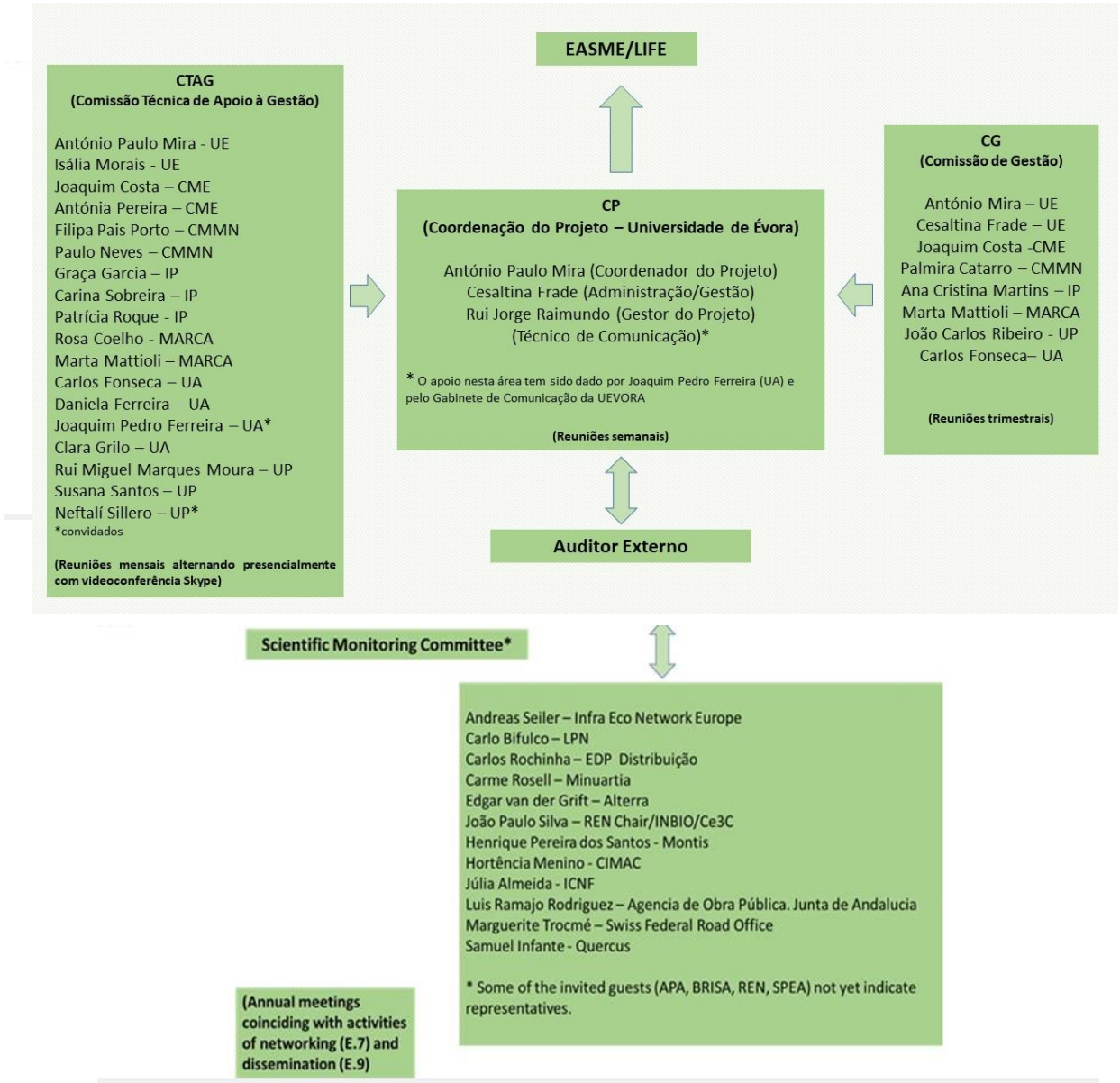

Figure 1. Organigram of the project Management Structure

During the project development, several changes in the team has occurred due to different reasons. In this case, CTAG and CG head director of Environmental Department of IP Ana Cristina Martins was replaced by Luísa Almeida Vales (CG). In CTAG Liliana Rosmaninho was replaced by Isália Morais since January 2018.

Face-to-face meetings of the members of the different Commissions, whenever needed, is the main *modus operands* of the project. For implementation of the nuclear conservation actions, information compiled and gathered in the project was used to propose preliminary locations and type of conservation actions. Then, we performed joint field trips with all the partners involved in each task to evaluate *in situ* all the possible solutions and their feasibility. A final decision was taken by consensus, or, in the few cases when it was not possible, by the beneficiary responsible for each action. Moreover, partners often take advantage of each other experience, in tasks where the main responsible has fewer skills (e.g. MARCA is helping CME and IP in volunteer programs).

The partnership composition (project beneficiaries) and the collaborations (REN, EDP – Distribuição) is an added value for the project. It includes the major linear infrastructure operators in Portugal, such as IP and the collaborators mention above, which are able to replicate successful the project tasks. Includes also teams from universities specialized in communicating science to citizens (UA) and on innovation through the development of robotic systems for monitoring and dissuasion and remote sensing (FCUP). A local NGO (MARCA) has large experience on volunteers and stakeholders' involvement in conservation programs. National NGO (QUERCUS, depending on approval of the amendment request) has a strong commitment, with EDP and REN, in reducing impact of electric powerlines on birds mortality. UEVORA team is composed by fauna and vegetation experts, with experience in previous LIFE projects, strongly focused on biodiversity conservation and some of them specialized in road and railway ecology.

The NEEMO monitoring members as changed in the second year of the project (Dr. Sara Barceló replaced Dr. João Salgado). However, both members, are well aware of the particularities and difficulties often associated with the full implementation of the LIFE projects. Communication with both was easy as NEEMO staff was available when requested and gave LIFE LINES a strong support. This is helping a lot to overcome project drawbacks.

A formal amendment for the project proposing QUERCUS as a new beneficiary as substitute of EGSP and including new devices and conservation measures for actions A.6 and C.5, respectively, was concluded and sent to EASME on 23rd May 2018. This amendment included, whenever possible, suggestions from and answers to EASME requests. We are prepared to implement this change in project as soon as we have an authorization from EASME. If it will happen before the summer holidays, new devices will be produced and put in place till the end of June 2019 and one year of monitoring will be possible.

6. Technical part

6.1. Technical progress, per Action

Action A.1 – Completing and updating of baseline characterization – Concluded

Foreseen start date: 01/08/2015 Actual start date: 01/08/2015
Foreseen end date: 30/07/2016 Actual end date: 30/03/2018

All the tasks to this action are now concluded. The action began, as predicted, 1st on August 2015. Most of the work was finished by 30th June 2017. However, owl movements and one micro reserve characterization were only completed on 31st March 2018. This postponement was not the cause for any delays in the implementation of conservation actions.

The information already existent for the Study Area (SA) concerning biophysical, socio-economic, species distribution and roadkill data was compiled in a Geographic Information System Database. Based on this information, the needs for complementary data (species/groups and locations without or with poor data) were identified. Additional sampling in several locations was done for the main target groups of the project including amphibians, passerines, owls and mammal carnivores. Moreover, at intervention sites (roads, road verges, culverts, micro reserves, and very high voltage powerline poles) a detailed characterization of the main target groups for which the intervention was planned, was carried out taking into account a Before-After-Control-Impact (BACI) design.
See the Deliverable "Non-technical Final Report of Action A.1" accompanying this report (Annex I).

The database layers (Annex II) excluding the six that cannot freely distributed due to licence constrains, are available through the following web link (username: lifelines; password: zanywhale80). Moreover, a digital copy of all these layers in a hard drive accompanies will now be sent to EASME. All the layers were organized according to the guidelines established in the beginning of the project (Annex III).

Action A.2 – Compilation, structuring and implementation of a national database and multi-user web platform - In progress

Foreseen start date: 01/10/2015 Actual start date: 01/10/2015
Foreseen end date: 31/12/2016 Actual end date: 31/12/2018

A national database was already implemented with the data provided by several entities/persons holding this type of data, including IP (All National Road kills from 2010 to 2018), FCUP, Estrela Matilde (a student that have compiled national wild boar roadkilled data for her Masters thesis), Clara Grilo (a road ecologist senior researcher that have made extensive roadkill surveys in the framework of her projects), and UEVORA.

A protocol with National Republican Guard (GNR), since this entity has a database of the car accidents involving large animals, is finished (Annex IV) and is now under a final process signature process after revision of the original version to fulfill all signatories demands. This is the reason why this action is delayed. Most of all other Road Concessionaries and Sub-concessionaries (highways and some more recent national roads) have been contacted, but until now we have no further positive answers (Annex V). The action will be concluded with the

integration of GNR data in the 2nd semester of 2018. However new road kill data will be added to the database when available.

By the end of the reporting period, 73.809 records of roadkills belonging to 208 species are already in the database. This is a National Database and records included are nationwide, despite the higher concentration in the LIFE LINES IA.

Meanwhile, the aggregated road-kill data can be viewed online through the WebGIS of the project (https://mapserver.uevora.pt/webgis_lifelines_lm313/lizmap/www/index.php/view/). This database application aims two kinds of users: public data, available at a broad scale; and private working data that, at this stage, is available at a finer scale only for the project team. Detailed data for other professionals can be available on request.

Action A.3 – Project implementation, licensing, procurement of permits and contracting procedures necessary to actions C – Concluded

Foreseen start date: 01/08/2015 Actual start date: 01/08/2015
Foreseen end date: 30/06/2017 Actual end date: 31/12/2017

This action has begun in the expected date and ended six months later. Nevertheless, an additional amount of time was invested in talks with different stakeholders in order to improve/adapt the projects according to the expectations of all the parts involved and whenever possible, increase the cost-benefits ratio. This together with all the mandatory administrative procedures needed by law are responsible for some delays. At the moment authorizations and licenses (Annex VI; Annex VII; Annex VIII; and Annex IX) are gathered and following execution projects are completed:

(1) Design and authorizations of the amphibian passage warning signal
(5) Construction of dry ledges for fauna on 5 culverts,
(7) Installation of fences at N4, N114 e IP2
(2) Installation of walls to elevate flying vertebrates fly on N114
(1) Installation of barriers and adaptation of culverts for amphibians on N114
(1) Installation of reflectors for owls on N4
(1) EM529 - Implementation of barriers and tunnels for amphibians and walls for owls
(1) EM535 - Intervention Plan
(1) NIA – Restoration Plan for Nucleus of Environmental Interpretation
(2) Contractual procedures to promote public awareness and voluntary activities in actions in the responsibility of IP
(1) Installation of nets covering the slopes to avoid rabbits
(1) Implementation of a strawberry tree barrier to elevate owl's flight

Several tasks of Action C.1 and Action C.2, such as implementing new fences along the roads, implementing reflectors to avoid owls at the road, and all the services related to Action C.2 (mowing and cutting vegetation, control of invasive species, planting vegetation) are contracted on the IP's new Road Maintenance Contract. In the Annex X, are presented some pieces of reference terms for the new Road Maintenance Contract, including the LIFE LINES

specifications, the Chapter 5 (describing the implementing methods), and the timetable concerning all the actions of the Contract (not only for LIFE LINES). For a better understanding an extract of the timetable relating the actions of LIFE LINES (and the places they concern) with the ones in the contract is presented in the Table 1. Main tasks are translated in the 2nd column.

These tasks (implementing new fences along the roads, implementing reflectors to avoid owls at the road, and all the services related to Action C.2) weren't executed yet, because several issues have delayed the new Road Maintenance Contract signature. A detailed explanation of this is as follows:

The terms of reference for the new Road Maintenance Contract, including the LIFE LINES specifications were submitted to Government approval[2] in the 1st semester of 2017 but Government approval to initiate contract procedures was just published on 29th December 2017. IP has initiated the contract procedures immediately and a company is already selected to contract. As soon as the Court of Auditors[3] authorizes the contract, the works will start, which is expected to happen in September/October 2018.

[2] Multi-annual budgets for activities that take longer than one fiscal year must be approved by the Government (by both the Ministry of Finance and the Ministry of Planning and Infrastructure).
[3] Contracts above 950.000,00€ need the authorization of the Court of Auditors.

Table 1. Extract of the new Road Maintenance Contract timetable relating the activities contracted with the actions of LIFE LINES and the places they concern (in yellow).

		Descrição dos trabalhos específicos em que importa realçar algumas épocas para a sua execução	LIFE LINE S correspondence
6.12.1	Conservação de pavimentos		
6.12.2	Regularização e Limpeza de Bermas e Valetas, Passeios, Intersecções, Ilhéus e Separadores	Regularização e alteamento de bermas não pavimentadas	
		Regularização de valetas não revestidas	
		Limpeza por aspiração	
		Limpeza de , intersecções e ilhéus	
		Limpeza de separadores	
		Limpeza de Áreas de Repouso e Outras Zonas de Paragem	
6.12.3	Limpeza, conservação, reconstrução e construção de órgãos de drenagem	De banq., de crista, pé de talude, incl. caleiras de descida de talude	
		Valetas e Valas revestidas existentes na plataforma da estrada	
		Limpeza e conservação de outros órgãos de drenagem e acessórios	
		Conservação de sistemas de retenção/tratamento	
		Reconstrução ou construção de novos órgãos de drenagem	
6.12.4	Manutenção e estabilização de taludes	Manutenção de taludes	
		Estabilização das zonas afetadas por escorregamentos	
6.12.5	Conservação da rede de vedação (Implementation and maintenance of fences)	Inspeção da Rede de Vedação	IP2 (kms 209-226)
		Manutenção da Rede de Vedação	
		Fornecimento e colocação de Rede de Vedação	
6.12.6	Conservação de Obras de Arte e Túneis	Meios de Acesso	
		Identificação das Obras de Arte	
		Limpezas Gerais	
		Fundações e Linhas de Água	
		Componentes Estruturais	
		Guarda Corpos, Passeios e Cornijas	
		Juntas de Dilatação	
		Taludes e Órgãos de Drenagem	
		Escoramentos	
6.12.8	Atividades Ambientais (Environmental activities: mowing and cutting of vegetation; chemical and physical treatment of invasive vegetation; vegetation and trees removal; plantation, etc.)	Ceifa e corte de vegetação	IP2 (kms 209-226) EN4 (kms 82-143) EN114 (kms 161-189) EN18 (kms 230-267,5) EN18/IP2 (kms 267,5-281) Micro-reserves Invasive vegetation parcels
		Corte seletivo de vegetação	
		Deservagem química/térmica	
		Manutenção vegetação arbórea	
		Poda de árvores e arbustos e abate de arbustos	
		Proteção e manutenção de árvores com valor excecional	
		Abate de árvores	
		Remoção de cepos	
		Remoção de árvores caídas e ramos caídos	
		Caiação de troncos	
		Abertura de caldeiras	
		Controlo físico e químico de plantas invasoras	
		Eliminação de exemplares de plantas invasoras	
		Manutenção zonas com tratamento paisagístico	
		Sementeiras	
		Mantas orgânicas	
		Plantações	
		Dispositivos de proteção acústica	
6.12.9	Atividades de Segurança (Implementation of "safety equipments" such as road signs and refletors)	Conservação da sinalização vertical	
		Colocação de sinais e aplicação de equipamentos de segurança	EN4 (kms 92,550 - 93,750)
		Conservação da sinalização horizontal	
		Conservação e manutenção de guardas de segurança	
6.12.10	Obras de Contenção	Execução de Muros de suporte	
		Demolição de muros	
6.12.12	Outras Atividades	Remoção de mensagens publicitárias	
		Reconstrução pontual de passeios, ilhéus e separadores	
		Correção altimétrica de cxs de visita existentes na plataforma da estrada	
		Execução dos Inventários	

Some of these services, especially the mowing and cutting of vegetation, have been assured until now by the actual Road Maintenance Contract that ended in December 2017. At the moment, there is only a contract going on, for emergency services. To guarantee the mowing and cutting of vegetation services during the 1st semester of 2018, IP initiated a specific tender process, but there were not any proposals submitted[4].

Other tasks of Action C.1 and C.2 were implemented under the Road Maintenance Contract that ended in December 2017, such as implementation of nets to avoid rabbits, implementing fences near culverts, and also mowing and cutting vegetation along the roads (periodic task that takes place every year of the project).

The project's design for amphibian's roadkill mitigation measures and barriers to elevate the bird's flight (including an outdoor to promote the LIFE LINES project) for action C.1 were concluded in October 2017. Both were joined in one single contractual procedure.

Tender process for the construction was initiated on 28th December 2017, after the execution project has been concluded, but only two companies have submitted proposals. Both applied with budget above the base price and were excluded because public institutes aren't allowed to accept proposals above this price. The base price had been estimated according the usual price but the market has changed substantially, with increasing costs, due to new legislation concerning infrastructures maintenance (a vast amount of works, such as cutting trees and vegetation near the road in all country, is now a legal obligation with a short deadline, so the service providers are saturated and the market prices have increased substantially). Consequently, it was prepared a new tender process with an increased base price that was published on May 9, 2018 (https://dre.pt/web/guest/home/-/dre/115251098/details/2/maximized?serie=II&at=c&parte_filter=41&dreId=115242052). This time, 3 companies submitted suitable proposals and the adjudication procedure has already been initiated with the chosen company. Regarding C.10 the protocol with REN (National Electric Network) is signed since December 19, 2017 (Annex XI- protocol REN).

Action A.4 – Development, testing and evaluation of automated systems of monitoring and/or deterrence - <u>In progress</u>

Foreseen start date: 01/08/2015	Actual start date: 01/08/2015
Foreseen end date: 30/06/2018	Actual end date: 30/01/2019

In the original proposal, the University of Minho was indicated as the main developer of the prototypes because they have more experience (by External assistance) but the costs have risen substantially so the team from FCUP assumed the development of prototypes without resorting to external assistance but hiring an Engineer from University of Minho and buying the materials. So, the University of Minho has been substituted by the FCUP in order to maintain the final costs of Task A.4 as previously planned.

[4] At the moment there are no companies available to these services. Due to the new legislation to prevent fires, all companies are contracted to the cleaning and deforestation works in all country

We have developed five prototypes, four of which have already been tested. For three of this, based on test results improvements are continuing to be made. The hardware of the fifth prototype (Mobile Roadkill Mapper) is completed and the core software have been developed (Annex XII). However, the algorithm needs to be trained with numerous roadkill photos for which a compiling process is under way. Only after these, real tests (for amphibians and small birds) can be efficiently done with this device. This is the reason why we postponed the end date of this action. This postponement does not imply any delay in conservation actions.
Annex XIII summarize the characteristics and stage of development for each prototype.

Action A.5 – Installation of autochthonous plant nursery for conservation actions – Concluded

Foreseen start date: 01/08/2015 Actual start date: 01/08/2015
Foreseen end date: 31/12/2016 Actual end date: 31/12/2016

The nursery infrastructure was finished in the foreseen end date, as explained in the deliverable "Non-technical report of the action A.5" accompanying this report (Annex XIV). Concerning action A.5, the infrastructure and land where it was predicted to be installed the plant nursery became no longer available because in the period that mediated project proposal and approval the site was designated for other purposes by its owner. In order to attain the objectives and targets initially proposed, other alternatives were assessed. After several other institutional contacts with local partner's a new location has been found at the property of Casa João Cidade (a local association working with disabled people) The referred land parcel was been made available to MARCA with the purpose of installing the Plant Nursery since the beginning of April 2016. The new place found to install the nursery did not interfere with its functioning neither the end date of the action. All the deliverables/milestones and indicators were achieved.

Action A.6 – Development of prototypes for deterring avifauna in medium voltage lines - In reformulation

Foreseen start date: 01/08/2015 New proposal starting date: 01/10/2017
Foreseen end date: 30/06/2017 New proposal end date: 31/07/2018

Delayed due to AB (EGSP) withdrawal from the project. An amendment to project proposal was been send to EASME on May 23, 2018 and waiting for an answer. QUERCUS already chose the lines to intervene and EDP-Distribuição already developed the prototype (design is finished) and is just waiting for authorization to start the production.

Action C.1 – Integrate Mitigation of the reduction of connectivity and permeability of the landscape in national and principal roads - In progress

Foreseen start date: 01/03/2016 Actual start date: 01/03/2016

Foreseen end date: 31/12/2017 Actual end date**:** 31/03/2019

Most of the procedures needed for interventions in the framework of action C.1 started on the predicted date (Annex XV; Annex XVI). However, time-consuming administrative processes or difficulties in contracting service providers, as explained in action A.3, delayed the beginning of some interventions in the field. Now, the state of play of the tasks associated with C.1 actions is as follows:

Dry ledges installation in 6 culverts at N4, N114 and IP2

Installation work concluded in august 2017.
Dry ledges were implemented in 6 culverts, instead of 5, because culvert 660 is connected to a second culvert (6499) that had also to be adapted in order to the fauna crossings to be effective (see Table 2). Nevertheless, the cost didn't exceed the predicted budget for this task.

Table 2. Culverts with fauna dry ledges

Culvert number	**Road**	**Km**	**Name**
644	N114	169+000	Pontão da Serra de Pégoras
660 + 6499	N114	171+700	PH Ribeira de Santa Sofia
2748	N4	111+350	Ponte de Mendos Marques
6453	N4	107+030	
2434	IP2	219+000	Ponte do Ribeiro das Pinas

Implementation and rectification of fences in small segments near 7 culverts at N4, N114 and IP2

Building work was concluded in November 2017, at 6 culvert locations (Figure 2 and Table 3), under actual Road Maintenance Contract.

Figure 2. Fence installed near one of the selected culverts

Tabela 3. Culverts with fences installed

Culvert number	Road	Km	Dry Ledge	Fences
660 + 6499	N114	171+700	yes	Existing (private)
637	N114	168+600	No	Installed
without number	N114	166+110	No	Canceled
6439	N4	92+550	No	Installed
2741	N4	102+055	No	Installed
2748	N4	111+350	yes	Installed
Without number	N4	111+390	No	Installed
2434	IP2	219+000	yes	Repaired

Although it was predicted to implement fences near the culvert at N114, km 166+110, it was noticed that there was no space between the top of the culvert and the road to install the fence. So, as there was another culvert that also needed fences (PH without number, at N4 near km 111+390) and IP implemented the fences at this one.

In what concerns culverts 660+6499, just before the beginning of the fences installation was noticed that the adjacent private lander had installed proper fences exactly on the same place as IP was planning. So instead of spending resources duplicating this measure, it was decided to cancel it, especially because the purpose of the measure will be achieved the same way.

If the monitoring (roadkills) results come to show that other measures of this type are needed, IP will consider installing more fences, but the installation can only be done after the beginning of the new Road Maintenance Contract.

Installation of 100 Swareflex wildlife warning reflector at N4

It was difficult to find a company willing to sell and install these devices and only by the end of July 2017 we had the confirmation from one firm that were available to sell. Meanwhile a field visit with a technician from the firm has already happened and a detailed project to implement these devices was developed. The installation is planned to be done under the new Road Maintenance Contract, which is not yet contracted (as explained in Action A.3) due to the delay on its authorization by the Government (that happened only on 29th December 2017). Nevertheless, IP expects to have the contract procedures completed in the 2nd semester of 2018, and will ask the contractor to implement this measure in the very beginning of the contract.

Repairing/replacement of the existing fences at IP2 and implementation of a complementary net set in "L" format stapled to the existing fences

Although some repairs on the existing fences have been developed under the actual Road Maintenance Contract, full implementation of these measures will be achieved with the beginning of the new Road Maintenance Contract. As IP has only received the Government approval to initiate contract procedures on 29th December 2017, this task is not concluded yet. Nevertheless, IP expects to have the contract procedures completed in the 2nd semester of 2018, and will ask the contractor to implement this measure in the very beginning of the contract.

Amphibian's roadkill mitigation measures and Barriers to elevate the bird's flight

These two projects were joined in one single contractual procedure, for logistic reasons and were concluded in October 2017. The project has included an outdoor to promote the LIFE LINES Project.

In what concerns the amphibian barriers and the culvert adaptations, the chosen location is at one important segment of N114 bordered by several water bodies and where have been registered a high number of amphibians' roadkills, being important to mitigate. The initial solution proposed in LIFE LINES Project (construction of specific tunnels for amphibians), was studied during the preparatory studies and the IP civil engineers did not approve it for the following reasons: due to safety and maintenance constrains it is not viable to construct in N114 the kind of tunnels usually used in smaller roads with reduced traffic and velocity. In fact, N114 is a main road that supports high levels of traffic associated with high speed. The introduction of different structures in the pavement can risk the safety driving since the irregularities associated to these different structures tend to cause accidents. This kind of problems don't happen with drainage culverts because they are installed deeper and the embankment is large enough. On the other hand, there are few segments at this road with embankments large enough to implement new tunnels, so it was necessary to look for alternative solutions.

During the preparatory studies, it was realized that there were two drainage culverts at the road segment chosen to be intervened that could be adapted to allow its use by amphibians, as long as they were guided by barriers. So, the new project included the necessary adaptations to be made on the culverts to promote their use by amphibians, instead of installing the initially proposed passages. Adaptations comprise building ramps for amphibians' access (there are steps in the actual accesses) and rising the lateral culvert walls to connect with the barriers that will be implemented. It is important to notice that experts from the project Scientific Monitoring Committee agree that culverts, particularly in the Mediterranean, may be efficient for this purpose. So, we expect these alternative solutions to achieve the same results and if so, its appliance in the future will be more viable since all roads have a large number of culverts that can be easily adapted for this purpose.

In what concerns the **barriers to elevate the owl's flight**, and following the advice of road ecology specialized members of the Scientific Monitoring Committee, it was decided to opt, in first place, by the simpler solution from the different possibilities considered in the project proposal, that is, high barriers parallel to the road. The solution had to take in account some safety restrictions identified, especially in what concerns its implementation on a bridge. Implementing high barriers on bridges is unadvisable, due to the risk of falling when submitted to wind. Due to this fact there were some delays in the project design which was concluded assuming barriers of 3 m high, with metal resistant nets that are permeable to wind (Figure 3).

Figure 3. Barriers to elevate the owl's flight design project

The owl's and amphibian's measures were projected by the same engineer and will be built by the same contractor. As explained in Action A.3, tender process for the construction was initiated on 28th December 2017, but only two companies submitted proposals, both above the base price (and were excluded). The new tender process with an increased base price, which was initiated on 9th May 2018, had three suitable proposals and the adjudication procedure has already been initiated with the chosen company. It's important to clarify that the increased base price was estimated accordingly the actual market prices as well as the prices presented in the first tender process. So, it was evident that the budget estimated in LIFE LINE Project was not enough to implement these projects. IP has then draw the LIFE LINE Coordinator's attention to this question, suggesting to use part of the budget that concerned Action C.2 to fulfill the gap, namely the budget to consumables for solar systems (see Table 4) that are not essential to the success of Action C.2. After analyzing this issue, the team has agreed that the Amphibian's road-kill mitigation measures and Barriers to elevate the bird's flight Projects were more important and fundamental to the coherence of LIFE LINE Project. Thus, we ask permission to EASME to remove part of the budget from consumables form C.2 and added to Service acquisition in action C.1 (Table 4).

Table 4. Budgets of consumables concerning Action C.2 that will be used to Action C.1 (source: LIFE LINES Project, Consumables Table, p. 324)

Consumíveis para apoio à ação C.2: 2 kits solares de bombagem/rega para fornecimento de água (compostos de bomba, sensores, e painel fotovoltaico, no total de 6.400€/unidade)	12.800,00
Consumíveis para apoio à instalação de soluções de monitorização fixa contínua (painéis fotovoltaicos, baterias, sistemas de distribuição de energias e soluções antivandalismo/ roubo) para ação C.1	21.600,00
Total	34.400,00

Implementation of nets covering the slopes to avoid rabbits

It was planned to execute this task under the new Road Maintenance Contract, which includes the LIFE LINES specifications. Nevertheless, IP was able to execute this service under the

current Road Maintenance Contract (on the last trimester of 2017), ensuring that it was concluded within the original timetable.

The nets were applied on November 2017 on both sides of two segments of National Road 4 (N4) with high levels of rabbits' mortality, identified by the UEVORA team, specifically km 130,660 - 131,160 and km 88, 315 - 88,815 (Figure 4).

Figura 4. Installing nets to avoid rabbits at EN4

Electronic prototypes to avoid owls and small mammals near the roads

These devices were developed by FCUP under the framework of Action A.4. IP has helped to install them.

Due to the mentioned delays, especially the tasks depending on the new Road Maintenance Contract, we suggest to extend the period of action C.1 execution until March 2019.

Action C.2 – Potentiation of the verges and marginal parcels of roads infrastructures as shelter areas, refuge, food and / or displacement - <u>In progress</u>

Foreseen start date: 01/03/2016 Actual start date: 01/03/2016
Foreseen end date: 30/06/2018 Actual end date**:** 31/07/2020

Action C.2 has 3 main tasks:

- Control of road vegetation and control of invasive Species
- Implementation of micro-reserves
- Implementation of a strawberry tree barrier to elevate owl's flight

Procedures that took place until now to accomplish them, are as follows:

<u>Control of road vegetation and invasive Species</u>

The usual methods used by IP to control vegetation on the road verges consist in mowing and cutting the vegetation once a year. This technique is also the one used usually to control

invasive species along with: cutting the trees with no other techniques associated and applying herbicide (that had impacts on the native species and pollutes the soil and water resources).

To perform this task, with improved control techniques, there will be two different approaches (Annex X):

1. The general and regular control of vegetation, including the invasive species, with improved techniques, applied in the IP2, N4, N114 and N18/IP2 verges, on approximately 3 m wide strips counting from the limit of the paved section, each side of the road, on a total of 154 km. The area of intervention is approximately 462.000 m^2 (1st case) and the interventions are predicted to occur twice a year at least (2 x 154 km) until 2020 (autumn 2018, early spring 2019, summer 2019, early spring 2020, summer 2020).
2. The selected spots where different specific methods are going to be applied to invasive species, under close monitoring, in order to test and compare its results. The area of intervention is approximately 7.073 m^2 (IP was able to add more spots to the original Plan that comprised 5.979 m^2).

The methods used in the 1st case include mowing and successive cuts of invasive vegetation as it seems to be the method that has a better relation between its efficiency and less ecological impact. IP has been mowing and cutting the road verges vegetation since the beginning of the Project, under the actual Road Maintenance Contract, but with the usual methods. The new Road Maintenance Contract provides for the improvement of these techniques in order to be more efficient in this task and cause less damage to the green corridor role played by the slopes. Thus, the improved techniques will include: more frequency in mowing actions (shortening the time intervals between mowing actions when weather conditions promote excessive vegetation growth); possibility of mowing just 1,5 m in the immediate proximity of the asphalt, instead of the 3 m established on the actual contract (in areas where it's important to keep a green strip as corridor for small animals); and possibility of leaving some bushes and vegetation "islands" (instead of cutting all the vegetation) that can create refuges and stepping stones for small animals.

The methods used in the 2nd case is presented in the Control of Invasive Species Plan and include the improved methods suggested by literature, consultancy of specialists and other projects experience, to control the invasive species *Acacia dealbata*, *Acacia melanoxylon*, *Ailanthus altissima and Arundo donax.*

These improved techniques are more complex and will be used in the selected areas, under close monitoring, in order to test and compare its results. The selected areas, chosen during the preparatory studies, took into consideration the possibility of choosing the best technique at each case. These techniques include:

- Herbicide brush application on the stump immediately after the tree cut;
- Injection of herbicide in the trees, so they die without new shoots;
- Debarking of the tree trunk so the trees die without new shoots (*Acacia* spp.);
- Successive cuts of the stems (*Arundo donax*);
- Total remove of small new shoots (including the roots);
- Plantation of native trees to compete with the invasive species (combined with the previous techniques).
-

The improved methods were chosen according to the species and parameters such as age, density, proximity to other patches in private lands, and presence of native species.

Notice that the Control of Invasive Species Plan presented in the Annex X refers only to the 1st year (1st phase – Initial Control). The remaining years will be planned accordingly to the results of the first intervention in order to adequate the methods to be used. In the Plan are presented the information obtained at the moment, namely: estimated areas of intervention, its location, and the methods to be used. Fifty-eight patches were selected for control and five patches to be used as "reference situation" (in those 5 patches, for comparison proposes, invasive species control will be done using the traditional techniques and not the improved ones).
As the field studies progressed, it was verified that few of the patches could not be intervened for several reasons including erroneous species identification or patch area being out of IP's jurisdiction. So, there were some changes to the original plan but IP was able to increase the number of patches to the original Plan, due to some extra field work developed in 2018. So, there are now 58 patches and the total area of intervention is now 7.073 m^2.

In the 1st year, actions of initial control will be applied in all of the 58 patches predicted to be intervened with improved methods. It is not possible, in most situations, to guarantee the eradication of the invasive species in the first year, since there is a seed bank in the soil that will take several years to control. Also, these species are very resistant to the control actions, being necessary to repeat the procedures, sometimes year after year. These facts are well documented in the bibliography. So IP strategy consists in applying sequential actions, which was indeed predicted in the Project proposal (p. 148)[5]. Therefore, there will be a 2nd phase to repeat procedures if necessary or even to apply alternative solutions, as well as to control the new shoots that predictably will appear in some patches – Continuity Control.
The 3rd phase, called Maintenance Control, will be similar to the 2nd one, but hopefully in a much less frequency, regarding mainly the plants from the bank seeds in the soil. This 3rd phase will start in 2020 will start in 2020 and go on through the sequent years, including after LIFE work since it is not possible to assure a definitive eradication of the invasive species during the project lifetime.

The Continuity and Maintenance Control phases were predicted in LIFE LINES Project since it is well known the great resistance of these species. Please note that the indicator (100% control of woody invasive plants) refers to the proportion of the areas that will be intervened with improved control methods and not to all the area covered by invasive plants. These works are included in the new Road Maintenance Contract, which includes the LIFE LINES specifications. Nevertheless, some of these services have been assured until now by the actual contract that ended in December 2017, especially the mowing and cutting of vegetation along the verges of the roads (see Figure 5), in approximately 462.000 m^2 and the cutting of *Arundo Donax* in the selected parcels (see Figure 6).

Although these actions seem to be recurrent, namely the mowing and cutting of vegetation, it is important to clarify that the quantities contracted for these services, although comprising all national roads in the district in general, are below the usual needs and they are performed only

[5] "(…) *os trabalhos integrarão assim, de forma sucessiva, ações de controlo inicial (…) às quais se seguirão uma ou mais intervenções de controlo de monitorização (dirigidas a assegurar a efetiva erradicação dos espécimes já intervencionados mas também o controlo inicial de outros, mais jovens, que existam nas áreas de intervenção) e por último controlo de seguimento (já apenas dirigido a trabalhos de controlo regular, com práticas adequadas, de novas plantas nascidas do banco de sementes existente e/ou por propagação radicular)*" (the tasks will include in a successive way, initial control actions (…) followed by one or more control interventions (to assure the effective eradication of the intervened specimens and also to do an initial control of new plants, younger, that exist in the intervention area) and finally the maintenance control interventions (directed to regular control of new shots, born from the bank seeds in the soil and/or root spread))

on chosen roads accordingly to the development of the vegetation. Thus, due to Project LIFE LINES, IP was able to give priority to the roads covered by the Project and assure that vegetation is maintained bellow the typical size.

Figure 5. Cutting vegetation along the verges at N4

Figure 6. Reappearance of *Arundo donax* shoots after cutting the adults

At the moment, IP has only a contract active, for emergency services. To guarantee the mowing and cutting of vegetation services during the 1st semester of 2018, IP has initiated a specific tender process, but there wasn´t any proposals submitted, since there are no companies available in the market, as explained before.

IP is making all the efforts to sign the new Road Maintenance Contract, as already explained. As soon as the Court of Auditors authorizes the contract the works will start, which is expected to happen in September/October 2018.

As requested by IP, UEVORA participated in the selection, measurement and marking of invasive plants plots for intervention with specific and improved methods. UEVORA also performed the characterization of these invasive plants plots, on spring 2017 or 2018, as referred to in the final report of action A.1.

Implementation of micro-reserves

IP and UEVORA have established the patches along the roads to be used as micro-reserves (image below). One of the parcels – A – have 3,9 ha and the other one – B – has 1,6 ha, in a total of 5,5 ha (see Figure 7). The next step is the micro-reserves installation project that was developed by UEVORA. Due to the weather conditions in Portugal (very dry summers), it's advisable to plant only in autumn to guarantee the plants survival. The micro-reserve A has a reasonable plant diversity that is being maintained (see Figure 8) and it will be complemented with the seeds and plants that are being prepared in the Action C.9. The strawberry trees aiming to elevate owls flight (see next point) were planted in the micro-reserve B, in a location where several owl road crossings were documented (see final report of action A.1). This plantation, besides its primary function, will contribute to the achievement of micro-reserve goals including promotion of autochthonous vegetation and butterflies (e.g. *Charaxes jasius* which larvae fed only of this bush). Seeding and planting the other preconized species will occur in the autumn. Micro-reserves will be maintained (there is the need of taking care of the growing plants and replace the ones that may die) during the total period of the Project and beyond it, since IP will keep it after the Project ends.

Figura 7. Map of the two micro-reserves with indication of the area in hectares (please note that pavement on the southern part corresponds to the previous road alignment and none, or a residual, traffic is associated with it)

Figure 8. Image of the micro-reserve A

As requested by IP, and based on respective characterization on action A.1, UEVORA developed the intervention plans for the N4 micro-reserves (Annex XVII).

Implementation of a strawberry tree barrier to elevate owls' flight

IP has acquired 360 *Arbutus unedo* (strawberry tree) to plant near the road N4, in an area of high level of owl mortality. As it was coincident with the micro-reserve B, the plantation was partially incorporated in the micro-reserve plan. The strawberries trees were planted in two lines, parallel to the road, since there was an interruption in the front line where there was no soil available to keep planting. They are partially overlapped to guarantee there were no interruptions in the barrier (see Figure 9).
It was planned to plant the strawberry trees in the 3rd trimester of 2017, during the autumn, since it was expected that it would be raining by then. Due to the unusual prolonged period of drought, the plantation was postponed to February 2018, in order to guarantee its successful establishment and growing. This task was executed with help from volunteers, in the framework of Action E.8.

Figure 9. Map of the strawberries trees plantation lines (blue lines)

In the autumn, the strawberry trees that may die (which is usual to happen in a small percentage) will be replaced by new ones. As the purpose of this measure is to grow a consistent barrier, all the empty spaces caused by dead plants will be replaced.

Although most of the tasks of this Action C.2 must be concluded as soon as possible, there are some tasks that are supposed to continue (in order to be maintained) until the end of the project LIFE, namely mowing of the verges and controlling of the invasive species. In fact, it is mentioned in the Project proposal that either the **mowing with the improved techniques** and either the **control of invasive species**, will happen during 2017-2020. This makes sense since it is not a task that can be done in just one year period. For instance, for the invasive vegetation control, the plan includes three phases (Initial Control, Continuity Control and Maintenance Control). If we only apply one of these phases, the measure will be ineffective. Thus, the requested extension of deadline for this action (31-07-2020) doesn't concern all the tasks involved, but only the activities that have to be continued after the first phase of implementation. By this we mean:
- maintenance of the micro-reserves (that are already being implemented);

- continuity of the mowing and cutting of the verges vegetation (that have started in the 2015 and will continue until the end of the project in an improved way (and predictably after it), as foreseen in the proposal (p. 315: "*Serviços especializados em ceifa e corte de vegetação (l=3m) segundo práticas melhoradas (…) (2017-2020). Total: 308 km lineares*")[6]
- and control of invasive species that involves 3 phases (initial, continuity and maintenance control to eliminate new shoots (p. 148)). Also, as it can be seen at the p. 315, this service was already predicted to last until 2020: "*Serviços especializados de controlo de vegetação invasora (…) segundo práticas melhoradas (2017-2020)*"[7].

Thus, we ask for the correction of the inaccuracy on the deadlines previously defined for this Action and propose 31/07/2020 as a new deadline that takes in account the time needed for continuing and maintaining the tasks of this Action.

Action C.3 – Development and installation of vertical road traffic signs – Concluded

Foreseen start date: 01/10/2015	Actual start date: 01/10/2015
Foreseen end date: 31/03/2017	Actual end date: 30/06/2018

The design of amphibian's road sign was completed in 2016. The process of requesting authorization was initiated in September 2016. The new road sign was approved by the National Authority for Road Safety in February 2018. All the road signs were installed on national roads as predicted in June 2018. In Annex XVIII are the proposed design for the amphibian passage warning signal and their installation on N4 and N114). Beside the reporting date 30th of April we decide to add this information since the action is concluded by the time we finish written the report.

Action C.4 – Mobile Application to promote the collection of mortality data - In progress

Foreseen start date: 01/10/2015	Actual start date: 01/10/2015
Foreseen end date: 31/07/2020	Actual end date: 31/07/2020

The development phase of the mobile application to register fauna roadkills events (Figure 10) is concluded, and it is now in a testing phase. The mobile application uses android operating system (version 5.0 Lollipop or greater). It allows submitting mortality events with corresponding event properties such as species, age, sex, GPS coordinates, and photos. It is possible to view existing events in a map or a list. All the information is collected in the roadkill national database mentioned in Action A.2.
As soon as all quality parameters are achieved, the application will be available to the public, for free, in google play. We expect this to happen during the next months. The official launch of the application (including a major media event) is set to the third trimester of 2018.

[6] Specialized services in mowing and cutting verges vegetation (wide=3mts) with improved procedures (…) (2017-2020). Total: 308 linear km
[7] Specialized services in controlling invasive vegetation (…) with improved techniques (2017-2020)

Figure 10. Screenshots of the mobile application to register fauna roadkills

After meetings between the teams of Évora and IP, a specialized firm was hired to specifically develop the web services. These are the command lines that link the database to the application that is being developed in the Action C.4. At this moment all the scripting to synchronize data between the database from UE and the database from IP have been developed and is working in order to maintain database updated and send the information to the App.

Action C.5 – Testing devices for deterring avifauna landing in medium voltage lines - <u>In reformulation</u>

Foreseen start date: 01/07/2016
Foreseen end date: 31/12/2019

New proposal starting date: 01/08/2018
New proposal end date: 30/06/2019

<u>Delayed due to AB (EGSP) withdrawal from the project. An amendment to project proposal was send to EASME/EU Commission and we are now waiting for the decision.</u>

Action C.6 – Development, essay and application of biodiverse grasslands to promote biodiversity in linear infrastructures - <u>In progress</u>

Foreseen start date: 01/01/2016
Foreseen end date: 31/12/2019

Actual start date: 01/09/2015
Actual end date: 31/12/2019

In relation to previous report, the reference to the Annex XXIX was, in fact, misplaced. Annex XXIX was the updated list of native species in the study area to be used for biodiversity improvement in actions C and was produced under action A.1 (Annex XIX). Furthermore, to illustrate action C.6 works three photos were to be sent (Annex II) but never did. Therefore, at the time the report was produced, action C.6 works were timely in progress as foreseen and documented in the photos that are now sent (Annex XX). Results from these works are now already available and are presented below.

During 2017, UEVORA developed germination protocols for species with conservation interest and respective summary sheets (see Deliverable of action C.6 accompanying this report – Annex XXI).

Since the last report (August 2017), UEVORA reinforced the seed bank with seeds of the species needed in bigger amounts for future use in actions C (mostly to use in autumn 2018). Seed harvesting as well as the maintenance and organization of the seed bank will continue throughout the project, to provide seeds for good execution of actions C. Moreover, UEVORA participated in the *Curso de gestão de coleções biológicas utilizando Specify 6* (7-9 February and 26-28 March 2018) in order to update knowledge about biological collections management.

UEVORA is testing two mixtures for each type of infrastructure (roads and ecotrails; Annex XX); due to ecological reasons linked to availability of different habitats; furthermore we wanted to enhance habitat for butterflies and small mammals preferably on ecotrails, where the risk of mortality by trampling or collision is smaller. On the other hand, the mixture to be sown in roads verges should take into consideration primarily road security, namely regarding biomass production. Our mixtures have well defined percentages of large taxonomical groups (Asteraceae – 10%; Fabaceae – 30%; Poaceae – 30%) but within these groups we had several suitable species. To determine how suitable were they it was important to test them also in the field conditions but on the end, of these, one mixture for roads and other for ecotrails will be selected for seeding on experimental demonstrative plots. UEVORA has already sown the four test mixtures on *ex situ* plots at Herdade da Mitra, and the practical evaluation of these plots is being made in Action D.3 (during 2017 and 2018 spring). The preliminary results suggest that one road mixture is more suitable than the other and will probably be selected for the experimental demonstrative plots. Regarding ecotrail mixtures, species behaviour was similar in the first year and perhaps a combination of the two mixtures will be used. The second year of evaluation is ongoing.

UEVORA selected the locations of the experimental demonstrative plots on roads (four on road N114, one on road N4 and two on road N18) and respective reference plots (two on road N114, one on road N4 and one on road N18). At the last report, the progress indicator of action C.6 "selected species" should not have been filled but, by mistake, it mentioned 50 species. This indicator concerns the species that will constitute the final composition of the mixture(s), and it will comprise between 10 and 50 species (fulfilling the indicator). The 50 species mentioned are those species that constitute the test mixtures in Herdade da Mitra from which the final mixture(s) species composition will be selected.

The experimental demonstrative plots for ecotrails mixture were integrated on different types of micro-reserves (six in Évora ecotrail and seven in Montemor-o-Novo ecotrail, one on the road N4 micro-reserve and two on powerlines poles) and are referred in their respective intervention plans. The initial detailed characterization of the experimental demonstrative plots was made on spring 2017 or 2018.

The greenhouse construction was finish at December of 2017 (Annex XX).

Action C.7 – Mitigation measures and potentiation of roads in Évora municipality – In progress

Foreseen start date: 01/04/2016 Actual start date: 01/10/2015
Foreseen end date: 30/06/2018 Actual end date: 31/12/2018

Municipal Road EM529

UEVORA analysed the amphibian and owl roadkill data and adjusted with CME the priority locations of the amphibian tunnels and barriers and owl walls (see A.1 final report)

Road adaptation began on November 2017 with vegetation cleaning and management, verge realignment and execution of foundations for amphibian barriers. Then, work continued with the installation of specific ACO amphibian tunnels and newly designed (by Municipality engineers) longitudinal barriers to guide them for new tunnels and existing culverts (Figure 11). In total, seven specific ACO tunnels and 666 m of barriers covering 9 passages (two existed culverts plus the seven new ACO tunnels) were installed at two locations (locations are in the end of the document presented in Annex XXII).

Figure 11. Installed ACO climate tunnel for amphibians (left) and longitudinal concrete barriers (right)

After full installation of tunnels and barriers, small adjustments (often cement transversal walls) were made in order to correct for uneven ground surface and better guide small animals for safe passages. Complementary work of, resurfacing, verge levelling, fence replacement when taken off or damaged during passage and barriers installation and signalling with LIFE placards was also done.

Amphibian (and other small fauna) conservation work ended in the final of April 2018 and the installation of the owls' wall is expected to take place until the end of September 2018. The delay in the installation of the wall was related with the necessity to find a solution, compromising the conservation goals with the robustness to support strong winds and a light weight to not exceed pressure on bridge that will support the structure.

Évora Ecotrail

During March 2017, UEVORA, in collaboration with CME, selected ten micro-reserves in Évora ecotrail, that summed up a total of 2.15 ha, and five reference plots (for the BACI procedure) totalizing 0.52 ha.

For monitoring purposes, in April 2017 UEVORA performed the native flora detailed cartography, in the selected Évora ecotrail areas (micro-reserve and invasive flora control), using surveying quadrats.

As requested by CME, and based on respective initial characterization, UEVORA defined the intervention plans for the Évora ecotrail micro-reserves (Annex XXIII). During February 2018, CME, with the support of the UEVORA, initiated the micro-reserves plantations (Annex XXIII). The shrubs used were provided by CME, MARCA and UEVORA. The remaining plantations and sowing will be made in the Autumn of 2018, because this is technically the appropriate season to do so.

Concerning exotic invasive plants, *Arundo donax* is the only well represented species in Évora ecotrail. Among the other five expected species, only three were detected and even those were poorly represented: small nuclei of *Acacia dealbata* and *Acacia* sp. on private land and of *Robinia pseudoacacia* in private land or on instable slopes difficult to access and to be intervened. Thus, as requested by CME, UEVORA compiled and selected improved methods, with basis on literature and other projects to control *Arundo donax* only (March 2017). To perform this, UEVORA and CME selected eight patches of *Arundo donax* with a total of 0.66 ha for improved methods and also four reference plots, totalizing 0.13 ha. CME made the first year of invasive plants control on all the plots and the subsequent plantations with native species was initiated.

Action C.8 – Mitigation measures and potentiation of roads in Montemor-o-Novo municipality - In progress

Foreseen start date: 01/08/2015	Actual start date: 01/08/2015
Foreseen end date: 30/06/2018	Actual end date: 31/12/2018

Municipal Road EM535

Most of the mitigation measures concerning fauna roadkills are already implemented since the end of March 2018. Only canvas barriers, which are already prepared, need to be installed.
Different types of materials and designs were used (ACO amphibian tunnels, concrete culverts, concrete barriers, canvas barriers, etc.) in order to test for the more efficient solution, as proposed in the original application. In total, 4.300 m of newly designed (in cooperation with CME) concrete barriers, two ACO tunnels and two new concrete tunnels were installed (Annex

XXIV). Additionally, two concrete dry ledges, for small fauna, not predicted in the proposal were built in a culvert that is often flooded. About 980 meters of canvas barriers are predicted to be installed in Autumn 2018 with the help of volunteers in the framework of action E.10. The delay in this installation is due the excessive waterlogging of soil associated with the unusually high rainfall in the spring 2018. Despite the help of volunteers, it may be necessary to allocate additional human resources from CMMN or consider their implementation through external assistance. Thus, it may be necessary transfer part of the funds associated with infrastructure costs, to the external assistance. The human resources of CMMN and equipment are increasingly reduced, and therefore there are difficulties in securing works. The external adjudication of these works may allow a better compatibility of the work to be carried out in the intervention plots.
Regarding the new practices of vegetation management on verges under the new biomass fuel management rules it has not yet been possible to move forward but first works are still scheduled for this year. UEVORA and CMMN have regular meetings and talks about this issue, including, more recently, about the best way to make compatible the conservation needs (minimize the impact of the current management practices small fauna) and the new legislation (DL20/2018, 14 February) about fire prevention. However, to maximize results, CMMN has been increasing the awareness, involvement and training of fuel management personnel, as well as about the control of exotic invasive species. For this, employees have been given specific training (Annex XXV).

Montemor-o-Novo Ecotrail

The selection of the invasive plant control plots was finish by CMMN, with the collaboration of UEVORA and MARCA.
Twenty-two patches totalizing 0.84 ha were selected to control the four woody invasive species present in the CMMN ecotrail. This area is smaller than that foreseen in the project (3.2 ha), since not all invasive plots were selected for intervention. In fact, some plots are located on high step slopes, difficult to access. Others extend to private property. Due to available resources and for security reasons, it was decided not to intervene on these places. UEVORA made the baseline characterization of the selected invasive plants plots.
Control of exotics will be made, through individual manual removal (mostly for young plants), repeated cutting followed by detailed individual chemical control, perforation and chemical injection inside the trunk and, for *Acacia* sp., individual debarking including, whenever possible, trunk scraping. Some of these techniques were learned in the Seminar "Municipalities and Invasive Plants Management" organized by LIFE Biodiscoveries, in which CMMN has participated.
At this moment, the tender procedure to contract firms to perform specialized tasks for invasive plant control (other than cutting) is being prepared. However, it is being difficult to get indicative budgets because most firms are poorly interested in doing these detailed tasks, particularly when there is a sharp increase in market demand for vegetation control work, to fulfil the new legislation concerning fire prevention (DL 10/2018 de 14 de Fevereiro).
Despite this, in the smallest patches, the work, supervised by MARCA, has already started, in the framework of action E.10. With the help of volunteers, it was possible to remove a small core of reeds at the ecotrail, and planting *Pistacia lentiscus*. Annex XXVI provides a photographic record of the works.

To promote the habitat for the target small mammals and butterflies UEVORA, with the support of CMMN, selected ten micro-reserves (four more than predicted in the proposal) with a total area of 1.582 ha and six areas to act as control (monitored but not intervened) of 0.14

ha. The characterization of the vegetation, butterflies and small mammals was done by UEVORA during the spring of 2017 and 2018. As requested by CMMN, UEVORA prepared the intervention plans for Montemor-o-Novo ecotrail micro-reserves based on A.1 characterization (Annex XXVII). At the intervened flora patches, we intend to use five plant endemisms (more three than foreseen), three Iberian, namely *Digitalis thapsi, Ferula communis* and *Linaria amethystea* subsp. *amethystea*, and two Lusitanian, *Ulex australis* subsp. *welwitschianus* and *Adenocarpus anisochilus*. We will also proceed with planting of *Calicotome villosa*, which although not endemic has a restricted distribution in Portugal. With all of this, it is hoped to boost habitat of 10 butterflies (seven more than planned in the application) and two small mammals species. The planting and sowing are expected to occur next fall/winter during the second edition of a volunteer program of action E.10.

It is estimated that, to safeguard the objectives of the action, the planned work on exotic control and habitat enhancement at edges of ecotrail will be completed by the end of 2018, six months behind schedule in order to be accomplished in the most appropriate time of the year. Nevertheless, two springs will be still available for monitoring purpose.

Action C.9 – Operations in plant nursery to the conservation actions - <u>In progress</u>

Foreseen start date: 01/01/2017 Actual start date: 01/01/2017
Foreseen end date: 30/09/2020 Actual end date: 30/09/2020

The nursery is fully operational, and several works are involved in the production and maintenance of plants and space care. Since the beginning of the project, at least 3.000 plants (trees and shrubs) of 70 different native species have been produced. About 8.559 seeds were sown, of which 2.394 of 56 different species are germinating. (Annex XXVIII).

According with UEVORA agreement, we have already produced for most species the quantity needed for actions C. From the trees we are producing seeds of *Celtis australis, Crataegus monogyna, Fraxinus angustifolia, Phillyrea angustifolia, Pistacio lentiscos, Prunus spinose, Pyrus bourgeana, Quercus faginea, Quercus pyrenaica, Rhamnus alaternus,* and *Viburnum tinus*. From the shrubs we are producing seeds of *Arbutus unedo, Cistus albidus, Cistus crispus, Cistus populifolius, Cistus psilosepalus, Cistus psilosepalus, Cistus salviifolius, Cynara humilis, Cytisus arboreus* subsp. *baeticus, Ferula communis, Lavandula pedunculata, Lavandula stoechas, Lavandula stoechas subsp. luisieri, Lavandula stoechas subsp. stoechas, Lonicera implexa, Myrtus communis, Osyris lanceolata, Rosa canina, Rosmarinus officinalis, Ruscus aculeatus, Ruta angustifolia, Smilax aspera, Stachys germanica , Ulex australis welwitshianus,* and *Urginea maritima*.

In addition, we are also producing bulbs of 5 species, such as *Gynandriris sisyrinchium, Gladiolus italicum, Gladiolus illyricus, Muscari comosum* and *Scilla monophyllos* and seeds of 19 herbaceous species, including *Aegilops geniculata, Aegilops triuncialis, Brachipodium dystachion, Brachipodium sylvaticum, Briza maxima, Briza minor, Campanula lusitanica, Cynosurus equinatus, Petrorhagia nauntelii, Silene colorata, Silene gallica, Silene scabriflora, Trifolium arvense, Trifolium campestre, Trifolium stelattum*, among others. So far, some herbaceous species have not yet germinated, most likely because they are dormant.

Annex XXIX shows some photos of the nursery with the pot species and the plots for seed collection.

Action C.10 – Promotion of "islands" of Biodiversity along power lines - <u>In progress</u>

Foreseen start date: 01/07/2016 Actual start date: 01/07/2016
Foreseen end date: 31/12/2018 Actual end date: 31/12/2018

In the scope of C.10 action, prior to the promotion of biodiversity "islands" along powerlines paths, we sampled small mammals, carnivores, butterflies and vegetation on the base of 20 very high voltage powerlines poles (see final report of Action A.1).

Intervention on poles included:

1) A group of 15 poles with five experimental sets of three poles each (one with no intervention, for control; another only fenced to avoid livestock grazing; and another fenced and with active intervention including plantation and sown of several native species of grasses and shrubs).

2) A set of 5 sequential poles linking, as stepping stones, the borders of two Mediterranean forest patches. These were fenced, plowed, shrubs produced in the Project were planted and herbaceous were sown.

Based on baseline characterization, UEVORA defined the vegetation intervention plan for the high voltage power lines poles and the planned planting and sowing were made at December 2017 (Annex XXX). As some trees dried up, in the early spring of 2018, some species were replanted. If necessary, some bulbs and shrubs will be replanted in autumn 2018.
As predicted in the intervention plan, two of the sequential poles were sowed with ecotrail seed mixture developed in action C6; UEVORA developed also a seed mixture appropriated for power line poles (Annex XXX), with shrubs, that was sown in five poles and in ex situ plots at Herdade da Mitra.

Each powerline pole base has about 48 m^2. Thus, in total, an area of 720 m^2 (including all the fenced bases of poles) are expected to act as biodiversity islands and stepping stones for flora and small fauna.

This action has begun on the predicted date and going to finish in the predicted date. However, the first months were spent in talks with REN (operator of these powerlines) aiming to sign a protocol of collaboration and to have their support on getting landowners authorization for the interventions. A protocol of Collaboration was signed with REN in the framework of this action in December 2017 (Annex XI). Plantation, seeding and fences were already installed. Monitoring of vegetation started in spring 2018 and replacement/reinforcement of dead vegetation will be done in the Fall 2018. After this, two monitoring seasons will be done.

Action D.1 – Monitoring / evaluation of socio-economic effects of the project - In progress

Foreseen start date: 01/08/2015 Actual start date: 01/08/2015
Foreseen end date: 31/07/2020 Actual end date: 31/07/2020

The results of this action are the result of the approved list by CTAG in the beginning of 2017. This list (Annex XXXI) pretends to demonstrate the local and social economic impact of the project. The results presented are since the beginning of the project (August 2017) which perform 11 updates until now corresponding to 11 semesters. The results are presented in Annex XXXII. There are items related with the improvement of infrastructures, local businesses dynamics and creation of employment (economic) and others related to training (capacity building), synergies and leverage (social).
The more relevant (and with consistent data) are the Money spent with local companies, Number of local contracted companies, Money spent in missions in the intervention area and Number of volunteers involved in activities. Figures 12 and 13 show the money spent and number of local companies contracted, quarterly.

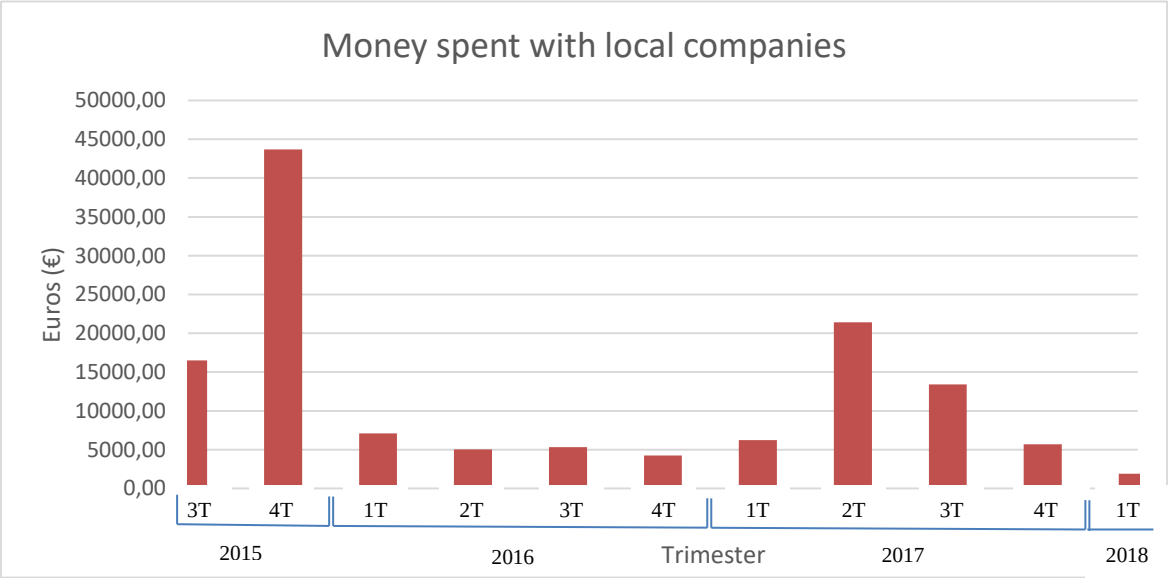

Figure 12. Money spent with local companies by trimester

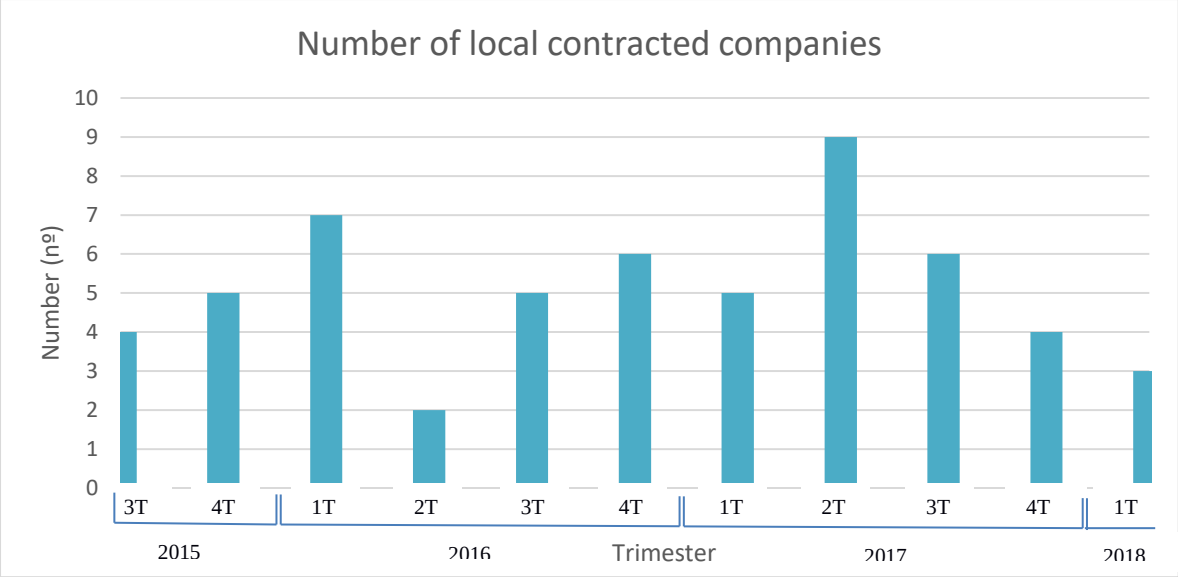

Figure 13. Number of local contracted companies by trimester

Both figures show a higher value in the beginning of the project and in the 3rd trimester of 2017 when most of the conservation actions started to be installed. A total of 130424,37 € were spent in 56 different companies.

Figure 14 shows a higher amount of money spent in mission's in 2016 which are certainly correlated with the work associated with action A.1 – Completing and updating of baseline characterization. The total amount spent until April 2018 was 42617,66 €.

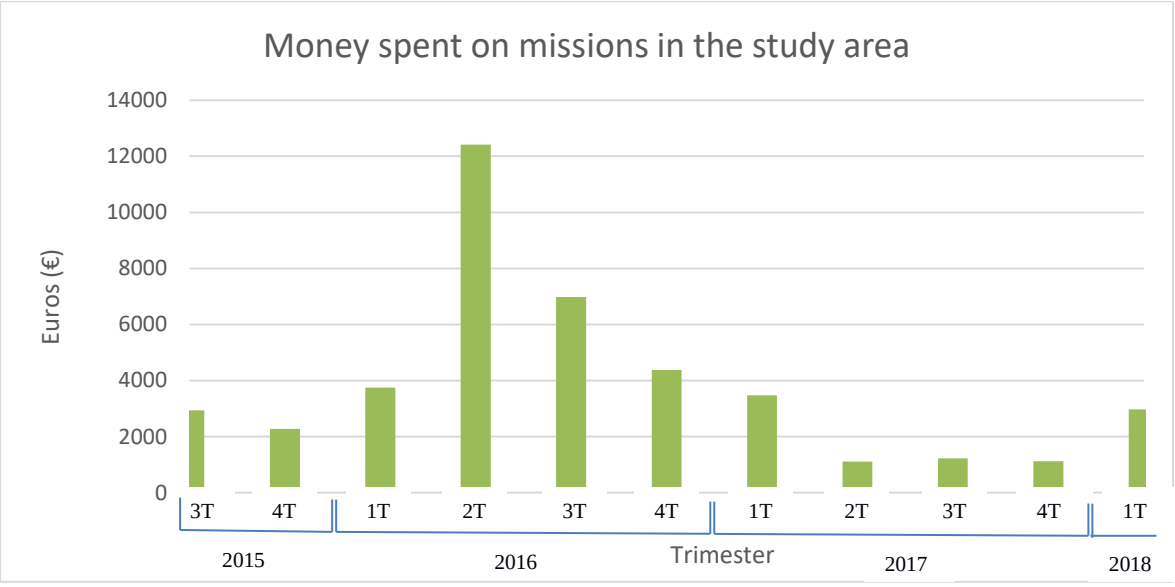

Figure 14. Money spent on missions in the study area.

Figure 15 shows a higher number of volunteers in the 2nd trimester of 2017 and in the 1st trimester of 2018, both related with activities of different partners mostly concerning control of invasive species and environmental awareness. Until now, the total number of volunteers involved in the project is 831.

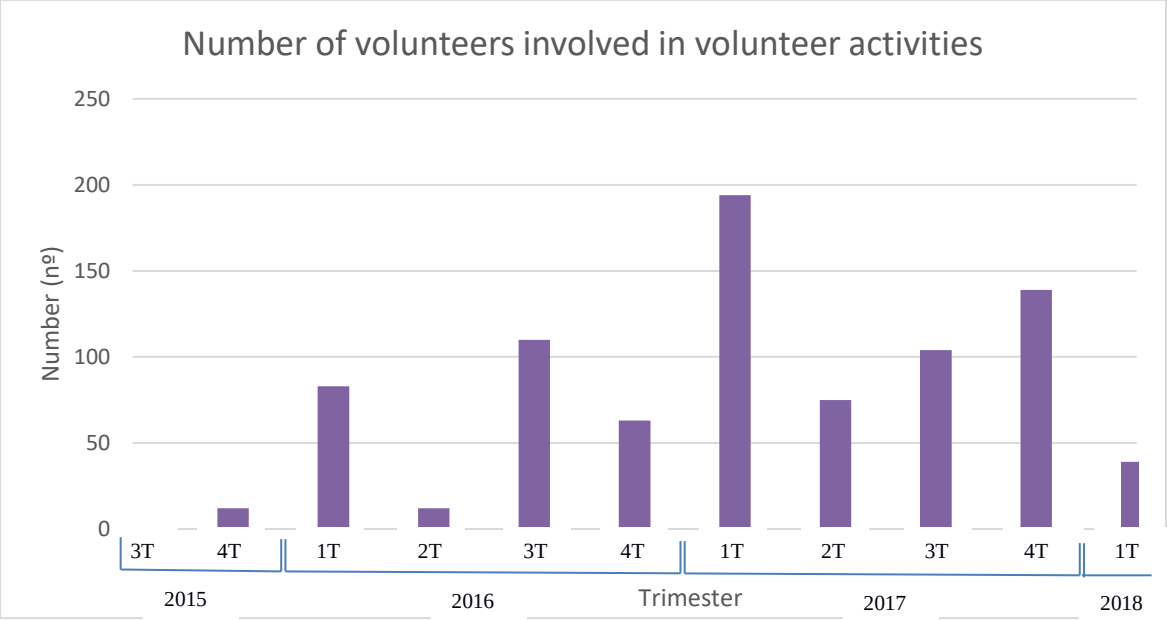

Figure 15. Number of volunteers involved in volunteer actions.

Regarding indicators of social networks, Figure 16 shows a peak of interactions (likes and views) in the beginning of 2017 related with the launch of the third video of the project about "Volunteering in nature" and then in the end of 2017 and beginning of 2018 related with the news about the works in the municipal roads, particularly the installation of amphibians' tunnels and barriers.

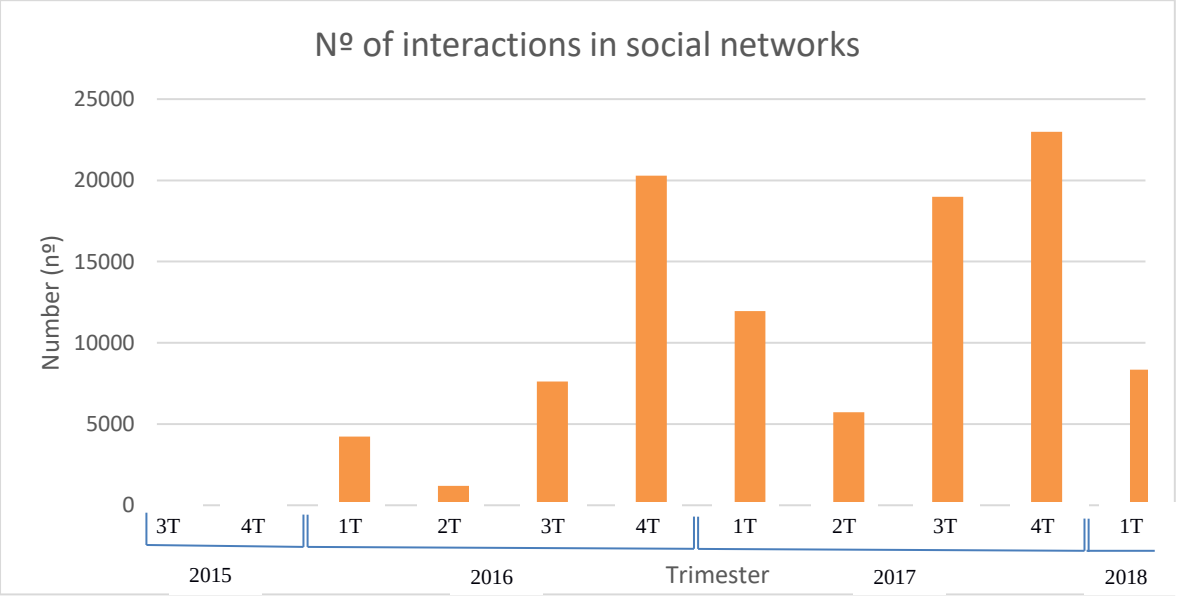

Figure 16. Nº of interactions in social networks. Data by Facebook of UEVORA and MARCA-ADL

There are 28 presentations and talks in seminars, workshops, etc. made by several team members from all the beneficiaries and 118 awareness/training actions. Other results are presented in Annex XXXII.

Action D.3 – Monitoring / evaluation of the effects / impacts of conservation measures – Started

Foreseen start date: 01/07/2016 Actual start date: 01/07/2016
Foreseen end date: 31/07/2020 Actual end date: 31/07/2020

This action started on the predicted date. However, because the finishing of many conservation actions is delayed, the monitoring at this initial stage, only included:

The effects of the mowing of the verges, which is being executed since 2015/2016 on roadkills that have been monitored by IP, on a weekly basis, on the main roads of the project. The data was validated and integrated on Roadkill (Action A.2). On June 2017, IP enlarged the monitoring to other road stretches located in the project Intervention Area in order to increase and complement the data.

- Daily roadkills monitoring (all year) on N4, N114 and N18 since October 2017 (UEVORA)
- Daily monitoring of dry ledges uses with camera trapping, since October 2017. Figure 17 shows preliminary results for culvert use after dry ledges have been built. Note the higher use of dry ledges, comparing with floor, for almost all species except the badger *(Meles meles*), the wildboar (*Sus scrofa*) and the dog (*Canis lupus familiaries*).
- Monitoring Genet movements in the vicinity of culverts with dry ledges and/or new fences with GPS tracking.
- Evaluation of the performance and sustainability of the *ex-situ* plots biodiverse herbaceous seed mixtures (action C.6) through assessment of species frequency, abundance, and biomass production. UEVORA initiated in spring 2017 and evaluation is being repeated once a year, in the spring of 2018. The preliminary results are reported in action C.6.
- Monitoring vegetation surveys for the high voltage power line poles (action C.10) and for the invasive plants plots intervened in Action C.7 are done once a year in spring (spring 2018 is now being done).
- Monitoring of the development of planted shrubs in Évora ecotrail micro-reserves (C.7) initiated (spring 2018)

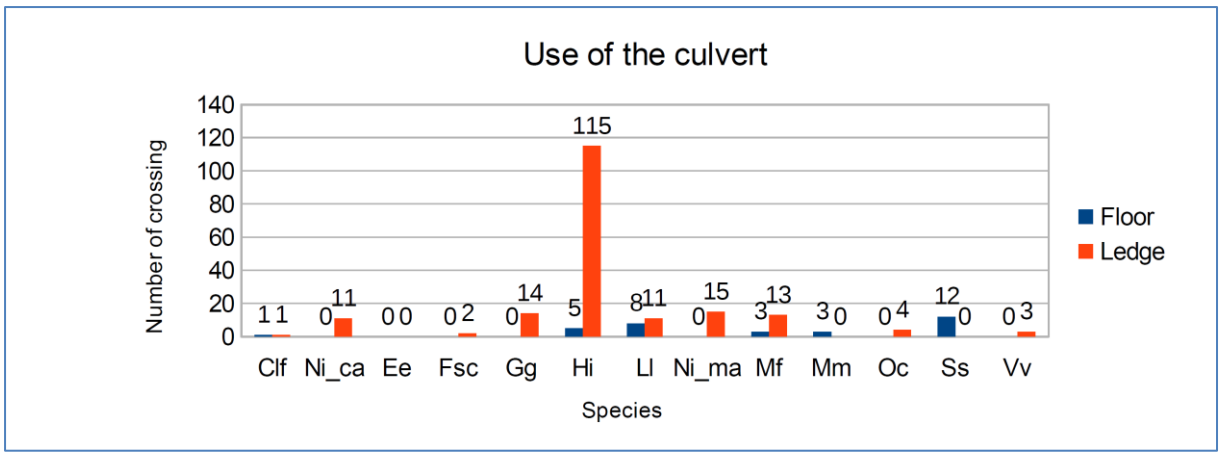

Figura 17. Comparison of culvert spatial use (floor and ledge) according the species. Species: Clf – *Canis lupus familiaris*, Ni_ca – non-identified carnivores, Ee – *Erinaceus europaeus*, Fsc – *Felis catus silvestris*, Gg – *Genetta genetta*, Hi – *Herpestes ichneumon*, Ll – *Lutra lutra*, Ni_ma – non-identified mammal, Mf – *Martes foina*, Mm – *Meles meles*, Oc – *Oryctolagus cuniculus*, Ss – *Sus scrofa*, and Vv – *Vulpes vulpes* (adapted from Constantino, Erasmus Report in preparation)

Other monitoring of the effects/impacts of the project will begin after each conservation task is completed.

The effects of improved techniques on verge management on small mammals, butterflies and the success of invasive plant control will be evaluated through surveys done on Spring of 2019 and 2020.

Action E.1 – Communication Plan- Project website - <u>In progress</u>

Foreseen start date: 01/08/2015 Actual start date: 01/08/2015
Foreseen end date: 31/07/2020 Actual end date: 31/07/2020

The LIFE LINES website is online in both English and Portuguese languages (https://lifelines.uevora.pt) since October 2015. Since then, changes to the page design have been made taking into account the visitors/viewers feedback. Overall the LIFE LINES webpage, till now, have been updated 100 times and has an average number of 211 visitors / month, from 65 different countries. The page views achieve 23.345 from 5.909 visitors.
Additionally, since February 2016, a Facebook account was created, where promotion and dissemination of the project is also made through this platform. The web page also includes a link to the LIFE LINES Facebook account. Figure 18 shows the page views and the number of users by semester. There is a peak of viewers at the beginning of the project and other in the first trimester of 2018.

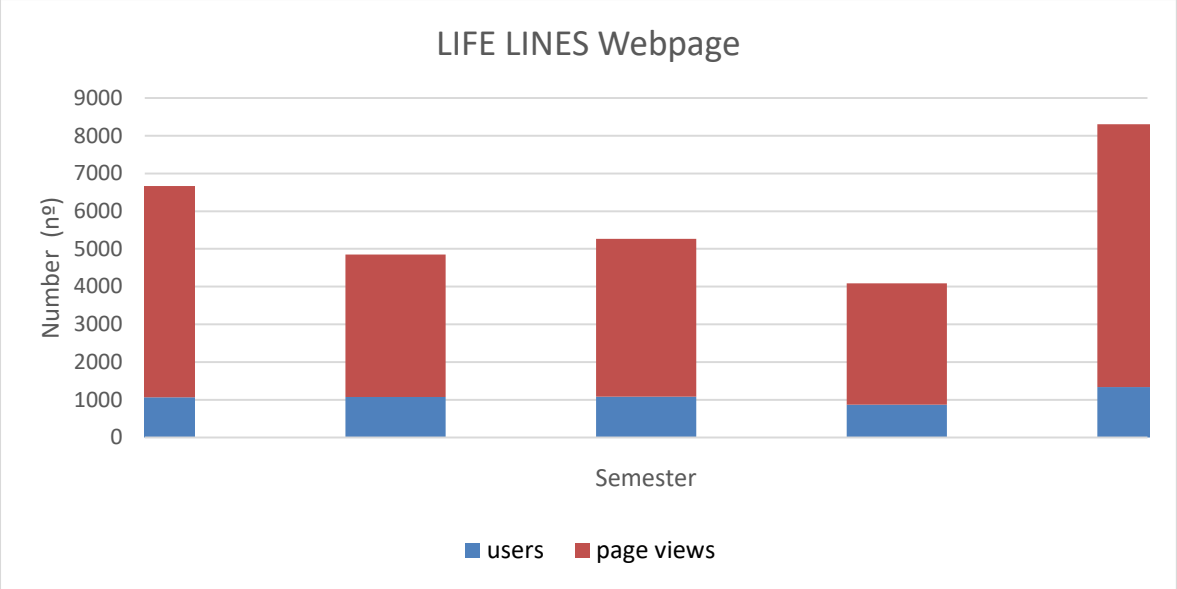

Figure 18. Users and page views of LIFE LINES webpage. Data by UEVORA

Action E.2 – Communication Plan - Outdoors in the intervention areas - <u>In progress</u>

Foreseen start date: 01/10/2015 Actual start date: 01/10/2015
Foreseen end date: 31/07/2020 Actual end date: 31/07/2020

Until now, 18 outdoors of medium size were installed in the intervention area. The location and contents of these are:

Action	Position	Contents
A.4	38°35'21.78"N 8°0'16.07"W	Electronic prototypes to avoid owls and small mammals near the roads
A.4	38°41'30.22"N 8°5'30.58"W	Electronic prototypes to avoid small mammals near the roads
A.4	38°31'48.56"N 8°0'33.83"W	Electronic prototypes to avoid large birds near the roads
C.1	38°37'47.45"N 8°6'54.82"W	Fauna passages in culverts
C.1	38°37'8.61"N 8°5'13.06"W	Fauna passages in culverts
C.1	38°40'30.76"N 8°8'26.43"W	Implementation of nets covering the slopes to avoid rabbits
C.2	38°42'8.67"N 8°3'35.81"W	Implementation of a strawberry tree barrier to elevate owl's flight
C.2	38°42'0.70"N 8°3'56.91"W	Implementation of micro-reserves
C.6	38°31'36.37"N 8°1'2.67"W	Rehabilitation of Greenhouse
C.6	38°38'2.41"N 8°11'32.65"W	Plant nursery
C.6	38°31'31.91"N 8°0'57.97"W	Experimental field
C.7	38°38'31.32"N 8°0'3.10"W	road barrier effect and passages for small fauna
C.7	38°40'40.15"N 8°2'31.16"W	road barrier effect and passages for small fauna

C.8	38°32'31.35"N 8°10'24.16"W	road barrier effect and passages for small fauna
C.8	38°30'58.15"N 8°15'6.81"W	road barrier effect and passages for small fauna
C.8	38°30'28.66"N 8°18'25.71"W	road barrier effect and passages for small fauna
C.8	38°38'46.93"N 8°13'19.70"W	Implementation of micro-reserves (stepping stones)
C.10	38°28'13.40"N 8°6'30.66"W	Electronic prototypes to avoid owls and small mammals near the roads

The design and contents of the outdoors were developed by the members of CTAG and maintain common image graphics (Annex XXXIII).

Action E.3 – Communication Plan – Public disclosure sessions and contacts with the media - In progress

Foreseen start date: 01/08/2015 Actual start date: 01/08/2015
Foreseen end date: 31/07/2020 Actual end date: 31/07/2020

Since the first report, a high effort has been made to put the LIFE LINES in national and local media. A Communication Plan produced with the help of a professional Communication Agency was approved by CTAG in 18th of November 2016 (Annex XXXIV). It includes a communication strategy and graphic guidelines standards aiming a better and uniform image for LIFE LINES promotion and dissemination. At the same meeting, a LIFE LINES Communication Committee (integrating the project manager and specialized communication technicians from IP and UA) has been approved. Nevertheless, we recognize that some indicators (including the number of press conferences and radio spots, see Action E.4) may have been overestimated in the initial proposal.

A sharp increase in the number of news have been reached along the last year. This is mostly related with the debate at the National Parliament of three initiatives, from different parties, aiming to produce legislation to monitor and reduce roadkills at a national level. All the news about this subject make reference to LIFE LINES project.

Meanwhile, important outputs have been produced, from which we highlight: (1) a piece in a private TV channel (TVI) regarding roadkills and the project LIFE LINES (2016); (2) a 25 minutes television documentary, included in the "Biosfera" series that was dedicated to the impacts of linear infrastructures on biodiversity that was mostly based on the LIFE LINES project (it was broadcasted on National Television Network - RTP2 on April 2017); (3) a short radio program of the series "90 segundos de ciência" (90 seconds of science) that was broadcasted on National Radio (Antena 1) on July 2017 and was entirely dedicated to the LIFE LINES; (4) a short radio program of the series "Minuto verde" (Green minute) that was broadcasted on National TV (RTP1). In 2018 a piece in National TV (RTP regiões) regarding fauna passages and an interview in a local radio (Radio Nova Antena) were broadcast (Annex XXXV).

Action E.4 – Communication Plan – Complementary works and materials - <u>In progress</u>

Foreseen start date: 01/08/2015 Actual start date: 01/08/2015
Foreseen end date: 31/07/2020 Actual end date: 31/07/2020

Until the reporting date, eight teasers (videos for social networks and webpage of the project) and seven thematic videos (interviews with simple editing to be available to the media whenever necessary) were produced (Figure 19).

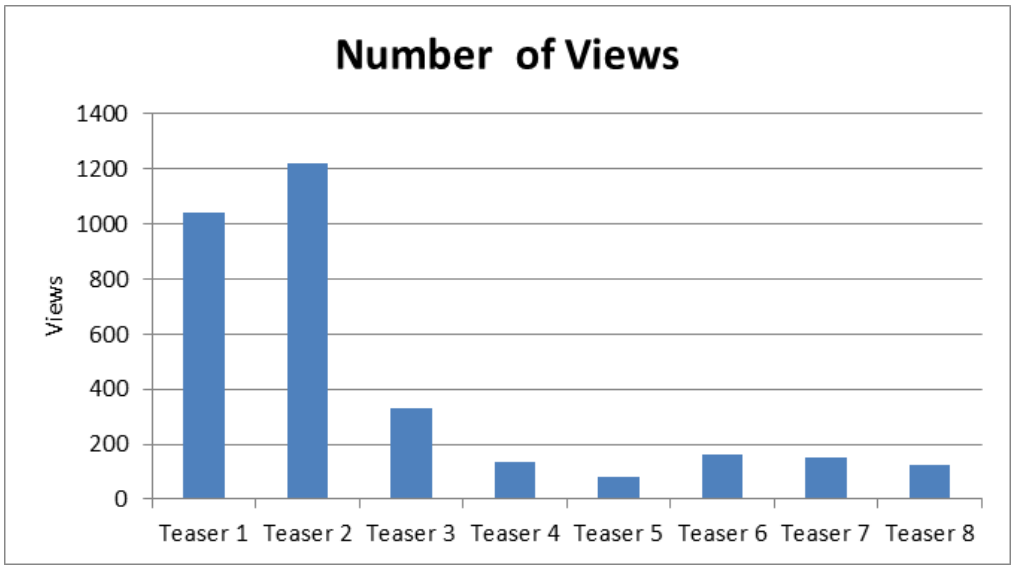

Figure 19. Number of views per teaser

These teasers are trying to show the different components of LIFE LINES project, since the most viewed like the one dedicated to Green infrastructure (Teaser 2) and project presentation (Teaser 1) until some more technical like Remote Detection (Teaser 6) or Biodiverse Mixtures (Teaser 4). The less viewed are related to a practical class in Biodiversity (Teaser 5). Teasers 7 and 8 are quite recent so the views are normally above the expected.

The full list is available in the project webpage (https://lifelines.uevora.pt/index.php/galeria/videos/) with English subtitles and in the Anexx XXXVI:

Teaser 1 – Project presentation
Teaser 2 - Green infrastructure
Teaser 3 – Volunteering for Nature
Teaser 4 – Biodiverse Mixtures
Teaser 5 – A practical class in Biodiversity
Teaser 6 – Remote Detection
Teaser 7 – Spying to help Nature – Carnivores
Teaser 8 – Spying to help Nature - Owls

In the original project proposal the production of ten spots of radio were suggested in the project indicators, for which was allocated a 1.624 € budget. This value is too small and corresponds, on average, to the value of producing and broadcasting one radio spot. This issue was broadly discussed in the CTAG, where it was concluded that a technical misword happened in the original application where "radio spot" meant indistinctly true radio spots and radio news. Nevertheless, as was previously agreed a radio spot regarding the promotion on the app to be developed in action C.4 and to broadcast as widely as possible, will be produced, and for which was allocated a 1.624 € budget. Moreover, we propose that the project should aim to achieve at least more seven radio events (including news, spots, and specialized information programs such as "90 minutos de Ciência" – see Action E.3) to fulfil the project indicators, changing the original "10 radio spots" to "10 radio events".

Action E.5 – Awareness and involvement of the academic community in collecting information / data - <u>In progress</u>

Foreseen start date: 01/08/2016 Actual start date: 01/08/2016
Foreseen end date: 31/07/2020 Actual end date: 31/07/2020

Until May 2018, two Master Thesis done in the framework or with the support of LIFE LINES were finished: (1) "Factors influencing the use of road-crossing culverts by carnivores" by João Craveiro and (2) "Road and landscape fragmentation effects on tawny owls: density, population trend, and intra-and inter-year territory occupancy" by Shirley van der Horst (Annex XXXVII; Annex XXXVIII). A PhD and another Master thesis are ongoing. Awareness for the project and app has already begun with room and field classes for students at the University of Évora and University of Lisboa in order to get volunteers for the project. A summer course co-organized with CEBE (Council of Biology Students of University of Évora) took place between 7 and 11 of July 2017 (Annex XXXIX).

Action E.6 - Training / dissemination among stakeholders – <u>Started</u>

Foreseen start date: 01/01/2018 Actual start date: 01/01/2018
Foreseen end date: 31/07/2020 Anticipated end date: 31/07/2020

This action starts in January 2018 with the preparation of the 1st workshop with the stake holders. In this case we are preparing a workshop to guards of Guarda National Republicana (GNR) that are responsible by surveillance in all the roads in the country and collect the data of incidents caused by animals in the roads. This workshop pretends to train the elements of the GNR to identify correctly the road kill fauna.

Complementary, IP teams that monitor the road kills and insert the data in the IP's GIS are being trained (Figure 20). IP monitoring program and database have a national ambit, so all the road inspectors received this training to guarantee the best performance.

Figure 20. Fauna Monitoring Training Session

All the materials and program for the workshops and Good Practice Guides are now being prepared.

Action E.7 – Networking with other LIFE and non-LIFE projects - <u>In progress</u>

Foreseen start date: 01/04/2016	Actual start date: 01/02/2016
Foreseen end date: 31/03/2020	Actual end date: 31/03/2020

On February 2016 part of the team of the LIFE LINES project conducted a field trip to Toledo, Spain, to visit and networking with the "LIFE Impacto Cero" project (Development and demonstration of an anti-bird strike tubular screen for High Speed Rail lines - LIFE12 BIO/ES/0000660). Two different visits (MARCA and UEVORA) were made to Bussaco (BRIGHT - Bussaco´s Recovery from Invasions Generating Habitat Threats - LIFE10 NAT/PT/0000759) in the framework of invasive plants control actions. Strong networking took place also when the LIFE LINES team was invited to present the project in events organized by several LIFE and non-LIFE projects: (1) Seminar "Ways to Green Infrastructure Today and Tomorrow" (poster) - organized the LIFE ZARAGOZA NATURAL - Creación, gestión y promoción de la Infraestructura Verde de Zaragoza - LIFE12 ENV/ES/000567" (Zaragoza, October 2016); (2) "1st Ibero-American Congress on Biodiversity and Road Infrastructure" (oral talk), organized by Centro Brasileiro de Ecologia de Estradas (Lavras – Brasil, November 2016) (with no costs for the LIFE LINES project); (3) Seminar "INTER LIFE PT 2016" (oral talk) organized by LIFE14 CAP/PT/000004 (Luso, Novembro 2016); (4) II International Congress Education, Environment and Development (oral talk) (5) Workshop "Formation/Capacitation to support of call proposals" (oral talk) , organized by LIFE14 CAP/PT/000004 (Évora, April 2017).

Moreover the coordinator of the project attended 5th IENE International Conference on Ecology and Transportation in Lyon in August 2016, where the intention to organize the 7th IENE International Conference in 2020 in Évora in the LIFE LINES framework was presented to the IENE Steering Committee. Two members of the team attended the "CEDR research Workshop on Roads and Wildlife Workshop" organized by Conference of European Directors of Roads (Cologne, November 2016) and the Railways Ecology Symposium organized by Cátedra

REFER (Lisbon, December 2017); MARCA ADL participated in XIV congress of environmental psychology, at University of Évora (June 2017) (Annex XL). Two researchers from UEVORA participated in the *Jornadas Internacionales Especies Exóticas Invasoras* at 20 and 21 March 2018 in Cáceres (Spain) to get acquainted with new invasive control techniques and with other researcher's practical experience gathered in the framework of other conservation projects.

Action E.8 – Volunteer Program for young people - <u>In progress</u>

Foreseen start date: 01/04/2016	Actual start date: 01/10/2015
Foreseen end date: 31/07/2020	Actual end date: 31/07/2020

Until the date, about 20 activities have been developed with medium and large groups and others with occasional collaboration of young volunteers or small groups. In total, approximately 461 participants were involved, corresponding to an average of 23 participants per activity. The total of participants (831) includes the 461 from this action and the rest are from the activities of the two municipalities (CME and CMMN) in control of invasive species in Ecotrails and from the E.10 activities by CMMN. (Annex XLI)
In November 2016, IP organized an institutional volunteer event, "Apanha da Bolota", (Annex XXXIX) with 35 participants. Between April and July 2017, IP in cooperation with MARCA elaborated the terms of reference needed to acquire external assistance to implement three Institutional volunteer events in 2017. These 3 events have occurred with 41, 45 and 47 participants, concerning "Sowing seeds", "Controlling invasive species" and "Planting shrubs". There is some delay concerning the number of already executed events, due to IP's constrains in contracting this type of services. IP expects to compensate this delay during the next two years increasing the number of events per year or/and increasing the number of participants.
In May 2017, CME organized the first volunteer action in Ecotrail of Évora involving local students to help the control of exotic invasive flora. Tasks include the cutting of reeds in both sides of the Ecotrail and remove the garbage. This action was published in the regional newspaper "Diário do Sul"of 2nd May 2017 (Annex XXXV).
After August 2017, several volunteer activities were carried out, which were related to sowing, cutting, transplanting and seeds collection of native flora species. These activities, organized by CMMN and Marca ADL had the participation of several local organizations: Associação Porta Mágica, Casa João Cidade and Oficinas do Convento. Other Portuguese entities, involved in LIFE17 ESC/PT/00003 LIFE VOLUNTEER ESCAPES have also participated in these activities, as volunteers. In these activities it was also involved some volunteers from different countries, during the International Work camps, and also during the activities developed by the volunteers of European Voluntary Service (EVS) and European Solidarity Corps (ESC)
In summary, 11 associations, 2 municipalities and 8 institutions and companies were involved in this activity. It should be noted that several activities of invasive species control have been carried out, using appropriate methods, mainly in Montemor-o-Novo deactivated railway (Ecopista do Montado). Additionally, planting a strawberry tree's curtain, in partnership with IP, took place in February 2018 in a micro-reserve near N4.
A questionnaire was given to most of the project volunteers to evaluate the impact of the project and their level of satisfaction. More than **80% were satisfied or very satisfied** with the **participation** in the activities; More than **70% are willing to participate in voluntary**

environmental activities in the future; More than **80% of participants** consider that they have acquired **new knowledge** related to project issues.

For the year 2018, it was developed an activity plan targeting different types of voluntary groups (young, associative and cooperative) (Annex XLII).

Action E.9 – Technical seminars to present the developments and results of the project - In progress

Foreseen start date: 01/06/2016 Actual start date: 01/06/2016
Foreseen end date: 30/06/2020 Actual end date: 30/06/2020

Until now, we have organized two LIFE LINES project seminars, one in 2nd June 2016 and another in 8nd May 2018. The first took take place at auditorium of PCTA in Évora and was attended by 102 people from different entities. The second one was at Auditorium of Colégio do Espirito Santo at the University of Évora and was attended by 45 people. Meanwhile, we organized another seminar entitled "25 years of LIFE program in South of Portugal" that was held on 26th May 2017 in the framework of the 25 years Celebrations of LIFE program. It included eight oral presentations about LIFE projects recently finished or ongoing in southern Portugal and was attended by 65 people. The information about the seminars are in Annex XLIII.

The official intention to organize the 2020 IENE International Conference in Évora was already send to the IENE Steering Committee. This proposal was welcomed and we are waiting for the response.

Action E.10 – "Adopt a road", environmental educational / awareness program with local schools - In progress

Foreseen start date: 01/08/2015 Actual start date: 01/09/2015
Foreseen end date: 30/07/2020 Actual end date: 30/07/2020

The action began a month later than expected.
The work foreseen in this action involves two tasks whose situation is described below:

1. Holiday camps and awareness actions at NIA - Environmental Interpretation Center

Two camps (in holidays of 2016 and 2017) were carried out in NIA, involving three thematic issued related to the Project, and biodiversity conservation (Annex XLIV). These actions involved 22 youngers with age between 15 and 21 years. The third camp, scheduled for April 2018, has been postponed, due to bad weather and NIA rehabilitation work. It will take place after conclusion of NIA rehabilitation that is currently underway and the launch of mobile application (C.4). This postponement does not compromise the execution of four editions foreseen in candidature until the end of the project (2019 and 2020).
The rehabilitation work planned to adapt NIA to the objectives of this action (improvement of windows, pavement, painting, creation of kitchen space) are being finalized. These are

fundamental to receive in a proper way the participants in the activities to develop in the next years of the project and in the post-project (Annex XLIV).

2. Definition and implementation of "Adopt a road" program

This task began in September 2015, involving several working meetings between CMMN and UEVORA technicians to define the action plan (Annex XLV), which included actions aimed at schools, university students, youth groups through the Youth Center of Montemor-o-Novo and general population. In these actions, it was sought to arouse the interest of target public to the project environmental problematic and to promote a better knowledge on biodiversity, divulging and encouraging the use of mobile application developed in action C.4.
At the school level, in the 2016/2017 school year, two groups of students (42) from 10th and 11th grade were involved. A 60 minutes session was held for each group, addressing the project environmental problem, and a visit to University of Évora with specialist in fauna, aiming biodiversity observation. One of the classes developed a research work focusing on road security and prevention of wildlife mortality (13 sessions), which resulted in a teaser including a song with music and lyrics written by the students. Also an environmental education activity was done directed at 42 children of primary school were they had to draw a road sign referring to the roadkill problem (Annex XLVI).
In 2017/2018 school year, four project sessions were conducted for schools in Montemor-o-Novo county, involving a one-day session with several classes of EB 1, two outdoor sessions of 45 min in EB 2,3 of S. João de Deus and a 90 min session at ecotrail. About 327 students, aged between 8 and 13, participated in the study. Also, several native trees were planted at their respective schools (1st and 2nd cycle) and they participate at a peddy paper at ecotrail about the topics of the project (2nd cycle).
A volunteer program (Annex XLVII) with young people from the Youth Center of Montemor-o-Novo took place between January and April 2018. Seven people, aged between 16 and 32 years, were involved in a continuous way and participated in 11 sessions of five hours each. The program included classroom training and awareness about the project: three sessions of invasive exotic species control and plantations at micro-reserves areas to be created in action C.8; three sessions of observation and identification of wild fauna, including camera trapping and a visit to the EM535 road mitigation measures; three sessions of accompaniment of environmental education actions directed to children and adults, including production of a video and thematic contents; one nocturnal session of amphibian monitoring at municipal road EM535.
In the coming months of the project, it is hoped to promote the "adoption of road sectors" by youth groups, using the mobile application for registration of fauna mortality (C.4).
In addition, actions aimed at general population were carried out, including: a memory game with the most affected fauna species in the project area and a workshop on "animals in recycled paper", in framework of the "Children's Day " celebration attended by about 600/700 children and their families (June 2016 and June 2018) (Annex XLVI); a night out with 20 participants for wildlife observation at ecotrail (March 2017); a walk on montado with a LIFE LINES photographic marathon with nine participants, integrated in the Week of Acorn - an activity carried out in an event with national coverage (March 2018).
These actions allowed the production by CMMN team of a memory game and, with the collaboration of young people involved, two videos, several drawings and different types of contents about fauna and flora, which can be used in future actions.
Several other deliverables to support these action activities were produced or acquired: t-shirts (54 units - April 2017) and reflective vests (20 units - April 2016), 9 tents, 18 sleeping bags

(Annex XLVIII) and 18 mattresses (March 2016), 7 tablets, 30 lanterns, gloves and other consumables.
The flyer "adopt a road" was completed in May 2017 and a 2nd version was subsequently adapted and produced for dissemination to young people in October/November 2017 (250 leaflets and 20 posters) (Annex XLIX). Also worthy of note, is the production of 250 keychains and 250 kits to support field trips (including a cloth bag, clipboard, notepad and running scarf) (Annex XLVIII), with the aim of capturing the attention of young people and promoting greater involvement in the project's theme.

Action F.1 – Project management - <u>In progress</u>

Foreseen start date: 01/08/2015 Actual start date: 01/08/2015
Foreseen end date: 31/07/2020 Actual end date: 31/07/2020

This action was initiated as initially proposed.

The coordinator and the operational administrative supervisor of the LIFE LINES have been present on the LIFE14 Kick-off Meeting that took place on 4th November 2015 in Murcia and presented the project to the LIFE External Monitoring teams, EASME and other LIFE 14 beneficiaries.

Management structure including the Project coordination (CP), Technical Committee to support project management (CTAG), Management Committee (CG), and Scientific Monitoring Committee (CA) were implemented in the beginning of the project and are working properly. Sometimes, whenever discussing specific small issues involving only a few beneficiaries, large CTAG and CG meetings were replaced by partial/informal meetings involving only the directly interested parts. This proved to be more efficient and productive than ordinary CG and CTAG meetings. The meeting between members of CP are done on a weekly based (especially between the coordinator and the project manager) and whenever necessary with team members of specific areas (flora, fauna, invasive species control, etc.)
The CP does not have an individual technician specialized in communication. However, the project manager accumulates his regular functions with the communication supervision, and when needed, Joaquim Pedro Ferreira (an invited post-doc from UA specialized in science communication) attends the CP meetings. Moreover, a Communication Committee was including the Project Manager (Rui Raimundo), Joaquim Pedro Ferreira (UA) and the responsible from communication from IP (Paula Fagulha) and UEVORA Communication Office supports communication tasks when needed.
The first meeting of the Scientific Monitoring Committee (CA) was held at 2nd and 3rd of June 2016 and included the 1st LIFE LINES Seminar open to the general public. The second was held at 7 and 8 of May of 2018 together with the 2nd LIFE LINES Seminar. An average of 83,3% of members of CA were present in the first meeting and 58.3% in the second.
Until the end of April 2018, LIFE LINES had two visits of the NEEMO monitoring team that took place at 12nd and 13rd of April 2016 (with João Salgado) and in 23rd and 24th of March 2017 (with Sara Barceló)

The composition of the CTAG and CG has been submitted to adjustments due to reorganization of the departments and/or teams of some of the beneficiaries (see chapter 5. Administrative part). Until April of 2018, 21 CTAG, 114 CP and 2 CG meetings were performed.

The Project Manager started working on 1st April 2016. Most of the main services and material acquisitions by UEVORA, despite the highly complex procedures associated with the recent legislation are concluded. The rented cars of the project arrived in October of 2017 and are being fully used in the several project tasks.

All the meeting records are compiled in Annex L.

Action F.2 – Compilation and Structuring the Indicators of Development of the project - In progress

Foreseen start date: 01/08/2015 Actual start date: 01/08/2015
Foreseen end date: 31/07/2020 Actual end date: 31/07/2020

The original LIFE LINES proposal already included, for each action, a list of indicators to be achieved along the project development. These are the main indicators to be incorporated and used in Action F.2. Since July of 2017, this list is on the LIFE LINES website and three updates have been done until this moment. Table 5 shows the predicted quantity and the executed indicators until this moment per action.

Table 5. List of progress indicators showing the evolution of indicators between 2nd Progress Report (August 2017) and the Mid-Term Report (April 2018).

Action	Indicator	Predicted quantity	Executed until August 2017	Executed until April 2018	Diference
A. Preparatory actions, elaboration of management plans and/or of action plans					
A.1 - Completing and updating of baseline characterization	Data information layers integrated into GIS database	Nº, O=79	388	388	0
	Occurrence records integrated into GIS database	Nº, O=25.000	79819	79819	0
	Species covered by wildlife database	Nº, O= 7 Amphibians, 8 Reptiles, 25 Mammals and 80 Birds	254= 14 Amphibians, 17 Reptiles, 53 Mammals and 170 Birds	254= 14 Amphibians, 17 Reptiles, 53 Mammals and 170 Birds	0
	Connectivity maps generated	Nº, O=2	6	6	0
	Fraction of intervention sites covered by detailed data / maps in GIS database	%, O=100	100	100	0
	Animals tracked with GPS/GSM system	Nº, O=12	6	12	6
	Number of wildlife	Nº., N=50	307	307	0
	Invasive species with new approach of remote sensing methodology	Nº, N=4	6	6	0
A.2 - Compilation, structuring and	Number of persons / organizations that	Nº, N=16	3	5	2

implementation of national database and multi-user web platform	contributed with GIS data information layers				
	Roadkill data incorporated into GIS database	Nº, N=50.000	50076	73809	23733
	Species incorporated into GIS database	Nº, N=120	199	208	9
	Nº of Institutional users registered and with a regular use of the platform	Nº, O=4	0	3	3
	Nº of academic users registered and with a regular use of the platform	Nº, O=6	0	8	8
	Nº of professional users registered and with a regular use of the platform	Nº, O=8	0	3	3
	Nº of NGO´s registered with a regular use of the platform	Nº, O=4	NA	NA	
	Nº of citizens registered with a regular use of the platform	Nº, O=20	NA	NA	
	Average number of new records send in a regular basis to the platform	Nº/month, O=600	NA	NA	
	Records send by mobile application	%/total, O=10%	NA	NA	
A.3 - Project implementation, licensing, procurement of permits and contracting procedures necessary to actions C	Execution projects (Forestry and civil engineering / Landscaping) produced	Nº, O=12	10	13	3
	Authorizations, licensing and procurement of permits necessary to actions C obtained	%, Target=100	100	100	0
	Procedures of public contracting launched	%, Target=100	50	100	50
A.4 - Development, testing and evaluation of automated systems of monitoring and / or deterrence	No. of monitoring prototypes developed	Nº, N=2	1	2	1
	No. of dissuasion prototypes developed	Nº, N=3	0	5	5
	Effectiveness of automated prototypes comparing with traditional methods	%, O=150	NA	NA	
	Records of approach to powerlines obtained with the monitoring prototype	Nº	0	50	50
	Records of passerines mortality obtained with the monitoring prototype	Nº	NA	NA	
A.5 - Installation of autochthonous plant nursery for conservation actions	No. of created nurseries	Nº, O=1	1	1	0
	Area of produced plants created	m^2, O=5.000	5000	5000	0
	Plots to seeds production installed	m^2, O=1.000	1000	1000	0
	Number of woody species in growth	Nº, O=4	22	22	0
	Number of bulbous species in growth	Nº, O=1	2	5	3

	Growing plants to conservation tasks (Actions C)	Nº, O=1000	3000	3000	0
A.6 – Development of prototypes for deterring avifauna in medium voltage lines	Prototype solutions developed for reducing bird kills	(nº, O=1)	NA	NA	
	New device produced to reduce simultaneously bird electrocution and collisions	(nº, O=85)	NA	NA	
	Selection/extension of the total length of medium tension lines with the new typology for the poles and new anti-collision signalization	(km, O=13)	NA	NA	
	C. Concrete Conservation actions.				
C.1 - Integrated Mitigation of the reduction of conductivity and permeability of the landscape in national and principal roads	Dry ledges for fauna installed on culverts.	Nº, O=5	0NA	6	6
	Structural improvement of culverts to prepare mitigation work	Nº, O=1	0	1	1
	Restauration of fences and plantations to lead to culvert paths.	Nº, O=7	0	6	6
	Total length of national roads (EN) and main itineraries (itP) covered by mitigation measures	km, O=37	0	2,4	2,4
	Total length of national roads (EN) and main itineraries (itP) covered by complementary measures to support mitigation measures	km, O=104	0	154	154
	Number of typologies of innovative solutions	Nº, O=4	0	2	2
	Number of typologies of demonstrative solutions	Nº, O=5	0	3	3
C.2 - Potentiation of the verges and marginal parcels of roads infrastructures as shelter areas, refuge, food and / or displacement	Micro-reserves installed /established	Nº, O=2	0	2	2
	Favourable habitat increase to target butterflies populations.	Ha, O=4	NA	NA	
	Occupied area for invasive species subject to initial control actions.	%, O=100	0	29,2	29,2
	Occupied area related to the initial, by invasive species subject to monitoring control actions.	%, O=75	NA	NA	
	Occupied area related to the initial, by invasive species subject to following control actions.	%, O=25	NA	NA	
	Control methods of reeds tested and evaluated as effective.	Nº, O=2	NA	NA	

	Protocols to prevent, detect and control of invasive species along the IP roads.	Nº, O=2	1	1	0
	Mortality reduction of Tawny Owl by installing shrub screens	%, O=10	NA	NA	
C.3 - Development and installation of vertical road traffic signs	Vertical signals created	Nº, O=1	1	1	0
	Vertical signals acquired and installed.	Nº, O=10	0	10	10
C.4 - Mobile Application to promote the collect of mortality data	Mortality records validated in GIS database by mobile application.	Nº/month, O=600	NA	NA	
	Records send by mobile application	(%/total; O=10%)	NA	NA	
	Validation time (between entry and validate the data)	(days, O=4)	NA	NA	
C.5 – Testing devices for deterring avifauna landing in medium voltage lines	Anti-electrocution/collision devices installed	(nº, O=85)	NA	NA	
	Extension of medium voltage lines with the new type of prototypes installed	(km, O=13)	NA	NA	
	Effectiveness of new anti-electrocution devices (% reduced mortality)	(%, O=80)	NA	NA	
C.6 - Development, essay and application of biodiverse grasslands to promote biodiversity in linear infrastructures	Species evaluated in preselection	Nº, O=20	1064	1064	0
	New protocols of species germination with conservation interest	Nº. O=5	0	8	8
	Species with harvested seeds	Nº, O=20	153	153	0
	Selected species	Nº, O=10			
	Intervention essay areas	Nº, O=10	NA		
	Quantity of seeds collected by volunteers	%, O=25	30	30	0
	Rehabilitated greenhouses for conservation objectives	Nº, O=1	0	1	1
C.7 - Mitigation measures and potentiation of roads in Évora municipality	Total length of municipal roads parts covered by mitigation measures.	Km, O=9	0	9	9
	Total length of disabled railways covered by mitigation measures.	Km, O=21	0	21	21
	Endemic flora species target of potentiation work.	Nº, O=6	NA	NA	
	Butterflies species target of habitat potentiation	Nº, O=4	NA	NA	
	Invasive plant species target of control/eradication	Nº, O=6	1	1	0
	Reduction of mortality records in EM529	%, O=20%	NA	NA	
C.8 - Mitigation measures and potentiation of roads in Montemor-o- Novo municipality	Total length of municipal roads parts covered by mitigation measures.	Km, O=15	0	15	15
	Total length of disabled railways covered by mitigation measures.	Km, O=13	0	13	13
	Endemic flora species target of potentiation work.	Nº, O=2	NA	NA	
	Butterflies species target of habitat potentiation	Nº, O=3	NA	NA	
	Small mammal species target of habitat potentiation	Nº, O=2	NA	NA	

	Invasive plant species target of control/eradication	Nº, O=7	4	5	1
	Invasive flora area species target of control/eradication	m^2, O=32000	0	8400	8400
C.9 - Operations in plant nursery to the conservation actions	Plant Production area installed	m^2, O=5000	5000	5000	0
	Plots of production of seeds installed	m^2, O=1000; Nº=10	1000	1000	0
	Woody species propagated with the action	Nº, O=9	22	22	0
	Herbaceous species propagated with the action	Nº, O=11	0	25	25
	Produced plants vs necessary plants to the conservation works	%, O=100	NA	NA	
C. 10 - Promotion of "islands" of Biodiversity along the power lines	Experimental plots installed to create Biodiversity Islands	Nº, O=3	0	15	15
	Total area covered	m^2, O=300	0	720	720
	Installed fence	m, O=75	0	420	420
D. Monitoring of the impact of the project actions					
D.1- Monitoring / evaluation of socio-economic effects of the project	Adopted indicators to monitoring the effects	Nº, O=20	18	34	16
	Trimestral update of the indicators	Nº, O=15	1	11	10
	Produced and sent reports	Nº, O=1	NA	NA	
D.3 - Monitoring / evaluation of the effects / impacts of conservation measures	Update of data information layers integrated into GIS database	Nº, O=20	0	2	2
	New occurrence records integrated into GIS database	Nº, O=10000 to 20000	0	7598	7598
	Update of fauna species mortality records covered by the fauna database (10 amphibians, 10 reptiles, 35 mammals and 85 birds).	Nº	0	10 amphibians, 9 reptiles, 26 mammals, 64 birds	10 amphibians, 9 reptiles, 26 mammals, 64 birds
	New permeability maps produced	Nº, O=15	NA	NA	
	New functional connectivity maps produced	Nº, O=2	NA	NA	
	Animals tracked with GPS/GSM system	Nº, O=12	0	3	3
	Monitored of power lines supports	Nº, O=60	NA	NA	
	Seeds plots of biodiverse mixtures monitored	Nº, O=20	NA	NA	
	Monitored sites of successful invasive species control	Nº, O=20	NA	NA	
	Invasive species target of remote sensing methods of analysis	Nº, O=4	NA	NA	
E. Public awareness and dissemination of results					
E.1 - Communication Plan - Project Website	Content update frequency	Nº of updates, N=20	24	100	76
	Monthly average users	Nº, O=200	148	211	63
	Statistics on numbers, average session time (AST) and geographical provenience of users	AST (min)	3,11	2,42	0,69
	Downloads from the website	Nº, MB	NA	NA	

E.2 – Communication Plan – Placards/Outdoors in intervention area	Placards of medium size installed in sites of C Actions interventions	Nº, O=50	3	18	15
	Large Outdoor installed as part of C.1 Action intervention	Nº, O=1	NA	NA	
E.3 - Communication Plan - Public disclosure sessions and contacts with the media	Press releases/schedule emitted or written throughout the project	Nº, O=30	3	29	26
	Press conferences organized during the project	Nº, O=10	NA	NA	
	Public seminars organized (annual)	Nº, O=5	2	3	1
	Average of participants in the public seminars	Nº, O=80	83.5	70.6	12.9
E.4 - Communication Plan - Complementary works and materials	Short teasers (about 1 minute) produced and distributed on the Internet throughout the project	Nº, O=20	6	8	2
	Thematic videos of medium duration with audiovisual supporting content for specialized media visits	Nº, O=20	6	8	2
	Radio spots produced/broadcasting	Nº, O=10	1	3 (including 2 events)	2
	Project documentary	Nº, O=1	NA	NA	
	Tutorials videos	Nº, O=2	NA	NA	
E.5 - Awareness and involvement of the academic community in collecting information/data	Researchers of UEVORA, FCUP and UA With credentials to the national platform.	Nº, O=14	NA	NA	
	PhD and Master Thesis concluded.	Nº, O=6	2	2	0
	Students of UEVORA, FCUP and UA registered in mobile application	Nº, O=200	NA	NA	
	Researchers of UEVORA, FCUP and UA registered in mobile application	Nº, O=80	NA	NA	
	Collected data by academic community of UEVORA, FCUP and UA	Nº, O=8000	NA	NA	
E.7 - Networking with other LIFE and not LIFE projects	European experts invited to visiting the project	Nº, O=4	4	5	1
	LIFE and non-LIFE projects visited by members of the project team.	Nº, O=4	4	5	1
	Presentations of the project in Green Week editions	Nº, O=2	NA	NA	
	Presentations of the project in European seminars/events	Nº, O=4	2	5	3
	Ideas of network projects to integrate the Communication and Conservation Post-LIFE Plan.	Nº, O=2	NA	NA	
E.8 - Volunteer Program for young people	Average number of young people participants in the program	Nº, O=30	22	23	1
	Associations and IPSS participants in the program	Nº, O=12	2	11	9
	Enterprises/institutions participants in the program	Nº, O=8	4	8	4

	Habitat area beneficiated by voluntary work	Ha, O=2	0	0,71	0,71
	Species of flora beneficiated by voluntary work	Nº, O=10	0	11	11
	Species of fauna beneficiated by voluntary work	Nº, O=8	0	5	5
E.9 - Technical seminars to present the developments and results of the project	Professional participants in the initial seminar	Nº, O=50	102	102	0
	Professional participants in the middle seminar	Nº, O=120	0	45	45
	Professional participants in the final seminar	Nº, O=200	NA	NA	
	Power Point presentations	Nº, O=80	22	27	5
	Abstract book edited in digital form.	Nº, O=3	0	NA	
E.10 - "Adopt a road", environmental educational/awareness program with local schools	Young people involved by municipality in vacation camps	Nº/year, N=9	11	22	11
	Total of young people involved by municipality in vacation camps	Nº, O=72	22	22	0
	Juvenile Center use by young people between regular activities	Nº/municipality, O=9	0	7	7
	Juvenile Center use by young people involved by municipality	Nº, O=9	NA	7	7
	Identified roadkilled animals	Nº, O=1000	NA	NA	
	Adopted sections of roads	Nº, O=2	0	1	1
	Surveys at stretches of roads adopted	Nº, O=24	0	16	16
	Mortality records of fauna in the mobile app by section of road	Nº, O=100	NA	NA	
F. Project management and monitoring of project progress (obligatory)					
F.1 – Project management	CP team members present in the kick-off meeting	Nº, O=2	2	3	1
	CG meetings accomplished	Nº, O=20	2	2	0
	CTAG meetings accomplished	Nº, O=60	16	21	5
	CP meetings accomplished	Nº, O=240	88	114	26
	CA meetings accomplished	Nº, O=6	1	2	1
	CA members present in meetings	%, O=90	83.3	70,8	12.5
F.2 – Compiling and Structuring the Indicators of Development of the project	Regular update of the progress indicator´s list	NA		3	3

Since the last report, 68 increased, 21 maintain and 3 decreased. The great majority of the indicators are improving as expected and some passing largely the expected. The indicators form Action A.2 Compilation, structuring and implementation of national database and multi-user web platform, C.1.- Integrated Mitigation of the reduction of conductivity and permeability of the landscape in national and principal roads, C.10 - Promotion of "islands" of Biodiversity along the power lines and E.8 - Volunteer Program for young people almost all increased as predicted. Some surpassed the maximum predicted (specially the A.2 indicators).

The indicators that maintain the value are mainly in actions or tasks that are completed (ex. Action A.5 - Installation of autochthonous plant nursery for conservation actions) or not initiated.

The indicators that decreased are the "Statistics on numbers, average session time (AST) and geographical provenience of users", "Average of participants in the public seminars" and "CA members present in meetings".

The explanation for this are, the first indicator (Statistics on numbers, average session time (AST) and geographical provenience of users) was because the decrease of average time of users consulting the webpage, the second (Average of participants in the public seminars) has because of the third seminar participants (45) were below the first two, 102 in the first seminar and 65 in the second. So the average decreased, in the final we expect an improvement of these numbers because the final seminar of LIFE LINES is predicted to be 350 participants because is a joint-venture with the IENE international conference.
The last one, the presence of CA members in meetings decrease because the attendance in the first meeting was higher than the second. In the first meeting were present 10 of the 12 members (83,3%) and in the second 7 of the 12 members (58,3%). So the cumulative percentage is lower than before (70,8%).

Action F.3 – External audit - <u>In progress</u>

Foreseen start date: 01/08/2015	Actual start date: 01/09/2015
Foreseen end date: 31/07/2020	Actual end date: 31/07/2020

The administrative process of contracting an external auditory team was included with other ongoing projects at the University. There is already a decision to contract and the process will be launched on the public procurement platform by the end of July. Despite this, the normal internal audit process is ongoing. The new rules of LIFE program determinate that only the partners that have 750.000 € or more need external audit. In this case, only UEVORA and IP are in these conditions.

6.2 Main deviations, problems and corrective actions implemented

The main problem associated with LIFE LINES development is, in our opinion, the administrative procedures and superior authorizations needed to perform some tasks. Among these, the procedures to hire persons or acquired equipment and services by public entities (all beneficiaries except MARCA) are particularly relevant. These are being increasingly complex and demanding, in part to fulfil UE requirements (e.g. DL 111-B/2017 of 31 August). Delays in several tasks associated with conservation actions C.1 and C.2 are a consequence of this procedures, as explained in the Technical part of this report. The Road Maintenance Contract to be made by IP, in which the LIFE LINES tasks are included, is waiting for Court of Auditors authorization, which is expected to happen until October 2018, and missing conservation work will start immediately after approval. Despite this, most of the conservation actions are now under way or being finalized,

Fire prevention legislation is also of concern. DL 10/2018 of 14 February was published after the big fires of June and October 2017 in Portugal, where over 100 people died. The DL clarifies the fuel management criteria in the secondary bands of fuel management, reinforcing and amending DL 124/2006 of June 28. The reinforcement of this legislation can limit the full potential of roadsides and other marginal areas associated with LI for biodiversity conservation. This may have implications to the full achievement of some LIFE LINES objectives (micro-reserves and biodiversity refuges; control of alien invasive plants with non-cutting techniques). Particularly important are obligations included in points C- "shrub height cannot exceed 50cm" and D –" grass height cannot exceed 20cm" of paragraph 1 (DL 10/2018), if they are followed in an extensive and unweighted manner. The issue was debated in the last Scientific Monitoring Meeting (7 May 2018) and one of the members highlighted the possibility of asking for legal exceptions aiming conservation proposes, in locations where fire risk is not so high (as in most of LIFE LINES IA). The project team is aware, from the beginning of the project, of the need to take into account fire risks in vegetation management. However, in the region where the project takes place, the historical record shows that fire spreading risk is often low due to the characteristics of the dominant forest type which often lacks a bushy stratum and present variable and often large distances between tree canopies. On demand of some beneficiaries, the project coordinator and the coordinator for vegetation of LIFE LINES have already produced a document (Annex LI) alerting for the risks concerning biodiversity conservation of this legislation. This document intends to be used to support exceptions and adaptations requests in vegetation cutting in the LIFE LINES project framework. These requests will be done to "Municipal Committees of Forest Defence" and "Forest and Nature Conservation Institute" (ICNF). immediately after the summer holidays and before the next season of vegetation cutting.

Preparatory action A.1 lasted longer than predicted but no delays in conservation actions were due to this fact. Additional work was needed mostly to complete some field surveys and map important landscape features (all permanent water bodies), which also justifies a 22% increase in personnel expenses action A.1, comparing with the original proposal. However no additional costs will be inputted for the project because lower expenses in other actions, such as D.3, will be shorter than proposed and will cover the surplus in A.1 spent budget.

Action D.3 started on the predicted date. However, initially only the effect of road verges vegetation cutting and mowing on roadkills were observed. Monitoring of other conservation actions started after each measure has been completed. For the measures for which implementation was delayed for several reasons, the monitoring period is inevitably shorter than the predicted in the project proposal. This will be particularly evident for a few measures included in actions C.1 and C.2 (see technical part of this report) that predictably will be finished only in the winter of 2019. Taking into account this constrains, the strategy adopted is to start monitoring the efficacy of each conservation measure as soon as possible after each its implementation and performing the monitoring as long as possible. The spring season will be for the most of the target groups (for amphibians the autumn will be also an important season) the more appropriate season to perform the surveys. So, if as expected, all conservation actions will be finish till the winter of 2019, monitoring results will be gathered for two years (spring of 2019 and 2020) allowing to some inter annual evaluation. We hope, to compensate partially the shorter period of monitoring with a more intensive evaluation, i.e., more surveys in shorter time. Moreover, roadkills (an important indicator for evaluating the success of several conservation measures) are being monitored by IP on intervened national roads on a weekly basis since October 2016 (to monitor the effect of road verges vegetation cutting and mowing on roadkills) and by UEVORA, on a daily basis, since October 2017, after dry ledges on culverts have been built.

A major deviation from the original project plan concerns the control of alien invasive vegetation for two reasons: (1) a misunderstanding of the application proposal or misspelling may have led to the interpretation that all target invasive plants would be eradicated on stretches of national roads that are intervened in the project framework. Indeed, in the 3 roads that were predicted to be intervened in the project, the invasive control has been made with improved vegetation cutting a regular and systematic procedure, and, in selected with more complex and specific techniques. But eradication by 100% was not the goal, due to the well know difficulty in assuring the full eradication of these species. The indicator is intervention on 100% of the area, which is happening. (2) Complex governmental/administrative procedures, that caused the delay in starting the new Road Maintenance Contract (that includes the improved techniques), which is estimated to start in the autumn 2018.

Press conferences are below than predicted, despite the approval of the project Communication Plan, and the sharp increase in the number of press releases. Reaching National Media has been particularly hard. To overcome this situation, we have contacted and have already a proposal from a professional communication agency. Budget received is well above the available resources (available for this task: 8.469 €; proposal: 31.980 €). The project team is now asking for new proposals and is evaluating possible budget adjustments in order to accommodate the predictably higher costs than proposed. Particularly important press conferences with National overage Media will be done with release of the APP (C.4) and the LIFE LINES Final Seminar (E.9).

Other changes that are worthwhile to highlight are:

A full-time person aiming to support Project Management was hired. Instead of the service acquisition proposed in the LIFE application, this technician was hired through an open public call. This procedure, although involved higher personal costs, are balance by the lower service acquisition required for project assistance. So, it did not involve any additional costs for the project.

The monitoring of the socio-economic effects is revealing to be a particularly complex task. A new and simplified list of socio-economic indicators is already being used. Nevertheless, some indicators are still hard to fill because they required information on individual costs (e.g. persons/day on service acquisition) that are not easily available in a such detailed way. Nevertheless, for some indicators we have results that are described in "chapter 6 -Technical Part" that allow us to verify the evolution of the influence of LIFE LINES project in local economy (Ex: number and money spent in local companies) and in the local community (nº of volunteers, nº of awareness/formation actions, etc.)

A new automatic camera (photographing every 10 seconds), not predicted in the LIFE application and used for the first time in Portugal, was acquired to monitor the use of small culverts by small fauna (amphibian, reptiles and small mammals) as well as a service to run an algorithm that automatically identifies the species/group photographed. We used the money left from the acquisition of the regular trapping cameras and, thus, there are no additional costs for the project.

6.3. Evaluation of Project Implementation

Project implementation have been slowly than predicted in the original proposal. Delays are mostly due to administrative processes related with authorizations, personal hiring and acquisition of services. The need to ask for an amendment to substitute one of the beneficiaries (EGSP) have delayed the main tasks on which EGSP was involved (A.6 and C.5).
Methodology proposed for project general project development is globally being followed despite the inevitable adjustments. Core conservation actions are implemented or will be finished during the next months. Communication with the media is below expectations due to difficulties in acquiring specialized services at a reasonable cost. We expect to overcome this situation soon.

Table 6. Comparisons of the results achieved against the objectives and expected results foreseen in the proposal and described in section 4.1

Action	**Foreseen in the revised proposal**	**Achieved**	**Evaluation**
A.1 – Completing and updating of baseline characterization	*Objectives:* - Systematization of information and complement of ecological characterization to inform conservation work *Expected results:* - Construction of the project database - 2 functional connectivity maps - Remote detection of invasive plants	All main goals and expected results were achieved. Most indicators have been exceeded	This action is finished. Despite the delay, and higher costs all the information needed for further actions (mostly C) was gathered in advance and was used do define or make adjustments to conservation actions. (see deliverable "Action A.1 non-technical report)
A.2 – Compilation, structuring and implementation of national database and multi-user web platform	*Objectives:* - Identification and characterization of existing databases - Definition of database technical specifications using free software - GIS database and computer platform online *Expected results:* 1. Creation of a National Database of fauna mortality 2. Development of an online multiuser platform 3. Database users: 4 institutions, 6 academic researchers or students, 8 professionals, 4 NGOs, 20 regular citizens 4. Partnerships with at least 2 other biodiversity data platforms 5. Dynamic link to the app 6. At least 50000 mortality records introduced	Main goals were reached. Expected results 1, 2, 5 and 6 results have been fully achieved or exceeded but the 3 and 4 are still below that proposed. Last results of the app tests indicate that technical problems associated with its connection to the roadkill database are now solved.	The database and core related structures are completed. However this is a dynamic and ever in progress database that is predicted to be regularly updated, and efforts to add other already existing data (from entities and experts extern to the Project) are continuously being made. A new approach to include data from road sub-dealers, which until now have been unsuccessful, involves trying joint meetings with UEVORA, IP and each sub-dealer. Expected result 4 will predictably be achieved in the next months, after the official release of the app, which will potentiate the use of the database. We are still working on result 5 to share data at least with "Biodiversity for All" and "Global Biodiversity Information Facility"
A.3 - Project implementation, licensing, procurement of	*Objectives:* - Make the inventory, get together and obtain all technical, legal and administrative documentation necessary to actions C	Goals and expected results have been achieved, although with some delay comparing to the	The heavy administrative work and government authorizations that are required to fulfil this action are the main cause

permits and contracting procedures necessary to actions C	*Expected results:* - Have all technical and legal documents necessary to launch the execution of actions C - All the documents necessary for actions c are available at the stage of award or already awarded contracts.	initially proposed date.	for the delays. This is major drawback to accomplish some of the project deadlines. Despite this, most of conservation actions contracts have already been awarded and predictably, conservation actions will be finished along the predicted deadlines.
A.4 - Development, testing and evaluation of automated systems of monitoring and/or deterrence	*Objectives:* - Development of a mobile mapping system to automatically detect dead animals on roads - Development of fixed systems for detection and monitoring of large birds in power lines *Expected results:* 1. One new and one improved mobile system to map small fauna road-kills 2. Three automatic ultrasonic deterrent devices for rodents, owls (to decrease roadkills) and large birds (do avoid electrocution) 3. Replication of at least some devices created with possibility of production/ commercialization, in post-project period	All the hardware and most of the software for the automated systems have been built or developed. However, software, particularly for the automatic roadkills detection systems still needs to be improved. .	The 3 deterrent devices were already built and are being tested and improved when necessary. A new, much smaller and autonomous device have been developed to automatically monitor small birds and amphibian roadkills. Automatic identification is based on machine learning algorithms. The successes of these depend on the data available to train the machine. We are increasing the roadkills photo database to access the efficiency of the algorithms. Among the devices, we think the automatic roadkills and the deterrent for large birds have a high potential to be effective and thus have a higher probability of production/ commercialization, in post-project period
A.5 - Installation of autochthonous plant nursery for conservation actions	*Objectives:* - Installation of nursery for production of plant material (plants and seeds) necessary for the conservation work provided in actions C *Expected results:* 1. Adaptation of a building for installation of plant nursery 2. Training of rural workers for operational activities in the nursery 3. Production of woody and bulbous plants necessary for conservation work	Objective and expected results attained.	The action has been finished on the predicted schedule.
A.6 - Development of prototypes for deterring avifauna in medium voltage lines	*Objectives:* - Test and develop a new typology of support for medium voltage power lines to minimize collision and electrocution by birds *Expected results:* - New typology of support for medium voltage lines, "Eco horizontal treadmill" - Cooperation between various entities with intervention in the thematic area of	Waiting for decision on amendment request.	Design is already under way. Cooperation between the various entities has already begun in the framework of the preparation of the amendment.

	work (partners, collaborators and entities of Monitoring Committee)		
A.7 - Elaboration and approval of Internal Standards of guidance to support management in post-project	*Objectives:* - Develop and internally approve a set of standards, involving both guidelines for internal teams and subcontracting *Expected results:* - Existence of a set of internal rules that bind IP technical bodies to apply good practices of the project - Future implementation of a set of standards that ensure the sustainability, maintenance and replication of investments made	Predicted to start only on Autumn 2019	Guidelines of good practices have already, or are being, prepared for most conservation actions. These, whenever needed will be improved and will be the basis for the standards that ensure the sustainability, maintenance and replication of investments made
C.1 - Integrated Mitigation of the reduction of conductivity and permeability of the landscape in national and principal roads.	*Objectives:* - Mitigation of the identified roadkill hotspots with solutions of different types and adapted to each target group - Mitigation of the impact caused by linear infrastructure on landscape connectivity. *Expected Tasks/Results:* 1. Placing of wire net in L in about 16 km of roads 2. Placing and affixing tight mesh metal grids on 2 x 500 road slopes 3. Design and installation of wall of microperforated canvas, to elevate owl and other vertebrates flight 4. Installation of barriers and/or tight mesh walls to guide flying vertebrate flights 5. Installation and operation of the two electronic prototypes based on sound emissions for the deterrence of small owls and small rodents 6. Cutting / harvesting of vegetation on verges and to deter the presence of small rodents 7. Installation of light reflects reflectors to dissuade owls from approaching the road 8. Installation of 5 transverse tunnels for the passage of amphibians and coupled longitudinal barriers 9. Installation of dry ledges for fauna on 5 culverts 10. Installation/adaption of fences for guiding fauna on 7 culverts 11. With the previous measures/structures we predict a 20% reduction of fauna roadkills at the IA and 10% at the SA.	Action in progress. Tasks 2, 9 and 10 have already been completed. Task 10 have been done in 6 locations. Installation and operation of two sound prototypes for the deterrence of small owls and two ultrasound devices for small rodents (task 5) have already been done. However, first tests show that prototypes need to be improved or moved to other locations. Tasks 1 and 7: Implementation in the field is dependent on the starting of Road Maintenance Contract, already awarded by IP. Works will predictably start next September and finish in March 2019 Tasks 3,4 and 8: Projects concluded and works will start in the second semester of 2018. Task 6: Started in the beginning of the project and keeps going on as predicted in the project.	A large delay in this action is mostly due authorizations and long administrative process required to perform some actions. Task 4. IP, based on comments of some members the Scientific Monitoring choose to implement the barrier wall solution Task 8, aiming amphibians, had to be changed due to traffic safety reasons. The overall intervention extension is similar but no specific passages will be built. Barriers will guide animals to two already existing culverts that will be adapted to amphibians access. Despite the delays and changes we keep the same expected results concerning the reduction of roadkills.
C.2 - Potentiation of the verges and marginal parcels of	*Objectives:* - Control and eradication of exotic plants at the sites intervened with improved techniques on national road verges	Selection of all sites to be intervene is already done.	This is the action, which at this moment is more away from the initial goals. Complex administrative

roads infrastructures as shelter areas, refuge, food and / or displacement.	- promote specific training to the elements of the internal IP monitoring team detect and inform invasive alien plants, - Use of areas owned by IP near the roads to promote autochthonous flora and butterflies with the use biodiverse seed sets developed in C.6. - Installation of a strawberry tree hedge to elevate owl flight *Expected results:* 1. Two areas totalizing 4 ha, managed as biodiversity (flora and butterflies) refuges 2. Successful control of invasive woody alien plants in intervened sites with multiple interventions, when needed 3. Prevention of introduction and rapid detection and control of new nuclei of invasive alien woody species 4. Evaluation the efficiency of the strawberry tree hedge in owls roadkill mitigation	Action in progress. Mowing and cutting vegetation on going but the main improved techniques to control invasive species dependent on the starting of the new Road Maintenance Contract, already awarded by IP. Works will predictably start next September and finish in March 2019. Micro-reserves areas defined (5,5 ha) and Plan done. Strawberry tree hedge planted.	procedures; misunderstanding and different interpretations of the invasive control expected results; are the main factors explaining this delay. The start in force of the tasks associated with the new Road Maintenance Contract, next Autumn, should overcome most of the worries that now persist about this action.
C.3 - Development and installation of vertical road traffic signs	*Objectives:* - Creation and installation of vertical road signals for amphibians roadkill hotspots - Installation of vertical road alert signals for wildlife at to new places *Expected results:* - Installation of vertical road signals at five new roadkill hotspots - Creation and installation of vertical road signals for amphibians at roadkill hotspots - Evaluation of the efficiency of the new installed signals	Action in progress. Authorization from Road Safe National Authority, for the new amphibian sign, only came out in February 2018. The signs will be put in place until the end of June 2018	Despite the delay the action will be finished soon and about two years of monitoring will be possible. Thus, we will fulfil all the major goals and expected results associated with this task.
C.4 - Mobile Application to promote the collect of mortality data	*Objectives:* - Planning and development of a Mobile Application for Android to record animal roadkills *Expected results:* 1. Working Mobile Application to record animal roadkills by any user 2. Using the APP regularly: at least 4 institutional users, 20 academic users, 10 professional users, 4 non-governmental organizations users, 100 individual users 3. At least 600 records for month	Action in progress. App development is concluded, and the app is now being tested. The official launch will be in Summer 2018.	As soon as all quality parameters are achieved, the application will be available to the public, for free, in google play. We expect this to happen during the next two months. After and until the end of the project we expect to fulfil results 2 and 4.
C.5 - Testing devices for deterring avifauna landing in medium voltage lines	*Objectives:* - Test and evaluate the new typology of support developed at A.6 *Expected results:* - Reduced mortality by electrocution and collision by birds	Waiting for decision on amendment request.	The action can start within 3 months after approval and finished on the next 3 months. If that will happen soon, it will be possible to monitor its efficacy during about 15 months, including two springs.

C.6 - Development, essay and application of biodiverse grasslands to promote biodiversity in linear infrastructures	*Objectives:* - Develop mixtures of seeds of native plant species with conservation interest for sowing in slopes of linear infrastructures in order to increase the plant diversity of these structures. - Promote butterfly habitats. *Expected results:* 1. identify the specific composition of the seed mixture best suited for conservation actions; 2. Identify criteria to select best plant species to sown; 3. Creation of a database of plant species suitable to be used in verges and slopes of LI. 4. Identify plants that need to be raised in nurseries to avoid their collection in nature 5. Improve plant biodiversity in the intervened sites 6. Creation of micro-reserves with habitats favourable to the installation of new populations of target butterfly species and that can be useful for other small fauna species 7. Develop new germination protocols for species of high conservation interest	Action is in progress and all goals and results are expected t be fulfilled on the predicted schedule. Some indicators exceed the values anticipated in the proposal. Task 1 is being tested and the seed mixtures will be implemented in the next autumn along with Tasks 5 and 6. Task 3 is almost finished (the only missing procedure is the adaption of the database to the final composition of seed mixtures). The results 2, 4 and 7 were achieved.	Despite the delays associated with the green house installation, which is now fully operational is has been possible to fulfil all required tasks.
C.7 - Mitigation measures and potentiation of roads in Évora municipality	*Objectives:* -structural adjustment of 9km the road to reduce road kills including specific passages for amphibians and one wall to raise owl flight - enhancement of road verges in the deactivated railways (21km) for biodiversity, through the control of invasive alien plants and promotion of bushy and herbaceous vegetation; *Expected tasks/results:* 1. Installation of 5 amphibian tunnels 2. Installation of one wall for owls and other flying fauna t 3. Installation of 10 micro-reserves to promote autochthonous flora and butterflies 4. Removal, control and monitoring the woody invasive alien nuclei present along the disable railway. 5. Critical analysis of the implemented solutions evaluating its potential to be done in other locations	Action in progress. Tasks 1 is completed. Task 2 is underway and will be finished this summer. Task 3 is ongoing and will be finished in the next autumn. Task 4. First control of invasive alien plants have been done in most areas of the disable railway. Task 5 will be start only after having monitoring results	Structural measures are already or are nearly finished. More one amphibian passage than predicted was putted in place. 666 m of newly designed barriers to guide small fauna to new passages or existing culverts have been built Invasive species control will not be possible in all areas due to security reasons. In fact, very often invasive species (usually *Arundo donax*) were deliberately planted to stabilize slopes and their removal at predicted costs is virtually impossible. Seeding and plantations on micro-reserves is going on. At two locations, nearer the urban areas, these were destroyed due to vandalism
C.8 - Mitigation measures and potentiation of roads in Montemor-o-Novo municipality	*Objectives:* - Structural adjustment of 15 km of municipal road with installation of low cost or traditional solutions (barriers and passages) to reduce amphibians and small mammals roadkills - Essay new practices of vegetation management on verges;	Action in progress. Task 1 is almost finished, only canvas barriers, which are already prepared need to be put in place. Task 2 is delayed and needs to be	Structural adaptation associated with task 1 exceed the original proposal because three new tunnels (two for amphibians and one for small mammals) not predicted on the proposal were built on low

	- Enhance the habitat for several for small mammals and butterflies in a deactivated railway. - Invasive alien plants control and promotion of autochthonous shrub and herbaceous in the deactivated railway. *Expected task/results:* 1. Installation of barriers to guide small fauna to road safe-crossings (existing culverts); 2. Development of new practices of vegetation management on verges making compatible reduction of fire risk and conservation of biodiversity 3. Installation of ten micro-reserves to plant and seed autochthonous and improve habitat for butterflies and small mammals. *4.* Remove, control and monitoring the woody invasive alien nuclei present in about 17800 m^2 along the disable railway.	reevaluated due to new legislation (February 2018) regarding fire prevention. Tasks 3 and 4 although delayed are ongoing,	connectivity or high roadkill risk areas. Canvas barriers will be put in place this summer, previously to the higher roadkill risk for small fauna, particularly amphibians. About half of the job have been accomplished in tasks 3 and 4. New plant and seeding will be intensified in the autumn 2018 and invasive control will continue to the end of project. We are confident that all main goals will be achieved. Task 2 is until now below the expectations and a high priority will be given to deal with the "legislation problem" and implement, as soon as possible, adapted practices of vegetation management on verges.
C.9 - Operations in plant nursery to the conservation actions	*Objectives:* - keep the nursery in operation to assure all the needs for the project, replication after project and potential commercialization as ornamental plants *Expected results:* Regularly meet all the needs for conservation actions of at least 9 woody and 11 herbaceous species	Action ongoing as predicted. Objectives and expected results have been achieved and exceeded.	Action development is going well despite the changes in the field worker. Delays in the second project payment may put in cause the regular continuity of this action.
C.10 - Promotion of "islands" of Biodiversity along the power lines	*Objectives:* - Promotion, through seeding and plantation of autochthonous vegetation of areas under the poles of power lines as "islands" of biodiversity. This will act as refuges or stepping stones for the displacement of small fauna. *Expected results:* 1. Iinstallation of at least three small "islands" covering a total area of 300 $m^2$of biodiversity *2.* Increase vegetation, butterflies and small mammals diversity in the intervention sites and their surroundings.	Schedule has been kept. Installation works were completed in the predicted time. Objectives are being achieved. Result 1 was exceeded. Result 2 can only be evaluated after monitoring.	The action is going beyond the proposed goals and indicators. Five poles (48 m^2 each) in a row linking two areas of Mediterranean forest were planted, fenced and seeded to potentiate their role as stepping-stones between the two areas. Another five poles were intervened as mentioned and other five were fenced. This will be part of an essay to evaluate the efficacy of planting seeding and fencing comparing with only fencing and no action (control). A reinforcement of plant and seeding will be done in October/November, if and where needed. The action is being done in with the collaboration of REN.

D.1 - Monitoring / evaluation of socio-economic effects of the project	*Objectives:* - Evaluate the socio-economic effects of the project on the local economy and population. *Expected results:* Collecting data and updating on a quarterly basis of a grid of indicators that allows the evaluation of socio-economic effects	Action started later than predicted but now is ongoing normally.	The delay was due to the necessity to find a consensus about the grid of indicators and the procedures to fill it. This should be simple and easily, which was not an easy task. A formal grid has been approved and filled since the beginning of 2017. However, some argumentation still exists among the beneficiaries, and it may be possible that some adaptations will be needed.
D.2 - Monitoring / evaluation effects of the project on ecosystem functions	*Objectives:* Evaluate the effects of the project conservation actions on ecosystem functions *Expected results:* 1. Increase landscape connectivity in the IA and thus increase the delivery of the main ecosystem services associated with it; 2. Increase the perception of locals and visitors about local faunal and floristic values as well as the existing threats posed by IL and the presence of invasive plants	Action will start, as predicted, on July 2018.	Real information about people perceptions prior to the project will not be possible to achieve. Thus, to evaluate the impact of project this will be done through the comparison of people perceptions in the IA and outside of it.
D.3 - Monitoring / evaluation of the effects / impacts of conservation measures	*Objectives:* Evaluate the efficiency of project conservation actions, whenever possible with a BACI methodology *Expected results:* • Project database updated with all the information generated during the monitoring • Updated cartography of at least 4 invasive species in the areas intervened for control • New (after conservation) maps of landscape/permeability for at least 15 species for comparison with maps produced before conservation (A1); • Specific reports about the efficacy of each type of conservation action.	Action started, with monitoring of roadkills after first conservation measures have been done. However, monitoring of most actions is delayed due to the retarded end of many C actions.	Monitoring data is critical to access the effect of conservation action and monitoring should be as long as possible. The delays in C actions will inevitably lead to shorter monitoring periods than proposed. We expect to overcome this with a more intense monitoring (more surveys in a shorter time) and we are madding all the efforts to have at least two springs monitored for the nuclear C actions. A BACI approach will be used most of the times. However, in a few instances it will not possible due to shortage of equipment or because no truly similar areas are available for control.
E.1 - Communication Plan - Project website	*Objectives:* Creation of the website of the project. *Expected results:* Presentation, dissemination of the activities developed and publication of various materials produced	Action in progress. Main goals and results are being achieved as expected	The web page is operational and large reformulations of it have been done to better fulfil its aims. Page updates have been whenever needed and in a higher frequency than proposed.

E.2 - Communication Plan – Outdoors in the intervention areas	*Objectives:* Ensure greater visibility to the areas involved in project works. *Expected results:* Installation of medium-sized placards in all areas of conservations actions (Actions C.)	Action in progress. Main goals and results are being achieved as expected.	Whenever possible, as soon as conservation actions are finished, the placards are installed at their location as predicted.
E.3 - Communication Plan - Public disclosure sessions and contacts with the media	*Objectives:* Define and approve graphic image of the project Ensure broader communication and dissemination of project objectives, developments and results. *Expected results:* 1. Regular editing of press releases, organising press conferences and visits of media to the project activities. 2. Emissions of radio spots; 3. Organizing seminars to the general public.	Action in progress. Graphic image is defined and has been used since the begging of 2016. Communication with National Coverage Media has been lower than expected. Organization of seminars is going as proposed. A lower than predicted number of radio spots (we mean radios news) have been broadcasted	Despite the lower coverage than desired, a higher visibility of the project has been achieved since the recent (beginning 2018) proposal at National Parliament of legislation to produce laws aiming to reduce and monitor fauna roadkills. We expect to overcome the difficulties in the achievement of some expected results with key communication events associated with important project outputs: app release, documentary broadcast at the national television and final LIFE LINES Seminar (associated with the 2020 IENE Conference)
E.4 - Communication Plan - Complementary works and materials	*Objectives:* Production of a set of audio-visual materials that, in a transversal way, contribute to the dissemination of project objectives, developments and results. *Expected results:* 1. One project video documentary 2. 20 teasers to put online 3. 2 tutorial videos to support the app (action C.4) and roadkills and training actions 4. 10 radio spots	Action in progress. Materials for 1, 2 and 3 are being produced and results will be achieved predicted. Spot radios are turn into event radios	Radio spots have a higher cost than predicted. To compensate for this, we will make efforts to increase news on local and national radio, particularly during the upcoming key events of the project. These radio events should achieve the former objective (10).
E.5 - Awareness and involvement of the academic community in collecting information/data.	*Objectives:* 1. Raising awareness of other professional researchers and other researchers for the use of the platform and app; 2. Introduction of contents related to the project in curricular units of the Masters in Conservation Biology of the University of Évora; 3. Recruitment of UEVORA and FCUP students to validate data from mobile automatic monitoring prototypes. *Expected results:*	Action in progress. All results and objectives will predictably be fulfilled although some with small delay.	The issues of Project LIFE LINES are already tough in the Conservation Biology Masters classes. Two master's thesis supported by LIFE LINES are finished and approved and one PhD is ongoing LIFE LINES sessions for researchers and post graduate students were held in Faculty of Sciences of Lisbon and University of Évora. The results and goals will be fully achieved as soon as the improvement of

	The creation of habits and routines, to contribute to changing mentalities of members of the academic community (students and researchers) in order to collaborate more actively in the data collection the national mortality database (A.2).		birds and amphibians roadkills identification algorithms will be finished and the app will be ready for download from Google Play.
E.6 - Training / Dissemination with the stakeholders	*Objectives:* Enhance replication of project results and thus contribute to their demonstration objectives (thematic workshops) *Expected results:* 1. Ensure training and the dissemination of project results to stakeholders through the organization of 8 workshops production of 3 Good Practice Guides. 2. Adoption of good practices by at least 50% of workshop participants	Action started on January 2018 and all objectives and results will predictably be achieved.	Material and program for the workshops and Good Practice Guides are now being prepared and the first workshop should take place in the Autumn 2018, after most conservation actions are finished and consolidated
E.7 - Networking with other LIFE and not LIFE projects	*Objectives:* Ensure a set of contacts with the respective beneficiaries (LIFE projects), in order to exchange experiences and information *Expected results:* 1. The visit to the LIFE LINES of European experts 2. Visit of team members to projects (LIFE and non-LIFE) outside Portugal; 3. Participation of team members in Greenweek issues and other related European seminars / events; 4. Establishment of durable relations with the possibility of future enlargement; 5. Application / replication of project results to other geographic and socio-economic contexts, at least in the European area.	Action ongoing as predicted. Objectives and results will be achieved	Strong net working with other projects and involvement with other European experts and teams is already underway. Project presentation in the European Green Week is intended to be held in 2019 and 2020, after conservation actions will be implemented preliminary results of their efficacy will be available
E.8 - Volunteer Program for young people	*Objectives:* Involve local communities as well as groups of external entities in the pursuit and execution of conservation works. *Expected results:* Creation of a Volunteer Program directed to different publics / groups, including a Youth Volunteer, another of Volunteer Associations and another of Corporate / Institutional Volunteering.	Action ongoing as predicted.	Action development is going well despite the changes in the team work. Also delays in the second project payment may put in cause the regular continuity of this action.

E.9 - Technical seminars to present the developments and results of the project	*Objectives:* Ensure communication, technical-scientific discussion and dissemination of project objectives and results. *Expected results:* Organize and promote three high-quality technical-scientific seminars.	Action is ongoing. All objectives and results will predictably be achieved	Two LIFE LINES Seminars have already been done. A formal proposal to organize the IENE 2020 Conference, including the LIFE LINES FINAL Seminar is under appreciation of the IENE Steering Committee and we believe it will be accepted.
E.10 - "Adopt a road", environmental educational/awareness program with local schools	*Objectives:* Public awareness of the school's public to the mortality of fauna on roads of two municipalities (Évora and Montemor-o-Novo) and adoption of a section of a road collect mortality data to the application of C.4 action. *Expected results:* Involvement of young people in implementation of mitigation measures; regular use of the mobile mortality platform / application by young people.	The contact with local school consists in pontual actions. The volunteer program has 8 sessions until now. The next one is planned to the end of 2018.	The involvement of young people is week, so we pretend change the target (older people) specially in implementation of mitigation measures.
E.11 - Layman Report	*Objectives:* Creation of the Layman Report, which aims to ensure the communication and dissemination of the objectives, developments and results of the project, to a vast and non-specialized audience. *Expected results:* It is expected that the results of the LINES project will be widely and effectively disseminated as well as the support given to it by LIFE program.	Action will start, as predicted, on January 2020	The layman's report will summarizes the work of the LIFE LINES project for a general audience.
F.1 - Project management	*Objectives:* Creation and operation of a management structure that guarantees the proper execution of the project. *Expected results:* Management structure that guarantees the proper execution of the project.	Action ongoing as predicted. Objectives and results will be achieved	The action is going beyond the proposed goals and indicators. The number of reunions are bellow of predicted but the management structure is working as a full partnership and the main achievements of the project goals are being executed (Ex: C. Actions are all ongoing). The project demonstration actions will reach is peak in the next years.
F.2 - Compilation and Structuring the Indicators of Development of the project	*Objectives:* The grid of indicators to be used will include not only those provided for in the "Project Output Indicators" table, but	Action ongoing as predicted. Objectives and results will be achieved	Since the last report 64 indicators increased, 25 maintain and 3 decreased. We expected to fulfill the predicted indicators in the end of the project.

	also an additional selection of indicators to evaluate the evolution of each action. *Expected results:* Create and keep up-to-date a list of project development indicators that will allow an assessment of their appropriate development.		
F.3 - External audit	*Objectives:* Verification of financial compliance of the project with LIFE + requirements. *Expected results:* Writing and sending to the Commission, within the anticipated timings, of the External Audit Report; Verification of eligibility of 100% of the expenses incurred and presented; the financial implementation / execution of the project as planned in the application.	Action is started. Objectives and results will be achieved	The Verification of financial compliance of the project with LIFE + requirements will be fulfilled.
F.4 - Conservation Plan and Post-LIFE Communication	*Objectives:* Writing of a "Post-LIFE Communication and Conservation Plan" which will also respond to the obligations of any beneficiary of a project. *Expected results:* The joint and participated writing of the Post-LIFE Conservation and Communication Plan, and its submission to the Commission, within the expected timings; The implementation of the provisions of the Plan by the various partners and in line with the agreement already in the post-project period.	Action will start, as predicted, on January 2020	"Post-LIFE Communication and Conservation Plan" will be presented in English and in the beneficiary's language a t the end of the project.

Each conservation action will have a high visibility as soon as it is done because it is implemented in locations highly used by drivers (e.g. roads) or recreational activities (e,g, deactivated railways). The large barrier/outdoor at N114, to be implemented briefly, will be of particular relevance. The strategic role of some actions (e.g. contribution to the European Green Infrastructure) will be less perceived immediately by regular citizens, but will be of high importance as a demonstration for land planners and decision makers. Global predictors concerning biodiversity enhancement will be increasingly visible in the next three and following years.

A request of project amendment is waiting for decision by EASME. The new proposal will fulfil the same final goal of the initial: to reduce bird kills in electric powerlines using new

devices. If the amendment is not approved, these objectives will be strongly reduced despite the potential of the prototypes developed in Action A.4.

Concerning replication, we will perform at least 8 workshops, dedicated to specialized groups (LI operators, field workers dedicated to verge maintenance and vegetation Management; conservation ONGs, etc.). We already applied to organize de 2020 IENE International Conference in 2020, which will include the LIFE LINES FINAL seminar as a side event. Two protocols of collaboration were signed with the two major operators of power lines in Portugal. IP, which is a project beneficiary, is the most important and widespread road and railway operator in Portugal. Therefore, replication at the national level will the natural adoption of project results by Portuguese LI operators. At international level, replication will be highly potentiated through IENE conferences and meetings, interaction with other LIFE and non-LIFE projects, and the European homologues of national LI operators, with which they have privileged contacts.

Dissemination to local stake holders is being and will continue to be made, by involvement of students in conservation in several activities of the project; giving talks and include project issues in postgraduate classes; reporting in local and national media, presence in local fairs; organization of thematic seminars; put in place placards explaining conservation measures; regular update of webpage; and the diffusion of high quality project teasers on the internet and in all events (seminars, fairs, classes, etc.) where the team members are present. The project Communication Plan defines three key occasions/events, still to come, for the project communications and dissemination: (1) the national launch of the roadkill app, (2) the broadcast of the project documentary on national TV; (3) the IENE 2020 Conference/LIFE LINES proposed to be held in Évora. With these, we hope to overcome the difficulties experienced so far in reaching the larger national media.

The project has a high potential to impact policy because it will focus on strategic European issues concerning biodiversity conservation and related ecosystem services. The focus on EGI is particularity important. The project will contribute to the implementation, at a regional level, of conservation actions based on sound science and rigorous planning that will promote landscape connectivity (and the many associated ecosystem services) affording benefits for both people and nature. These are key elements of the EGI strategy. Moreover, the project will be a major vehicle to inform stakeholders and the general public about what is a GI and what is its importance and benefits. The project will use standard (dry ledges, fencing, walls, etc.) and new solutions (detailed vegetation management, automatic road kill monitoring, automatically deployed dissuasion devices, etc.) to reduce fauna mortality, promote fauna movement and provide refuges, that will contribute to the achievement of several goals of National and European Biodiversity strategies.

The main input of LIFE LINES to the targets of EU 2020 Biodiversity Strategy is mostly through the support to the implementation of a Green Infrastructure. The following actions will directly contribute to this goal: reduction of road mortality and of barrier effects in the IA and among the 2.000 sites of Monfurado and Cabeção (Actions C.1, C.3, C.7 and C.8); (ii) promotion biodiversity refuges for small fauna and flora (C.2, C.7, C.8 and C.10); (iii) promotion of habitat corridors and patches that will act as stepping stones for small fauna movement (C.2, C.7, C.8 and C.10).

In national terms, the project contributes directly to works and achievements clearly related to 7 out of 10 strategic targets of the Portuguese national strategy for nature and biodiversity

conservation (Resolução do Conselho de Ministros nº 152/2001), namely targets as 1), 5), 6), 7), 8), 9) and 10).

The project will also support, indirectly Natura 2000 conservation through the benefit of several species included in Annex I (*Bubo bubo, Ciconia ciconia, Milvus milvus, M. migrans, Circaetus gallicus,Hieraaetus pennatus, Alcedo atthis, Lulula arborea, Sylvia undata*,….) of Birds Directive or Annexes II/IV (*Lutra lutra, Felis silbvestris, Microtus cabrerae, Rhinolophus* spp, *Pipistrellus* spp; *Miniopterus schreibersii; Discoglossus galganoi, Alytes cisternasii, Coluber hippocrepis, Chalcides bedriagai, Emys orbicularis, Mauremys leprosa, Euphydryas aurinia*…) of Habitats Directives.

Most of the solutions can be easily replicable worldwide as they are often simple and not excessively expensive. The monitoring and evaluation (D actions) of the project effects on local socio-economy, ecosystem functions and impact of conservation actions will be based, whenever possible, in the comparison with a prior (pre-conservation actions) and control situations. This anticipates highly effective assessments on which possible posterior replications can truly rely on. Final guidelines to be produced at the end of the project will reflect and optimize these results. We expect that these guidelines will officially approved not only by LI operators that are beneficiaries and collaborators but also by most of the other LI operators. Additionally, several species autochthonous plant species will be tested and used in conservation action, replacing, whenever possible invasive alien plants.

6.4. Analysis of benefits

LIFE LINES grounds on three important strategies: (1) use and demonstrate the efficacy of low budget already established solutions that can easily be generalized and replicated in similar systems in other areas or transferred to other systems (dry ledges, fences, canvan barriers, vegetation management); (2) test innovative solutions of different types (robotics, mechanical devices, reflectors aiming other groups different from the ones originally target, etc.), that if successful have the potential to be adopted all across the EU; (3) compare efficiency of different solutions (e.g. measures aiming to reduce owl roadkills and barriers of different types for amphibians) in a cost-effectiveness framework and advice on future use of these solutions. Additionally, there is a strong commitment in awareness and involvement of citizens in general and decision-makers and stakeholders, in particular, on the project causes. Most existing linear infrastructures in the EU and worldwide were built before the legal requirement to perform an Environmental Impact Assessment, and often do not took into account conservation needs. Moreover, many marginal vegetated areas associated with and managed by the operators of these infrastructures have a high potential as biodiversity refuges or corridors whose value still needs to be evaluated and demonstrated. LIFE LINES main results will contribute to supress these caveats and, when successful, will inspire the use of these solutions across all the linear infrastructures network. Thus, the replicability potential across Europe is very high. Most solutions are policy-dependent. However, public awareness of the problem and pressure for their solution is rising inside and outside the project area, which hopefully will lead to new conservation legislation and decisions. An example of this is the discussion in January 2018 at the National Parliament of three initiatives, from three different parties, demanding a national program to minimize and monitor fauna roadkills. Robotic solutions that are being tested, particularly the ones associated with the automatic monitoring of road-kills of small fauna, have high potential market value and replication.

Guidelines for best practices in vegetation management on road and railway verges are predicted to be delivered at the end of the project, after evaluation actions concerning these issues LIFE LINES have been done.

Regarding possible limitations, new legislation relating vegetation management in infrastructures to reduce fire risk have been in force since February 2018 (DL 10/2018, 14 February). Thus, some predicted tasks needed to be re-evaluated or previously authorized in order to conform with this new legislation. Moreover, near high traffic roads the balance between the role as biodiversity refuge and the roadkill risk for small fauna of verges still needs to be clarified.

Best practices of the project regard the conciliation of the main role of IL (transporting people and energy) with nature conservation, thus reducing their impact on biodiversity and ecosystem services. This is being done through adapting or complementing existing infrastructure-associated buildings or the management of vegetation on areas under supervision of IL operators. The project will deliver best practices on "Habitats Related to Linear Infrastructures (HRLI) management including selective vegetation cutting, IAS control, effective road fencing, promotion of culvert use by fauna. We also aim to inspire others through the use of best practices associated with monitoring the effects of conservation actions and in data compilation.

Most innovation of the project is associated with development and testing of automatic robotic systems for (1) roadkill monitoring and (2) dissuasion and on (3) new design of powerlines supports. The first will allow evaluation in an efficient way of the small fauna roadkills, which often are not taken into account in monitoring programs due to difficulty and intensive work necessary. The second will take advantage of the increasingly accurate motion detection technology and/or the use of sound to model individual species behaviour in order to decrease roadkill risk. The later relies on new position, distances and isolation of powerlines supports that will reduces simultaneously risks of bird electrocution and collision.

Best practices will be demonstrated regarding vegetation management in HRLI, rules for road/railway fencing, culvert design and adaption, HRLI maintenance and monitoring. These have a high potential to be taken-up at national and European legislation. Nevertheless, new legislation enforcing restrict rules for vegetation cutting near all infrastructures may be a barrier to the full implementation of the vegetation management best practices first at the IA and later at a national level (see above).

7. Key Project Level Indicators

The list of the LIFE LINES Project Specific Indicators tries to demonstrate the global impact of the project in the environment, local economy and social benefits. Some descriptors like "Partial reduction of specific pressures/threats affecting the spatial extent of the project in comparison to the present level" or "Ecosystem Assessment" are related with the total area of direct interventions (182,13 ha). Others like "Ecosystem Condition" and "Ecosystem Trend" are related with the previous, actual and future "state" of the all Ecosystem in the IA and tries to evaluate the project contribution to their improvement and the improvement of the associated ecosystem services.

For example, the control of 9,8 ha of invasive plant species (*Arundo donax, Ailanthus altissima, Acacia dealbata, Acacia melanoxylon*) and their replacement by autochthonous species in a major part of this area will be a contribution to improve the overall ecosystem condition.
The total area of intervention that is, the area effectively intervened with concrete actions, (eradication of invasive plant species, installation of amphibian tunnels and barriers, culvert adaptations, etc.) is predicted to be 182,13 ha. However, after adoption of the good practices developed in the project framework by IP, it will arise, in the after LIFE to at least 452,13 ha.
The web page has 23.345 views from 5.909 visitors from 65 different countries. Seventeen information boards that have been already installed in high visibility locations, the broadcast in 4 national TV´s programs as well as others forms to dissemination (radio, volunteer's actions, etc.) are slowly contributing to a higher public awareness. The aim is to reach direct or indirectly 168.000 people and it will be achievable. We are convinced that the dissemination of the LIFE LINES contributed, at least indirectly, to the 3 legislative initiatives regarding reduction of roadkills previously mentioned that were discussed in the National Parliament in the beginning of 2018. In April, because of the LIFE LINES, we were contact by Vila de Franca de Xira municipal deputies in order to prepare a joint project to reduce roadkills in a stretch of N10 road.

Most of the solar predicted were allocated to water pumps to bring water to the surface in micro reserves. However, the installation of ponds near the roads is not recommendable because of increasing the risk of roadkills particularly of amphibians. We will try to change some operative devices to solar systems to compensate for this reduction. Solar energy is already used in the camera to monitor bird behavior in action A.4.

Concerning the socio-economy the direct creation of 11 new full-time jobs during the project and spending and acquiring services from local persons or firms, whenever possible is a great contribution for a peripheral depressed region.

The full evaluation of the accomplishment of these indicators will only possible at the end of project and for some of them (ecosystem trend and condition) after that. Despite this, ecosystem global trends in project indicators are positive and we expect that this tendency will continue until the end of the project.

Table 7 shows a preliminary update of the performance indicators.

Table 7. Preliminary update of the performance indicators

DESCRIPTOR	START VALUE	ACTUAL VALUE	END VALUE	BEYOND END VALUE	UNIT
Partial reduction of specific pressures/threats affecting the spatial extent of the project in comparison to the present level	0	0	182,13	452,13	ha
Solar	0	5	2.920	2920	kwh/year
Ecosystem Assessment	0	0	182,13	452,13	ha
Ecosystem Condition	Moderate		Good/favourable	Good/favourable	
Ecosystem Trend	Deterioration		Improving	Improving	
Arundo donax	6,03		0	0	ha
Ailanthus altissima	0,67		0	0	ha
Acacia dealbata	1,41		0	0	ha
Acacia melanoxylon	1,69		0	0	ha
Terrestrial natural	0		60,6	60,6	kg/ha/year
Transport facilities	0		5	5	Number of facilities
Large enterprises	1		1	1	entities
National authorities	0		9	9	Number of supervisory / enforcement bodies involved
NGO	1		5	5	number of stakeholders involved due to the project
No. of individuals	0		12.000	13315	number
No. Downloads	0		0	0	number
No. of unique visits	0		0	0	number
Average visit duration (minutes)	0		0	0	number
Publications/reports	0		1	1	number

Displayed information (poster, information boards)	0		5	5	number
Hotline/information centre	0		0	0	number
Other media (video/broadcast)	0		168.000	168.000	number
Events/exhibitions	0		0	0	number
Print media	0		0	0	number
Students (in higher education)	0		160	160	No. of individuals
Other	0		200	200	No. of individuals
Professionals	0		100	100	No. of individuals
Members of interest groups	0		6	6	No. of individuals
Jobs	14,38		20,41	14,38	No. of FTE
Running cost/operating costs during the project and expected in case of continuation/replication/transfer after the project period	0		5.540.485	0	€
Beneficiaries' own contribution				2.216.182	€

8. Comments on the financial report

For the reasons explained in previous sections the complex and slow, administrative procedures required by law to hire people and acquire goods and services, despite the efforts to speed them up, have been the main forces preventing a higher budget implementation.

Table 8 informs about the expenses for the first thirty-three months of the project, corresponding to about 55% of its predicted duration. Until now, 34% of the budget have already been spent. Among the cost categories, Personnel (49%), Infrastructure (36%), Other costs (34%), Overheads (33%) and Equipment (32%) have the higher spending rates.

Until the reporting date, spending in External Assistance is just 22% because most road works that are completed or are under way have not being paid yet. Moreover, the new Road Maintenance Contract to be awarded by IP, involves a large amount of spending in this category. Also 93.500 (UEVORA) and 40.046 € (FCUP) of External Assistance were moved to Personnel hire a project Manager and to support grants for A.4 prototypes development, testing and improvement. Also, for bureaucratic reasons the car resting only started on September 2017, two years after the proposed in the application.

Travel is the category with a smaller rate of expending (15%). Part of this can be explained by the following reasons: (1) no expenses were allocated to actions A.6 and C.5 that have change and the new versions have not started yet; (2) some C tasks are delayed and the monitoring of the these will start later, although with a higher frequency; (3) many missions abroad (e.g. EU Green Week in Brussels, 2018 IENE International Conference) will be done in the blast two years of the project; (4) travel for workshops with stakeholders is now starting.

The prototype costs are just 19% of the proposed budget, despite the prototypes are already been developed. The main reason for the low spending is that the budget proposed to be used in the contracts with University of Minho in action A.4, was moved to Personnel Costs category, in the same action, because the prototypes were directly developed in FCUP without necessity of acquiring services to University of Minho. Moreover, additional personal budget was for updating the grants of FCUP technicians (Diana Guedes and Hélder Ribeiro) for testing and improvement of the prototypes. Please note that in the application, a Bachelor grant was proposed to hire a technician to help to develop the prototypes of action n A4. However, there are very few technicians with the skills to this work and only on the fourth call was possible to hire someone, with the compromise of updating the grant to fulfil the values associated with technician degree (Masters) as soon as possible.

The spending rate of consumables is very low because many tasks associated with these expenses have only recently been concluded or are underway and/or few expenses were allocated to them until the reporting date. This is the case for part of consumables associated with implementation actions C.1 and C.2 (IP), for which the conclusion is dependent on the signature of new Road Maintenance Contract; for the consumables used the mitigation measures and potentiation of roads in Évora municipality (C.7, CME); for consumables of the Volunteer Program for Young People, which, despite had already begun but will be fully implement in the coming months (E.8, MARCA and IP).

Table 9 inform about the expenses by project action.

Until now the major deviations are related to Action A.1 and E.4. Preparatory action, A.1 which is n ow closed, lasted longer than predicted but no delays in conservation actions were due to this fact. Additional work was needed mostly to complete some field surveys and map important landscape features (all permanent water bodies), which also justifies a 22% increase in expenses (mainly personnel costs) comparing with the original proposal.

The work carried out and to be carried out by UA in the framework of the action in actions E had been fully awarded in one single administrative process to overcome delays and bureaucracy associated with public contracts. However, the contract includes a clause to assure the fully achievement the work hired. Action E.4 was included in this contract with a budget above the one predicted because the production of the high quality videos has a much higher cost than expected. This explain the 139 % of costs already spent with E.4. However, no additional costs will be incurred for LIFE LINES because lower costs will be associated with actions E.1 and E.3.

Another question is related with the changes between type of expenses. Following the recommendations of the kick off LIFE 14 Meeting held in Múrcia, a full-time person aiming to support Project Management was hired, by UEVORA, for the LIFE LINES. Instead of the service acquisition proposed in the LIFE proposal, this technician was hired through an open public call as enforced by the Portuguese law for contracts exceeding 75.000 €. Another advantage of this procedure is that this technician will be 100% dedicated to the project, a situation that was difficult to achieve via service acquisition. This manager will also give support to part of project communication and awareness actions. To account for these changes, about 93.500 € were moved from "Service Acquisition" to "Personal Costs". However, this didn't imply any change in overall project budget. Some circumstantial, time overlapping in some tasks of actions A.1 and D.3, increased field wok in action A.1 (see above) and project leave by one most experienced field technicians (Pedro Costa), required UEVORA to open an additional Bachelor grant (André Oliveira) not predicted in the application to perform help in some field tasks. This will not have additional costs for the project as low spending in other categories (e.g.travel and consumables) will cover the grant costs. As explained above, all prototype costs of FCUP were moved to personnel costs.

8.1. Summary of Costs Incurred

Table 8. Project budget summary by category of expenditure, indicating the amounts spent until 30/04/2018 and the respective percentage in terms of the total costs predicted by category.

Budget breakdown categories	Budgeted costs in €*	Costs incurred from the start date to 30/04/2018 in €	% of Budget**
1. Personnel	2.061.181,00	1.013.730,46	49%
2. Travel and subsistence	270.821,00	41.260,46	15%
3. External assistance	1.309.611,00	285.709,10	22%
4. Durable goods		-	

Infrastructure	852.485,00	308.888,46	36%
Equipment	165.612,00	53.580,29	32%
Prototype	56.606,00	10.834,69	19%
5. Land purchase / long-term lease		-	
6. Consumables	371.551,00	40.211,55	11%
7. Other Costs	106.740,00	36.148,01	34%
8. Overheads	345.878,00	114.963,00	33%
TOTAL	**5.540.485,00**	**1.905.326,02**	**34%**
	60% Co-financing	1.143.195,61	

Table 9. Summary of budget implementation by project action, including the budgeted costs and hours and proportions of them that have already been spent. This last one calculates the percentages by budget lines: e.g. the % of the budgeted personnel costs that were actually incurred

Action number and name	**Budgeted costs**	**Budgeted days**	**% of Budget spent**
A.1 – Completing and updating of baseline characterization	373.043,00	1803	122%
A.2 – Compilation, structuring and implementation of national database and multi-user web platform	89.310,00	419	64%
A.3 - Project implementation, licensing, procurement of permits and contracting procedures necessary to actions C	174.075,00	830	35%
A.4 - Development, testing and evaluation of automated systems of monitoring and/or deterrence	85.535,00	584	53%
A.5 - Installation of autochthonous plant nursery for conservation actions	51.693,00	240	42%
A.6 - Development of prototypes for deterring avifauna in medium voltage lines	31.780,00	200	0%
A.7 - Elaboration and approval of Internal Standards of guidance to support management in post-project	13.839,00	63	0%
C.1 - Integrated Mitigation of the reduction of conductivity and permeability of the landscape in national and principal roads.	660.090,00	444	19%
C.2 - Potentiation of the verges and marginal parcels of roads infrastructures as shelter areas, refuge, food and / or displacement.	517.746,00	472	20%
C.3 - Development and installation of vertical road traffic signs	5.678,00	19	55%
C.4 - Mobile Application to promote the collect of mortality data	59.472,00	315	47%
C.5 - Testing devices for deterring avifauna landing in medium voltage lines	115.372,00	612	0%

C.6 - Development, essay and application of biodiverse grasslands to promote biodiversity in linear infrastructures	259.299,00	934	42%
C.7 - Mitigation measures and potentiation of roads in Évora municipality	680.578,00	1.247	16%
C.8 - Mitigation measures and potentiation of roads in Montemor-o-Novo municipality	522.014,00	626	57%
C.9 - Operations in plant nursery to the conservation actions	66.031,00	1.014	30%
C.10 - Promotion of "islands" of Biodiversity along the power lines	71.047,00	354	63%
D.1 - Monitoring / evaluation of socio-economic effects of the project	25.400,00	180	28%
D.2 - Monitoring / evaluation effects of the project on ecosystem functions	26.520,00	180	0%
D.3 - Monitoring / evaluation of the effects / impacts of conservation measures	548.571,00	3.379	8%
E.1 - Communication Plan - Project website	19.132,00	0	26%
E.2 - Communication Plan – Outdoors in the intervention areas	21.483,00	0	21%
E.3 - Communication Plan - Public disclosure sessions and contacts with the media	49.856,00	0	51%
E.4 - Communication Plan - Complementary works and materials	16.337,00	0	139%
E.5 - Awareness and involvement of the academic community in collecting information/data.	5.331,00	10	76%
E.6 - Training / Dissemination with the stakeholders	31.537,00	0	71%
E.7 - Networking with other LIFE and not LIFE projects	15.600,00	0	49%
E.8 - Volunteer Program for young people	131.904,00	205	9%
E.9 - Technical seminars to present the developments and results of the project	49.454,00	0	19%
E.10 - "Adopt a road", environmental educational/awareness program with local schools	132.672,00	685	40%
E.11 - Layman Report	5.000,00	0	0%
F.1 - Project management	288.480,00	900	54%
F.2 - Compilation and Structuring the Indicators of Development of the project	10.248,00	60	4%
F.3 - External audit	28.158,00	90	0%
F.4 - Conservation Plan and Post-LIFE Communication	12.322,00	18	0%
Overheads	345.878,00		35%
TOTAL	**5.540.485,00**	**15.883,00**	

*) If the EASME has officially approved a budget modification through an amendment, indicate the breakdown of the revised budget. Otherwise this should be the budget in the original grant agreement.
**) Calculate the percentages by budget lines: e.g. the % of the budgeted personnel costs that were actually incurred

Tabela 10. Summary of budget implementation by project action and cost category, including the budgeted costs and days and proportions of them that have already been spent.

Action number and name	Personnel	Travel	External assistance	Infraestructures	Equipment	Prototype	Consumables	Other	Total
A.1 – Completing and updating of baseline characterization	386.278,12	23.698,3	8.340,9	0	12.207,27	0	13.956,96	10.546,02	455.027,56
A.2 – Compilation, structuring and implementation of national database and multi-user web platform	27.499,81	220,82	27.994,8	0	0	0	1.841,31	0	57.556,732
A.3 - Project implementation, licensing, procurement of permits and contracting procedures necessary to actions C Action A.3 – in progress	60.942,51	288,23	0	0	0	0	0	0	61.230,73
A.4 - Development, testing and evaluation of automated systems of monitoring and/or deterrence	25.984,87	1.775,12	4.825	0	1.006,7	10.834,69	0	904,06	45.330,44
A.5 - Installation of autochthonous plant nursery for conservation actions	5.251,55	66	0	14.501,78	1.857,14	0	0	0	21.676,47
A.6 - Development of prototypes for deterring avifauna in medium voltage lines	0	0	0	0		0	0		0
A.7 - Elaboration and approval of Internal Standards of guidance to	0	0	0	0	0	0	0	0	0

support management in post-project									
C.1 - Integrated Mitigation of the reduction of conductivity and permeability of the landscape in national and principal roads.	18.723,22	2.270,3	98.034,83	0	6.469,32	0	516,6	328,42	126.342,69
C.2 - Potentiation of the verges and marginal parcels of roads infrastructures as shelter areas, refuge, food and / or displacement.	63.697,65	1.775,56	39.744,68	0	295,12	0	0	0	105.513,01
C.3 - Development and installation of vertical road traffic signs	841,21	0	2.260,92	0	0	0	0	0	3.102,13
C.4 - Mobile Application to promote the collect of mortality data	25.170,61	160,51	2.424,95	0	0	0	0	0	27.756,07
C.5 - Testing devices for deterring avifauna landing in medium voltage lines	0	0	0	0	0	0	0	0	0
C.6 - Development, essay and application of biodiverse grasslands to promote biodiversity in linear infrastructures	64.069,88	1.544,29	856,08	0	24.188,01	0	6.388,39	12.804,89	109.851,53
C.7 - Mitigation measures and	55.393,30	253,41	4305	47.869,99	473,34	0	0	0	108.295,04

potentiation of roads in Évora municipality									
C.8 - Mitigation measures and potentiation of roads in Montemor-o-Novo municipality	50.691,37	333,37	0	246.516,09	830,54	0	0	0	298.371,37
C.9 - Operations in plant nursery to the conservation actions	15.409,40	845,03	0	0	1.308	0	14,26	2.214	19.790,69
C.10 - Promotion of "islands" of Biodiversity along the power lines	39.759,10	859,43	1.000	0	902,28	0	2.043,71	0	44.564,52
D.1 - Monitoring / evaluation of socio-economic effects of the project	7.199,84	0	0	0	0	0	0	0	7.199,84
D.2 - Monitoring / evaluation effects of the project on ecosystem functions	0	0	0	0	0	0	0	0	0
D.3 - Monitoring / evaluation of the effects / impacts of conservation measures	30.827,02	626,29	0	0	2.260,51	0	7.262,51	583,64	41.559,96
E.1 - Communication Plan - Project website	915,09	0	4.126,42	0	0	0	0	0	5.041,51
E.2 - Communication Plan – Outdoors in the intervention areas	0	0	4.126,42	0	390,18	0	0	0	4.516,60
E.3 - Communication Plan - Public disclosure sessions and contacts with the media	1.099,73	0	24.175,62	0	0	0	0	0	25.275,35

E.4 - Communication Plan - Complementary works and materials	0	0	22.761,53	0	0	0	0	0	22.761,53
E.5 - Awareness and involvement of the academic community in collecting information/data.	1.625,80	179,36	2.260,92	0	0	0	0	0	4.066,08
E.6 - Training / Dissemination with the stakeholders	0	0	22.310,12	0	0	0	0	0	22.310,12
E.7 - Networking with other LIFE and not LIFE projects	4.766,44	2.162,01	0	0	0	0	0	719	7.647,45
E.8 - Volunteer Program for young people	0	0	9.073,46	0	0	0	2.518,82	136	11.728,28
E.9 - Technical seminars to present the developments and results of the project	1.551,33	387,76	521,52	0	0	0	57,56	6.783,23	9.301,4
E.10 - “Adopt a road”, environmental educational/awareness program with local schools	47.246,52	0	0	0	0	0	5.550,63	0	52.797,15
E.11 - Layman Report	0	0	0	0	0	0	0	0	0
F.1 - Project management	147.687,53	3.709,69	2.260,92	0	1.391,89	0	60,8	478,65	155.589,47
F.2 - Compilation and Structuring the Indicators of Development of the project	384,16	0	0	0	0	0	0	0	384,16
F.3 - External audit	0	0	0	0	0	0	0	0	0

F.4 - Conservation Plan and Post-LIFE Communication	0	0	0	0	0	0	0	0	0
Overheads		0	0	0	0	0	0	0	121.264,79
TOTAL									1.975.852,68

8.2. Accounting System

Each beneficiary creates a "Center of Cost" in their own accounting system to allow a clear monitoring of the expenses and revenues associated with the project. All the beneficiaries maintain the originals of the documents, to a period of 5 years. The financials documents of all the beneficiaries (invoices, receives, etc) are in a Google drive created for LIFE LINES and regularly updated. All the procedures with personnel costs, travel, equipment, consumables, external assistance, other costs have the reference of the project LIFE14 NAT/PT/001081. In the first meeting of CTAG (14th September 2015) these procedures were approved and applied since then. These procedures are described in Annex LII.
The University of Évora uses an integrated management system, called SIAG - AP (Integrated Management Support System - Public Administration). This system has a Center of Cost clearance module, where each of the University projects is created individually.
All expenses are authorized higher, in accordance with the delegation of powers inside the University, even though they are carried out under funded projects. Each expenditure of UEVORA is sent by the project coordinator. Expenses from other beneficiaries are sent by them to UEVORA LIFE LINES administrative supervisor every three months and are included in the project cost center. The entire process, up to the final stage, including invoice, is therefore allocated to the LIFE project concerned. With regard to personnel costs, the investigative timesheets of each researcher, in the approved and current model, are sent monthly to the University Administrative Services.
The same procedures are utilized by IP and other public organisms (municipalities and universities) that are regulated by the same mandatory procedures. With the exception MARCA-ADL, which is a non-public body, that has their own internal rules.

9. Envisaged progress until next report (this section should be included only for the Mid-term report)

An essential part of the nuclear part of LIFE LINES, the conservation actions, must be completed until the next report. This include all the construction or adaptation work, installation of devices and signalling. Despite the number of records in the roadkill database (A.2) has already exceeded the predicted, the database will continue to be updated. We hope to be able to convince other roadkill data holders to include it in the database. The app (C.4) will be fully operational and we think it will be a main driver to pull up many E actions goals and associated indicators. The launch of the app will also support a higher visibility to the project than until now. New mechanical part and basic software of automatic and robotic solutions (A.4) are ready. However, the tests are showing that a larger period than predicted is necessary to achieve operational prototypes (particularly in the software) which can be used by the project and others. Thus, we predicted a strong engagement on testing these prototypes until the next report. Also monitoring (Actions D) will be largely reinforced in the next months with a stronger

evaluation of socio-economic indicators (D.1); beginning of ecosystem function monitoring (D.2); and entry in force of monitoring of the conservation measures impacts.

Table VII. Gantt table. Summary of the foreseen (grey) and actual (brown) progress for each action. Red thick line shows actual project time
* means action in reformulation that depend on amendment approval by EASME/Commission; X - Progress report; O - Midterm/Final Report.

Action			2015		2016				2017				2018				2019				2020			
Action number	Name of the action		3T	4T	1T	2T	3T	4T	1T	2T	3T	4T	1T	2T	3T	4T	1T	2T	3T	4T	1T	2T	3T	4T
Overall project Schedule		Proposed			X						X			O				X						O
		Actual			X						X			O				X						O
A. Preparatory actions, elaboration of management plans and/or of action plans																								
A.1	Completing and updating of baseline characterization	Proposed																						
		Actual																						
A.2	Compilation, structuring and implementation of national database and multi-user web platform	Proposed																						
		Actual																						
A.3	Project implementation, licensing, procurement of permits and contracting procedures necessary to actions C	Proposed																						
		Actual																						
A.4	Development, testing and evaluation of automated systems of monitoring and / or deterrence	Proposed																						
		Actual																						
A.5	Installation of autochthonous plant nursery for conservation actions	Proposed																						
		Actual																						
A.6*	Development of prototypes for avifauna deterrence in medium voltage power lines	Proposed																						
		Actual										*	*	*	*									
A.7	Development and adoption of internal guidelines to support the management in post-project	Proposed																						
		Actual																						
C. Concrete conservation actions																								
C.1		Proposed																						

Action			2015		2016				2017				2018				2019				2020			
Action number	Name of the action		3T	4T	1T	2T	3T	4T	1T	2T	3T	4T	1T	2T	3T	4T	1T	2T	3T	4T	1T	2T	3T	4T
	Integrated mitigation of connectivity reduction and landscape permeability by national roads and other main roads	Actual																						
C.2	Potentiation of verges and other road marginal patches as shelter, food and / or corridors	Proposed																						
		Actual																						
C.3	Development and installation of vertical road traffic signs	Proposed																						
		Actual																						
C.4	Mobile app to promote roadkill data collection	Proposed																						
		Actual																						
C.5*	Test of devices for deterring bird landing in medium voltage power lines	Proposed																						
		Actual													*	*	*	*						
C.6	Development, testing and application of biodiverse seed mixtures to promote plant biodiversity in the surroundings of linear infrastructures	Proposed																						
		Actual																						
C.7	Mitigation and potentiation measures in Évora municipality routes	Proposed																						
		Actual																						
C.8	Mitigation and potentiation measures in Montemor-o-Novo municipality routes	Proposed																						
		Actual																						
C.9	Plant nursery operation for conservation actions	Proposed																						
		Actual																						
C.10		Proposed																						

Action			2015		2016				2017				2018				2019				2020			
Action number	Name of the action		3T	4T	1T	2T	3T	4T	1T	2T	3T	4T	1T	2T	3T	4T	1T	2T	3T	4T	1T	2T	3T	4T
	Promotion of biodiversity "islands" along powerlines paths	Actual																						
D. Monitoring of the impact of the project actions																								
D.1	Monitoring / evaluation of socio-economic impacts of the project	Proposed																						
		Actual																						
D.2	Monitoring / evaluation of the project impacts on ecosystem functioning	Proposed																						
		Actual																						
D.3	Monitoring / evaluation of project conservation actions effects / impacts	Proposed																						
		Actual																						
E. Public awareness and dissemination of results																								
E.1	Communication Plan - Project Website	Proposed																						
		Actual																						
E.2	Communication Plan - Placards/Outdoors in intervention areas	Proposed																						
		Actual																						
E.3	Communication Plan - Public disclosure sessions and contacts with the media	Proposed																						
		Actual																						
E.4	Communication Plan - Complementary works and materials	Proposed																						
		Actual																						
E.5	Awareness and integration of the academic community in data/information collection	Proposed																						
		Actual																						
E.6	Training / dissemination among stakeholders	Proposed																						
		Actual																						

Action			2015		2016				2017				2018				2019				2020			
Action number	Name of the action		3T	4T	1T	2T	3T	4T	1T	2T	3T	4T	1T	2T	3T	4T	1T	2T	3T	4T	1T	2T	3T	4T
E.7	Networking with other LIFE and non-LIFE projects	Proposed																						
		Actual																						
E.8	Young and institutional volunteer program	Proposed																						
		Actual																						
E.9	Technical seminars for presentation of project developments and results	Proposed																						
		Actual																						
E.10	"Adopt a road", environmental educational/awareness program with local schools	Proposed																						
		Actual																						
E.11	Layman report	Proposed																						
		Actual																						
F. Project management and monitoring of project progress																								
F.1	Project management	Proposed																						
		Actual																						
F.2	Structuring and compilation of project development indicators	Proposed																						
		Actual																						
F.3	External audit	Proposed																						
		Actual																						
F.4	Post-LIFE conservation and communication plan	Proposed																						

10. References

European Commission (2013). Building a Green Infrastructure for Europe. Luxembourg: Publication Office of the European Union, 24pp.