



Population level management and conservation of brown bears in northern Dinaric Mountains and the Alps

Project LIFE13 NAT/SI/000550 - LIFE DINALP BEAR

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PROJECT DETAILS

Project title:

Population level management and conservation of brown bears in northern Dinaric Mountains and the Alps

Project acronym:

LIFE DINALP BEAR

Time frame:

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Finished: 30/06/2019

Coordinating beneficiary:

Zavod za gozdove Slovenije (Ljubljana, Slovenia)

Associated beneficiary:

University of Ljubljana (Ljubljana, Slovenia)

Veterinarski fakultet, Sveučilište u Zagrebu (Zagreb, Croatia)

Autocesta Rijeka-Zagreb d.d. (Zagreb, Croatia)

Provincia Autonoma di Trento - Servizio Foreste e Fauna (Trento, Italy)

Regione del Veneto - Unità di Progetto Caccia a Pesca (Mestre, Italy)

Research Institute of Wildlife Ecology, University of Veterinary Medicine, Vienna (Vienna, Austria)

Eurofins Erico Slovenija d.o.o. (Velenje, Slovenia)

Progetto Lince Italia (Tarvisio, Italy)

Total project budget:

Total eligible project budget: 5,987,478 Euro

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Project webpage and social media:

<https://dinalpbear.eu/>

<https://varna-pasa.si/>

<https://discoverdinarics.org/>

@dinalpbear (FB page LIFE DINALP BEAR)

The LIFE programme is the EU's funding instrument for the environment. The general objective of LIFE is to contribute to the implementation, updating and development of EU environmental policy and legislation by co-financing pilot or demonstration projects with European added value.

Website: <http://ec.europa.eu/life>

Table of contents

PROJECT DETAILS.....	2
Abbreviations	4
ABOUT THE LIFE DINALP BEAR PROJECT	5
SIGNIFICANCE AND IMPACT OF THE LIFE DINALP BEAR PROJECT	6
THREATS	7
SWOT ANALYSIS	10
AFTER LIFE CONSERVATION PLAN	15
Transboundary management and monitoring.....	15
Conflict mitigation.....	16
Communication and coexistence promotion.....	18

Abbreviations

LC – large carnivore

LGD – livestock guarding dog

BiH – Bosnia and Herzegovina

WISO Platform – Large Carnivores, Wild Ungulates and Society Platform

FIWI – Research Institute of Wildlife Ecology, University of Veterinary Medicine, Vienna

FVM – Faculty of Veterinary Medicine, University of Zagreb

PLI – Progetto Lince Italia

PAT – Provincia Autonoma di Trento

RVEN – Regione del Veneto

UL – University of Ljubljana

SFS – Slovenia Forestry Service

ARZ – Autocesta Rijeka-Zagreb d.d.

MOP – Slovenian Ministry for Environment and Spatial Planning

ARSO – Slovenian Environment Agency

ZRSVN – Slovenian nature protection agency

DARS – Družba za avtoceste v Republiki Sloveniji (company for Slovenian highways)

SZ – Slovenian railways

DRSI – Slovenian infrastructure agency

MKGP – Slovenian Ministry for Agriculture, Forestry and Food

KGZS – Kmetijsko gozdarska zbornica Slovenije (Slovenian farmers and foresters chamber)

MA – Croatian Ministry of Agriculture

MNPE – Croatian Ministry of Nature protection and Energetics

RDP – Regional Development fund

ABOUT THE LIFE DINALP BEAR PROJECT

The main goals of the project were threefold: (1) to facilitate the transition from local-scale practices to population-level conservation, monitoring and management of brown bear in the northern Dinaric mountains and the south-eastern Alps, (2) to decrease human-bear conflicts and promoting better coexistence, and (3) to promote natural expansion of Brown bears from Dinaric Mts into the Alps. The project was addressing the complex and diverse challenges of brown bear conservation in the human-dominated, politically and physically fragmented landscape of Northern Dinaric mountains and the Alps. Bears in the project area belong to Alpine (smaller, isolated population) and Northern Dinaric (larger, part of the Dinaric-Pindos bear population) populations. However, dispersal between them is very limited (absent, so far, from the larger to the smaller population) and subsequently the natural recolonization process of the Alpine area remains slow. Habitat fragmentation and low human tolerance of bears in the areas where bears have been absent for many decades are not benefiting the establishment of a stronger connection between the populations. What is more, the management of these bear populations follows contrasting goals that reflect local-level interests and lack support from efficient population-level monitoring. The fragmentation of management provides a poor basis for a long-term conservation of the species. Insufficient human-bear conflict mitigation measures, traffic related mortality and poor understanding of value of brown bear are also threats that are preventing successful natural expansion of bears to the Alps. The LIFE DINALP BEAR project actions were designed to tackle these threats step-by-step. The most important conservation and communication actions, which also represent the basis of the After LIFE Conservation Plan, are following the main objectives of:

- Adopting national/regional brown bear management plans in all partnering countries that incorporate Common Guidelines for population-level brown bear management
- Implementing a complex, transboundary, science-based surveillance of the bear population
- Decreasing human-bear conflict with efficient mitigation measures in conflict hot-spots and with 2 new fully operational intervention groups (in Italy and Croatia)
- Minimizing further fragmentation and urbanization of bear habitat with integration of new knowledge on habitat suitability and connectivity into spatial planning
- Decreasing traffic caused bear mortality on railways, highways and regional roads
- Promoting responsible non-consumptive use of brown bear by creating new ecotouristic programmes
- Adaptation of the practice of artificial feeding of bears to enhance its positive effects and decrease the negative
- Promoting added value of products and services created using best human-bear coexistence practices (“Bear-friendly” label)
- Improving knowledge and awareness on causes of conflicts and solutions and about the value of bears

The expected long-term effects of the project are presented in this “After LIFE Conservation Plan” which aims to secure population-level brown bear management, ensure the connection between the Dinaric and the Alpine areas and further promote human-bear coexistence.

SIGNIFICANCE AND IMPACT OF THE LIFE DINALP BEAR PROJECT

In five years, LIFE DINALP BEAR project successfully joined four countries that host the Alpine and Northern Dinaric brown bear population and created a harmonized population-level guidelines for brown bear management, monitoring and conservation. This was the first attempt to pave the way for creation of a Dinaric-Alpine metapopulation from the management perspective. The project represents a good example for other European countries facing similar issues and had been used as a reference project of their own (e.g. LIFE Amybear, LIFE Ursuslife, Interreg Carnivora Dinarica). Despite a detected increase of Northern Dinaric and Alpine bear populations, the conflict rate in hot-spots did not increase, as well as the number of traffic-related bear mortality and the number of interventions. The innovative approaches developed within the project for promoting coexistence (efficient mitigation measures, ecotouristic opportunities) have been accepted in the local environment and the tolerance towards bears remained on a sufficient level. In the After LIFE Conservation Plan, we outline the means to further maintain these achievements.



THREATS

1. Human-bear conflicts and insufficient conflict mitigation measures

While much of the project area is covered by well-preserved natural landscapes that form some of the best brown bear habitat in Central Europe, it is still human-dominated. Considerable human-bear conflicts have been an ever-present reality, and at least in some parts of the study area the number of these conflicts were on the rise. The prevalent mitigation measures used to deal with this problem were culling of the bear population, removal of problem bears and damage compensations, while prevention was scarce. Except of the latter, these measures, while mitigating some consequences of the conflicts, are not effective in their prevention. Therefore, we designed and implemented innovative robust bear proof compost bins and garbage bins in conflict hot spots (Action C.1, based on action A.1) which prevent bears to access anthropogenic food near settlements. We held several communication activities for local communities to introduce the new measures and insure their proper use. To reduce damage cases (Action C.2), we distributed electrified fences to farmers and beekeepers in Slovenia and Italy. We also started collaborating with livestock-guarding dog (LGD) breeders and distributed pups to farmers in Slovenia and Italy. The project team have supported the adoption of new equipment and dogs through the process with advice, field controls and promotion. The different conflict mitigation measures were monitored via camera traps and were shown highly effective. We also captured bears for telemetry in conflict hot-spots and helped to manage bears in critical situations. The telemetry data provided new insights on the underlying reasons for bear conflict behaviour (Action D.1).

2. Management fragmentation and poor transboundary cooperation in brown bear monitoring and management

Brown bear is a species with large spatial demands; any population of this species will need to span over several national borders if its size is to approach the long-term viability thresholds. On the other hand, management and monitoring efforts ended at national or even regional borders, causing “management fragmentation”. The situation was as local-scale management efforts frequently had uncoordinated, or even conflicting management goals. The level of transboundary cooperation in management and conservation of the bear in our study area was generally poor. With LIFE DINALP BEAR project, it was possible to prepare Common Guidelines for population-level brown bear management (Action A.6) and include them in revised national management plans in Slovenia and Croatia, as well as extend them on the entire Alpine area through WISO platform and to Bosnia and Hercegovina (BiH) through their own responsible public bodies. The inclusion of guidelines to Slovenian and Croatian management plan was performed with participative approach to ensure its acceptance and comprehension among different stakeholders. Moreover, monitoring of bear conservation status was established and optimized (Action C.5) combining multiple sources of data (genetic data, count data, health status and damage records) from all participating countries which are available in different resolutions to experts and public through an internet based geo-database (action C.8). The geo-database is highly transferable to other species, can receive additional data from other interested institutions and is replicable to any other international management model at the population level.

3. Obstacles to brown bear population expansion are limiting long-term population viability and evolutionary potential

We obtained a new estimate of effective population size of the bear population in Northern Dinaric Mountains and it is evident that the population has doubled from 1990 to 2015 (Action C.5). However, we also found that the differences in bear management considerably affect genetic structure of Slovenian-Croatian bears and that Slovenian bears have a much lower effective population size. Since population density has in many areas reached or exceeded the social carrying capacity, the only way to ensure this long-term viability is by spatial expansion. The obvious expansion route is to the north and west, but there are serious obstacles, including fragmented habitat, traffic infrastructure and low people's tolerance. During the project, we detected an increase in the number of bears, including females with cubs, in the Slovenian pre-Alpine area which indicated continuous dispersal of bears from Dinarics towards the Alps. We believe that the long-term goal of connecting Northern Dinaric population with the isolated population in Trentino, Italy can be reached, however slower than expected.

4. Poor understanding of the value of brown bears, exaggerated perception of bear attack risks and consequently lower tolerance of bears

With surveys in the bear core areas, we found that social carrying capacity for bears has been reached in Slovenia and that Italians are willing to tolerate most conflict situations (Action A.2). The most important drivers of the decrease in the human tolerance are frequent human-bear conflicts, and fear for personal safety. That is problematic especially in the areas where bears have been gone for a century or more. Fear for personal safety originates in large part from ignorance and misinformation, and is exacerbated by sensationalistic media reports. There is little awareness of the ecological value of large carnivores, and although the brown bear is an iconic species that is attracting more and more eco-tourists to this region, its potential for promotion of the region or local products is overlooked. The project thus put a strong emphasis on education and awareness raising. We widely distributed brochures, leaflets, posters, handbooks, educational kits and games; we set up information boards and organized local events, workshops and a photo contest. We worked intensively with media and issued press releases, e-news and social media posts, published popular articles and responses to misleading or biased news (E actions). We have supported all conflict mitigation activities with strong communication activities. We improved the work of existing and new bear intervention groups with defining a strict protocol and organizing special training camps. We held educational seminars for damage inspectors and updated the handbook they use for inspections. All events triggered high interest and we received positive responses from the participants. The surveys at the end of the project showed that the attitude of people towards bears in the Dinaric Mts remained high during the project.

5. High traffic-related bear mortality

Increasingly high numbers of bears were killed every year on roads and railways in the study area. These accidents affect population dynamics and have the potential to slow down the expansion of the population towards the Alps. High-speed vehicle collisions, especially on highways, also present a serious risk to public safety. This risk was addressed with devising and installing specific mitigation measures which reduced traffic-related bear mortality at highways, roads and railways for over 50% (Actions C.4 and D.2).

6. Increasing fragmentation of habitat caused by expanding traffic infrastructure and urbanization

With habitat suitability and connectivity models (action A.3) we showed that the bear habitat in Northern Dinaric Mts and the Alps is sufficient, however highly fragmented. Even the largest forest complexes are relatively small from the bear perspective, and survival of the population depends on their connectivity. Several important habitat corridors for bears were recently disrupted by growing urbanization and traffic infrastructure, and the risk is becoming more and more severe. Although environmental impact assessments (EIA) need to be performed, they rarely consider large carnivores. It seems that institutions preparing EIA's often lack the materials and knowledge required to appropriately address fragmentation-related threats to bears. Therefore, we incorporated the new knowledge on bear habitat suitability and connectivity into a handbook for spatial planners (Action C.3). We disseminated the handbook at specific seminars where high interest for the topic was evident. The handbook represents an important addition to the information used during environmental impact assessments of planned infrastructure.

7. Depletion of wild ungulate carcasses available to bears

Bear diet analyses indicated that carrion represents an important part of the bear diet (Action A.5). However, large part of wild ungulates that die in nature are being taken out of the ecosystem by people and are consequently not available to bears and other scavengers that are vital for normal ecosystem functioning. Instead of the ungulates killed in vehicle collisions being burnt, they were transported to the artificial feeding sites for bears and monitored with automatic cameras (Action C.7). We found preference of bears over carrion only happens in years with overall low natural food availability, i.e. when other protein rich food sources in the nature were likely very low, except in a rich beech nut year. Wild ungulate carcasses can thus represent an important source of food for bears and should be left in the nature.

SWOT ANALYSIS

We have used a structured planning method called SWOT analysis to evaluate the strengths, weaknesses, opportunities and threats at the end of the project. The analysis allows the identification of internal and external factors that are favourable or unfavourable to achieve a certain objective or a goal.

The overall goal of the LIFE DINALP BEAR project was to establish a more strategic and territorial approach to the conservation, monitoring and management of brown bear in northern Dinaric mountains and south-eastern Alps. Moreover, we aimed to decrease human-bear conflicts and promote coexistence as well as promote natural expansion of brown bear from Dinaric mountains into the Alps.

As a result of the project structure and its objectives, the SWOT analysis was first carried out separately for each of the concrete conservation and awareness raising actions in the project. After that, an overarching SWOT matrix following the three main project objectives was produced (below).

	HELPFUL	HARMFUL
	STRENGTHS:	WEAKNESSES:
INTERNAL ORIGIN	<p>Transboundary management and monitoring</p> <ol style="list-style-type: none"> 1. common guidelines for population level brown bear management represented a basis for national management plans - this was the first effort to harmonize bear management at a population level 2. a handbook for EIA agencies in SLO and CRO is based on research using state of the art methodology and excellent data; robust results are presented in high quality maps about bear habitat suitability and connectivity which are easy to interpret 3. extensive genetic sampling (involving hunters and foresters) and next generation sequencing (NGS) methodology resulted in highest precision of estimated population size; a solid methodological foundation and a best practice example were provided for long-term population monitoring 4. the online geo-database offers easy and efficient data exchange among institutions and countries; summary data available to public and journalists; interactive data visualisation 5. guidelines for population level monitoring provide a template for transboundary collaboration in brown bear monitoring 	<p>Transboundary management and monitoring</p> <ol style="list-style-type: none"> 1. not all agencies performing EIA were reached, handbook for EIA agencies was disseminated only at workshops and project webpage; the maps were not included in standard online materials that are used during EIA 2. population modelling system provides solutions that should not be overtrusted due to the predictions and uncertainties underlying in any modelling approach 3. the geo-database was designed in a very wide sense and its development took a lot of time; additional active promotion is needed

<p>Conflict mitigation</p> <ol style="list-style-type: none"> 1. the map of conflict hot spots guided the implementation of mitigation measures which were well accepted 2. 2 new bear intervention groups (BIGs), in CRO and IT, were established, trained and will remain operational under the common international protocol for BIG; the protocol also enables data comparison and understanding of conflict dynamics 3. the collared bears provided valuable data about habitat use and conflict behaviour; it also provided opportunity for constant monitoring and solving of critical situations 4. functional and well accepted bear proof garbage bins were implemented at more locations than foreseen, the design is freely available online and the bins can be produced at home; project partners and local experts communicated (at workshops or individually) and controlled proper use and maintenance during the entire project 5. electric fences along the highway, the dynamic traffic signs and acoustic deterrents at black spots of traffic related bear mortality significantly decreased bear mortality; they are regularly maintained by contracted institutions 6. dog owners in IT (PAT) established a LGD Association that will guarantee a good continuation in the management of dogs 7. based on project positive experience, Slovenian Environmental Protection Agency (ARSO) decided to subsidize high electric fences to whom suffered damage 	<p>Conflict mitigation</p> <ol style="list-style-type: none"> 1. the map of conflict hot spots shows the situation in a particular time frame; it may change in time 2. no bears were equipped with collar (and thus telemetry data gathered) in Veneto, Italy, due to lack of bear presence 3. maintenance of the implemented measures in traffic was more demanding than expected 4. additional interest from communities that did not receive fully funded bear proof compost bins/garbage bins could not be addressed due to diminished funds 5. we do not know about species-specific consumption and the effective availability of wild ungulate carrion 6. bear feeding sites were monitored for only 2 seasonally very different years; the results per-se cannot be used to explain the occurrence of bear-human conflicts
<p>Communication and coexistence promotion</p> <ol style="list-style-type: none"> 1. the survey of people's attitudes to bears provided objective description of the social climate and was used to inform project communication efforts and decision making at the administrative level; the survey was designed so it may be repeated at any time and the results compared 2. communication plan was a live document and was updated constantly; it provided a platform for communication skills capacity building 	<p>Communication and coexistence promotion</p> <ol style="list-style-type: none"> 1. survey of people's attitudes is time-consuming; it is difficult to get representative samples of inhabitants in some countries, so external companies with panel samples had to be used 2. communication plan was sometimes challenging to implement due to lack of time; project team is not used to using a communication strategy and sometimes ad hoc solutions were implemented; difficult to assess the effects

	<ol style="list-style-type: none"> 3. awareness raising activities, publications, boards and educational tools resulted in knowledge gained and shared within; info points represented a novel tool to reach a broad audience at chosen venues 4. skills and knowledge of officials working with human-bear conflicts were improved 5. eco-touristic guidelines lay out specific do's and don'ts for tourism operators offering bear tourism programs 6. bear friendly label has a potential to promote regional and local products as well as damage prevention measures and responsible tourism practices; all certified business are presented at discoverdinarics.org portal 7. FB profile and project web page are widely recognised, especially in SLO, and will remain the main communication platform 8. evaluation of media pieces showed how the project achievements were portrayed and how the public attitudes changed 9. networking with other projects/institutions working with bears created good practice exchange and project result dissemination; enabled easier internal capacity building 	<ol style="list-style-type: none"> 3. no activities done with pro nature, animal and environmental organizations; there is a lack of knowledge what are their needs and how to approach them 4. limited founding for further maintenance of info points and dissemination activities; that may lead to passive relationship with the public and the media 5. limited funding and human resources make promotion of discoverdinarics.org portal difficult in the competitive tourism market 6. the bear friendly label only appeals to those that already have some preference towards LC <p>many communication and networking activities were unforeseen in the project proposal thus making them often very difficult to implement due to lack of resources</p>
EXTERNAL ORIGIN	OPPORTUNITIES:	THREATS:
	<p>Transboundary management and monitoring</p> <ol style="list-style-type: none"> 1. the established protocol for BIGs and the guidelines for officials working with bear-human conflict can be used in other countries (as it was already in BiH) 2. common guidelines for bear management were extended to entire Alpine area through WISO and adopted in BiH 3. interest for the handbook for spatial planning has already been shown; it can be further disseminated opportunistically and via other projects 4. population modelling system provides a novel, innovative tool for bear management; it can be used for other populations and species and has as such considerable transferability, replicability and demonstration value 	<p>Transboundary management and monitoring</p> <ol style="list-style-type: none"> 1. common guidelines for population-level management are not yet fully incorporated in the national management plan - the SLO government did not yet adopt the national strategic documents 2. the absence of lethal bear management in Italy may cause low level of acceptance 3. maps of bear habitat suitability and connectivity cannot be improved in resolution; maps are not published as shape files together with other publicly available environmental data which is used for EIA studies 4. geo-database needs to be constantly updated, maintained and adjusted; needs constant supervision by data administrators

<p>5. the online geo-database will be transferred to other species, other institutions can join with data sharing and it can be replicated to any other international population-level management model</p> <p>1. population level monitoring guidelines provide a transboundary monitoring template both in the countries involved in this project as well as in the wider Dinaric - Pindos bear population, hopefully transcending in the long-term the boundaries of this project and the EU</p> <p>genotyping by high-throughput sequencing, which we were the first in the world to use in a real-life wildlife study, holds incredible promise for genetic monitoring of brown bears and other species in terms of speed, replicability, compatibility between laboratories and lower costs</p>	<p>5. population level monitoring guidelines still need to be fully implemented in national monitoring schemes</p> <p>6. results of genotyping by high-throughput sequencing, while robust and completely transferable between laboratories, are difficult to combine with old data obtained by other methods</p>
<p>Conflict mitigation</p> <p>1. map of conflict hotspots can be updated with new data</p> <p>2. successfully implemented mitigation measures may be expanded on other areas where conflicts occur; proper and consistent use and maintenance can be promoted and controlled; irregularities can instantly be improved and removed to ensure better user experience and bear-proofness of the measure</p> <p>3. reduced bear mortality in traffic can induce new/additional measures being implemented at a national level</p> <p>4. wildlife carrion should be left in the forest as it brings important benefits for bears and other scavenging species</p>	<p>Conflict mitigation</p> <p>1. damage prevention equipment will need to be replaced after some years</p> <p>2. bear-proof equipment will need maintenance; if more sites will not be equipped, the effect of the action will be too small on the wider scale</p> <p>3. If measures reducing traffic mortality are not maintained properly, the measures will not be operational</p> <p>4. misinterpretation of the recommendations for leaving carrion in the nature; carrion derived from predation of LC is sometimes transported to feeding sites</p>
<p>Communication and coexistence promotion</p> <p>1. the results of the survey about people's attitudes about bears can be used for management decisions and provides a good baseline for potential future monitoring efforts</p> <p>2. an effective communication plan may be used in other LIFE projects and be evaluated "on the go"</p> <p>3. bear friendly label has a potential to be developed as a certified collective label, strengthening the cooperation among bear friendly ambassadors</p>	<p>Communication and coexistence promotion</p> <p>1. results of the survey about people's attitudes to bears can be used selectively to promote certain interests</p> <p>2. dissemination of project outputs becomes very passive and limited due to lack of funding and personnel</p> <p>3. communication between institutions, with bear friendly ambassadors and with key interest groups after the end of project deteriorates due to lack of funding</p> <p>4. limited funding for marketing tourism programs after the project</p>

<ol style="list-style-type: none"> 4. discoverdinarics.org portal can be further promoted within other projects and upgraded to promote coexistence with other large carnivores 5. guidelines for responsible bear tourism could be reasonably transposed into legal documents 6. the video obtained with the video radio collar has a strong communication potential 7. lessons learned from media evaluation can be used in future media relations activities and provide a baseline for reevaluations or monitoring in the future 8. the strong relationships that we've built with key stakeholders represent more chances for successful implementation of different activities 9. info points can be used to promote other bear-related topics; national parks and eco-touristic offers 10. lessons learnt about how proactively communicate with public can be used in other LIFE projects 11. the main communication channels can serve as tools to communicate and promote other LC and coexistence 12. the networking activities created opportunities for future collaboration and facilitate replicability and transferability 	<ol style="list-style-type: none"> 5. guidelines for responsible bear tourism remain guidelines on paper, while bear tourism remains unsupervised
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AFTER LIFE CONSERVATION PLAN

Transboundary management and monitoring

One of the fundamental actions of the project was to prepare the common guidelines for population-level brown bear management in all partnering countries and elaborate them into the brown bear management plans in Slovenia and Croatia, respectively. The action was more than successful, as the guidelines were extended to the wider Alpine area through WISO platform and to BiH. The elaboration of guidelines into national management plans followed a participatory approach in Slovenia and Croatia and involved meetings and workshops with stakeholders (researchers, NGOs, farmers, hunters, ministries, agencies, etc.). The management plans were delivered to the responsible Ministries in both countries. Furthermore, the guidelines were compared to the revised Italian bear management plan for the Alpine area (PACOBACE) and we suggested the necessary additions to PACOBACE to harmonize the documents. The Austrian bear management plan was also revised in accordance with the guidelines. In a scope of EU INTERREG SI-CRO programme, within Carnivora Dinarica project, transboundary collaboration on authority's level between Slovenia and Croatia will be continued for all three large carnivores. The basis for a long-term collaboration of the project partners was set with drafting the guidelines for transboundary harmonization of bear population monitoring.

The brown bear management plans in Slovenia and Croatia define the harmonized optimized population-level surveillance of brown bear conservation status, including the extent and frequency of acquiring estimates of bear population size via genetic sampling, the use of the population modelling systems (for Slovenia and Croatia), maintenance of shared databases and transboundary coordination of management measures in the bear core area. The online geo-database developed within the project represents the central tool for experts and to some extent also general public, to view, explore and exchange data about brown bears in the project area and will be upgraded with data about other large carnivore species.

A comprehensive study of bear habitat suitability and connectivity was performed to provide a better understanding of the wider spatially explicit issues regarding bear expansion from Dinaric to the Alps. With targeted distribution of a handbook explaining the identified issues of habitat fragmentation among crucial stakeholders (spatial planners), we aim to avoid future inappropriate infrastructure development in the project area. It remains necessary however, to adapt and adjust measures to the local context, as well as to the specific needs and possibilities of the location.

Overall goal: to continue the transboundary collaboration and follow common and standardized approaches to brown bear management and monitoring

Measure	Responsible	Funding	Timeframe
Geo-database maintenance (SLO) and exchange of monitoring data; human-bear conflicts, damages, measurements of dead bears, counting bears at permanent counting points, telemetry, genetics (IT, AUS, CRO, SLO)	All project partners (for data collection and entering – FIWI, FVM, PLI, PAT, RVEN, UL, SFS), SFS for database maintenance	Own funding for data collection and entering, MOP (for database maintenance)	regular

Measure	Responsible	Funding	Timeframe
Monitoring the movement, abundance and presence of females in the Alpine project area with non-invasive genetic sampling (sampling takes place every 4 years in SLO; every year in AUS, Veneto (IT) and in Trentino (IT))	MOP, FIWI, PAT, RVEN, PLI	Own funding (FIWI, PAT, RVEN, PLI), projects (MOP)	2023
Estimating bear population size and sex structure in the Dinarics with non-invasive genetic sampling (every 8 years; SLO, CRO)	MOP, MA	Projects (MOP, MA)	2023
Estimating bear population size and sex structure in the Dinarics with population modelling system, analysis of bear counting and cementum age estimates (SLO, CRO)	MOP, FVM	Projects (MOP, MA)	2019-2023
Coordinating the bear removal plans between Slovenia and Croatia at the Ministry level	MOP, MA	MOP, MA	regular
Three bilateral meetings within Carnivora Dinarica project, on authority's level, for all three large carnivores (SLO, CRO)	UL, MOP, SFS, FVM, MA	EU project (Interreg SI-HR Carnivora Dinarica)	2019-2021
International biannual meetings of project partners for management and monitoring coordination	All project partners	Own funding	regular, starting with 2021
Collaborating in validation of spatial plans on municipality levels to assure preservation of important habitat patches and corridors for bears (SLO, CRO)	ZRSVN, SFS, FVM	MOP, MKGP CRO: own funds	regular

Conflict mitigation

Mitigation of human-bear conflicts underpins a successful coexistence of people and large carnivores. Immediate responsiveness, ongoing communication and efficient prevention are the backbone of conflict mitigation. Removal of problematic bears, if other options do not produce any results, is an important tool that has to be taken into account as well. The research performed within the project enabled to identify the main conflict hot-spots where we could target the implementation of specific mitigation measures for livestock protection and waste management. The distributed protective measures (electric fencing, livestock guarding dogs, bear proof compost bins and garbage bins) proved highly effective and will continue to be operative and maintained on the field. Overall, the number of conflicts decreased and in 2018, there was the lowest number of conflicts reported since 2003. Importantly, the communication activities allowed us to establish a close collaboration with local communities and educate selected locals that will continue to ensure proper use of the measures on the field. We also put high efforts in raising awareness about the consequences of improper waste disposal and bear habituation and received good feedback from the local communities; where bear-proof containers were accepted, the municipalities

funded the concrete basis needed for installation of the bear-proof housings. In some areas of Slovenia where the innovative compost and garbage bins were distributed, they are now searching for ways to fund and install additional bear proof containers themselves. These innovative solutions are also raising attention outside the project area (e.g. in Greece).

Important lessons were taken from establishing working lines from LGDs and distributing electric fencing to the farmers. With constant communication, presence on the field and advice to end users we managed to win the recognition of the project and the lead partner, SFS, as the main specialists for preventing human-bear conflict in Slovenia and we aim to keep and to promote that reputation. With good presentation of project efforts to the Slovenian EPA (ARSO), the agency started a programme of subsidizing equipment for damage prevention and will continue to offer this help to farmers in the long term. Moreover, the Slovenian Ministry of Environment and Spatial Planning has prepared new regulations about protective measures and modified the damage compensation system to prevent misuse of protection measures. A specifically designed webpage www.safe-grazing.com was established at the end of the project to provide information about mitigation measures and promote conflict prevention especially for farmers. In Italy, collaboration between LIFE DINALP BEAR and LIFE WolfAlps was essential for extensive implementation of livestock protection measures (electric fencing and LGDs). An LGD Association was also formed at the end of the project in Trentino - Italy to guarantee a good continuation of LGD related practices. It received significant sponsorship from pet companies and expert support from both LIFE projects.

To prevent immediate conflicts, two new bear intervention groups were established in Croatia and Italy (Veneto), and trained to intervene under a protocol when a bear wanders to the highway or to the vicinity of settlements, respectively. Moreover, members of existing BIGs and officials, working with human-bear conflict, received additional training through workshops and training camps and have access to an updated handbook for performing damage inspections. The number of interventions in Slovenia decreased during the project. The project team in Trentino successfully used telemetry to help the intervention team prevent immediate direct conflicts between people and collared conflict bears. At traffic infrastructure (highways, regional roads and railways) in bear core area (Slovenia and Croatia) we also successfully reduced bear mortality with implementing most appropriate measures or their combination (deterrents, electric fences, jump out ramps, bear-proof containers at resting places etc.). With a strong support of educational activities for end-users and the general public we managed to assure commitment of the responsible companies to maintain and invest in the measures after the project. These activities will play an important role in further promotion of bear expansion from Dinarics towards the Alps.

Overall goal: further decrease of human-bear conflicts through the use of efficient mitigation measures, state based financial support and coordinated interventions.

Measure	Responsible	Funding	Timeframe
Co-financing the effective measures for bear damage prevention (electric fences, LGDs) also to the end users which have not yet suffered damage from LCs (SLO, CRO, IT)	ARSO, SFS, MNPE, Carnivora Dinarica project partners, PAT, RVEN	MKGP, MOP, MNPE, EU project (Interreg SI-HR Carnivora Dinarica), own funding (PAT), RDP funds (RVEN)	regular
Establishment and maintenance of LGD working lines (SLO, IT)	ARSO, SFS, Carnivora Dinarica project partners, PAT	MOP, MKGP, EU project (Interreg SI-HR Carnivora Dinarica), own funding (PAT)	regular

Measure	Responsible	Funding	Timeframe
Distribution of protective measures, advising livestock breeders, beekeepers and other interested people about the correct use of co-financed measures, controlling their proper use (SLO, IT, CRO)	ARSO, SFS, KGZS, RVEN, PAT, Carnivora Dinarica project partners, MNP	MOP, MKGP, MNPE, EU project (Interreg SI-HR Carnivora Dinarica), own funding (PAT), RDP funds (RVEN)	regular
Evaluating the current status of garbage disposal system in the bear core area and establishing a plan for its improvement so that the garbage does not attract bears to the settlements (SLO, IT)	MOP, PAT	Projects (MOP), own funding (PAT)	2020-2024
Maintaining the bear-proof garbage containers at the highway Rijeka-Zagreb (CRO)	ARZ	Own funding	2019-2024
Monitoring the effectiveness of electric fences with camera traps (SLO, IT)	RVEN, SFS, Carnivora Dinarica project partners	Own funding (RVEN), EU project (Interreg SI-HR Carnivora Dinarica), MOP, own funding (RVEN)	2019-2021
Continue with bear telemetry (SLO, CRO, IT)	PAT, PLI, UL, FVM	Projects	2019-2021
The traffic mortality mitigation measures are constantly operating, (and non-functional wildlife passes repaired; CRO)	DARS, SZ, DRSI, ARZ	Own funding	2019-2024
Maintaining the positive and reducing negative impacts of feeding (SLO, CRO)	SFS, MA	MKGP Projects (MOP, MA)	2019-2024
Bear intervention groups and damage inspection services remain operational (SLO, CRO, IT, A)	PAT, RVEN, National Committee for Bear Management (CRO), FVM, SFS, ARSO, FIVI	MA, MOP, own funding (PAT, RVEN, FIVI)	2019-2024

Communication and coexistence promotion

Implementation of conservation actions cannot happen without a strong communication support. We have identified key stakeholders at the beginning of the project with whom we have built strong partnerships, which led to a successful implementation of different project activities. We have been lucky to receive professional support for communication activities already at the beginning of the project from an expert for human-bear conflicts. With this involvement, we based the produced handbooks, guidelines and protocols on years of experience from abroad as well as gained several first-hand advice for effective approaches of communication on the field. We have established a good way of internal and external

communication through many networking events, meetings and academic exchanges. We hosted the 26th International Conference on Bear Research and Management in collaboration with the International Bear Association in 2018 in Ljubljana, Slovenia that was attended by 266 participants from 42 different countries and thus increased the visibility of the LIFE DINALP BEAR project on a global level.

Several seminars, workshops, presentations, working meetings and one-on-one meetings resulted in an increase of knowledge about bears and the means of damage prevention. The educational events we held for local officials working with human-bear conflict became a norm and will be continued undisruptive after the project. The info-points in human-bear conflict hot spots were installed at locations, where they can reach a wide audience of visitors and online communication platforms (project webpage and Facebook) have gained recognition among general public. We expect these digital platforms to remain the main source of information as for general public, while they can additionally serve as communication channels about large carnivores and coexistence. One of the most popular handouts was a leaflet “How to behave in bear areas”, which was reprinted in several thousand copies and offered in digital format for printing to organizations with their own funds. We handed out many other materials that can be used for teaching, awareness raising and education. Our communication activities have also been noticed by the media, which presented the project as a solution-provider. The project communication activities improved the knowledge and awareness of all key interest groups which can importantly decrease the number of conflicts. The results of the survey of people's attitudes towards bears were used to inform project communication efforts and decision-making at the administrative level. The surveys showed that the attitude towards bears in the Dinarics has remained high during the project.

The website discoverdinarics.org has joined and promoted several bear related tourism packages and bear friendly products and services. The portal and the bear friendly label gained significant attention and will maintain operational after the project. The interest for alternative touristic offers is rising in the bear core area and the portal acts as the basic platform for opportunities being sought by for responsible tour operators. The portal will continue to be advertised through other LC projects.

Overall goal: promotion of coexistence through ongoing communication, promotion of non-consumptive use of brown bear and collaboration with local communities

Measure	Responsible	Funding	Timeframe
Raising awareness of local people from bear core area about the importance of the measures that prevent bears to access the anthropogenic food sources and about appropriate behaviour in the bear habitat (SLO, IT, CRO)	MOP, SFS, UL, MA, FVM, PAT	Projects (MOP), own funding (SFS, UL, PAT), MA	regular
Maintaining the main sources of information, established within the project (project webpage, portal discoverdinarics.org, portal varna-pasa.si, social media)	UL, MOP, SFS	Own funding, MOP	regular
Interactive informing of visitors about bears on different locations in bear area via info-points (SLO, CRO)	UL, FVM, ARZ	Own funding	2019-2024
Implementation of workshops in schools and scouting organizations (distributed educational bear kits), dissemination of project publications, reusing exhibition photos on public locations (SLO, CRO, IT)	UL, FVM, SFS, PAT	MOP, Own funding	2019-2024
Maintaining the “Bear friendly” scheme and labelling the products (maintaining an active committee, printing and distributing labels), promoting the guidelines for non-consumptive use of bears in tourism	UL, FVM	Own funding, MOP	2019-2024

Measure	Responsible	Funding	Timeframe
Surveilling the public and key stakeholders' attitudes towards bears (via a standardized questionnaire) using a representative sample size (every 5 years) (SLO, CRO)	MOP, FVM	Projects (MOP), MA	2023
Active involvement of key stakeholder groups in bear management plans; preparing or revising strategies, action plans and other management documents and regulations (SLO, CRO)	MOP, SFS, ZRSVN, FVM, MA	MOP, MA	2022,2023
Proactive media relations, including responding to fake news (SLO, CRO, IT)	MOP, FVM, MA, PAT	MOP, MA, Own funding (FVM, PAT)	regular



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