

**Tagung der Alpenkonferenz**

**Réunion de la Conférence alpine**

**Sessione della Conferenza delle Alpi**

**Zasedanje Alpske konference**

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06-10-2022

## **ANNEX**

- 3 Activity Report of the Large Carnivores, Wild Ungulates and Society Working Group (WISO) for the period 2021-2022 (EN)**

**ACTIVITY REPORT OF THE  
LARGE CARNIVORES, WILD UNGULATES AND SOCIETY WORKING  
GROUP (WISO)  
FOR THE PERIOD 2021-2022  
(BETWEEN THE XVI AND XVII MEETINGS OF THE ALPINE CONFERENCE)**

**1. Overview of the mandate given by the XVI Alpine Conference**

Summary of the objectives according to the 2021-2022 mandate or work programme

The main tasks for the WISO working group according to the mandate were:

- To promote the exchange among the Working Group members of information, scientific data and experiences in order to support decision-making processes as well as the coordination of responding actions concerning large carnivores.
- To maintain and improve spatial connectivity for large carnivores and ungulates in the Alps, also transnationally, and, as WISO working group, contribute with its expertise to the implementation of the pathways of the Alpine Climate Board within the sector of activity "Ecosystems and Biodiversity".
- To review the implementation of recommendations made in the previous mandate periods' reports on the coordinated management of Bear, Wolf and Lynx in the Alps and on the report on livestock prevention measures and thereby lay the foundation for an update of said reports and recommendations.
- To continue the exchange and discussion about wild ungulate management.

The WISO Working Group was chaired by Mr. Rok Černe from Slovenia Forest Service, by authorization of the Slovenian Ministry for the Environment and Spatial Planning.

**2. Meetings**

Summary of the meetings held (date, place, main topics and milestones)

The WISO Working Group met four times during its 2021–2022 mandate. In these meetings, all topics foreseen by the mandate were tackled.

1. Online, 19. 5. 2021. Topics: review of the mandate; update and final report on co-adaptation of humans and wolves in the Alpine space by CIPRA; spatial connectivity for LC and ungulates in the Alps – presentation of the topic, overview of current work, ALPBIONET2030 project; updates from the representatives regarding LC; other topics of the mandate.

2. Online, 18. 11. 2021. Topics: presentation of the results of the ecological connectivity modelling for large mammals in the Alps by SFS; presentation of the draft questionnaire for the overview of the implementation of the WISO recommendations for the lynx by KORA and Bundesamt für Umwelt; presentation of the planned phase II of the project on co-adaptation strategies for humans and wolves in the Alps by CIPRA; updates from the representatives regarding LC.
3. Online, 15. 2. 2022. Topics: presentation of the results of the ecological connectivity modelling for large mammals in the Alps by SFS; presentation of the draft report based on the questionnaire for the overview of the implementation of the WISO document for the management of the lynx by Bundesamt für Umwelt; presentation of the Interreg Adrion project “DINALPCONNECT” by EURAC; presentation of the draft report based on the questionnaire for the overview of the implementation of the WISO document for the management of the brown bear by SFS; presentation of the LIFEStockPROTECT project by European Wilderness Society.
4. Bled (Slovenia), 20.-21.4.2022. Topics: presentation and confirmation of the final report for the ecological connectivity modelling for large mammals in the Alps by SFS; presentation of the draft report based on the questionnaire for the overview of the implementation of the WISO document for the management of the wolf; updates from the WISO members; the role of large carnivores on the wild ungulates’ management; debate on the future mandate; presentation of the Dinaric platform by BFN. The meeting also included the excursion visiting the lynx enclosure in Jelovica plateau built in the LIFE Lynx project, the box trap for ungulates used in the LIFE WOLFALPS EU project, locations for camera traps and location for the box trap for lynx.

### 3. Activities carried out

Synthetic description of further activities carried out (including outreach and communication activities)

The Working Group carried out the following activities for the fulfilment of the mandate:

1. Exchange of information: a regular agenda item was set at the Working Group meetings in order to allow for a regular exchange among members on the status of large carnivores, ungulates and the main news related to their management as well as on other events relevant for WISO.
2. Dialogue: to establish new connections with relevant organisations and stakeholders, different projects and their outputs were presented at the meetings.

3. Exchange on wild ungulates management: based on the presentation of SFS, the contracting parties discussed their ideas for the next mandate regarding the issue how to adapt the wild ungulates' management according to the presence of large carnivores. The representatives agreed to set a podium for the exchange of best practice examples, experiences, practical approaches, expertise, good ideas, since the basis is different from country to country (different hunting systems, different impact of LC on the WU). A symposium about adapting the WU management according to the presence of LC with a broader presence of the stakeholders will be one of the objectives to be achieved until the XVIII Alpine Conference.
4. Report on the landscape connectivity for large carnivores and wild ungulates in the Alps: on the first meeting, the current work and projects on the topic were presented, on other meetings, draft versions of the report were presented, discussed, updated and adapted regarding the comments of the contracting parties.
5. Reports on the implementation of management options for the conservation of brown bear, lynx and wolf in the Alps: on the second meeting, the draft questionnaire for the overview of the implementation of the WISO recommendations for the lynx was presented and later adapted for brown bear and wolf. Representatives filled in the online questionnaires and based on the answers, two reports (for brown bear and wolf) were prepared and sent for confirmation to contracting parties. The report for lynx was not prepared.

#### 4. Outputs and results

##### Description of the main outputs and results achieved

1. Exchange of information: regular exchange among member states and observers, shared and updated knowledge of the Alpine-wide situation and developments concerning large carnivores and ungulates.
2. Dialogue: for the communication of the results and activities of the Working Group, the channels and platforms made available by the single WG members were used. The outputs of the Working Group were shared also by the cooperating projects.
3. Exchange on the role of large carnivores on the wild ungulates' management: the summary was produced by the Working Group, proposing to organise a symposium about adapting the WU management according to the presence of LC with a broader presence of the stakeholders.
4. Report on the landscape connectivity for large carnivores and wild ungulates in the Alps: the report was produced by the Working Group.

5. Reports on the implementation of management options for the conservation of brown bear and wolf in the Alps: two reports were produced by the Working Group.

## 5. Cooperation

Description of cooperation developed with other Alpine Convention bodies and further relevant partners and processes, and of the resulting benefits

The Working Group cooperated with the following organisations and projects:

- CIPRA project on co-adaptation strategies for humans and wolves in the Alp, presentations in the online meetings (19. 5. 2021, 18. 11. 2021).
- INTERREG ALPINE SPACE, ALPBIONET2030 project, through the presentation of the results regarding the ecological connectivity, online meeting (19. 5. 2021).
- INTERREG Adrion project “DINALPCONNECT”, through the presentation and the discussion about the results, online meeting (15. 2. 2022).
- LIFESTOCKPROTECT project, through the presentation and the discussion about the results, online meeting (15. 2. 2022).

The Working Group presented its work and results during the online workshops of Thematic Working Bodies (17. 6. 2021 and 25. 1. 2022) and on the meeting for the establishment of the Dinaric platform (16. 11. 2021) as a best-practice example. The results of the landscape connectivity for large carnivores and wild ungulates in the Alps were presented at the conference of the Interreg DINALPCONNECT project in Slovenia (6.–7. 6. 2022).

## 6. Attachments

List of the documents attached to this report, such as papers proposed for approval by the XVII Alpine Conference (thematic reports, guidelines, statements etc.) and supporting documents (workshop proceedings, survey reports, communication materials etc.). *Please kindly provide a PDF file of each attachment. Do not include the minutes of regular meetings!*

- *Short report (summary) about the wild ungulate management discussion*
- *Report on the landscape connectivity for large carnivores and wild ungulates in the Alps*
- *Report on the implementation of management options for the conservation of Brown bear in the Alps*
- *Report on the implementation of management options for the conservation of Wolf in the Alps*

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# SHORT REPORT (SUMMARY) ABOUT THE WILD UNGULATE MANAGEMENT DISCUSSION

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**LARGE CARNIVORES, WILD UNGULATES AND SOCIETY WORKING  
GROUP (WISO) of the Alpine Convention**

*Mandate 2021–2022*



ALPENKONVENTION  
CONVENTION ALPINE  
ALPSKA KONVENCIJA  
CONVENZIONE DELLE ALPI

This report is the result of the WISO mandate under Slovenian Presidency.

The members of the Working Group are:

**President:** Rok Černe, Zavod za gozdove Slovenije

**National delegates:**

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- **Italy:** (1) Umberto Fattori (*Regione Friuli Venezia Giulia*); (2) Piero Genovesi (*ISPRA*); (3) Claudio Groff (*Provincia Autonoma di Trento*)
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**Observers:** Marion Ebster (*CIPRA*), Christian Pichler (*WWF*), Johanna Platzgummer (*Club Arc Alpin*), Kaspar Schuler (*CIPRA*), ISCAR, Elisa Kerschbaumer (*Alpine Space Programme*), Veronika Schulz (*Club Arc Alpin*)

**Permanent Secretariat of the Alpine Convention:** Stefano Chelo

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## Summary

In the mandate proposal of the working group on Large Carnivores, Wild Ungulates and Society (WISO) for the period 2021-2022 until the XVII Alpine Conference, one of the objectives was to continue the exchange and discussion about wild ungulate management.

WISO aims at finding solutions to manage large carnivores and wild ungulates harmoniously with society. Wild ungulates, due to the more charismatic character of large carnivores, tend to be in the second plan. Therefore, the focused debate on the fourth WISO meeting covered the crosswise scope of large carnivores and wild ungulates – how to adapt the wild ungulates' management according to the presence of large carnivores.

The representatives agreed to set a podium for the exchange of best practice examples, experiences, practical approaches, expertise, good ideas, since the basis is different from country to country (different hunting systems, different impact of LC on the WU). Since this is not the core focus of the current members of the WISO, other speakers should be invited (forest managers, researchers, practitioners), and also stakeholders.

A symposium about adapting the WU management according to the presence of large carnivores with the working title: "Wild ungulates with/without large carnivores: adapting the WU's management according to the presence of large carnivores" will be one of the objectives to be achieved until the XVIII Alpine Conference with a short report planned as an output.



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# LANDSCAPE CONNECTIVITY FOR LARGE CARNIVORES AND WILD UNGULATES IN THE ALPS

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**LARGE CARNIVORES, WILD UNGULATES AND SOCIETY WORKING  
GROUP (WISO) of the Alpine Convention**

*Mandate 2021–2022*



ALPENKONVENTION  
CONVENTION ALPINE  
ALPSKA KONVENCIJA  
CONVENZIONE DELLE ALPI

This report is the result of the WISO mandate under Slovenian Presidency.

**Authors:** Jernej Javornik, Bojana Lavrič, Filippo Favilli, Cathérine Frick, Claudio Groff, Maja Humar, Georg Rauer, Sarah Stehly, Manfred Wölfl, Anja Jobin, Albin Blaschka, Martin Janovsky, Olivier Nägele, Davide Righetti, Luigi Spagnoli, Elisa Malenotti, Elisabetta Maria Rossi, Blanka Bartol, Matija Stergar and Rok Černe

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## 1. PREFACE

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Alps are among the most preserved and biodiversity rich areas in Europe (Rahbek et al. 2019). A key part of the Alps biodiversity is a rich mega- and mezzo-fauna that was preserved through the history. Species such as brown bear (*Ursus arctos*), wolf (*Canis lupus*), Eurasian lynx (*Lynx lynx*), wild boar (*Sus scrofa*), red deer (*Cervus elaphus*), roe deer (*Capreolus capreolus*), chamois (*Rupicapra rupicapra*) and endemic alpine ibex (*Capra ibex*) can still be found in many areas in the Alps. Those are keystone species with a significant influence on alpine ecosystems structure, biodiversity and nutrient cycling (Ripple et al. 2014). Many conservation and management efforts were undertaken in the past to protect those species, increase their population sizes, reintroduce them in areas where they were locally extinct and mitigate conflicts and damages. Thanks to that, population sizes of large carnivores and wild ungulates in Alps are increasing and recolonization of suitable habitats can be observed for most of the mentioned species. Some of the ungulates, such as wild boar and red deer are becoming even overabundant in some regions of the Alps (population sizes that exceed current social acceptance of the species). However, some species, especially bears and lynxes, are still living in small and isolated populations, which are too small to ensure long-term survival of those species in the Alps (Kaczensky et al. 2012). Regardless of the current status of large mammals in the Alps it is necessary to ensure sufficient gene flow within and between populations. Sufficient gene flow produces healthy populations that are adaptable to various stochastic events and risk factors. In human-dominated alpine landscapes sufficient gene flow can only be ensured by management of landscape connectivity. Therefore, Landscape connectivity is becoming one of the key aspects of modern wildlife management.

Physical movement barriers (hereafter barriers), such as urban areas, intense agriculture areas, transport infrastructure and tourist areas, are among the most important factors of habitat fragmentation. Because of this, barriers significantly alter species movement and are considered as critical points of landscape connectivity (Scott et al. 2011). Identifying barriers and restoring landscape connectivity within them is therefore the most important part of active wildlife landscape connectivity management

Alps are relatively densely populated and an important tourist destination. Currently Alps are a subject of intense anthropogenic landscape changes due to urbanization pressure and transport or tourist infrastructure development (Walzer et al. 2013, Santolini et al. 2016). As a result, open spaces (i.e. natural areas of sufficient habitat) are becoming increasingly scarce in Alps (Job et al. 2020). Despite the fact that most of large carnivores and wild ungulates can move great distances, barriers alter their movements between suitable habitats (Tucker et al. 2018). Because of this, it is becoming increasingly important to reassess landscape connectivity for large carnivores and wild ungulates in the Alps. Especially to identify barriers that alter movement of those species. In barriers, strategic planning of management actions is advised to improve and restore landscape connectivity. For large carnivores and ungulates this means (re)establishment and necessary protection of green movement corridors and green bridges across transport infrastructure (Gilbert-Norton et al. 2009).

Within the current WISO (Large carnivores, wild ungulates and society) working group mandate (2021-2022) our goals was to a.) Provide an overview of the work so far conducted

on the topic of landscape connectivity and barriers in the Alps, b.) Reassess landscape connectivity for large carnivores and ungulates in the Alps, c.) Identify barriers for large carnivores and wild ungulates in the, d.) Provide an overview of landscape connectivity management actions already conducted in the barriers and e.) Propose further management actions to increase landscape connectivity in the identified barriers.

## 2. A BRIEF OVERVIEW ON LANDSCAPE CONNECTIVITY CONCEPT AND ACTIVITIES IN ALPS

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Landscape connectivity, the extent to which landscape facilitates movement of organisms and their genes, faces increasing threats from both habitat fragmentation and habitat loss (Rudnick et al. 2012). The migration and dispersion of organism is vital to ensure sufficient gene flow between populations to prevent population isolation (Tabor 2019). Population isolation is one of the biggest threats to long-term species conservation, especially for small populations where inbreeding can occur with higher rates (Lynch et al. 1995). Maintaining and restoring landscape connectivity to mitigate negative impacts of fragmentation on species is therefore identified as one of the key wildlife management activities in 21st century (Tabor et al. 2019) and recently landscape connectivity has received increasing attention in researches, projects and management actions around the globe, including Alps. In the following chapter we are providing a short overview on landscape connectivity concept important for further understanding of our work. In addition, we are presenting also a review of activities conducted on large carnivores and wild ungulates landscape connectivity in the Alps so far.

### The landscape connectivity concept

Landscape connectivity approaches can be divided into two main concepts, structural and functional connectivity (Rudnick et al. 2012, Taylor et al. 2010). Structural connectivity focus on describing physical characteristics of a landscape that influence movements of organisms, such as land cover and topography and identifying corridors, barriers and other important connectivity areas. On the other hand, functional connectivity approaches are focusing on measuring actual gene flow and individual movement in the landscape. Researches and projects dealing with structural connectivity are much more represented in the literature, including the Alpine region. This is mostly because the sufficient data on actual gene flow and individual movement is still lacking for most landscapes (Taylor et al. 2010). In addition, functional connectivity concept cannot be used in areas which are not yet colonized by the species in focus. On the other hand, results of a structural connectivity analysis approach can be only valid, if there is a sufficient knowledge, that identified corridors could be used by species of interest, therefore knowledge on species movement behaviour is vital (Taylor et al. 2010).

Another important question regarding (structural) landscape connectivity is also how to assess connectivity and connected management actions for multiple species at once, especially for biodiversity rich areas, such as Alps. This is namely often the wish of managers, spatial

planners and decision makers (Walzer et al. 2013). However, analysing landscape connectivity for multiple species can be a difficult task. In particular, if species with different ecological and behaviour characteristics are in focal point because of the lack of common connectivity indicators (Gilbert-Norton et al. 2009). Such results can be invalid or even misleading, as at least some species will not be able to use identified important connectivity areas (Taylor et al. 2010). Therefore, it is much better to evaluate connectivity for specific species or taxon's with similar ecological and behavioural characteristics (Gilbert-Norton et al. 2009).

### Landscape connectivity activities review in the Alps

The most comprehensive study on landscape connectivity in the Alps and its surroundings was till now conducted within the Econnect ([www.econnectproject.eu](http://www.econnectproject.eu)) and ALPBIONET2030 (<https://www.alpine-space.org/projects/alpbionet2030/en/home>) projects. One of the key results of Econnect project (project duration: 2008-2011) was to model habitat suitability and landscape connectivity for a number of key alpine species, including brown bear, wolf, Eurasian lynx and red deer (Belardi et al. 2011). This was one of the first attempts to model landscape connectivity for the whole Alpine region (Belardi et al. 2011). At the time GIS tools for modelling structural landscape connectivity for such a large area were just in development. So the results of this modelling are presented on a very coarse spatial scale, which is hindering the use of this results in detailed landscape connectivity management planning. Nevertheless, Econnect project set important foundations to landscape connectivity management in Alps.

Following the Econnect project and a number of other landscape connectivity initiatives in the Alps (see Plassman et al. 2019 for review), the ALPBIONET2030 project was conducted in the period of 2016 – 2019. The purpose of the project was to investigate for the first time to what extent the alpine landscapes are facilitating ecological connectivity in the European Macro-regional Strategy for the Alps (EUSALP) study area (Plassman et al. 2019). To do this, an innovative spatial approach was used, the Continuum Suitability Index (hereafter referred as CSI). CSI summarizes different landscape connectivity indicators; land use, fragmentation by transport infrastructure, environmental protection, population pressure, altitude and slope. Main results of the CSI analysis were three categories of strategic alpine connectivity areas (i. e. SACA areas). The three categories are (Figure 1); areas in which connectivity is still preserved and sufficient (i. e. Ecological Conservations Areas – SACA 1), areas in which connectivity is still preserved to some extent, but would benefit from enhancements (SACA 2) and areas where landscape connectivity is not working any more (SACA 3 – barriers). This approach categorised alpine landscapes and regions for the first time according to how good their landscape connectivity is preserved. With this approach also general management actions can be proposed for enhancing connectivity in each SACA category, such as environmental protection, corridor establishment and restoring connectivity, respectively. Although this approach is very novel and promising, it was originally set for analysing connectivity for a broad scope of species. During our review, we observed that some connectivity indicators (e.g. fragmentation, environmental protection and population pressure) and some indicator values (e.g. indicator values for forests in land use) are not representing well the connectivity and habitat requirements of large carnivores and large ungulates. As this



can produce erroneous results (Gilbert-Norton et al. 2009), we therefore advice caution when applying these results to large carnivores and wild ungulates.

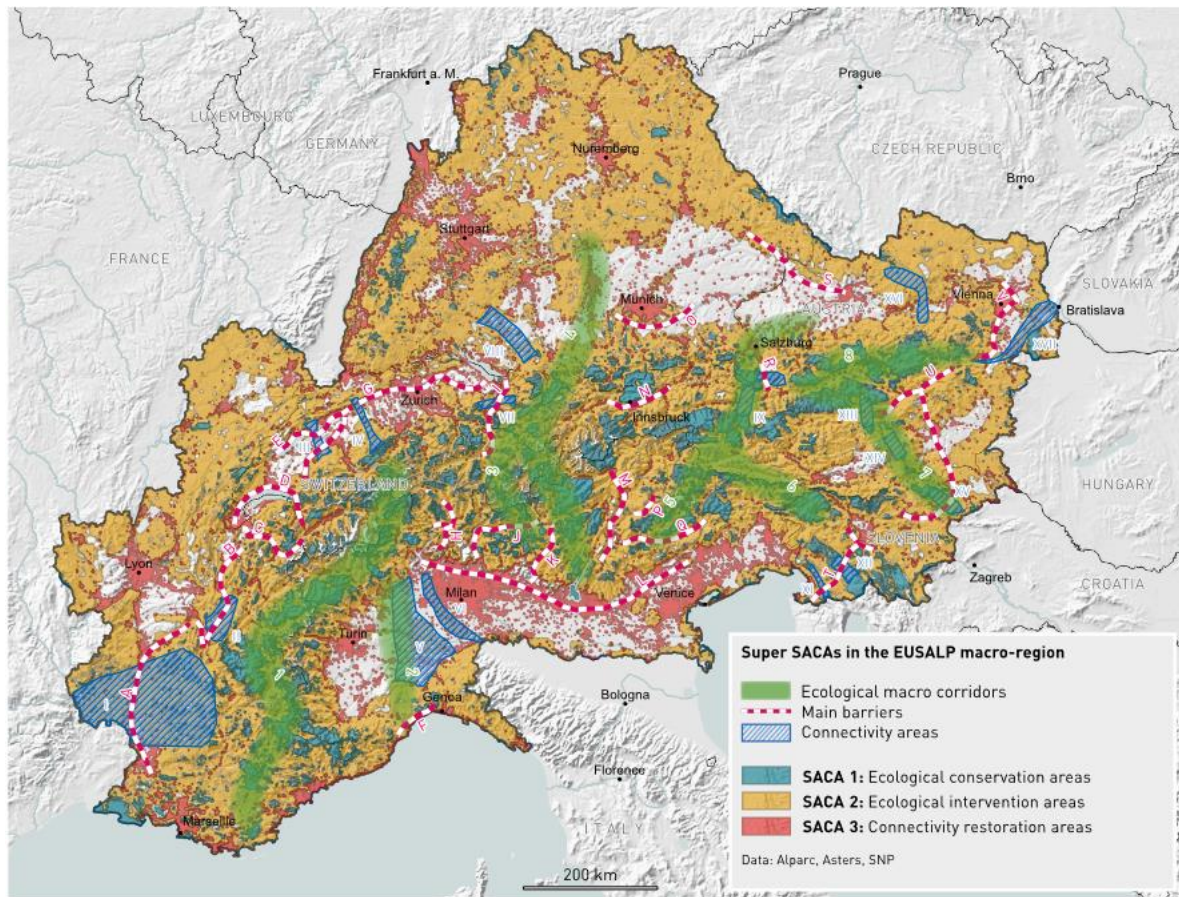


Figure 1: Strategic Alpine connectivity areas (SACAs) in the EUSALP macro-region as determined within the ALPBIONET2030 project. Source: Alparc, Asters, SNP.

To the best of our knowledge, no results are available that would consider landscape connectivity specific for large carnivores and wild ungulates for the whole area of the Alps. There are researches and projects however, that focused on analysing landscape connectivity on smaller, regional scale.

During the LIFE DINALP BEAR project (<https://dinalpbear.eu/home-page-1/>) a habitat suitability map for brown bear for south-eastern Alps was produced (Recio et al. 2021). In the same studies landscape connectivity for brown bear in the same region was assessed by classifying habitat patches based on their importance for the whole south-eastern Alps brown bear population (Figure 2).



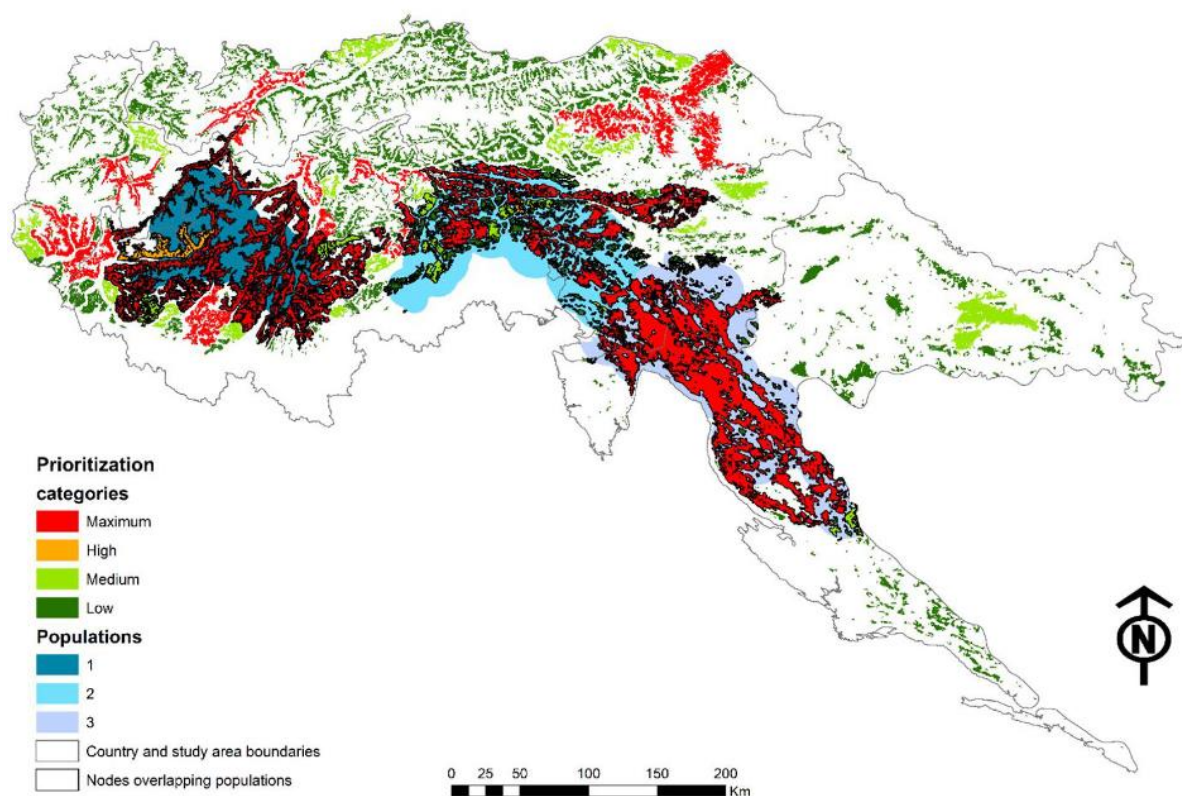


Figure 2: Brown bear habitat patches for the Dinaric (3), south-eastern alps (2) and Trentino (1) brown bear populations categorized based on their importance for landscape connectivity (Prioritization categories). Source: Recio et al. 2021.

Brown bear structural landscape connectivity was studied more specifically also in the Autonomous province of Trento where there is a reintroduced population of brown bears (Peters et al. 2015). The Adige valley is well known to be the most important barrier for brown bear movement in Trento (Černe et al. 2017). The study of Peters et al. 2015 identified two potential corridors or brown bear across the Adige valley.

Landscape connectivity is intensively studied also in the border region of Alps. This is because of the efforts to ensure ecological connection between Alps and other neighbouring biodiversity hotspots area. One of such hotspots are Dinaric Mountains, which are the most important origin area for the brown bear natural recolonization of Alps (Kaczensky et al. 2003). Currently DINALPCONNECT project ([https://www.kis.si/en/Project\\_collection/DINALPCONNECT\\_EN/](https://www.kis.si/en/Project_collection/DINALPCONNECT_EN/)) is underway and one of the main goals of DINALPCONNECT project is to assess structural connectivity between Dinaric Mountains and Alps. To achieve this similar methodology (CSI index) as in ALPBIONET2030 project will be used (Laner et al. in preparation). Structural landscape connectivity for large carnivores and wild ungulates in the transition zone between Dinarics and Alps in Slovenia was assessed also in the study of Javornik et al. (in preparation). The goal of this study was to identify potential regional corridors between large carnivores and wild ungulates habitat patches in Slovenia (Figure 3) and to provide a solution for legal protection of these corridors within the established forest and wildlife management planning system in Slovenia.

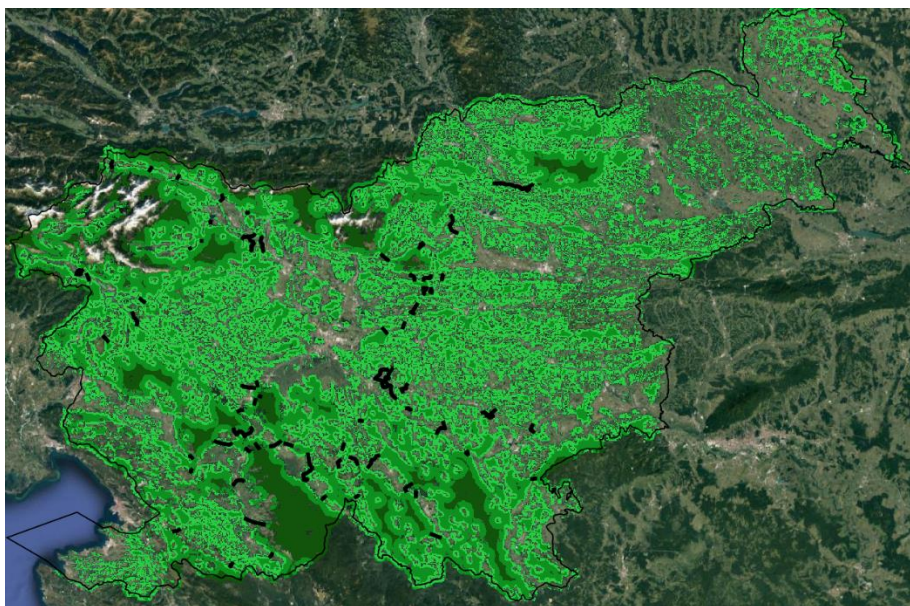


Figure 3: Established regional wildlife corridors (in black) connecting habitat patches for large carnivores and wild ungulates in Slovenia. Source: Javornik et al. in preparation.

Landscape connectivity was assessed also in other boundary parts of the Alps. Including Carpathians and Alps (the “Alpen-Karpaten-Korridor project”; <https://www.wwf.at/artikel/alpen-karpaten-korridor/>), Jura mountains and Alps in Switzerland (Trocme 2005), Massif Central and Alps in France (Gurrutxaga et al. 2011) and between Northern Apennines and Central Alps in Italy (Dondina et al. 2020).

### 3. REASSESSMENT OF LANDSCAPE CONNECTIVITY AND BARRIER IDENTIFICATION FOR LARGE CARNIVORES AND UNGULATES IN THE ALPS

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#### Background

Our literature review on the landscape connectivity in Alpine region revealed, that there are no studies up to date focussing on the landscape connectivity for large carnivores and wild ungulates for the whole area of Alps (see Chapter 2). We therefore conducted an analysis of landscape connectivity for large carnivores and wild ungulates for the entire Alpine region (Alpine Convention perimeter). Specifically, we decided to do one connectivity model for all three species of large carnivores, red deer and wild boar, because this species are expressing similar habitat and movement characteristics and are living in fragmented populations thought the Alpine arc. On the other hand, we excluded roe deer, chamois and Alpine ibex from the model, because this species have very different habitat and movement requirements from the ones mentioned above. Although we believe establishing landscape connectivity for roe deer,

chamois and Alpine ibex is very important, they thrive and move on a much smaller scale, which would be difficult for us to model on such a macro regional Alpine scale. Therefore, we advise, that landscape connectivity for roe deer, chamois and Alpine ibex is considered on regional scales for specific cases of interest.

## Methods

Our landscape connectivity model for large carnivores, red deer and wild boar in the Alps is based on the CSI methodology, which was for the first time developed and used within the AlpBioNet2030 project (Plassman et al. 2019). We choose this methodology, because weighted average indexes of various relevant connectivity indicators are computational relatively fast and therefore among the most suitable methods for landscape analysis on such a large geographic scale.

However, the original CSI methodology in the Alpbionet2030 project (hereafter original CSI analysis; Plassman et al. 2019) was set to analyse landscape connectivity for a broad scope of species. Therefore, we adopted the CSI index for our target species. The reasons for our decision is based on the fact that some connectivity indicators and their values were not representing the connectivity requirements of our target species. We provide explanations for our decision in the following paragraphs.

Land use (or land cover) is the most important landscape connectivity indicator, because it represents species habitat selection. Therefore, it is very important that indicator values are set in accordance with target species habitat selection. We saw that indicator values for some land cover classes in the original CSI analysis were not set in accordance to our target species, therefore we decided to change them in accordance with the knowledge of their habitat selection (Table 1). For example, forests and other dense woody vegetation are the most important habitat types for connectivity for large carnivores and wild ungulates because they offer cover. Because of this they must get a higher weight in the analysis (Table 1).

Table 1: Indicator values for Corine land cover classes used in our Continuum suitability index (CSI) modelling. Values were set based on the current knowledge on the large carnivores and wild ungulates movement ecology and habitat selection with the most important criteria's being the amount of anthropogenic disturbance and natural (vegetation) cover.

Land Cover Class	Indicator value (0 – 10)
1.1.1. Continuous urban fabric	0
1.1.2. Discontinuous urban fabric	0
1.2.1. Industrial or commercial units	0
1.2.2. Road and rail networks and associated land	0
1.2.3. Port areas	0
1.2.4. Airports	0
1.3.1. Mineral extraction sites	0
1.3.2. Dump sites	0
1.3.3. Construction sites	0
1.4.1. Green urban areas	0
1.4.2. Sport and leisure facilities	0
2.1.1. Non-irrigated arable land	3
2.1.2. Permanently irrigated land	3
2.1.3. Rice fields	3
2.2.1. Vineyards	3
2.2.2. Fruit trees and berry plantations	3
2.2.3. Olive groves	3
2.3.1. Pastures	3
2.4.1. Annual crops associated with permanent crops	3
2.4.2. Complex cultivation patterns	3
2.4.3. Land principally occupied by agriculture, with significant areas of natural vegetation	5
2.4.4. Agro-forestry areas	5
3.1.1. Broad-leaved forest	10
3.1.2. Coniferous forest	10
3.1.3. Mixed forest	10
3.2.1. Natural grasslands	5
3.2.2. Moors and heathland	10
3.2.3. Sclerophyllous vegetation	10
3.2.4. Transitional woodland-shrub	10
3.3.1. Beaches, dunes, sands	2
3.3.2. Bare rocks	2
3.3.3. Sparsely vegetated areas	5
3.3.4. Burnt areas	10
3.3.5. Glaciers and perpetual snow	2
4.1.1. Inland marshes	5
4.1.2. Peat bogs	10
4.2.1. Salt marshes	1
4.2.2. Salines	1
4.2.3. Intertidal flats	3
5.1.1. Water courses	3
5.1.2. Water bodies	3
5.2.1. Coastal lagoons	0
5.2.2. Estuaries	0
5.2.3. Sea and ocean	0

Next, topography in Alps is also of high importance for species movements in Alps, because of the diverse relief determined by the changes in altitude and slope. Altitude and slope parameter are even more important in habitat selection of large carnivores and wild ungulates, because of the avoidance of humans and their activities. Based on our observations our target species are selecting steeper slopes and higher Altitudes to minimize the risk of encountering humans. This seems to be especially the case for large carnivores, such as brown bear and lynx. Therefore, we performed a slope and altitude selection analysis based on the data from GPS collared bears and lynx individuals from Trentino (20 bears and 1 lynx individual) and Slovenia (6 lynx individuals from Julian Alps area)). We then used the results from this analysis to set the indicator values for slope and altitude (table 2).

Table 2: Indicator values for altitude and slope that were used in our Continuum suitability index (CSI) modelling. Values were set based on a slope and altitude habitat selection study conducted on the GPS collared brown bears and lynxes in Slovenia and Trentino.

Altitude indicator values (0 – 10)		Slope indicator values (0 – 10)	
< 800	7	< 10°	7
800 – 1700	10	10° - 45°	10
1700 – 2600	7	45° - 75°	7
2600 – 3000	2	> 75°	1
> 3000	1		

The third important landscape connectivity indicator is road infrastructure or fragmentation. Highways pose the most significant barrier for large carnivores and wild ungulates movement. This is because highways are often fenced, wide, vehicles are moving with a high speed and there is a significant traffic frequency also during the night. On the other hand, non-highway roads that are not fenced are not known to represent a movement barrier for our target species (Javornik et al. in preparation). Therefore, we decided to simplify fragmentation indicator used in the original CSI analysis and include only highways as the most important fragmentation agent.

CSI index analysis undertaken in this report is based on three indicators adopted to the large carnivores, red deer and wild boar movement ecology; land use indicator, topography indicator and highway presence indicator. The topography indicator consists of two factors altitude and slope. As in the original CSI analysis undertaken in the AlpbioNet2030 project the land use and topography indicator values are ranging from 0 (not suitable for connectivity) to 10 (maximum connectivity suitability). However, we undertook the following changes to the model set up. Firstly, the model is checking for settlement presence in the spatial unit. If a settlement is present in a spatial unit all indicator values, including the topography are set to 0. Secondly, our model is checking for the highway presence in the spatial unit. If the highway is present all indicator values for land use and topography are set to 0. Finally, if there is no settlements and/or highways in the unit, then the CSI is calculated as a weighted average of land use and topography indicator (figure 4).



1. *Check for the settlement presence in the land use indicator; if “YES” CSI = 0, if “NO” go to the second step.*
2. *Check for the highway presence; if “YES” CSI = 0, if “NO” calculate the index as:*

$$CSI = land\ use + 0.5 * (altitude + slope) / 2$$

Figure 4: A scheme of the CSI model structure used in our landscape connectivity reassessment and barrier identification.

#### Data compilation and indicator values classification

Spatial data for the land use indicator calculations in our CSI analysis was CORINE Land Cover 2018 raster with 100m x 100 m resolution (CLC 2018). We reclassify the CLC 2018 land cover classes according to our expert opinion and a number of habitat selection research of target species (Table 1). To each land cover class, we assigned a value between 0 (not suitable for habitat/connectivity) and 10 (the most suitable habitat/connectivity area). The final land use indicator map can be seen in Annex 1 of this report.

The base raster dataset for the topography indicator analysis was the European Digital Elevation Model with the spatial resolution of 25 m x 25 m (EU DEM, Copernicus programme, European commission). In the first step of the data preparation we rescaled the EU DEM layer to our working spatial resolution of 100 x 100 m. From the rescaled EU DEM layer we generated a slope raster layer. We set the altitude and slope indicator values (Table 2) based on the altitude and slope derived from data of GPS collared bear and lynx individuals from Trentino (20 bears and 1 lynx individual) and Slovenia (6 lynx individuals from Julian Alps area)). The altitude and slope indicator maps can be seen in Annex 2 and 3 of this report.

We compiled the highway spatial data layer from the open source road map of the Open Street Map (OSM road map). Road data was downloaded from online repository for each country/region separately in a vector format. Firstly, we merged the road spatial layers of each country within the area of our analysis. Secondly, we clipped the merged layer to the exact border of our analysis area. From this merged and clipped road network dataset we created a subset layer containing only highways without highway bridge/viaduct or tunnel sections longer than 100 m. The reasoning behind the exclusion of above mentioned sections is based on the empiric observation that highway crossings longer than 100 m do not represent a barrier for the target species movement. Finally we rasterized the compiled highway vector layer to a working resolution of 100m x 100 m. The final highway map used can be seen in Annex 4 of this report.

We did all of the clipping of the used spatial data in QGIS. We performed all other data preparation in R, using packages “raster”, “sf” and “Tidyverse”.

### Continuum suitability index (CSI) calculation and barriers identification

Our study area was the Alpine Convention area represented by the Alpine convention perimeter (Alpine Convention spatial data repository). We also set a 50 km buffer around the study area to analyse the landscape connectivity also in the boundary parts of the Alps.

Finally, we calculated the CSI index for our analysis area using the prepared spatial data described above and our CSI index model. The calculations were done using the “mosaic raster” function in “raster” package in R. To define the CSI index value range that represents barriers for our target species we used the GPS data of brown bears and lynxes in Trentino and Slovenia (dataset described above). We analysed the distribution of the bear and lynx GPS data in the relation of the CSI index and set the lower 2.5 percentile of this distribution as a barrier for the target species movement. The identified lower 2.5 percentile CSI index value was  $< 5$ , which is identical to the CSI value that defines a barrier in the AlpBionet2030 project landscape connectivity analysis.

We then used the calculated CSI index analysis with the defined CSI barrier range to identify the main barriers for large carnivores, red deer and wild boar landscape connectivity in the Alps. This was performed using the “raster sieve” analysis in R, which removes all barriers smaller than a defined criterion. We defined the criteria area value to  $< 9200$  ha, which is representing a theoretical rectangle with a length of 20000 m and width of 4600 m. The length of 20000 m (20 km) is the maximum natal dispersal distance of red deer, which are the poorest dispersing species of the target species in focus. The width of 4600 m corresponds to the maximum recorded distance made by female brown bears into the non-habitat in Alps and Dinaric mountains (Recio et al. 2020 – cite!).

The highway barriers defined in our analysis are sections of highways that do not have important highway crossing (bridge, viaduct or tunnel longer than 100m on a section of highway that is longer than 20000 m, the maximum natal dispersal distance for red deer. To identify highway barriers we first identify important highway crossings that connect areas of CSI index value  $> 5$  (non-barriers). Then we clipped the compiled OSM highway vector layer with the identified important highway crossings in the QGIS program. Finally, we used the clipped highway vector layer to perform a line section analysis in R to identify the line sections without crossings (highway) longer than 20000 m (20 km).

## **Results**

Our CSI calculation results for large carnivores, red deer and wild boar in the Alps and surroundings (50 km buffer from Alpine convention perimeter) are shown on Figure 5. We showed that in many areas in Alps (i.e. Alpine convention area) landscape connectivity for large carnivores, red deer and wild boar is still well preserved. Especially when compared to the Alps surroundings. Namely, in the Alps the majority of areas have a CSI value above 5 (Figure 5). We expected such a result, as also previous studies showed, that in Alps there is still a lot of suitable habitat for our target species .

Barriers (CSI value 5 or less) are much less abundant according to our results (Figure 5). This is because barriers are mostly located within alpine valleys in which settlements, infrastructure and agricultural activities are aggregated. Importantly to note is also that the density of barriers

is higher in northern Alps, north-western Alps and southern Alps compared to other areas (Figure 5).

Although the CSI analysis results are promising in general, there are a number of very important barriers for large carnivores and wild ungulates movements in Alps. **We identified 27 such barriers across the whole study area (Figure 6 and Table 3).** Those are barriers represented by large densely populated Alpine areas and/or long highway section (> 20 km) with no existing suitable highway crossing (> 100 m). Those barriers represent important movement obstacles for large carnivores and wild ungulates, because they are hindering dispersion, mating excursions and seasonal movements. **Barriers listed in Table 3 and showed Figure 6 are therefore priority areas in Alps for executing management actions necessary for restoring/enhancing landscape connectivity for large carnivores and wild ungulates in the Alps. Management actions aimed for improving landscape connectivity in identified barriers are also among the most important aspects of joined Alpine transboundary population level species management.**

With our analysis we also identified the most important existing highway crossings in Alps and the most important Landscape connectivity areas that are connecting Alps to neighbouring mountain massifs (Figure 6). The most important existing highway crossing are highway bridges and tunnels that are longer than 100 m and are located in the areas that are highly suitable for target species connectivity (CSI values >5). **Identified existing highway crossing by our analysis are very important for highway permeability, therefore they should be treated with the same importance as main barriers. Their surroundings should be protected as corridors to prevent fragmentation of suitable connectivity habitat that lead to these highway crossings.**

Our identified priority areas for connectivity towards Alps (Figure 6) are very similar as they were identified also by other studies (see Trocme 2005 Gurrutxaga et al. 2011, Recio et al. 2021) and are connecting Alps with Dinaric Mountains, Jura Mountains, Bohemian forest, Massif Central and Apennines. **It is vital to preserve landscape connectivity in those areas. Especially in areas where landscape connectivity is good preserved. Such area is the connection between Apennines and the Alps in northwestern Italy (Liguria and Piedmont regions; Figure 6). We advise suitable wildlife corridors establishment in this areas to prevent further possible connectivity habitat fragmentation. In all other important landscape connectivity areas (Figure 6), management measures for enhancing and restoring connectivity are advised.**



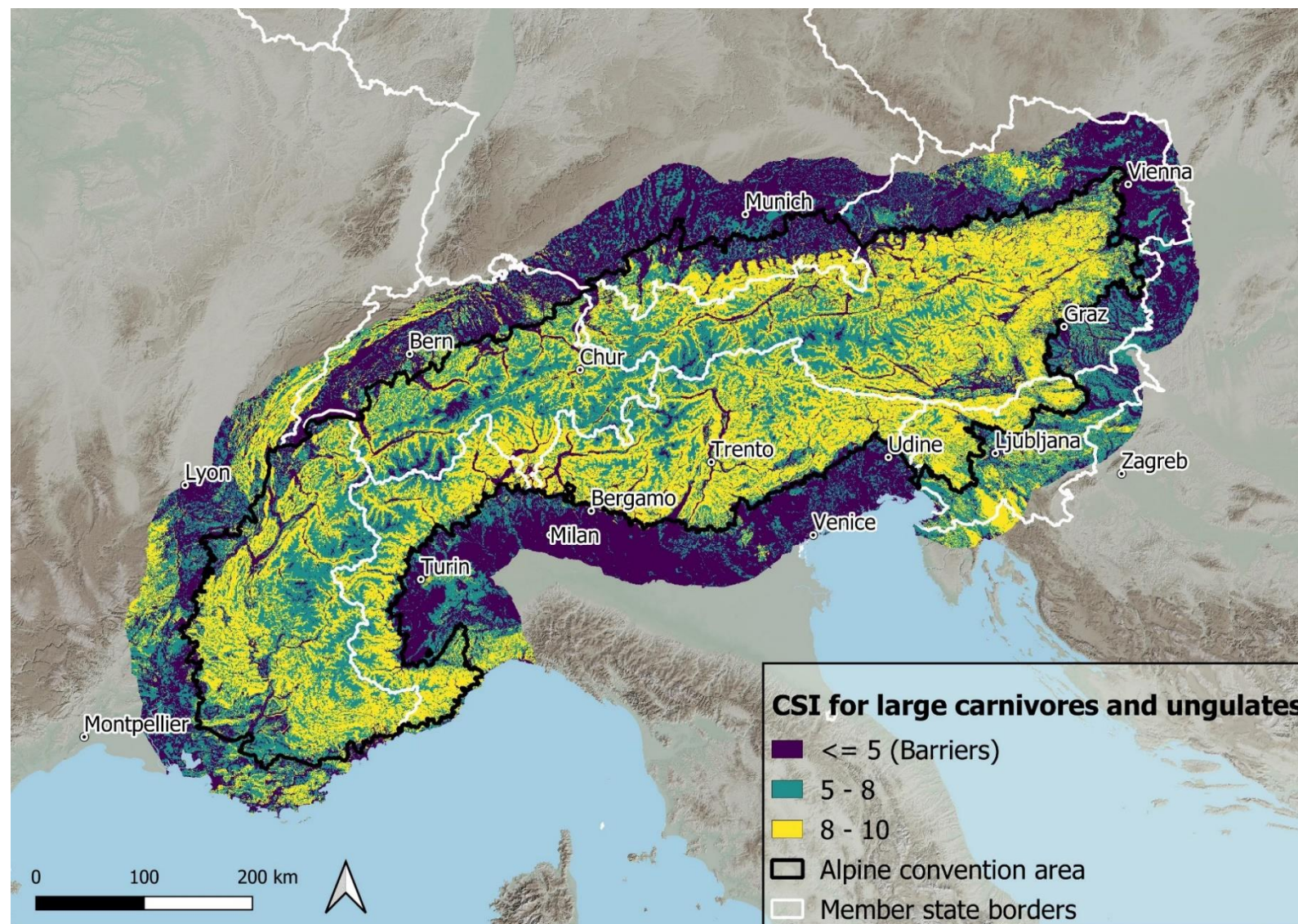


Figure 5: Results of the conducted Continuum Suitability index (CSI) modelling for large carnivores and wild ungulates in the Alps. The results are shown for the Alpine convention area perimeter with the functional surroundings (50 km buffer).



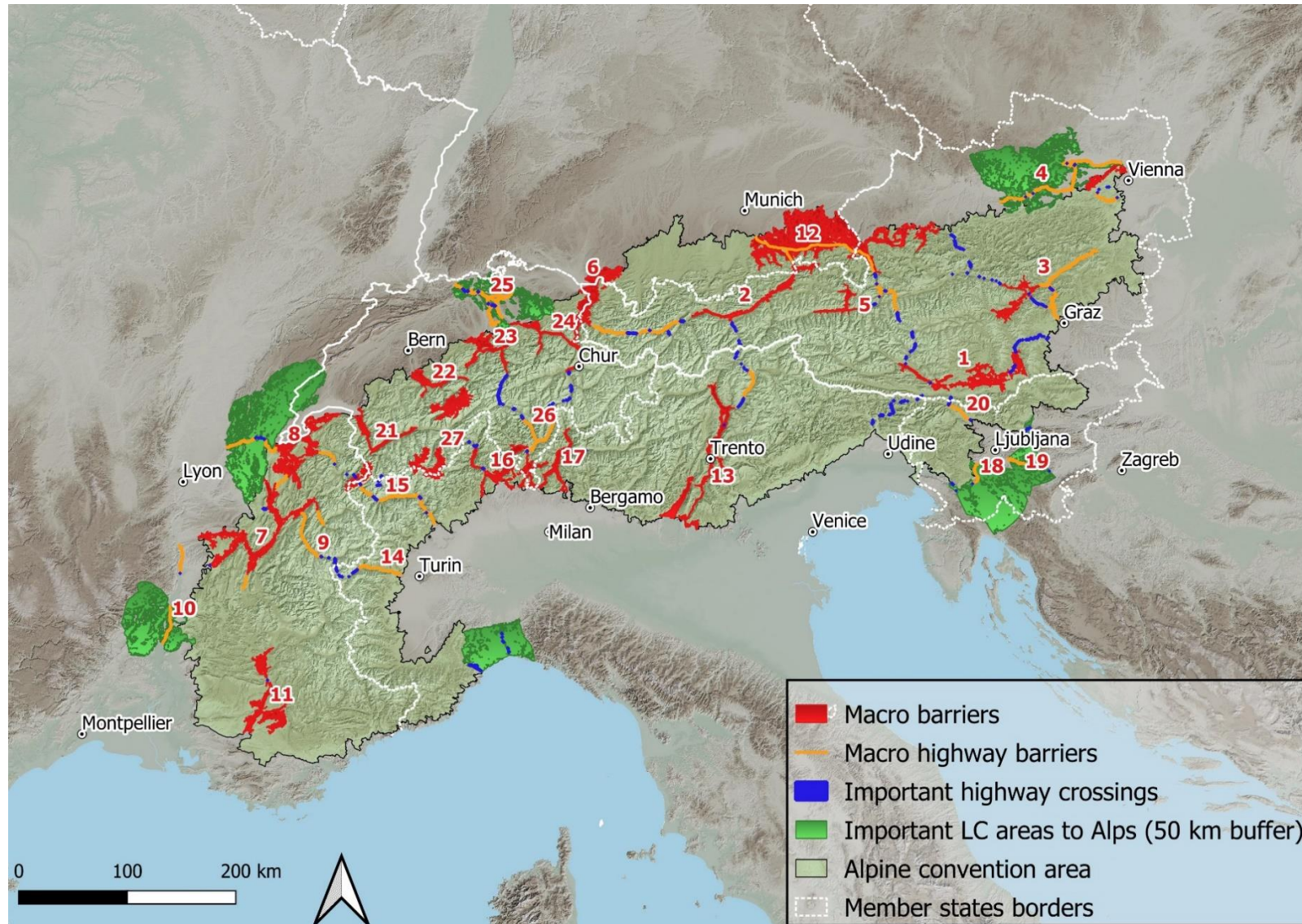


Figure 6: Identified barriers – urban and intense agricultural areas (red) and highways (orange) – together with identified important large-scale highways crossings (blue) and important landscape connectivity areas (green) in the Alps. The results are shown for the Alpine convention area perimeter with the functional surroundings (50 km buffer).

**Table 3: Identified barriers for large carnivores and wild ungulates movement in the Alps. Barriers are listed for each Contracting Parties in alphabetical order. The barrier ID number correspond to those on Figure 6. An approximately length of each barrier is given together with the recommended management actions.**

Barrier	Member State	Length	Recommended Management actions
1. DRAU VALLEY AND KLAGENFURT BASINT-LAVANT VALLEY	Austria	150 km	corridors establishment
2. INN VALLEY	Austria	>240 km	corridors establishment and green bridge infrastructure
3. MUR AND MÜRZ VALLEY	Austria	80 km	Corridors establishment and green bridge infrastructure
4. St. PÖLTEN – VIENNA HIGHWAY	Austria	140 km	Established corridors incorporated into regional development plans
5. SAALACH-SALZACH VALLEY	Austria	45 km	Established corridors maintenance
6. LOWER RHINE VALLEY	Liechtenstein, Switzerland, Austria and Germany	>70 km	Corridors establishment and green bridge infrastructure
7. “GRENOBLE – CHAMBERY” BARRIER	France	200 km	Corridors establishment and green bridge infrastructure
8. THE “GENEVA BARRIER”	France	>100 km	Corridors establishment and green bridge infrastructure
9. HIGHWAY “AITON-MODANE”	France	50 km	Corridors establishment and green bridge infrastructure
10. HIGHWAY “AVIGNON-VALENCE”	France	40 km	Corridors establishment and green bridge infrastructure
11. DURANCE VALLEY	France	90 km	Corridors establishment
12. THE INNTAL AND NUMBER “8” HIGHWAYS BARRIER	Germany	140 km	Corridor establishment, improvement of existing highway underpasses and incorporation of landscape connectivity into construction planning of the new “Intall railway”
13. ADIGE RIVER VALLEY	Italy	>150 km	None.
14. “TURIN-MODANE” HIGHWAY	Italy	80 km	green bridge infrastructure
15. “CHAMONIX-IVREA” HIGHWAY	Italy	100 km	corridors establishment
16. LAKE MAGGIORE	Italy	90 km	corridors establishment
17. LAKE COMO	Italy	80 km	corridors establishment and green bridge infrastructure
18. “LJUBLJANA – KOPER” HIGHWAY	Slovenia	50 km	Established corridors maintenance and green bridge infrastructure

19. "LJUBLJANA- NOVO MESTO" HIGHWAY	Slovenia	40 km	Established corridors maintenance and green bridge infrastructure
20. "LJUBLJANA- JESENICE" HIGHWAY	Slovenia	30 km	Established corridors maintenance
21. RONA RIVER VALLEY	Switzerland	80 km	Established corridors maintenance and green bridge infrastructure
22. THUNER- AND BRIENZERSEE BARRIER	Switzerland	50 km	Established corridors maintenance and green bridge infrastructure
23. "LUZERN BARRIER"	Switzerland	90 km	Revision of established corridors
24. UPPER REN VALLEY – WALENSEE BARRIER	Switzerland	90 km	green bridge infrastructure
25. "WINTERTHUR- ZÜRICH-ZUG" HIGHWAYS BARRIER	Switzerland	100 km	green bridge infrastructure
26. THE LUGANO- BELLINZONA BARRIER	Switzerland	80 km	Revision of established corridors
27. BERNESE, PENNINE AND GRAIAN ALPS	Switzerland	-	None (natural barrier)

## 4. CONCLUSIONS AND RECOMMENDATIONS FOR ENHANCING AND RESTORING LANDSCAPE CONNECTIVITY WITHIN THE BARRIERS

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Barriers and important landscape connectivity areas in the Alps for large carnivores and wild ungulates movement are listed in Table 3 and Figure 6. **These are priority areas in the Alps for transboundary management activities for enhancing and restoring landscape connectivity.** In the following chapter we provide a short description for each identified barrier, a list of connectivity improvement action that were already conducted and our recommendations for further actions necessary to facilitate landscape connectivity. Barriers are listed according to the contracting parties and the barrier numbers are corresponding to those in Table 3 and Figure 3.

### Barriers listed by Contracting Parties with management recommendations

#### Austria

##### 1. DRAU VALLEY AND KLAGENFURT BASIN-LAVANT VALLEY

With a length of more than 150 km this is one of the largest barriers in the Alps. The direction of barrier is west-east and it stretches from the city of Spittal in the west across Villach and Klagenfurt towards Wolfsberg on the east. The barrier consists of urban fabric, agricultural land, river Drava and few larger lakes. There is a highway going through the whole length of the barrier. Because of its size and west-east direction, this is one of the most important barriers for wildlife movement in the eastern Alps. It affects the movement of target species from high valuable habitats in the southern Alps (Julian Alps, Karawanken, Friuli-Venezia Giulia region) towards highly valuable habitats in the northern Alps in Austria.

#### **Conducted management actions for improving landscape connectivity.**

Within the LIFE project “Schütt-Dobratsch” (LIFE00 NAT/A/007055) a 92m wide green bridge was constructed for bears and other wildlife in 2004 ([http://www.schuett.at/life/massnahmen\\_gruenbruecke.php](http://www.schuett.at/life/massnahmen_gruenbruecke.php)).

The “Freiraumkonzept Kärnten” registers open spaces and wildlife corridors. Within the regional development plans every commune shall determine areas kept free from further development (Leitner et al. 2016).

#### **Further actions for improving connectivity**

Both west and east from the barrier there are areas of highly permeable landscape, therefore it is important to prevent fragmentation of landscape in these areas. Especially important is the mountain range east from the barrier (east of Wolfsberg, i.e. “Koralpen”) with highly permeable habitat (CSI>8) and a high density of existing suitable highway crossings. Nevertheless, due



to the size of the barrier we recommend to undertake measures to increase the connectivity also within the barrier. Therefore, we recommend establishing wildlife corridors within the barrier. There are two potential areas for corridors within the barrier. The first one is just at the village of Weißenbach. In this location, there is a bridge across the highway and some forest patches connecting the valley. These forest patches are intersected with some industrial units, but we predict that there is still enough connection for a wildlife corridor. Therefore, this area needs protection from further fragmentation. The second area is a forested ridge east of Griffen with a series of bridges and tunnels across the highway. This area is sparsely populated with well-connected forest patches and it has a big potential for a wildlife corridor.

## 2. INN VALLEY BARRIER

The valley of river Inn stretches on the direction of southwest-northeast. With more than 240 km in length this is one of the biggest barriers for wildlife in the Alps, although the valley itself is more or less narrow. It stretches from Landeck in the west to Rosenheim (northeast) in Germany. A highway and fenced railway are running through the valley together with other types of transport infrastructure. From Roppen downstream the valley becomes wider and opens to a dense urban fabric and agricultural lands.

### **Conducted management actions for improving landscape connectivity.**

Three possible sites for green bridges have been determined by the ASFINAG from Roppen to Kufstein. Proposed areas are east of Telfs, east of Stans and between Radfeld and Kundl (Völk et al. 2001, Proschek 2005, BMVIT 2006). No determined green bridge was built to date.

### **Further actions for improving connectivity**

We recommend realizing planned green bridge infrastructures. In addition, it would be important to establish wildlife corridors in the functional vicinity of the green bridge infrastructure. In addition to the planned locations, another potential wildlife corridor could be discerned near the town of Schwaz. Some forest patches along the Vomper Bach could in the current state act as corridor if a green bridge would be built across the highway.

## 3. MUR AND MÜRZ VALLEY

Mur and Mürz valley represents together with the “S6” and “S36” highways a wildlife movement barrier which is around 80 km long. The barrier is directed southwest towards northeast. In the Southwest and northwestern part the barrier consists mostly of the urban fabrics of the Judenburg, Knittelfeld and Leoben cities and on the east the barrier is represented mostly by the S6 and S36 highways.

### **Conducted management actions for improving landscape connectivity.**

A green bridge is planned close to the town of Kraubath an der Mur (Völk et al. 2001, Proschek 2005, BMVIT 2006). For large carnivores and wild ungulates, an especial important location

for a green bridge is between the villages of Altendorf and Leising, where there is an area of connected forest patches across the valley of Mura, which could become a movement corridor across the valley to the north. A planned alternative location for green bridge location is also by the village of St. Stefan ob Leoben.

Green zones and ecological corridors have been designated in the enacted regional plans (Leitner et al. 2016).

#### **Further actions for improving connectivity**

We recommend to establish planned green bridge and wildlife corridors green infrastructure.

#### **4. “St. PÖLTEN - VIENNA” BARRIER**

In the Northeast of Austria there is an area between the cities of St. Pölten and Amstetten which may allow the connection between the Alps and the Bohemian (Šumava) Massif in the North (figures 5 and 6). Some connected forest patches are preserved in this area, especially along the Donau river and in the eastern vicinity of the city Amstetten. “The western” highway cuts through this area. Also the river Donau is a strong natural barrier here that should be taken into account.

#### **Conducted management actions for improving landscape connectivity.**

A green bridge was constructed in the commune of Bergland (ASFINAG press release, 21.10.2015; [https://www.ots.at/presseaussendung/OTS\\_20151021\\_OTS0047/asfinag-gruenbruecken-als-lebensraum-verbindung-ueber-autobahnen-und-schnellstrassen](https://www.ots.at/presseaussendung/OTS_20151021_OTS0047/asfinag-gruenbruecken-als-lebensraum-verbindung-ueber-autobahnen-und-schnellstrassen)). The corridor passing the commune of Bergland between the Alps and the Bohemian (Šumava) Massif was also highlighted in the Interreg project “Crossborder Habitat Network and Management – Connecting Nature AT-CZ”. The action plan developed within the project presents ways how to incorporate the protection of wildlife corridors into the regional development planning. (Frey-Roos et al. 2021)

#### **Further actions for improving connectivity**

We recommend to incorporate the planned wildlife corridor into the regional development planning.

#### **5. SAALACH-SALZACH VALLEY BARRIER**

The Saalach-Salzach valley barrier is a small barrier that is 45 km long and mostly around 1,5 km width. It “runs” in two directions, west-east and south-north and is representing a wildlife movement barrier in the direction southeast- northwest. The barrier consists mostly of small settlements and intensive agricultural land.

**Conducted management actions for improving landscape connectivity.**

A number of regional and supra-regional “Green corridors” crossing the Saalach-Salzach valley in the district of Pinzgau were legally established between Mittersill and Taxenbach within the regional programs (Regionalprogramm Pinzgau and Regionalprogramm Oberpinzgau; <https://www.salzburg.gv.at/themen/bauen-wohnen/raumplanung/ueberoertliche-raumplanung/regionalplanung>). The corridors are situated close to Uttendorf, Lengdorf, Niedernsill, and Bruck an der Glocknerstraße.

**Further actions for improving connectivity**

The protection of existing wildlife corridors should be maintained.

Liechtenstein**6. LOWER RHINE VALLEY BARRIER (AUSTRIA, LIECHTENSTEIN, SWITZERLAND AND GERMANY)**

The Rhine valley barrier is located in the territories of three countries, Austria, Liechtenstein and Switzerland, however the majority of its area is in Austria. The Rhine valley runs in the direction of south north and is a wide, densely populated valley, especially towards the northern part and with high density of traffic infrastructure.

**Conducted management actions for improving landscape connectivity.**

In the mentioned barrier between the municipalities Weite/Wartau and Balzers/Triesen a highway crossing (green bridge) is at the beginning of an implementation process. The same is the case for the location between the municipalities Buchs/Grabs/Gams/Sennwald (Switzerland) and Schaan/Eschen (Liechtenstein) about 12 km in northern direction.

**Further actions for improving connectivity**

In the context of a package of measures that was adopted by the Government of the Principality of Liechtenstein in 2020, the improvement of wildlife corridors within the potential migration corridors of red deer must be reviewed. The Office of Environment has been tasked with developing a concept with proposals for the implementation of habitat connectivity elements and optimized migration corridors (Massnahmenpaket zur Verbesserung der Waldverjüngung...). On the border between Liechtenstein and Switzerland between the municipalities of Weite/Wartau (Switzerland) and Balzers/Triesen (Liechtenstein) an establishment of a corridor needs to be considered. In this area there are few settlements and some patches of riparian forest by the river Rhine that could serve as a needed vegetation cover. There is also a highway (A13) running parallel along the river Rhine in this area. If a corridor could be established in the area this would be an important area connecting Alps and



Jura Mountains (Via the “Churfürsten”, see barrier description number 24. Rhine valley - Walensee barrier in Switzerland.). This area between Weite/Wartau and Balzers/Triesen is part of the forthcoming reviews. Provided that the implementation process runs as planned, Rhine valley crossing wildlife corridors could be achieved within the next 10-15 years.

## France

### 7. THE “GRENOBLE-CHAMBERY-ALBERTVILLE” BARRIER

The valley of Grenoble, Chambéry and Albertville in France is a barrier that stretches from Voiron and Saint-Marcelin on the west to Chambéry and Albertville in the east. The direction of the barrier is southwest – northeast. All together this barrier is more than 200 km long and more than 5 km wide on the widest part. This barrier is important because it is affecting the connectivity between Alps and Jura mountains.

#### **Conducted management actions for improving landscape connectivity.**

A 12-meters-wide green bridge across highway A43 has been put into service at the start of 2022, south of Chambéry, on the territory of the Porte-de-Savoie municipality.

A 12-meters-wide green bridge has been put into service at the start of 2022, on the Aix-les-Bains / Annecy section of the A41 motorway, south of Annecy, on the territory of the Montagny-les-Lanches municipality.

#### **Further actions for improving connectivity**

Within the barrier, the most important part regarding the connectivity is located on the northeastern part, between Aix-les-bains and Annecy. This area is a landscape of fragmented forest mosaics and agricultural lands and it is still sufficiently connected according to our CSI analysis (CSI between 6 and 8). Therefore, it represents the best existing connection on an axis towards Jura. The highway A41 is the most problematic here. We recommend establishing a wildlife corridor in the vicinity of the new green bridge across A41 in the Montagny-les-Lanches municipality to facilitate movement across this green bridge. An existing possible A41 highway crossing is also the highway bridge crossing the river Cheran. Therefore, we also recommend that river Cheran and surrounding riparian forest are protected as wildlife corridor.

### 8. THE “GENEVA BARRIER”

This is a larger barrier in the vicinity of Geneva and lake Lemman on the border with Switzerland. It consists of urban areas around the cities of Geneva, Annecy and Thonon-les-Bains.

#### **Conducted management actions for improving landscape connectivity.**

The construction of a green bridge has been launched in spring 2022, on the Annecy-Geneva section of the A41 highway, north of Annecy, on the territory of the former Pringy municipality. Works are expected to end in spring 2023.

**Further actions for improving connectivity**

We recommend that the forest surrounding the planned green bridge across the “A41” on the territory of the former Pringy municipality is protected as wildlife corridor to facilitate species movement in this area. We also recommend that possibilities for further green bridge locations are considered if possible.

**9. HIGHWAY “AITON-MODANE”**

The section of the A43 highway between Aiton and Modane is around 50 km long and goes from the city of Aiton to Modane across a narrow, partly densely populated area. With the exception of the southern most part near Modane it has no major suitable highway crossing, therefore it is problematic in terms of target species connectivity.

**Conducted management actions for improving landscape connectivity.**

No information has been communicated regarding this barrier.

**Further actions for improving connectivity**

We recommend undertaking measures establishing and improving connectivity on this highway. This includes green bridge infrastructure. The most promising parts for a green bridge location is just south of the Saint-Marie-de-Cuines settlement on the southeastern border of the Saint-Marie-de-Cuines municipality. At this location, the valley is the narrowest and no settlements are located.

**10. HIGHWAY “AVIGNON-VALENCE”**

A 40 km long section of the highway A7 Avignon-Valence is intersecting two potential forested corridors south and north of the Montelimar municipality which are connecting the Alps with the Massif Central. In addition to the highway, a natural barrier intersecting those corridors is also the river Rhone together with some small settlements and industrial/commercial units.

**Conducted management actions for improving landscape connectivity.**

No information has been communicated regarding this barrier.

**Further actions for improving connectivity**

We recommend protecting the existing forested corridors to minimize the risk of further fragmentation. In addition, we recommend a green bridge infrastructure across the A7.

## 11. DURANCE VALLEY BARRIER

The majority of this barrier is situated in the Durance river valley from Manosque in the south to La Saulce in the north. The barrier is more than 90 km long and up to 9 km wide. It includes a hydraulic canal over all its length, a highway A51 and a railway line over a part of the valley. Moreover, the Durance itself is a watercourse, which creates a natural barrier between the two sides of the valley. Within the barrier, especially two locations in the north of the identified barrier (in the territory of La Saulce and Ventavon municipalities) are considered as “black spots”, where landscape connectivity needs to be improved as a priority. The valleys of Durance’s tributaries are not considered as parts of a barrier, as they are not concerned by any major infrastructure.

### **Conducted management actions for improving landscape connectivity.**

The A51 motorway is a relatively recent motorway, with wide wildlife crossings in operation since its construction. In addition, competent authorities carry out actions in the two priority sectors referred to above (La Saulce and Ventavon), to improve the understanding of landscape connectivity problems and promote remediation actions.

### **Further actions for improving connectivity**

The barrier is the narrowest by Vallée (on the territory of the Salignac municipality), where there is also a highway bridge across Durance river. In this location, there are also forested areas with permanent cover and with no large settlements nearby. We recommend establishing a wildlife corridor at this location to prevent further fragmentation and reconnect this area.

## Germany

## 12. THE INNTAL AND NUMBER “8” HIGHWAYS BARRIER

In the vicinity of Rosenheim and west of Salzburg (south-eastern Germany; Figure 6) the habitat for our target species is very fragmented with many agricultural lands and small settlements intersecting forested areas. However, because of many good connected forest patches, we believe connectivity of this area is still sufficient. Nevertheless, management actions are needed to enhance connectivity. The strongest barriers in that region are the “number 8” highway, which is running east-west from Salzburg to Munich, and the “Inntal” highway “number 93” which is located in the River Inn valley.

### **Conducted management actions for improving landscape connectivity.**

Concerning the upgrading of the “number 8” highway from Salzburg to Rosenheim some minor measures for enhancing wildlife landscape connectivity are planned on the existing underpasses of creeks and river valleys. The construction of specific green bridges for wildlife crossing is currently not in discussion.

For the Inntal-highway “number 93”, no measures for improving landscape connectivity is currently planned.

### **Further actions for improving connectivity**

During the upgrading of highway “number 8” planned improvements of existing underpasses should be carried out as planned. Those measures should be aimed also in preserving and connecting small existing forest patches and/or hedges to guide animals towards these underpasses.

For the highway “number 93”, the planning process of the new railway tracks should be used for discussing and implementing a concept for a better landscape connectivity of the German part of the Inn valley. A transboundary planning approach with Bavarian/Tyrol authorities is recommended (Bavarian Agency of Environment, 2008).

## Italy

### **13. THE ADIGE RIVER VALLEY**

Adige river valley, going all the way from the vicinity of Verona across Trento to Bolzano and Merano, is one of the most important barriers for wildlife movement in the Alps. This barrier is almost 150 km long and is therefore one of the largest barriers in the Alps also due to the presence of highway, railways, urban areas and intensive agricultural areas. A reintroduced population of brown bears is living in the forested habitat west of Trento and this is the only population of brown bears with recorded reproduction in the Alps. The Adige valley barrier is hindering the movement of bears to east towards a large area of suitable habitat and the area where bears for the Dinaric population are present. Nevertheless several cases of crossing from bears (successful and unsuccessful) have been reported, together with cases of car accidents with them and other wildlife species, mainly ungulates. Regarding the wolf, we believe that the valley is more permeable, due to the higher adaptation of this species, but no data have been yet collected for wolf crossing. Therefore this barrier is not impermeable, however landscape connectivity is in general poor. Especially in the section between Bolzano and Merano.

### **Conducted management actions for improving landscape connectivity.**

No actions have been undertaken to improve connectivity or are expected, also due to the fact that the ration costs/benefits would be too low.

### **Further actions for improving connectivity**

No actions are expected due to the high financial input needed to increase connectivity. Studies have documented that the only existing suitable highway crossings are located north of Bolzano (a documented case of bear accident in 2012 between Bolzano and Merano; Figure 6). These highway crossings are of very high importance for connectivity in the Alps and must be protected as wildlife corridors. In addition, adaptations of these existing crossings would be beneficial to increase and direct animal movement. North of Trento a suitable potential corridor exists, but was not accepted as suitable.

#### 14. “TURIN-MODANE” HIGHWAY

This highway is located at the western part of Piedmont region and runs for approximately 80km. Several cases of accidents with wildlife (wolves and ungulates) have been reported on this highway.

##### **Conducted management actions for improving landscape connectivity.**

The LIFE WOLFALPS EU ([www.lifewolfalps.eu/en/](http://www.lifewolfalps.eu/en/)) project is conducting a specific action aimed to improve ecological connection in this barrier. In 2020 a study on the ecological corridors present in the valley and the most critical points have been identified. In 2021, in close collaboration with the infrastructure management society, ANAS, RFI and SITAF, numerous inspections were carried out to identify solutions for the number of accidents and reduce road mortality in the various critical points.

##### **Further actions for improving connectivity**

Management actions for improving wildlife connectivity are planned by Life WolfAlps Eu project; this measurement includes establishments of suitable green bridge infrastructure or adaptation of existing infrastructures for wildlife crossing.

More detail information about these activities can be obtained at the following address;  
<https://www.lifewolfalps.eu/proseguono-i-lavori-per-ridurre-gli-investimenti-di-lupi-lungo-la-ferrovia-e-le-statali-in-alta-valle-di-susa/>

#### 15. THE “CHAMONIX-IVREA” HIGHWAY

The highway leading from Chamonix in France to Ivrea city in Italy is around 100 km long. Across the length of the highway there are four locations of suitable wildlife highway crossing. These locations are north of Entreves, by Derby-Villaret, at Borgo and finally at Bard.

##### **Conducted management actions for improving landscape connectivity.**

No information.

##### **Further actions for improving connectivity**

The four mentioned highway crossings are of the most importance for connectivity in the Alps and should be maintained and fragmentation of forests prevented via suitable corridors establishment. In addition, adaptations of these existing crossings would be beneficial to increase and direct animal movement.

## 16. LAKE MAGGIORE BARRIER

This barrier largely consists of the lakes Maggiore and d'Orta with their surroundings. To the northwest this barrier continues to the Toce river valley. A highway goes throughout the barrier. The barrier is around 90 km long.

### **Conducted management actions for improving landscape connectivity.**

In that barrier studies have been conducted about ecological corridors in order to elaborate a specific map of ecological networks and critical points for wildlife crossing.

### **Further actions for improving connectivity**

Lake Maggiore and d'Orta with urban surroundings are absolute barriers. However, in Toce river valley there are three locations with suitable wildlife highway crossings. Especially important is the viaduct by Albo, which is situated in the middle of the barrier. All these highway crossings are important for connectivity. Maintenance with the prevention of the deforestation and protection as corridors is important.

## 17. LAKE COMO BARRIER

This barrier which is around 80 km long is represented by the lake Como, which is a natural barrier, and the highway "Strada statale 36" which runs from lake Como into Valtellina valley. On the east part of lake Como the highway is in many parts in tunnels, therefore this section is not problematic for connectivity.

### **Conducted management actions for improving landscape connectivity.**

In the lower part of Valtellina in order to improve connectivity a design for the improvement of ecological connectivity (project "greeway dell'Adda"; <https://naturachevale.it/wp-content/uploads/2021/12/Greenway-Adda-in-bassa-Valtellina.pdf>) was approved in 2021 and shared by the municipalities involved. The design of the local ecological network foresees actions for the improvement of landscape connectivity, the preserving of the major corridors and the design of major bridges for defragmentation.

### **Further actions for improving connectivity**

Planned activities are listed in the greeway dell'Adda project documentation;  
<https://naturachevale.it/wp-content/uploads/2021/12/Greenway-Adda-in-bassa-Valtellina.pdf>

Slovenia

## 18. THE “LJUBLJANA – KOPER” HIGHWAY

The forested area of Dinaric mountains plateaus between the town of Vrhnika on the east and the village Razdrto on the west (Figure 6) are of the most important corridors for large carnivores and ungulates connecting Dinaric mountains and Alps. Based on the suitable connectivity habitat the area would be highly permeable for target species. Especially between towns of Vrhnika and Unec and between Unec and Postojna where large continuous forest areas are preserved. However, the highway intersecting those areas with very few suitable wildlife crossings is a barrier importantly hindering animal movement.

**Conducted management actions for improving landscape connectivity.**

A green bridge is planned between Unec and Postojna and currently a spatial planning document is being prepared. A wildlife corridor is established in the area protecting forests in the functional vicinity of the planned green bridge (Javornik et al. in preparation). Corridors are also established in the functional vicinities of important existing highway crossings, such as “Ravbarkomanda” bridge near Postojna and on three locations in the vicinity of Razdrto, Senožeče and Podnanos (highway towards Ajdovščina).

**Further actions for improving connectivity**

The vicinity of the only existing largescale highway crossing between Unec and Postojna, the “Ravbarkomanda” bridge, is already very fragmented. A study is needed to assess the functional connectivity of the “Ravbarkomanda” bridge.

## 19. THE “LJUBLJANA- NOVO MESTO” HIGHWAY

East of Ljubljana another important landscape connectivity area from Dinaric mountains towards Alps is located (figure 6). It consists of connected forest patches at the vicinity of the towns Grosuplje and Ivančna Gorica in the south and leads towards the mountainous areas of Zasavje and from there towards the Menina planina Plateau in the eastern Slovenian Alps. Important barrier that intersects this landscape connectivity area is the highway “Ljubljana- Novo mesto”.

**Conducted management actions for improving landscape connectivity.**

A number of small-scale green bridges are constructed on the highway section. However, currently it is unknown if this green bridges are functional in providing target species connectivity. A recent landscape connectivity study made by the Slovenia Forest Service (Javornik et al. in preparation) showed that the most important connectivity area is between Grosuplje and Ivančna Gorica at the villages of Peč and Višnja Gora. These area was therefore protected as wildlife corridor within the forest and wildlife management plans. However, at this location there are no existing green bridges.

**Further actions for improving connectivity**

A detailed study on the highway permeability is recommended focusing on the functional connectivity of the existing green bridges. A construction of green bridge at the villages of Peč and Višnja Gora should be considered.

**20. THE “LJUBLJANA-JESENICE” HIGHWAY**

The “Ljubljana-Jesenice” highway leads northwest from the vicinity of Ljubljana (“Sorško polje”) towards Jesenice and Austria. It intersects and affects the connectivity between Julian Alps on the west and Karawanken Alps on the east.

**Conducted management actions for improving landscape connectivity.**

There are two important bridges on this highway located at Ljubno and Žirovnca-Moste. At both of these locations forest patches are connecting the valley. Therefore, we assess that both areas still provide functional connectivity (Javornik et al. in preparation). Therefore, forests in the functional vicinity of those locations are protected as wildlife corridor within the forest and wildlife management plans.

**Further actions for improving connectivity**

The protection of existing wildlife corridors should be maintained and deforestation of those corridors prevented.

Switzerland

Switzerland has a large number of corridors recognized by the Federal Roads Office (FEDRO) all over the country. All information about the status of the corridor with the cartography can be found on the cartography portal of the Swiss confederation. Link [Interregional Wildlife corridors](#). Each corridor has a specific ID (i.e. corridor VD-22.1/VS-12). We are referring to this ID number through the text.

Furthermore, a program of remediation of a large number of corridors is under responsibility of the Federal Roads Office (FEDRO). Further information can be found on the link: [Teilprogramm Sanierung der Wildtierkorridore 2021 \(in German\)](#).

**21. THE RONA RIVER VALLEY**

Barrier in the Rona valley is around 80 km long and 1 km to 6 km wide. It consists of urban areas and agricultural land. The largest urban areas are located around the cities of Sion, Monthey and Sierre. A highway goes through the valley with no suitable tunnels or bridges for animal crossing.



**Conducted management actions for improving landscape connectivity.**

Three wildlife corridors exist in this section of the Rona River (from Chablais to Sierre). One green bridge has been built on Saint-Barthélémy River (corridor VD-22.1/VS-12) and was finished in 2021. Further north from this one (corridor VD-20.1), another bridge is in planned.

Further east in the valley, near to Sierre, another corridor does exist (corridor VS-42) which is currently disturbed mainly by vineyard surfaces. Major traffic disruptions (highway and rail are partially buried, which will improve the permeability of the corridor.

**Further actions for improving connectivity**

Construction of a green bridge is currently in the process of planning within the corridor VD-20.1 in the vicinity of the town of Chessel and Versvey.

**22. THE THUNER- AND BRIENZERSEE BARRIER**

This barrier consists of a densely populated area around the Thunersee and Brienzensee lakes. At the far north of the barrier there is the city of Thun. This barrier is around 55 km long and 1-10 km wide.

**Conducted management actions for improving landscape connectivity.**

Within this barrier three wildlife corridors are recognized by the Federal Roads Office (FEDRO). The first is in the eastern most part the barrier by Innertkirchen (corridor name BE-17). Within the BE-17 corridor no wildlife passage is necessary due to its intact status and because the barrier is passable (cantonal road). The connectivity in these corridors is so far provided.

Secondly, there is a wildlife corridor between the two lakes in the vicinity of Interlaken (corridor name BE-15). This corridor is largely interrupted and measurement for increasing landscape connectivity are needed.

Finally there is a third corridor (corridor name BE – 11a at Kiesen, north of Thun.

**Further actions for improving connectivity**

Within the wildlife corridor BE-11a the construction of an underground wildlife crossing at Kiesen is in progress.

At Interlaken (BE-15) the construction of a wildlife crossing on the highway A8 is necessary but not yet planned by the FEDRO (Federal Roads Office) program. Wildlife-friendly development of the roadway and navigation channel environs should be undertaken. Nevertheless, further east of the corridor BE-15, the highway is partially buried which may serve as passage of large fauna.

## 23. THE “LUZERN BARRIER”

This barrier represents a densely populated area in the vicinity of the city of Luzern. It stretches from the cities of Sarnen on the west to Luzern in the north and from Schwyz on the east to Altdorf on the south.

### **Conducted management actions for improving landscape connectivity.**

In this area, there are several wildlife corridors recognized. Due to urbanization and agriculture development these wildlife corridors are mainly interrupted and disturbed. In some of them green bridges were already build to facilitate large mammal's connectivity and others have no measures planned yet:

- In the corridor OW-2 the study of a wildlife crossing bridge is in progress (status July 2021).
- Corridor SZ-05: the construction of a wildlife green bridge at Röten Goldau is in progress.
- Corridor ZG-06: the study for a wildlife bridge at Bürglen Risch has been approved.
- Corridor LU-02: the construction of a wildlife bridge in Neuenkirch is in progress.

### **Further actions for improving connectivity**

Corridor SZ-06: currently no measures are planned but corridor is included in the FEDRO (Federal Roads Office) remediation program. Improvements of the under passage or the construction of a wildlife bridge are proposed but not planned yet. The current status of the corridor is largely interrupted.

The following corridors all have a disturbed (but not interrupted) status and have no measures planned and are not included in the remediation program of the FEDRO: SZ-04; AG-28/LU-01/ZG11; LU-22; LU-23; LU-03; LU-04; LU-24; LU-09. Still, wildlife should be able to cross and the connectivity more or less provided.

## 24. THE UPPER REN VALLEY – WALENSEE BARRIER

This barrier stretches from Obersee lake across Walensee lake and up the Ren valley to the city of Chur. This barrier is connected to the “Ren valley” barrier, which crosses the territory of Switzerland, Lichtenstein, Austria and Germany (see Liechtenstein). This barrier is approximately 87 km long and 1-7 km wide. A highway runs through the whole barrier with no suitable large-scale crossings for wildlife within our analysis.

### **Conducted management actions for improving landscape connectivity.**

In this area, there are several wildlife corridors recognized. The following wildlife corridors within the barrier are not interrupted and because of this have no improvement programs:

- GR-02: intact corridor due to a wildlife bridge already constructed prior to the FEDRO remediation program.
- SZ-01 and SZ-03: intact corridors.

- GL-05: corridor disturbed but no improvement program planned.
- GR-45/SG-06: corridor disturbed but no improvement program planned.

Disturbed corridors should still be more or less crossable for wildlife even if barriers and disturbances in the area are not unneglectable.

Other wildlife corridors are currently part of the FEDRO remediation projects:

- GL-07/SG-02/SZ-07: remediation of a lower wildlife crossing completed.
- GR-01/SG-26: Landscape connectivity improvements completed.
- SG-06: Landscape improvements completed.
- SG-09: Landscape improvements on the existing cantonal road bridge completed.
- GR-06: Wildlife bridge is planned: preliminary design study in progress.
- GL-06: Wildlife bridge is planned: preliminary design study in progress.
- SG-04: Wildlife bridge is planned: preliminary design study in progress.
- SG-07: Wildlife bridge is planned: preliminary design in progress
- SG-08: Wildlife bridge is planned: preliminary design in progress.
- GL-04: Wild warning system: not planned yet but foreseen in the FEDRO remediation program.

### **Further actions for improving connectivity**

Following actions for existing wildlife corridors are planned within the FEDRO remediation projects:

- SZ-11/SG-27: Upper wildlife crossing planned but studies did not started yet (study starts in 2023 and construction in 2031).
- GR-06: Green bridge is planned: preliminary design study in progress.
- GL-06: Green bridge is planned: preliminary design study in progress.
- SG-04: Green bridge is planned: preliminary design study in progress.
- SG-07: Green bridge is planned: preliminary design in progress
- SG-08: Green bridge is planned: preliminary design in progress.
- GL-04: Wild warning system: not planned yet but foreseen in the FEDRO remediation program.

## **25. THE “WINTERTHUR-ZÜRICH-ZUG HIGHWAYS” NETWORK**

This barrier consist of a network of highways around Zürich, Zug and Winterthur. These highways are important as they intersect a number of forested ridges connecting Alps with Jura mountains. There are two important continuous areas that could serve as potential corridors connecting Alps and Jura. One goes west from Zürich and Obersee Lake and the other east, near the city of Winterthur. The later corridor, which leads to the Churfirten ridge in Alps is wide and more connected, but is intersected with two highways near Winterthur. In addition, the Churfirten ridge is cut off from the rest of the Alps with the Ren valley and Walensee barrier (number 24.). The western corridor runs thought more fragmented forested landscape, but is more connected to Alps with high density of suitable highway crossings.

**Conducted management actions for improving landscape connectivity.**

Within the barrier several wildlife corridors are recognized by the FEDRO (Federal Roads Office) – see below. For more details about the status of corridors in this barrier see link: [Interregional Wildlife corridors](#).

**Further actions for improving connectivity**

Within this highway network, some wildlife crossing projects are included in the FEDRO remediation program:

- ZH-18: Green bridge projects with studies not yet started.
- ZH-20: Green bridge projects with studies not yet started.
- ZH-21: Green bridge projects with studies not yet started.
- AG-29: Green bridge not yet planned but in the program foreseen.
- AG-01: Preliminary design underway.

Other corridors are already largely interrupted and there are no remediation projects at this time:

- For example ZH-09.

**26. THE LUGANO-BELLINZONA BARRIER**

The valley of Lugano, Lugano lake and the city of Bellinzona represent a west-east barrier that is more than 80 km long. Together with “lake Como” and “lake Maggiore barriers” (both in Italy see, numbers 16. and 17.), the “Lugano-Bellinzona barrier is representing a network of barriers in central-southern Alps. All three valleys are representing a movement barrier running west-east. The direction south-north however is well connected.

**Conducted management actions for improving landscape connectivity.**

North of Lugano, the corridor named TI29-30 has been remediated with a green bridge above the highway A2. This green bridge and the corridor are supposed to connect the Lugano and Bellinzona areas. North of Bellinzona the landscape connectivity is the most interrupted; two of the wildlife corridors in this area are largely interrupted (TI-24 and TI-21,-25).

**Further actions for improving connectivity**

For this barrier, the landscape connectivity is not studied in details and projects are quite scarce. Some further actions on improving connectivity are still planned:

- TI-15-19: Arrangement works are in progress.
- TI-20/GR-11: A preliminary project for an ecological under passage is in progress.

The TI-24 is largely interrupted but no remediation project is planned in this corridor. Same for TI-44, TI-21,-25.

## 27. BERNESE, PENNINE AND GRAIAN ALPS

The Bernese and Pennine Alps in Switzerland are together with the Graian Alps on the border between Switzerland and France the largest areas of higher altitudes in the Alps (Figure 6). Nevertheless, they are natural (geomorphological) barriers that should be taken into account when considering large carnivores, red deer and wild boar connectivity, because such altitudes are considered to be unsuitable habitat for those species.

### **Conducted management actions for improving landscape connectivity.**

None (natural barrier).

### **Further actions for improving connectivity**

None (natural barrier).

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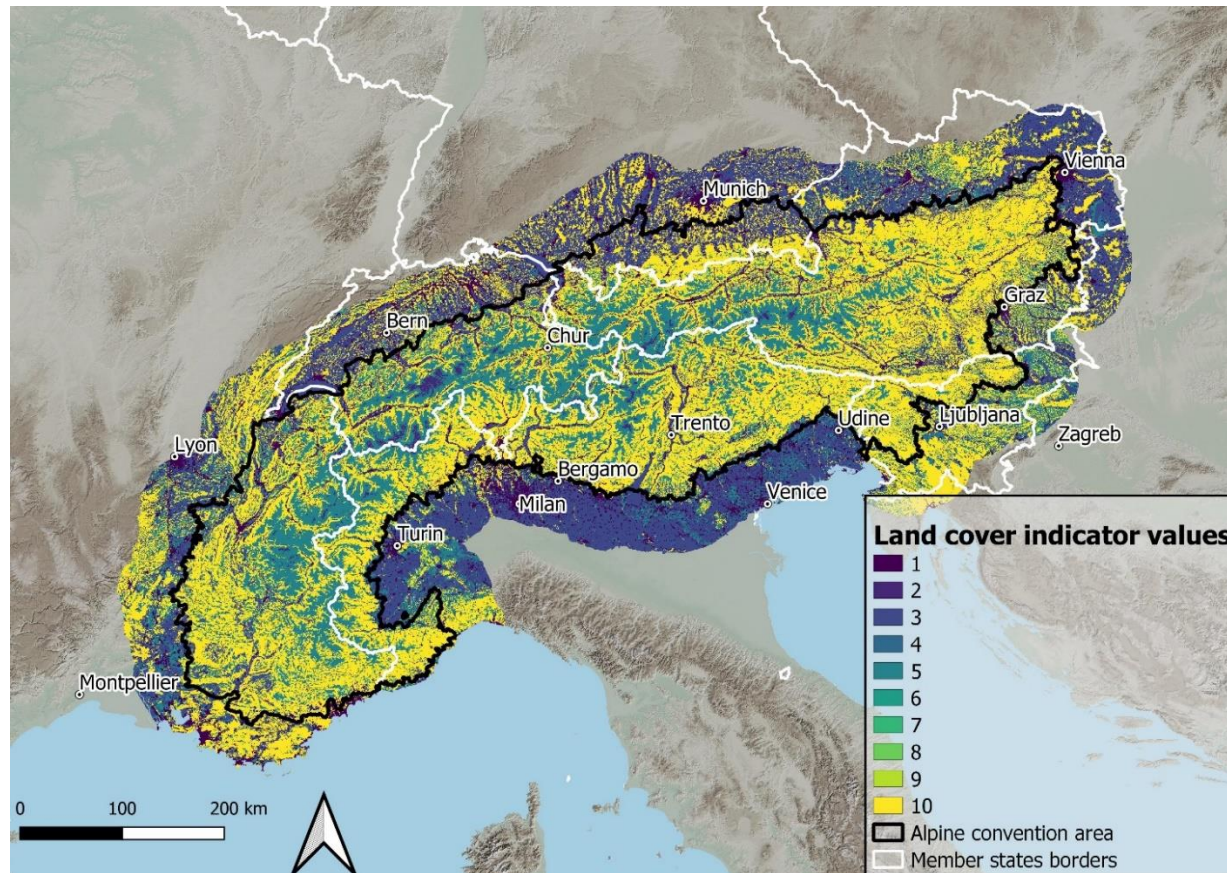
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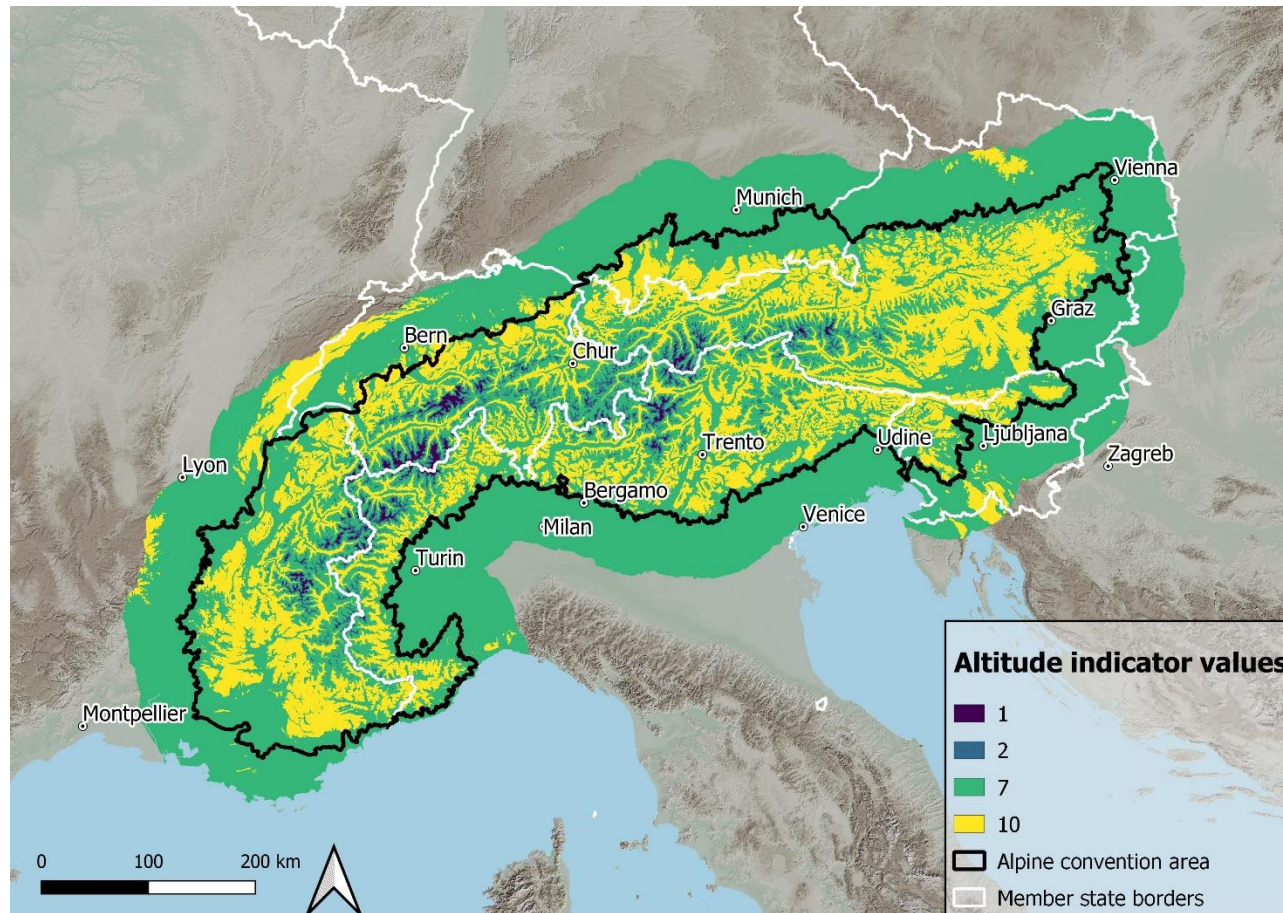
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## ANNEX 1



Map of Corine land cover indicator values used in our CSI modelling for large carnivores and wild ungulates in the Alps. The indicator values are shown for the Alpine convention area perimeter with the functional surroundings (50 km buffer).

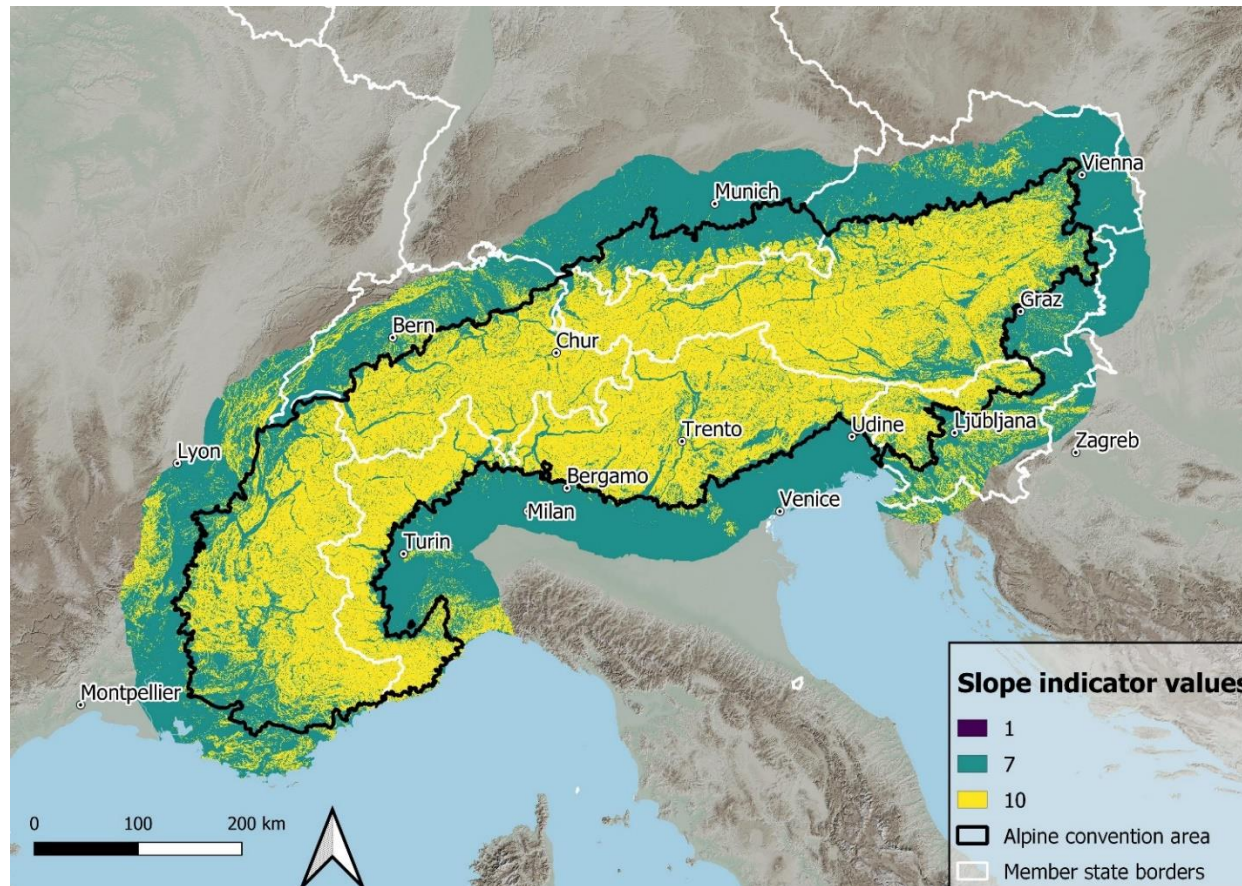
## ANNEX 2



Map of Altitude indicator values used in our CSI modelling for large carnivores and wild ungulates in the Alps. The indicator values are shown for the Alpine convention area perimeter with the functional surroundings (50 km buffer).



## ANNEX 3



Map of Slope indicator values used in our CSI modelling for large carnivores and wild ungulates in the Alps. The indicator values are shown for the Alpine convention area perimeter with the functional surroundings (50 km buffer).



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# IMPLEMENTATION OF MANAGEMENT OPTIONS FOR THE CONSERVATION OF BROWN BEAR IN THE ALPS

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**LARGE CARNIVORES, WILD UNGULATES AND SOCIETY WORKING  
GROUP (WISO) of the Alpine Convention**

*Mandate 2021–2022*



ALPENKONVENTION  
CONVENTION ALPINE  
ALPSKA KONVENCIJA  
CONVENZIONE DELLE ALPI



This report is the result of the WISO mandate under Slovenian Presidency.

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## Introduction

In 2017, as part of the LIFE DINALP BEAR project (LIFE13 NAT/SI/000550), Guidelines for Common Management of Brown Bear in the Alpine and Northern Dinaric Region (hereinafter: Guidelines, 2017) were developed and confirmed at the meeting of WISO in the mandate 2017–2018 as a document of high quality and significance for joint further steps towards a harmonized

Alpine-wide brown bear management. These guidelines include ten management actions for brown bear management. These actions differ between the Alpine and Dinaric management units (hereinafter: MU). In this report, we focus mainly on the management action in the Alpine MU, because WISO represents the Alpine Convention area.

At the beginning of 2022, a questionnaire was sent to the contracting parties of the Alpine Convention. The purpose was to find out which of the ten management options were implemented by the official authorities of those contracting parties.

The questionnaire consisted of 51 questions, of which 21 were close-ended and offered the respondents different answers in advance. The other 30 questions were open-ended to gather in-depth answers from the respondents regarding certain topics. One representative from each contracting party (Austria, France, Germany, Italy, Switzerland, Liechtenstein and Slovenia) was included in the study (total respondents included: N=7).

Based on the collected answers (the [questionnaire](#)), the following document summarizes the approaches in brown bear management by the included member state.

## Results of the survey

### 1. National legalisation

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All involved countries, which are members of the European Union, are obligated to follow European laws and ratifications of international conventions. Brown bear in the EU is a strictly protected species and is governed by different authority sectors. In addition to this background, management of this large carnivore is set in strategic documents. These documents provide a good background for bear management but the need for more regional and concrete guidelines has been recognised.

In Alpine MU's main objectives, concerning national legislation is to secure a.) legal background for long-term conservation and b.) coexistence of brown bears and humans, to remove obstacles for interventions and enable fast response when needed.

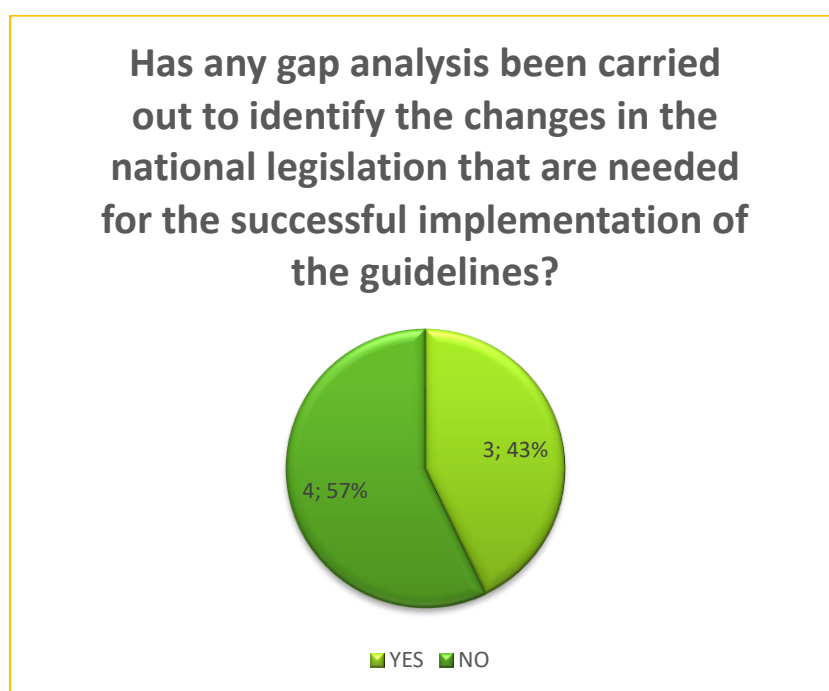


Figure 1; Answer to question 1.

Three of seven respondents answered affirmative to the question if there has been any gap analysis carried out. The other four respondents stated that until now, no such analysis has been conducted. More detailed answers are presented further.



Figure 2; Answer to question 3.

The majority of the respondents (six out of seven) answered affirmative to the question if any action has been taken to establish a legal background for expert based management of the bears. More detailed answers are presented further.

Slovenia and Switzerland answered 'YES' to both questions.

Since the population of the brown bears in Switzerland consists mainly of male individuals, legal acts regarding the management of brown bears are gender-specific. In case of larger female presence in the future, the management scenarios would need to be revised and supplemented. Based on the Federal Council report from January 2021, the main identified problem is organic waste near settlements, which provide easily accessible food to bears. In the area, where conflict and damage occur, there is a possibility of additional optimization of the prevention practices.

In Slovenia, the National management strategy was prepared based on the Guidelines but not adopted by the Government. Legal background for livestock guarding dogs (LGD) was established. Bear management includes and enables the possibility of quick removal of conflict bears. Bear watching is regulated through the game management plans. As part of the LIFE Lynx project, police officers were further trained to effectively investigate and detect poaching cases.

Respondents from Liechtenstein, Italy, Austria and Germany stated that no gap analysis was carried out. Nevertheless, a legal background for expert based management of bears was established.

The national legislation of Liechtenstein includes basic management options (Table 1), which can be complemented in case of (frequent/regular) bear presence.

In Italy, the Autonomous Province of Trento has adopted management legal acts for brown bears based on Specific guidelines, according to which BIG (bear intervention group), the system of continuous education and training of damage inspectors has been established. New



regulation on damage prevention and damage compensation has been adopted, as well as EU state subsidy system.

In Germany, they are working on a bear intervention group and advising on protection measures.

Since no bear presence is currently recorded in the Alpine part of France, no activity has been carried out for this purpose. However, a National Action Plan has been adopted, which may be amended in regards to the possible presence of brown bears in Alps in the future.

In Austria, the management plan is drawn up as a set of recommendations. It is not used as a strategic document. State authorities decide when and which management issues need to be addressed. An operating system of damage inspectors has been established and is administered by each federal state. The hunting laws of Tirol (§ 52a) and Lower Austria (§ 100a) have been adopted to enable state administration to act in a case of conflict and bear presence on specific hunting grounds. Currently, there is no need for special programs dealing with prevention measures. The legal system for the implementation of measures is regulated. Persecution of poaching is the duty of the Federal and State Department for Environmental Crime Investigation.

	NATIONAL LEGISLATION
LI, IT, CH, FR	1. Ensure continuation and implementation of accepted strategic documents.
LI, IT, DE, CH, AU, FR	2. Ensure legal backgrounds for work of Bear intervention groups (BIG) and damage inspectors in the whole area.
LI, IT, DE, CH, SL, AU, FR	3. Ensure legal backgrounds for the protection of livestock and other human property.
IT	4. Ensure legal backgrounds for proper "bear proof" waste management.
LI, IT, CH, SL	5. Enable quick removal of conflict individuals.
CH, SL	6. Ensure legal background for bear watching in national/regional legislation.
LI, SL, AU, FR	7. Ensure proper legal backgrounds for an efficient response of police in poaching cases.

Table 1; Implemented activities in countries.

## 2. Population monitoring and research

---

The objective of the population monitoring is to have sound data, to evaluate bear population status and dynamics overall the MUs, as well as a detailed record of all bear mortality and certain types of bear-human interactions. Monitoring also needs to have a temporal component, so that not only abundance but also population dynamics is regularly documented.

There are two different types of monitoring data, that ensure comprehensive, holistic monitoring:

- (1) Data on population status that includes all parameters required to assess population status at the population level (mortality, abundance and population expansion/connectivity, genetic status, health).
- (2) Data on human-bear interactions, since bears in this area live in a densely populated landscape with high anthropogenic influence, which makes humans the most influencing factor to bear conservation in this areas. Understanding human attitudes towards bears and the drivers shaping these are of foremost importance for human-bear coexistence, and ultimately for bear conservation (human-caused mortality, interventions by Bear Intervention Groups (BIG), damages done by bears, human attitudes towards bears).



Photo 3; Bear with the telemetry collar (Photo: Andrej Rot).

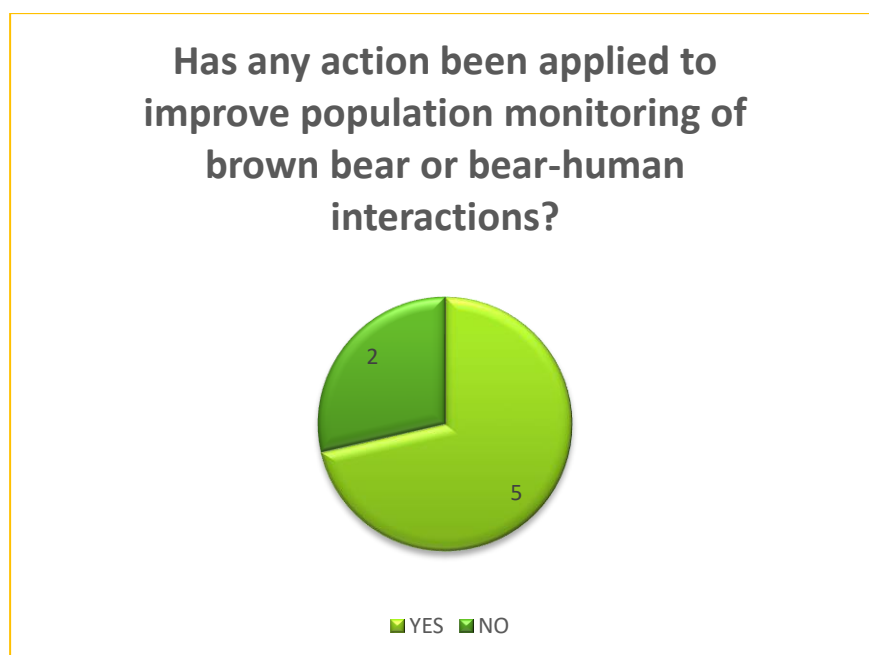


Figure 4; Answer to question 8.

Five out of seven respondents answered affirmative to the question on population monitoring. More detailed answers are presented further.

No action was applied in Liechtenstein and Germany.

The main reason for this is that there are no bears in Liechtenstein and France Alps, but France gathers data of the bear population in the Pyrenees. The same is true for Germany, where there are small bear numbers and therefore no political support.

In Italy, monitoring is carried out on a yearly base with intensive monitoring every second year. A sampling of non-invasive genetic material, monitoring of changes in distribution and monitoring of bear genetic status is regularly carried out. Regular specific autopsies are performed and a database has been set up in Trentino. A yearly report (mainly on monitoring) is published, discussed and communicated to the public through social channels ([grandicarnivori.provincia.tn.it](http://grandicarnivori.provincia.tn.it)).

In Slovenia, the next genetic monitoring (population size estimation, effective population size) is planned for 2023 (Dinaric MU every 8 years, Alps every 4 years). Distribution is monitored via questionnaires for hunters. Bear mortality and human-bear interactions are systematically monitored on regular basis.

Switzerland, has established national monitoring. There is regular communication and cooperation with neighbouring countries and communication to increase the acceptance of bears.

In Austria, non-invasive genetic samples are analysed to determine the sex, origin, distances travelled and length of stay of individual bears. Nation-wide collection of all reported bear signs is conducted by Österreichzentrum Bär Wolf Luchs. There are few mortality cases, but each case is carefully reviewed and analyzed by a wildlife veterinarian.

	POPULATION MONITORING
IT, SL, FR	1. Monitoring of abundance, sex and age structure in regular intervals where reproduction occurs (at least once per generation time – every 5 years).
IT, CH, AU, FR	2. Sampling of non-invasive genetic material that monitors (1) survival of individual bears, (2) origin of individual bears and dispersal distances, and (3) parentage analyses.
IT, CH, SL, AU, FR	3. Monitoring of changes in distribution.
IT, CH, SL, FR	4. Monitoring of bear genetic status.
IT, CH, SL, AU	5. Routine examination of all detected bear mortality not caused by severe trauma by a qualified wildlife veterinarian. Regular examinations of a sample of other bear mortality for specific pathogens.
IT, CH, SL, AU, FR	6. Monitoring of bear-human interactions.
SL	7. Standardized (across MU) structured questionnaire with questions about attitudes toward bears and bear management applied to a representative sample of the general public and the most important stakeholder groups.
IT	8. Organization of a regular population-level forum where monitoring activities are coordinated and discussed.

Table 2; Implemented activities in countries.

### 3. Research recommendations

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An important issue from the perspective of population-level management and conservation is to identify research priorities, and state research recommendations for the Alpine MU and the population as a whole. This would provide a foundation for applied researchers to prepare project applications for appropriate funding instruments, and a basis for the relevant management authorities in each MU to plan for and provide funding or (co)funding instruments.

The chapter covers the definition of research activities that contracting parties of the Alpine Convention consider necessary for bear management and conservation. Summarized answers from open-ended questions below.

In Liechtenstein, International collaboration was pointed out.

In Italy, the emphasis is on research into the factors that lead to problematic bear behavior.

In Germany, genetic analysis was planned in the Alps to compare individuals and their origins.

In Switzerland, national monitoring, communication, collaboration with neighbouring countries and communication with the purpose to increase acceptance is established.

In France, as there is no bear presence, there are no concerns regarding bear research activities required for bear management and conservation.

In Slovenia, optimization of monitoring and reducing its costs is planned. Activities are focused on finding new approaches/improvements of measures used to maintain positive attitudes towards bears and coexistence (damage prevention, prevention of approaching settlements) and finding out what the influence of bear presence on populations of wild ungulates (via e.g. predation of calves).

Due to the low number of bears in Austria, no in-depth applied research activities that go beyond regular monitoring of the occurrence and activities related to human-bear interactions are carried out.

#### 4. Stakeholder dialogue and involvement

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The main objectives of this chapter are as follows: to ensure stakeholders' commitment to long-term recovery and conservation of the brown bear population in coexistence with humans, to improve collaboration, dialogue, relationships, and trust amongst relevant stakeholder groups by integrating them into the process of planning and to integrate relevant stakeholders into the implementation of actions.

A stakeholder is a person, group or organization that has an interest or concern in bear management. Stakeholders can influence or are influenced by bear management decisions, objectives and policies. In brown bear management, a combination of all types of stakeholder involvement, wisely selected for the local context and management objectives, should be used. Concerns and identification of key stakeholder groups such as hunters, farmers, local communities and environmentalists provide regular input to the planning and implementation of the coordinated population-level management.

Not all stakeholders' influence is of the same importance. The urban public, for example, is entitled to fair consideration as a constituency for which bear populations are also managed, but they are not entitled to the same level of consideration as, say, the local (rural) public living within bear range who face the daily challenges and opportunities of coexisting with bears. Stakeholders may also differ depending on their country of origin. In brown bear management, a combination of all types of stakeholder involvement should be wisely selected- according to the local context and management objectives. When planning communication, it is important to carefully take into account stakeholders' characteristics, their expectations and even stakeholders' network dynamics.



Figure 5; Answer to question 14.

Five of seven respondents answered affirmative to the question on improving stakeholder dialogue and involvement. More detailed answers are presented further.

In Lichtenstein and Germany, no action was taken to improve stakeholder dialogue and involvement, mainly because of no bear presence and therefore no political priority.

In France, in the Pyrenees, regular forums to exchange experience and ideas among stakeholders are organised more often than every 3 years, active involvement in planning and implementation of management at the national level and involvement of the stakeholders in population monitoring.

In Italy, the main stakeholders are involved at least twice a year in regular meetings.

In Switzerland, cantons are involved in monitoring and implementing measures. Several meetings per year take place between the cantons and the Confederation to discuss the management of large carnivores.

In Slovenia, all stakeholders are involved in the preparation of national strategic documents. Agricultural organisations are regularly involved in projects focusing on damage prevention, hunters are systematically involved in monitoring activities.

In Austria, the Österreichszentrum Bär Wolf Luchs was established in 2019. The aim of this association of the administrations of the nine states and two national Ministries (agriculture, environment) is to further develop the management of large carnivores in Austria. Stakeholder organizations and University institutes take part in the discussions as additional members at general meetings twice a year and in specific working groups. Within the LIFE DINALP BEAR project, they conducted systematic bear monitoring was performed in southern Carinthia involving local hunters between 2017 and 2019. In 2020, the Österreichszentrum Bär Wolf Luchs and the Carinthian administration assisted by local hunters intensified the monitoring in an area of alpine pastures to determine whether more than one bear was causing problems.



STAKEHOLDER DIALOGUE AND INVOLVEMENT	
IT, AU, FR	1. Organization of regular (every 3 years) population-level stakeholder forums for the exchange of experience and ideas among stakeholders.
IT, CH, SL, AU	2. Yearly consultations with the key stakeholder organizations at the MU level.
AU	3. Authorities delegate representatives to coordinate work with stakeholders planned under (3.1.) and (3.2.).
CH, SL, AU, FR	4. Active involvement of the stakeholders in planning and implementation of the management at the national level.
IT, CH, SL, AU, FR	5. Active involvement of the stakeholders in population monitoring.

Table 3; Implemented activities in countries

## 5. Conflict management

Conflict management is one of the most important aspects of brown bear conservation and management. The presence of brown bears in the human-dominated landscape often leads to conflicts between humans and bears that decrease human acceptance of bears, low human acceptance of bears is considered one of the main threats to bears worldwide. Conflicts usually arise due to the damages that bears can cause to human property. Bears very rarely attack people, but this still happens and not just “problematic bears” are involved. Such events can cause fear among some people and the public in Alpine MU seems to be more sensitive to such issues, because of the lost tradition of coexistence with bears.

Bears are opportunistic omnivores and therefore can be easily attracted to anthropogenic food sources that often trigger food-conditioned behaviour. With proper protection of human property, it is possible to reduce the occurrence of conflict bears. There are several measures for preventing bears’ access to anthropogenic food sources, the most important being:

Prevention of bear’s access to human waste; bear-proof waste management, use of bear-resistant garbage cans and compost bins, ban of organic waste dumps (slaughter dumps accessible to bears) and also protection of crops and domestic animals, beehives with the use of electric fences, night enclosures, shepherds and livestock guarding dogs.

Damages caused by bears sometimes occur despite proper protection of human property. For such cases, a damage compensation system has to be established (regional or state authorities can pay damages).

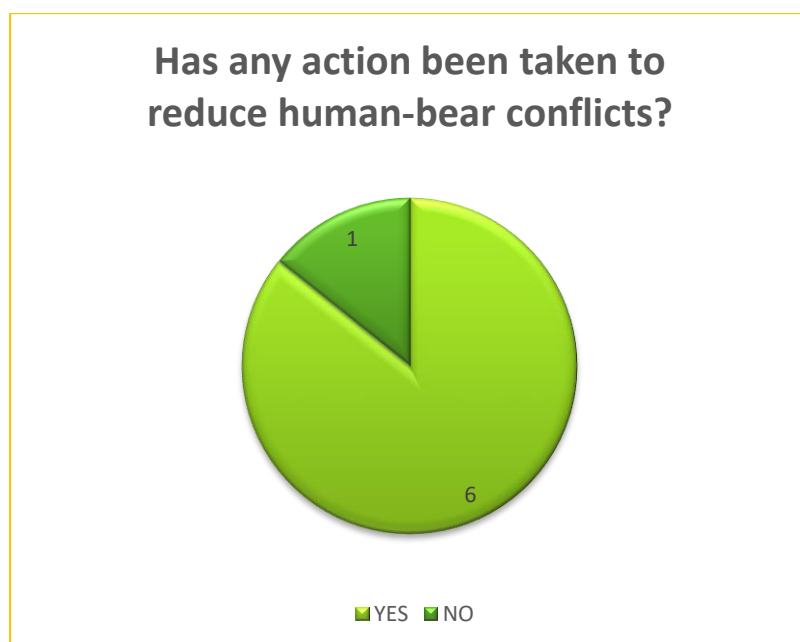


Figure 6; Answer to question 19.

Six of seven respondents answered affirmative to the question concerning reducing human-bear conflicts. More detailed answers are presented further.

In Lichtenstein, no action was applied to reduce human-bear conflict, due to the absence of bears.

In France, there are several options to consider in bear management (from the Pyrenees) to reduce conflicts, although their target species in French Alps is not bear, but wolf. It can be applied in case a bear appears.

In Italy, all of the listed options (Table 4) were taken into account, but it was still not enough to reduce conflicts at a satisfactory level.

In Switzerland, in 2008 and 2013, two conflict bears had to be shot because they lost their natural timidity and often visited inhabited villages. Some rare attacks on sheep and donkeys have occurred in recent years.

In Germany, advice is given to livestock keepers on prevention methods, such measures are paid for from public funds. Also, damages caused by bears, are compensated with public funds.

In Slovenia, all listed options (Table 4) are implemented in the public system (public service). Nevertheless, there are still some improvements that can be made.

In Austria, the information not to feed bears and how to behave if encountering a bear is spread on several websites (state administration and other organizations). Some beekeepers use electric fences to protect beehives. In addition, bear damages are compensated by state administrations.

	CONFLICT MANAGEMENT
IT, SL, AU	1. Active promotion of good practices and education for preventing bears from accessing anthropogenic food sources.
IT, SL, AU, FR	2. Active promotion of good practices to reduce the risk of attacks.
IT, CH, SL, FR, AU, FR	3. Applying damage prevention measures (LGDs, electric nets, bear-resistant compost/garbage bins etc.).
IT, DE, CH, SL, FR, AU, FR	4. Damage compensation for damages caused by bears despite reasonable use of protection measures.
IT, DE, CH, SL	5. Removal of bears.

Table 4; Implemented activities in countries.



Photo 7; Bear accesses the anthropogenic food source (Photo: Bojana Lavrič).

## 6. Removal of individuals

Removal of bears from the population is always done under strict conditions because they are a protected species. However, in some situations removal of bears is the only reasonable management decision to improve human safety and acceptance of bears among local people.

Bears, which are recommended for removal from the population in any situation, are those that represent a serious threat to people or property or other particularly problematic bears. If no action is taken immediately, these bears can cause a rapid drop in human acceptance of bears (locally or on a wider scale), therefore jeopardising the efforts for human-bear coexistence and long term conservation of the bear population.

Normally specially trained Bear Intervention Groups (BIGs) are responsible for the removal of dangerous and other problematic bears; the help of local hunters can also be used.



Figure 8; Answer to question 24.

Three out of seven respondents answered affirmative to the question on removing potentially dangerous bears and particularly problematic bears. More detailed answers are presented further.

In Italy, there were five bears removed between 2006 and 2020. Competent local authorities removed the bears.

In Switzerland, a bear was shot in 2008 and another one in 2013. Those two bears were systematically searching for food in the vicinity of the houses. The canton, in the agreement with the Confederation, authorized the shooting of the animal.

In Slovenia, in the year 2021, 128 bears were culled and 20 additional cases of bear mortality (mostly traffic collisions) were registered. The removal of the bears was carried out by hunters.

In Austria, there were no removals recently. In 1994, a problematic bear causing damage close to settlements was removed by order of a district commissioner in Upper Austria. More recently, no bear acted in a way posing a threat to people. Other requests to remove bears killing unprotected sheep were not approved by the relevant authorities.

## 7. Functional connectivity and habitat quality including food availability

The main objectives of this management action are to preserve bear habitat quality and its functional connectivity and to improve habitat connectivity where needed. Maintenance or preservation of the corridors implemented in the strategic document are expected to result in this chapter.

In the Alpine MU, the habitat connectivity needs to be improved in the Inn valley and the Adige valley. Both valleys are wide and the valley bottoms are more or less without forest cover and are used for settlements and agriculture. Additionally, highways and railways follow these valleys.

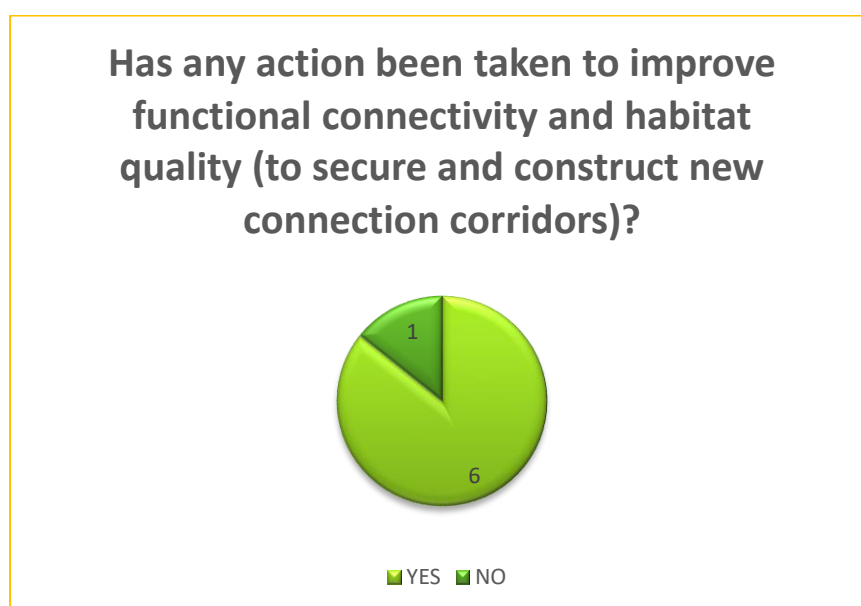


Figure 9: Answer to question 28.

Six of seven respondents answered affirmative to the question concerning improving functional connectivity and habitat quality. More detailed answers are presented further.

In Germany, no action was taken due to the absence of bears, and the consequent political insignificance of the matter.

In Lichtenstein, they are working on general habitat connectivity (Rhine valley connection corridors); Because of its current absence, the brown bear is not the focus of these actions.

In Switzerland, an inventory of wildlife corridors has been established. A program to safeguard and establish functionality is in place, including planning to build bridges across the national highways and railroads where necessary.

In Slovenia, workshops for spatial planners were conducted, the most important corridors were determined and implemented into wildlife management plans, and the process of preparing a state spatial plan focused on building the ecoduct crossing the Ljubljana-Koper highway has started.

In Italy, specific signs have been placed in spots where car accidents with bears have occurred in the past.

In France, some general improvements in connectivity have been made, but their target species was lynx, not bear. Nevertheless, the improvements can be applied also to bear.

In Austria, in 2006, the Ministry of Transport issued an instruction to the ASFINAG (Motorway and Expressway Financing Joint-Stock Company) to upgrade the existing network of motorways and expressways with wildlife crossings (over-or underpasses) at 20 important linkage zones until 2027. Three sites have been selected in the Inn valley (Telfs, Stans, Kundl). The construction of the green bridges in the Inn valley is still pending. Within the LIFE project, "Schütt-Dobratch" a green bridge was constructed on motorway A2 between Villach and Arnoldstein. ([http://www.schuett.at/life/massnahmen\\_gruenbruecke.php](http://www.schuett.at/life/massnahmen_gruenbruecke.php)).

	FUNCTIONAL CONNECTIVITY AND HABITAT QUALITY INCLUDING FOOD AVAILABILITY
SL	1. Integration of awareness about bear habitat and its connectivity into spatial planning processes (education, workshops, guidebooks, etc.)
SL	2. Conservation of the appropriate bear habitats and corridors connecting habitat patches.
AU	3. Determination of the most suitable micro-locations and type of mitigation measures to implement for the reduction of the barrier effect in Inn valley and Adige valley.
LI, CH, FR, AU	4. Construction of the mitigation measures (green bridges, reforested corridors etc.)
	5. Evaluation of the effectiveness of the mitigation measures.
LI	Other: General connectivity (Rhine valley).
IT	Other: Specific road signs in some high rate of bear crossing spots.

Table 5; Implemented activities in countries.



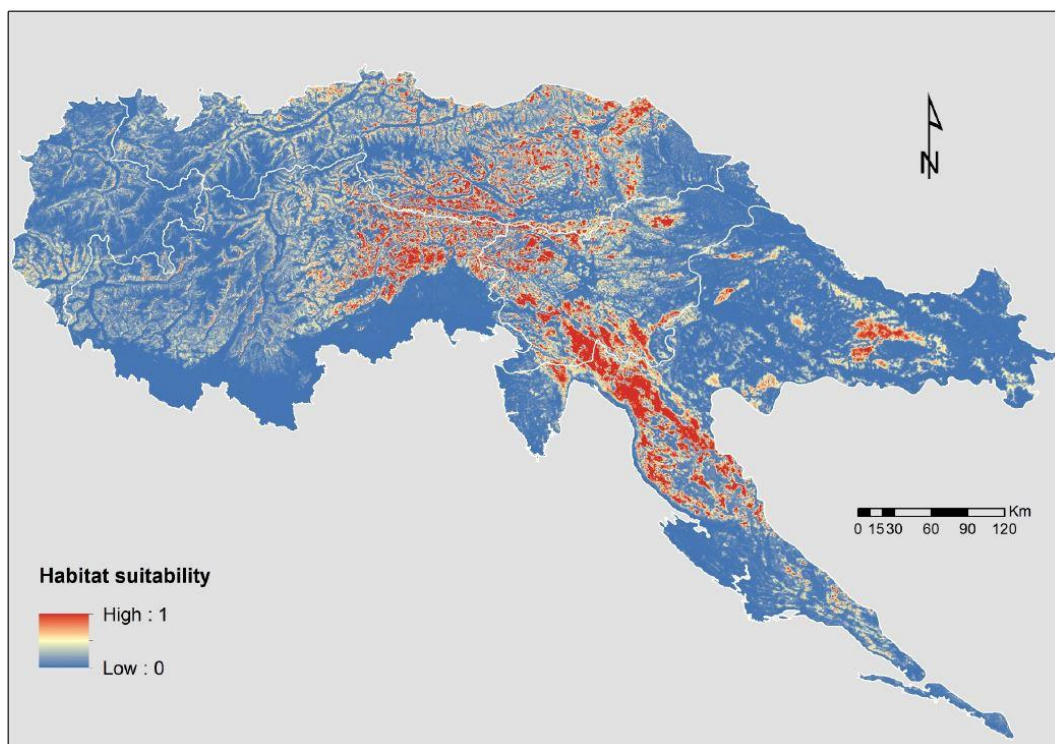


Photo 10; Functional connectivity and habitat quality (Recio et al. 2021).



Photo 11; Traffic mortality (Photo: Marko Masterl).

## 8. Governance and cross-sectorial coordination

The main objectives of this chapter are to establish or continue the sound collaboration between different national and regional sectors within each country and to continue the dialogue at the international level to ensure the long-term recovery and sustainability of the brown bear population. In addition, the plan is to improve cross-sectorial dialogue, trust and particularly coordination regarding the making and implementation of relevant managing decisions.

The optimal expected result is that relevant interest groups are involved in bear management and relevant sectors in decision-making and managing collaboration in well-coordinated population-level management.

The establishment and implementation of sound management plans require an active involvement of different stakeholders at different levels: local, regional, national and international. The developed recommendations need to be incorporated by responsible authorities into national Management and Action plans and regional decision making to meet the goals of different MU and brown bear populations per se.



Figure 12; Answer to question 32.

Six of seven respondents answered affirmative to the question concerning improving governance and cross-sectorial coordination. More detailed answers are presented further.

In Germany, due to the absence of brown bear, no actions were applied to improve governance and cross-sectorial coordination, and therefore political support is missing.

Liechtenstein takes part in regular meetings with the adjacent Swiss cantons concerning large carnivore management in the larger region as well as the Bundesamt für Umwelt BAFU. They are in contact with the Bundesland Vorarlberg concerning the situation of large carnivores.

In Italy, regular meetings at both national and international levels are held, despite severe limitations due to Covid-19.

In Switzerland, coordinated management between the sectors of conservation, hunting, forestry, agriculture and tourism for all large carnivore species is established

Slovenia is actively involved in the WISO working group, cooperation between wildlife management- environmental- and agriculture sectors.

In France the, regular cross-sectorial meetings are organised to exchange experiences and discuss challenges on a regional or national level. Challenges at the international level are discussed through the WISO working group of the Alpine Convention.

In Austria, the Österreichzentrum Bär Wolf Luchs was established in 2019. The purpose of this association, as the administration of the nine states and two national Ministries (agriculture, environment), is to develop the management of large carnivores in Austria. Stakeholder organizations and University institutes take part in the discussions as additional members at general meetings twice a year and in specific working groups.

	GOVERNANCE AND CROSS – SECTORIAL COORDINATION
CH	Identify a list of all relevant sectors.
LI, IT, CH, AU, FR	Organization of regular cross-sectorial meetings/workshops to exchange experiences and discuss challenges at the regional and/or nation level (at least once per year).
	Each sector delegates a person to coordinate work with other sectors planned under 7.2.
LI, CH, SL, FR	Organization of regular meetings/workshops with national management authorities at least once per year to exchange experiences. Discuss challenges at the international level (e.g. through the WISO working group of the Alpine Convention).
LI, IT, CH	Each MU/country delegates a person to coordinate work with other Mus/countries planned under 7.3.
CH	Active involvement of all responsible sectors in planning and implementation of relevant managing decisions.

Table 6; Implemented activities in countries.

## 9. Artificial feeding

Artificial feeding of wildlife is a controversial measure, practised in many areas worldwide. It serves different purposes and is an expensive measure with complex social background and many possible direct and indirect effects on target and non-target species.



Photo 13; Artificial feeding (Photo: Miha Krofel).

The topic was intensively studied in the Dinaric part of the project area (LIFE DINALP BEAR, [2018](#)).

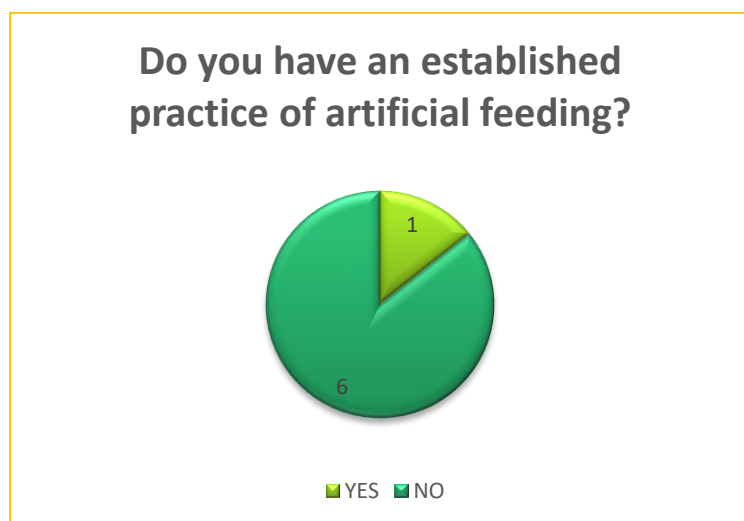


Figure 14; Answer to question 37.

One in seven respondents answered affirmative to the question concerning the established practice of artificial feeding. More detailed answers are presented further.

Slovenia has established the practice of artificial feeding that is in line with the wildlife management plans. There is a lot of space to improve the regulations in practice. No other

country has/is currently considering implementing the practice of artificial feeding, mainly because of:

- There are not any bears in the French Alps.
- In Germany, it is not a political priority due to no bears.
- Italy does not want artificial feeding; it is not necessary and may have a negative effect.
- In Liechtenstein currently there are no practices of feeding large carnivores artificially, also the artificial feeding of ungulates is forbidden (with very few exceptions in times of need or luring/baiting in hunting).
- In Switzerland, artificial feeding of wildlife is under the control of the cantonal authorities. For large carnivores, it is forbidden.
- In Austria there is no need and no practice to feed bears artificially but sometimes bears are attracted to cereals provided by hunters at roe deer feeding sites.

## 10. Poaching control

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The illegal killing of bears and other large carnivores is widespread across Europe. In some bear populations, poaching may be a threat to the population – either in small and endangered ones or in ones without regulated and implemented management. Police investigations rarely dedicate significant resources to detecting poaching and very few cases are successfully prosecuted. Killing can be caused by shooting (where large carnivores are directly targeted) and poisoning or trapping/snaring (where large carnivores may not always be the primary target).

Motivation for illegal killing in Europe seems to be linked to low tolerance and social protest rather than economic gain. Moreover, our common goal is to raise consciousness that the illegal killing of large carnivores is a serious crime and that society expects its laws to be upheld, such that political disagreements about large carnivore management and conservation are conducted through legal channels.



Figure 15; Answer to question 46.

Four of seven respondents answered affirmative to the question concerning improving poaching control, other members have already established practice. More detailed answers are presented further.

## POACHING CONTROL

	1. Perform the survey (questionnaire) on the stakeholders' opinion on the bear poaching issue: motivations, extends, ways to achieve a positive attitude and control poaching.
	2. Survey the relevant legislation in each country.
SL	3. Organize the initial and then regular (every 3 years) workshops with key stakeholder organizations.
AU, FR	4. Organize the information campaign and training for the authorities: for customs and border officials on CITES and other document use, for hunting inspectors and police ways to detect and report poaching, or for courts to enforce the regulations.

Table 7; Implemented activities in countries

In Lichtenstein, general poaching control is established.

In Slovenia, several activities are focusing on improving law enforcement and prosecution of illegal killings.

In addition, Italy has already established control that is working in Trentino.

In Switzerland, a system of supervision of wildlife by a professional wildlife warden is already in place.

In Germany, due to no bear presence there is no political interest to do such activity.

In France, there is no bear presence in the Alpine part of the country, but they have an established group for poaching control for other large carnivores, so it can be applied to brown bear if it appears.

Within Action A.3 of the LIFE WOLFALPS EU, project workshops are planned for the transfer of best practices of anti-poaching activities from the Italian Alps to Austria (and Slovenia). Over the period from 2007 to 2017 information about the situation of large carnivores in Austria was regularly presented in the training program for local police officers responsible for the investigation of environmental crime case in Niederösterreich, Steiermark and Salzburg.



## Conclusion

When we compare different Alpine countries regarding bear management in general, it is hard to understand the different state of the population of brown bears and compare it. The starting point of every state is different and our goal is to share experiences, build international collaboration and therefore manage the bear population and conserve the suitable habitat for the Alpine bear population.

Slovenia, Austria and Switzerland have prepared some national management strategies. Austria has a management plan, but not in form of a strategic document, but as a compilation of recommendations. In Slovenia, there are several activities and some waiting for adoption from the government. In Switzerland, they have sufficient legal bases for the management of male brown bears, but if a female comes, the law would have to be revised. In Liechtenstein, Italy and Germany, they established the legal background for expert based management of bears. In France, a national action plan is set, but their main concern is wolf and not bear, but it can be adapted for bears, if needed.

In the Alpine region, we should keep track of the re-colonization process and focus on how it is perceived by the local residents. A major obstacle to bear conservation in this area are negative attitudes of the general public and critical stakeholder groups that can hinder or even prevent bear population expansion. This makes monitoring of human attitudes towards bears possibly the most important monitoring activity in this area.

There was no population monitoring in Lichtenstein, France and Germany. Slovenia and Italy have monitoring carried out yearly. In Italy, yearly reports (mainly on monitoring) are published, discussed and communicated to the public ([grandicarnivori.provincia.tn.it](http://grandicarnivori.provincia.tn.it)). In Slovenia, bear mortality and human-bear interaction are systematically monitored. In Austria, non-invasive genetic samples are analysed to determine the sex, origin, distances travelled and length of stay of individual bears. In addition, nationwide monitoring of all reported bear signs (Österreichzentrum Bär Wolf Luchs) was summed. The international data is shared through the joint online database in Italy, Slovenia and Austria, established within the LIFE DINALP BEAR project in 2016.

In the chapter Research recommendations, we wanted contracting parties to define research activities that are considered necessary for bear management and conservation. In Liechtenstein and Switzerland, International collaboration and communication to increase acceptance were necessary. For Italy, research on factors that develop problem behaviours in bears was pointed out. Germany has planned research in genetics for comparing individuals and origin. In Slovenia, optimization of monitoring and reducing its costs, and finding new approaches of measures are used to maintain positive attitudes towards bears and coexistence. Some research has been conducted about the influence of bear presence on populations of wild ungulates. The low number of bears in Austria does not allow for profound applied research activities extending beyond the regular monitoring of occurrence, and human-bear interaction. There is a similar situation as in France, not the main priority because of the low number of bears in the country.



Concerns and identification of key stakeholder groups such as hunters, farmers, local communities, foresters and environmentalists provide regular input to the planning and implementation of the coordinated population-level management. Italy, Switzerland, Slovenia and Austria have yearly consultations with the key stakeholder organizations at the MU level, active involvement of stakeholders in planning and implementation of the management at the national level, and collaboration in population monitoring. In Germany and Lichtenstein, there is no bear presence; therefore, there is no interest to include stakeholders' groups. In France in the Alpine part, the situation is similar as in Germany and Lichtenstein. But in the Pyrenees, they have regular forums to exchange experience and ideas among stakeholders, organised more often than every 3 years, and active involvement in planning and implementation of management at the national level, involvement of the stakeholders in population monitoring. These experiences could be easily applied in case a bear appears in the Alpine part.

The best way to deal with human-bear conflicts is to prevent the occurrence of so-called "problematic" bears, which are food-conditioned and/or human-habituated. Usually, a small percentage of bears in the population turn into problematic, but they cause the majority of all human-bear conflicts. In that case, the removal of the individual is urgent for bear conservation and human tolerance for species.

In the chapter on conflicts, we found out that countries with high bear density have regular conflict prevention methods and others have different priorities. For example, in France, there are prevention methods well developed concerning wolves as a target species. In addition, in case that bear numbers go up, then countries can apply prevention methods to manage problematic bears as well.

It is essential to preserve bear habitat quality and its functional connectivity, with improved habitat connectivity in the Inn valley and the Adige valley. Both valleys are wide and the valley bottoms are more or less without forest cover and are used for settlements and agriculture. Additionally, highways and railways follow these valleys as a barrier.

In Germany, no measures to improve habitat were taken due to the absence of bears, and the consequent political insignificance of the matter. In France and Liechtenstein, work on general habitat connectivity is carried out, and although their target species was not bear, the measures can still be used. In Switzerland, an inventory of wildlife corridors has been established. A program to safeguard and establish functionality is in place, including planning to build bridges across the national highways and railroads where necessary. In Slovenia, workshops for spatial planners were conducted, the most important corridors were determined and implemented into wildlife management plans, and the process of preparing a state spatial plan focused on building the ecoduct crossing the Ljubljana-Koper highway has started. In Italy, specific signs have been placed in spots where car accidents with bears have occurred in the past. In Austria, in 2006, the Ministry of Transport issued an instruction to the ASFINAG (Motorway and Expressway Financing Joint-Stock Company) to upgrade the existing network of motorways and expressways with wildlife crossings (over- or underpasses) at 20 important linkage zones until 2027.

Cross-sectorial coordination, as well as coordination among different governance levels, is of utmost importance in bear management. Countries achieve the coordination with the

organization of regular cross-sectoral meetings/workshops to exchange experiences and discuss challenges on regional levels and/or national levels, or with the organization of regular meetings/workshops with national management authorities at least once per year to exchange experiences and discuss challenges at international level (e.g. through the WISO working group of the Alpine Convention). All contracting parties have some sort of cross-sectorial coordination and collaboration established, especially the one with a population of brown bears in the Alpine region.

The responses in the artificial feeding chapter all agreed (except Slovenia) that feeding wild animals is neither necessary nor in the plan for future implementations. In Slovenia, artificial feeding was intensely studied in the Dinarides (LIFE DINALP BEAR).

As far as poaching is concerned, it is clear that all countries have some sort of general poaching control already established. It may not be specific to the species of brown bear, but it can be adjusted just according to the situation when needed.

## ANNEX

	NATIONAL LEGISLATION	LIECHTENSTEIN	FRANCE	ITALY	GERMANY	SWITZERLAND	SLOVENIA	AUSTRIA
1	Has any gap analysis been carried out to identify the changes in the national legislation that are needed for the successful implementation of the guidelines?	NO	YES	NO	NO	YES	YES	NO
2	If yes, please provide further details	Naturschutzgesetz	X	X	X	An analysis report by the Federal Council (Jan. 2021)	A national management strategy was prepared based on the guidelines. The Ministry of the Environment is leading the adoption process.	X
3	Has any action been taken to establish the legal background for expert based management of the bears?	YES	NO	YES	YES	YES	YES	YES
4	Has any option listed below been taken to follow objectives?	1,2,3,5,7	1,2,3,7	1,2,3,4,5	2,3	1,2,3,5,6	3,5,6,7	1,2,3,7
5	Please provide further details for each of the options, which has been selected (a brief description of the action(s): region, date, duration, links to reports, comments...)	national legislation	Options are developed for wolf management, in case a bear appears it can be applied.	specific guidelines, BIG, bear-proof waste management	working on BIG, advised on protection measures,	Sufficient legal bases for the management of male bears. Room for improvement in damage prevention.	Legal background for LGD with the status of working dogs, quick removal of conflict bears implemented, bear watching regulated through the game management plans, development of proper legal background and efficient police teams for the prosecution of poaching cases (LIFE Lynx project).	Management plan as a compilation of recommendations. No need for a special program for prevention methods.
6	If nothing has been done, please specify the reasons (more than one answer is possible)	X	X	X	X	X	X	X
7	Comments	X	no bears in French Alps	X	X	X	X	X

Spreadsheet 1; Questions regarding national legislation.

	POPULATION MONITORING	LIECHTENSTEIN	FRANCE	ITALY	GERMANY	SWITZERLAND	SLOVENIA	AUSTRIA
8	Has any action been applied to improve population monitoring of brown bear or bear-human interactions?	NO	YES	YES	NO	YES	YES	YES
9	Has any option listed below been implemented in population monitoring of brown bears?	X	1,2,3,4,6	1,2,3,4,5,6,8,9	X	2,3,4,5,6	1,3,4,5,6,7,9	2,3,5,6,9
10	Please provide further details for each of the option, which has been selected (brief description of the project(s): region, the start of the project, duration of the project, links to reports, comments...)	X	X	Yearly monitoring, autopsies, database, yearly report	X	X	Next genetic monitoring is planned for 2023 (Dinaric MU every 8 years, Alpine MU every 4 years). Distribution of the monitoring information from hunters (questionnaires). Bear mortality and human-bear interactions are systematically monitored on regular basis.	Analysis of non-invasive genetic samples. Nation-wide monitoring of all reported bears. Mortality is analysed by a wildlife veterinarian.
11	If nothing has been done, please specify the reasons (more than one answer is possible)	no bear presence	X	X	no political support for not being concerned about the bear presence in the country	X	X	X
12	Comments	X	no bear presence in French Alps	X	only the occasional presence of brown bear, and usually short-termed	There are only a few bears.	X	X

Spreadsheet 2; Questions regarding population monitoring.

	RESEARCH RECOMMENDATION	LIECHTENSTEIN	FRANCE	ITALY	GERMANY	SWITZERLAND	SLOVENIA	AUSTRIA
13	Please define and rate in the order of priority applied research activities that you consider necessary for bear management and conservation, identify also possible sources of (co)funding:	International collaboration	no bear presence in French Alps	Research in factors that develop problem behaviors	Alpine genetics analysis, to compare individuals and origin	National monitoring, communication and collaboration with the neighboring country, and communication to increase acceptance.	Optimization of monitoring and reducing its costs. Finding new approaches/improvements of measures used to maintain positive attitudes towards bears and coexistence (damage prevention, preventing entering settlements etc.) What is the influence of bear presence on populations of wild ungulates (via e.g. predation of calves)?	Due to the low number of beares, no rearcheserch activities extending beyond regular monitoring are needed.

Spreadsheet 3; Question regarding further research activities.

	STAKEHOLDER DIALOGUE AND INVOLVEMENT	LIECHTENSTEIN	FRANCE	ITALY	GERMANY	SWITZERLAND	SLOVENIA	AUSTRIA
14	Has any action been taken to improve stakeholder dialogue and involvement?	NO	YES	YES	NO	YES	YES	YES
15	Has any option listed below been taken to improve stakeholder dialogue and involvement?	X	1,4,5	1,2,5	X	2,4,5	2,4,5	1,2,3,4,5
16	Please provide further details for each of the options, which has been selected (a brief description of the action(s): region, the start of the project, duration of the project, links to reports, comments...)	X	X	Meeting of main economic stakeholders at least twice	X	Cantons are involved in monitoring and implementation of measures. Several meetings per year to discuss the management of large carnivores.	Stakeholders are involved in the prevention of national strategic documents. Agriculture organisations are involved in projects focusing on damage prevention. Hunters are systematically involved in monitoring activities.	Authorities, stakeholder organizations and university institutes take part in discussions twice a year and in a specific working group. The Österreichzentrum Bär Wolf Luchs was established in 2019 to develop the management of large carnivores.
17	If nothing has been done, please specify the reasons (more than one answer is possible)	no bear presence	X	X	no political support	X	X	X
18	Comments	X	no bear presence in French Alps	X	due to the small number, there is no political priority	X	X	X

Spreadsheet 4; Questions regarding stakeholder dialogue and involvement.

	CONFLICT MANAGEMENT	LIECHTENSTEIN	FRANCE	ITALY	GERMANY	SWITZERLAND	SLOVENIA	AUSTRIA
19	Has any action been taken to reduce human-bear conflicts?	NO	YES	YES	YES	YES	YES	YES
20	Has any option listed below been taken to reduce human-bear conflicts?	X	2,3,4	1,2,3,4,5	3,4	3,4,5	1,2,3,4,5	1,2,3,4
21	Please provide further details for each of the options, which has been selected (a brief description of the project(s): region, the start of the project, duration of the project, links to reports, comments...)	X	X	all 5 options have been taken, it has not been reduced enough)	advise on prevention methods, compensation by public funds	Some rare attacks on cattle in recent years and two problem bears were shot because they often visited inhabited villages.	All listed options are implemented in the system (public service). Some improvements can still be made.	Awareness raising how to behave in bear country. Compensation for damages, by state administrations. Use of electric fences, some beekeepers.
22	If nothing has been done, please specify the reasons (more than one answer is possible)	no bear presence	X	X	X	X	X	X
23	Comments	X	no bear presence in French Alps	X	X	X	X	X
24	Has any action been taken to remove potentially dangerous bears and particularly problematic bears?	NO	NO	YES	NO	YES	YES	NO
25	Comments	no bear presence	no bear presence in French Alps	removing bears lead to unbelievable public debates with ARA	A working group is installed to discuss how to quickly remove	X	X	X
26	Please provide further details – the number of bears removed per year, the particularities, who executed the removal...?	X	X	8 bears (06-20), local competent authorities	X	One in 2018 and one in 2013 (radio collar), Confederation, the canton authorized the shooting.	In 2021, 128 bears were culled and we registered 20 additional cases of bear mortality. Hunters executed the removal.	No removals recently, in 1994 a bear caused damage close to an inhabited area; it was removed by order of a district commissioner.
27	If no conflict bears were removed, please specify the reasons.	no bear presence	no bear presence	X	the last bear we had did not behave in a conspicuous manner	X	X	No bear acted in a way posing a threat to people. Request to remove a bear killing unprotected sheep was not approved.



Spreadsheet 5; Questions regarding conflict management.

	FUNCTIONAL CONNECTIVITY AND HABITAT QUALITY	LIECHTENSTEIN	FRANCE	ITALY	GERMANY	SWITZERLAND	SLOVENIA	AUSTRIA
28	Has any action been taken to improve functional connectivity and habitat quality (to secure and construct new connection corridors)?	YES	YES	YES	NO	YES	YES	YES
29	Has any action listed been taken to improve functional connectivity and habitat quality (to secure and construct new connection corridors)?	4, other	4	Other: Specific road signs in some high rate bear crossing spots	X	4	1,2	3,4
30	Please provide further details for each option, which has been selected (a brief description of the action(s): region, the start of the project, duration of the project, links to reports, comments...)	General connectivity (Rhine valley)	X	where car accidents with bears occurred in the past	X	An inventory of wildlife corridors has been established. A plan to build green bridges across the national highways and railroads?	Workshops for spatial planners were conducted, important corridors were determined and implemented into wildlife management plans, and the process of preparing a state spatial plan focused on building the Eco duct crossing the Ljubljana-Koper highway started.	In 2006, instruction to the ASFINAG, to install wildlife crossings at 20 important linkage zones until 2027. Within the LIFE project "Schütt-Dobratsch" a green bridge at the motorway; Villach - Arnoldstein. The construction of green bridges in the Inn valley is still pending.
31	If nothing has been done, please specify the reasons (more than one answer is possible).	X	X	X	no political support/priority	X	X	X

Spreadsheet 6; Questions regarding functional connectivity and habitat quality.

	GOVERNANCE AND CROSS-SECTORIAL COORDINATION	LIECHTENSTEIN	FRANCE	ITALY	GERMANY	SWITZERLAND	SLOVENIA	AUSTRIA
32	Has any action been taken to improve governance and cross-sectorial coordination?	YES	YES	YES	NO	YES	YES	YES
33	Have any options listed below been taken to improve governance and cross-sectorial coordination	4, 5, other	2,4	2,5	X	1,2,4,6	4	2
34	Please provide further details for each of the options, which has been selected (a brief description of the activity(s): region, the start of the project, duration of the project, links to reports, comments...)	regular meetings concerning large carnivore	X	Regular meetings at both national and international level	X	Coordinated management between the sectors of conservation, hunting, forestry, agriculture and tourism for all large carnivore species.	Active involvement in WISO Platform, cooperation between wildlife management-environmental and agriculture sectors in Slovenia.	The Österreichzentrum Bär Wolf Luchs was established in 2019 to develop the management of large carnivores. Stakeholder organizations and university institutes take part in discussions twice a year and in a specific working group.
35	If nothing has been done, please specify the reasons (more than one answer is possible)	X	X	X	no political support/priority	X	X	X
36	Comments	X	no bear presence In French Alps	X	no political pressure due to no bear presence	X	X	X

Spreadsheet 7; Questions regarding governance and cross-sectorial coordination.

	ARTIFICIAL FEEDING	LIECHTENSTEIN	FRANCE	ITALY	GERMANY	SWITZERLAND	SLOVENIA	AUSTRIA
37	Do you have an established practice of artificial feeding?	NO	NO	NO	NO	NO	YES	NO
38	Has any action been taken to evaluate areas with artificial feeding?	X	X	X	X	X	YES	X
39	Have any options listed below been taken into management plans for areas with artificial feeding?	X	X	X	X	X	1,2,3	X
40	Please provide further details for each of the options which have been selected	X	X	X	X	X	Covered with wildlife management plans. A lot of space for the improvement of the regulations in practice.	X
41	Has any action been taken to implement the practice of artificial feeding?	NO	NO	X	NO	NO	X	NO
42	Have any options listed below been taken into consideration in case it is considered to be implemented	X	X	X	X	X	X	X
43	Please provide further details for each of the options, which has been selected (a brief description of the project(s): region, the start of the project, duration of the project, links to reports, comments...)	X	X	X	X	X	X	X
44	If nothing has been done, please specify the reasons (more than one answer is possible)	other: absence of brown bears	no bear presence	do not want artificial feeding, not necessary, negative effect	no political support/priority	Other: artificial feeding of wildlife is under the control of the cantonal authorities. Forbidden for large carnivores.	X	No need
45	Comments	artificial feeding of ungulates is forbidden	no bear presence	X	no political pressure due to no bear presence	Under control of the cantonal authorities.	X	Most bears are dispersers, visiting the country for short periods.

Spreadsheet 8; Questions regarding artificial feeding and possible implementation of artificial feeding.

	POACHING CONTROL	LIECHTENSTEIN	FRANCE	ITALY	GERMANY	SWITZERLAND	SLOVENIA	AUSTRIA
46	Has any action been taken to improve poaching control?	YES	NO	NO	NO	NO	YES	YES
47	Have any options listed below been taken to improve poaching control	other: general poaching control	X	X	X	X	3	4
48	Please provide further details for each of the options, which has been selected (a brief description of the action(s): region, the start of the project, duration of the project, links to reports, comments...)	Office of the Environment	X	X	X	X	Bear poaching is not a big issue in Slovenia (compared to wolf poaching). Several activities are focusing on improving law enforcement and prosecution of illegal killing of wildlife (LIFE Lynx project).	Within action A3 of the LIFE WolfAlps EU, project workshops are planned for best practices of anti-poaching activities in the Alps.
49	If nothing has been done, please specify the reasons (more than one answer is possible)	X	other: no bear presence	already established and working in Trentino	no political support/priority	In all Swiss cantons within the Alps, a system of supervision of wildlife by professional wildlife wardens is in place.	X	X
50	Comments	X	no bear presence	X	no political pressure due to no bears	Supervision of wildlife wardens in all Swiss cantons.	X	X

Spreadsheet 9; Questions regarding poaching control.

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# REPORT

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## ***Implementation of management options for the conservation of the Wolf in the Alps***

**LARGE CARNIVORES, WILD UNGULATES AND SOCIETY WORKING  
GROUP (WISO) of the Alpine Convention**

*XVII ALPINE CONFERENCE*



ALPENKONVENTION  
CONVENTION ALPINE  
ALPSKA KONVENCIJA  
CONVENZIONE DELLE ALPI



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## Introduction

In March 2016, the report: *"Wolf in the Alps – Recommendations for an internationally coordinated management"*, was produced as part of the RowAlps (Recovery of Wildlife in the Alps) project, launched to support the Working Group "Large Carnivores, Wild Ungulates and Society" (WISO – Fauna and Society) of the Alpine Convention. This report contains in particular several recommended management options for the conservation of the wolf and the facilitation of its coexistence with human activities.

A questionnaire was circulated among WISO members between March 22 and April 14, 2022. The purpose was to find out which of the six management options were implemented by the authorities of those contracting parties.

The questionnaire consisted of 34 questions, including 20 closed questions (choice between different proposed answers) and 14 open questions (to be answered with the respondent's own words). The representatives of six contracting parties (Austria, Germany, Liechtenstein, Switzerland, Slovenia and France) answered to the questionnaire.

Based on the answers collected, the following document summarizes the implementation of management options for wolf among alpine countries.

## Results of the survey

### 1. Secure sustainable damage compensation systems for livestock damages

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Damage to livestock by wolves can be substantial. The acceptance of the species, and the cohabitation or coexistence with human activities and in particular with breeding, requires reducing and compensating for the impact of predation.

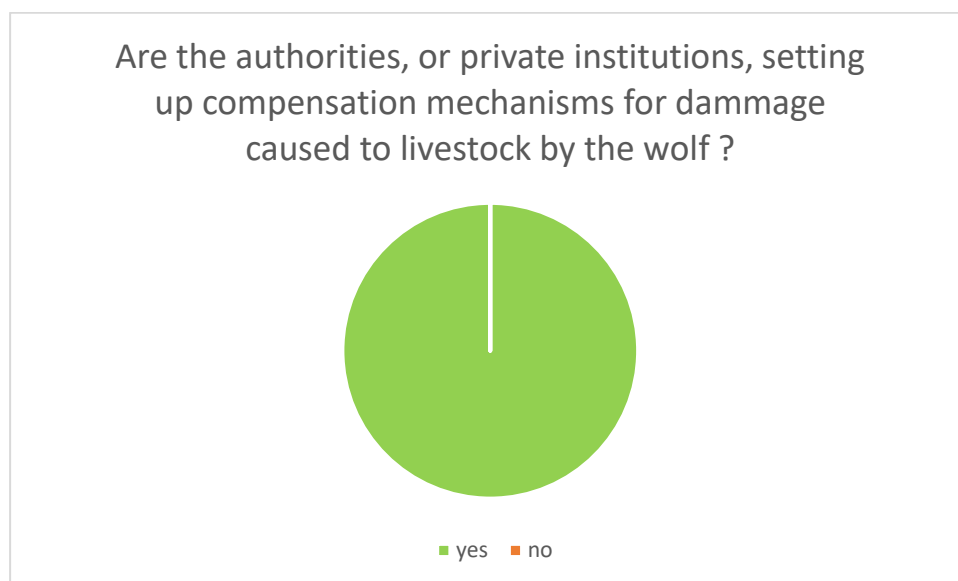


Figure 1; Answer to question 1

In the six contributing states, compensation mechanisms for damage caused by the wolf to livestock have been implemented.

In Slovenia, Liechtenstein, Switzerland and France, authorities compensate livestock damages according to current “official lists” **based on a legal obligation**.

In Germany and Austria, authorities compensate livestock damages according to current “official lists” **without any legal obligation**.

**In Liechtenstein**, according to the applicable law, all damage caused to livestock are compensated. The amount of compensation is in accordance with the official tables provided by the breeding associations of the type of livestock concerned. The amounts differ, for example purebred animals (herd book) are paid more than mixed breeds, or a dairy ewe is more valuable than a lamb.

**In Slovenia**, the authorities (Ministry of Environment and Spatial Planning) compensate for the damage caused by large carnivores if minimum protection measures are put in place. The damage is assessed by the Slovenian Forest Service.

**France** has set a regulatory scale according to which direct and indirect losses (proportionate to the cost of the direct losses) are compensated. Herds and apiaries are compensated on the condition of being previously subject to reasonable protection measures or being recognized as not eligible for protection. The species concerned (sheep, goats, horses, cattle) is taken into account in the scale, as well as the age and sex of the animal, and the kind of production (quality marks, organic production, etc.)

**In Germany**, the amount of the compensation is fixed by the authorities in charge of agriculture taking into account gender, age and special conditions (e.g. animal husbandry, organic farms, rare species). This system was set up in 2008 with co-funding by private institutions and modified in 2020 to complement state funding.

**In Austria**, there is no legal obligation to compensate for livestock damage inflicted by large carnivores. Every federal state does compensate livestock damage but regulations differ from state to state. The amount of indemnification follows official average prices when sold for meat or breeding, respectively. Some states (Oberösterreich, Steiermark) also calculate expected future economic losses, for example due to reduced breeding capacity after loss of a ewe.

	<b>Secure sustainable damage compensation systems for livestock damages</b>
CH, LI, SL FR	1. Authorities compensate livestock damages according to current "official lists" based on a legal obligation
DE, AT	2. Authorities compensate livestock damages according to current "official lists" without any legal obligation
	3. Private institutions compensate livestock damages according to current "official lists" without any legal obligation

Table 1; Implemented options to compensate for the damage caused by wolves to livestock



## 2. Secure sustainable damage prevention systems for livestock damages

Support for the protection of domestic herds faced with wolf predation aims at ensuring the sustainability of pastoral activity within the regulatory context of the protection of the wolf and the maintenance of the good conservation status of its population. It must contribute to the acceptance of the lupine species.

Breeders need to have access to various means of protection. The acquisition of one or more devices of protection of the herds constitutes an additional cost for the stockbreeders that can be the object of a financial compensation thanks to systems set up by the authorities.

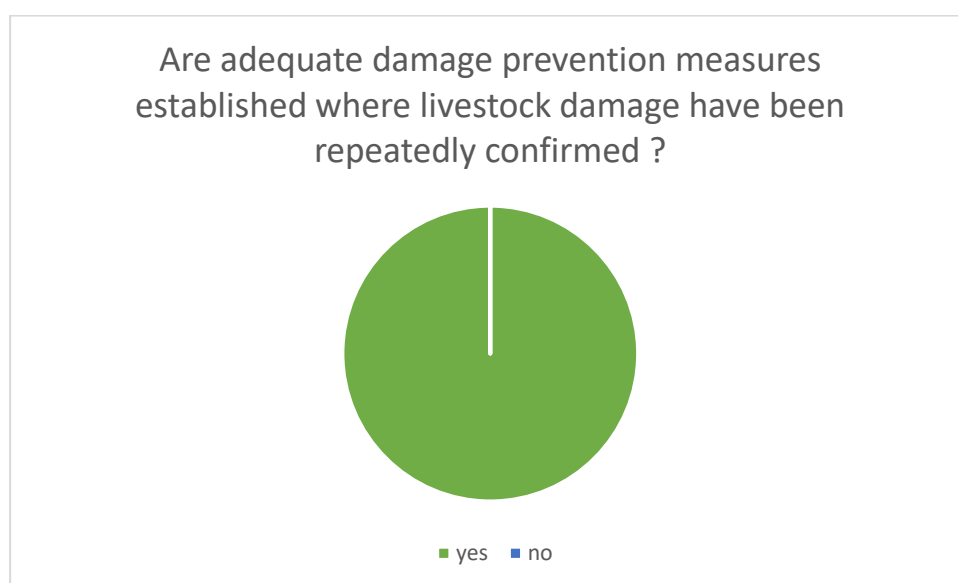


Figure 2; Answer to question 2

**In the six contributing states**, adequate damage prevention measures are in place where damage to livestock has been repeatedly confirmed (in Liechtenstein, there has been no cases of livestock damage so far).

In **Austria**, some administrations propagate livestock protection measures with restraint. The public debate concerning alpine pastures focusses on the implementation of wolf-free zones, as nearly all alpine pastures are judged as not defendable against wolf attacks by relevant stakeholders. Several protection measures are considered not feasible due to technical and legal constraints as well as the undue workload and costs they imply.

In Slovenia, Switzerland, Germany, Liechtenstein and France, the **payment of compensation is conditioned to the application of damage prevention measures**.

**In Germany**, in regions where wolf is regularly present more than 1 year, the implementation of "basic" preventive protection measures is necessary to benefit from compensation (e.g.

90cm electric fence or having livestock in pasture that could not be secured). As it stands, no financial support for the development of farming practices is provided.

**In Slovenia**, livestock needs to be protected with electricity (at least 1 electric wire). That is often not enough to protect livestock.

**In Liechtenstein**, the protective measures provided by law are fences, herd guard dogs, shepherds. The wolf management plan is currently being revised. It is intended to include a list of damage prevention measures considered reasonable at a more detailed level than the ones listed in the current legislation.

In Slovenia, Switzerland, Austria and France, **summer pasture farming systems need to be adapted to establish effective damage prevention measures.**

**In Slovenia**, EARDF can provide funding for the additional work needed for the installation of electric nets, livestock guarding dogs and shepherds. Adaptation is necessary to make the system more effective.

**In Austria**, two pilot projects are funded by the government of Tirol to test herding systems and night enclosures for sheep grazing on alpine pastures.

**In France**, the state can subsidize vulnerability analyses, fences, guard dogs so that breeders and shepherds adapt their practices to the presence of the wolf.

The adaption of summer systems has not been implemented yet in the **Liechtenstein** but is a medium to long-term possibility.

**In the six states, authorities assist breeders for the implementation of damage prevention measures.**

**In Germany**, administration of agriculture and administration of environment provide advice and assistance in the implementation of damage prevention measures.

**In Slovenia**, SFS gives advice on the way to protect livestock when damage cases occur.

**Liechtenstein** offers free theoretical and practical (on site) consulting for livestock owners.

**In France**, analysis of the vulnerability of farms are subsidized by the State, which can also finance experiments from the results of these analyses.

**In Austria**, general information on methods of livestock protection is provided by the Österreichzentrum Bär Wolf Luchs and on websites of some administrations. The installation or upgrading of fences against wolf attacks and advice on livestock protection is funded in several states up to 80 % of the investment costs. The Österreichzentrum Bär Wolf Luchs is partner of the LifeStockProtect project.

	Options implemented to prevent wolf damage to livestock
SL, LI, FR, CH, DE	1. Link compensation payments to application of damage prevention measures
SL, CH, FR, AT	2. Adapt summer systems in order to establish effective damage prevention measures

SL, LI FR, CH, DE, AT	3. Secure mechanisms for the advice on and assistance in implementing damage prevention measures by institutions in charge
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Table 2; Implemented options to prevent wolf damage to livestock

### 3. Foster dialogue among authorities, with wildlife managers, hunters and foresters

The conservation of the wolf requires the support of the citizens and in particular of the actors concerned by the subject.

Taking legislative measures alone is not enough to guarantee the good conservation status of the wolf. The participation of stakeholders in the process of developing conservation plans, and in their implementation, is essential.



Figure 3; Answer to question 3

**In the six contributing states, information and consultation mechanisms** about the wolf have been set up to promote **dialogue between the authorities, wildlife managers, hunters and foresters.**

In the **six states, round tables and workshops** are implemented to foster **dialogue between authorities and interest groups.**

**In France, Austria and Slovenia** different forms of participation in pilot regions are conducted, and the results in terms of best practice projects are evaluated.

**In Slovenia, Switzerland and France,** authorities develop and **implement guidelines** on the way to **integrate the presence of wolves in the management of ungulates and forests,** based on consultations with interest groups.

In **Slovenia, Liechtenstein, Switzerland and France**, appropriate units for the management of wolves, ungulates and forests, within national and transboundary borders are in operation.

**Slovenia, Liechtenstein, Switzerland and France** enable and promote **factual communication within the group**.

In **Slovenia and France**, regular **systematic public surveys are undertaken to assess and refine the work with interest groups and the general public** ("social monitoring")

**Slovenia** is preparing **strategic documents about the wolf**. They are prepared in such a way that all stakeholders are invited to participate in the process. **Workshops are organized and all stakeholders are invited**. A public opinion survey was carried out. Workshops with hunters were organized to create measures to take the wolf into account in the management plans for ungulates.

**Liechtenstein** provides stakeholders with the possibility to make statements on changes of legislation and management plans concerning wolf management. When necessary, discussions, round tables etc. are organized to work together on detailed issues.

In **Germany**, a Bavarian Working Group for Large Carnivores has been set up and meets approximately once a year. At district level, round tables are organized on request with the main stakeholders (administration, interest groups).

In **France**, a national wolf group (GNL), and a national action plan (PNA) on wolf and breeding activities, have been set up. The GNL associates representatives of the government (local and national administrations), of hunters, of agricultural professions, of environmental protection associations, elected officials, etc. It meets several times a year. Working groups on different subjects are set up according to current events or according to the requests of the GNL.

Similar committees are set up in each department concerned by the presence of the wolf.

Regular communications are made to the GNL, or to local elected officials, etc., on subjects relating to the wolf and coexistence with human activities. The prefect of the Auvergne-Rhône-Alpes region is the coordinating prefect for the implementation of the policy relating to the wolf in France: the website of the Regional Directorate for the Environment, Planning and Housing in the region Auvergne-Rhône-Alpes contains an information section dedicated to the wolf. The websites of the prefectures of the departments concerned by the presence of the wolf also contain information on measures to protect flocks, etc...

The French Office for Biodiversity (OFB), a public establishment, has a "large predators" department, which steers and leads the "wolf-lynx network" which monitors the wolf population and provides information on its state of conservation, based on various presence indices, genetic analysis, etc. within the framework of a scientific and globally recognized monitoring protocol and method. An estimate of the number of wolves is produced annually at the end of each winter; an estimate of the number of packs is made at the end of each summer. These two estimates also provide information on the spatial evolution of the wolf. Naturalists, hunters,

breeders, park staff, volunteers etc. can participate and supply presence indices to the "wolf-lynx network" after compulsory training.

**In Austria**, the Österreichzentrum Bär Wolf Luchs has been established in 2019. The aim of this association of the administrations of the nine states and two national ministries (agriculture, environment) is to further develop the management of large carnivores in Austria. Stakeholder organizations and research institutes take part in the discussions as additional members in general meetings and specific working groups.

In Vorarlberg a board formed by the state administration and interest groups (Koordinationsgruppe Großraubwild) provides information on large carnivores and facilitates the coordination of management actions.

The government of Tirol has initiated two projects to investigate the practical consequences of shepherding in the setting of Tyrolian alpine pastures.

	<b>Options taken to foster dialogue among authorities, with wildlife managers, hunters and foresters by establishing information and consultation mechanisms about the wolf</b>
SL, LI, FR, CH, DE, AT	1. Establish round tables and workshops to encourage dialogue among authorities and interest groups
SL, FR, AT	2. Establish different forms of participation in pilot regions and evaluate outcome in terms of best practice projects
SL, CH, FR	3. Based on consultations with interest groups, authorities develop and implement guidelines on the way to integrate wolf presence into ungulate and forest management
SL, LI, CH, FR	4. Create suitable units for wolf, ungulate and forest management within the national and cross-border borders
SL, LI, CH, FR	5. Enable and foster fact-based in group communication
SL, FR	6. Undertake regular systematic public surveys to evaluate and refine work with interest groups and broad public ("social monitoring")
SL	7. Other

Table 3; Implemented options to foster dialogue among authorities, with wildlife managers, hunters and foresters by establishing information and consultation mechanisms about the wolf

#### 4. Integrate local people in the wolf monitoring

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Beyond the actors directly concerned by the presence of the wolf, or predation, the involvement of local populations is an important factor for the acceptance of this species. The inhabitants who share their territories with the wolf can also directly contribute to knowledge of the species and to research by sharing their observations and their knowledge. They can thus anchor, in the territories, information intended for a wider audience.



Figure 4; Answer to question 4

**In the six contributing states**, measures are taken to integrate local populations in the wolf monitoring.

**Slovenia, Germany, Liechtenstein, Switzerland, Austria and France** involve local stakeholders, e.g. hunters, foresters and nature enthusiasts in wolf monitoring.

**In Germany**, a network of volunteers made up of different interest groups (hunters, foresters, conservationists) is formed to document possible evidence of wolf presence (e.g. sightings, tracks, kills).

**In Slovenia**, howling is part of wolf monitoring. It is carried out with interested volunteers. In addition, foresters and hunters participate in the collection of genetic sample.

**In Liechtenstein**, the general public as well as interest groups are encouraged to share evidence or suspicions of the presence of the wolf. The Environmental Bureau communicates its findings, for example the identification of individuals to the general public.

**In Austria**, any endeavour to collect information on wolf presence in an area relies on the cooperation with local hunters and landowners. In some states local hunters have been designated as "Rissbegutachter" (kill inspectors) trained to investigate game carcasses and



other items of suspected wolf evidence. Officials of hunting organizations are involved in the monitoring activities in most states.

**France** is developing an incentive system for the documented presence of the wolf at regional or municipal level. After completing compulsory training, any person, whatever its profession, and including hunters, can participate in the "wolf-lynx network", which, under the management of the OFB and according to a recognized scientific method, assesses the presence and number of wolves in France. Clues of all kinds – photo shots, hair, faeces, urine, blood, etc. – are collected and analysed by the OFB, then validated or invalidated. Induced howling sessions are also organized, as well as genetic monitoring.

At the end of 2021 and 2022, the OFB has increased and continues to increase training sessions for new members of the wolf-lynx network, in particular for hunters and breeders.

	Options taken to integrate local people in the wolf monitoring
SL, LI FR, CH, DE, AT	1. Involve interested people at local level, e.g. hunters, foresters and nature enthusiasts in the monitoring of wolf
FR	2. Authorities develop an incentive system for the documented presence of wolf at regional or communal level

Table 4; Implemented options to integrate local people in the wolf monitoring

## 5. Prevent and prosecute illegal action through law enforcement

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Illegal killing is a threat for wolf in Europe and can have a severe effect on local populations of the species. However, environmental crimes are usually not a priority in law enforcement.

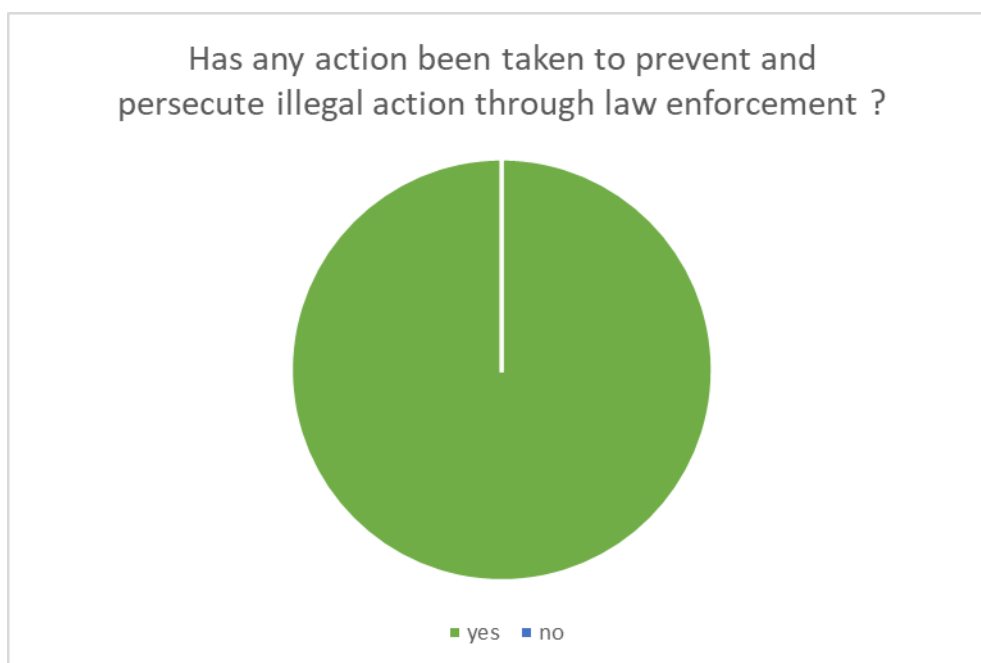


Figure 5; Answer to question 5

**In the six contributing States, measures are taken to prevent and prosecute illegal actions through law enforcement.**

**Liechtenstein, Switzerland and France** establish or strengthen **corps of independent state-employed rangers and game wardens.**

**Slovenia, Germany, Austria and France** sensitize the police, prosecutors and judges to the illegal mortality of protected species.

**Liechtenstein, Germany, Switzerland, Austria and France** secure and guarantee professional investigation methods.

**Liechtenstein, Switzerland, Austria, France and Slovenia** enable and encourage interest groups to fight against illegal actions.

**In Liechtenstein**, with the recent change of hunting law, **a second game warden** for the country has been approved.

**In Germany**, work is being done on joint **adaptation and improvement of the treatment concept for illegal killing** of large carnivores and specially protected species.

**Slovenia hunting association** is educating the police officers, hunters and foresters on the way to proceed in case of detection of illegal killing.

**In France**, awareness is raised among prosecutors, and the penalties incurred in the event of the destruction of a protected species are known. The French government files a complaint in the event of illegal destruction of wolves. The OFB is regularly called upon by prosecutors to participate in investigations in support of the police and/or the gendarmerie.

**In Austria**, within Action A3 of the Life WolfAlps EU project workshops are planned for the transfer of best practices of anti-poaching activities in the Italian Alps to Austria (and Slovenia). Moreover, departments of environmental crime investigation do investigate poaching cases. Finally, a project against wildlife crime, funded by national funds and coordinated by WWF Austria, will start in spring 2022 having the focus on birds of prey and large carnivores.

	<b>Options taken to prevent and prosecute illegal action through law enforcement</b>
LI, FR, CH	1. Establish or strengthen corps of independent state employed rangers and game wardens
SL, DE, FR, AT	2. Raise awareness within police, state attorneys and judges regarding illegal mortality of protected species
LI, DE, CH, FR, AT	3. Secure and guarantee professional investigation methods
LI, CH, FR, AT, SL	4. Enable and encourage interest groups to address illegal actions

Table 5; Implemented options to prevent and prosecute illegal action through law enforcement

## 6. Control of wolf-dog hybrids and domestic dogs

The KORA report indicates that, as there are fewer stray dogs in the Alps compared to other parts of Europe, the risk of hybridization is considered as low for the Alpine Wolf population. Nevertheless, as hybridization has been detected in nearby wolf populations (e.g. the Apennines), this issue needs to be addressed.

In December 2014, the Standing Committee of the Bern Convention adopted a recommendation on the way to solve the problem of hybridization between wolves and domestic dogs. The options reflect the content of this recommendation.

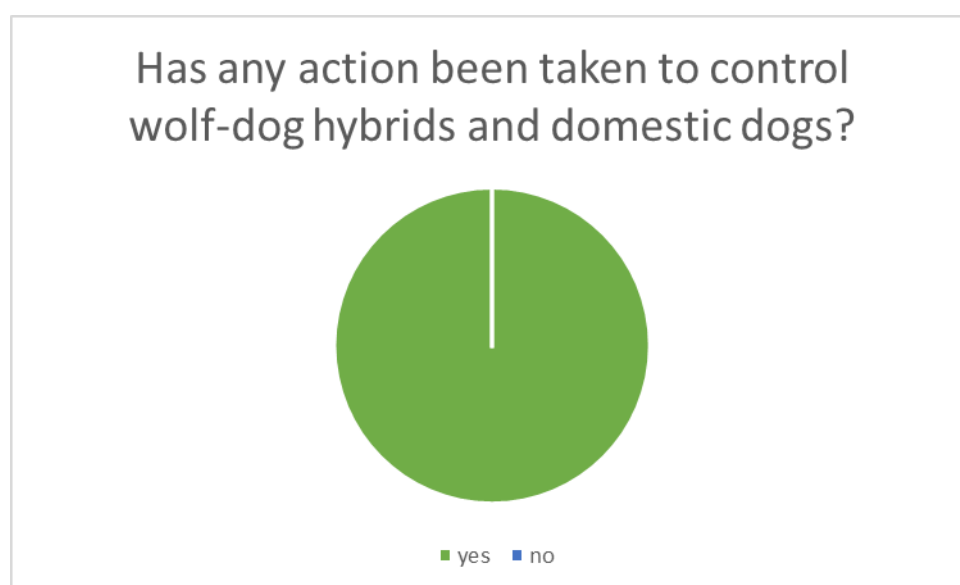


Figure 6; Answer to question 6

**The six contributing States** take steps to control wolf-dog hybrids and domestic dogs.

**In Slovenia, Germany, Liechtenstein, Switzerland and France**, authorities control, prohibit or restrict the keeping of wolves and wolf-dog hybrids as pets. **France** indicates that it is not taking any other measure because the genetic analysis regularly carried out show that hybridization this is not a significant problem in France.

**In Liechtenstein, Austria, Switzerland and Slovenia**, authorities encourage the detection of free-ranging wolf-dog hybrids by establishing effective surveillance systems.

**In Liechtenstein and Austria**, the authorities entrust the elimination of wolf-dog hybrids to State bodies.

**No state claims to establish specific measures to prevent wolves from being killed intentionally or by mistake as wolf-dog hybrids** (wolf-dog hybrids have the same protection status under the Bern Convention as the wolf).

**In Germany**, authorities control the detention of wolves and wolf-dog hybrids. Mainly genetic monitoring can reveal possible hybrids in the wild. Elimination of hybrids is possible (see Bavarian wolf action plan).

**In Slovenia**, official permissions are given for lethal removal of hybrids from nature.

**In Liechtenstein**, the keeping of wild animals is subject to a permit in accordance with the legislation in force. The Liechtenstein Veterinary Office (Amt für Veterinärwesen und Lebensmittelkontrolle) is the executive authority in this case. This control allows the identification of hybrid individuals. **In the wild, hybrid detection is linked to DNA sampling** (saliva, feces, tissues) which **is part of wolf monitoring**. The **elimination** of wolf-dog hybrids **is provided for in the Liechtenstein Wolf Management Plan** (Konzept Wolf Liechtenstein). <https://www.llv.li/inhalt/118450/amtsstellen/wolfsmanagement-umgang-mit-dem-wolf>

**In Austria**, the genetic monitoring is maintained by all states and coordinated by the Österreichzentrum Bär Wolf Luchs. The laboratory in charge is prompted to detect wolf-dog hybrids. Moreover, the national recommendations concerning the wolf management advises the relevant authorities to mandate the removal of confirmed wolf-dog hybrids.

**In France**, the genetic analysis carried out during the monitoring of wolves (estimate of the number of wolves, health status, etc.) show that today **the phenomenon of hybridization does not constitute a significant problem**. If these analyses were to demonstrate the need to implement specific measures, the French government would then act accordingly.

	Options taken to control wolf-dog hybrids and domestic dogs
SL, DE, LI, CH, FR	1. Authorities control, prohibit or restrict the keeping of wolves and wolf-dog hybrids as pets
LI, CH, AT, SL	2. Authorities promote the detection of free-ranging wolf-dog hybrids by establishing effective monitoring systems
LI, AT	3. Authorities entrust state bodies with the removal of wolf-dog hybrids
	4. Authorities establish measures to prevent wolves from being intentionally or mistakenly killed as wolf-dog hybrids (wolf-dog hybrids have the same protection status in the Bern Convention as the wolf)

Table 6; Implemented options to control wolf-dog hybrids and domestic dogs

## 7. Implementation of management options in the near future (within the next five years)

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Despite the diversity of situations faced by wolf management in the Alpine countries, the RowAlps project has identified a set of general management options for the entire alpine wolf population. Although there may be regional and national variations in the priority of implementation of these management options, proposals for pan-Alpine priorities in time and space are needed.

### **1. Secure sustainable damage prevention and compensation systems for livestock damage.**

**In Germany**, although this is already **done**, it will be **improved and adapted**. **In Austria**, it is beyond dispute that **the competent state administrations will continue to provide compensation systems** in the next years. This was recently underlined by a working group of the Österreichzentrum Bär Wolf Luchs tasked with elaborating up-to-date recommendations for compensation payments. **The four other states will continue to apply these measures.**

### **2. Foster dialogue among authorities, with wildlife managers, hunters and foresters by establishing information and consultation mechanisms regarding the wolf.**

**In Germany**, although this is already **done**, it will be **intensified according to rising wolf presence**. **Liechtenstein, Switzerland and France** will **put it in place or continue to practice it**. **Austria** indicates that **the Österreichzentrum Bär Wolf Luchs will continue to play a central role** in the further development of the wolf management.

### **3. Integrate local people into wolf monitoring**

**Germany** indicates that **this should be maintained at the current level**. **Slovenia, Liechtenstein, Switzerland and France** will **put it in place or continue to practice it**. In **Austria**, within a project supported by rural development funds, a working group formed by members of the Österreichzentrum Bär Wolf Luchs will evaluate and propose refinements to the current monitoring system. **The involvement of local hunters, foresters and land owners will be promoted.**

### **4. Prevent and prosecute illegal action through law enforcement**

**Germany** indicates that it is moving towards a progressive conceptual development: they are **adjusting and implementing law enforcement**. **Slovenia, Liechtenstein, Switzerland and France** will **put this action in place or continue to practice it**.

## **5. Control of wolf-dog hybrids and domestic dogs**

**Slovenia, Liechtenstein, Austria and Switzerland will put this action in place or continue to practice it; Germany and France do not plan any particular development.** In **Austria**, recent improvements in DNA-analysis to detect wolf-dog hybrids will be considered in the **further development of the genetic monitoring.**

### **General considerations**

**Slovenia** notes that one of the biggest challenges is the protection of livestock in the Alpine region where wolves were not regularly present for several decades.

**Austria** notes that general recommendations in the RowAlps report meet complicated local circumstances.



## Conclusion

The wolf keeps on spreading in the Alps, with a more or less important population in the countries that are contracting parties of the Alpine Convention. If this spreading represents good news for biodiversity, it also raises concerns, particularly for rural communities with extensive breeding practices, namely pastoralism.

Ensuring the recovery and good conservation status of the wolf in the Alps, in accordance with the status of the species, and with transnational and national legislation, requires, particularly in countries where the wolf had previously disappeared, the implementation of measures aimed at promoting its acceptance by trying to mitigate and compensate for the pressure it can have on human activities, and the damage it can cause to herds through predation.

In order to ensure the good conservation status of the lupine species by taking into account the conditions of its acceptance – mainly by breeders' communities –, the report *Wolf in the Alps: Recommendations for an internationally coordinated management* recommended the implementation of certain measures:

- secure sustainable herd protection systems;
- secure sustainable livestock damage compensation systems;
- promote the dialogue between authorities and wildlife managers, hunters and foresters by establishing information and consultation mechanisms on the wolf;
- integrate local populations in the monitoring of the wolf;
- prevent and prosecute illegal actions towards wolves through law enforcement;
- control wolf-dog hybrids and domestic dogs.

This report is based on the answers provided by the representatives of the States parties to the Alpine Convention regarding the implementation of these measures, whether they are effective, yet to be consolidated or to come.

The answers provided by the six contributing states show a consensus on the necessity to implement these measures to ensure the good conservation status of the wolf, and promote its acceptance despite the pressure and damage it can cause to breeding activities. Indeed, each State, with its specificities, implements the recommended measures to a certain extent.

Thus, the six contributing States have set up a system of compensation for damage linked to the predation of the wolf on the herds. In Liechtenstein, Slovenia, Switzerland and France, the payment of compensation is ensured by the authorities and is enshrined in legislation or regulations. In Germany, compensation was provided by private institutions; since 2020 the State has supplemented this funding. In Austria, compensation is provided by the State without any legal obligation.

Similarly, in the six contributing States, adequate damage prevention measures are in place where damage to livestock has been repeatedly confirmed. As the authorities assist breeders with the implementation of these measures, the payment of compensation is conditional on the application of these measures. In Slovenia, Switzerland, Austria and France, this may require, or has required, adapting the rearing systems in summer pasture.

These measures are taken to reduce the impact of predation on herds, and to promote the coexistence and cohabitation of wolves with farming communities. However, the six contributing States go further, by organizing and promoting dialogue with wildlife managers, hunters and foresters. To do this, the authorities are implementing information and consultation mechanisms on the wolf. In addition, in Slovenia, Liechtenstein, Switzerland and France, appropriate units for the management of wolves, ungulates and forests, within national borders or transborder, are operational.

Similarly, the six contributing States take steps to integrate local populations into wolf monitoring, involving altogether hunters, foresters and nature lovers in the process.

As the wolf is a protected species, its good conservation status obviously depends on the prevention and repression of acts of wolf illegal destruction. In the six contributing States, steps are taken to prevent and prosecute illegal actions through law enforcement.

Finally, the six contributing States take different approaches to control wolf-dog hybrids and domestic dogs.

## ANNEX

	LIECHTENSTEIN	France	GERMANY	SWITZERLAND	SLOVENIA	AUSTRIA
Are the authorities, or private institutions, setting up compensation mechanisms for damage caused to livestock by the wolf?	Yes	Yes	Yes	Yes	Yes	Yes
Authorities compensate livestock damages according to current "official lists" based on a legal obligation	Yes	Yes	No	Yes	Yes	No
Authorities compensate livestock damages according to current "official lists" without any legal obligation	No	No	Yes	No	No	Yes
Comments			system established in 2008 with cofunding by private institutions and			
Private institutions compensate livestock damages according to current "official lists" without any legal obligation	No	No	No	No	No	No
Please provide further details for each of the options which has been selected (categories of species compensated; amounts differentiated according to the age or the sex of the animals; specificities related to genetically selected breeds or breeding methods - "organic farming", etc.)	<p>According to the current law all damages of livestock are being compensated (Art. 9 VVSV: ). The amount of compensation conforms to official tables provided by breeding associations of the regarding genus of livestock. The amounts differ, for example pedigree animals (herd book) are compensated higher than mixed breeds, or a milk sheep is more valuable than a lamb.</p> <p>Link to the legislation:  <a href="http://www.gesetze.li">www.gesetze.li</a>; Verordnung vom 11. September 2018 über die Verhütung und Vergütung von Schäden durch spezifisch geschützte Tierarten (VVSV)</p>	<p>France has set in the regulations a scale according to which direct and indirect losses (proportionate to the cost of the direct losses) are compensated. Herds and apiaries are compensated subject to having previously been the subject of reasonable protection measures or being recognized as not eligible for protection. The species are taken into account (sheep, goats, horses, cattle) and in particular the age, sex, label, production method (organic, etc.) of the circuit (short, etc.).</p>	<p>amount of compensation set by administration of agriculture</p> <p>considering sex, age and special conditions (e.g. breeding, organic farms, rare species)</p>		<p>SLO authorities (Ministry for environment and spatial planning) compensate the damages caused by large carnivores if minimal protection measures are implemented. Damages are evaluated by Slovenia Forest Service.</p>	<p>There is no legal obligation to compensate for livestock damages inflicted by large carnivores. Every federal state does compensate livestock damages but regulations differ from state to state. The amount of indemnification follows official average prices when sold for meat or breeding, respectively. Some states (Oberösterreich, Steiermark) also calculate expected future economic losses, for example due to reduced breeding capacity after loss of an ewe.</p>

Spreadsheet 1; Questions regarding sustainable damage compensation systems for livestock damage (question 1).

	LIECHTENSTEIN	France	GERMANY	SWITZERLAND	SLOVENIA	AUSTRIA
Are adequate damage prevention measures established where livestock damages have been repeatedly confirmed?	Yes	Yes	Yes	Yes	Yes	Yes
Link compensation payments to application of damage prevention measures	Yes	Yes	Yes	Yes	Yes	No
Comments			only in regions where wolf is regularly			
Adapt summering systems in order to establish effective damage prevention measures	No	Yes	No	Yes	Yes	Yes
Comments						Two pilot projects funded by the government of Tirol to test herding systems/night enclosures for sheep grazing on alpine pastures
Secure mechanisms for the advice on and assistance in implementing damage prevention measures by institutions in charge	Yes	Yes	Yes	Yes	Yes	Yes
Comments			(technical measures: administration of agriculture; guarding dogs; administration of environment)			General information on methods of livestock protection is provided by the Österreichzentrum Bär wolf Luchs and on websites of some administrations. The installation or upgrading of fences against wolf attacks and advice on livestock protection is funded in several states up to 80 % of the investment costs. The Österreichzentrum Bär Wolf Luchs is partner of the LifeStockProtect project.
Please provide further details for each of the option which has been selected (what protective measures must be implemented to give rise to compensation in the event of an attack; what types of adaptations/evolutions to farming practices are implemented; what types of advice or assistance are provided to farmers and what form does it take - theoretical, practical, etc)	In Liechtenstein there haven't been cases of livestock damages so far so this question can not be answered.  2.1: fences, livestock guarding dogs, shepherding (Art. 2 VVSV). The management plan for the wolf in Liechtenstein is currently being revised. It is planned to include a list of damage prevention measures that are considered to be reasonable on a more detailed level than listed in the current legislation.  2.3 Liechtenstein offers free theoretical and practical (on site) consulting for livestock owners.  The adaption of summering systems has not been implemented yet but is a medium to long-term possibility.	option 1 : herds and apiaries are compensated on condition that they have previously been the subject of reasonable protective measures or are recognized as unprotectable,  option 2 : the state can subsidize vulnerability analyses, fences, guard dogs so that breeders and shepherds adapt their practices to the presence of the wolf  option 3 : analysis of the vulnerability of farms are subsidized by the state, which can also finance experiments from the results of these analyses	basic prevention needed for compensation (e.g. 90 cm electric fence or having livestock in pastures which could not be secured) financial support of developing herding practices not yet supplied		1. Livestock needs to be protected with electricity (at least 1 electric wire). That is often not enough to protect livestock. 2. With EARDF funds additional work for installation of electric nets, livestock guarding dogs and shepherds can be provided. Adaptation is necessary to make the system more effective. 3. SFS is giving advice how to protect livestock when	There is no clear yes or no to answer the question if adequate damage prevention measures are established. Yes: see answers above No: Some administrations propagate livestock protection measures with restraint. The public debate concerning alpine pastures focusses on the implementation of wolf-free zones as nearly all alpine pastures are judged as not defendable against wolf attacks by relevant stakeholders. Several protection measures are considered not feasible due to technical and legal constraints as well as the undue workload and costs they imply.

Spreadsheet 2; Questions regarding sustainable damage prevention systems for livestock damage (question 2).

	LIECHTENSTEIN	France	GERMANY	SWITZERLAND	SLOVENIA	AUSTRIA
Has any action been taken to foster dialogue among authorities, with wildlife managers, hunters and foresters by establishing information and consultation mechanisms regarding the wolf ?	Yes	Yes	Yes	Yes	Yes	Yes
Establish round tables and workshops to encourage dialogue among authorities and interest groups	Yes	Yes	Yes	Yes	Yes	Yes
Comments			- Bavarian wide working group for Large Carnivores, meeting about once a year - on demand round tables with key stakeholders (administration, interest groups) on district level			
Establish different forms of participation in pilot regions and evaluate outcome in terms of best practice projects	No	Yes	No	No	Yes	Yes
Based on consultations with interest groups, authorities develop and implement guidelines on how to integrate wolf presence into ungulate and forest management	No	Yes	No	Yes	Yes	No
Create suitable units for wolf, ungulate and forest management within the national borders and cross-border	Yes	Yes	No	Yes	Yes	No
Enable and foster fact-based in-group communication	Yes	Yes	No	Yes	Yes	No
Undertake regular systematic public surveys to evaluate and refine work with interest groups and broad public ("social monitoring")	No	Yes	No	No	Yes	No
Other	No	No	No	No	Yes	No
Comments					Preparation of strategic documents.	

Spreadsheet 3; Questions regarding dialogue among authorities, with wildlife managers, hunters and foresters (question 3).

	LIECHTENSTEIN	France	GERMANY	SWITZERLAND	SLOVENIA	AUSTRIA
Please provide further details for each of the options which has been selected (brief description of the project(s): region, start of the project, duration of the project, links to reports...)	Liechtenstein provides stakeholders with the possibility to make statements on changes of legislation and management plans concerning wolf management. When necessary, discussions, round tables etc. are being organized to work together on detailed issues.	<p>Options 1, 2, 3 and 5 : a national wolf group (GNL), and a national action plan (PNA) on the wolf and breeding activities, have been set up. It associates representatives of the state (local and national administrations), representatives of hunters, representatives of agricultural professions, environmental protection associations, elected officials, etc. It meets several times a year. Working groups on different subjects are set up according to current events or according to the requests of the GNL.</p> <p>Similar committees are set up in each department concerned by the presence of the wolf.</p> <p>Regular communications are made to the GNL, or to local elected officials, etc., on subjects relating to the wolf and coexistence with human activities. The prefect of the Auvergne-Rhône-Alpes region is the coordinating prefect for the implementation of the policy relating to the wolf in France: the website of the Regional Directorate for the Environment, Planning and Housing in the region Auvergne-Rhône-Alpes contains an information section dedicated to the wolf. The websites of the prefectures of the departments concerned by the presence of the wolf also contain information on measures to protect flocks, etc...</p> <p>options 4 and 6 : The French Office for Biodiversity (OFB), a public establishment, has a "large predators" department which steers and leads the "wolf-lynx network" which monitors the wolf population and provides information on its good state of conservation on the basis of various presence indices, genetic analysis, etc. within the framework of a scientific and globally recognized monitoring protocol and method. An estimate of the number of wolves is produced annually at the end of each winter; an estimate of the number of packs is made at the end of each summer. These two estimates also provide information on the spatial evolution of the wolf. Naturalists, hunters, breeders, park staff, volunteers etc. can participate and supply presence indices to the "wolf-lynx network" after having pursued training.</p>			<p>Strategic documents for wolf are prepared in the way that all stakeholders are invited to participate in the process. Workshops are organized all stakeholders are invited.</p> <p>Public opinion survey has been carried out.</p> <p>Workshops with hunters were organized to create the measures how to take wolf into account in ungulate management plans.</p>	<p>Option 1: The Österreichszentrum Bar Wolf Luchs has been established in 2019. The aim of this association of the administrations of the nine states and two national ministries (agriculture, environment) is to further develop the management of large carnivores in Austria. Stakeholder organizations and research institutes take part in the discussions as additional members in general meetings and specific working groups. In Vorarlberg a board formed by the state administration and interest groups (Koordinationsgruppe Großraubwild) provides information on large carnivores and facilitates the coordination of management actions.</p> <p>Option 2: The government of Tirol has initiated two projects to investigate the practical consequences of shepherding in the setting of Tyrolean alpine pastures.</p>

Spreadsheet 4; Questions regarding dialogue among authorities, with wildlife managers, hunters and foresters (question 3, end).

	LIECHTENSTEIN	France	GERMANY	SWITZERLAND	SLOVENIA	AUSTRIA
Has any action been taken to integrate local people in the wolf monitoring?	Yes	Yes	Yes	Yes	Yes	Yes
Involve interested people at local level, e.g. hunters, foresters and nature enthusiasts in the monitoring of wolf	Yes	Yes	Yes	Yes	Yes	Yes
Authorities develop an incentive system for the documented presence of wolf at regional or communal level	No	Yes	No	No	No	No
Please provide further details for each of the options which has been selected (brief description of the project(s): region, start of the project, duration of the project, links to reports...)	The general public as well as interest groups are encouraged to share evidence or suspected evidence of wolf. The Office of Environment communicates its findings e.g. the identification of individuals with the general public.	options 1 and 2 : France is developing an incentive system for the documented presence of the wolf at regional or municipal level. After completing compulsory training, any person, whatever their profession, and including persons holding a hunting license and claiming to be hunters, can participate in the "wolf-lynx network" which, under the management of the OFB and according to a recognized scientific method, assesses the presence and number of wolves in France (collection of clues of all kinds - photographic, hair, faeces, urine, blood, etc. that are analysed by the OFB then validated or invalidated). Provoked screaming sessions are also organized, as well as genetic monitoring. At the end of 2021 and 2022, the OFB has increased and continues to increase training to become a correspondent for the wolf-lynx network, in particular for hunters and agricultural professions.	volunteer network composed of different interest groups (hunters, foresters, nature conservationists) are trained for documenting possible evidence of wolf presence (e.g. observations, tracks, kills)		Howling is part of wolf monitoring in Slovenia. It is carried out with interested volunteers. Foresters and hunters are involved in collection of genetic samples	Option 1: In general any endeavour to collect information on wolf presence in an area relies on the cooperation with local hunters and landowners. In some states local hunters have been designated as "Rissbegutachter" (kill inspectors) trained to investigate game carcasses and other items of suspected wolf evidence. Officials of hunting organizations are involved in the monitoring activities in most states.

Spreadsheet 5; Questions regarding the integration of local people in the wolf monitoring (question 4).



	LIECHTENSTEIN	France	GERMANY	SWITZERLAND	SLOVENIA	AUSTRIA
Has any action been taken to prevent and persecute illegal action through law enforcement ?	Yes	Yes	Yes	Yes	Yes	Yes
Establish or strengthen corps of independent state employed rangers and game wardens	Yes	Yes	No	Yes	No	No
Raise awareness within police, state attorneys and judges regarding illegal mortality of protected species	No	Yes	Yes	No	Yes	Yes
Comments						Within Action A3 of the Life WolfAlps EU project workshops are planned for the transfer of best practices of anti-poaching activities in the Italian Alps to Austria (and Slovenia)
Secure and guarantee professional investigation methods	Yes	Yes	Yes	Yes	No	Yes
Comments						Departments of environmental crime investigation do investigate poaching cases.
Enable and encourage interest groups to address illegal actions	Yes	Yes	No	Yes	Yes	Yes
Comments						A project against wildlife crime, funded by national funds and coordinated by WWF Austria, will start in spring 2022 having the focus on birds of prey and large carnivores.
Please provide further details for each of the options which has been selected (brief description of the project(s): start of the project, duration of the project, what has been done? links to reports...)	With the recent change of the hunting law, a second game warden for the country of Liechtenstein has been approved.	options 1 to 4 : the legislation governing protected species is known, awareness is raised among the prosecutors, and the penalties incurred in the event of the destruction of a protected species are known. The french state files a complaint in the event of illegal destruction of wolves. The OFB is regularly called upon by prosecutors to participate in investigations in support of the police and/or the gendarmerie.	Common adaption and improvement of concept for dealing with illegal killing of large carnivores / special protected species		Slovenia hunting association is educating the police officers, hunters and foresters how to proceed in case of detection of illegal killing.	

Spreadsheet 6; Questions regarding the prevention and prosecution of illegal actions through law enforcement (question 5).

## Implementation of the management options for the conservation of the wolf in the Alps

## Alpine Convention

	LIECHTENSTEIN	France	GERMANY	SWITZERLAND	SLOVENIA	AUSTRIA
Has any action been taken to control wolf-dog hybrids and domestic dogs?	Yes	No	Yes	Yes	Yes	Yes
Authorities control, prohibit or restrict the keeping of wolves and wolf-dog hybrids as pets	Yes		Yes	Yes	Yes	No
Authorities promote the detection of free-ranging wolf-dog hybrids by establishing effective monitoring systems	Yes		No	Yes	Yes	Yes
Comments						The genetic monitoring is maintained by all states and coordinated by the Österreichszentrum Bär Wolf Luchs. The lab in charge is alert to detect wolf-dog hybrids.
Authorities entrust state bodies with the removal of wolf-dog hybrids	Yes		No	No	No	Yes
Comments						The national recommendations concerning the wolf management in Austria advises the relevant authorities to mandate the removal of confirmed wolf-dog hybrids.
Authorities establish measures to prevent wolves from being intentionally or mistakenly killed as wolf-dog hybrids (wolf-dog hybrids have the same protection status in the Bern Convention as the wolf)	No		No	No	No	No
Other	No		No	No	Yes	No
Comments					Removal of Hybrids	
Please provide further details for each of the options which has been selected (brief description of the measures, start of the measure, duration, what has been done? links to reports...)	6.1: The keeping of wild animals is subjected to a permit according to the current legislation. The Veterinary Office of Liechtenstein (Amt für Veterinärwesen und Lebensmittelkontrolle) ist the executive authority in this case. <a href="https://www.llv.li/inhalt/12553/amtsstellen/wildtiere-private-und-gewerbsmassige-haltung">https://www.llv.li/inhalt/12553/amtsstellen/wildtiere-private-und-gewerbsmassige-haltung</a>  6.2: The detection of hybrids is tied to DNA sampling (saliva, scat, tissue) which is part of wolf monitoring.  6.3: The removal of wolf-dog hybrids is stated in the wolf management plan of Liechtenstein (Konzept Wolf Liechtenstein). <a href="https://www.llv.li/inhalt/118450/amtsstellen/wolfsmanagement-umgang-mit-dem-wolf">https://www.llv.li/inhalt/118450/amtsstellen/wolfsmanagement-umgang-mit-dem-wolf</a>		Authorities control keeping of wolves and wolf-dog hybrids Mainly genetic monitoring should reveal possible hybrids in the wild Removal of hybrids principally possible (see Bavarian Wolf Action plan)		Official permissions are given for lethal removal of hybrids from nature.	
If nothing has been done, please specify the reasons : not concerned in view of the extent of the hybridation phenomenon		Yes				
If nothing has been done, please specify the reasons : we do not have enough expertise in the field and support to carry out such a project		No				
If nothing has been done, please specify the reasons : no political support/priority		No				
If nothing has been done, please specify the reasons : we do not have enough financial means		No				

Spreadsheet 7; Questions regarding the control of wolfdog hybrids and domestic (question 6).

## Implementation of the management options for the conservation of the wolf in the Alps

## Alpine Convention

	LIECHTENSTEIN	France	GERMANY	SWITZERLAND	SLOVENIA	AUSTRIA
Secure sustainable damage prevention and compensation systems for livestock damages	Yes	Yes	Yes	Yes	Yes	Yes
Comments			done, but will be improved and adapted			It is beyond dispute that the competent state administrations will continue to provide compensation systems in the next years. This was just underlined by a working group of the Österreichzentrum Bär Wolf Luchs tasked with elaborating up-to-date recommendations for compensation payments.
Foster dialogue among authorities, with wildlife managers, hunters and foresters by establishing information and consultation mechanisms regarding the wolf	Yes	Yes	Yes	Yes	No	Yes
Comments			done, will be intensified according to rising wolf presence			The Österreichzentrum Bär Wolf Luchs will continue to play a central role in the further development of the wolf management in Austria.
Integrate local people into wolf monitoring	Yes	Yes	Yes	Yes	Yes	Yes
Comments			should be kept on current level			Within a project supported by rural development funds a working group formed by members of the Österreichzentrum Bär Wolf Luchs will evaluate and propose refinements to the current monitoring system. The involvement of local hunters, foresters and land-owners will be promoted.
Prevent and persecute illegal action through law enforcement	Yes	Yes	Yes	Yes	Yes	No
Comments			progressive conceptual development -> adjusting/implementing law enforcement			
Control of wolf-dog hybrids and domestic dogs	Yes	Yes	Yes	Yes	Yes	Yes
Comments		the genetic analysis regularly carried out show that this is not a significant problem in France. If these analysis were to demonstrate the need to implement specific measures, the french state would then take the appropriate decisions.	no special further development planned			Recent improvements in DNA-analysis to detect wolf-dog hybrids will be considered in the further development of the genetic monitoring in Austria.
	LIECHTENSTEIN	France	GERMANY	SWITZERLAND	SLOVENIA	AUSTRIA
Please provide further details for each of the options which has been selected (brief description of the project(s): start of the project, duration of the project, what has been done? links to reports...)	These options are already in the process of being implemented.	The french state will keep on pursuing a policy that focus on preserving the good state of the wolf population and supporting breeders facing predation			Management is implemented according to management plan.	Management options can be considered without specific projects (with a definite starting point, a defined duration, reports...). The compensation of damages is not legally binding but the political reality does not allow state administrations not to ensure compensations. The Österreichzentrum Bär Wolf Luchs is not a project limited in time ( <a href="https://baer-wolf-luchs.at/">https://baer-wolf-luchs.at/</a> ). The refinements of the monitoring system will be discussed in a working group within the Österreichzentrum Bär Wolf Luchs; the working group shall be formed in the next weeks. To watch out for wolf-dog hybrids is a continuous task for the relevant administrations. The lab at the Vetmeduni Vienna analysing the samples collected within the wolf monitoring investigates the possibilities to implement the SNP panel developed at the Senckenberg lab using cheaper technical equipment.

Spreadsheet 8; Questions regarding the implementation of the management options proposed in the WISO report in the near future (within the next five years) (question 7).

	LIECHTENSTEIN	France	GERMANY	SWITZERLAND	SLOVENIA	AUSTRIA
General comments					One of the biggest challenges in Slovenia is protection of livestock in the Alpine region where wolfs were not regularly present for several decades.	There is a grey zone between Yes and No. General recommendations in the RowAlps report meet complicated local circumstances.

Spreadsheet 9; General comments (question 8).

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