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HUMANITA

Local Action Plan to monitor and resolve human-nature conflicts in Malá Fatra NP

D.3.4.1.

Partner: University of Žilina

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Introduction

Within the framework of Interreg CE Humanita project, involved natural parks and protected areas are required to develop per each pilot site the Local Action Plan (D.3.4.1) to monitor and resolve human-nature conflicts in respective sites.

The Action plan is the operational plan of the park/protected area's strategy for managing tourism impacts. The Action plan document showcases the actions needed to achieve sustainable management of tourism according to the defined objectives of optimizing human activities with biodiversity and nature protection.

It provides practical guidance on the implementation and monitoring of actions that the organization is committed to achieve upon approval.

The document begins by outlining the context of the park/protected area and displaying the main issues and criticalities that currently threaten the biodiversity and health of the areas' habitats. It describes the current impacts' mitigation measures in place, featuring the main gaps and weaknesses that still exist.

It highlights challenges and potential room for strengthening the strategies in force by combining integrative measures and tools resulting from the monitoring activities performed and knowledge exchange that occurred along the project progress. It illustrates how the action plan will be included in a wider framework of strategies in effect, within which administrative and legislative structures at local, regional, and national levels will be part, and how it will reinforce them as well.

The document also includes actions specifically aimed at developing new narratives of the park/protected area to foster human responsibility and awareness about environmental values.

An action plan contributes with concrete actions to achieving policy changes and real-world impacts.

1. Introduction to the Protected Area

Malá Fatra National Park, located in north-western Slovakia, represents one of the country's most diverse and ecologically valuable mountain areas. The park encompasses a rugged landscape of limestone and dolomite formations, deep valleys, gorges, and the distinctive ridge of the Krivánska Malá Fatra range, whose highest peaks offer panoramic views of the surrounding Carpathian region.

Malá Fatra National Park features an exceptional variety of geological and climatic conditions. Together with its pronounced vertical relief, this has contributed to the creation of a remarkable diversity of plant and animal communities. The park hosts a rich mosaic of habitats, from montane beech and fir forests to alpine meadows, supporting high biodiversity and numerous endemic, rare, and protected species. Over 900 species of non-vascular and more than 1140 species of vascular plants have been found so far in the territory of the National Park and its protection zone. Of these, 22 are Western Carpathian endemics, 14 Carpathian endemics, 15 Carpathian subendemics, one Pannonian subendemic, and four endemics of Malá Fatra

Malá Fatra is the westernmost national park of the Carpathians with a permanent presence of large carnivores (bear, wolf, lynx) and original, relatively well-preserved ecosystems in which fundamental ecological and evolutionary processes are still maintained. For the industrialised countries of Central and Western Europe, the area is of transnational eco-stabilisation importance, as it enables the spread of Western Carpathian species into neighbouring territories where these species have retreated or disappeared due to intensive human activity.

To preserve the rarest and most threatened habitats and species, the national park has been designated as part of the Natura 2000 network — both as a Site of Community Importance and as the Malá Fatra Special Protection Area for birds. Within its territory, 26 types of protected habitats, six plant species, and 29 animal species of European importance are safeguarded.

Notable natural values also include extensive karst phenomena, waterfalls, and river systems such as the Váh and Varínka. The area also contains significant cultural and historical heritage, including traditional mountain settlements, wooden architecture, and long-standing pastoral landscapes.

Malá Fatra offers ideal possibilities for holidays in every season. It offers hundreds of kilometres of hiking, walking, and cycling routes in the beautiful scenery of untouched nature. Visitors can also enjoy several historical castles, museums, ancient folk traditions, and adrenaline sports near the traditional village Terchová, the touristic centre of Malá Fatra National Park. Winter is one of the most attractive periods of the year. There is one of the best and most famous ski resorts in Slovakia - Vrátna Free Time Zone, where visitors can enjoy downhill and cross-country skiing, freeride, and snowboarding, as well as great tracks for ski touring. The biggest attraction in recent years has become the frozen gorge Jánošíkové Diery. In addition to outdoor activities, the locality offers many options for wellness and relaxation, and the village of Terchová is known for countless large or small events with folklore and traditional themes.

Visitors to the Malá Fatra area contribute money to regional economies while creating hundreds of private-sector jobs. Visitors can profit from various tourism services. In turn, the labour income from these jobs spurs more economic growth in nearby communities, making the park an essential driver of the local economy. Malá Fatra region is an important center for outdoor recreation and tourism. However, these same factors contribute to several sensitive features and management challenges: the pressures of increasing visitor numbers, habitat fragmentation, invasive species, and the impacts of climate change on forest and alpine ecosystems.

Moving toward more structured management strategies requires strengthening visitor regulation, improving ecological monitoring, promoting sustainable tourism, and enhancing cooperation among local communities, stakeholders, and conservation authorities. The integration of scientific research, adaptive management, and education will be essential to balance nature protection with responsible regional development.

2. Current state-of-the-art of tourism impacts

The Vrátna Valley, situated in the heart of the Malá Fatra National Park, is a popular destination for both summer and winter tourism. The area offers a variety of activities, including hiking, skiing, and mountain biking, attracting numerous visitors annually. Notably, the cable car to Chleb provides access to high-altitude trails, making it a favoured starting point for ridge hikes and offering panoramic views of the surrounding peaks.

However, the increasing number of tourists has led to several environmental concerns. The formation of secondary trails due to heavy foot traffic, especially in sensitive areas such as Mt. Rozsutec and Tiesňavy National Nature Reserves, as well as in the areas of Mt. Chleb and Mt. Veľký Kriváň, has resulted in soil erosion and habitat degradation. Additionally, activities such as mountain biking on hiking trails and bivouacking in unauthorized areas contribute to the disturbance of local ecosystems. Hikers are required to use only designated and officially marked tourist trails. However, several prohibited activities occur here. Habitat degradation due to trampling is ongoing, and the movement of tourists during winter and nighttime hours frequently disturbs local wildlife.

Although the mountain range is not very high, its easy accessibility makes it a popular destination for ski touring. Officially, ski touring is permitted only along designated hiking trails and within areas reserved for downhill skiing and snowboarding, typically near cable cars and ski lifts. Peaks also attract less experienced skiers, leading to a higher number of accidents. Frequent rescue helicopter interventions in this area further disturb the local fauna.

2.1. Vegetation

The main threat to vegetation in Malá Fatra National Park is the excessive trampling of popular tourist hot spots, as well as the creation of new secondary trails. All of these hot spots are located near major peaks and saddles. For example, the cable car to Snilovské sedlo allows large numbers of less experienced tourists to reach alpine terrain that would otherwise be inaccessible to them.

Although this is prohibited by the NP's visitor regulations, several suitable places for bivouacking are still well known. Many nature enthusiasts want to watch the sunset or sunrise directly from the peaks. Repeated use of the same camping sites can contribute to the degradation of existing habitats. Three years ago, a fire broke out from an overturned camping stove at one such site, destroying more than two hectares of grassland.

Malá Fatra is not a large mountain range. Many of its plant species and habitats occur only in the highest parts, which are also the most attractive for tourists and ski mountaineers. Because winters have become increasingly snowless in recent years, endangered species and habitats are not sufficiently protected during the winter and are under growing pressure from off-piste skiing.

Eutrophication is an overlooked problem, particularly in the Jánošíkove diery gorge. Many people use hidden natural spots near the trail and stream as their restroom.

2.2. Wildlife

In the area of Malá Fatra National Park, movement on official tourist trails is allowed during the summer season (April 16 to October 31) only from 6 a.m. to 9 p.m., and during the winter season (November 1 to April 15) only from 7 a.m. to 6 p.m. At pilot sites where camera traps were installed, we recorded tourists moving during late-night as well as early-morning hours. Ascents to the main ridge in the early morning (mostly to watch the sunrise) and descents during late-night hours (after sunset) cause considerable stress to the park's fauna.

Because the territory of the national park is not very large, encounters between humans and animals are common. Animals are accustomed to people on designated trails; therefore, disturbances in their natural habitats and resting places in the open terrain affect them even more. This includes tourists using trail shortcuts, cyclists riding off designated routes, and skiers descending through gullies (Fig. 2.1 and Fig. 2.2). For example, during winters with heavy snowfall, ski tracks can be seen in almost all areas of the higher parts of the national park.

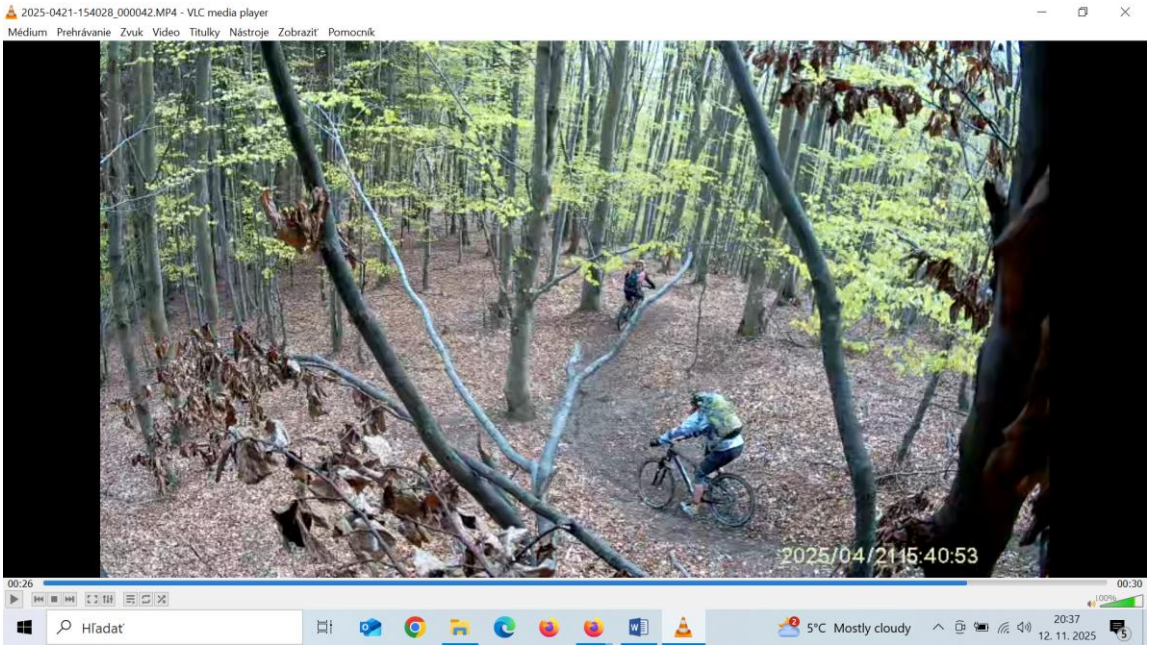

Fig. 2.1 Wildlife camera trap recorded an unauthorized bike ride

Fig. 2.2 Berry picker recorded by camera trap off trail

In spring, three hiking trails are closed from March 1 to June 15:

- Medziholie – Veľký Rozsutec – Medzirozsutce: closed due to the nesting of rare raptor species (peregrine falcon Falco peregrinus, golden eagle Aquila chrysaetos, and the newly documented nesting species for Slovakia – the Eurasian crag martin Ptyonoprogne rupestris).
- Obšívanka – Malé nocľahy: closed due to the nesting of rare raptors (peregrine falcon Falco peregrinus, eagle-owl Bubo bubo, etc.).
- Vendovka – Malý Kriváň: closed due to the beginning of the breeding season of gallinaceous birds, especially the rare capercaillie and black grouse. Any human disturbance during this period is unacceptable.

In autumn, when forest fruits ripen, there is a problem with collectors of berries (such as bilberries and lingonberries). Wild animals are preparing for winter and trying to build up fat reserves, so they spend almost the entire day foraging and feeding—they are in a phase of hyperphagia.

2.3. Soil erosion and soil biodiversity

One of the most visible impacts of tourism in Malá Fatra National Park is the erosion of hiking trails. It is caused by many factors, among others, by thousands of footsteps every year. Trail erosion caused by tourism does not occur everywhere in the park in the same way. Its intensity depends largely on natural conditions such as the type of rock and soil, slope steepness, vegetation cover, and local climate conditions. On steep or poorly vegetated slopes, rainwater easily washes away loose soil, and hikers' footsteps accelerate the process. In contrast, areas with dense grass or stable rocky ground are much more resistant to damage. Frequent rainfall, melting snow, or heavy tourist traffic increases the risk of erosion.

When hikers repeatedly walk along the same path, the soil becomes compacted, reducing its ability to absorb water. Rainwater then runs off the surface instead of soaking in, washing away loose soil and deepening the trail. Over time, this leads to the widening of paths and even the formation of small gullies that can alter natural water flow. The worst situation occurs in areas with heavy tourist traffic — on ridges, trails near cable cars, and in places where the rocks and soil are less resistant (Fig. 2.3).

Erosion removes the upper, most fertile layer of soil that contains organic matter and microorganisms. Without this layer, plants struggle to grow, and the soil loses its ability to store water and nutrients. Over time, eroded areas become dry, less productive, and more vulnerable to further degradation. Compaction, on the other hand, occurs when soil particles are pressed tightly together by the action of trampling. This reduces the spaces between them, limiting the movement of air and water. As a result, roots cannot grow freely, and soil organisms lose their habitat and oxygen supply. Together, erosion and compaction create a cycle of decline: fewer plants mean less protection against erosion, and the soil becomes poorer with each passing season.

Fig. 2.3 Erosion on the hiking trail at the pilot site Chrapáky, caused by the synergistic effect of natural factors and tourist movement.

2.4. Water

The rivers and streams in the Malá Fatra region are generally valued for their high natural quality, but they face increasing pressures from human use and environmental change. Recreational tourism, especially around the Štefanová settlement and Vrátna Valley, contributes to pollution through inadequate wastewater disposal, and increased nutrient loads from accommodation facilities. Studies highlight the potential for tourism activities to degrade water quality if proper management practices are not in place.

Seasonal water scarcity during dry periods can concentrate contaminants, while snowmaking and land use change alter the natural water regime and affect flow patterns. Improper wastewater treatment and leakage from septic systems can lead to elevated nutrient and organic pollutant levels, particularly downstream of populated areas.

Local initiatives, such as riverbank clean-ups organized by park authorities and volunteers, aim to reduce litter and improve habitat conditions, but ongoing efforts are needed to address infrastructure gaps and sustain water quality in this ecologically sensitive national park.

2.5. Priorities among the areas of impact to establish medium- to long-term planning for direct and staggered actions

The priorities focus on protecting sensitive habitats, directing visitor flow, regulating high-impact activities, minimizing wildlife disturbance, education, and monitoring.

Vegetation

- Protect endangered and sensitive plant species in reserves (e.g., Mt. Rozsutec, Tiesňavy).
- Prevent damage to vegetation from tourist pressure by restricting access to marked trails only.
- Restore degraded grassland and forest habitats through planting and vegetation stabilization.
- Monitor and control invasive species that could threaten native flora.

Wildlife

- Minimize disturbance to animals during winter, nighttime, and breeding/mating periods.
- Establish and maintain quiet zones and protective buffers around critical habitats.
- Educate visitors on proper behavior to reduce stress and conflicts with wildlife.
- Monitor populations and migration patterns to adapt management measures as needed.

Soil Erosion and Soil Biodiversity

- Repair and reinforce trails in areas with high erosion risk.
- Prevent formation of secondary trails through clear marking and visitor education.
- Support soil biodiversity by maintaining natural ground cover and minimizing mechanical damage.

Surface Water in Rivers

- Protect springs and streams from pollution (waste, chemicals, runoff).
- Regulate human activities near rivers
- Prevent municipal wastewater and human-induced pollution
- Monitor water quality

3. Current mitigation measures

To mitigate these impacts, the Malá Fatra National Park administration has implemented measures like seasonal trail closures from March 1 to June 15 to protect wildlife during critical breeding periods. Furthermore, projects aimed at promoting sustainable tourism and enhancing visitor education are underway, including the development of a visitor center and the creation of a unified smart tourism information platform.

3.1. Vegetation

In cooperation with the regional tourism organization and the mountain rescue service, measures to mitigate the negative effects of tourism are planned at selected sites. These include building bridges over wetlands and springs, installing drainage, and stabilizing unstable trail edges. The restoration and reconstruction of two educational hiking trails is planned within the framework of the Swiss-Slovak cooperation project. The information panels will include photos and texts about the flora, fauna, geology, and other features of the area. Occasional inspections are carried out by employees of the Malá Fatra NP Administration, and if any violations are detected, tourists are warned or fined. This also helps educate visitors so they know how to behave in the natural environment.

3.2. Wildlife

The closed trails are Medziholie – Veľký Rozsutec – Medzirozsutce (red trail), Obšívanka – Malé nocľahy (blue trail), and Vendovka – Malý Kriváň (blue trail). Spring is the most sensitive period of the year for raising and rearing the young of various bird and mammal species. For these animals, it is important to have at least a few months of peace without human disturbance. Another trail is occasionally closed because of a nearby eagle nest, which is used once every few years.

The visitor regulations of the national park draw attention to the fact that this territory is shared with wild animals and other organisms. Park employees try to educate visitors, either through educational panels or by conducting field inspections. They communicate with visitors in an approachable way about the complex and important relationships between them and the local biota. The best way to convey this knowledge and influence visitor behaviour is through various lectures or guided field trips, which they occasionally organize depending on public interest.

3.3. Soil (erosion and biodiversity)

The closures of trails serve, among other purposes, to protect and restore the soil cover, which is more susceptible to erosion immediately after the winter season. Park administration regularly closes certain paths in the spring to allow the soil and vegetation to recover. Protecting soil structure by reducing pressure on sensitive areas and restoring vegetation is therefore essential for maintaining both soil health and erosion protection. In 2018, erosion measurements were carried out on one hiking trail, and several cross-sectional profiles were prepared. On several trails, technical measures were implemented, but these were primarily designed to improve tourist safety. Some of the structures also served for drainage. However, these measures were insufficient, and in the future, it will be necessary to pay increased attention to this problem. Such measures help protect fragile mountain ecosystems and prevent further damage. Tourists can help by staying on marked trails, avoiding muddy shortcuts, and respecting seasonal closures.

3.4. Water

The quality and quantity of water in the park are not monitored. Only a probe for measuring basic parameters is available. The condition of wetlands in the park is monitored, and maintenance is carried out.

4. Monitoring activities' results

Our monitoring activities aimed to understand the spatiotemporal behaviors of hikers and bikers in four pilot areas and other parts of Malá Fatra National Park (Fig 4.1). Visitor monitoring helps us assess the frequency of hikers and bikers on official and promoted trails, as well as on unofficial trails, and to better understand which areas of high visitation may lead to negative environmental impacts on various natural assets. We focused particularly on monitoring trampling processes at pilot sites, identifying species threatened by visitor impacts, and evaluating the effects of increased tourist activity and the presence of tourist infrastructure on wildlife and erosion development. In addition, water quality was monitored in rivers. All monitoring activities at the pilot sites were complementary. Detailed results can be found in Report D2.2.1 – Annex 1.

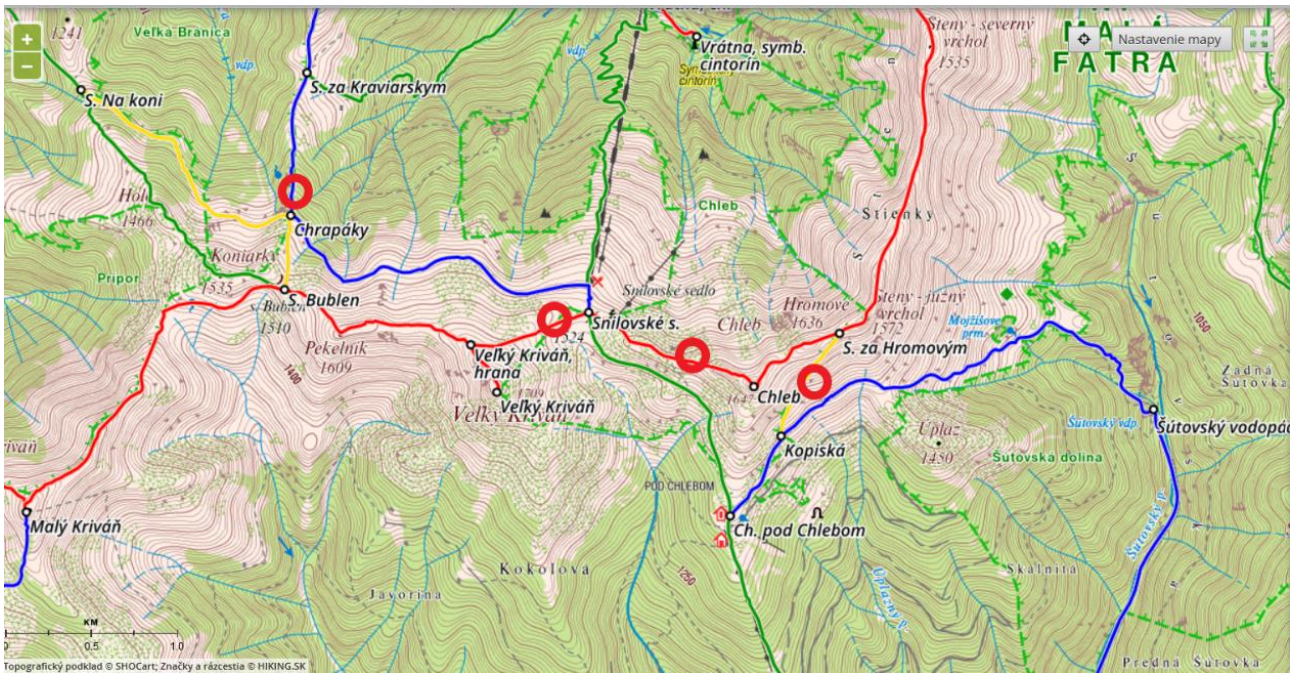

Fig. 4.1 Pilot sites (Veľký Kriváň, Chleb, Kopiská, Chrapáky)

4.1. Visitors

UNIZA performed digital visitor monitoring for all pilot sites that are part of the HUMANTA project. Data from the STRAVA Metro app were analyzed regarding user activities and digital information on official and unofficial trail networks. Some of the motion-triggered camera traps were used to efficiently collect data on humans and wildlife through a single data collection process. We also used five automatic tourist counters, installed next to the trails, which detected visitors by evaluating the change in the thermal field generated by them in the profile.

We placed tourist counters in high-traffic areas to gain an overview of the total number of visitors at the pilot sites. One of them was installed in a location where tourists violate the rules by moving off marked trails. These are also areas where rare species are present. This helped us determine how prohibited activities affect the abundance of rare species. The assumption was confirmed that ski mountaineers passing through this area during the winter and spring months disturb nesting capercaillies. Their numbers increase especially on weekends, resulting in a decline in the population (Fig. 4.2).

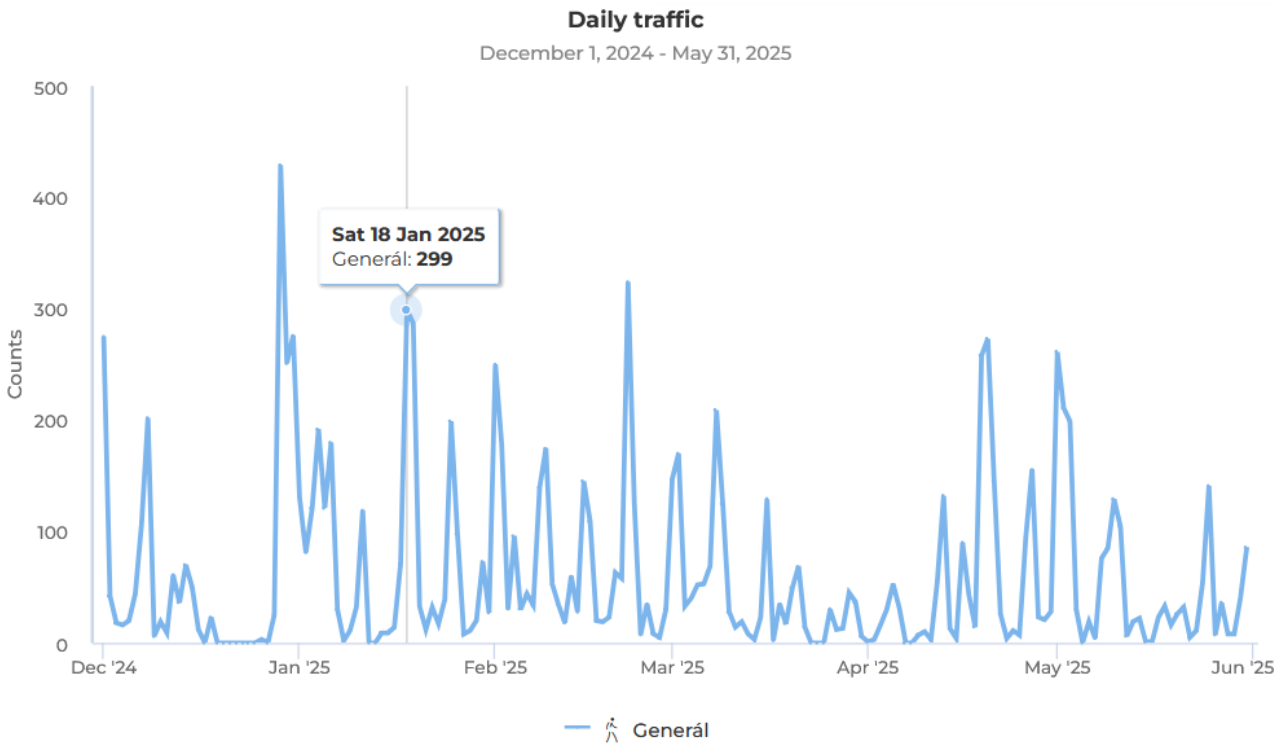

Fig. 4.2 Number of tourists using trail to General in selected time period

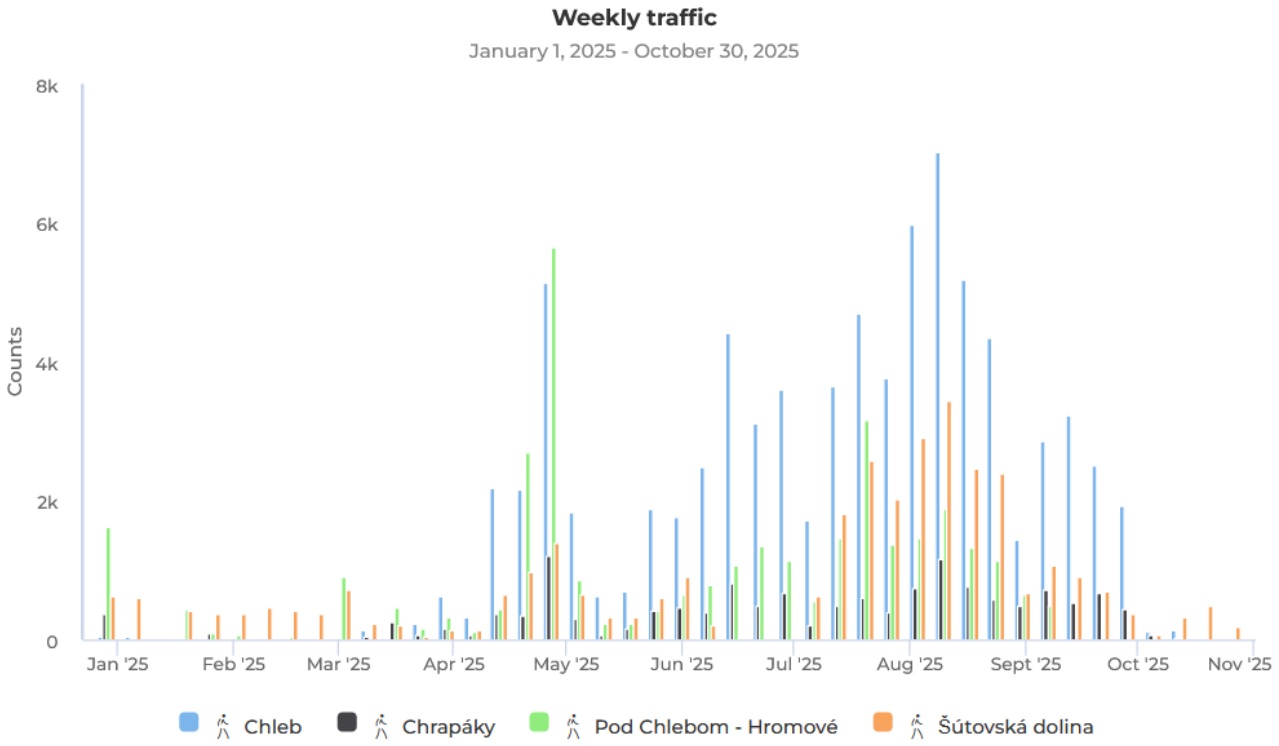

Fig. 4.3 Weekly traffic on the trails at four pilot sites

Another counter helped us determine the number of visitors coming from the Šútovská Valley to Chata pod Chlebom, or moving in the opposite direction. This allows us to more accurately define the number of tourists moving between Chata pod Chlebom and the Hromové saddle to compare these numbers with erosion grade. The most visited pilot site is the Mt. Chleb (Fig. 4.3).

UNIZA, in collaboration with the Administration of Malá Fatra NP (A-NPMF), step by step installed 19 new **Camera traps.** Together with some older ones, we use them as a standard monitoring tool for wildlife monitoring in Malá Fatra NP. However, we also test their application for visitor monitoring at some selected places. The University of Parma prepared new method using camera traps with integrated artificial intelligence. They can be used to detect unauthorised activities and human movement in protected areas. It can also be used to count visitors and cyclists based on object categories (person, bicycle, animal) (Fig. 4.4).

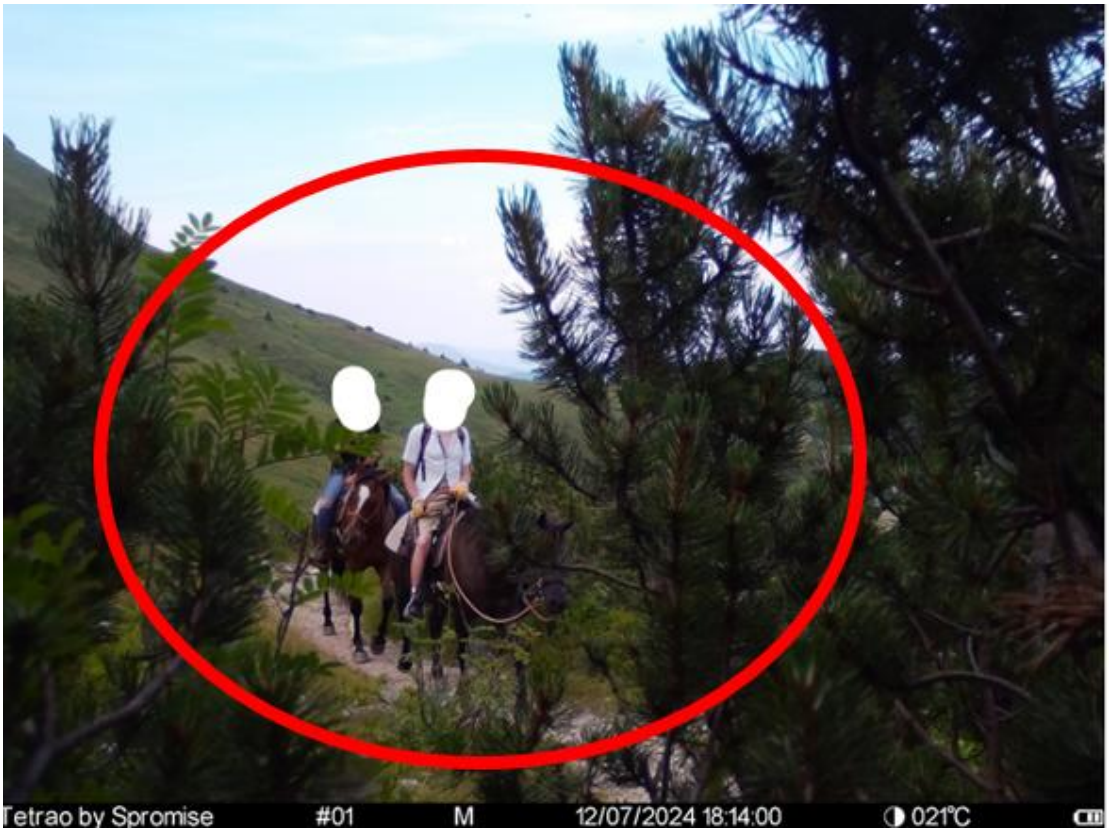

Fig. 4.4 Unauthorised entrance on horses

Visitors using the STRAVA Metro app record their activities in the park. Based on aggregated data, which we obtained with the consent of the app owners, we can identify the frequency of visitors on official trails as well as their unauthorized activities. We can also determine the types of activities visitors engage in within the park and identify areas with the highest visitor concentration. The figure shows several areas with the greatest intensity of activity throughout the park (e.g. Jánošíkové Diery, Sniovské Sedlo, Chata pod Suchým, Sedlo Medziholie, Šútovo) (Fig. 4.5).

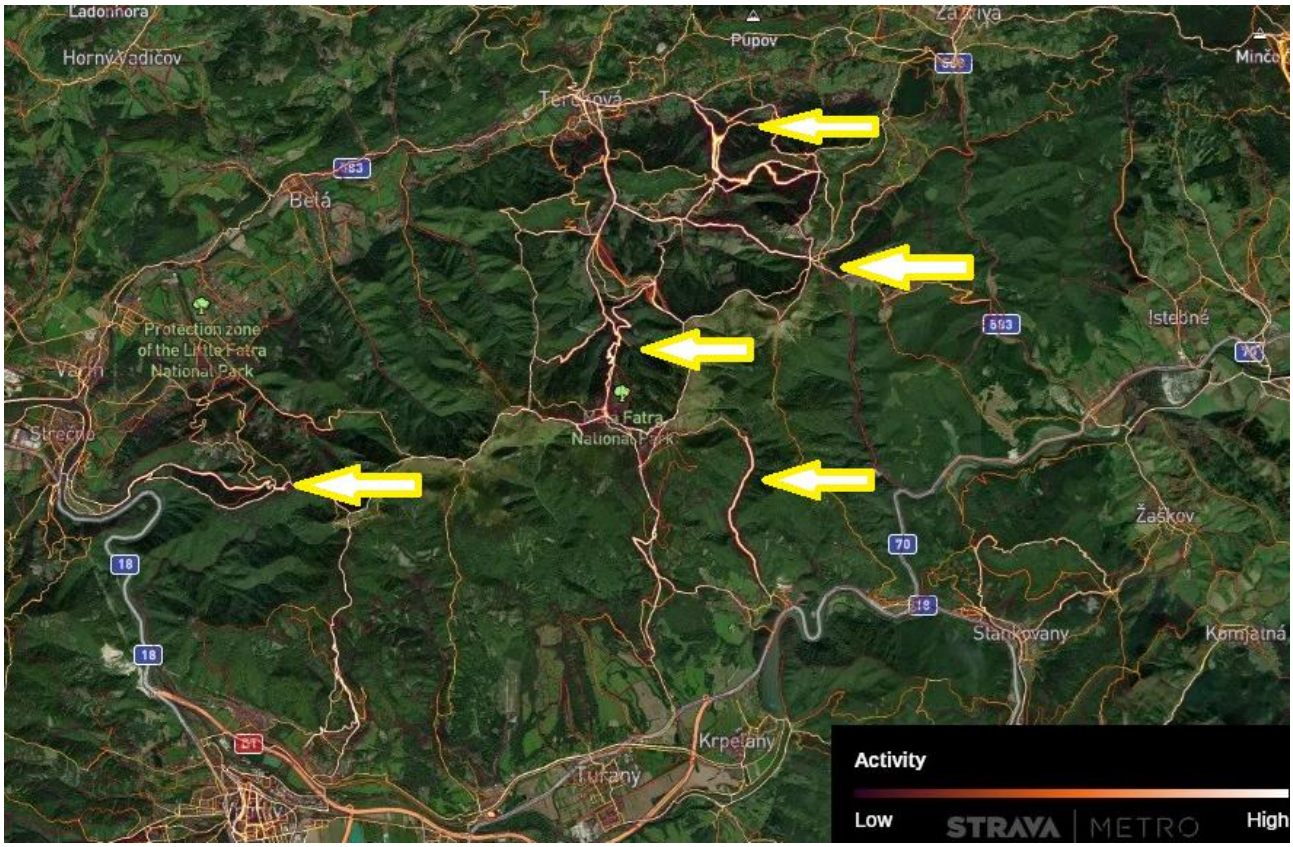

Fig. 4.5 Heat map of visitor frequency across the entire park.

4.2. Vegetation

We used two approaches to monitor vegetation: a botanical survey (Fig. 4.7) and participatory monitoring (Fig. 4.6). The botanical survey was performed twice in 2024 and 2025, in a period when the alpine vegetation was optimally developed. This monitoring aims to record the presence of habitats of European and Slovak importance, as well as protected and endangered species of plants. We observed pilot sites step by step, wrote down all species, and assigned them a level of coverage according to the Braun - Blanquet scale. We took a lot of photos, and some plants were collected and later identified in the office.

The participatory monitoring for the HUMANITA project via iNaturalist started in July 2024. In September 2025 there were 6658 (3909 in 2024) observations of 1232 (903 in 2024) species from 324 (244 in 2024) observers in our iNaturalist project “Biodiversity of Malá Fatra National Park”. Compared to 2024, the number of observations in the project grew by 2749 in 2025, which is a pretty high percentage of the total number of observations (41 %). The number of recorded species and observers also grew by 302 and 80 respectively.

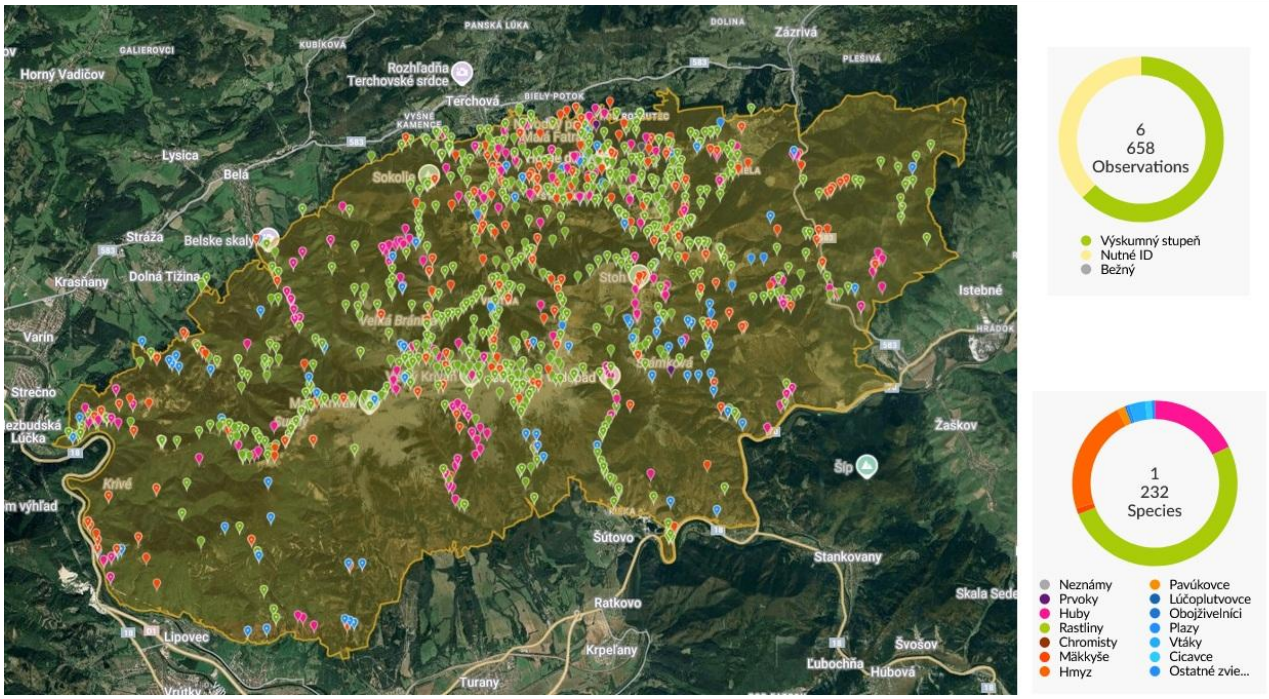

Fig. 4.6 Map of iNaturalist observations in Malá Fatra NP, a chart showing the number of observations and types of organisms recorded on the right.

Fig. 4.7 Botanical survey on the left, *Traunsteinera globosa* (orchid) on the right

Fig. 4.8 Trampling along hiking trails

Trampling along hiking trails damage delicate vegetation, compact soil, and disrupt habitats, particularly in sensitive mountain ridge areas. Rare and endemic plant species, which often grow in these high-altitude environments, are especially vulnerable. Even a small number of visitors straying off the trail lead to long-term impacts on these fragile ecosystems (Fig 4.8).

In 2025, a tourist trail at the pilot site Chata pod Chlebom – Sedlo za Hromovým was partially reconstructed, and erosion control measures were implemented. Nets made of sheep wool were placed on bare soil areas lacking vegetation, with the aim of promoting the recovery of plant cover. The most widespread habitat in the vicinity of the netted areas is 6520 Mountain hay meadows. We hand-mowed tufts of grasses and herbs and placed them between the nets so that ripe seeds would fall directly onto the desired spots. The species used were primarily grasses (Agrostis capillaris, Briza media, Calamagrostis arundinacea, Deschampsia caespitosa, Carex sempervirens) and herbs (Campanula glomerata, Carduus defloratus subsp. glaucus, Cirsium eriophorum, Chamaenerion angustifolium, Geranium sylvaticum, Senecio ovatus, Solidago virgaurea). The results of this experiment are expected to become visible in subsequent growing seasons.

4.3. Wildlife

We used camera traps to collect data on animals. Beyond just pictures, the data collected helped us to monitor population sizes, movement patterns, and habitat use. This information is crucial for conservation efforts, identifying areas of high biodiversity, and assessing the impacts of human activity on wildlife. Camera traps, such as Zadná Šútovka 10 and Ostredok 9, detected the movement of a pregnant female wolf in an advanced stage of gestation, as well as a group of wolves (Fig. 4.9). They also recorded the movements

of a female bear with her cubs. These camera traps were installed deep within the reservation, confirming our assumption that the animals primarily move and stay in these untouched areas.

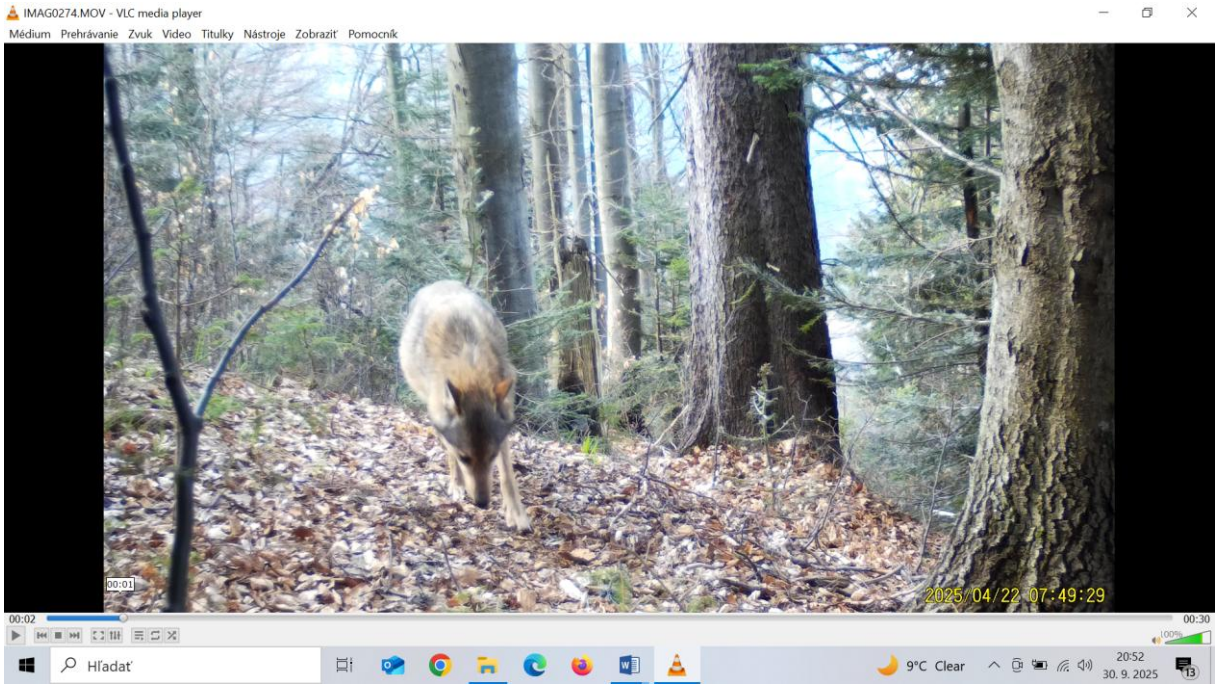

Fig. 4.9 Pregnant female wolf in an advanced stage of gestation

Detailed information about the results of data collection is available in D2.2.1. One of the main advantages of camera traps is their flexibility. They can be relocated as needed throughout the park. This mobility allows us to monitor different habitats, trails, or sensitive areas depending on the focus of the study or emerging conservation priorities. By moving cameras to new locations, it is possible to track seasonal changes in wildlife activity, detect shifts in animal movement patterns, or respond to areas where human-wildlife interactions are increasing. Additionally, this adaptability makes camera traps a cost-effective and efficient tool for long-term ecological monitoring, as the same equipment can be used in multiple sites without the need for permanent installations.

4.4. Soil (erosion and biodiversity)

Successful control of erosion on hiking trails requires effective monitoring and a thorough understanding of erosion processes and their triggering factors. Data from repeated LiDAR acquisitions is one of the possible methods for deriving erosion-related information across large areas, for example, by generating digital elevation models (DEMs). Our monitoring activities utilized repeated UAV-LiDAR acquisitions in combination with the Lidaretto System to improve understanding of DEM uncertainties. The monitoring aimed to capture the terrain's shape on specific measurement dates. These dates were selected to capture the terrain both before and after the tourist season. Consequently, measurements are conducted twice a year. Four trails were observed (Fig. 4.10). By comparing repeated measurements, we could quantify soil erosion, detect changes in trail morphology, and identify erosion hotspots. The results can be visualised and analysed by various methods (Fig. 4.11). Additionally, we can measure localized soil loss and observe the effects of human traffic on trail conditions. Combining these approaches provides a comprehensive understanding of trail erosion and supports the design of effective mitigation measures.

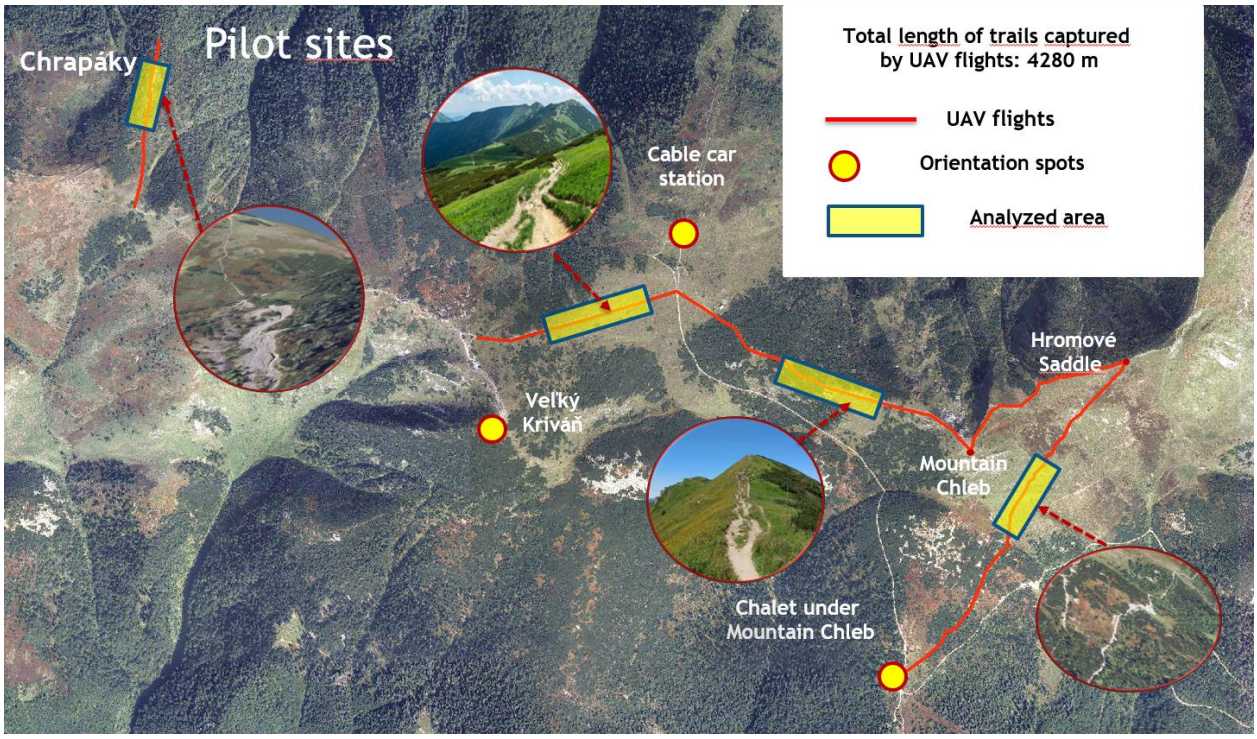

Fig. 4.10 Pilot sites – analysed areas.

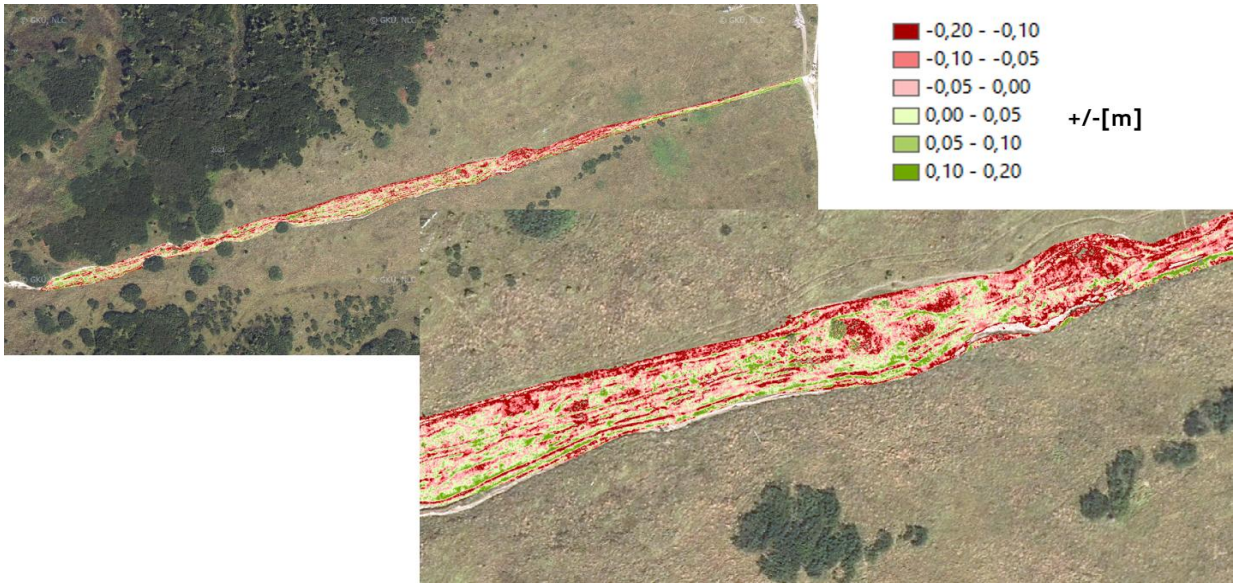

Fig. 4.11 Comparative raster analysis (loss - red, resp. gain - green of the soil mass between 09/2023 and 05/2024 - pilot site Veľký Kriváň)

Recent research has underlined the importance of mites in biomonitoring, identifying them as valuable soil bioindicators. Since mite communities are highly sensitive to different types of soil disturbance, our study aims to determine whether the diversity and abundance of soil mites found along tourist trails and in their surroundings reflect the impact of human activity on the landscape and whether mites can be effectively used in regular monitoring programs. Samples were collected manually twice a year (6/2023, 6/2024, 9/2024, 6/2025 and 9/2025) before and after the main tourist season. Three samples were collected at each pilot site, directly on the trail, at ecotone, and near the trail at the unaffected place.

Samples taken from natural grassy areas near trails (control sites) showed the highest number of mites individuals, accompanied by a large variance, and also exhibited the highest density and diversity (Simpson's Index) of all locations. The transition sites had lower values across all indicators when compared to the control sites, but still higher than the trail samples. At the trail sites, all biodiversity indicators were close to zero, indicating highly degraded or disturbed conditions.

4.5. Water

A systematic statistical analysis was conducted on a water quality dataset from the Varínka catchment, collected over one year from August 2024 to August 2025. The core objective was to quantitatively assess the impact of human recreational activities originating from the Štefanová settlement on the aquatic environment. The study employed a comparative approach, contrasting data from two reference (upstream) sampling sites with two impacted (downstream) sites. A combination of descriptive statistics, graphical analysis (box plots and time series plots), and non-parametric hypothesis testing (Mann-Whitney U test) was used to evaluate three a priori hypotheses rigorously. Based on the project's objective to assess anthropogenic impacts from recreational activities, a subset of key indicators was selected for detailed analysis. These parameters are widely recognized as robust indicators of municipal wastewater and human-induced pollution:

Chemical Oxygen Demand (COD): An aggregate measure of organic pollution.

- Conductivity: A proxy for the total dissolved solids, indicative of inorganic and ionic pollutants.
- Ammonium ions (NH_4^+): A primary indicator of recent sewage or wastewater contamination.
- Nitrates (NO_3^-): An indicator of older, more oxidized organic pollution or septic system leachate.
- Phosphates (PO_4^{3-}): A critical indicator of contamination from detergents and domestic wastewater.
- Turbidity: A measure of water clarity affected by suspended solids, which can be linked to runoff and pollution events.

Comparison of Stohový potok 1 (Reference) vs. Stohový potok 2 (Impacted): The data strongly suggest that the stream segment between the Stohový potok 1 and Stohový potok 2 sampling points is subject to significant contamination, consistent with the impact of the Štefanová settlement. The reference site Varínka 1 exhibits low concentrations for all pollution indicators, confirming the high water quality of the upper reaches of the river. The downstream site Varínka 2, located after the confluence with Stohový potok, shows a discernible increase in the mean concentrations of most indicators (COD, NH_4^+, PO_4^{3-}) when compared to Varínka 1. This increase, however, is substantially less pronounced than the contamination observed in Stohový potok itself. This pattern is suggestive of a **dilution effect**, whereby the larger volume of the Varínka river partially mitigates the pollution load. Nevertheless, the impact remains measurable.

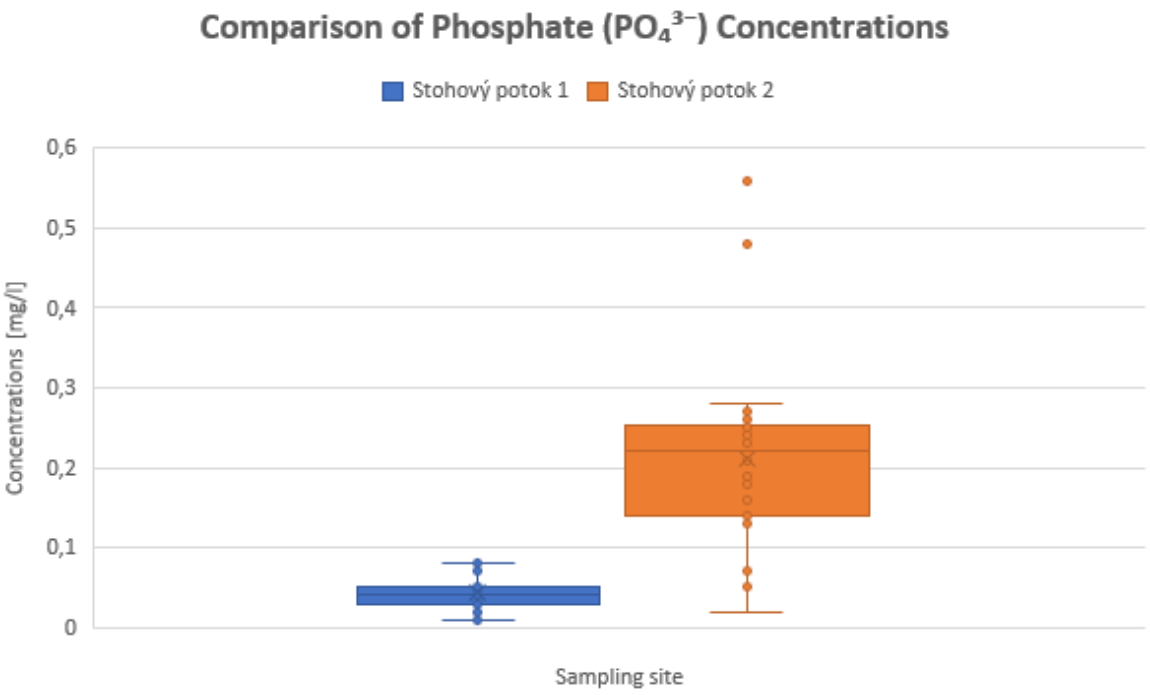

Fig. 4.12 Comparison of phosphate (PO_4^{3-}) concentrations

Fig. 4.12 illustrates a dramatic upward shift in phosphate concentrations. The entire data distribution for Stohový potok 2 is elevated significantly above that of Stohový potok 1, where concentrations remain consistently low. This visualization strongly suggests a substantial input of phosphate-containing pollutants between the two sites.

5. Gaps/weaknesses to address

The Malá Fatra National Park faces several critical challenges that require targeted short-term actions to ensure effective management and long-term conservation of its natural values. The most significant issues include unsustainable forestry practices in buffer zones, growing tourism pressure on sensitive habitats, and insufficient coordination among landowners, municipalities, and the park administration.

To address these problems, it is essential to strengthen monitoring and data collection tools (especially for biodiversity indicators, erosion risk, and visitor impact), and to implement adaptive management methods that integrate both ecological and socio-economic perspectives.

Further, the zoning system needs to be fully completed and enforced, ensuring that at least 50 % of the park area remains under strict non-intervention management. Restoration measures should focus on forest naturalization, river corridor revitalization, and the removal of invasive species.

Capacity-building within the park administration, improved stakeholder participation, and cross-sectoral cooperation (with forestry, tourism, and local governance) are key short-term priorities.

6. Integration into the current tourism impact management strategy

The Protection Project of the Malá Fatra National Park has been developed for the purpose of the park's zoning, the refinement of its boundaries and those of its buffer zone, as well as for the definition of conservation objectives — primarily the preservation or gradual restoration of natural ecosystems, including the protection of undisturbed natural processes on approximately three-quarters of the park's territory.

Document was finished in September 2025. This plan is currently being approved by the Ministry of the Environment of the Slovak Republic.

The activities and measures proposed in the HUMANITA project action plan for the Administration of the Malá Fatra National Park are in line with the Protection Project and will contribute primarily to its following objectives operational objective of the Protection Project:

Operational objective 2.1: To preserve or improve the favorable status of non-forest habitats (especially permanent grasslands) by ensuring appropriate management according to environmental conditions and limitations.

Operational Objective 3.1: Improving knowledge, monitoring, and research of protected and particularly significant components of nature and the landscape, as well as setting up and ensuring appropriate management measures for protected species.

Operational objective 5.1: To develop a support network based on cooperation and to apply sustainable tourism management for the administration of the Malá Fatra National Park.

Operational objective 5.2: To create an offer of nature-based tourism products focused on discovering the natural and cultural heritage of the Malá Fatra National Park.

Operational objective 5.3: To increase public awareness of the Malá Fatra National Park, its protected features, and the importance of the protected area. To implement environmental education and public awareness activities.

The activities proposed by the HUMANITA project align closely with the operational objectives of the Protection Project:

Objective 2.1

New actions will support the preservation and restoration of grasslands and other non-forest ecosystems through active monitoring, sustainable land management practices, and habitat-specific interventions.

Objective 3.1

The project introduces additional research, monitoring programs, and species-specific management measures, which will enhance the park's existing database and improve decision-making.

Objectives 5.1 & 5.2

Initiatives such as guided tours, visitor education, and sustainable tourism planning will complement existing tourism strategies, supporting responsible visitation and stakeholder collaboration.

Objective 5.3

The project strengthens educational outreach, awareness campaigns, and interactive programs, reinforcing the park's communication and visitor engagement strategies.

7. Linkages to national-regional plans

7.1. National policies

Strategy of the Environmental Policy of the Slovak Republic until 2030 (adopted in 2019)

The biggest environmental problems in Slovakia also include habitat and species conservation, especially in forest, meadow and wetland ecosystems. Insufficient protection of rare habitats and species within forest ecosystems (such as capercaillie), balancing their protection with economic development, legal security of rare localities (e.g. beech primeval forests) and insufficient approximation of EU directives to the SR legal system in relation to nature protection and forest conservation, have been criticized by institutions such as

the European Commission or UNESCO. The action plan is in line with this policy mainly in the following points:

- The assessment and appropriate completion of protected areas scheme as well as drafting, approval and implementation of documents will provide protection opportunities for all significant species and habitats in the SR. A simplified system of protected areas, and degrees of protection will enable a stricter protection and targeted care in accordance with international standards. An integrated concept of landscape protection will be developed and implemented.
- Quality environmental education and training for sustainable development not only increase the environmental awareness of the population, but also build an active approach to the environment by developing the skills that are necessary for sustainable development.
- The awareness of local bodies about the benefits of local nature conservation will be improved, as well as information and promotion activities on nature conservation and care, including educational support, training, and research. In the context of the European Landscape Convention, an information campaign, work with the public, cooperation with the media and educating professionals and local authorities will be ensured.
- Improvement of environmental awareness through cultural and natural heritage and tourism.
- In spite of the existing possibility, a number of inhabitants, due to various causes, are still yet to connect to public sewers. A system of accounting and inspection has to be strengthened.
- Better Data for Better Decision Making.

National Water Policy for 2030 with forecast to 2050 (adopted in 2022)

- The development and implementation of water policy is an open process that fully utilizes participation tools and the creation of partnerships at all levels, including local governments, business entities, and the interested public.
- The Water Policy Concept is based on current scientific and research knowledge in the fields of water protection and use, landscape management, and nature conservation.
- The Concept emphasizes the principle of eliminating causes and preventing pollution or environmental damage at its source.

Act No. 543/2002 Coll. on Nature and Landscape Protection (and its amendments, adopted in 2021)

It regulates the protection of species, habitats, and protected areas. The objective is, for example, to ensure that by 2025 at least 50% of the territory of national parks will consist of non-intervention zones, and by **2030 up to 75%*.

7.2. Regional policies

- Integrated Territorial Strategy of the Žilinský Region
- Economic and Social Development Programme of Żilinský Region 2021+
- Action Plan 2023-2025

8. Pilot site Action plan

> **ACTION 1** **TITLE OF THE ACTION:**	**Improvement of monitoring of various components of the natural environment.**
> **DESCRIPTION**	> Improving knowledge, monitoring, and research of protected and particularly valuable components of nature and the landscape, and establishing effective management measures for protected species. Building on the results of the HUMANITA project implement measures at pilot sites and extend these measures to other areas with increased tourist activity.
> **SPECIFIC OBJECTIVES**	> 1) Improve systematic monitoring of key species and habitats to track changes in biodiversity status. > 2) Integrate modern technologies – use remote sensing, drones, camera traps, and automated sensors to improve accuracy and efficiency of environmental data collection. > 3) Regularly report and evaluate monitoring results – use collected data for adaptive management and to improve conservation strategies.
> **PROJECT MANAGEMENT TOOLS**	1) > Monitoring Database and GIS Platform > Unified field data collection templates > Coordination of teams 2) > Roadmap map describing equipment use, maintenance, and data integration > Training for staff on using technologies 3) > Monitoring and evaluation framework (indicators, timelines, responsibilities)
> **RESPONSIBLE PERSONS (Administration of Malá Fatra NP)**	Mgr. Limánek, Mgr. Majdiš, Ing. Kicko, PhD., Ing. Vajs >
> **INVOLVED STAKEHOLDERS**	> Land owners, service providers
> **IMPLEMENTATION STEPS**	1) > Update Monitoring Database and GIS Platform > Design or improve standardized field data collection templates

	> Establish clear roles, responsibilities, and coordination mechanisms among field teams, data analysts, and coordinators. > Schedule regular field campaigns and define reporting intervals. 2) > Prepare a Technology Integration Roadmap > Ensure compatibility with existing monitoring systems > Ensure training for staff on data collection, maintenance, and troubleshooting of new technologies. 3) > Design monitoring and evaluation framework, design indicators, data sources, timelines and responsibilities. > Set up a reporting and evaluation schedule > Integrate monitoring results into an adaptive management system > Communicate outcomes to stakeholders and the public to enhance awareness.
> **IMPLEMENTATION PERIOD TIMELINE**	> 01/2026 - 12/2029
> **POSSIBLE FUNDING SOURCE AND COSTS ESTIMATION**	> Envirofond, State budget, Project monitoring 3 – 30.000,00 EUR
> **EXPECTED RESULTS / MONITORING**	> Improved knowledge and data quality > Enhanced monitoring efficiency and coverage > Strengthened management and decision-making > Capacity building of park staff > Better protection of species and habitats > Increased stakeholder engagement

> **ACTION 2** > **TITLE OF THE ACTION**	**Preservation or improvement of the favorable status of non-forest habitats**
> **DESCRIPTION**	> Preservation and improvement of the favorable status of non-forest habitats (especially permanent grasslands) by ensuring appropriate management according to environmental conditions and limitations of individual sites.

SPECIFIC OBJECTIVES	1) Maintain traditional management practices – Support mowing, grazing, and other extensive land-use methods that promote biodiversity in permanent grasslands. 2) Restore degraded grassland habitats – Reintroduce appropriate management on abandoned or degraded areas to restore their ecological functions. 3) Engage local stakeholders – Involve farmers, landowners, and local communities in sustainable management and conservation of grasslands.
PROJECT MANAGEMENT TOOLS	1) Land Management Database - Digital registry of grassland plots with information on ownership, management type, and biodiversity status. Formal cooperation agreements with local farmers. Track field operations. 2) Establish restoration plan Tracking restoration progress and ecological indicators. 3) Workshops and Training Materials for stakeholders.
RESPONSIBLE PERSONS (Administration of Malá Fatra NP)	Mgr. Limánek, Ing. Toman
INVOLVED STAKEHOLDERS	Farmers, landowners, and local communities.
IMPLEMENTATION STEPS	1) Identify priority grasslands where traditional practices (mowing, grazing) need to be maintained or reintroduced. Create Land Management Database mapping grasslands and recording management types, ownership, and conservation value. Conduct a stakeholder mapping to identify key farmers, landowners, municipalities, and NGOs, which can be involved in grassland management. Develop and sign agreements or cooperation contracts with local farmers and landowners to ensure biodiversity-friendly practices. Organize participatory sessions to build awareness and practical skills in sustainable grassland management. 2)

	> Develop restoration plans for each site, including methods such as controlled grazing, reseeding with native species, or invasive species removal. > Monitor restoration outcomes using ecological indicators. 3) Increased awareness and capacity of local communities in sustainable grassland management.
> **IMPLEMENTATION PERIOD TIMELINE**	> From 2026 onwards
> **POSSIBLE FUNDING SOURCE AND COSTS ESTIMATION**	> Envirofond, State budget, Other sources, 7.000,00 EUR per year
> **EXPECTED RESULTS / MONITORING**	> Increased awareness and capacity of local communities in sustainable grassland management. > Ecological functions of grasslands restored, including higher plant and animal species diversity. > Knowledge and practical skills improved through workshops, field demonstrations, and training materials. > Increased local participation and responsibility for sustainable land management. > Restored ecological functions of degraded areas.

> **ACTION 3** > **TITLE OF THE ACTION**	**Improve a coordinated stakeholder network**
> **DESCRIPTION**	> Strengthen and coordinate a network of stakeholders in the national park, including local communities, landowners, farmers, NGOs, and authorities, to enhance collaboration, knowledge sharing, and joint action for sustainable land management and biodiversity conservation.
> **SPECIFIC OBJECTIVES**	> 1) Map and identify key stakeholders within and around the national park, including local communities, landowners, farmers, NGOs, and relevant authorities. > 2) Facilitate regular communication and collaboration among stakeholders. > 3) Develop joint action plans and agreements to implement sustainable land management practices and biodiversity conservation initiatives across the park.
> **PROJECT MANAGEMENT TOOLS**	> 1) Stakeholder Analysis Matrix – to categorize stakeholders by influence, interest, and role.

	> 2) Communication Plan and tools. > 3) Action plans. Monitoring & Evaluation Framework – to track implementation progress of action plans and conservation initiatives.
> **RESPONSIBLE PERSONS (Administration of Malá Fatra NP)**	> Ing. Žídek, Mgr. Zimenová, Mgr. Badurová, Ing. Dybalová, PhD.,
> **INVOLVED STAKEHOLDERS**	> Local communities, landowners, farmers, NGOs, and authorities,…
> **IMPLEMENTATION STEPS**	> 1) > Define criteria for stakeholder identification – e.g., influence, interest, role in park management, or land ownership. > Collect data on potential stakeholders. > Create a Stakeholder Database including names, contact info, interests, and level of influence. 2) > Facilitate regular communication and collaboration > Organize initial stakeholder meeting/workshop to introduce the project, objectives, and collaboration opportunities. > Schedule regular workshops or field visits to maintain engagement, exchange experiences. 3) > Develop joint action plans detailing responsibilities, timelines, resources, and expected outcomes. > Develop formal agreements with stakeholders to ensure commitment to agreed practices. > Implement pilot activities in selected areas to test and refine management approaches. > Monitor and evaluate implementation progress, adjusting plans as needed based on results and stakeholder feedback.
> **IMPLEMENTATION PERIOD TIMELINE**	> Start of implementation 2027, onwards, (4 times per year, or as needed)
> **POSSIBLE FUNDING SOURCE AND COSTS ESTIMATION**	> Envirofond, State budget, Other sources, 3.000,00 EUR per year
> **EXPECTED RESULTS / MONITORING**	> Comprehensive stakeholder database created > Improved understanding of stakeholder relationships, needs, and potential for collaboration.

	> Established communication channels and coordination mechanisms among stakeholders. > Regular communication. > Joint action plans for sustainable land management and biodiversity > Partnership agreements > A coordinated stakeholder network established and actively engaged in park management.

> **ACTION 4** > **TITLE OF THE ACTION**	**Creation of an offer for tourism products focused on discovering the natural and cultural heritage of the Malá Fatra National Park.**
> **DESCRIPTION**	> To create an offer of nature-based tourism products and services focused on discovering the natural and cultural heritage of the Malá Fatra National Park.
> **SPECIFIC OBJECTIVES**	> 1) Develop and promote a diverse portfolio of nature-based tourism products that highlight the park's natural and cultural heritage while ensuring minimal environmental impact. > 2) Establish new Information Centre as a key hub for visitor education, interpretation, and promotion of sustainable tourism activities. > 3) Strengthen knowledge and skills of park staff, guides, and tourism operators through targeted training and capacity-building programmes focused on sustainable tourism, visitor management, and nature conservation.
> **PROJECT MANAGEMENT TOOLS**	1) > Marketing and Communication Plan - to coordinate promotion, branding, and outreach to target audiences. > Visitor Feedback System - online surveys or mobile apps to assess visitor satisfaction and environmental impact. 2) > Infrastructure Development Plan - outlining design, budget, and timeline for centre construction. > Interpretation and Exhibition Design Tools - templates for educational materials, infographics, and visitor flow planning. 3) > Training Needs Assessment - to identify gaps in knowledge and define training priorities.

	> Training Plan and Calendar
> **RESPONSIBLE PERSONS (Administration of Malá Fatra NP)**	Ing. Dybalová, PhD., Mgr. Limánek, Mgr. Podolan, Ing. Gáborová, Mgr. Zimenová, Ing. Vajs, Mgr. Schwarzkopfová, PhD.,
> **INVOLVED STAKEHOLDERS**	Local tourism organizations and associations, municipalities and local communities, local entrepreneurs and accommodation providers, tourism operators and guides, interpretation and education specialists, training institutions and universities, NGOs specialized in sustainable tourism and nature conservation, Ministry of Environment and regional authorities.
> **IMPLEMENTATION STEPS**	1) > Develop and promote a diverse portfolio of nature-based tourism products > Design and pilot new innovative tourism products (e.g., guided hikes, thematic trails, local craft workshops, wildlife watching). > Develop interpretative materials – brochures, maps, and online content. 2) > Prepare architectural and technical designs. > Construct the centre. > Develop educational and interpretive exhibits on the park's biodiversity, geology, and cultural heritage, etc. 3) > Conduct a training needs assessment. > Develop a comprehensive training plan. > Establish partnerships with universities and NGOs to ensure professional and up-to-date content. > Prepare training materials and manuals. > Organize trainings for staff, guides, and local tourism providers. (online and printed) for ongoing self-learning.
> **IMPLEMENTATION PERIOD TIMELINE**	> 2025 – 12/2028
> **POSSIBLE FUNDING SOURCE AND COSTS ESTIMATION**	> Swiss-Slovak Cooperation Project, Envirofond, 1.600.000,00 EUR
> **EXPECTED RESULTS / MONITORING**	> Diverse portfolio of nature-based tourism products. > Greater involvement of stakeholders.

	> A modern, accessible Information Centre constructed as a central hub for visitor education, interpretation, and sustainable tourism promotion. > High-quality exhibitions and educational materials produced, increasing visitors' understanding of natural and cultural values. > Park staff, guides, and tourism operators trained in sustainable tourism, visitor management, and biodiversity protection. > Better visitor behaviour and lower environmental impact through well-informed and responsible guidance.

> **ACTION 5** > **TITLE OF THE ACTION**	**Creation of environmental education and public awareness activities**
> **DESCRIPTION**	> **One of the main goals of the park's administration is to increase public understanding of its natural and cultural values. Through environmental education and public awareness programs, the park seeks to inspire both locals and visitors to preserve nature.**
> **SPECIFIC OBJECTIVES**	> 1) Increase awareness of endangered species and their habitats in Malá Fatra and the importance of their protection among public. > 2) Promote responsible visitor behavior – teach proper use of hiking trails, waste prevention, and ways to minimize negative impacts on the environment. > 3) Educate the young generation – organize workshops, lectures, and interactive programs for schools to help children and youth understand the value of nature and the importance of sustainable practices.
> **PROJECT MANAGEMENT TOOLS**	> Project Planning and Scheduling Tools > Collaboration and Communication > Budget and Resource Management > Documentation and Reporting
> **RESPONSIBLE PERSONS (Administration of Malá Fatra NP)**	> Ing. Dybalová, PhD., Ing. Gáborová, Mgr. Zimenová, Mgr. Hanzlíková
> **INVOLVED STAKEHOLDERS**	> Schools and Teachers, Local Communities, Visitors and Tourists, Local Authorities and Municipalities, NGOs, Media and Press, Researchers, Funding Agencies.

> **IMPLEMENTATION STEPS**	1) > Create educational content for social networks highlighting endangered species, unique habitats, and conservation efforts. > Develop short awareness campaigns during peak tourist seasons 2) > Organize guided excursions and field activities in the park, demonstrating correct trail use, waste management, and low-impact tourism practices. Use the information center to display educational panels and interactive exhibits about sustainable visitor behavior. 3) > Organize school workshops and lectures in collaboration with local schools. > Conduct interactive programs at the information center, including hands-on activities, nature games, and observation exercises. > Develop learning materials aligned with school curricula.
> **IMPLEMENTATION PERIOD TIMELINE**	> 01/2026 – 12/2028
> **POSSIBLE FUNDING SOURCE AND COSTS ESTIMATION**	> Swiss-Slovak Cooperation Project, Envirofond, 10.000,00 EUR
> **EXPECTED RESULTS / MONITORING**	> Increased online engagement (social media analytics) > Improved visitor knowledge, reduced littering, and better behavior to park rules. > Increased kids and student knowledge and engagement with conservation

9. Zone Plan

Zoning of national parks in Slovakia is a process in which the territory of a park is divided into several zones according to the level of nature protection and the sensitivity of the area. Its purpose is to ensure that the most valuable and vulnerable parts of the park receive the highest possible level of protection, while less sensitive areas can be used for recreation, management, or service development. Currently, a five-zone model is used, which is gradually being implemented in all national parks.

Zone A represents the most strictly protected area, where strict nature conservation is the priority. Only research activities, strict habitat protection, and public movement along designated trails are allowed here.

Zone B is a zone of enhanced protection, where only low-impact activities are carried out, such as maintaining hiking trails and performing necessary management measures.

Zone C is a nature-friendly landscape that allows traditional land use, such as sustainable forestry and agriculture without significant interventions.

Zone D is used more intensively—tourist facilities, ski resorts, or transport infrastructure may be located here.

Zone E includes built-up areas of settlements located within the national park.

Zoning ensures a balance between nature protection, sustainable land use, and tourism opportunities while respecting the natural values of each area.

The Malá Fatra National Park Protection Project has been developed for the purpose of the zoning of the Malá Fatra National Park, the refinement of the park's boundaries and its buffer zone, as well as the definition of conservation objectives, which primarily include the preservation or gradual restoration of natural ecosystems, ensuring the undisturbed course of natural processes. Zoning of the Malá Fatra National Park is a process through which the territory of the national park is divided into zones with different levels of protection.

The process was in the stage of official consultation until July 31, 2025. The Administration of the Malá Fatra National Park has submitted a proposal based on which various stakeholders — such as municipalities, towns, forestry entities, private landowners, and tourism-related companies — may submit their comments and objections. Comments and recommendations based on the findings of the HUMANITA project have also been incorporated into this plan.

This objective is achieved through the zoning of the national park (Section 30, Paragraph 3 of Act No. 543/2002 Coll. on Nature and Landscape Protection). According to the proposed zoning, the total area of the national park will be reduced to 20,836.08 ha, and the buffer zone to 20,854.61 ha. The proportion of areas by protection level under the proposal is as follows: 5th level of protection (Zone A) – 6,781.45 ha (32.6 %), 4th level of protection (Zone B) – 896.04 ha (4.61 %), 3rd level of protection (Zone C) – 12,968.03 ha (62.2 %), 2nd level of protection (Zone D) – 190.58 ha (0.9 %) of the total area of the national park (Fig. 9.1). The majority of the territory of the Malá Fatra National Park and its buffer zone (hereinafter referred to as "BZ") is part of the European network of protected areas – Natura 2000. The entire territory of the Malá Fatra National Park and a large part of its buffer zone are included in a Protected Bird Area.

7.3.1. Mapa navrhovaných zón

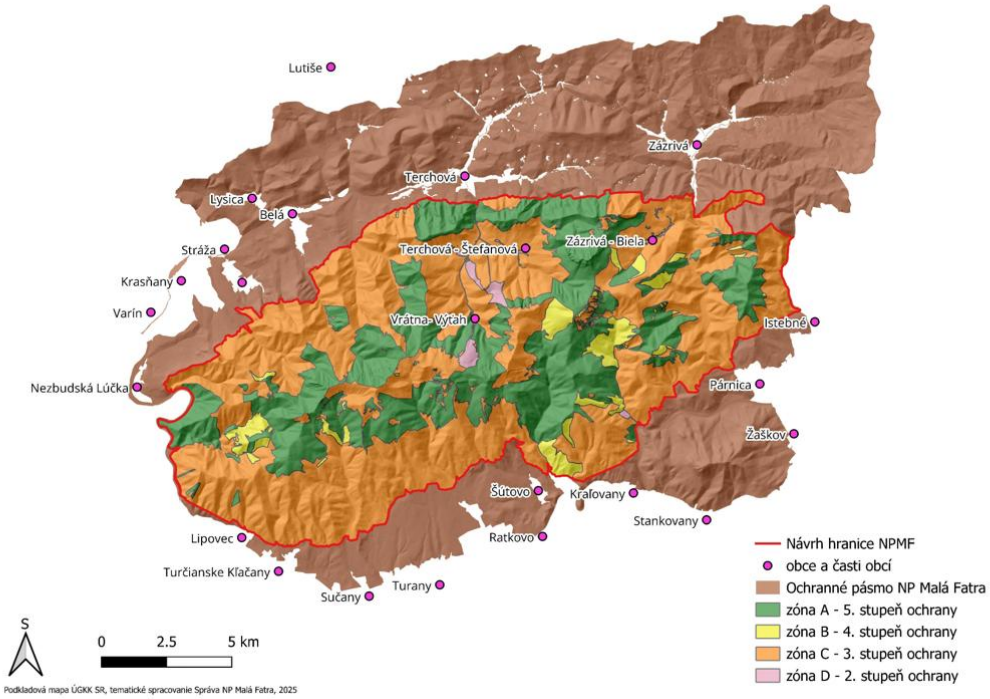

Fig. 9.1 zone map

10. Remarks and Conclusions

Malá Fatra National Park is one of Slovakia's most diverse mountain regions, hosting numerous endemic, rare, and protected species, with ecosystems that support large carnivores and fundamental ecological processes. The park's accessibility, scenic beauty, and well-developed infrastructure (cable cars, ski resorts, and trails) attract high numbers of visitors year-round, contributing significantly to the regional economy.

Increased tourist activity in the park can cause a wide range of environmental and ecological impacts. It already has already led to habitat degradation, soil erosion, formation of secondary trails, and disturbance to wildlife, particularly during night-time hours or winter months. Mountain biking, bivouacking in unauthorized areas, and off-piste skiing exacerbate these pressures.

Balancing tourism development and nature conservation is a complex problem. Natura 2000 designation, along with the presence of rare habitats and species, highlights the need for strict protection measures and adherence to zonation and trail regulations. Visitor impacts are intensified also in sensitive areas like Rozsutec, Tiesňavy, Chleb, and Veľký Kriváň. Regular ecological monitoring, coupled with evaluation of tourism, is necessary.

Existing mitigation measures, including monitoring, trail maintenance, educational panels, and field inspections, are essential but require strengthening, especially regarding visitor awareness and compliance. Effective conservation in Malá Fatra requires combining habitat protection, visitor regulation, sustainable tourism planning, and adaptive management strategies.

Cooperation with local communities, tourism operators, and stakeholders is crucial to ensure sustainable development while preserving the park's ecological integrity. Promoting low-impact recreational activities, or integrating environmental education will help achieve a balance between visitor experience and nature conservation. Despite economic and recreational pressures, preserving Malá Fatra's unique biodiversity and habitats should remain the top priority, ensuring the park's ecological and socio-economic benefits persist for future generations.

This action plan provides a structured, practical framework for solving some of the environmental and management challenges in Malá Fatra National Park. Defining concrete steps, responsibilities, and timelines, it ensures that conservation goals are translated into real, measurable actions. It helps move from general concern, such as visitor pressure, habitat degradation, or disturbance to wildlife, to targeted solutions that can be implemented and evaluated. It identifies the most urgent issues and organizes them by importance, ensuring that resources are directed where they are most needed.