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HUMANITA

Local Action Plan to monitor and resolve human-nature conflicts in pilot sites

D.3.4.1.

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Partner:

The Appennino Tosco-Emiliano National Park (PNATE)

Authors: Francesca Moretti; Cecilia Molinari

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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.

Action plan is the operational plan of the park/protected area's strategy of tourism impacts' management. 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 still exist.

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

Action plan includes a Zone plan to designate areas of the parks/protected areas for different recreational use other than their current use.

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.

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

1. Introduction to the Protected Area

1.1 Overview

The Appennino Tosco-Emiliano National Park (PNATE) is an Italian public body designated for nature protection. It manages 15 Natura 2000 sites and coordinates the UNESCO MaB Reserve "Appennino Tosco-Emiliano". As a HUMANITA project partner and pilot site, PNATE participates in all project activities and implements fieldwork to monitor environmental impacts of tourism, develop innovative monitoring methods and datasets, establish best practices for assessing touristic impacts, and manage human–nature conflicts in collaboration with the University of Parma and other partners.

1.2 Geographic setting and governance framework

Established by Presidential Decree on 21 May 2001, PNATE is located along the northern Apennines across Emilia-Romagna and Tuscany, covering the mountainous portions of the provinces of Reggio Emilia, Parma, Lucca and Massa Carrara. Thirteen municipalities fall within the park perimeter (not all their territories are fully inside the Park), with a combined population of 44,694 inhabitants. The Park covers a total of 26,149 ha (16,763 ha in Emilia-Romagna and 9,386 ha in Tuscany). Within the Park there are four State Nature Reserves—Orecchiella, Lamarossa, Pania di Corfino and Guadine Pradaccio—covering 827 ha and managed by the Carabinieri Department for Biodiversity.

Fig. 1 - Territorial framework of Appennino Tosco-Emiliano

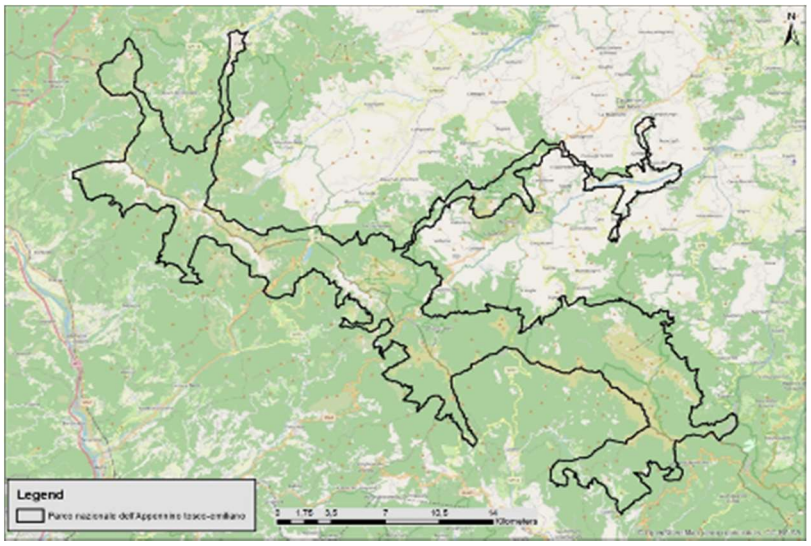

Fig. 2 - Appennino Tosco-Emiliano National Park boundary National Park in northern Italy

1.3 Natural values and distinctive features

PNATE encompasses some of the most representative landscapes of the northern Apennine ridge, bringing together outstanding natural, environmental, and cultural features. The Park extends across the watershed between Emilia and Tuscany, including a variety of geological, climatic, and ecological conditions that generate remarkable landscape diversity.

The area features markedly different valley systems — wide, glacially-shaped valleys on the northern (Emilian) side (such as those of the Enza, Secchia, Parma, and Baganza), and deeply incised fluvial valleys on the southern (Tuscan) side (the Magra and Serchio, draining toward the Lunigiana and Garfagnana areas). It also includes glacially modelled landforms (cirques, moraine deposits, and lakes) mainly developed on the northern side of the ridge, together with a mosaic of forests, moorlands, and high-elevation grasslands.

This geomorphological diversity underpins a wide range of habitats and ecosystems, supporting both alpine and Mediterranean species and contributing to the Park's exceptional natural value.

Key distinctive and sensitive features include:

- **High-elevation habitats**, including moorlands, ridge prairies, screes, and rocky outcrops, represent the ecological core of the northern Apennine ridge. These environments host a distinctive combination of arctic–alpine species, Apennine endemics (e.g., Primula apennina, Saxifraga porophylla), and glacial relicts, which persist in isolated niches shaped by cold microclimates and thin soils.

  The summit plateaus and slopes above 1,600 m form a mosaic of grasslands (Nardus stricta, Festuca violacea), dwarf shrub heaths, and lichen communities that provide crucial habitat for pollinators and high-altitude invertebrates. These areas are particularly sensitive to climate change and visitor pressure, serving as valuable indicators of ecosystem resilience in the face of environmental shifts.

- **Forest ecosystems** cover more than half of the Park's surface and form a complex altitudinal gradient from mixed oak and chestnut woods at lower elevations to extensive beech forests in the montane belt. Beech (Fagus sylvatica) stands dominate the central zone, while reforested or residual conifer patches — mainly silver fir (Abies alba) and Norway spruce (Picea abies) — mark historic forestry areas.

  In the lower valleys, traditional chestnut groves (Castanea sativa) and mixed deciduous woodlands maintain both ecological and cultural value. Over the past decades, the progressive abandonment of agro-pastoral activities has triggered a widespread natural recolonisation process, enhancing forest

connectivity and creating transitional habitats between open meadows and closed canopies. This ongoing dynamic contributes to the Park's landscape diversity and to the recovery of forest-associated fauna and flora.

- **Hydro-geomorphological features** encompass an exceptional variety of water-related and geological elements that shape the Park's identity and ecological functions. These include torrents, waterfalls, peat bogs, and high-elevation lakes of glacial origin, particularly evident on the northern slopes shaped by Quaternary glaciations. Glacial lakes such as Lagdei, Lago Santo Parmense, and Prado represent both geomorphological witnesses and biodiversity hotspots, hosting specialized aquatic and peatland vegetation.

  Equally significant are the karst systems linked to Triassic gypsum formations, where the dissolution of soluble rock has generated a complex network of caves, dolines, and resurgence springs. Among these, the Poiano spring stands out as one of Europe's largest gypsum springs. Such systems are crucial for groundwater recharge and the regulation of local hydrography, forming an intricate underground landscape that complements the glacial and fluvial dynamics visible at the surface.

- **Faunal diversity** mirrors the Park's ecological gradients and habitat heterogeneity. The area supports a well-structured community of large and medium-sized mammals, birds, reptiles, amphibians, and invertebrates, several of which are of conservation concern under the EU Habitats and Birds Directives.

  The wolf (Canis lupus) is stably established with multiple packs across ridges and valleys, ensuring natural regulation of ungulate populations such as roe deer (Capreolus capreolus), red deer (Cervus elaphus), and wild boar (Sus scrofa).

  Avian fauna includes raptors like the golden eagle (Aquila chrysaetos), peregrine falcon (Falco peregrinus), and goshawk (Accipiter gentilis), together with both alpine and forest passerines, such as the ring ouzel (Turdus torquatus) and crested tit (Lophophanes cristatus).

  Amphibians of conservation interest include the Italian crested newt (Triturus carnifex), fire salamander (Salamandra salamandra), and yellow-bellied toad (Bombina variegata), all sensitive to habitat alteration and hydrological variability.

  This faunal assemblage reflects the Park's role as a biogeographical crossroads between Alpine and Mediterranean regions, where species of different origins coexist, underpinning the high biodiversity value of the Tuscan-Emilian Apennines.

1.4 Conservation framework (Natura 2000 and zoning)

Sixteen Natura 2000 sites fall within PNATE, covering 19,874 ha—approximately 76% of the Park area—and hosting 31 habitats of Community interest (plus 3 of regional interest). The Park's statutory zoning (Protection Regulations) distinguishes three zones with graduated protection levels: (1) areas of significant naturalistic, landscape and environmental interest with limited or no anthropisation; (2) areas of naturalistic, landscape, agro-environmental and cultural interest with moderate anthropisation; (3) analogous areas with higher anthropisation.

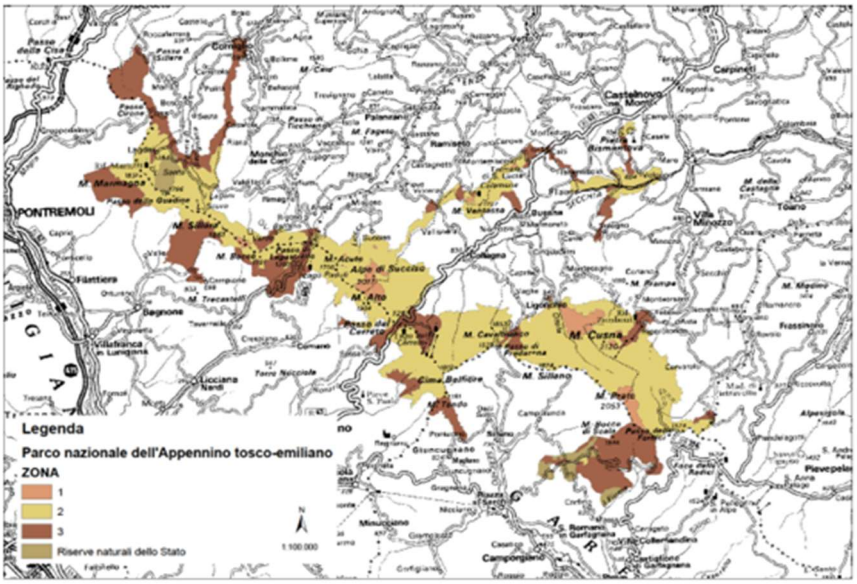

Fig. 3 - Appennino Tosco-Emiliano National Park zones

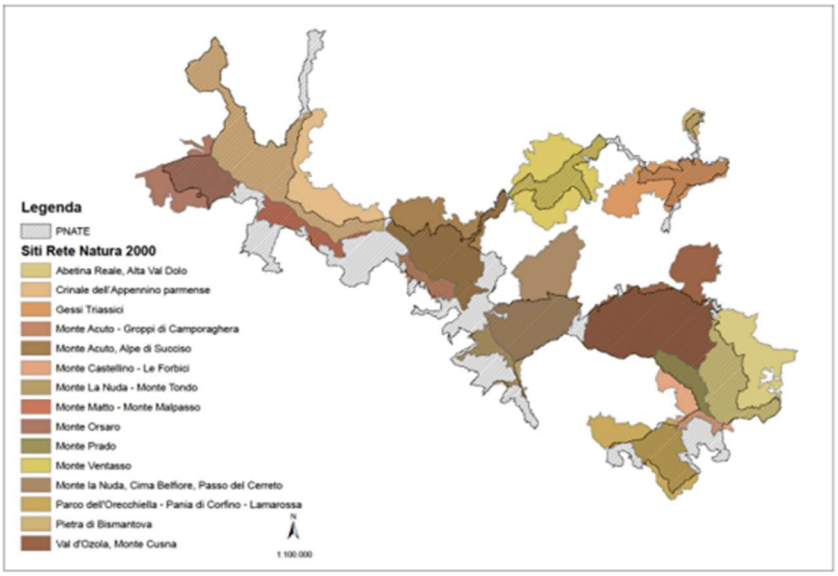

Fig. 4 - Appennino Tosco-Emiliano National Park Natura 2000 sites

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

Tourism flow: available data are fragmented and mainly refer to *overnight visitors*, as there are no consistent or site-level counts of *day trippers*. Statistics are available only at regional and provincial level (Tuscany; Emilia-Romagna; Provinces of Lucca, Massa Carrara, Parma, Reggio Emilia) and for the Park's municipalities/ECST area, not at full municipal granularity. Between 2017–2022, tourism flows declined due to COVID-19, with a partial recovery from 2021 (both Italian and foreign arrivals). The ECST area mirrors this pattern.

Recent increases in demand for outdoor activities—especially at touristic hotspots—have highlighted the need to manage visitor flows to safeguard natural values while meeting visitor expectations and preventing negative impacts and human-nature conflicts. Current mitigation measures coexist with gaps and weaknesses re-

lated to: concentration of use in sensitive habitats and seasons; pressures on high-elevation prairies, moorlands and peat bogs; disturbance to wildlife and erosion along popular trails and access nodes; and the legacy of reforestations and abandoned agro-pastoral areas affecting forest structure and fire risk.

Within **HUMANITA**, **PNATE** strengthens a data-driven approach—by developing and testing monitoring methods and datasets and by fostering knowledge exchange among partners—to create an operational strategy for managing the impacts of tourism. This Local Action Plan will need to integrate with existing regulatory, administrative, and legislative frameworks at the local, regional, and national levels, and proposes actions aimed at promoting new narratives that enhance visitors' responsibility and awareness of environmental values.

2.1 Impact categories – current situation from monitoring and observations

2.1.1 Habitat and soil (trampling, erosion, compaction)

The pilot sites considered in this analysis include a range of highly sensitive mountain and karst environments, characterised by fragile soils, specialised vegetation, and habitats of high ecological value. These areas are also marked by strong recreational attractiveness and varying degrees of accessibility, which expose them to multiple forms of human pressure. The following sections provide an overview of the main impact categories observed across the sites, which are subsequently analysed in detail for each location.

Fonti di Poiano :

Soil erosion where visitors leave marked trails or cut across slopes. Significant erosion is observed along the margins of lakes and watercourses, resulting from repeated pedestrian traffic between the shoreline and recreational areas (sunbeds, towels). Trampling pressure, particularly in the absence of a sandy substrate and in the presence of compacted soil, has led to soil disturbance and degradation of the riparian zone.

Additional impacts are caused by informal paths across grassed areas and by recreational activities (e.g. ball games, frisbee), which further contribute to vegetation damage and soil compaction.

Pietra di Bismantova:

Soil erosion off-track hiking and cycling on the summit plateau despite existing restrictions, with clear evidence of the creation of informal alternative paths (shortcuts) between official, well-marked trails. These informal tracks, in addition to being increasingly used as they become more visible, are particularly vulnerable to atmospheric erosion processes (rainfall, surface runoff, wind), due to the loss of protective vegetation cover. This results in a self-reinforcing degradation cycle, leading to further widening of the paths and soil loss.

Geosite damage (opening of new routes, pitons) The opening of new climbing routes and the installation of pitons and fixed anchors cause direct damage to geosites, leading to irreversible alteration of rock surfaces. These activities promote the initiation and acceleration of erosion processes by increasing rock fracturing, material loss, and vulnerability to weathering agents (rainfall, freeze–thaw cycles).

Climbing activities may also trigger rockfall events, posing a safety risk for visitors located below and contributing to further physical degradation of the geosite. These processes can additionally cause localized disturbance to cliff-dwelling fauna.

Lama Lite - Monte Cusna:

Soil erosion: the area is frequented by hikers, cyclists, and horse riders, many of whom do not restrict themselves to official trails. The most critical period occurs in autumn, during mushroom and bilberry harvesting season, when foot traffic—especially off-trail—increases significantly. During this period, vehicle traffic also rises, despite private vehicle access on the connecting dirt road being prohibited under Park regulations. Most of the traffic comes from the private vehicles of the two mountain refuges in the area and from a seasonal shuttle that runs the road several times a day.

Alta Val Parma :

Soil erosion: trails are heavily eroded and incised due to intensive use by hikers and cyclists, and are further degraded by atmospheric agents. The greatest soil impacts occur in summer, due to high tourist attendance and easy accessibility, and in autumn, during the mushroom and bilberry harvesting season, when most use occurs off-trail.

2.1.2 Disturbance to wildlife (especially during breeding)

Pietra di Bismantova

Bird nesting: It is a key site where climbing and slackline activities cause disturbance to raptors and cliff-nesting species, sometimes leading to nest abandonment, fledgling falls, and interruption of parental care.

During the breeding season, the disturbance also affects birds that nest and seek refuge on the ground in grass or low vegetation. Off-trail hiking, visitor presence, and dogs cause adults to leave their nests temporarily, increasing the risk of indirect predation.

The most critical periods for these impacts are spring and summer, corresponding to the breeding season of most species present.

Another source of disturbance is generated by facilities (refuges, bars, restaurants) in the area, which can cause acute disturbance during festive evenings that may develop into chronic disturbance if prolonged throughout the season

Human-induced alterations reduce habitat continuity and disturb insect feeding and breeding sites. Trail expansion, soil compaction, and vegetation damage lead to a decline in species richness and disrupt ecological interactions within forest ecosystems. Vegetation degradation and the creation of secondary paths reduce habitat connectivity and microhabitat quality, compromising opportunities for reproduction, feeding, and shelter, and threatening the persistence of key insect species in the area.
Disturbance from **light pollution**: artificial lighting is used during numerous events and festivities throughout the year. Powerful spotlights illuminate the entire cliff face, disturbing birds that nest or roost on the cliffs and bats that use the area for foraging or shelter. The recurring and intense illumination may disrupt natural behaviors, interfere with feeding, and potentially affect reproductive success.

Lama Lite - Monte Cusna

Lama Lite on Monte Cusna is a high-altitude environment reaching up to 2,000 m, where wildlife experiences disturbance throughout the year, with impacts varying according to the season and species:

Autumn: coincides with the reproductive season of deer (rut) and the mushroom-collecting period. The high presence of hikers and mushroom gatherers disturbs the deer, interfering with courtship behaviors and increasing stress.

Winter: skiing activities and skier traffic cause animals to move, resulting in the loss of critical energy needed to survive the winter.

Spring: during the birth and growth of offspring, including wolf pups and other species, human presence can interrupt parental care and induce movements, increasing the vulnerability of the young.

Summer: high tourist attendance generates general disturbance to wildlife. This period is also crucial for ungulates, which need to increase energy intake and accumulate reserves to survive the winter; human disturbance can interfere with these physiological processes.

Disturbance from light pollution: The Febbio 2000 chairlift is fully illuminated and operational even at night. The artificial lighting along the lift and surrounding areas creates continuous light exposure, which can disturb nocturnal wildlife, altering natural activity patterns, foraging, and resting behavior of birds and bats.

Disturbance caused by **motorized vehicles** also occurs in winter due to the unauthorized presence of snow-mobiles.
Another source of disturbance is generated by facilities (refuges, bars, restaurants) in the area, which can cause acute disturbance during festive evenings that may develop into chronic disturbance if prolonged throughout the season.

Val Parma

In the lower part of Val Parma, wildlife disturbance, particularly to birds, is mainly caused by the high number of vehicles on dirt roads during the summer and autumn.

In the upper part, disturbance results from foot traffic along trails and at points of interest, such as Lago Santo, areas around bivouacs and refuges, and peatland zones. Unauthorized diving in Lago Santo disturbs fish and other aquatic organisms, altering natural behaviors and habitat. Herpetofauna in the peatlands is also disturbed by inconsiderate visitor behavior.

Human-induced alterations reduce habitat continuity and disturb insect feeding and breeding sites. Trail expansion, soil compaction, and vegetation damage lead to a decline in species richness and disrupt ecological interactions within forest ecosystems. Vegetation degradation and the creation of secondary paths reduce habitat connectivity and microhabitat quality, compromising opportunities for reproduction, feeding, and shelter, and threatening the persistence of key insect species in the area.

Fonti di Poiano

The area of Fonti di Poiano and the Trassic gypsum formations is particularly sensitive during summer and late summer–early autumn. In summer, the very high number of visitors, due to the easy accessibility and the possibility to cool off from the heat, causes direct disturbance to riparian and aquatic fauna. In late summer and early autumn, the period coincides with the deer rut, with deer concentrating in the area and attracting large crowds of visitors and photographers who set up observation points in an unethical way, disregarding the disturbance to wildlife, throughout the rutting season.

Another source of disturbance comes from facilities in the area (refuges, bars, restaurants), which can cause acute disturbance during festive evenings and may develop into chronic disturbance if prolonged over the season.

2.1.3 Vegetation damage and collection pressure

Pietra di Bismantova

Vegetation is threatened and damaged primarily by the heavy passage of hikers, horseback riders, and cyclists (cycling is prohibited on the summit). Additional threats arise from unauthorized camping in areas not designated for this activity, where fires are often lit, and from the illegal collection of protected plant species. In some heavily frequented sections, tree roots have lost the surrounding soil protection, becoming exposed and vulnerable to trampling. Portions of grassland and forest on the summit are also affected by a dense network of secondary trails, leading to habitat fragmentation and degradation, increasing species vulnerability and reducing ecological connectivity.

Lama Lite - Monte Cusna

The vegetation most affected consists mainly of blueberry plants, especially during the harvesting period. Mushrooms, although not vegetation, also suffer significant damage: many non-edible specimens are removed and destroyed due to ignorance or lack of environmental awareness. Additional vegetation damage occurs during periods of intensive grazing, sometimes involving thousands of animals: grasslands are subject to trampling, grazing, and animal droppings, resulting in heavily degraded or “burned” areas. Tourist activity also contributes to vegetation degradation through the collection of rare or protected plant species.

Val Parma

Vegetation damage in Val Parma is similar to that observed at Monte Cusna and mainly affects bilberry plants. Although not vegetation, fungi are also frequently damaged or destroyed, often due to lack of awareness during collection activities.

Further impacts include the collection of rare or protected plant species and the exposure of roots along heavily frequented trails, particularly on rocky substrates. Damage to young trees caused by trampling or mechanical stress is widespread throughout the area.

Fonti di Poiano

At the Fonti di Poiano there are spring-fed wet meadows, composed of natural hygrophilous herbaceous vegetation, adapted to soils that are permanently water-saturated and therefore unsuitable for trampling.

The passage and prolonged presence of visitors — including picnicking with tablecloths, towels and loungers, as well as recreational ball games — cause direct disturbance to the vegetation, resulting in the following impacts:

- direct trampling, leading to crushing and destruction of the herbaceous cover
- soil compaction, which alters drainage and root oxygenation
- formation of bare soil and surface erosion
- alteration of floristic composition, with the loss of the most sensitive and specialized species

2.1.4 Fire risk

Since its establishment in 2001, the territory of the PNATE has been affected by a total of 22 wildfires, with an overall burned area of 87.32 hectares. This corresponds to less than 1% of the total extent of the protected area, with an average of 0.96 events per year.
However, over the last decade the total burned area has tripled compared to the previous decade, despite the number of events remaining substantially unchanged. This increase is mainly attributable to several fires that occurred in 2019 and 2024, which were characterized by significantly larger burned areas than the average of fires affecting the Park.

In particular, in 2024 a wildfire affected a large area of the National Park near the Monte Cusna ridge, primarily involving high-altitude grasslands. The fire originated below the southern slopes of the ridge, at approximately 1,800 meters above sea level, at the intersection of two CAI trails, and may have been ignited by hikers. The area affected by the fire was estimated at around 40 hectares.

Anthropogenic climate change is leading to an increase in the frequency and duration of drought periods and heatwaves. Even the most cautious emissions scenarios indicate, over the next fifty years, an increase in burned area of up to 40% in the Mediterranean region of Europe. In addition, the expected increase in the severity of extreme climatic events—such as windstorms and insect outbreaks—could lead to an accumulation of dead fuel, thereby increasing the flammability of the Park's forests.

In recent years, moreover, several mountain areas in Italy have recorded an increase in fires affecting forest types that were historically little impacted by fire, such as beech and spruce forests, due to exceptional drought conditions that risk becoming increasingly frequent in a warmer climate characterized by high atmospheric concentrations of greenhouse gases.

The causes of fires in the Park are exclusively attributable to anthropogenic factors, both accidental and deliberate. The main ignition sources, particularly those linked to careless behavior, are not expected to decrease in the near future and, on the contrary, will increasingly act on vegetation that is ever more flammable for the reasons outlined above. Nearly one third of the fires that have occurred in the National Park in

recent years have affected pilot sites included in the HUMANITA project, in particular Pietra di Bismantova and the Triassic Gypsum areas. Inappropriate behaviors such as unauthorized camping and camping in non-equipped areas, as well as the lighting of ground fires—frequent in the Pietra di Bismantova and Monte Cusna areas—can increase the risk of wildfire ignition, potentially damaging habitats and species of conservation importance and posing a danger to people.

Over the last 20 years, the Alta Val Parma Forest has been affected by a parasite that has caused the death of large areas of fir forest, increasing the presence of dead and standing dead trees and thus raising the risks associated with wildfires and visitor safety. This situation has required extraordinary interventions by the Park Authority to secure the area, also in view of its high tourist attendance.

2.1.6 Waste and pollution

Waste abandonment is recurrent at high-traffic sites such as car parks, lakes, mountain huts, and popular plateaus. In particular, at the Pietra di Bismantova and Triassic Gypsum sites, during periods of peak tourist attendance—especially in May—a significantly higher production of waste is recorded. This increase is not matched by a corresponding enhancement of waste collection services, resulting in increasingly frequent and widespread cases of littering in natural areas.

These situations lead to site degradation in terms of visual quality and overall environmental conditions, but they also generate impacts on wildlife, which may be attracted by food residues or exposed to risks related to waste ingestion, as well as potential water pollution.

Pietra di Bismantova

At the **Pietra di Bismantova**, the issue of **littering** is promoted by several factors related to the high accessibility and strong recreational appeal of the area.

The site is easily accessible via a **paved road leading to a large parking area**, and vehicles frequently stop along the road itself for picnicking and recreational activities. Visitors can reach the mountain huts and the summit of the plateau **within a very short distance and time**.

Both the lower surroundings and the summit of the Pietra are highly popular for **picnics and prolonged stays**, also due to the presence of additional points of interest such as the hermitage and the chestnut grove known as *Orto dei Frati*, which is equipped with tables.
This concentration of visitors and recreational use increases the risk of **waste abandonment and dispersion** in the natural environment.

In some cases, visitors may be inclined to intentionally leave food in order to attract or feed wildlife, or may fail to completely remove food remains after stopping. Although such behaviours are generally sporadic, they may lead to alterations in natural wildlife behaviour and represent a potential source of localized disturbance.

Lama Lite - Monte Cusna

In the most intensively frequented areas, particularly around mountain huts, sporadic occurrences of food waste may be recorded.

These may result from visitors intentionally providing food to wildlife or from the incomplete removal of food remains following recreational stops. Although infrequent, such practices have the potential to affect natural wildlife behaviour and to generate localized ecological disturbance.

Val Parma

In the most frequently visited areas of Val Parma, particularly in parking areas and around mountain huts, the occasional presence of food residues may occur. The site is easily accessible to private vehicles, camper vans and tour buses, which contributes to a high concentration of visitors during peak periods.

This accessibility results in increased air pollution due to vehicle emissions, as well as noise pollution associated with traffic, engine idling and visitor concentration, particularly near access points and parking areas. In addition, the presence of large vehicles intensifies parking pressure and contributes to localized congestion

Fonti di Poiano

At the Fonti di Poiano and Gessi Triassici site, environmental pressures are driven by a combination of high accessibility, strong recreational appeal, and the direct interaction of visitors with the aquatic environment, Visitors often sit on the meadows and riverbanks with deckchairs and towels; many dip their feet in the water (permitted), and some immerse themselves completely, believing the waters to have beneficial properties.

In parking areas or in locations equipped with picnic tables, the occasional presence of food leftovers may occur.

In some instances, visitors may leave food deliberately to attract or feed wildlife, or may inadvertently leave food remains behind after resting. While these occurrences are generally limited, they can result in changes to natural wildlife behaviour and act as a localized source of disturbance.

The constant presence of water attracts large numbers of visitors, particularly during the summer season, leading to direct alterations of water quality. These include:

- the release of sunscreens, deodorants and other personal-care products,
- the introduction of microorganisms by bathers,
- sediment resuspension and water turbidity caused by disturbance of the spring bottom.

Together, these factors contribute to the degradation of both terrestrial and aquatic components of this sensitive spring-fed ecosystem.

The area is easily accessible, with parking areas located only a few metres from the destination, as well as roadside clearings used for stopping. The presence of wet meadows and open spaces suitable for prolonged stays, together with tables and designated barbecue areas, encourages picnicking and recreational use. While these equipped areas may help to concentrate barbecuing activities in controlled locations, they also tend to concentrate waste in the same areas, increasing the risk of littering.

2.1.7 Mobility, traffic, and parking pressure

Fonti di Poiano - Gessi Triassici

At the Fonti di Poiano and Gessi Triassici site, vehicular traffic increases during certain periods of the year, particularly on weekends and throughout the summer season, due to recreational use. Direct car access to locations very close to the destination favours a substantial inflow of vehicles, generating traffic congestion and parking pressure.
Despite the progressive expansion of parking areas over time, congestion of parking spaces still occurs during peak days, albeit to a lesser extent than at other sites.

Pietra di Bismantova

At the Pietra di Bismantova, vehicular traffic represents a significant critical issue during periods of high tourist attendance. Traffic along access roads generates noise, dust, exhaust emissions and congestion, exacerbated by the presence of a paved road and parking areas close to the main access points.
Although parking capacity has increased over the years, saturation of parking areas frequently occurs during peak periods, with vehicles also accumulating along access roads. A free municipal shuttle service has been introduced in specific periods as a mitigation measure, though parking pressure remains evident during peak days.

Val Parma

In the Alta Val Parma area, vehicular traffic along access and forest roads is particularly intense during peak periods, generating noise, dust, exhaust emissions and congestion.
Several mitigation measures have been implemented, including seasonal traffic restrictions (e.g. Corniglio municipal ordinances) and pilot shuttle services (e.g. CEETO initiative). Despite these efforts and the expansion of parking areas over time, parking congestion remains significant at the main access nodes during periods of high visitor numbers.

Lama Lite

At the Lama Lite – Monte Cusna site, vehicular traffic is more limited compared to the other pilot sites. This is due to the less accessible road network and the presence of authorization systems managed by the park authority, which regulate vehicle access.
Additional mitigation is provided by local shuttle services (e.g. connections to Lama Lite–Bargetana–Battisti), contributing to reduced private vehicle use and preventing significant congestion.

Other locations showing similar criticalities include Lake Calamone, Lake Pranda, the Secchia springs, and Lake Lagastrello, all affected by peak-period crowding and the resulting impacts related to trampling and litter accumulation.

2.1.8 Priority areas for medium–long-term planning (derived from evidence)

Visitor flow and mobility management at critical sites (Pietra di Bismantova; Alta Val Parma; Lama Lite/Cusna; lakes): strengthen/extend seasonal access rules, shuttle services, and parking control.

Protection of sensitive habitats and species (cliff- and ground-nesting species, peat bogs, summit grasslands): maintain and enforce seasonal restrictions, climbing and route management, and policies on fire bans and waste abandonment; increase monitoring and enforcement by competent authorities, alongside targeted awareness and communication actions.

Data and monitoring system (cross-cutting): build on experience gained through projects to standardise counts and pressure indicators (e.g. trail counters), enabling trend monitoring and evaluation of the measures implemented.

Deseasonalisation and redistribution of visitor flows: engage ECST operators and visitor centres to spread use over time and space, promoting suitable alternatives during peak periods (in line with conservation objectives).

3. Current mitigation measures

Measures in place and previous findings

- **Regulatory instruments:** zoning; prohibitions (camping on Pietra top; motorised access on certain roads; flying/arms; fishing in Zone 1); **road closures** (e.g., Lama Lite); mayoral and Park ordinances for cycling bans on sensitive plateaus. **Tree felling** subject to Park authorisation.
- **Mobility pilots and services: Shuttle buses** tested/operated (CEETO pilot at Alta Val Parma; free municipal shuttle to Pietra di Bismantova; summer shuttle to Lama Lite refuges); **parking management** by local association at Lagdei–Alta Val Parma.
- **Governance/engagement: ECST** pathway (since 2014; Phase 2 launched 2022 with operators' action plans); **92 ECST-aligned activities** including four certified tour operators (2023). Visitor centres co-managed with trained private operators (integration with local businesses).
- **Infrastructure and accessibility:** established, extensive **trail network** (≈483–500 km) including **accessible trails** at selected sites; refuges and information network support controlled fruition.

Monitoring note: monitoring is generally conducted through **project-based initiatives** (e.g., EU programmes); a park-wide, standardised **visitor pressure monitoring framework** is **not described** in the provided material.

Current mitigation measures by impact category

The Appennino Tosco-Emiliano National Park (PNATE) has implemented a range of mitigation measures aimed at counteracting the main pressures related to tourism use identified at the pilot sites. These measures are based on regulatory instruments, access and mobility management, and site-specific rules, and address different categories of environmental impact, including soil and habitat degradation, vegetation damage, wildlife disturbance, traffic pressure, waste accumulation, and fire risk.

3.1 Soil and habitat (trampling, erosion, compaction)

Measures aimed at mitigating soil erosion, trampling, and habitat degradation are primarily based on the Park's regulatory framework and zoning system. Zoning assigns different levels of protection to the territory and regulates permitted activities, including restrictions on off-track access, camping, the opening of new trails, and motorised circulation in the most sensitive areas.

Measures currently in place include the ban on camping on the summit of Pietra di Bismantova, restrictions on motorised access along certain roads, and bans on cycling on sensitive plateaus introduced through Park and mayoral ordinances.

In particularly fragile areas, such as Lama Lite, road closures have been introduced to limit pressure on soils and habitats. The Park also manages an extensive official trail network (approximately 483–500 km), which represents a key tool for directing visitor use and reducing the formation and use of informal paths.

At the local level, mitigation measures are applied at the main hotspots. At Pietra di Bismantova, access regulation, the cycling ban on the summit plateau, and the management of climbing activities contribute to limiting erosion and habitat degradation. At Fonti di Poiano and within the Triassic Gypsum system, access regulation and visitor channelling aim to protect karst environments and spring-fed areas. In Alta Val Parma and on Monte Cusna, permitted-route systems and access limitations reduce trampling and erosion associated with high visitor numbers.

3.2 Vegetation

Vegetation protection is addressed through general prohibitions and access regulation measures already in force within the Park. The collection of protected plant species is prohibited, and activities that may damage vegetation cover are regulated through zoning and access rules.

Sensitive environments such as summit grasslands, peat bogs, and spring-fed wet meadows are subject to use regulation in order to limit trampling and long-term vegetation degradation.

3.3 Wildlife disturbance

Mitigation of wildlife disturbance is addressed through activity regulation and the application of site-specific restrictions. Measures are particularly aimed at limiting disturbance to the most sensitive species and habitats affected by recreational use.

At Pietra di Bismantova, bans on camping, cycling, and lighting fires contribute to reducing disturbance to wildlife.

Disturbance generated by facilities such as mountain huts, bars, and restaurants is recognised as a pressure factor, particularly during festive evenings, which may result in acute disturbance if prolonged. The regulation of access and activities in sensitive areas helps to reduce these impacts.

3.4 Mobility, traffic, and access

Pressures related to mobility and traffic are mitigated through a combination of access regulation, road closures, and alternative transport solutions. Several municipal and Park ordinances regulate vehicle access to forest and mountain roads, particularly in areas characterised by high visitor numbers.

Seasonal or permanent road closures have been introduced at sensitive sites such as Lama Lite and in some areas of Alta Val Parma. Shuttle services have also been tested or activated to reduce private vehicle use, including the CEETO pilot shuttle in Alta Val Parma, the free municipal shuttle service to Pietra di Bismantova, and the summer shuttle service to the Lama Lite mountain huts.

Parking management is implemented at certain strategic access nodes. These measures aim to reduce congestion, uncontrolled parking, and associated environmental impacts.

3.5 Waste and fire risk

Waste abandonment and fire risk are addressed through regulatory prohibitions and management measures. Lighting fires outside authorised areas is prohibited, and camping and improper use of fire are subject to control, particularly during periods of high visitor attendance and during drier seasonal phases.

Waste management focuses on the most heavily frequented areas, such as parking areas, lakes, mountain huts, and popular plateaus, where litter accumulation is more likely. The concentration of recreational activities in equipped areas, where present, helps to limit waste dispersion and reduce fire risk.

4. Monitoring activities' results

The monitoring activities implemented by the Appennino Tosco-Emiliano National Park (PNATE) within the HUMANITA project aimed to establish a reliable system to evaluate visitor pressure, environmental impacts, and ecosystem responses in four pilot sites: Pietra di Bismantova, Fonti di Poiano, Alta Val Parma, and Mount Cusna.
The integrated approach included monitoring of visitors, vegetation, wildlife, soil erosion, and water demand, combining technological tools such as camera traps, infrared people counters, acoustic sensors, UAV photogrammetry, and traditional ecological surveys. The results obtained so far provide a comprehensive baseline to understand visitor behavior, identify sensitive areas, and prioritize management actions for the long-term conservation of habitats and species.

4.1 Visitors monitoring

Visitor monitoring activities started on 1 August 2024 and involved the installation of **10 camera traps** and **11 infrared people counters** distributed across the four pilot sites.
The main objectives were to quantify visitor numbers, identify the main modes of access (on foot, by bicycle, on horseback, by motorbike, or by car), and detect potential unauthorized access to restricted areas.

By September 2025, a total of **117,951 video files** had been collected from camera traps:

- 60,173 from **Alta Val Parma**,
- 10,390 from **Lama Lite**,
- 47,388 from **Pietra di Bismantova**.

In addition, people counters provided continuous data on visitor flows. The partial results available show that **attendance peaks occurred during August** and, on a weekly scale, **during weekends and public holidays**, confirming the expected seasonal pattern of tourism in the area.

However, **no quantitative synthesis of visitor counts** is yet available, as the data are still being processed and verified. Some counters experienced temporary malfunctions (e.g., the main device at Fonti di Poiano), and several camera traps were disconnected or tampered with during the summer season, particularly around mid-August when visitation was highest. Despite these limitations, the monitoring network proved effective in recording a large amount of raw data suitable for future trend analysis.

The experience highlighted both the potential and the weaknesses of the adopted methods.

- **People counters** showed good reliability and low maintenance needs, though their installation requires precision and appropriate foundations.
- **Camera traps** allowed detailed visual data collection but were affected by heavy memory use, frequent resetting, and a higher risk of vandalism.
  Data uploading also posed challenges due to file size limits and slow transfer speeds, suggesting the need for improved digital infrastructure.

Overall, the visitor monitoring activity successfully established a **baseline dataset** on tourist flows and access patterns across the Park's pilot areas. The data will be instrumental for correlating visitor pressure with environmental impacts recorded through vegetation and erosion monitoring in the next project phases.

4.2 Vegetation and habitat monitoring

Vegetation monitoring started in May 2025 and focused on **Fonti di Poiano** and **Pietra di Bismantova**, two of the most visited and ecologically sensitive areas of the Park. Surveys conducted at the beginning and end of the summer season provided an initial comparison of the effects of trampling and management practices.
At Poiano, despite the heavy presence of visitors, areas with deeper soil layers remained stable, while drier meadows showed signs of **vegetation thinning and erosion**. Unregulated maintenance interventions caused the **loss of protected species** such as *Digitalis ferruginea* and *Orchis simia*.
At Bismantova, the most evident impacts were observed along **climbing access routes and summit trails**, where the proliferation of unofficial paths damaged grassland habitats (priority habitat 6210 under Directive 92/43/EEC).
Indicator species such as *Alyssoides utriculata* and *Delphinium fissum* currently appear stable, but continuous monitoring is required to detect potential future declines linked to visitor pressure.

4.3 Wildlife monitoring

Wildlife monitoring through **four acoustic sensors** began in August 2025, targeting two main forest roads (Lagoni and Lagdei). The system collected **1,253 recordings**, which will be analyzed using bioacoustic software to assess differences in bird activity between disturbed and undisturbed areas.
Although results are still under processing, the method proved reliable for continuous, non-invasive monitoring. The Park plans to expand this approach through a **volunteer-based citizen science programme**, ensuring long-term continuity and public involvement.

4.4 Soil erosion monitoring

Erosion monitoring, started in 2023, combined UAV and ground-based photogrammetry with dendrochronological analysis of exposed roots. The approach enabled the creation of high-resolution digital models to detect soil loss and trampling patterns along trails. Preliminary data from Pietra di Bismantova indicate a **mean soil erosion rate of 4.55 mm per year** over the past decade. UAV-based surveys at all pilot sites confirmed the occurrence of **trail widening and off-path disturbances**, particularly in areas with higher tourist density. These findings emphasize the need to reinforce trail maintenance and visitor guidance measures to prevent further landscape degradation.

4.5 Key findings and management priorities

The HUMANITA monitoring phase has generated an extensive and multidisciplinary dataset that establishes a robust foundation for evidence-based management of the Park. Key issues requiring attention include:

- **Incomplete visitor data processing**, which limits immediate quantitative analysis but highlights the importance of maintaining and protecting the monitoring network;
- **Habitat degradation** due to trampling, unauthorized paths, and unregulated maintenance;
- **Challenges in data storage and processing**, particularly for video files;
- **Need for visitor education and awareness campaigns** on the importance of staying on designated trails;
- **Long-term sustainability** of monitoring activities, to be ensured through staff training and community involvement.

Addressing these priorities will strengthen PNATE's capacity to manage tourism sustainably, ensuring both visitor satisfaction and the conservation of valuable habitats and species within the protected area

5. Gaps/weaknesses to address

The most significant critical issues in impacts' mitigation that require the additional Action plan's measures to improve the management and protection of the protected area, and which require strengthening in the short term are listed below:

- Impacts of sport activities on nature, like rock climbing and slackline on protected bird nesting sites and on geological heritage: la mancanza di consapevolezza nei visitatori rispetto al valore naturalistico dei luoghi frequentati origina comportamenti scorretti che incidono sulla conservazione di habitat e specie aumentando gli impatti per eosione, danneggiamenti alla vegtazione e disturbo alla fauna. Azioni di informazione ed educazione ambientale, e installazione di cartellonistica specifica contribuiranno ad un miglioramento della qualità della fruizione turistica
- Fighting illicit acts like illegal motorized tourism, camping and lighting fires were not permitted: I visitatori non sono abbastanza informati su divieti e regolamentazioni vigenti nelle aree fequentate: l'installazione di Cartelli informative contribuirà alla qualificazione della fruizione.
- Monitoring the cycling activity that in some more sensitive areas is limited or forbidden by ordinances of the park, but however practiced: è neecessaio rendee più consapevoli frruitori sulle corrette modlità di visita e sui metodi consentiti offrendo anche soluzioni alternative (sentieri alternativi con minor impatto)
- Reducing trampling and disturbance to protected species, especially birds in Pietra di Bismantova, and following paths outside the designated paths: per incentivare un corretto comportamento soprattutto a Bismantova e Poiano offrire e predisporre percorsi preferenziali per passeggiate e picnic per evitare il calpestio diffuso e incontrollato.

- Improving tourists' discipline in respecting the environment, and fighting unsustainable behaviors like littering: attività di educazione e informazione sia rivolte ai turisti che agli operatori economici e partecipazione alle attività di monitoraggio rendereranno la popolazione e i visitatori più consapevoli.

6. Integration into the current tourism impact management strategy

Governance, enabling frameworks, and support tools

This chapter brings together the instruments and pathways already in place that do not constitute direct mitigation measures, but instead provide a strategic, managerial, and knowledge-based support framework for impact management actions.

Natura 2000 and Appropriate Assessment

The territory of PNATE includes fifteen Natura 2000 sites (sixteen if we include a SPA included in a wider SAC), covering approximately 76% of the Park's total area. Conservation measures are implemented through the Appropriate Assessment (VIncA) framework, which aims to prevent habitat degradation, disturbance to species, and hydrological and territorial alterations.

All plans and projects potentially affecting Natura 2000 sites are subject to the Appropriate Assessment procedure, which constitutes a fundamental preventive filter.

European Charter for Sustainable Tourism (ECST)

The Park has adhered to the European Charter for Sustainable Tourism (ECST) since 2014. Phase II, launched in 2022, led to the development of shared action plans with local tourism operators. In 2023, 92 activities were aligned with the ECST, including four certified tour operators.

The ECST network represents a participatory governance tool that supports visitor flow distribution, the promotion of responsible behaviour, and coordination between the Park and local operators.

Environmental education

PNATE has long promoted structured environmental education programmes, coordinated by the Park's Environmental Education Unit. These include initiatives such as Neve Natura and Autunno d'Appennino, structured into modules comprising reception, guided outdoor activities, interpretative moments, and final feedback sessions.

These programmes take place along authorised routes and are led by trained educators, contributing to group management and the dissemination of responsible behaviour.

Communication and interpretation

The Park uses a range of communication and interpretation tools, including visitor centres, printed and digital informational materials, on-site panels, and trail signage. Within projects such as HUMANITA, dedicated materials have been developed for specific sites, including Pietra di Bismantova and the Triassic Gypsum system.

These tools support visitor orientation and enhance understanding of the area's environmental values.

Participation, volunteering, and citizen science

The Park collaborates with local associations and volunteers on activities such as trail maintenance, mobility management, and logistical support in some highly frequented areas. Within the HUMANITA project, citizen science initiatives related to wildlife monitoring are also under development, particularly through the use of acoustic sensors.

Projects and the contribution of European programmes

Participation in European projects has contributed to the development of tools and pilot actions for visitor management. Projects such as CEETO have introduced pilot measures on mobility and visitor flow management, while HUMANITA provides monitoring data on visitors, vegetation, wildlife, and erosion.

These projects strengthen the knowledge base and support the adaptive evolution of management policies over time.

7. Linkages to national-regional plans

Strategic coherence of the Action Plan with national-level plans

The Action Plan is consistent with several national plans and strategies. Within these frameworks, tourism in protected areas is shifting from being considered a pressure factor to becoming an active tool for conservation, capable of supporting nature protection, strengthening territorial identity, and ensuring long-term benefits for future generations.

National Strategy for Sustainable Development (SNSvS)

The National Strategy for Sustainable Development (SNSvS) represents the overarching reference framework, aligned with the UN 2030 Agenda. It integrates environmental, economic, and social dimensions, guiding public policies and investments toward more resilient and sustainable models. The SNSvS provides a direct and structural framework for sustainable tourism in protected areas, positioning tourism use as a lever for conserving natural capital and promoting long-term territorial development.

The SNSvS recognizes natural capital as a fundamental infrastructure of the country.
In protected areas, sustainable tourism:

- enhances ecosystems, landscapes, and biodiversity without compromising their integrity;
- promotes active conservation as a prerequisite for tourism use;
- strengthens the role of parks as territorial hubs of sustainability.
  Conservation is not a constraint, but rather the enabling condition for the tourism offer.

In line with the SNSvS objective on circular economy and sustainable consumption, tourism in protected areas promotes:

- low environmental impact accommodation facilities;
- waste reduction and efficient resource use;
- local supply chains and responsible tourism services.
  Protected destinations thus become replicable models of sustainable tourism.

The SNSvS also integrates the social dimension of sustainable development.
Tourism in protected areas:

- creates economic opportunities compatible with conservation;
- supports qualified local employment (guides, educators, environmental operators);
- strengthens a sense of belonging and stewardship of the territory.
  Environmental sustainability translates into social cohesion and local resilience.

The SNSvS promotes multilevel and participatory governance.
Applied to tourism in protected areas, this means:

- coordination among managing authorities, municipalities, tourism operators, and citizens;
- integration of environmental, territorial, and tourism planning;

- shared objectives, rules, and responsibilities.
  Shared governance reduces conflict and increases the effectiveness of conservation measures.

The SNSvS identifies education for sustainability as a key factor.
Tourism in protected areas:

- fosters informal learning experiences;
- increases awareness of environmental values;
- encourages responsible behavior beyond the visit itself.
  Visitors thus become ambassadors of sustainability

National Biodiversity Strategy 2030

The National Biodiversity Strategy 2030 aims to protect and restore terrestrial and marine ecosystems, strengthen protected areas, and enhance ecological connectivity, adopting a long-term vision for the conservation of natural capital.
The Strategy recognizes that well-preserved ecosystems, high-quality landscapes, and properly managed protected areas form the foundation of informed and responsible nature-based tourism (e.g. hiking, cycling tourism). Protecting natural values becomes an investment in environmental quality and in the enhancement of protected areas, also increasing the value of the tourism experience.

National Integrated Energy and Climate Plan (PNIEC)

The National Integrated Energy and Climate Plan (PNIEC) defines objectives for emissions reduction, renewable energy, and energy efficiency, and is a key tool for guiding the ecological and climate transition in the coming decades.

The PNIEC and climate policies promote low-emission tourism by encouraging:

- soft mobility (walking routes, cycling paths, local public transport);
- energy-efficient accommodation facilities;
- the use of renewable energy sources.

Sustainable tourism directly contributes to decarbonization goals by reducing the impact of travel and tourism services.

National Climate Change Adaptation Plan (PNACC)

The National Climate Change Adaptation Plan (PNACC) aims to reduce the vulnerability of territories, ecosystems, and infrastructure to climate impacts (heatwaves, droughts, floods), promoting nature-based solutions and preventive planning.
Within sustainable tourism, this translates into:

- seasonal redistribution of visitor flows and reduced peak concentration;
- diversification of tourism activities;
- management of visitor carrying capacity in sensitive areas.

This results in reduced pressure during critical periods and increased territorial resilience.

Water Protection Plans

Water protection plans coordinate the sustainable management of rivers, lakes, aquifers, and coastal areas, with the aim of improving water quality and ensuring long-term water availability.
These plans are fundamental for promoting sustainable use of wetlands and interface with the Action Plan through participatory monitoring of springs and by increasing visitor awareness of the importance of water resource protection and management.

National Waste Management Programme

The National Waste Management Programme guides the system toward a circular economy, waste prevention, increased recycling, and reduced landfill disposal.
It interfaces with sustainable tourism and the Action Plan, particularly through improved waste management by tourism operators and accommodation managers, including:

- waste reduction in accommodation facilities;
- effective separate collection systems;
- "plastic-free" events and services, improving the image, competitiveness, and social acceptance of tourism in local areas.

An integrated strategic framework

Taken together, these instruments are not merely protective measures, but strategic actions aimed at ensuring a safer, more resilient, and compatible future—especially in areas of high natural value and in protected areas. National environmental protection plans are increasingly interconnected with sustainable tourism, which can be regarded as an opportunity for local development compatible with the conservation of natural capital.

Protected areas as laboratories for sustainable tourism:
Within national legislation, parks and protected areas translate environmental planning into concrete actions through visitor regulation, environmental education, and community involvement. Tourism thus becomes a tool for active conservation and compatible economic development.

Looking ahead, the link between environmental policies and sustainable tourism is set to strengthen further: no longer tourism *despite* conservation, but tourism as an ally of environmental protection, capable of generating lasting value for territories, ecosystems, and communities.

Coherence with Agenda 2030 and European policies

Sustainable tourism in protected areas contributes transversally to several Sustainable Development Goals (SDGs), particularly SDGs 8, 11, 12, 13, 14, and 15, reinforcing the alignment of the SNSvS with EU biodiversity and climate policies.

Regional-level plans

The Environmental Action Plan for Sustainable Development (PAA) is the Region's overarching framework for addressing environmental components in an integrated manner:

- it coordinates plans on air, water, soil, biodiversity, climate, and waste within a comprehensive sustainability approach;
- it defines strategic objectives and regional actions consistent with national and European environmental policies;
- it involves local authorities and citizens and is periodically updated.

The Emilia-Romagna Regional Strategy for Agenda 2030 translates the 17 UN Sustainable Development Goals at the local level:

- identifying quantitative targets to be achieved by 2025–2030;
- integrating economic, social, and environmental aspects into a unified vision of sustainable development;
- involving multiple institutions and regional stakeholders in monitoring and implementation.

The Region defines planning instruments that integrate environment, landscape, and development:

- Regional Territorial Plan (PTR): establishes objectives for the protection and enhancement of environmental and cultural resources, consistent with sustainable economic development;
- Regional Landscape Territorial Plan (PTPR): regulates the protection of landscape, environmental, and cultural values at the territorial scale.

These plans guide territorial transformation toward sustainability.

The Region promotes integrated policies for natural areas and sustainable tourism enhancement:

- management of regional parks and Natura 2000 networks to conserve biodiversity, landscapes, and natural systems;
- support for projects combining environmental protection and slow tourism (e.g. trail and cycle path maintenance in parks);
- activation of sustainable tourism packages in protected areas, developed through the European Charter for Sustainable Tourism (CETS) and participatory processes involving institutions and local operators.

These actions aim to make tourism a lever for conservation and local development.

The Region also participates in initiatives such as the European Tourism Indicator System (ETIS), designed to monitor the sustainability performance of tourist destinations and support operators and policymakers in improving outcomes and impacts.

8. Pilot site Action plan

> ACTION 1 > TITLE OF THE ACTION	**Implementation of mowing and brush cutting along routes in open grassland areas in order to discourage use outside designated trails.**
> DESCRIPTION	> In the most heavily visited areas of the Park, such as the summit of Pietra di Bismantova and the grassland areas of Poiano, targeted mowing and brush cutting of specific zones is planned to prevent hiking and recreational activities from occurring off-trail. These areas are currently used by visitors for picnics and walks. The objective is to encourage movement along designated areas while discouraging uncontrolled trampling, with particular attention to habitats of Community interest. Visitors tend to walk through and use areas with low vegetation more frequently than areas perceived as unmanaged or poorly maintained. In particular, on the summit area of Pietra di Bismantova and in Poiano, this approach aims to prevent activities such as picnics and walks from damaging flowering plants, grassland habitats, and areas close to wetlands, as highlighted by botanical monitoring carried out within the framework of the HUMANITA project.
> SPECIFIC OBJECTIVES	> Reduce erosion and trampling in areas of high natural value > Redirect visitor use toward areas of lower ecological value > Limit uncontrolled hiking activities through the creation of preferential routes > Promote the conservation of habitats and species of Community and conservation interest
> PROJECT MANAGEMENT TOOLS	> Use GIS software (ArcGIS – QGIS) to identify areas and design routes and interventions > Park trail cadastre > Detailed (executive) project design > Infrared people counters and camera traps > Brush cutters, mulchers, and operational machinery
> INVOLVED STAKEHOLDERS	> Mayors of the municipalities concerned > Local companies > Botanical experts for monitoring and works supervision > Environmental hiking guides > Members of local sections of the Italian Alpine Club > Climbers and climbing associations

> IMPLEMENTATION STEPS	> Identification of routes to be managed through mowing and brush cutting > Monitoring of visitor flows using methods developed within HUMANITA (camera traps and people counters) > Ex ante botanical monitoring > Detailed design of interventions and definition of the implementation schedule (2–3 mowing campaigns) > Ex post botanical monitoring > Communication of the intervention through social media, the Park website, and press releases >
> IMPLEMENTATION PERIOD TIMELINE	> Starting from summer 2025, to be repeated annually
> POSSIBLE FUNDING SOURCE AND COSTS ESTIMATION	> Budget funds; extraordinary state funds (Ministry of the Environment); structural funds (CSR, ERDF) > € 15.500/anno
> EXPECTED RESULTS / MONITORING	> Almost exclusive use of the designated routes > Reduction in erosion due to decreased trampling in sensitive areas > Reduced damage from trampling and collection of plant species of conservation interest > Increased visitor awareness of the need to use marked trails and avoid off-trail and uncontrolled use >

> ACTION 2 > TITLE OF THE ACTION	**Installation of on-site signage and explanatory and informational panels concerning prohibitions, codes of conduct, and the natural value of the areas.**
> DESCRIPTION	> Installation of informational signage along the main access routes to the sites > Precise identification of installation locations > Installation of no. 4–5 informational panels (60 × 90 cm, full color, mounted on wooden posts with ground spikes) and no. 4 interpretive notice boards with 125 × 125 cm wooden panels, wooden structure, and protective cove
> SPECIFIC OBJECTIVES	> Creation of signage and panels to inform and raise awareness among visitors and local users about the site, habitats and species, natural value, threat factors, and good behavioral practices, with particular reference to trails and areas

	subject to high visitor pressure (Pietra di Bismantova, Poiano, Monte Cusna, Alta Val Parma Forest) > Prevention and/or mitigation of anthropogenic disturbance resulting from inappropriate or poorly informed tourist and recreational activities
> PROJECT MANAGEMENT TOOLS	> Use of GIS software (ArcGIS – QGIS) to identify installation sites > Detailed (executive) project design > PNATE infrastructure and facilities database > Informational materials for notice board and sign content (conservation measures, Park protection regulations) >
> INVOLVED STAKEHOLDERS	> Mayors of the municipalities concerned > Landowners > Forestry Carabinieri > Environmental hiking guides > Members of local sections of the Italian Alpine Club
> IMPLEMENTATION STEPS	> Identification of signage installation sites > Definition of content > Graphic design and printing of the signage > Installation of the structures by a specialized company
> IMPLEMENTATION PERIOD TIMELINE	> Strarting from 2026
> POSSIBLE FUNDING SOURCE AND COSTS ESTIMATION	> Budget funds of the Authority – Regional funds of Emilia-Romagna for UNESCO World Heritage sites
> EXPECTED RESULTS / MONITORING	> Provision of information to visitors on the characteristics of the area, the founding objectives of the Park, and its scientific and natural values, promoting informed and responsible use.

> ACTION 3 > TITLE OF THE ACTION	**Promotion of best practices in hospitality and sustainable accommodation to ensure environmentally compatible use of the Park.**
> DESCRIPTION	- Implementation of training activities aimed at the local community, designed to provide practical information on development opportunities and on the sustainable management of accommodation facilities. The training is intended to reach interested operators and to convey good management practices (e.g. waste management; events without loud music, lighting, or fireworks; rational use of water; use of traditional local products and short supply chains; correct visitor behavior; and the ability to communicate the natural values and environmental significance of the area to guests). It will also highlight possible organizational, administrative, and fiscal incentives associated with low-impact tourism activities. - Implementation of an information campaign aimed at current or potential visitors interested in local natural and cultural values. Thanks to broad and widespread access to information, particular attention may be given to a province-wide and mountain-area network system, and potentially also to foreign visitors, who generally show greater familiarity with sustainable and responsible accommodation options
> SPECIFIC OBJECTIVES	> To convey the message that protected areas are environments of high natural value where sustainable and responsible tourism is practiced, relying on informal accommodation facilities and low–environmental-impact management approaches. To introduce innovative principles in the enjoyment of natural environments, promoting the dissemination of elements that enhance visitors' perception of being in an area with outstanding environmental value.
> PROJECT MANAGEMENT TOOLS	> CETS – European Charter for Sustainable Tourism > Questionnaires > Educational materials > Workshops > Social media, website > Mailing lists
> INVOLVED STAKEHOLDERS	> Managers of accommodation facilities in the pilot areas (mountain huts, restaurants, shops, and equipment rental services)

	> Environmental hiking guides > Mayors of the municipalities concerned > Local population > Local associations > Tourist information and visitor centers
> IMPLEMENTATION STEPS	> Appointment of an external training expert or use of internal resources (Park ECST operators) > Design of training course content > Organization of online and in-person lessons and development of a training schedule; possible awarding of certificates or credits to operators
> IMPLEMENTATION PERIOD TIMELINE	> From 2026, once per year
> POSSIBLE FUNDING SOURCE AND COSTS ESTIMATION	> Park budget funds linked to the maintenance and implementation of the CETS: €10,000
> EXPECTED RESULTS / MONITORING	> This activity contributes to the creation of a sustainability pathway through the dissemination of a model of conscious tourism, starting with accommodation managers and economic operators. It both encourages the arrival of visitors who are already environmentally aware and attracts the traditional target audience, increasing their awareness and promoting good visitation practices (appropriate behavior, information on prohibited activities, and guidance on periods of greater or lesser sensitivity, for example in relation to wildlife disturbance) > Monitoring through the administration of questionnaires to accommodation guests and facility managers within the framework of ECST activities

> ACTION 4 > TITLE OF THE ACTION	**Monitoring activities of the natural environment using methods developed in HUMANITA also with volunteers (citizen science).**
> DESCRIPTION	Continuation and enhancement of natural resource monitoring activities using the methods developed within HUMANITA and, based on the project results, extension of monitoring and management measures to other areas of the Park affected by increasing tourist pressure (Lago Calamone, Lago Pranda, Triassic Gypsum cycle path), also with the support and assistance of appropriately trained and coordinated volunteers. Continuation of participatory spring monitoring in collaboration with the Emilia-Romagna Region
> SPECIFIC OBJECTIVES	Improve systematic monitoring of key species and habitats in order to track changes in biodiversity status. Use modern technologies and artificial intelligence (remote sensing, drones, camera traps and automated sensors, flora and fauna species recognition applications, applications for spring monitoring) to increase the accuracy and efficiency of environmental data collection. Regularly produce reports and evaluate monitoring results, using the data collected for adaptive management and to improve conservation strategies within the protected area.
> PROJECT MANAGEMENT TOOLS	Management plans for Natura 2000 Network sites Camera traps, people counters, drones, LiDAR, bioacoustic recorders, water monitoring instruments, nets for capture activities HUMANITA dashboard Monitoring protocols developed within HUMANITA GIS software (ArcGIS, QGIS)
> INVOLVED STAKEHOLDERS	> Local population > Park Environmental Hiking Guides > Professionals > Mayors of the municipalities concerned > Local associations > Universities and schools in the area and in nearby cities
> IMPLEMENTATION STEPS	> Engagement of professionals > Design of training course content for volunteers and Park technicians > Organization of online and in-person lessons

	> Organization of demonstration field trips and data collection outings > Synthesis of monitoring results > Preparation of reports > Proposal of management measures to mitigate the impacts of recreational activities
> IMPLEMENTATION PERIOD TIMELINE	> From 2026, twice per year
> POSSIBLE FUNDING SOURCE AND COSTS ESTIMATION	> Park budget funds, LIFE projects, state funds
> EXPECTED RESULTS / MONITORING	> Improved knowledge and data quality > Greater efficiency and coverage of monitoring activities > Strengthened management and decision-making processes > Enhanced skills of Park staff > Promotion of citizen science within the Park and recognition of volunteers > Improved protection of species and habitats > Greater involvement of stakeholders

> ACTION 5 > TITLE OF THE ACTION	**Routine and extraordinary maintenance of alternative trails in order to distribute localized tourist flows over wider areas**
> DESCRIPTION	> In the most heavily visited areas of the Park, such as the summit of Pietra di Bismantova and the grassland areas of Poiano, in order to avoid overcrowding along the same routes, trails, and areas, the recovery, maintenance, signage, and promotion of nearby and alternative trails is planned. These alternatives to the most frequently used tourist routes aim to disperse and relocate visitor flows, thereby preventing erosion damage and excessive disturbance at the same locations. In particular, with regard to access to the summit of Pietra di Bismantova, access points other than Piazzale Dante will be promoted, along with the use of trails in the surroundings of the Poiano springs (e.g. trails descending from Sologno, Busana, etc.).
> SPECIFIC OBJECTIVES	> Reduce erosion and trampling caused by concentrated and localized tourist use at the same sites and during the same periods of the year

	> Redirect visitor use toward areas of lower ecological value > Limit uncontrolled hiking activities through the creation of routes to be promoted and encouraged > Promote the conservation of habitats and species of Community and conservation interest
> PROJECT MANAGEMENT TOOLS	> Park trail cadastre; people counters and camera traps for visitor counting; Park website and social media for promotion; GIS software (ArcGIS – QGIS) to identify and design routes and interventions > Park trail cadastre > Detailed (executive) project design > Infrared people counters and camera traps > rush cutters and operational machinery
> INVOLVED STAKEHOLDERS	> Mayors of the municipalities concerned > Local companies > Environmental hiking guides > Members of local sections of the Italian Alpine Club
> IMPLEMENTATION STEPS	> Identification of routes requiring routine and extraordinary maintenance > Detailed design of the interventions > Procedures for contracting specialized companies to carry out the works > Communication and promotion of new routes and completed interventions through social media, the Park website, and press releases > Monitoring of visitor flows using methods developed within HUMANITA (camera traps and people counters)
> IMPLEMENTATION PERIOD TIMELINE	> Starting from summer 2025, to be repeated annually
> POSSIBLE FUNDING SOURCE AND COSTS ESTIMATION	> Budget funds; extraordinary state funds (Ministry of the Environment “Green Infrastructure” programme); structural funds (CSR, ERDF) > €15,500 per year

> EXPECTED RESULTS / MONITORING	> Almost exclusive use of the designated routes > Reduction in erosion due to decreased trampling in sensitive areas > Reduced damage from trampling and collection of plant species of conservation interest > Increased visitor awareness of the need to use marked trails and avoid off-trail and uncontrolled use

> ACTION 6 > TITLE OF THE ACTION	**Organization of environmental education and public awareness activities.**
> DESCRIPTION	Implementation of environmental education and awareness-raising activities aimed primarily at schools, tourists, residents, general visitors, and guides and other tourism professionals. These activities will be based on direct experiences in the field, also sharing the monitoring steps and providing feedback on the results emerging from the HUMANITA project. The activities will be designed to increase awareness of the impacts of tourism use on habitats and species, promoting responsible behavior consistent with the Park's conservation objectives. Initiatives may include themed guided hikes in the pilot sites (Pietra di Bismantova, Poiano, Monte Cusna, Alta Val Parma Forest), outdoor workshops, outreach meetings, public evenings, and educational activities, with particular attention to the most sensitive areas.
> SPECIFIC OBJECTIVES	• Increase visitor awareness of the effects of trampling, wildlife disturbance, fire lighting, conscious water use, collection of natural specimens, and off-trail use Increase visitor awareness of the effects of trampling, wildlife disturbance, fire lighting, conscious water use, collection of natural specimens, and off-trail use Promote correct and responsible behavior during recreational and tourism activities Encourage voluntary adherence to use regulations (use of trails, respect for prohibitions, reduction of disturbance) Share with the public the results of monitoring and activities carried out within the framework of HUMANITA

	Strengthen the link between the local community, visitors, and the Park's conservation objectives
> PROJECT MANAGEMENT TOOLS	Park environmental education programs Outreach materials derived from HUMANITA results Park website and social media channels Collaboration with the CETS network Collaboration with accredited training bodies
> INVOLVED STAKEHOLDERS	Park Environmental Hiking Guides Schools and educational institutions in the area Local and cultural associations Municipalities and Unions of Municipalities Tourism operators and accommodation facilities Trained volunteers (citizen science)
> IMPLEMENTATION STEPS	Identification of target groups (schools, families, tourists, residents) Design of the annual outreach and environmental education program based on the identified target groups Definition of content (general treatment of impacts or in-depth focus on specific topics such as fire, wildlife disturbance, etc.) and formats (guided hike, workshop, role-playing activity, lesson, public meeting), always tailored to the target audience Logistical and practical organization of themed hikes, workshops, and public meetings Production of supporting outreach materials Communication and promotion of activities
> IMPLEMENTATION PERIOD TIMELINE	Starting from 2026, monthly scheduling (at least one event per month)
> POSSIBLE FUNDING SOURCE AND COSTS ESTIMATION	Park budget funds linked to environmental education programs; ministerial funds related to UNESCO sites and reserves – €5,000
> EXPECTED RESULTS / MONITORING	• Greater knowledge of Park use regulations and natural values • Reduction of inappropriate behavior in the most sensitive areas

- Creation of a multiplier effect of knowledge, encouraging the informal dissemination of content and good practices beyond direct participants, who will act as ambassadors for key themes

9. Zone Plan

PNATE is not currently provided with a Park Plan. The Italian Framework Law on national protected areas provides that the Park be divided into four distinct zones corresponding to different levels of protection:
a) **integral reserves**, in which the natural environment is preserved in its entirety;
b) **general oriented reserves**, in which it is prohibited to construct new buildings, expand existing structures, or carry out land transformation works. However, traditional productive uses, the construction of strictly necessary infrastructure, natural resource management interventions carried out by the Park Authority, and maintenance of existing works may be permitted;
c) **protection areas**, in which, in harmony with the founding objectives and the general criteria established by the Park Authority, agro-forestry-pastoral activities, as well as fishing and the collection of natural products, and high-quality artisanal production may continue, according to traditional practices or organic farming methods;
d) **economic and social promotion areas**, forming part of the same ecosystem and more extensively anthropized, in which activities compatible with the Park's founding objectives are permitted and aimed at improving the socio-cultural life of local communities and enhancing visitors' enjoyment of the Park.

At present, the PNATE has a provisional zoning defined by the decree establishing the protected area, which divides the territory into three zones:
Zone 1 – areas of significant naturalistic, landscape, and environmental interest with no or limited degree of anthropization;
Zone 2 – areas of naturalistic, landscape, agricultural-environmental, and cultural interest with a moderate degree of anthropization;
Zone 3 – areas of naturalistic, landscape, agricultural-environmental, and cultural interest with a higher degree of anthropization.

These three zones correspond to different levels of protection defined by the activities regulated under the safeguard regulations.

The pilot areas of the Park monitored within the framework of the HUMANITA project are already classified as **Zone 2** of the Park, with a moderate degree of anthropization and a potentially high level of protection. The absence of a Park Regulation, and therefore of more specific rules compared to the more general protection framework included in the decree establishing the Park Authority on a provisional basis pending the drafting of a proper regulation as defined by Law 394/91, has affected—more than the Plan itself—the possibility of limiting and mitigating the impacts of recreational activities within the protected area.

Therefore, with a view to a future adjustment of the management tools of the National Park, the pilot areas monitored within HUMANITA should be included among the **Zone B** areas of the Park in the definitive zoning. More importantly, however, the measures envisaged by the Action Plan should be integrated into the Park Authority's Regulation in order to ensure a positive impact through improved conservation and safeguarding measures.

In addition to these PNATE-specific instruments, the actions planned under this Action Plan should be integrated, for greater effectiveness and impact, into the **Conservation Measures of the Natura 2000 Network sites** and into the **Management Plans**, where present (ZSC Triassic Gypsum and ZSC Pietra di Bismantova).

10. Remarks and Conclusions

In recent years, a significant increase in tourist attendance has been recorded in the National Park of the Tuscan-Emilian Apennines, particularly after the pandemic, although numbers were already rising even before then.
Tourist numbers have increased especially in areas where services are available (mountain huts, chairlifts, car parks, guides), and the widespread use of social media has also contributed to promoting the area and attracting visitors. Compared to visitors in the past, tourists are now generally less prepared and tend to expect the same services they find in urban areas, increasing the risk of both accidents and dissatisfaction.

The range of activities carried out by visitors has also expanded, and sporting activities within the Park have increased significantly. In addition to hiking, cycling has grown markedly, above all due to the spread of e-bikes. Ski mountaineering has also increased, and at Pietra di Bismantova, alongside climbing, other sports such as slacklining have become more widespread. With the increase in visitors, motorized traffic has also risen significantly.

Furthermore, as a result of global warming, periods of good weather have become longer and winters are characterized by less snow and milder conditions; consequently, periods of high tourist attendance have also lengthened.

Tourist flows appear to be concentrated in certain areas of the Park and during the same periods, leading to increased impacts on fragile natural ecosystems for which the Park has a responsibility for conservation and management. The INTERREG HUMANITA project made it possible to quantify what had previously been only perceived, as the Park Authority had never developed a systematic system for recording visitor numbers. At the end of the monitoring activities, a set of quantitative and descriptive data was obtained (number of people on trails, with corresponding periods and time slots), providing the managing authority with data collected using scientific and innovative methods. These data constitute a baseline on which to build management policies capable of mitigating the effects of tourism on the territory, monitoring impacts over the long term—also through the use of new technologies and computerized systems—and planning interventions aimed at reducing localized impacts such as soil erosion, wildlife disturbance, vegetation damage, and inappropriate behavior.

The involvement of the population—both residents (with particular reference to managers of tourism facilities and services) and visitors—contributes to greater knowledge and awareness of the natural values that characterize the Park area, as well as to a better understanding of the effects of individual choices and behaviors on environmental conservation.

The PNATE has not yet adopted a Park Plan but is subject to a set of safeguard regulations that include some general rules for territorial regulation and management. The PNATE is almost entirely included within Natura 2000 Network sites, which are equipped with management plans and general and specific conservation measures. The planning actions envisaged in this Action Plan will be included in the Park Plan once it is drawn up and, in any case, will be incorporated into the management plans of the corresponding Natura 2000 sites as soon as a review and amendment phase is opened by the Emilia-Romagna Region, which is responsible for Natura 2000 management instruments. This review phase is scheduled for the current year (2026).

Some of the planning actions envisaged in this Action Plan will also be extended to other areas of the PNATE beyond the pilot areas monitored during the HUMANITA project, as a replication of the good practices developed and tested within the project and in order to optimize the results achieved.