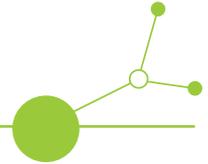


D.3.2.3 Report on participatory monitoring in PAs, lessons learned, and recommendations



Version 1
09 2025





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Introduction

The HUMANITA project aims to explore and mitigate the environmental impacts of tourism on protected areas through innovative and inclusive monitoring strategies. A central element of this approach is participatory monitoring, which actively involves citizens, students, and local communities in data collection and environmental assessment. The overarching goal is to develop a comprehensive monitoring system for nature conservation, focusing on the effects of outdoor tourism on natural assets.

Participatory approaches challenge traditional research models by fostering collaboration between practitioners and visitors. Rather than relying solely on expert-led assessments, HUMANITA embraces a citizen science framework that empowers non-experts to engage in meaningful observation and documentation. Through hands-on activities and digital tools, participants help monitor key ecological indicators such as vegetation and biodiversity, springs mapping, water quality, pollution levels, and trail erosion. These efforts are supported by mobile applications, field workshops, and educational resources designed to make data collection accessible and engaging.

Protected areas participating in the HUMANITA project have designated pilot sites that are particularly vulnerable to tourism-induced environmental pressures. Leveraging the project's transnational framework, these sites serve as testing grounds for context-specific monitoring methodologies tailored to the distinct ecological challenges of each location. Whether tracking invasive plant species via iNaturalist, assessing erosion with drone-based LiDAR, creating a database of plant locations, or documenting spring conditions through online forms, each activity contributes to a broader understanding of tourism's ecological footprint. These participatory efforts also serve as platforms for dialogue, learning, and community building—bridging the gap between science and society. By building strong local partnerships, data collected through citizen science can be integrated with other datasets gathered by project partners, strengthening the overall monitoring process. Within this framework, a summer school was organized to equip students with the skills needed to select appropriate monitoring methods, design effective plans, and carry out field measurements. Beyond technical training, the initiative fostered interdisciplinary collaboration and empowered participants to take an active role in conservation efforts. Educational materials developed for the event are also made available for universities and the public, promoting environmental awareness among diverse communities.

This report presents a detailed overview of the participatory monitoring that each pilot site carried out, framed in contextual features, displaying the achieved results. By comparing these diverse models, the report aims to identify transferable strategies and support the development of scalable participatory monitoring systems for protected areas (PAs). Data collected from pilot initiatives, enabled by the active participation of visitors, citizens, researchers, and students, constitute a significant source of knowledge. This information is meant to be transitioned from internal evaluation to accessible content tailored for various target groups. The data generated by participatory monitoring are also included in the interactive data visualization tool and reported within the project website and app, informing stakeholders, supporting decision-making, and contributing to the broader impact and long-term value of the HUMANITA project.



Malá Fatra National Park

PROJECT DESIGN	
Type of activity	Demonstration of data measurement
Period	May 2024 - September 2024
Target (to whom is addressed)	Students of Geodesy and Cartography
Number of participants	13

1. Objectives

Enhance Environmental Awareness:

- Promote a deeper understanding of environmental issues connected with erosion on tourist trails and the importance of local ecosystems through hands-on monitoring experiences.

Build Scientific Capacity:

- Develop participants' skills in data collection, environmental assessment, and critical thinking through practical training and collaboration with researchers. The primary objective was to educate participants on the methodology of LiDAR and UAV integration for monitoring tourist trail deformations. We aimed to demonstrate the data acquisition process, environmental conditions, and data processing techniques, fostering an understanding of accuracy and the potential for epochal change detection in hiking trails.

Support Evidence-Based Decision Making:

- Generate reliable, community-sourced environmental data that can inform environmental policies, conservation strategies, and resource management.

Bridge Academia and Society:

- Strengthen collaboration between universities, local communities, NGOs, and government agencies through shared monitoring goals and co-designed research initiatives.

2. Participants' outreach

The outreach strategy for this demonstration was intentionally targeted, focusing on a specific group of 13 students and researchers from Slovakia. The primary modality and channel utilized was direct, personal invitation, ensuring the audience possessed a keen, relevant interest in the topic. This bespoke approach bypassed the need for broader public promotion, allowing for a highly focused and engaged participant group.

Participants' outreach also refers to the actions and efforts made by the participants (in this case, university students) to engage, inform, and involve others in the initiative or cause they are part of. Participants shared information about environmental issues and monitoring activities with their peers, families, and communities through talks and social media.



3. Description of the activity performed

The demonstration unfolded in two main phases: field data acquisition and subsequent laboratory processing. On May 21, 2024, all necessary equipment, including a UAV and the Lidareto LiDAR system, was transported manually to the selected tourist trail from Snilovské sedlo to Chleb in the Malá Fatra.

Students were part of a participatory environmental monitoring project aimed at assessing erosion on a heavily used tourist trail. None of them had ever flown a drone before. Teachers began with a short session on UAV safety and regulations, and continue with description of technology, which lets us see patterns we can't spot on foot. In this way with aerial images and other data, we can monitor soil loss, vegetation cover, and trail widening over time. Hands-on training followed. Each student took turns learning how to pilot the UAV, map a flight path, and capture data.

The field measurement phase, lasting approximately four hours, began with crucial GPS georeferencing and IMU activation to prepare the system for precise operation. Following these initial calibrations, the UAV conducted its flight, actively collecting LiDAR data. Post-flight checks included verifying IMU functionality and reconfirming georeferencing accuracy to ensure data integrity.

Subsequently, the focus shifted to laboratory demonstration, spanning about 6 hours. Here, participants were introduced to post-processing software, witnessing first-hand the transformation of raw LiDAR data. The key highlight was the real-time elaboration and visualization of a high-resolution, georeferenced point cloud, enhanced with actual textural coloring for enhanced realism and detail. Finally, these freshly processed data were comparatively analyzed against previously collected data from the same trail segment, effectively showcasing the methodology's potential for epochal deformation monitoring.

4. Results

4.1. ACTIVITY OVERVIEW - number of data/samples/comments collected

Fill the correspondent <u>OUTCOME OF THE ACTIVITY</u>	
Data	LiDAR Point Cloud Data Raw Data: Successfully collected high-resolution, georeferenced 3D point cloud data from the specified tourist trail section (Snilovské sedlo to Chleb).
Samples	No physical "samples" were collected in the traditional sense (e.g., soil or water samples). The "samples" in this context are the digital datasets (LiDAR point clouds) representing the physical environment at specific points in time.
Comments	Informal feedback from the students and researchers highlighted their appreciation for the georeferenced and texture-coloured point cloud data, along with the clear data acquisition process.

4.2 ANALYSIS OF THE DATA COLLECTED

Fill the corresponding <u>ANALYSIS FOR THE DATA</u> collected	
Data	Georeferenced post-processed data with real texture that could be compared with previous data collected by employees of UNIZA.



Samples	Clipped Point Cloud representing the topography of the trails.
Comments	Data are usable as a basic data collected in this locality, while the locality is also objective of regular HUMANITA monitoring.

5. Feedback from participants

Participants were actively engaged, posing questions in informal discussions. Their reactions were overwhelmingly positive. They highly appreciated the practical methodology, especially the clear data acquisition steps. Visual quality and detail of the georeferenced, texture-colored LiDAR point clouds were rated very highly. Participant conduct was attentive and inquisitive, showing high interest and effective comprehension.

6. Criticalities and opportunities

From the project perspective in general, criticalities include challenging wind conditions limiting UAV use, high hardware/software acquisition costs, and the need for robust data processing capacity. Obtaining permits for protected areas is also a critical step.

Speaking about the potential of students' involvement in participatory monitoring of erosion on tourist trails brings both criticalities (challenges) and opportunities (benefits). Here's a breakdown of both:

Opportunities:

- Students gain practical field experience in environmental monitoring, GIS, UAV operation, and data analysis, enhancing their academic and professional development.
- Access to modern tools like UAVs, GPS, and remote sensing fosters innovation and introduces students to real-world applications of their studies.
- Students often bring new ideas, enthusiasm, and creativity, which can lead to more dynamic and effective monitoring approaches.
- With proper training, students can significantly expand the monitoring capacity by collecting regular, detailed, and localized data.
- As active participants, students can spread awareness among their peers and the public, promoting responsible tourism and environmental stewardship.

Criticalities:

- Students may initially lack the technical skills and fieldwork experience, requiring time-consuming training and supervision.
- Student participation may be limited by academic schedules or project timelines
- Without proper guidance, collected data may be inconsistent or inaccurate, compromising scientific reliability.
- UAV operation require adherence to strict regulations and permissions.
- Collaboration with park management or local agencies may be challenging, especially if roles, responsibilities, or expectations are unclear.



7. Scalability

The activity demonstrated considerable scalability. The LiDAR+UAV solution can be extended to cover larger regional trail networks and be integrated into existing GIS for broader management. Replication in various protected areas or with different stakeholders (e.g., local municipalities, forest managers) is highly feasible, provided criticalities are addressed. Scaling up requires investing in increased data processing capacity, potential automation of workflows, and developing or specializing operational teams. Systematic acquisition of permits for new settings is also essential. This methodology is adaptable for various deformation monitoring needs beyond tourist trails. Speaking about the scalability of participatory monitoring involving university students is highly scalable, especially when supported by proper frameworks, resources, and partnerships. However, its scalability depends on several key factors as:

- Standardized protocols for data collection (e.g., erosion measurement, UAV usage) can be taught and replicated easily across different campuses or regions.
- Universities are widely distributed, with access to motivated students and academic infrastructure, enabling geographic scaling. Multiple universities in a region could collaborate on monitoring erosion in a protected area network.
- Use of open-source software (GIS, data management) and cloud storage allows for data sharing, collaboration, and integration across locations.
- Experienced students or faculty can train new groups, reducing the need for repeated external training.
- Embedding participatory monitoring into environmental science, geography, or engineering courses ensures regular, institutionalized student involvement.

8. Ownership/durability

The demonstration's long-lasting effect for the protected area managers lies in validating the methodology and showcasing its operational capability. It provided invaluable practical experience, laying the groundwork for future initiatives. For our target group, its relevance is profound: fostering a critical understanding of cutting-edge technology, enhancing practical lab and field skills, and inspiring future engagement in environmental monitoring. The project's relevance stepped up by demonstrating expertise, strengthening its reputation, and identifying key optimization areas for the long-term implementation of this advanced monitoring tool.

Opportunities for Ownership and Durability

- Integration into Curriculum - embedding the monitoring project into university courses or thesis programs ensures regular participation and academic ownership.
- Teachers are more likely to sustain involvement when it's linked to learning outcomes or research.
- Involving local communities, park managers, and students in designing the monitoring goals and methods increases shared responsibility and commitment.
- When students see their data lead to real changes (e.g., trail management decisions, signage, erosion control), they develop a stronger sense of purpose and lasting connection.



Figure 1. Some moments of monitoring activities with university students in Malá Fatra National Park.



Geopark Karawanken-Karavanke

PROJECT DESIGN	
Type of activity	Citizen Scientist (Invasive Alien Plant Species) - direct approach
Period	November 2024 - ongoing
Target (to whom is addressed)	Geopark Community and local population
Participators	Nature enthusiasts, wildlife photographers, mountain guides, ...

1 Objectives

Enhance Environmental Awareness:

- Raising awareness and understanding of environmental issues related to the impact of non-native species in natural habitats and ecosystems.

Building Scientific Capacity with the help of the Citizen Scientist community:

- We conducted several interviews with dedicated members of the local community (nature enthusiasts, wildlife photographers, mountain guides, ...) to gain clues and information on the location of the Invasive Alien Plant Species in the Geopark.
- Encourage participants to take part in data collection, engage in environmental assessments, and develop critical thinking skills through basic training and collaboration with researchers. Our goal is to cover as much area as possible to gather crucial information on the presence of non-native species in the Geopark Karawanken-Karavanke.

Support Evidence-Based Decision Making:

- Create accurate, community-driven environmental data to guide policies, conservation efforts, and resource management decisions.

Cooperation:

- Enhance teamwork among local communities, scientists/experts, NGOs, and government agencies by setting shared monitoring goals and creating research and monitoring initiatives together.

2 Participants' outreach

The strategy focuses on connecting with individuals from specific interest groups related to outdoor activities like hiking, photography, or nature enthusiasts. The main method is direct, personal contact



tailored to each person's chosen interest, ensuring meaningful engagement with those already interested in the topic.

Raising awareness and involving selected volunteers has also sparked interest among secondary participants. These participants, through the main information channel, offer clues about the locations and confirmations of non-native species in the environment, sharing valuable insights through active volunteers or direct contacts.

3. Description of the activity performed

The process consists of three main phases:

- gathering data and clues from individuals through brief, productive interviews,
- identifying non-native plant species and confirming locations (field work),
- and entering the collected data into a database (Geopark Karawanken-Karavanke).

4. Results

4.1. ACTIVITY OVERVIEW - number of data/samples/comments collected

Fill the correspondent <u>OUTCOME OF THE ACTIVITY</u>	
Data	So far, more than 12,500 locations of non-native plant species in the Geopark Karawanken-Karavanke have been recorded in the database, based on collected clues and confirmed findings (most of them are Invasive Alien Species). Over 60 non-native plant species have been identified, and there are still over 5,000 clues awaiting verification.
Samples	No physical "samples" were needed throughout the process, except for individual photo materials used to identify species. Once the species and location were confirmed, the photos were not archived. In this context, "samples" refer to digital databases used for further analysis and creating the IAS map in the future.
Comments	There are a high interest and potential in creating a Citizen Science Community in the Geopark Karawanken-Karavanke.

4.2. ANALYSIS OF THE DATA COLLECTED

Fill the corresponding <u>ANALYSIS FOR THE DATA</u> collected	
Data	The analyses are still ongoing as data collection is not yet complete.
Samples	/
Comments	The analyses are still ongoing as data collection is not yet complete. This is the first such extensive, comprehensive survey of the entire Karawanken-Karavanke Geopark area. However, a preliminary review of the collected data indicates significant potential for the database's usefulness for further environmental management.



5. Feedback from participants

Participants responded positively, showing enthusiasm for co-creating in areas of interest and fostering a sense of belonging. They value the simplicity and efficiency of the process, which eliminates extra tasks like reporting and data entry. The exclusion of the APP was seen as a beneficial aspect. They appreciate the steps of the data collection method, the practical approach, the communication style, and the quality of the information shared.

6. Criticalities and opportunities

Monitoring data acquisition is important and demands more time and energy compared to using an app. This highlights both the positive and negative aspects of the approach. While the initial phase of collecting data, information, or clues is faster and more extensive than any app, the second and third phases are more time-consuming but yield better confirmed results - easily eliminating inaccurate information with more verified location

PROJECT DESIGN	
Type of activity	Citizen Scientist (Invasive Alien Plant Species) - iNaturalist Approach
Period	Jan 2024 - on going
Target (to whom is addressed)	Geopark Community, local population, NGOs, mountain guides, alpine associations, iNaturalist users, tourists, students
Participators	Nature enthusiasts, wildlife photographers, mountain guides, tourists, students...



CUAS / Geopark Karawanken-Karavanke

1. Objectives

The project aims to observe and document the spread of invasive alien plant species within the Karawanken-Karavanke UNESCO Global Geopark. It is part of the INTERREG Central Europe HUMANITA project, which develops evidence-based tools to assess tourism impacts in protected areas.

Key objectives include:

- **Monitoring and Early Detection:** Establishing a network to track invasive species and detect their spread early.
- **Awareness-Raising and Education:** Engaging the public to understand the impact of invasive species, climate change, and human activities.
- **Data Collection and Analysis:** Using iNaturalist to gather and analyse data on species occurrence, location, and frequency.
- **Management and Control:** Potential use of data for inclusion in action plans to mitigate the spread of invasive species and protect native ecosystems.

The project fosters collaboration between citizen scientists and researchers, enhancing knowledge and management strategies.

2. Participants' outreach

The project employs diverse strategies and channels to engage participants effectively. Key outreach efforts include:

- **Online Platforms:** Project details are shared on the CUAS website, social media, the iNaturalist project page and the website of Österreich forscht.
- **Online Green Academy:** CUAS produced materials for the online green academy with manuals and instructional videos on invasive species and using iNaturalist. These can be found on HUMANITA website, Österreich forscht website, as well as in our Phaidra repository.
- **Educational Institutions:** In July 2025, we involved HUMANITA summer school students in the data collection. Furthermore, 2 university students were engaged in the collection of invasive alien species observations from July to September 2025.
- **Leaflet and Poster:** Geopark Karawanken-Karavanke produced a flyer and posters that can be placed at frequently visited sites to invite visitors to participate in the project.
- **Events and Workshops:** The project was promoted at the "Long Night of Research" and presented at the introductory workshop in Geo.Dom, Geopark's visitor center at Petzen/Peca. Starting in September 2025 - October 2025, an external service provider carries out 4 workshops (2 on Austrian and 2 on the Slovenian side of Geopark Karawanken-Karavanke) with target groups to collect further observations and work on involving citizens into the contribution of data.
- **iNaturalist users:** iNaturalist users were directly contacted via iNaturalist platform and encouraged to document the locations of invasive alien plant species to support its management for Geopark Karawanken-Karavanke.



3. Description of the activity performed

The project activities focused on developing tools, engaging stakeholders, and promoting citizen science for monitoring invasive plant species in the Karawanken-Karavanke UNESCO Global Geopark. Activities started from Period 2 of the project. Key activities included:

Period 2 (October 2023 - March 2024)

- **Basic investigation:** testing of different apps to document invasive plant species.
- **iNaturalist Setup:** CUAS supported the Geopark in establishing the iNaturalist project for invasive alien species monitoring and introduced partners to the app.
- **Citizen Science Network Austria:** Registration on the Citizen Science Platform Austria “Österreich forscht” was initiated to promote the project. Citizen Science Network Austria is an associate partner in our project and supported us in the process of including the information on their website.
- **Engagement Strategy:** CUAS and Geopark began developing strategies to involve diverse groups (e.g., NGOs, locals, schools, tourists, sports clubs) in monitoring/observation activities.
- **Online Green Academy:** CUAS and Geopark initiated planning for an online Green Academy to educate participants on using iNaturalist.
- **Educational Materials:** CUAS prepared the text for a leaflet describing the app's use and five target species for monitoring. Geopark did the design for the leaflet.

Period 3 (April 2024 - September 2024)

- **Outreach:** Content was prepared for the “Österreich forscht” website and the iNaturalist project journal.
- **Introductory Workshop:** The “Invasive Alien Plants in View” workshop (10.09.2024) engaged local stakeholders, including conservation authorities and tourism operators. We prepared a workshop invitation that was sent out to Alpine associations, tourism organisations, as well as other local stakeholders who work with visitors within the Karawanken-Karavanke UNESCO Global Geopark. The Alpenverein and the Bergwanderführer promoted the workshop within their own newsletters. We reached 3 representatives of Alpenverein, 3 representatives of Bergwanderführer, 2 representatives from the Nature conservation agency of Slovenia, as well as representatives from tourism organisations (Petzen Bergbahnen, Podzemlje Pece, Tourismusverein Marktgemeinde Eisenkappel-Vellach)
- **Online Green Academy:** Guidelines for using iNaturalist were developed, along with info materials about invasive alien plant species.

Period 4 (October 2024 - March 2025)

- **Content Updates:** Updated materials were prepared for the “Österreich forscht” website.
- **Outreach:** Social media postings and outreach to iNaturalist users aimed to recruit new participants for the upcoming vegetation monitoring period.
- **Vegetation Monitoring:** GBIF data was analysed to identify already documented invasive alien plant species locations within the Karawanken-Karavanke UNESCO Global Geopark.



- **Online Green Academy:** A short video tutorial on using iNaturalist was created.

Period 5 (April 2025 - September 2025)

- **Integration of data into data repository:** University of Parma used the API function of iNaturalist to integrate the project data on the data repository and dashboard.
- **Targeted areas for documentation of invasive alien plant species:** Our students went on field trips to Landscape Protected Area Hemmaberg, Landscape Protected Area Kathreinkogel, and Vellacher Au. Other field trips are planned to the spring meadows around Petzen/Peca and Hochobir/Ojstrc.
- **External expert:** An external expert was contracted to carry out four workshops with stakeholders from Slovenia and Austria to raise awareness about invasive species, develop solutions on how to handle them in terms of management, and document sightings in the field. These workshops are planned on the following dates and sites:
 - *St. Michael 23.9. Ersatz 24.9. im Gšeft*
 - *Eisenkappel 25.9. Ersatz 29.9. im Haus der Kultur*
 - *Dravograd 1.10. Ersatz 2.10. Bukovje (Info center Geopark Karavanke) needs to be confirmed*
 - *Mežica 6.10. Ersatz 7.10. Podzemlje Pece (Info center Geopark Karavanke) needs to be confirmed*

Photo Gallery and links to activities

On the following pages, we include a gallery of activities that were performed during the project

- 1) Website Österreich forscht (Version 1 and 2) (<https://www.citizen-science.at/projekte/invasive-pflanzen-im-blick>)
- 2) iNaturalist Project (<https://www.inaturalist.org/projects/invasive-alien-species-geopark-karawanken-karavanke>)
- 3) iNaturalist Project Journal (unfortunately got deleted and was not reactivated)
- 4) iNaturalist Messages to users

Contents that were produced for the online Green Academy can be found here:

<https://phaidra.fh-kaernten.at/detail/o:31>

They are also uploaded to the HUMANITA webpage:

<https://www.interreg-central.eu/projects/humanita/?tab=media>



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Begriff

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- Geologie (6)
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- Kultur (15)
- Landnutzung (27)
- Medien (8)
- Nahrungsmittel (7)
- Pflanzen (18)
- Pilze (6)
- Politik (7)
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- Wasser (10)
- Wetter (9)
- Wirtschaft (5)
- Zusammenleben (7)

Aktivität

- Online Spiel (5)
- Beobachten (58)



aktuelle Projekte
Invasive Pflanzen im Blick
Monitoring im Karawanken UNESCO Global Geopark

Gemeinsam können wir die Ausbreitung invasiver Arten eingrenzen und die Biodiversität unserer Bergregionen schützen!

Einführung

Unser Citizen Science Projekt widmet sich dem Monitoring invasiver gebietsfremder Pflanzenarten (Invasive Alien Species, IAS) in den Bergregionen des Geopark Karawanken. Invasive Arten sind Pflanzen oder Tiere, die durch menschliches Handeln in Regionen eingeführt werden, in denen sie ursprünglich nicht vorkommen, zum Beispiel durch interkontinentalen Handel. Während die meisten eingeschleppten Arten auf menschliche Unterstützung angewiesen sind, um zu überleben, gibt es eine Minderheit, die sich an die neue Umgebung anpassen und dauerhaft überleben kann. Eine dieser Arten ist die gelbe Stachelschote, die sich in den Gebirgsregionen...

Co-funded by the European Union

HUMANITA

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Figure 1. Screenshot of Website Österreich Forscht (Version 1).

https://www.citizen-science.at/projekte/invasive-pflanzen-im-blick

Österreich forscht [PROJEKTE](#) [EINTAUCHEN](#) [BLOG](#) [NETZWERK](#) [KONFERENZ](#) [ÖCSK2026](#) [ÜBER UNS](#)
www.citizen-science.at

Arbeitsgruppen

Aktuelle Seite: [Projekte](#) > Invasive Pflanzen im Blick

Begriff

Thema

- Abfall (6)
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- Verkehr (3)
- Wasser (12)
- Wetter (9)

Invasive Pflanzen im Blick
Verbreitung von invasiven Pflanzen im Karawanken UNESCO Global Geopark

Gemeinsam können wir die Ausbreitung invasiver Arten eingrenzen und die Biodiversität unserer Bergregionen schützen!

Co-funded by the European Union

HUMANITA

Institution: FH Kärnten (UNESCO Chair on Sustainable Management of Conservation Areas)

Figure 2. Screenshot of Website Österreich Forscht (Version 2).

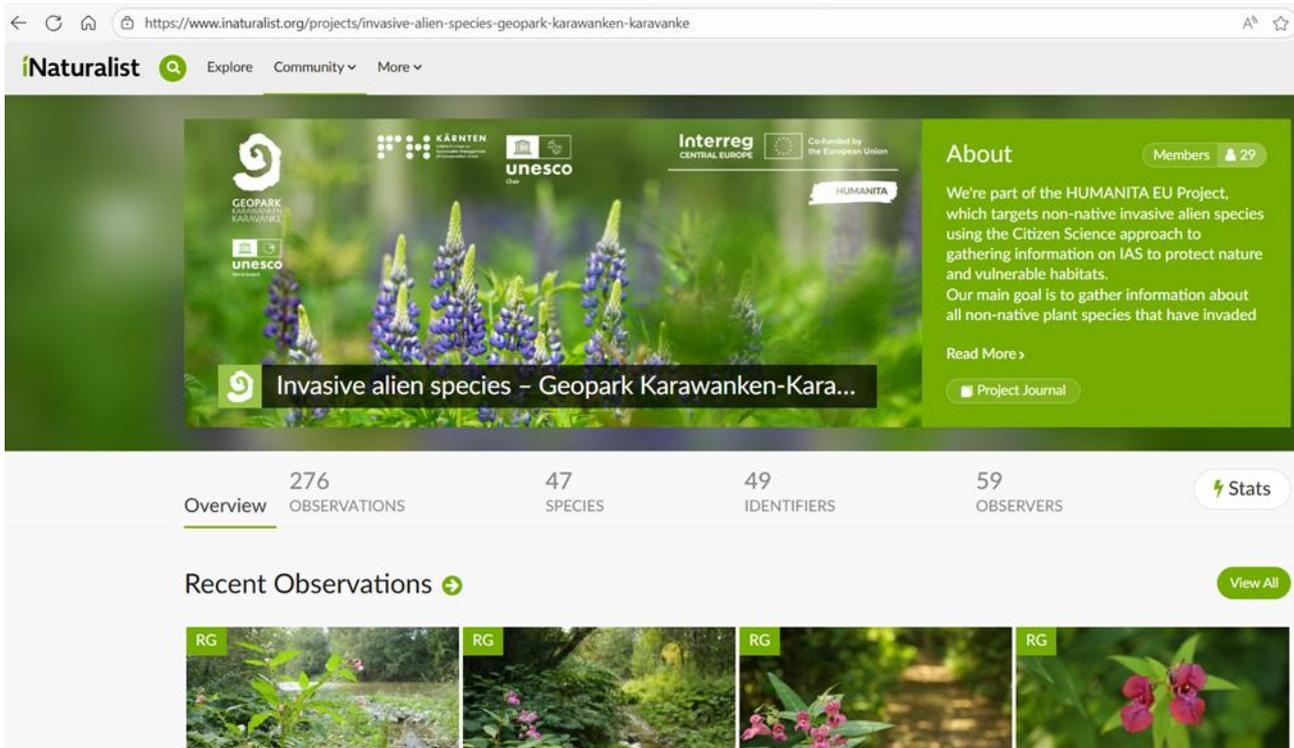


Figure 3. Screenshot of Website iNaturalist Project "Invasive Alien Species Karawanken-Karavanke UNESCO Global Geopark".



3. Juli 2024

Himalayan Balsam (*Impatiens glandulifera*)

Origin:

Himalayas. It was introduced in Europe in the 19th century as an ornamental plant.

Location:

Himalayan balsam likes moist and relatively nutrient-rich habitats. For this reason, it can be found on river banks, woodlands, roadsides or forest edges.

Influence:

This annual plant grows in dense stands which causes shading out and crowding out native species. It reproduces by seed dispersal (up to 2000/plant) which can be ejected ca. 7m from fruit and seeds can be washed out in streams and rivers. When growing on riverbanks, plants can increase soil erosion in winter, as their shallow root systems fail to stabilize the ground after they die. Due to big nectar production, Himalayan balsam is more attractive to pollinating insects than native plants which can cause a lack of pollination for them.

Recognition:

The plant grows typically up to 3 m high. Flowers have a hooded shape and are pink, white or purple. Inflorescences grow in groups of 2-14 flowers. Stems are reddish or green, branched and hairless. Leaves can reach 5-23 cm in length and when crushed have a strong musty smell. The seeds of Himalayan balsam are eatable and taste like nuts.



Photo: Urosh Grabner

veröffentlicht am 3. Juli 2024 01:48 PM von liliash | 0 Kommentare | [Einen Kommentar hinterlassen](#)

Figure 4. Screenshot of project journal entry: Himalayan Balsam.



11. Juli 2024

Giant Goldenrod (*Solidago gigantea*)

A related species of plant: Canada Goldenrod (*Solidago canadensis*)

Origin:

North America.

Location:

It typically thrives in open, sunny habitats such as prairies, meadows, road or railroad sides, and construction sites preferring well-drained soils.

Influence:

This perennial plant has two distribution strategies that are dangerous for native species: 1) by large flyable seed stock (up to 15,000 seeds/plant); 2) from small fragments stems which underground produce roots and shoots. Its rapid growth and dense stands decrease species richness and diversity.

Recognition:

Giant goldenrod features tall, erect stems reaching up to 2.5 meters, adorned with narrow, lance-shaped leaves arranged alternately along the stem. In late summer and early fall, the plant produces clusters of bright yellow flowers arranged in elongated, branching inflorescences.



Photo: Urosh Grabner

veröffentlicht am 11. Juli 2024 06:31 AM von prreiter | 0 Kommentare | [Einen Kommentar hinterlassen](#)

Figure 5. Screenshot of project journal entry: Giant Goldrod.



Black Locust (*Robinia pseudoacacia*)

Origin:

North America. It is a popular forest tree due to its fast-growing abilities.

Location:

Black locust grows in a place with sun exposure and thrive on sandy soils. It can be found on old pastures and fields, forest edges or floodplains.

Influence:

Black locusts form colonies due to the airborne seeds which can be transported up to 100m. Moreover, together with leaves, bark and shoots are toxic and can be a threat for livestock, especially horses. Leaves of the tree contain nitrogen which is transferred to the ground when they fall and can lead to the establishment of other weedy species.

Recognition:

It can grow up to 30 meters with an oval-shaped crown. Its branches have 1 cm long thorns and white flower clusters blossoming in mid-to-late spring. Each leaf is composed of 7-19 leaflets of oval shape and a small notch at the tip. Fruit of Black locusts are dark brown clusters of pods containing 4-10 seeds each.



Photo: Urosh Grabner

veröffentlicht am 11. Juli 2024 06:31 AM von prreiter | 0 Kommentare | [Einen Kommentar hinterlassen](#)

Figure 6. Screenshot of project journal entry: Black Locust.



Large-leaved Lupine (*Lupinus polyphyllus*)

Origin:

Western United States and Canada. Introduced to Europe to improve the soil on roadsides and in coniferous forests and as an ornamental plant (19th/20th century).

Location:

Bigleaf Lupine can be found from low to middle elevations in open and moist habitats. It prefers well-drained soils and often grows along roadsides, riverbanks, and in disturbed areas.

Influence:

The species has a strong impact on alpine mountain hay meadow communities because it changes the structure of usually low-growing vegetation. In its introduced range Bigleaf Lupine suppresses local plants and reduces the abundance of butterfly species.

Recognition:

Bigleaf Lupine's stem is upright, unbranched and can grow up to 1.5m. Its flowers are purple or purple-blue and have a pea-like shape. Bigleaf Lupine has long-stalked basal leaves which are composed of 10-17 leaflets and can grow up to 25 cm in diameter.



Photo: Urosh Grabner

veröffentlicht am 11. Juli 2024 06:31 AM von ppreiter | 0 Kommentare | [Einen Kommentar hinterlassen](#)

Figure 7. Screenshot of project journal entry: Large-leaved Lupine



Japanese Knotweed (*Reynoutria japonica*)

A related species of plant:

Bohemian Knotweed (*Reynoutria × bohemica*) and Giant Knotweed (*Reynoutria sachalinensis*)

Origin:

Japan. It was introduced in Europe in the 19th century as an ornamental plant.

Location:

Japanese knotweed can grow in different habitats for example: wetlands, roadsides or ditches.

Influence:

Japanese knotweed forms dense monocultures which can reduce sunlight penetration and prevent native species from growing. It can also regrow from small fragments of stem which underground produce roots and shoots enabling the plant to spread easily. This species has been observed to damage human infrastructure by growing through concrete/asphalt cracks.

Recognition:

Stems of Japanese knotweed are hollow, and smooth in purple or green colour. The plant can reach up to 4 meters each growing season and grow 10 to 30 cm per day. Flowers are small, white or cream and growing in clusters. Leaves have a heart flattened at the base shape and alternated along the stem in a distinctive zigzag pattern. Young shoots and leaves of Japanese knotweed can be eaten.



Photo: Urosh Grabner

veröffentlicht am 11. Juli 2024 06:30 AM von preiter | 0 Kommentare | [Einen Kommentar hinterlassen](#)

Figure 8. Screenshot of project journal entry: Japanese Knotweed.



https://www.inaturalist.org/messages/4631685?box=inbox

Suchen Entdecken eigene Beobachtungen Community ID-Modul Mehr

« Zurück zu: Posteingang 2. August 2024 03:21 PM

Citizen Scientist Project

gelöschter Benutzer Hey Lilia, 2 Aug 2024 15:21

I am reaching out to you on behalf of the Karawanken-Karavanke UNESCO Global Geopark.

We have come across your observations on iNaturalist, which pertain to our Geopark region, and we are impressed with your findings. We would like to invite you to participate in our Citizen Scientist project on iNaturalist to assist us in identifying Invasive Alien Species within our Geopark.

Project:
<https://www.inaturalist.org/projects/invasive-alien-species-geopark-karawanken-karavanke>

If you wanna hear more about our project, I will be happy to answer all your questions ... but overall, we are curious about which non-native plants can be found here.

Some more text to read what we are searching for, if you want:
<https://www.inaturalist.org/projects/invasive-alien-species-geopark-karawanken-karavanke/journal>

You are cordially invited to become part of our curiosity...

Thank you for your time, we appreciate it...

All the best from Karawanken-Karavanke UNESCO Global Geopark
Urosh Grabner, Project manager

Figure 9. Screenshot of outreach message to iNaturalist users inviting them to join our project and report observations.

https://www.inaturalist.org/messages/5112604

Werde Teil unseres Citizen Science Projekts im Karawanken Geopark

liliasch Lieber "MonkeyJodey", 24 Mär 11:29

wir haben gesehen, dass Du im Gebiet des Karawanken UNESCO Global Geoparks bereits einige Beobachtungen auf iNaturalist hochgeladen hast. Das ist großartig! Die FH Kärnten und der Geopark Karawanken arbeiten gemeinsam mit engagierten Citizen Scientists an der Dokumentation von invasiven Pflanzenarten im Geoparkgebiet.

Wir möchten Dich herzlich einladen, in der Vegetationsperiode 2025 Teil unseres Projekts zu werden und uns bei der Dokumentation von invasiven Arten zu unterstützen! Wenn Du beim Spazieren oder Wandern beispielsweise drüsiges Springkraut, kanadische Goldrute, Staudenknöterich, Robinien oder Götterbäume entdeckst, lade bitte ein Foto auf iNaturalist hoch. So können wir nachvollziehen, wo sich diese Arten bereits ausgebreitet haben.

Es würde uns sehr freuen, wenn Du Mitglied unseres Projekts auf iNaturalist „Invasive Alien Species – Geopark Karawanken-Karavanke“ werden würdest:
<https://www.inaturalist.org/projects/invasive-alien-species-geopark-karawanken-karavanke>

Ein kurzes Video mit weiteren Informationen über unser Projekt findest Du hier: <https://www.youtube.com/watch?v=1kml2MxfITQ>

Unser Citizen Science Projekt wird unterstützt von „Österreich forscht“:
<https://www.citizen-science.at/projekte/invasive-pflanzen-im-blick>

und wird durch das INTERREG Central Europe Projekt HUMANITA – Mensch-Natur-Interaktionen und Auswirkungen touristischer Aktivitäten auf Schutzgebiete mitfinanziert: <https://www.interreg-central.eu/projects/humanita/>.

Gemeinsam können wir einen wertvollen Beitrag zum Schutz unseres Geoparks leisten. Wir freuen uns auf Deine Unterstützung und Deine Beobachtungen!

Herzliche Grüße,
lilia

Figure 10. Screenshot of outreach message to iNaturalist users inviting them to join our project and report observations.



4. Results

In the summer season of 2024, we achieved 15 members of the project as well as 33 contributors, contributing data on invasive plant species observations in the area without actively joining our project. A total of 4,071 observations of invasive plant species have been reported back then. 3,948 - 97 % of observations have been reported by Urosh Grabner, HUMANITA's project coordinator from the Geopark side.

Due to concerns from our partners, this first iNaturalist project was deleted and reset. Observations from Geopark staff have been transferred to the Citizen Science "direct approach" project. A local backup of observations of the old project is stored locally and used for evaluation purposes.

In the newly established iNaturalist project, we achieved a total number of 29 members until September 2025. Members consist of summer school students, CUAS employees, Geopark employees, participants of the introductory workshop, and iNaturalist users who became aware of the project through other channels. In total we reached 276 observations of 47 different invasive alien species, reported by 59 observers and confirmed by 49 identifiers. Some species identifications still need to be confirmed to achieve a "research grade" (< 24 %).

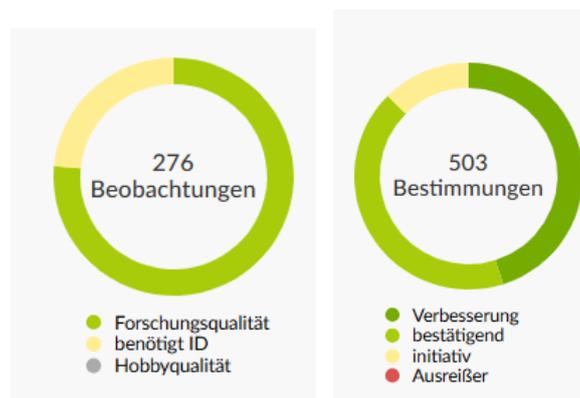


Figure 11: Statistic from iNaturalist project homepage.

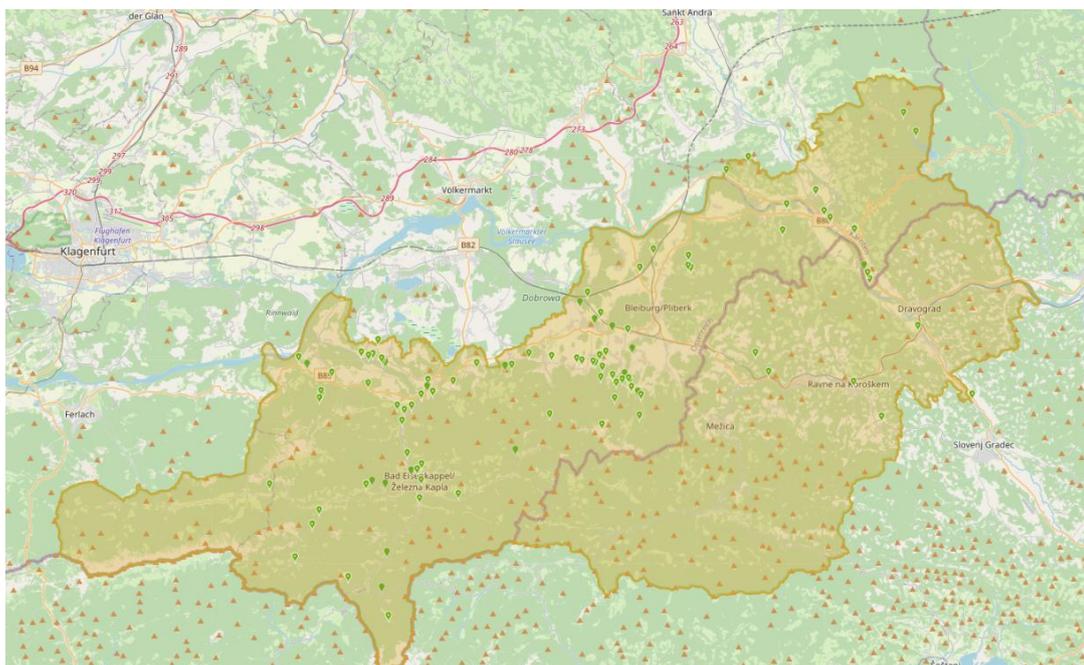


Figure 12. Map of observations from iNaturalist project homepage.



4.1. ACTIVITY OVERVIEW - number of data/samples/comments collected

Fill the correspondent <u>OUTCOME OF THE ACTIVITY</u>	
Data	276 observations, 29 members reached
Samples	
Comments	

4.2. ANALYSIS OF THE DATA COLLECTED

For the evaluation of data on invasive alien plant species, data from the following sources are used:

- GBIF (GBIF—the Global Biodiversity Information Facility—is an international network and data infrastructure funded by the world’s governments and aimed at providing anyone, anywhere, open access to data about all types of life on Earth).
- Citizen Science Direct Approach (locations of observations will be provided by Karawanken-Karavanke UNESCO Global Geopark).

GBIF

Data from the following publishers were analysed. In total, 570 observations of invasive alien plant species were reported (Last updated: 24th March 2025). From iNaturalist, only “Research Grade” observations are included in the GBIF database.

iNaturalist.org	142
Slovenian Forestry Institute	125
Pl@ntNet	116
naturgucker.de	52
Cornell Lab of Ornithology	33
Scientific Research Centre of the Slovenian Academy of Sciences and Arts, Institute of Biology	23
Observation.org	16
University of Vienna, Institute for Botany, Research Group for Plant Biogeography	16
Haus der Natur Salzburg, Museum für Natur und Technik	12
University of Graz, Institute of Plant Sciences	8
GEO-Tag der Artenvielfalt	6
University of Natural Resources and Life Sciences, Vienna	5
Staatliche Naturwissenschaftliche Sammlungen Bayerns	3
Biologiezentrum Linz Oberoesterreich	3



HUMANITA

The International Barcode of Life Consortium	3
Senckenberg	1
Lund University Biological Museum	1
University of Vienna - Herbarium WU	1
Tiroler Landesmuseum Ferdinandeum	1
BioFresh	1
Natural History Museum, Vienna	1
Royal Botanic Garden Edinburgh	1
Total Observation	570

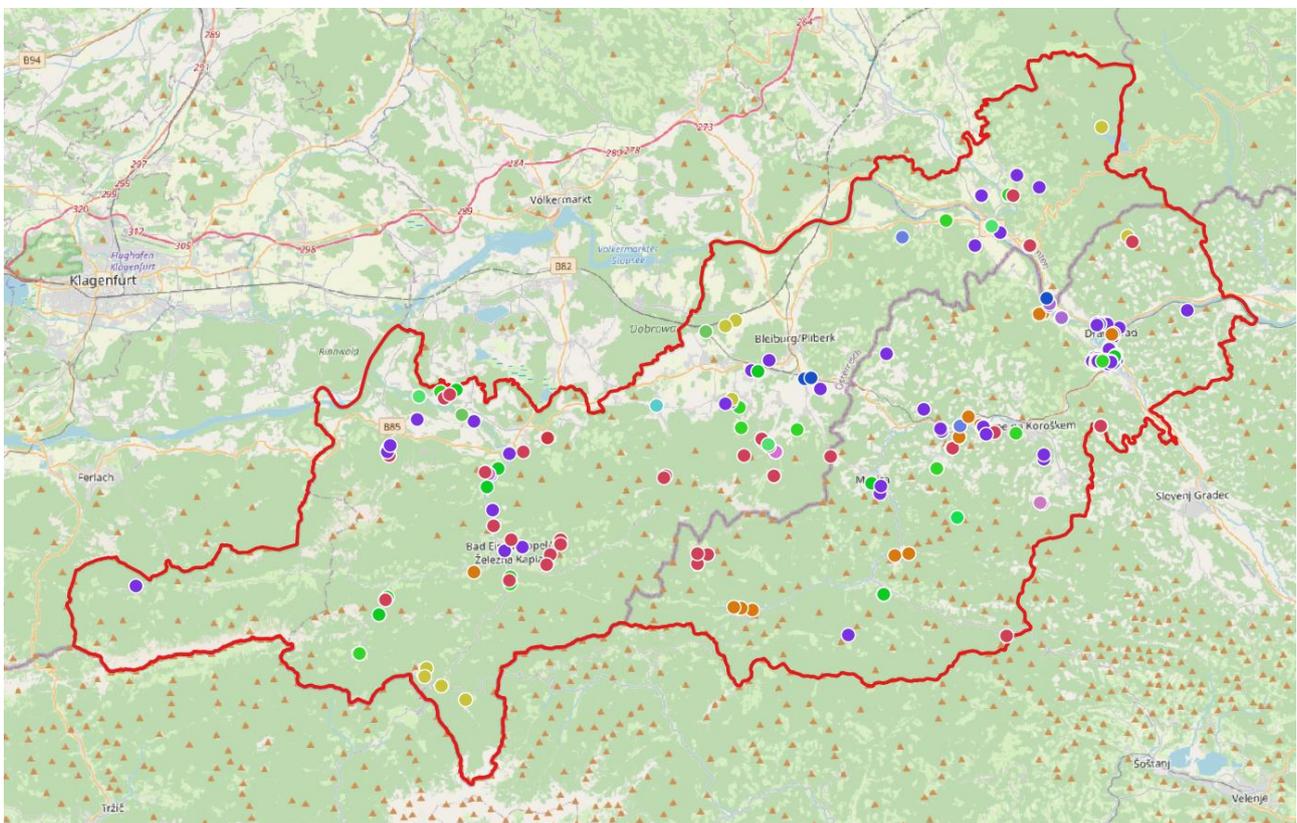


Figure 12: GBIF Observations of invasive alien plant species in Karawanken-Karavanke UNESCO Global Geopark (Source: GBIF, Open Street Map).

Fill the correspondent <u>ANALYSIS FOR THE DATA</u> collected	
Data	The analyses are still ongoing as data collection is not yet complete.
Samples	/
Comments	



4. Feedback from participants

When performing the introductory workshop, participants were engaged and interested in the project. During the HUMANITA summer school, the students were motivated to contribute their observations. One of the students came back to Geopark Karawanken-Karavanke to report further observations after summer school. Another student founded her own project about invasive plant species in the region where she lives.

On iNaturalist, users responded to the invitation to contribute to the project:

“Thank you, Lilia! If we are back here, I will happily add records! Many thanks and good luck with your great project!”

“Ahh, that sounds very nice! Thank you for getting back - I have now joined this project. Thank you!”

„Liebe Lilia, vielen Dank für die Infos. Bin dem Projekt beigetreten und werde zum Projekt beitragen, wenn ich wieder in diese Gegend komme. Liebe Grüße“

5. Criticalities and opportunities

Criticalities: Limited participation from non-local users and tourists may hinder data collection. Dependence on iNaturalist users for data quality and quantity could lead to gaps in monitoring/observations, as well as mistakes in data collection (the Accuracy of the location can be the main problem). Technical barriers, such as unfamiliarity with the app, may deter some participants.

Opportunities: iNaturalist provides a user-friendly platform for engaging diverse groups, including tourists, students, and locals. The app's global reach and existing user base can amplify data collection and awareness. Workshops and educational materials enhance public understanding of invasive species and their impacts.

Opportunities to Involve Tourists/Visitors: Tourists can be engaged through targeted outreach at visitor centers, trailheads, and accommodations. Flyers, posters, and QR codes linking to the iNaturalist project can encourage participation. Guided tours or workshops focusing on invasive species can provide hands-on learning experiences. Collaborating with tourism operators to promote the project as an eco-friendly activity can attract environmentally conscious visitors. Gamification, such as rewards for contributions, can further motivate participation.

6. Scalability

The iNaturalist-based approach is highly scalable due to its digital nature and global user base. It can be replicated in other protected areas or regions with invasive alien species issues by adapting outreach strategies and educational materials to local contexts. Collaboration with local stakeholders, such as tourism operators and schools, ensures broader engagement. The app's API allows seamless integration of data into other repositories, facilitating cross-regional comparisons and research.

7. Ownership/durability

The project fosters long-term engagement by building local capacity and awareness. Educational workshops, online resources, and partnerships with schools and tourism operators ensure sustained participation. The integration of data into repositories like GBIF ensures its long-term utility for research and management. For the Geopark, the project strengthens its role as a hub for citizen science and biodiversity monitoring, creating lasting value for both the community and the protected area.



CUAS / Geopark Karawanken-Karavanke

1. Introduction

This activity, focusing on environmental samples and their analysis, was carried out as part of the Humanita Project Summer School, aiming at providing participants with hands-on experience in modern biodiversity and pathogen monitoring techniques. The training combined theoretical background with practical application in alpine environments, focusing on the integration of environmental DNA (eDNA) and amphibian swab sampling and the use of a portable laboratory for the detection of emerging infectious diseases.

Water and amphibian sampling were conducted at the artificial reservoirs of the Petzen ski resort in the Geopark Karawanken (Austria) on 15 July 2025. These lakes serve as water storage for snow production but also represent potential habitats of ecological interest, where environmental DNA (eDNA) approaches can be applied to assess the occurrence of pathogens such as *Batrachochytrium dendrobatidis* (Bd).

2. Water Sampling and eDNA Extraction

Water samples for environmental DNA (eDNA) analysis, as well as swab samples from amphibians, were collected at three different sites. The primary aim of this study was to detect DNA traces from animals in water and on amphibian skin to assess the potential presence of the chytrid fungus (*Batrachochytrium dendrobatidis*), the pathogen causing chytridiomycosis in frogs.

The selected sites included:

- Site 1: Bergstation (mountain reservoir)
- Site 2: Talstation (valley reservoir)
- Site 3: Pirkdorfer See (natural lake)

2.1 Sampling Materials

- Smartphone (GPS coordinates)
- VWR multimeter (pH, conductivity)
- Sampling bottles (500 mL)
- Telescopic sampling rod
- Syringes
- Disposable filters
- Tweezers
- Cooling box with ice packs
- Tubes containing ATL buffer
- Tube storage box
- Protective gloves



2.2 Sampling Procedure

At each location, water samples were collected using a 500 mL bottle mounted on a telescopic rod. At the mountain reservoir, four separate sampling points were chosen, whereas at the valley reservoir and Pirkdorfer See, only two samples were collected per site. To minimize contamination from sediments or shoreline material, water was retrieved several meters offshore.

The collected water was filtered on-site by pushing it through single-use filters using a syringe until resistance became too high. For Sites 1 and 2, approximately 500 mL of water was processed per filter, whereas at Pirkdorfer See, only ~200 mL could be filtered due to the large organic particle content.

Filters were dried by pushing air through the filters and removed with sterile DNA-free tweezers, transferred into tubes pre-filled with ATL buffer, and immediately stored in a cooling box. Additional environmental parameters were measured on site: pH, water temperature, conductivity, and GPS coordinates.

2.3 Results

The following physicochemical parameters of water were measured at each location:

Site 1: Bergstation

Weather: sunny | Air temperature: 14 °C | Time: 10:00 | Altitude: 1740 m

Sample N	pH	H ₂ O T (°C)	Conductivity (µS/cm)	Coordinates
1	8.85	17.2	164.7	46° 30' 57.374"N 14° 46' 12.267"E
2	8.70	17.6	164.7	46° 30' 58.543"N 14° 46' 10.648"E
3	8.83	17.2	164.3	46° 30' 57.144"N 14° 46' 13.273"E
4	8.70	18.6	163.9	46° 30' 57.277"N 14° 46' 13.267"E

Site 2: Talstation

Weather: cloudy | Air temperature: 16 °C | Time: 11:45 | Altitude: 658 m

Sample N	pH	H ₂ O T (°C)	Conductivity (µS/cm)	Coordinates
1		9.0	21.8	155.8
2		9.0	21.6	155.4



Site 3: Pirkdorfer See

Weather: sunny | Air temperature: 26 °C | Time: 13:20 | Altitude: 502 m

Sample N	pH	H ₂ O T (°C)	Conductivity (µS/cm)	Coordinates
1	8.9	26.2	252.0	46° 55' 72.350"N 14° 75' 03.309"E
2	8.8	26.8	252.0	46° 55' 68.029"N 14° 74' 74.356"E



Figure 1. Measurement of physical parameters with a multiparameter probe



Figure 2. Water sample collection

3. Amphibian Swab Sampling

3.1 Background

As part of the HUMANITA Summer School Project, amphibian specimens were captured from an alpine lake to assess their health status and potential infection with the chytrid fungus *Batrachochytrium dendrobatidis*.



The primary aim of this activity was to collect mucus samples from the skin of amphibians using sterile swabs, enabling subsequent molecular analysis in the laboratory.

3.2 Materials and Methods

Field Sampling

The water bodies were observed for the presence of any amphibians. Once observed, amphibians were carefully captured by hand or with nets at the shoreline of the alpine lake. Handling was performed with protective gloves and for the shortest time needed to minimize stress and prevent contamination of amphibian skin and swabs. The amphibians were returned to their original location immediately after handling and swab collection.

Swab Sampling

- Each specimen was swabbed using a sterile cotton swab.
- The swab was gently rubbed over different body parts (ventral surface, thighs, and digits) to maximize recovery of mucus and skin-associated microorganisms.
- Immediately after sampling, each swab was transferred into a 5 mL Eppendorf tube containing ATL buffer (Qiagen).
- Tubes were stored in a cooling box with ice packs to ensure preservation during fieldwork.

Transport

All samples were transported under cooled conditions to the laboratory in Villach, Austria, where they will undergo DNA extraction and molecular diagnostics. They were frozen until further processing

4. Results and Observations

During the sampling session, several amphibians were successfully captured and swabbed. The procedure allowed for the non-invasive collection of mucus samples without harming the animals. Environmental conditions, such as clear water and stable temperatures, facilitated safe handling.



Figure 3. Bükk ranger taking sampling a newt at the mountain lake at Petzen



Figure 4. A frog being sampled at the mountain lake

5. qPCR Detection and Results

The objective of this session was to analyze amphibian swab samples and water samples collected during the fieldwork for the presence of the chytrid fungus *Batrachochytrium dendrobatidis*. The analysis was performed through the application of a DNA extraction procedure followed by a fungi-targeted quantitative PCR (qPCR) analysis.

5.1 Materials and Methods

Training and Preparation

At the beginning of the day, participants received a short introduction covering correct pipetting techniques, the principles of DNA extraction, and the basics of qPCR. The supervising team guided the students throughout the process, explained each step in detail, and provided assistance whenever necessary.

DNA Extraction

DNA was extracted from amphibian swabs and eDNA filters using the Qiagen DNeasy Blood & Tissue Kit and a portable Bento Lab kit.

- Extraction was carried out from step 2 onward by the students themselves, using the following reagents:

- AL buffer
- Ethanol
- Wash buffer 1 and Wash buffer 2
- AE buffer

The first step of the extraction protocol had already been completed the day before by Paolo and a student assistant Richard, since the samples required a minimum of three hours of incubation with lysis (Proteinase K), which could not be accommodated during this session.

All pipetting steps were performed manually. Students were instructed in correct pipette handling, and their technique was monitored to ensure quality and prevent errors.



qPCR

Following DNA extraction, the obtained DNA was subjected to qPCR to specifically test for chytrid fungal sequences. A portable qPCR device, Liberty16 (Ubiquitome Bio) coupled with a software on iPad (Apple) was used to quantify the results.

- The master mix was prepared in advance by Paolo Scariano to allow for immediate use.
- One student carried out the pipetting step of DNA extracts into the master mix under the close supervision of the CUAS team.
- Positive controls with fungal DNA and master mix were included to validate the process.

Careful attention was given to contamination prevention. The qPCR amplification run lasted approximately one hour, consisting of initial denaturation, 40 DNA amplification cycles and final elongation step. Amplification results were displayed as fluorescence curves and subsequently interpreted.

6. Results interpretation and Discussion

Analysis of the amplification curves revealed that:

- Only the positive control (pink curve) showed a clear increase in fluorescence (see Fig. 6), with a Cq value of 28.8, confirming that the qPCR setup functioned correctly.
- All other reactions (field samples) showed no amplification, as their curves remained flat across all cycles.



Figure 5. Workspace during DNA extraction

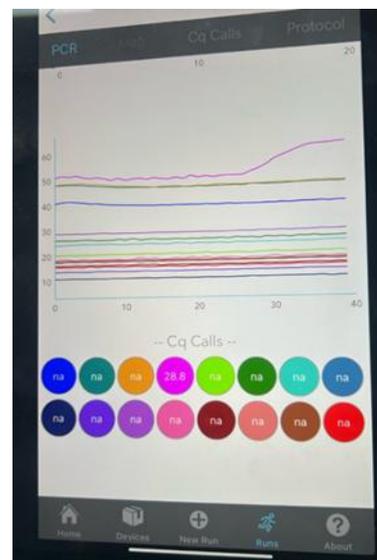


Figure 6. Results of the qPCR displayed on a tablet.

- No DNA of *Batrachochytrium dendrobatidis* was detected in the tested samples.
- The positive control confirmed the validity and reliability of the detection system.



The absence of amplification in all field-derived samples suggests that the chytrid fungus was not present in the tested amphibian swabs or water samples at the time of sampling. This negative result must be interpreted in the context of ecological variability and potential limits of detection, but the inclusion of a strong positive control ensures that the methodology itself was sound and free of technical errors.

The exercise also successfully trained participants in laboratory skills, including pipetting, DNA extraction, and qPCR analysis, reinforcing both theoretical and practical knowledge of possibilities in environmental monitoring and the spread of environmental hazards.

7. Conclusion

This field campaign successfully demonstrated standardized sampling of eDNA from freshwater reservoirs and amphibians. The data collected provide a solid foundation for molecular analysis within the scope of the HUMANITA project.



Public Institution Kamenjak

PROJECT DESIGN	
Type of activity	A citizen science approach through the use of the iNaturalist application in detecting alien and invasive alien species in the pilot area of Lower Kamenjak
Period	May 2024 - ongoing
Target <i>(to whom is addressed)</i>	Local community and visitors of the protected area of Lower Kamenjak
Participators	

1. Objectives

The objective is to foster active involvement of the local community and visitors in participatory monitoring of biodiversity within the protected area, with a particular focus on alien and invasive alien species that have spread across the site. Furthermore, the objective encompasses raising awareness among both the local community and visitors regarding the presence of alien and invasive alien species in the Lower Kamenjak protected area, as well as their adverse impacts on native plant species.

2. Participants' outreach

The target groups are the local population and visitors to the protected area of Lower Kamenjak and the Medulin Archipelago, as well as students of natural sciences, naturalists, nature enthusiasts, and researchers. A combination of digital and local communication channels was used to reach participants. Information about the activity and instructions for using the iNaturalist application were published through social media (Instagram, Facebook) and the official website of JU Kamenjak. Posts included visual guides, QR codes, and direct links to the application iNaturalist, ensuring easy access for all interested participants. Additionally, bookmarks were created, and promotional activities were carried out in local schools to inform the community and encourage participation. These combined efforts enabled the involvement of a wider audience and diverse target groups. Furthermore, leaflets in four languages (Croatian, English, German, Italian) about alien and invasive alien species present in the Kamenjak area were printed and distributed to visitors.

3. Description of the activity performed

The activities carried out include: developing an infographic on the use of the iNaturalist application and promoting it through the website and social media; publishing social media posts on alien and invasive alien species recorded in Lower Kamenjak and guidance on using the iNaturalist app for their detection; delivering a lecture at an elementary school on invasive species; printing and distributing leaflets and booklets on invasive species and the use of the iNaturalist app; creating an iNaturalist project entitled 'Alien and Invasive Alien Species in Lower Kamenjak' to monitor observation data (species and locations).

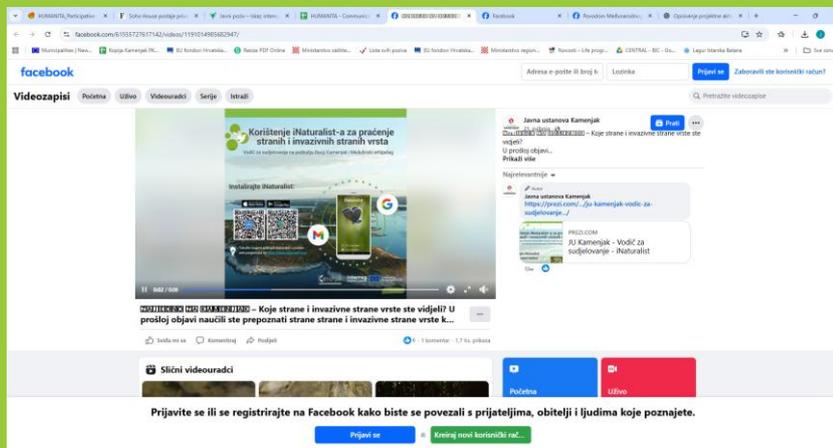


Table 1. Annex – Screenshots (Participants' outreach)

Table	Description	Screenshot
1	<p>Instagram post promoting the iNaturalist application, its use, and raising awareness on the distribution of alien and invasive alien species in the area.</p> <p>(including visible number of views on the post in the screenshot).</p>	<p>The screenshot displays an Instagram post titled "Korištenje iNaturalist-a za... stranih i invazivnih stranih...". The post includes a video player, a QR code, and a view count of 397. Below the post, two screenshots of the Instagram analytics page are shown. The first screenshot, titled "Analitika videouratka", shows a circular gauge for "Prikazi" (Views) at 397, with a breakdown: 55,9% for followers and 44,1% for non-followers. The second screenshot, titled "Analitika objave", shows a circular gauge for "Prikazi" (Views) at 722, with a breakdown: 81,7% for followers and 18,3% for non-followers. It also lists the top sources of views: Sažetak (68,3%), Profil (31,2%), and Broj dosegnutih korisničkih računa (333).</p>



2



<https://www.facebook.com/61555727617142/videos/1191014985682947/>

Facebook/web
post with
instructions and
QR codes,
Promotion in
schools





HUMANITA

KAMENJAK
JAVNA USTANOVA

PROTECTED AREAS | ECOLOGICAL NETWORK | NATURAL FEATURES | PLAN A VISIT | VIRTUAL WALK | WEB CAMERA

CENTRAL EUROPE | the European Union

HUMANITA

Through the INTERREG Central Europe project HUMANITA, which investigates the impact of tourist activities on protected areas, we have developed an infographic related to the use of the iNaturalist app. The app aims to encourage citizen science in monitoring alien and invasive species, allowing users to record and share their observations of plants and animals.

You can view the infographic [here](#).

This work was part of Work Package WPS, under Activity D.3.2.2 Green Academy, which focuses on community education and engagement in environmental protection. The HUMANITA project is supported by the INTERREG CENTRAL EUROPE Program 2021-2027, with co-financing from the European Regional Development Fund (ERDF).

Info
The objective
Activities
More information

Working visit from our partners participating in the HUMANITA project

<https://kamenjak.hr/hr/eu-projekti/projekti-u-tijeku/humanita-povezanost-covjeka-i-prirode-i-utjecaj-turistickih-aktivnosti-na-zasticena-podrucja>

Using iNaturalist for Monitoring Alien and Invasive Alien Species

Alien and Invasive Alien Species in Focus: A Guide to Participation in the Lower Kamenjak and Hrvatski Krčki Park

1. Installing iNaturalist on Your Smartphone

Scan the QR code to download the app from the App Store or Google Play.

Searching for Alien and Invasive Alien Species

In the app, select the "Project" option and choose "Kamenjak" or "Hrvatski Krčki Park". Filter results by location to find the Lower Kamenjak area.

Sharing or Publish Observations

If you notice any alien or invasive alien species, you can document them. Select the "Project" option, take a photo, and add a location. Share your observation with the community.

Using Photos and Identifying Plants

Use the app's photo and identification tools to identify species.

Integrating Your Observations

Share your observations on social media and with the community.

Working with the Community

Collaborate with other users to identify and monitor species.

Notifications and Education

Receive notifications about new observations and educational resources.

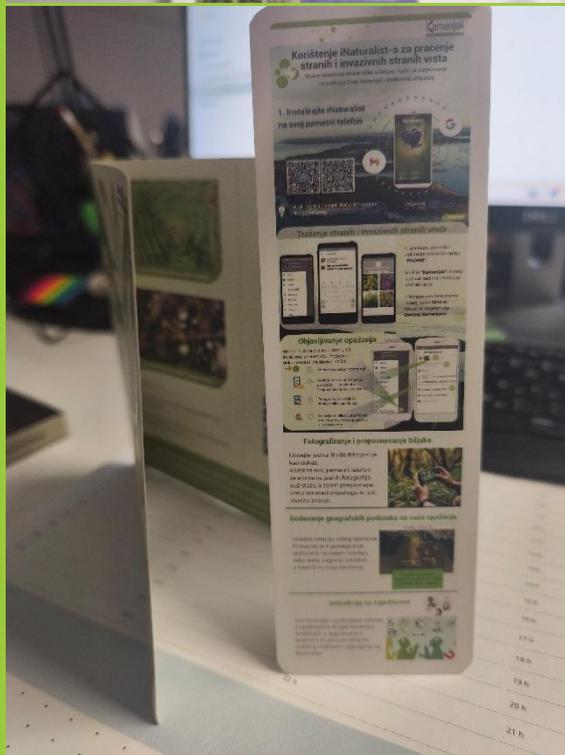
Citizen Science App (iNaturalist)

<https://prezi.com/i/mmt9n-kv2vbw/citizen-science-aplikacija-inaturalist/>



3

Leaflets/bookmarks distributed, promotion in schools and at the Nature House of the institution





4. Results

4.1. ACTIVITY OVERVIEW - number of data/samples/comments collected

Fill the correspondent <u>OUTCOME OF THE ACTIVITY</u>	
Data	Data are being collected through iNaturalist app about alien and invasive alien species and their location in pilot site of Lower Kamenjak. The focus is placed on the most common alien and invasive alien species detected in the area.
Samples	The collection of samples was not necessary. Instead, in the iNaturalist application, photographs with location data are collected.
Comments	

4.2. ANALYSIS OF THE DATA COLLECTED

Fill the correspondent <u>ANALYSIS FOR THE DATA</u> collected	
Data	The collection of observations is still ongoing; therefore, the data analysis has not yet been completed.
Samples	/
Comments	

5. Feedback from participants

Not available

6. Criticalities and opportunities

Criticalities: Based on our observations, iNaturalist is not commonly used by our visitors, and participatory monitoring is not a widespread practice.

Opportunities: There is potential to increase participatory monitoring and the number of observations through promotion on social media and the distribution of informational leaflets.

7. Scalability

This approach can also be applied in promoting the use of similar applications for participatory monitoring, such as the Croatian mobile application '*Invazivne vrste u Hrvatskoj*'. Furthermore, this approach can be implemented as an activity within larger events aimed at promoting biodiversity conservation, and it may also be integrated into field-based educational programs in primary schools and similar initiatives.



8. Ownership/durability

The promotion of participatory monitoring and the citizen science approach will continue through the iNaturalist project Alien and Invasive Alien Species in Lower Kamenjak, even after the HUMANITA project, as its duration is not limited to the project period. Efforts will continue to promote participatory monitoring and to raise public awareness about alien and invasive alien species as well as their negative impact on the protected area.

Bükk National Park Directorate

PROJECT DESIGN	
Type of activity	Participatory monitoring through two distinct citizen science applications: iNaturalist for invasive species tracking and Hulladékradar for illegal dumpsite reporting.
Period	The iNaturalist project began on May, 2025, The Hulladékradar on June 2024.
Target <i>(to whom is addressed)</i>	The projects are addressed to the general public, including residents of local villages and the towns of Eger and Miskolc , tourists , school groups, guides, and park rangers.
Participators	Nature enthusiasts, general public, park rangers

1. Objectives

The primary objective of the iNaturalist project is to generate a comprehensive dataset on invasive species within and around Bükk National Park. This data is intended to reveal the scale of interaction between tourism and conservation, identify the main points of spread for these species, and inform effective management strategies. By focusing on invasive species, the project supports conservation efforts without revealing the locations of vulnerable protected species.

The main purpose of the

Hulladékradar (Waste Radar) app is to encourage and facilitate the removal of illegally dumped waste. The data collected helps park management by identifying specific locations where waste removal is required and highlighting key hotspots for fly-tipping, which are often linked to accessibility.

2. Participants' outreach

To ensure the success of the citizen science projects, engagement and accessibility were prioritized. The study area for the iNaturalist project was intentionally extended beyond the park's formal borders to include surrounding villages. This was done because the park's remoteness limits public participation, and most tourists, who can be vectors for invasive species, stay in these villages. Future outreach plans include the continued promotion of both applications, with a focus on recruiting participants through social media.



3. Description of the activity performed

The monitoring was conducted using two mobile applications:

iNaturalist: Participants upload observations of invasive plant species. Each submission must include the species name, date, GPS coordinates, and a photograph for verification. The photograph is a key element, as it allows for expert verification and provides phenological information (e.g., blossoming, seed production) that can inform management techniques. To be included, observations must achieve "research quality grade," meaning at least two users agree on the identification.

Hulladékradar: Citizens report illegal dumpsites using the app. The data collected includes the location of the dumpsite and its estimated size, which is grouped into three categories: less than 1m³, 1 to 5m³, and over 5m³. Users also report on the site's accessibility (e.g., reachable by foot or car), which provides practical information for organizing waste removal efforts

4. Results

4.1. ACTIVITY OVERVIEW - number of data/samples/comments collected

Fill the correspondent <u>OUTCOME OF THE ACTIVITY</u>	
Data	<p>iNaturalist: So far, 91 contributors have made 661 observations of 48 different invasive species.</p> <p>Hulladékradar: Only 1.61% of dumpsites reported through the app were located within protected areas. Of these reports, 52% resulted in the litter being successfully cleared. Data showed that 48% of these dumpsites were located within 20 meters of a road.</p>
Samples	No physical "samples" were needed throughout the process, except for individual photo materials used to identify species. Once the species and location were confirmed, the photos were not archived. In this context, "samples" refer to digital databases used for further analysis and creating the IAS map in the future.
Comments	-.

4.2 ANALYSIS OF THE DATA COLLECTED

Fill the correspondent <u>ANALYSIS FOR THE DATA</u> collected	
Data	The analyses are still ongoing as data collection is not yet complete.
Samples	/
Comments	The analyses are still ongoing as data collection is not yet complete. □ iNaturalist: A heatmap analysis of the observations reveals a significant spatial bias, with a high concentration of data points in and around the city of Eger. This is attributed to the larger population and greater accessibility of the area. While the current ad-hoc nature and frequency of observations are insufficient to accurately track the spread of species



, the data is still valuable for the **early detection of and rapid response to problematic species.**

Hulladékradar: A weighted density analysis shows that dumpsites cluster in specific areas, particularly along roads, suggesting accessibility is a key factor in where illegal dumping occurs. The reported size of the dumpsites indicates the issue is more related to organized **fly-tipping rather than incidental littering from tourists.** The primary value of the data is its direct application to park management, as it pinpoints areas needing intervention.

5. Feedback from participants

Not available

6. Criticalities and opportunities

Criticalities: A major limitation of the iNaturalist data is its spatial bias towards populated areas like Eger and its inconsistency, which makes it difficult to draw strong conclusions about species spread in the current state of data collection. For Hulladékradar, a key concern is the potential for under-reporting within national parks, as visitors may assume waste management is the park's responsibility, or misunderstanding what constitutes as an illegal trash dumping site and what is only a accidentally dropped trash, leading to data gaps.

Opportunities: Despite limitations, the iNaturalist project is a powerful tool for early detection and rapid response management. The requirement of a photo provides valuable phenological insights. The Hulladékradar app provides an immediate and direct benefit to park management by identifying sites for waste removal, with a proven success rate of 52% of reports leading to clearance.

7. Scalability

The capacity for these activities to grow is high. The use of widely available smartphone applications means the model can be easily scaled and replicated in different protected areas or with different monitoring targets. The report explicitly states that with continued promotion and recruitment of participants through schools, guides, and rangers, the project's reach can be expanded. As more observations are collected over time, the current challenges related to low spatial and temporal data resolution are expected to diminish, improving the projects' effectiveness.

8. Ownership/durability

The long-lasting effect of these projects is twofold. Firstly, they generate a valuable, long-term dataset that directly supports the PA's management of invasive species and illegal waste. This enables more targeted and effective conservation action. Secondly, by involving the public in monitoring, the projects foster a sense of stewardship and engagement with the protected area among citizens and tourists. The use of established, free platforms like iNaturalist ensures technical durability, while the tangible outcome of waste being cleared provides a lasting benefit to the park's environment and demonstrates the value of citizen participation.



Appennino Tosco Emiliano National Park

1. Objectives

Natural ecosystems are heavily dependent on water, as it is essential for life. The ecology and landscape play an important role in the quality and availability of water. At the same time, global changes and local pressures related to the exploitation of water resources, and other human activities, including tourism, are significantly reducing springs and streams' quantity, quality, and biodiversity and threatening their ecological balance. Natural springs, untouched by aqueducts or human use, stand out as a precious environmental resource and a strategic asset for mountain communities, particularly in the face of today's changing climate.

The participatory census of natural springs in the Appennino Tosco Emiliano National Park, in collaboration with Regione Emilia-Romagna, Servizio Geologico, Sismico e dei Suoli (associated partner) aims to enrich and update knowledge about these natural springs through the active involvement of citizens (Citizen Science).

The starting point for mapping natural springs in Emilia-Romagna comes from the historic topographic maps at a 1:25,000 scale, published by the Military Geographic Institute between the 1930s and 1940s. In 2008, the Emilia-Romagna Region revisited these maps and confirmed the presence of 8,416 springs across the region: 4,065 are already tapped for aqueducts, 948 have been confirmed by regional technicians but as many as 3,117 springs are still waiting to be found and documented.

The objectives of the census are to:

- *contribute to building a map of the groundwater resources available in the mountains;*
- *highlight the wealth of geodiversity and biodiversity that these environments preserve;*
- *increase public awareness and sensitivity towards this vital resource;*
- *gathering data on mountain groundwater resources and building a knowledge base on mountain aquifers to support future planning and management.*

2. Participants' outreach

The activity has been based entirely on voluntary participation. The activity involved the community of people who, whether for work or leisure, spend time in the Appennino Tosco Emiliano National Park. These are individuals who enjoy walking, are interested in habitat protection and climate change, wish to acquire knowledge and participate in hands-on experiences, and are willing, on a voluntary basis, to take an active role in research on natural springs. Initially, the target audience was identified among the participants of a regional series of educational and informational meetings about the environment and territory of Emilia-Romagna and Appennino Tosco Emiliano National Park, primarily aimed at hiking environmental guides, hikers, and enthusiasts.

At the project's launch, several professional associations voluntarily joined the census, committing to promote the activity among their members. So far, participants have included the regional branches of the Italian Association of Environmental Hiking Guides (AIGAE), the Free Association of Professional Environmental Hiking Guides (LAGAP), the Italian Alpine Club (CAI), and Trekking Italia.

The participatory census aims to expand its community further by involving other potential stakeholders, such as students from the Departments of Geological and Natural Sciences of Emilia-Romagna universities, the provincial branches of the associations already participating at the regional level, and other interested parties.



3. Description of the activity performed

The process consists of these main phases:

Preparation of the digital tools needed to share project information and allow online reporting of natural springs. These tools include a simple online form to report springs; a dedicated webpage where participants can learn about the activity; a database to collect all reports, integrated with the existing database and WEBGIS system of Emilia-Romagna Region.

These tools make it easy for volunteers to participate, contribute data, and stay connected with the project.

Data collection and validation. When volunteers report a spring through the online form, the report is automatically sent to the regional project officer in charge of validation. The officer then checks each report against a range of georeferenced data layers, available at both regional and local scales (i.e., National Park's data).

This process ensures that all information collected is accurate and reliable, helping to build a trustworthy map of the natural springs.

Data publication. After validation, the data collected are added to the map of natural springs and published in the WebGIS "Springs and Geological Units Hosting Aquifers in the Emilia-Romagna Apennines." Updates with new census data usually take place every year between November and December, allowing the public to explore the latest information on these vital water resources.

Engagement Activities. Citizen Science works best when participants are involved at multiple stages of a project. For the natural springs census in Appennino tosco emiliano National Park, the first step is to inform potential participants about the project's goals and how they can take part. At the same time, volunteers receive training to help them identify springs and collect the necessary data using the reporting form.

Beyond training sessions, the project encourages the community to engage further by organizing meetings where participants can discuss project progress, results, interpretations, challenges, and emerging needs. Participants may even take part in: analyzing the data; reviewing results before they are published; presenting the findings to the public and training new volunteers. A feedback system tracks participants' engagement, satisfaction, and the skills they gain, as well as assesses the effectiveness of the project's tools.

Twice a year, in the Park area (usually in Gessi triassici pilot site) and online, training and informational sessions, and additional meetings are planned in collaboration with partner associations and other interested organizations to expand the community of volunteers.

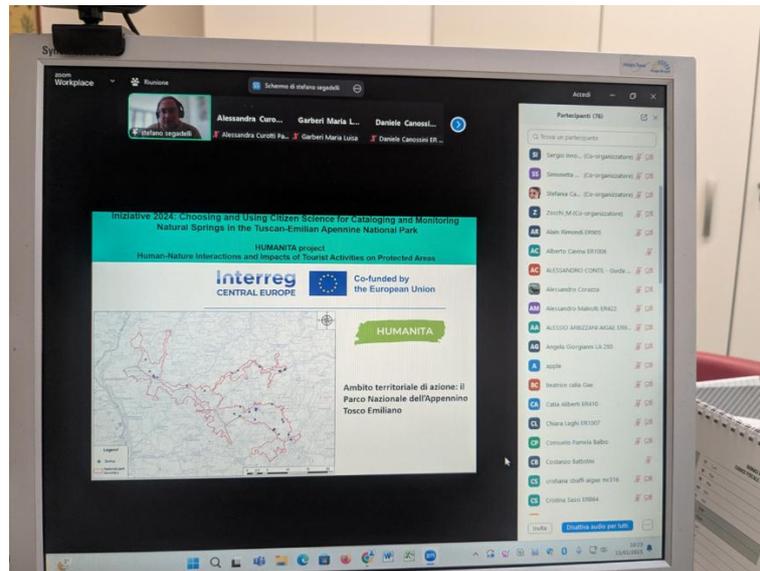


Figure 1. Online training course.



Figure 2. In the field training course.



Figure 3. Training course in Pilot site Gessi triassici - Poiano visitor centre



Figure 4. Equipment for the survey

4. Results

4.1. ACTIVITY OVERVIEW - number of data/samples/comments collected

Fill the correspondent <u>OUTCOME OF THE ACTIVITY</u>	
Data	Data have been collected filling in the online form. The data collected include the water springs location, the characteristic of spring (punctual, diffuse, permanent, seasonal, water speed, water flow)
Samples	The collection of samples is not necessary. The informations are measured and registered in the online form
Comments	

4.2. ANALYSIS OF THE DATA COLLECTED

Fill the corresponding <u>ANALYSIS FOR THE DATA</u> collected	
Data	118 Spring reports received, 97 validated (87 in Emilia -Romagna, 10 in Tuscany)
Samples	/
Comments	



5. Feedback from participants

Participants responded positively by participating in training courses and field visits, and also sent several suggestions. Volunteers have requested that more field training be organized in various local contexts.

As a form of recognition for their work, those who reported sources request to be cited both in the project progress reports (paper and digital format) and on the source identification sheet generated for uploading to the dedicated database.

6. Criticalities and opportunities

Criticalities: although many people take part in the training courses, both online and in person, only a small number actually go into the field to report springs. To strengthen the project, we need to engage more people, not only by involving associations of mountain lovers, but also by reaching out to students in local schools and universities.

Opportunities: as the census has advanced, the community has gained new skills and expertise. This result shows how important it is to involve even more people in the project. To support this goal, a dedicated platform has been launched on the website of the **project-associated** partner Servizio Geologico, Sismico e dei Suoli of the Emilia-Romagna Region.

7. Scalability

The project has high scalability because:

- its methods can be easily applied in other territories, starting from the analysis of historical cartography, and the organization of training courses online and in the field;
- the initiative can engage an ever wider community of citizens;
- The project can offer a model for participatory mapping of other natural resources.



8. Ownership/durability

The Participatory monitoring of springs in the Appennino tosco-emiliano National Park will continue even after the HUMANITA project, as its duration is not limited to the project period. Efforts will continue to promote participatory monitoring and to increase public awareness and sensitivity towards groundwater resources available in the mountains, highlighting the wealth of geodiversity and biodiversity that these environments preserve. In particular, the volunteer community will be involved in monitoring the Poiano spring, in the UNESCO site 'Karst and Caves in Evaporites of the Northern Apennines,' and other relevant springs.



Figure 5. Poiano spring (Gessi triassici pilot site)



Final Conclusions

The participatory monitoring activities carried out within the HUMANITA project have demonstrated the potential of citizen science to enhance environmental stewardship while actively contributing to data collection across diverse ecological contexts. Despite methodological differences, the project successfully tested a wide range of tools—from online platforms like iNaturalist and Hulladékradar to advanced technologies such as LiDAR and UAVs—proving their adaptability and scalability across pilot sites.

All activities enabled participants to acquire new skills and engage directly with environmental issues. Feedback highlighted and rewarded the clarity of methodologies and the visual quality of the data produced in the activities. The HUMANITA Summer School further reinforced interdisciplinary collaboration and long-term engagement among the youth, with some students continuing to contribute beyond the training period. In some cases, the activities have already demonstrated the direct support they can offer to park managers, as seen in the BNPD report, by facilitating waste removal, providing tangible evidence of their potential, and the value of community involvement. Most of the partners highlight the strong potential of citizen engagement as an important factor that needs further development. Collaboration with local stakeholders, including schools and tourism operators, emerged as a key factor for broader and sustained participation, and several partners identified the embedding of activities into university curricula as a promising strategy for long-term durability. As well as the importance of social media and effective communication as a tool to promote the activities and expand participation.

At the same time, some limitations were observed: low awareness or misleading perceptions among participants, as well as inconsistent participation and dispersion after the training phase (e.g., in PNATE). These challenges underscore the importance of continuous educational campaigns, stronger communication strategies, and the active involvement of schools and universities to secure long-term contributors. Showing that long-term sustainability lies in community involvement and educational programmes, in a virtuous cycle of participation and awareness-raising.

Confirming the relevance and utility of citizen engagement and active education, most of the partners are committed to keeping the current activities running while developing further participatory initiatives. Strengthening communication strategies and expanding partnerships with educational institutions will be essential to scale and sustain these efforts.