

Framework for standardising alpine protected areas data

Harmonising information on protected areas and nature-based activity

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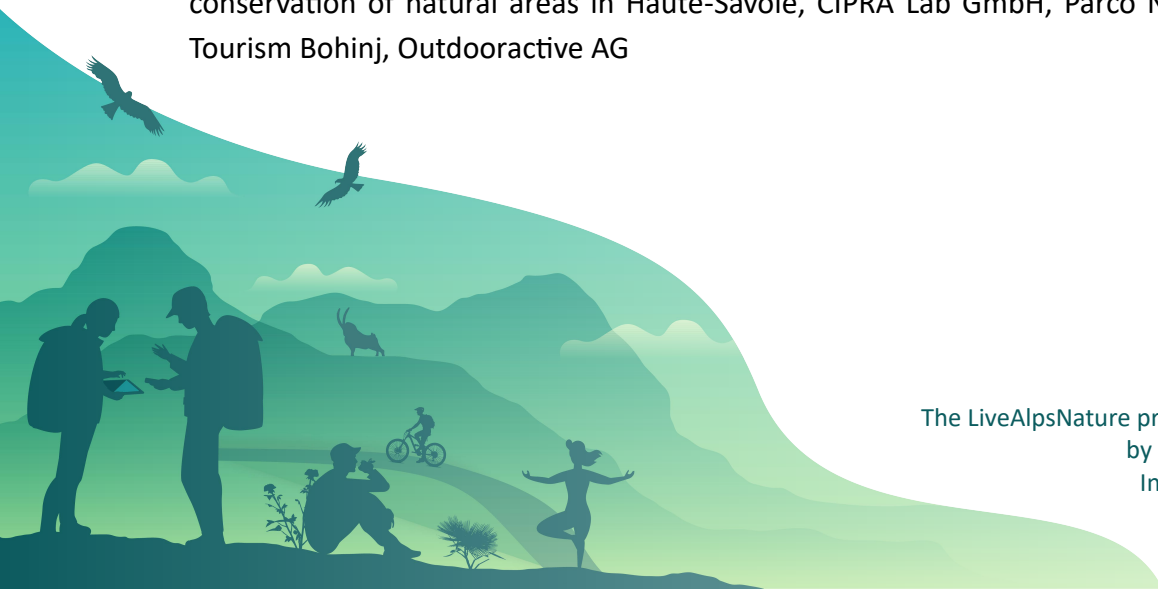


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1 Introduction and context

1.1 Why data standards for protected areas?

1.1.1 General description

In general terms, standardising data¹ aims to make it easier to understand, compare and exchange information across different systems and stakeholders. It reduces ambiguities, improves data quality and facilitates interoperability between tools and platforms.

In a broader digital context, standardisation also plays a key role in enabling automation, data integration and the development of new services. When data follows common standards, it can be more easily combined with other datasets, processed by software, shared and reused for multiple purposes. This increases the overall value of the data and supports better decision-making, transparency and innovation.

When an organisation uses a standardised data format, it does **not need to change its internal data structure**. The standard only defines how data is shared, not how it is stored internally. The organisation can keep its existing systems and simply map and share the required information. Only the data defined by the standard needs to be shared, not the entire internal dataset. This allows interoperability without impacting internal architectures.

Data standards will enable different databases and tools to share their information and publish it on **open data platforms** using a consistent format and structure.

1.1.2 Data standards for protected alpine areas

For protected areas and mountain environments, standardising data related to protected areas, regulations and outdoor activities is particularly important.

¹<https://europa.eu/youreurope/business/product-requirements/standards/standards-in-europe/index-en.htm>

These types of information are often scattered across multiple sources, published in different formats, and not always easy to access or interpret for outdoor platforms and users.

Standardisation first helps to make regulations clearer and more consistent. Rules of a protected area about authorised activities, access, and restrictions can be structured in a unified way, making them **easier to be shared** for the benefits of both visitors and professionals. This reduces the risk of misinterpretation and supports better compliance with environmental regulations.

Secondly, standardised data makes it possible to connect this information with **outdoor digital platforms**. Using standardised data formats allows protected areas information to be directly integrated into these applications. Users can then access reliable and up-to-date information while planning or practicing their activities, which improves safety, user experience and awareness of environmental constraints.

Standardisation is a strategic tool for the long-term management of mountain territories. It enables protected area managers to better disseminate their data, monitor how it is used, and reach a wider audience. By making information more accessible and reusable, data standardisation supports a better balance between the development of outdoor activities and the preservation of fragile natural environments.

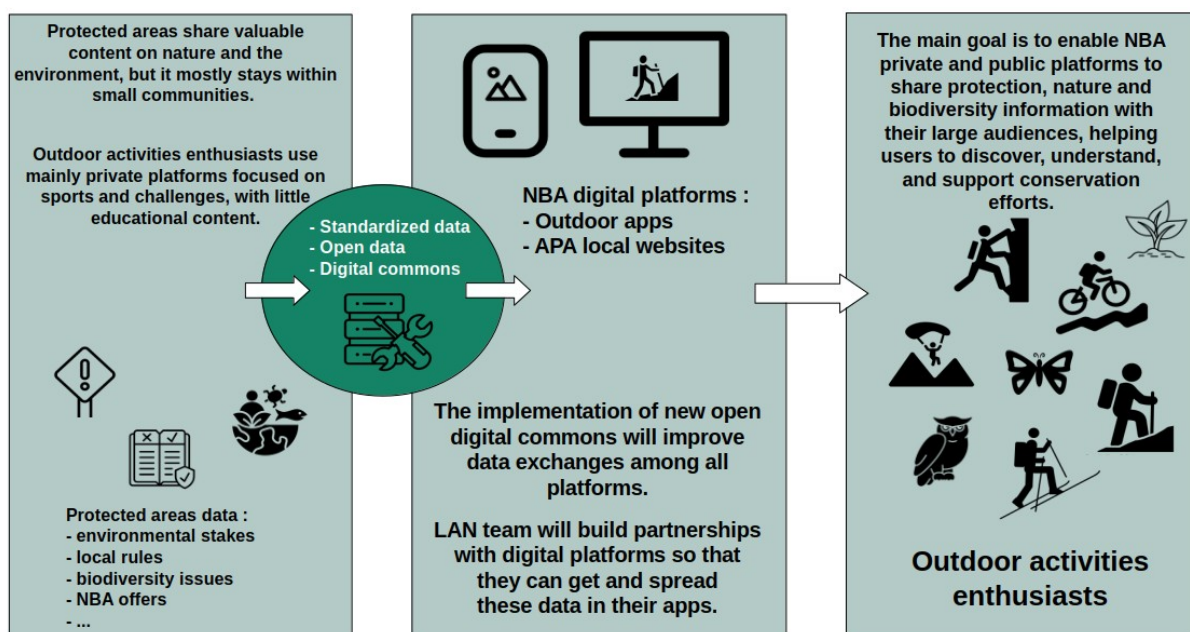


Figure 1: Diagram illustrating the data standardisation challenges within the project [NBA : Nature Based Activities]

1.2 Concept and explanations of how the data standards were built

The overall objective of this work was to design a data standard that is **simple, clear and accessible to all stakeholders**, regardless of their level of technical expertise. The approach focused on creating a shared framework that can be easily understood. Particular attention was paid to avoid unnecessary complexity so that the standard can effectively support data sharing, interoperability and long-term adoption.

Our main goal was to focus on essential information while ensuring compatibility and interoperability with existing systems, databases, and platforms. We made a particular effort to connect our work with national (data.gouv.fr, CNIG) and international initiatives (OSM, Wikidata, WDPA, Digitize the Planet, etc.).

The development of the data standards for protected areas information, applicable regulations, and outdoor activities was based on a collaborative approach.

The first step consisted of a review of existing data and practices from project partners.² This phase aimed to identify and analyse the datasets already in use, in order to understand how information is currently produced, structured and shared. It made it possible to highlight differences in formats, levels of detail, terminology, and data quality. This initial assessment provided a clear picture of the current situation and the main issues to be addressed. Thanks in particular to individual interviews, a mapping of data ecosystems in Alpine regions was carried out. This step helped to better understand territorial specificities, user needs and interoperability challenges across different contexts.

Building on these findings, a series of collaborative workshops were organised with a representative group of stakeholders. These workshops formed the core of the co-construction process. They provided a space for discussion, allowing participants to define common concepts, agree on data definitions, and collectively design the structure and content of the data standards.

The methodology consisted in focusing on essential elements. Although the data were sometimes structured differently, the concepts and needs expressed by the project partners are largely **similar and universal**, which facilitated the establishment of a common consensus.

The idea of this participatory approach was that the resulting standards are both simple and aligned with real-world practices. The data standards are the outcome of an iterative process combining analytical work and collective decision-making.

Four key types of data were identified as important and strategic to standardise in order to facilitate sharing and dissemination: **protected areas general information, protected areas rules, nature based activities with a focus on trails offers, and biodiversity sensitive areas.**

²See annexe "A-2-3 - LiveAlpsNature - Review of existing data and practices from LAN partners"

1.3 Call for collaboration with digital outdoor stakeholders

Digital outdoor platforms have become essential channels through which outdoor users access information about nature-based activities and the rules governing protected areas. These actors represent a key interface between protected area managers and the public, influencing how important information is communicated, understood, and respected.

Through the LiveAlpsNature project, we invite digital platforms to collaborate in adopting and implementing the proposed data standards. These standards have been designed to facilitate clear and structured data exchange between protected area managers and digital services, while remaining open, interoperable, and easy to integrate.

We welcome dialogue with platform operators to explore technical integration options, share implementation experiences, and ensure the standards meet real operational needs. By working together, data producers and platforms can improve the quality, consistency, and visibility of the information made available to outdoor users. This collaboration will help strengthen both the user experience and the sustainable management of protected areas by ensuring that official information is accurately and efficiently shared across the digital ecosystem.

In practical terms, the objective is to collaborate with outdoor digital platforms to ensure they can **read, import and display data in line with the standards** established by the project. In this framework, platforms will be able to retrieve data, for example relating to protected areas and their associated rules, process it according to the standard, and integrate it into their own systems for dissemination to their users.

Some platforms may also offer data export options, either as files or through APIs, based on these standards. This will allow platforms to share data in a **controlled and standardised** manner.

2 Data schemas

2.1 Protected areas

The protected areas data schema allows to harmonise the way basic information about *protected areas* is published and shared.

It is based on LiveAlpsNature project workshops with European partners and an analysis of existing data and systems (WDPA, OSM, Wikidata, Digitize the planet).

Table 1: Protected area data schema

Attributes	Types	Mandatory	Descriptions
name	string	yes	Protected area official name (default value)
name-en name-sl name-de name-fr names-it	string	no	Protected area official name (multilingual). Other languages can be added.
geometry	geom	yes	Protected area geometry (srid 4326, geojson/wkt)
type	string	yes	Protected area type code (national park, regional park, ...)
IUCN-category	string	no	Protected area IUCN category
description	string	no	Protected area general description
description-en	string	no	Protected area general

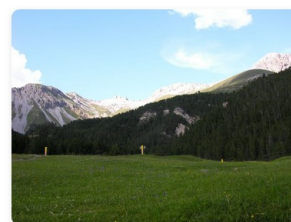
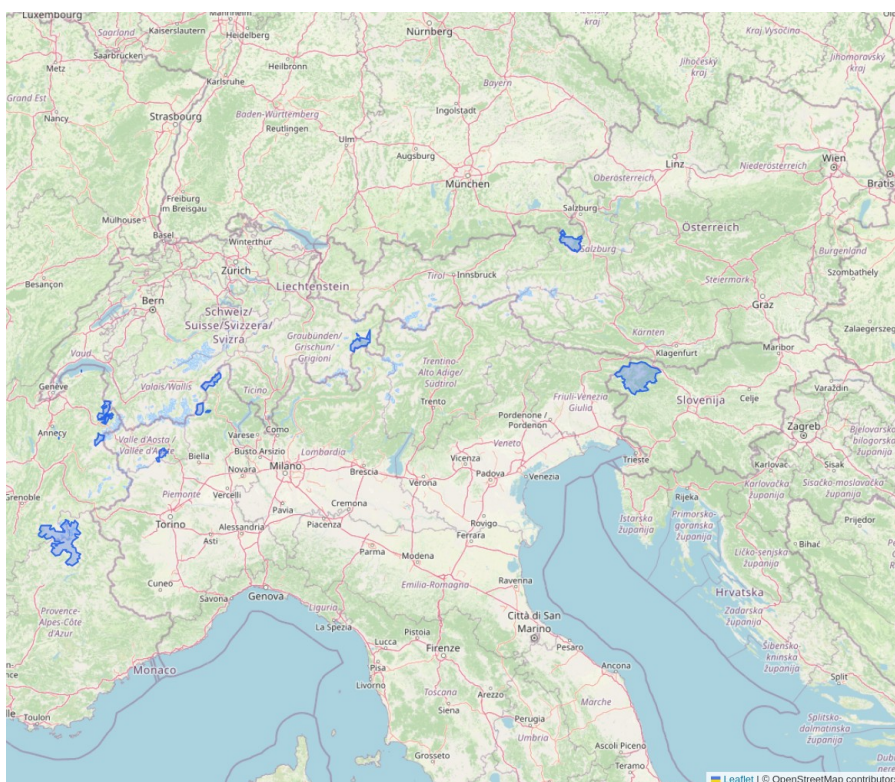
description-sl description-de description-fr description-it			description (multilingual)
country	string	no	Protected area country / ISO 3166
url-website	string	no	Link to the protected area website
url-logo	string	no	Link to the logo of the protected area
source	string	no	Source of the protected area data
pa-uuid	string	yes	Protected area UUID (from source DB : DTP, Geotrek, INPN...)
wikidata-id	string	no	ID in wikidata
wdpa-id	integer	no	ID in WDPA
osm-id	integer	no	ID in OpenStreetMap

Information regarding names and descriptions are proposed in the LiveAlpsNature project partners languages. This list is not exhaustive and can be made available in other languages if needed.

Within the data standards, UUIDs³ (*Universally Unique Identifiers*) are used. These identifiers are designed to be globally unique across systems and databases. They enable developers and information systems to uniquely identify entities without requiring central coordination. Because the same UUID can be stored

³RFC 9562 Universally Unique Identifiers (UUIDs), <https://www.rfc-editor.org/rfc/rfc9562>

across different datasets or platforms, it supports reliable linking and referencing of related data across systems.



Parc national Suisse

name	Parc national Suisse
name_en	Swiss National Park
name_it	Parco Nazionale Svizzero
name_fr	Parc national Suisse
name_de	Schweizerischen Nationalpark
name_sl	
type	NP
IUCN_category	Ia
country	CH
description	Le Parc National Suisse est une aire de nature sauvage strictement protégée, dans laquelle la faune et la flore évoluent librement et où les processus naturels se déploient sans entraves.
description_en	The Swiss National Park encompasses a particularly impressive piece of Alpine landscape with a wealth of flora and fauna. Within its boundaries nature is left to

Figure 2: Example of standardised information for the LiveAlpsNature protected areas

The example of standardised information for the LiveAlpsNature protected areas is available through this link: : <https://pnx-si.github.io/LAN-data-schemas/demo/pa.html>.

More information on the protected area data schema can be found on the github page of the project: <https://github.com/PnX-SI/LAN-data-schemas>

2.2 Protected areas rules

The protected areas data rules schema allows to harmonise the way essential information about *protected areas rules* are published and shared.

It aims to be compatible with:

- Digitize the planet data model for rules (<https://digitizetheplanet.org/wp-content/uploads/2025/10/englisch-1.pdf>)
- French CNIG working group on protected areas and their rules (<https://cnig.gouv.fr/gt-espaces-naturels-proteges-a26277.html>)

Table 2: Protected area rules data schema

Attributes	Types	Mandatory	Descriptions
protected-area-name	string	no	Protected area official name
protected-area-uuid	string	yes	Protected area UUID (from source DB : DTP, Geotrek, INPN...)
activity	string	yes	Nature based activity (defined list)
permission	string	yes	Allowed / allowed under certain conditions / forbidden
period-condition	string	no	Periods when the activity is allowed (seasonal or daily restrictions)
geom-condition	geom	no	Areas within the protected area where the activity is allowed
other-condition	string	no	Description of additional conditions
pa-rule-uuid	string	no	Protected area rule UUID
description	string	no	General description

			(multilingual)
url-pictogram	string	no	Link to pictogram(s) of the activity and permission
url-rules	string	no	Link to the official protected area rules

More information can be found on the github page of the project:

[\[https://github.com/PnX-SI/LAN-data-schemas\]](https://github.com/PnX-SI/LAN-data-schemas)

2.3 Nature based activity – Trails

The nature based activity data schema allows to harmonise the way basic information about trails are published and shared.

We define a trail as a defined path through a natural environment, intended for outdoor activities such as hiking, walking, cycling or horseback riding. It follows a continuous route with a clear starting point and an endpoint, which may either be the same location (a loop) or two different locations (point-to-point). Trails provide an identifiable and structured way to move through protected areas along a continuous course. The concept of a trail is implemented under different names across digital outdoor platforms, as described in these examples on digital outdoor platforms (*non-exhaustive list*): Outdooractive [**Route**] ; Geotrek, [**Trek**] ; AllTrails [**Trail**] ; Komoot [**Tour**] ; Strava [**Route**] ; Wikiloc [**Trail**].

The idea is to share only the minimum amount of information required by the data standard, while still keeping the data operational. In the table below, the fields name, presentation, route-instructions and recommendation are multilingual.

Table 3: Nature based activity - Trail data schema

Attributes	Types	Mandatory	Descriptions
name	string	yes	Trail name (multilingual)
geometry	geom	yes	Trail geometry (srid 4326, geojson/wkt)
trail-uuid	string	no	Trail UUID
activity	string	no	Trail activity (i.e pedestrian, bike, horse, trail, ...)
length	string	yes	Trail length in meters
duration	string	no	Trail duration in hours
start	string	yes	Start of the trail
finish	string	yes	End of the trail
elevation-gain	string	no	Trail elevation gain in meters
altitude-min	string	no	Trail minimum altitude in meters
altitude-max	string	no	Trail maximum altitude in meters
difficulty	string	no	Trail difficulty
presentation	string	no	Trail general presentation (multilingual)
step-by-step-guidance	string	no	Trail step-by-step guidance (multilingual)
recommendation	string	no	Trail general recommendation from the data source (multilingual)

OSM-id	integer	no	Trail OpenStreetMapid
url-picture	string	no	Trail main illustration
source	string	no	Trail data source of information

As part of the work on the data standard for nature based activities, an extension of this schema has been considered in order to integrate the concept of a **BREATHE score index**. The objective is not to challenge the proposed standard structure, but to supplement it in a manner that is consistent and interoperable with several criteria (strength, endurance, immune system, mental health, social health).

Table 4: Nature based activity - Trail data schema - BREATHE score extension

Attributes	Types	Mandatory	Descriptions
trail-uuid	string	yes	Trail UUID
breathe-strength	integer	yes	Refers to the path and possible places along the way
breathe-endurance	integer	yes	Refers only to the path
breathe-immune-system	integer	yes	Refers to the path and the immediate surroundings
breathe-mental-health	integer	yes	Refers to the view, sound and impression from the path into the landscape
breathe-social-health	integer	yes	Refers to the path, the wayside, and the view from the path

2.4 Biodiversity-sensitive areas

The biodiversity-sensitive areas schema allows to harmonise the way basic information about biodiversity-sensitive areas are published and shared.

A biodiversity-sensitive area is a location of particular importance for ecosystems and species where ecological features, habitats or populations require careful consideration and protection.

Table 5: Biodiversity sensitive areas data schema

Attributes	Types	Mandatory	Descriptions
pa-uuid	string	no	Protected area UUID
name	string	yes	Biodiversity sensitive area name (multilingual)
geometry	geom	no	Biodiversity sensitive area geometry (srid 4326, geojson/wkt)
description	string	no	General description (multilingual)
recommendation	string	no	General recommendation regarding the biodiversity sensitive area (multilingual)
url-information	string	no	Link to general information regarding the biodiversity-sensitive area
url-contact	string	no	Link to information or to a contact related to the biodiversity-sensitive area

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