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Beyond Accessibility: Towards an Experiential Paradigm for Inclusive Mountain Environments

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Abstract: Today, improving accessibility in mountainous regions is a key priority for international political agendas. Overcoming the barriers in these areas requires a fundamental change in approach. Within the framework of the 2030 Agenda and the UN recommendations for sustainable mountain development, accessibility and inclusion are now integral components of high-quality territorial policies, rather than secondary dimensions. Consequently, the natural, infrastructural, sensory, communicative or cultural barriers inherent in mountainous regions must not be considered as individual obstacles. Rather, they constitute an interconnected, multilevel system that restricts access and full participation for people with disabilities and anyone else with specific needs. Given this complexity, the key challenge is to understand how to create truly inclusive and accessible mountain environments. Through a comparative analysis of selected Italian projects and participatory initiatives, this research identifies the key design levels and collaborative processes necessary to achieve a systemic model of inclusion within mountain landscapes. The aim is to transform mountains from places to visit into places to enjoy. Trails and natural areas thus become meeting places where disability ceases to be a barrier to shared experiences. Implementing this vision requires a holistic, integrated approach to transform mountain environments from basic visitor infrastructure into spaces that actively promote wellbeing and social inclusion.

Key words: Inclusive mountain environment, accessibility, experiential design, social inclusion.

1. Introduction

Mountain regions are highly valuable due to the numerous environmental, social and cultural benefits they provide [1]. The diverse morphological, climatic and environmental conditions found in mountain regions have given rise to an extraordinary variety of natural and anthropic physical landscapes. These landscapes represent a rich cultural, historical and identity heritage, as well as diverse ecosystems [2], and provide opportunities for humans to interact with nature, thereby improving wellbeing [3]. Mountain environments offer a variety of natural and human-made soundscapes. These soundscapes are an important element to study and enhance in tourist areas, as they can have a positive impact on human health and wellbeing [4]. In line with the principles of sustainability and enhancing mountain areas, mountains are a distinctive and attractive resource for both locals and tourists [5, 6]. There are numerous experiences to be had in the mountains, including nature and relaxation activities, outdoor sports, wellness and slow tourism, cultural and traditional activities, and scenic attractions. While these can be enjoyed individually, they are often organized in groups.

It is worth asking whether mountains are truly accessible and inclusive today. The mountain environment has historically represented a significant barrier due to its intrinsic morphological characteristics. Mountains are often associated with the idea of being inaccessible and impenetrable places where natural obstacles do not distinguish between people with and without disabilities. The high altitude and vertical terrain impose limits and barriers, forcing everyone to challenge themselves and develop great moral strength

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and character [7]. The mountains are a heritage for everyone, not just for mountaineers; they should be accessible to all, including those seeking tranquillity and those who find wellbeing through physical effort [8]. We must move beyond thinking the mountains as "playgrounds for tireless hikers and superheroes" and recognise their potential as places of life and wellbeing for everyone, starting with those who live there [9].

Spending quality time in nature is becoming increasingly important, and making mountain trails and parks accessible is a major challenge [10]. Despite growing awareness of the importance of recreational activities in nature, the management of protected natural areas, such as parks, does not always ensure equal access for all potential visitors [11]. To enable the entire population to benefit from the positive effects that hiking, sports and high-altitude activities have on physical health and psychological wellbeing [12], it is fundamental to ensure inclusive access to natural and built mountain environments [6].

In the context of contemporary cultural, social and environmental changes, the issue of the accessibility and inclusivity of mountain spaces and communities is becoming increasingly important. This is recognised by Agenda 2030 [13] and the UN, which recommends "actions to accelerate progress towards inclusive, resilient and sustainable mountain development" [14]. Mountains in Europe are facing numerous challenges that require more research and coordinated policies to be resolved [15].

This paper is divided into five sections. The introduction contextualises the issue of accessibility and usability in mountain environments, highlighting its importance and referring to the theoretical framework. The second section classifies the barriers that PwD (people with disabilities) still encounter in mountain environments today. The third section analyses examples of good practice in Italian projects and initiatives that promote inclusion in mountain environments, particularly in natural areas. The fourth section is dedicated to discussion and outlines the characteristics of the process and the interconnected design levels of accessible and inclusive trails. The paper concludes with brief final considerations that return to the concept of transitioning from passive accessibility to actively promoting inclusion in mountain environments.

2. Barriers and Disabilities in the Mountains

In mountainous areas, an extensive system of barriers can prevent or drastically limit the accessibility of a place, the experience and access to information.

Firstly, mountains present intrinsic natural barriers that cannot be eliminated [16], such as rough terrain, steep slopes, narrow passages, uneven and precipitous terrain, variable weather conditions, etc. [17, 11]. Although mountains are a natural environment that can be hostile, even their infrastructure often presents physical barriers that prevent access and visitability. The lack of spacious and flat car parks near trailheads, cable car stations and facility entrances means visitors must walk long distances on often unsuitable terrain. Narrow, steep trails with uneven surfaces, such as rocks, potholes, tree roots, mud, natural or artificial steps and excessive slopes, are impractical for wheelchair users, people with walking frames or mobility difficulties, elderly and families with young children. In some places, gates, barriers or turnstiles that are not wheelchair-friendly may block access completely. Mountain huts and restaurants may have stairs at the entrance, narrow doors and cramped interior spaces that make it difficult to move around, as well as inaccessible toilets.

Barriers in the mountains can take many forms and can have a significant impact on the accessibility for people with visual, hearing or multiple sensory impairments. Individuals with visual impairments are limited in their autonomy and understanding of the surrounding environment by the lack of tactile signage, relief maps and information in alternative formats. Without tactile guidelines, blind or visually impaired individuals cannot travel independently along the trail. Furthermore, the variability of the terrain makes

mobility extremely difficult and dangerous. Information on flora, fauna, points of interest and hazards along trails or in parks is often presented visually only, excluding those who cannot see it. Moreover, information boards are often not adequately signposted. In shelters or rest areas, insufficient lighting can cause problems for visually impaired people, increasing the risk of falls or disorientation. In specific contexts, the exclusive use of verbal channels to provide relevant information, such as risk warnings or emergency communications (e.g. danger of falling rocks or sudden weather events), as well as additional information on services, can pose a significant problem for individuals who are DHH (deaf or hard of hearing), particularly in the absence of accessible alternative systems, such as visual signage or QR (Quick Response) codes linked to video content in LIS (Italian Sign Language). The inaccessibility of essential information can have a significant impact on safety, autonomy and social participation. Furthermore, the lack of LIS interpreters during themed group excursions can create a communication barrier, reducing participation and compromising the safety and quality of the experience for DHH. In some natural settings and during group activities, wind, water noise and other natural sounds can make verbal communication difficult, even with the aid of hearing aids, which can isolate hard of hearing participants.

The mountains are a particularly challenging environment, even for people with intellectual disabilities, ASD (autism spectrum disorders) or other conditions that affect cognitive function, due to their complexity and unpredictability. Barriers can arise from difficulties in comprehension, spatial orientation, and adapting to new situations. Mountain trails can be unclear with ambiguous or absent signage, which makes it difficult to follow the correct route and maintain orientation. A lack of easily recognisable landmarks or simplified maps can add to the confusion. Sudden changes in terrain (e.g. exposed passages, slippery sections, etc.), or in weather conditions (e.g. fog, rain) require adaptability and problem-solving skills, which may be compromised in unexpected situations involving injury or getting lost. In unexpected situations involving injury or getting lost, the ability to make quick and appropriate decisions, communicate the need for help, or follow complex instructions may de-crease, thereby increasing the risks. This can cause anxiety and disorientation. Information about routes, hazards, safety rules and available services may be presented in a way that people with cognitive difficulties find difficult to understand. A lack of clear, simple, visual communication can prevent access to important information. As previously mentioned, the mountain environment can contain a variety of visual, sound and tactile stimuli (e.g. intense light, snow reflections, strong wind and sudden noises, uneven surfaces and extreme temperatures) that can lead to confusion or stress in people with hypersensitivity. Added to this is the difficulty of planning the excursion and making decisions. Preparing for a mountain excursion requires the ability to assess one's own abilities, choose the right route, predict weather conditions, and prepare the necessary equipment. These steps can be challenging for people with cognitive disabilities, who may require substantial support.

Cultural and social barriers are often less tangible than physical ones, but no less impactful. These barriers relate to perceptions, attitudes and practices that can exclude PwD or limit their participation. There is still a widespread perception that the mountains are inaccessible to PwD and that their presence could represent a risk or burden. This stereotype can lead to a lack of opportunities and exclusion. An overly protective attitude, often driven by the fear and anxiety of parents or carers, can also restrict the independence of PwD, preventing them from overcoming challenges and enjoying meaningful experiences in the mountains. A lack of visibility of PwD taking part in mountain activities can reinforce the idea that the environment is off-limits to them, limiting inspiration and motivation. Mountain guides, mountain hut staff and tourist

operators may not have the appropriate training to support people with different disabilities, in terms of technical skills and interpersonal sensitivity. A lack of understanding of the needs of PwD (e.g. aids, different timings, alternative modes of communication, etc.) can lead to inadequate services or embarrassing situations. Restaurant menus, for example, are often a constant source of embarrassment and frustration for visually impaired or blind individuals. Low lighting can also cause anxiety and stress because they cannot see what they are eating [18]. Families with children or adults with disabilities require time and attention in terms of relationships, which is often hindered by bureaucracy and prejudices that still exist in society [19].

The cost of assistive devices, qualified guides and dedicated services can make access to the mountains prohibitive for many PwD. These economic barriers can be exacerbated by a lack of supportive policies or incentives. The difficulty of obtaining information and booking accessible services, as well as organising a trip, can be a significant deterrent.

Mountain areas may suffer from poor or nonexistent mobile network and internet coverage. This prevents the use of apps, GPS (Global Positioning System) navigators, emergency communication systems and other digital technologies that are essential for independence and safety. The lack of connectivity can further isolate those who need digital support to find their way around or communicate. The websites of tourist boards, nature areas and mountain huts, as well as mountain dedicated mobile applications, often do not conform to the principles of digital accessibility.

The concept of barrier free mountains is therefore part of the wider accessible tourism contest, which aims to make environments and services accessible for people with different needs, including those with disabilities.

3. Overcoming Barriers: Projects and Initiatives

Several projects and initiatives have been implemented in Italy to promote accessibility in mountain environments, from the valley floor to the highest altitudes. To obtain an overview of the current situation regarding accessibility in mountain areas, good practices were mapped at a national level. The survey was designed as a research tool to classify them and identify the strengths of the projects. Projects focusing on natural areas, primarily trails, were selected based on criteria such as social inclusion, quality, territorial impact, governance, project soundness and consistency with public policies.

Analysis of the selected projects and initiatives allowed them to be divided into three categories: (i) for the classification and mapping of trails, points of interest or protected natural areas; (ii) for the development of tools, skills and services for reception, assistance and promotion; (iii) for the organization and implementation of outdoor activities.

3.1 Classification and Mapping of Natural Areas

3.1.1 The CAI Project for Accessible Trails with Aids

In 2021, the CAI (Italian Alpine Club) introduced a classification system for accessible mountain trails. The CAI difficulty scale for accessible trails with aids (hereinafter referred to as “CAI accessible scale”) was developed in response to the absence of a widespread, shared classification system in Italy. This project integrates the CAI classification system for ordinary hiking trails, focusing primarily on accessibility for people with motor disabilities.

The CAI accessibility scale comprises three levels of difficulty: Accessible for Tourists (easy), Accessible for Hikers (challenging), and Accessible for Experienced Hikers (highly challenging). The objective parameters used to define this classification are summarized in Table 1. These parameters include trail characteristics related to terrain accessibility and potential hazards, together with additional explanatory notes [20].

Table 1 CAI difficulty scale for routes with aids.

Level of difficulty	Description
AT = Accessible for Tourists	Trails on cart tracks, dirt roads and grassy paths. Gradients < 8%, width > 1.5 m, elevation gain of < 150 metres and length < 3 km. Generally, even ground, without any artificial or natural steps, exposed sections or sharp bends that could make manoeuvring difficult. Notes: Although it is possible to overcome small slopes (4-5%) independently with a self-propelled wheelchair, it is never advisable to travel on mountain trails alone for safety reasons.
AH = Accessible for Hikers	Trails on paved paths and mule tracks. Gradients < 16%), width between 1 and 1.5 m, elevation gain < 300 m, length from 3 to 6 km. Uneven ground, few and modest artificial or natural steps that can be easily overcome by an off road vehicle, no significant obstacles, no exposed points and/or sharp bends that could make manoeuvring difficult. Notes: Regardless of the length of the route, it is necessary to consider the time required to complete the excursion, in relation to the critical issues of the passenger remaining in the seat of the aid.
AEH = Accessible for Experienced Hikers	Routes on mule tracks and paths with variable terrain. Are characterised by some sections with gradients > 16%, width < 1 m, elevation gain > 300 m, length > 6 km, uneven ground in places that requires compulsory passages, natural or artificial steps > 10 cm, significant obstacles, exposed points and/or tight bends. Notes: The presence of at least one of these characteristics classifies the route as AEH, as it requires skills, techniques, experience and a number of crew members adequate to overcome the difficulties indicated. Regardless of the length of the route, it is necessary to consider the time needed to complete the excursion, in relation to the criticality of the passenger's stay in the seat of the aid.

Thanks to regional legislation and funding, the CAI collaborates with volunteers and networks of disability associations to collect and validate this data. Together, they assess and compile detailed information sheets, which are then disseminated in printed publications or accessible geoportals. The sheets often include information notes for wheelchair users or their caregivers, as well as details on facilities or services (e.g. refreshment points, access to water, equipped rest areas, accessible toilets and signage).

The strength of this CAI project lies in the development of both a classification tool and a communication and awareness raising tool that provides the foundations for the informed use of mountain trails. The CAI accessible scale provides objective and clear information to help to plan a mountain route. This mapping has numerous positive impacts, both real and potential. Well classified and communicated trails enable people to participate in outdoor activities, as they can choose trails that suit their abilities and the aids available to them. This reduces uncertainty and the risk of having an unsafe or frustrating experience. They encourage families, groups and associations to enjoy shared experiences together, strengthening social bonds, reducing isolation and promoting inclusion in outdoor activities. A standardised classification system enables the creation of databases and catalogues that can be used by both users and authorities for land use planning purposes. The main challenge of this initiative is finding the resources to implement and monitor the mapping of routes, as mapping and maintaining trails require training and maintenance activities, which take time and require volunteers and investment.

3.1.2 The RES Project for Trails for All

Thanks to a solid regulatory framework that has transformed land management in the region of Sardinia into a model oriented towards inclusion, the Sardinian hiking network of classification has been created (hereinafter referred "RES accessible scale" where RES is Italian acronym of Sardinian hiking network). Key regulatory milestones include regional law No. 16 of 28/07/2017, which officially establishes the regional hiking network called RES and its regional land registry; subsequent regional resolutions approving technical management guidelines; regional resolution No. 28/1 of 24/08/2023, which approves Annex H of the guidelines and defines technical criteria and standards for classifying trails, extending the concept

Table 2 Subcategories of accessible trails according to RES classification scale.

Subcategory	Description
(1) Trails accessible for people with *motor disabilities.*	Suitable for independent or assisted travel with a wheelchair, as well as for accompaniment with aids such as Joëlette-type supports or other electrified wheeled aids. Built or equipped with works on the walking surface, as well as guide equipment and infrastructure supports for access and use. Information is also available on the condition of the ground and walking surface (e.g. dirt or stony terrain) and the effect of weather conditions (e.g. rain) on accessibility (e.g. muddy ground).
(2) Trails accessible to people with *sensory disabilities*.	As in (1), with the addition of guide equipment and supports enriches human sensory perception through technology, such as augmented reality (AR), NFC technology and Braille. This conveys information generally through tactile supports or other standardised media, including electronic formats that can be conveyed using ad hoc technology and apps. The aim is to maximise the amount of information that can be retrieved independently on site, as well as maximising perception of the route and landscape.
(3) Trails that facilitate access to people with *intellectual, mental, cognitive or relational disabilities*.	Given the specific nature and wide range of possible situations, it is important to pay attention to rest areas and ensure that advance information is available to help prepare for the hike (including also visual information). It is also important to consider limiting promiscuous use to prevent the route from causing emotional stress.

of accessibility beyond motor disabilities; and regional government resolution No. 5/23 of 23/02/2024, which adds specifications on information signage, as well as assessing processes by stakeholders.

The RES accessible scale maintains the CAI classification, which has three levels of difficulty (AT, AH, and AEH), but identifies three subcategories for each level: (1) trails accessible to people with motor disabilities; (2) trails accessible to people with sensory disabilities; and (3) trails accessible to people with intellectual, mental, and relational disabilities as shown in Table 2.

The RES system specifies the minimum equipment required for a route to be assigned to a level of difficulty and subcategory, as well as any additional equipment that would be advantageous. Trails are only classified and registered after on site assessment by end users, i.e. representatives of association of PwD who are asked to verify the routes [21]. To establish a network of trails for everyone, the regional technical committee has expanded the CAI classification system to include accessible trails. This classification defines the minimum requirements and standards for the classification and certification of trails, as well as the criteria for information and signage. These criteria include the use of symbols, technologies, and specific supports such as AAC (Augmentative and Alternative Communication) to overcome perceptual and communication barriers.

The strength of the RES project lies in its concrete application of the Design for All approach. This is achieved by designing routes that mitigate or eliminate natural environmental conditions, such as slopes and soil conformation, and by integrating additional structural solutions, such as signage, handrails and walking aids. The project also considers perceptual aspects, such as the availability of sensory stimuli appropriate to the user, to enable them to perceive their surroundings, including the landscape, environmental sounds and scents, and depth and visibility. Finally, cognitive aspects are considered to provide appropriate stimuli, modes of use and information content for users with specific needs.

The impact of a network of trails for everyone is multidimensional. It is not just infrastructure but a driver of change. Trails become meeting places where disability is no longer a barrier to participation. The use of technologies such as AAC allows people with complex communication needs to interact with their environment. The management of trails and related services (specialised guides, rental of aids such as the Joëlette, accessible accommodation) creates new opportunities for skilled employment.

3.1.3 The "Accessible Dolomites. A Heritage for All" Project

The commitment of UNESCO Dolomites Foundation to accessibility and social inclusion began in 2014 with the project entitled "Accessible Dolomites. A Heritage for All" [22]. This project is funded by the Ministry of Cultural Heritage and Activities and Tourism under law No. 77 of 20/02/2006 on "Special measures for the protection and enjoyment of Italian sites of cultural, landscape and environmental interest included in the World Heritage List and under the protection of UNESCO". It is a mapping and validation initiative involving collaboration between numerous associations and organisations to improve accessibility for users with motor disabilities, elderly people, and families with children.

The project produces a series of digital information sheets dedicated to trails and scenic viewpoints. Those dedicated to "accessible routes" document the objective parameters based on the CAI scale (e.g. length, elevation gain, average and maximum gradient, minimum width, type of terrain and presence of obstacles), as well as providing information on support services such as access by private or public transport, accessible parking, accessible toilets, refreshment points, accommodation facilities, information and assistance services, equipment rental and network cover-age. An example of a classified trail accessible through this project is the Lake Tovel itinerary in Trentino region. Its surface is compacted earth, mostly flat and equipped with rest areas. Accessible by public and private transport, it has ample parking with accessible facilities (Fig. 1).

Similarly, the sheets dedicated to "scenic point" for observing the Dolomite landscape contain information on how to reach them, their characteristics, support services, and any limitations. The integration of GPS mapping and Street View into the information sheets allows users to make an immersive preliminary assessment of itineraries and locations. This makes it possible to check the degree of difficulty, characteristics of the route and context in advance, enabling users to plan their excursion in an informed and considered manner.

The project represents a significant example of promoting social inclusion, expanding access to the UNESCO natural heritage to groups traditionally excluded from mountain experiences. Its concept of mountain accessibility goes beyond simply enjoying the natural environment but includes a network of services that welcomes people with disabilities and their families from their arrival at the destination until their departure.

3.1.4 The "Parks for All" Project

To promote accessibility within protected natural areas, particularly national parks, the Ministry of the Environment and Land Protection funded the national project called "'Parks for All: Usability for a Broader Range of Users" in 2001. As part of the project, guidelines were developed to help institutions and managers to plan effective actions to ensure the usability of spaces and services. Additionally, information sheets containing general information on the accessibility of natural and built spaces in national parks, limited to compliance with the current regulatory framework on accessibility and overcoming architectural barriers, were published on a dedicated web portal [23].

Data collection for park mapping was carried out using a checklist sent to the relevant management bodies. The survey covered infrastructure (e.g. rest areas, wildlife areas, botanical gardens, arboretums, park buildings, environmental education centres, animal rescue centres, study and research centres, visitor/information centres, museums, trails, scenic viewpoints, park authority headquarters and local offices), services (e.g. help desk, information service, guided tours, web information service, etc.), social and economic realities of the area in relation to assistance for PwD, and training.

On the one hand, this project has enabled an initial survey of infrastructure accessibility and service usability data to be carried out. On the other hand, it has contributed to the launch of a series of initiatives within



Fig. 1 Example of compacted ground, a drainage channel, and a rest area along a path designated as accessible by the Dolomiti UNESCO Foundation.

national parks to remove barriers. Although the guidelines and database for the parks have not yet been formally updated, integrated approaches and good practices adopted by some parks have improved accessibility. In recent years, the introduction of technologies such as virtual and augmented reality into the park system has promoted inclusion by providing immersive visitor centre experiences and augmented trail guides.

In this context, the "Park without Borders" project is particularly significant. Developed by ANFFAS Trentino and the Adamello-Brenta Natural Park in collaboration with a local communications company, it offers users an immersive VR (Virtual Reality) experience through which they can explore various sites in the park. Supported by narration in "easy-to-read" language, the project ensures cognitive accessibility [24]. The VR application was designed to generate a highly emotionally engaging experience, digitally replicating places and environments that are difficult to access physically. Its content is organised into several thematic sections: (i) 3D aerial panoramic views for an overview of the orography; (ii) ecosystems and biodiversity with modules dedicated to the characteristic habitats, flora and fauna of the protected area); (iii) virtual itineraries for the simulation of representative hiking trails. The application has been made available not only at the park information points and some schools but has also been used in ANFFAS (Italian acronym of national association of families of persons with intellectual and relational disabilities) centres and residential homes for the elderly. Similarly, VR applications have been developed by other parks to explore their territories with interactive aerial views, nature and history itineraries.

3.2 Development of Tools, Skills and Services

Alongside the implementation of classification and mapping projects, initiatives have been promoted to develop appropriate tools, skills and services relating to the accessibility of mountain environments, and to encourage a widespread culture of inclusion and safety.

3.2.1 The "Open Paths" Project

"Open Walks" is a recent national project coordinated by the Ministry of Tourism, involving several Italian regions, the CAI, and the Italian Federation for Overcoming Handicaps. The annual project promotes tourist itineraries and trails that focus on slow tourism, accessibility and sustainability. To this end, a methodological tool has been created to help public bodies, associations and professionals in the sector to improve the accessibility and usability of trails, including those in mountainous areas, for PwD or specific needs. Based on the principles of Universal Design, the tool addresses key issues such as ensuring an accessible physical environment (including trails, tourist infrastructure, signage and services) and a complementary virtual environment (e.g. apps, interactive maps, websites and digital tools) for users; providing accurate and accessible information through traditional and digital channels; and adopting a human and professional approach that values each participants as part of a shared experience.

The methodical approach proposes the following fundamental actions: data collection for mapping; clear information based on specific and transparent criteria allowing potential participants to independently evaluate the routes; improvement of infrastructure and services by removing physical, sensory, cognitive, and behavioural barriers; training of operators and volunteers to develop specific skills in managing walkers with special needs.

The strength of this project lies in its promotion of walks as integrated experiences that combine environmental, cultural, spiritual and social elements. Its main impact is to transform places into open destinations where walking together is an experience accessible to all with benefits for physical and mental wellbeing, social cohesion, personal and cultural growth, and regional development.

3.2.2 The "Accessible Mountains in Trentino" Project

The "Accessible Trentino Mountains" project was recognised by the European Commission in 2014 as one of the best accessible tourism practices in Europe. It promotes various activities in terms of training and disseminating the Open brand. As part of the project, training courses are organised for mountain professionals (e.g. mountain guides, ski instructors, etc.), to provide them with the necessary skills to accompany PwD during leisure activities and sports.

Specific training modules on accessible tourism and the Open brand promote the acquisition of skills relating to hospitality and services for PwD.

The Open brand is a voluntary quality certification that demonstrates a high level of accessibility and usability for PwD and people with special needs, exceeding current accessibility regulations. The Open system can be used to certify public and private facilities (e.g. restaurants, bars, accommodation facilities, outdoor places, cable car stations, information points, etc.). The Open regulations for outdoor locations and cable car station are significant for mountain environments. The first ones contain mandatory and optional criteria relating to outdoor information and orientation systems, technical aspects of natural trails or areas, rest areas, outdoor toilets, staff training, etc. The second ones include specific mandatory and optional criteria relating to information and orientation systems, access to the facility, mobility, internal services (e.g. ticket offices, equipment hire, refreshment points and toilets), and outdoor areas such as balconies and panoramic terraces [25, 26, 27].

The strength of this certification lies in promoting a systemic approach that goes beyond the removal of architectural barriers to include hospitality, staff training and service accessibility. The result is a region that can welcome visitors and ensure that spaces and services are accessible to all. This capacity for hospitality also has economic and tourist benefits.

3.3 Organisation and Implementation of Outdoor Activities

Three projects are notable for their approach to organising and implementing outdoor activities, which aims to enhance interaction with the surrounding environment and among participants.

The "Apennines for All" project was launched in Abruzzo in 2020 with the aim of creating a public-private network to improve regional accessibility, with a particular focus on mountain tourism. The project, which has now become a recognised and award-winning tour operator, organizes inclusive excursions, guided tours, and events in mountain areas, with a focus on natural attractions and villages [28]. Thanks to collaboration with numerous partners such as NoisyVision, it also offers multisensory experiences. Its operational model involves a systemic approach that integrates aids (e.g. Jo ettes, e-bikes and a motorised paraglider for PwD) and human resources, sensorial multimodality, and experiential, tailor-made tourism. The project has an impact on the territory and the economy because it attracts tourists to lesser-known areas and encourages accommodation facilities to adapt and provide exclusive hospitality services.

NoisyVision is an association in Veneto that empowers people with visual and/or hearing impairments and educates the community on accessibility and social inclusion issues. The association creates inclusive opportunities for people to meet through group walking activities, promoting mutual support and different ways of perceiving the surrounding environment. NoisyVision selects mainly flat nature trails without technical difficulties. The focus is on multisensory exploration discovering and perceiving the surrounding environment through all the senses and refining the ability to orientate oneself. The model also focuses on team building to construct authentic relational dynamics in which the needs and talents of all participants, as well as the helping relationship, can be valued. It also focuses on diversity management, which involves accepting differences and considering them an asset. This approach means that challenges are collectively managed instead of being left on the shoulders of PwD [29]. The "In the Mountains We Are All Equal" project involves designing and implementing multisensory itineraries. The methodology consists of mapping specific sensory points of interest along the routes (e.g. paving, forest ecosystems, flora and fauna, surface hydrography, specific lithologies, microclimates, etc.). These points are analysed and selected for their ability to stimulate tactile, olfactory and auditory perceptions. The aim is

to facilitate deeper, shared, immersive exploration of the environment, transforming the hiking experience into a participatory, perceptual analysis activity.

In Trentino, Sportabili is a key organisation in the field of inclusive sport. It adopts an operating model based on strategic collaboration with local authorities. This model is centred around the integrated provision of two key resources: specialised technical equipment (i.e. mobility aids and adapted sports equipment) and qualified human resources, including specialist instructors and trained volunteers. This enables a wide range of outdoor sports to be offered, including sports such as skiing and snowboarding, hand biking, assisted hiking (trekking with a Joëlette) and river sports such as rafting. The strength of Sportabili lies in its ability to break down barriers to participation, whether they are technical, socio-cultural, economic-organisational. Its primary impact is to act as a catalyst, transforming social investment into a multiplier of wellbeing, economic development and cultural progress for the whole region.

4. Discussion

All the projects and initiatives examined contribute to making the mountain environment more accessible and inclusive. The analysis clearly shows that, in the mountains, accessibility is not just about overcoming barriers; it is also about offering experiences that are open to everyone. Users evolve from passive visitors to active participants, becoming key players in the experience. This requires a complete rethink of the logic behind designing, managing and using mountain areas, putting people and their needs at the centre through integrated approaches. In this context, the emerging paradigm that shifts the focus from accessibility to experience requires in depth, interdisciplinary research into how designers can overcome inherent challenges and capitalise on opportunities to create trails and natural areas that are physically accessible and capable of providing meaningful experiences for all.

From a methodological point of view, realising accessible and inclusive natural areas is a participatory process that considers technical, social, communication and governance issues. The process must be inclusive in all its phases, from planning and design to implementation, verification and management, with all stakeholders involved from the beginning. Involving associations representing different disabilities from the outset and throughout the process is a fundamental strategy for obtaining shared solutions that are more responsive to real needs and effective. The co-design process facilitates the systematisation of heterogeneous skills, which are essential for defining intervention priorities, by encouraging the exchange of information and emotions between designers and end users [30]. These associations also play a key role in the operational activities of the testing and promotion phases. Alongside these associations, volunteers, environmental hiking guides and suitably trained companions contribute their expertise to one of the most delicate phases of the process: the assessment. Local authorities and municipal administrations ensure regulatory consistency and the long-term sustainability of management. To build an accessible and inclusive territory, it is essential to raise awareness and engage the community. This is vital for developing an integrated, sustainable offer.

The analysis of the projects highlights that a system of interconnected design levels contributes to the creation of accessible and inclusive trails. These levels can be structured as follows:

- Physical environment design: the focus is on infrastructure. This level is oriented towards the tangible and spatial features of “where” the experience takes place. In the case of trails, the priority is to ensure safe passage for people who move independently or with assistance, with or without aids. This requires careful technical design of the route in terms of its length, width, surface characteristics, etc. Interventions such as levelling the ground, installing ramps and transverse drainage channels correctly, and removing

physical obstacles are crucial. To maximise comfort and safety, longitudinal structures such as parapets, handrails and protective barriers should be installed at ex-posed points, and accessible and inclusive rest areas should be provided.

• Communication design: the focus is on information, which is an integral part of the offered experience. This level concerns "what" and "how" is communicated. Providing information, including hazard information, through accessible signage (both informative and indicative) is essential, as is integrating in-innovative technologies (e.g. QR codes or NFC) and the principles of AAC. The multisensory, multichannel approach enhances understanding and perception of the place, making information comprehensible to all, including those with sensory or cognitive disabilities, or complex communication needs. As the experience begins even before setting out, it is also important to pay attention to select, organize and disseminate information concerning the natural area. Providing detailed maps, textual descriptions, photo galleries and virtual tours is essential. 3D mapping and VR offer immersive previews of destinations, helping users make more informed decisions and reducing uncertainty before the trip. VR can provide an engaging experience for those who cannot physically visit the location. AR can enrich the on site experience by superimposing contextual digital content onto the physical environment and providing access to useful information in real time.

• Experience design: the focus is on the individual and the quality of their time. This level connects the other two. It focuses on sensations and emotions. A trail that is inclusive is not only accessible, but also pleasant, exciting, meaningful, safe, engaging and satisfying. Physical accessibility combines with sensory stimuli, emotional engagement and social interaction. For example, rest areas and points of interest become experiential meeting places where everyone on site can perceive the characteristics of the surrounding. The multisensory experience becomes a tool for ensuring universal accessibility and a therapeutic and inclusive tool.

In natural mountain areas, particularly those that are protected, planners, designers and local authorities are faced with the challenge of balancing accessibility with nature conservation goals [31]. This is accompanied by the challenge of effective experiences designing. In the experience design level, it is important to investigate strategies that can effectively translate the aesthetic and symbolic values of the natural mountain landscape (visual, auditory, tactile and olfactory) into sensory experiences for people with sensory impairments. It is also necessary to understand how sensory sequences can mitigate cognitive or sensory overload in people with hypersensitivity. Another issue to be explored is how the integration of assistive technologies can enhance the physical experience without affecting the perception of the "naturalness" of the environment. To ensure that experiential accessibility in mountain environments remains durable over time, it is advisable to seek participatory management and maintenance models that actively involve local stakeholders.

Accessibility in the mountains is not just a technical issue; it is also a process of changing social attitudes. The projects demonstrate that training operators and volunteers, empowering local communities, and raising awareness of disability are vital for challenging stereotypes. Inclusive mountains thus become spaces for collective learning, where encounters between differences generate social innovation.

Although the analysed experiences are relevant, they remain limited and dependent on individual contexts or project funding. For them to be replicable and scalable, medium to long-term structural policies are needed that integrate inclusion objectives into local and regional development strategies. Targeted investments and the allocation of economic, human, organisational and network resources are needed. In this sense, the 2030 Agenda and the UN recommendations for sustainable mountain development provide a framework for

considering accessibility and usability not as additional elements, but indicators of the overall quality of territorial policies.

5. Conclusion

Accessible and inclusive mountain environments are not an unattainable ideal but a realistic objective that requires coordinated and long-term commitment from institutions, local communities, and stakeholders. While current experiences in Italy remain fragmented, they offer valuable benchmarks and indicate promising directions for future development. The primary challenge lies in scaling these isolated projects and initiatives into an integrated, nationwide system capable of ensuring equitable access across the Italian territory.

Achieving this goal necessitates moving beyond the mere removal of physical barriers toward a multidimensional approach that synthesizes physical, communicative, and experiential design. Such a perspective promotes accessibility as a source of wellbeing and social participation, catering to the diverse needs of visitors while safeguarding the environmental and cultural integrity of mountain landscapes. Ultimately, mountains can evolve into vital settings for social inclusion, personal development, and shared enjoyment, proving that nature can truly be a space for everyone.

References

[1] UNIMONT (UNIversità della MONTagna) Website. May 9, 2026. https://www.unimontagna.it/ricerca-innovazione.

[2] Zanon, B. 2016. "Nuovi sguardi sul territorio montano." In *Quaderno n. 1 Essere Cittadini in Montagna*, pp 49-63. Tione di Trento: Editrice Rendena.

[3] Ebner, M., and Schirpke, U. 2025. "Participatory Mapping of Human-Nature Interactions in Mountain Landscapes: Instances of Experiential Multi-functionality." *Landscape and Urban Planning* 263: 1-14.

[4] Malec, M., Kędzior, R., and Ziernicka-Wojtaszek, A. 2023. "The Method of Soundscape Naturalness Curves in the Evaluation of Mountain Trails of Diversified Anthropopressure—Case Study of Korona Beskidów Polskich." *Sustainability* 15 (1): 1-18.

[5] Romeo, R., Russo, L., Parisi, F., Notarianni, M., Manuelli, S., and Carvao, S. 2021. *Mountain Tourism—Towards a More Sustainable Path*. Report UNWTO—FAO, Rome.

[6] UN Tourism (United Nations World Tourism Organization) Website. June 20, 2026. https://www.untourism.int.

[7] Gobbo, R. 2017. "Dolomiti accessibili: Quando la montagna non conosce barriere." In *Dossier di Famiglia Cristiana.it.* Accessed 2025/09/19. https://www.famigliacristiana.it/articolo/dolomiti-e-disabili-quando-la-montagna-non-conosce-barriere.aspx.

[8] Rey, G. 2002. *Alpinismo acrobatico*. Torino: Cda & Vivalda.

[9] Boccazzi Varotto, C. 2025. "Come migliorare l'accessibilità della montagna?" In *Superando*. Accessed 2026/01/14. https://superando.it/2025/01/27/come-migliorare-laccessibilita-della-montagna/.

[10] Moutsopoulos, D., Stergiadou, A., and Psilovikos, T. 2022. "Environmental Adaptation Assessment on a Mountain Trail as a Pathway to Local Prosperity Based on a Topographical Approach." *Euro-Mediterranean Journal for Environmental Integration* 7: 545-52.

[11] Aguilar-Carrasco, M. J., Gielen, E., Vallés-Planells, M., Galiana, F., and Riutort-Mayol, G. 2023. "Assessment of Barriers for People with Disability to Enjoy National Parks." *Frontiers in Psychology* 13: 1-16.

[12] Montagne Senza Barriere Website. May 10, 2026. https://www.montagnesenzabarriere.it.

[13] Agenda 2030 Website. June 10, 2026. https://sdgs.un.org/2030agenda.

[14] UN & FAO. 2022. *Sustainable Mountain Development: Report of the Secretary-General*. New York.

[15] Drexler, C., Braun, V., Christie, D., Claramunt, B., Dax, T., Jelen, I., Kanka, R., Katsoulakos, N., Le Roux, G., Price, M., Scheurer, T., and Weingartner, R. 2016. *Mountains for Europe's Future—A Strategic Research Agenda.* The Mountain Research Initiative, Institute of Interdisciplinary Mountain Research Austrian Academy of Sciences.

[16] Elmi, S. 2018. "Le barriere naturali che includono." In Accademia della Montagna (Ed.), *OPEN2020. Il Turismo Accessibile in Montagna Proceedings*, p. 61. Tsm, Trento.

[17] Zhang, G., Poulsen, D. V., Lygum, V. L., Corazon, S., Gramkow, M. C., and Stigsdotter, U. K. 2017. "Health-Promoting Nature Access for People with Mobility Impairments: A Systematic Review." *Int. J. Environ. Res. Public Health* 14 (703): 1-19.

[18] Richards, V., Pritchard, A., and Morgan, N. 2010. "(Re)envisioning Tourism and Visual Impairment." *Annals of Tourism Research* 37 (4): 1097-116.

[19] Benchimol, A. 2018. "Le figure professionali della montagna: Le opportunità della formazione continuano." In Accademia della Montagna (Ed.), *OPEN2020. Il*

Turismo Accessibile in Montagna Proceedings, pp. 34-37. Tsm, Trento.

[20] Club Alpino Italiano Website. January 21, 2026. https://www.cai.it.

[21] Sardegna Sentieri Website. January 21, 2026. https://www.sardegnasentieri.it.

[22] Accessible Dolomites. A Heritage for Everyone Website. June 20, 2026. https://www.visitdolomites.com/page1/dolomiti-accessibili/?lang=en.

[23] Parchi per Tutti Website. January 21, 2026. https://www.parchipertutti.it.

[24] Parco naturale Adamello Brenta Website. January 21, 2026. https://www.pnab.it/parco-senza-frontiere-al-via-il-progetto-di-realta-virtuale-sviluppato-con-anfass-e-medialab.

[25] Tsm-Accademia della Montagna Website. January 21, 2026. https://montagneinrete.it/eventi/la-montagna-inclusiva-la-formazione-per-l-accessibilita-in-montagna/.

[26] OPEN Certification. January 21, 2026. https://www.trentinofamiglia.it/Certificazioni-e-marchi/Marchio-Open.

[27] PAT Marchio Open. January 21, 2026. https://www.provincia.tn.it/Servizi/Come-richiedere-il-rilascio-della-certificazione-Marchio-Open.

[28] Appennini for All Website. January 21, 2026. https://www.appenniniforall.com/.

[29] NoisyVision, Website. February 7, 2026. https://www.noisyvision.org.

[30] Greco, A. 2012. "Accessibilità e fruibilità del patrimonio architettonico: Occasioni per una sostenibilità 'sociale' del recupero." *IN_BO. Ricerche E Progetti Per Il Territorio, La Città E l'architettura* 3 (5): 179-202.

[31] Godtman Kling, K. 2024. "Accessible Nature: Balancing Contradiction in Protected Areas." *Environment and Planning E: Nature and Space* 7 (5): 2036-57.