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The Role of E-Bike in Discovering Geodiversity and Geoheritage

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Abstract: This study analyzed the challenges and benefits of the identification and promotion of a long-distance cycleway in high mountain areas with the aim of promoting Alpine eco- and geo-tourism. We also investigated the role of e-biking in discovering local geodiversity and geoheritage in a sustainable way. In particular, we focused on the path from Bormio to the Forni Glacier (Upper Valtellina, Italy), analyzed within the framework of the "E-bike" Interreg project. We performed a detailed analysis to select the points of environmental–geological interest (POIs), with a focus on geoheritage sites to increase the knowledge of the natural heritage of the area. Since these sites are widespread in the study area, within the frame of the "E-bike" project, we selected only the most exemplary ones, covering a wide spectrum of attractions, from a moving geosite (i.e., landslide) to a paradigmatic example of the effects of climate change (glacier). The "E-bike" path represents in its entirety a great opportunity to visit mountain and high-mountain landscapes, even for inexperienced mountain bikers, and to enjoy places rich in naturalistic and cultural values. Our interdisciplinary approach allows visitors to identify the sites of interest and export the structure of the project in different environmental and human contexts.

Keywords: geoheritage; e-bike; landscape; outdoor activities; Central Italian Alps

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1. Introduction

Cycle tourism is an increasing trend in world tourism, with implications both on the economic and social environments [1]. At the same time, cultural tourism is growing, involving natural and human environments [2,3]. In this last frame, geotourism (i.e., tourism that focuses on the geology and landscape of an area to foster sustainable tourism development [4]) is increasing in importance [5]. Geodiversity, geoheritage (sensu [6–8]), and cultural heritage (e.g., [9]) represent a starting point for geoeducation (e.g., [10,11]), which can also be enhanced by geoscience museums [12]. A common thread between geo-cultural heritage and sustainable geotourism is represented by routes, paths, and trails developed for discovering geosites and cultural sites (e.g., [13]). Along these itineraries, some stops should be identified based on the results of recent research on geocultural sites (sensu [14]) supported also by specific thematic maps and cartography [15].

In recent years, electric bicycles (e-bikes) have become one of the fastest growing mobilities [16]. From 2011 to 2019, there was a large increase in the amounts of e-bikes sold (e.g., +475% in Italy, +460% in Austria, +270% in Switzerland, and +440% in Germany) [17].

Moreover, bicycle tourism has started attracting economic and scientific interest, especially in the Alps where it represents an upward trend [18]. In fact, e-bikes offer an interesting supplement to conventional bike tourism [16], opening a new and potentially broader field of vacation activities. As reported in several studies (e.g., [18]), the main factor driving the e-bike tourism was identified as enjoying nature/landscape, implying that e-bikes can also promote geotourism.

Recently, Alpine tourism has generally undergone a constant growth. For example, between 2014 and 2016, arrivals increased by 9.9%, and over 95 million long-stay tourists and 60 million day-trip visitors per year were reached [19]. The growth of tourism entails an increasing demand for leisure and sport activities. In this context, e-bikes can represent a double opportunity. On the one hand, e-bike tourists can reach sites that are not accessible with cars or to untrained people. On the other hand, even if e-bikers move more slowly than cars, they can reach more sites more quickly than hikers. In this way, e-bike tourists can better observe, learn about, and appreciate the landscape with its natural and anthropic features as well as the natural and cultural heritage through a fun and healthy sporting activity. In this context, e-mountain bikes (e-MTB) create more opportunities for tourists compared with those of a normal city e-bike. According to Mitterwallner et al. (2021) [20], e-bike tourists are progressively changing their destinations, thanks to the electric support that modifies the "spatio-temporal riding parameters", i.e., average speed, total distance, typology of climb, and surface. This implies a greater possibility to easily reach higher altitudes, enjoying spectacular landscapes.

However, the accessibility of forests, alpine pastures, and open landscapes for mountain bikes differs significantly among the Alpine countries. While Italy, Germany, and Switzerland opened their forests for mountain bikers, in other countries such as Austria, mountain biking is not allowed on forest roads [18], as mountain biking can appear to be a risk sport (e.g., [21]). Therefore, while e-bikes can be considered a solution towards sustainable tourism and ecotourism [22], there is a significant question concerning the spatial coverage of destinations for different transport modes, given that most infrastructures are primarily car-centric or pedestrianized. Therefore, a new configuration of roads, walkways, and cycle lanes should be planned. Recently, some international scientific projects have been developed to overcome these limits: one example is the "E-bike" project, which implemented a long-distance cycleway through the Italian-Swiss Alps, considering already available routes suitable for bikes.

The "E-bike" project (https://ebike-alpexperience.eu/en/home-en, accessed on 8 February 2023) was supported by the Interreg V-A Italy–Switzerland 2014–2020 Cooperation Program and was included in the axis relative to the Enhancement of Natural and Cultural Heritage, with the specific objective of guaranteeing a greater attractiveness of territories characterized by environmental and cultural resources with common features. The project partners were nine, including Italian regional agencies, associations, and universities, and Swiss agencies and associations. Specifically, the "E-bike" project aimed to guarantee the promotion and conservation of the natural and cultural heritage of the area through the development of a cross-border governance model for tourists and the aggregation of a cluster of services for tourism, of which the e-bike represents the central element. Therefore, the "E-bike" project focused on the increasing presence of tourists in the area, especially tourists who use e-bikes, which allow even untrained cyclists to travel long distances uphill without difficulties. To achieve all these objectives, an e-bike cycle path crossing the northern part of Italy and Switzerland was implemented. Along the "E-bike" path, e-bike tourists can discover a range of natural and cultural heritage sites proposed in the project webpage.

In this study, we described the points of cultural and environmental interest with a focus on geological and geomorphological features, selected within the framework of the "E-bike" project, considering the stretch from Bormio to Forni Glacier (Upper Valtellina, Central Italian Alps, Figure 1), in order to investigate the role of e-bikes in promoting geotourism and in the discovery of geodiversity and geoheritage. We chose this section of the "E-bike" path due to the presence of geoheritage sites (also known as geosites) with different characteristics, from a landslide to a glacier. Moreover, Bormio and its surroundings represent one of the most important destinations for tourism in Lombardy (some places can be enjoyed both in summer and in winter). The area was also chosen from among the most representative landscapes of the Italian territory [23]. The Bormio–Forni Glacier area has an elevation ranging from 1225 m a.s.l. (Bormio) to 3670 m a.s.l. (Mount San Matteo) [24,25]. Our study sites were located in the Ortles-Cevedale area that is geologically heterogeneous, with a close contact between sedimentary and metamorphic rocks [26,27]. In particular, the Zebrù Tectonic Line separates pre-Permian mica schist and paragneiss in the southern area from the Rhaetian dolomite and limestone outcropping in the northern part of the region [26].

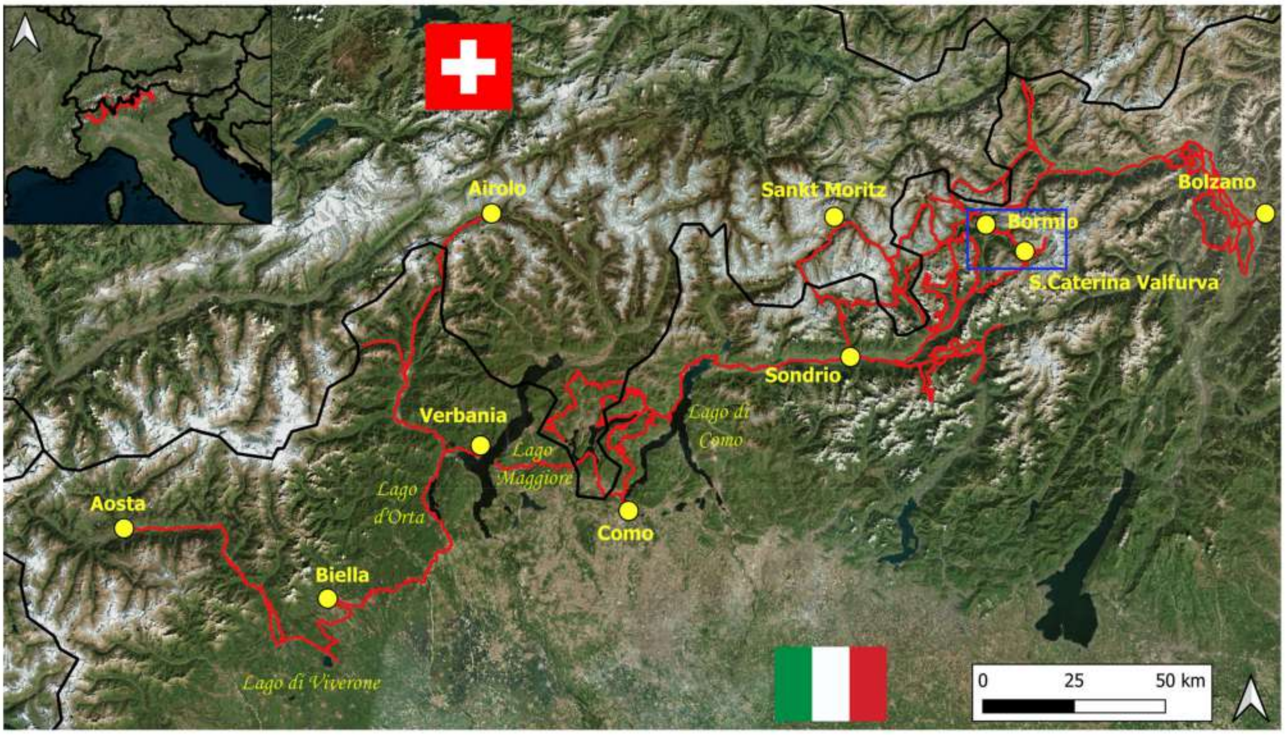

Figure 1. The "E-bike" path (in red). The focus area considered in this study from Bormio to Forni Glacier is shown in the blue box.

2. Methods

The "E-bike" path was designed while considering already available routes in order to cross the whole area of the "E-bike" project (the Italian regions of Aosta Valley, Piedmont, Lombardy, and Trentino Alto Adige, and the Swiss regions of Lugano and Poschiavo).

Along the whole path, some points of cultural and natural interest (POIs) were selected. In the POI selection process, some criteria were considered: (i) almost the entire broad spectrum of natural and cultural POIs should be covered, (ii) each site should be among the most representative of its category, (iii) the largest possible project area should be covered, (iv) a homogeneous number of POIs among the different regions considered in the project overall should be chosen, and (v) the POIs should also be useful for promoting less well-known locations. Once the POIs were identified, a description of each of them was prepared and published in the project webpage.

In order to select and describe the POIs, detailed analyses were carried out. Specifically, we took advantage of both field surveys and GIS cartography (e.g., orthophotos available at the geoportal of the Lombardy Region) for identifying cultural, environmental, geological, and natural values observable along the "E-bike" path.

In this study, we described the natural POIs located in the Bormio–Forni area, focusing on the link between them and the topic of geoheritage and its fruition, both in a traditional way and through e-bike. In addition, a bibliographic study was carried out to provide and update data and knowledge about the use of e-bikes and e-mountain bikes in traditional tourism, geotourism, and cultural tourism and to discuss opportunities and criticism related to e-bike riding.

3. Results

3.1. The "E-Bike" Path

One of the main and tangible outputs of the "E-bike" project was the implementation of a cycle path (Figure 1) along the Italian–Swiss Alps, starting in northwestern Italy (Aosta Valley) and moving eastward, crossing Piedmont to Lake Maggiore. From there, with eco-sustainable crossings, it is possible to discover the Lombardy region, remaining in Italy, or to continue towards the Canton of Ticino and the Lugano area, in Switzerland. Attention has also been paid to signage: the entire "E-bike" path has been implemented with unified signage. For each portion, the possibility to recharge e-bikes is guaranteed at mountain huts, bike hostels, and bike grills distributed throughout the whole area. Moreover, bicycle repair and bike rental shops are available for any kind of assistance. In addition, some professional guides (e.g., environmental naturalistic guides, mountain guides, and mid-mountain companions) are trained to provide technical support to the cyclists and share their knowledge of the natural and cultural heritage of the crossed areas.

3.2. The Analyzed Points of Interest

Along the whole "E-bike" path, about 600 POIs (including geoheritage sites) were identified and described in dedicated project webpages (where written descriptions and audio guides are also available), all situated along the itinerary or near the path. Focusing on the "E-bike" path from Bormio to Forni Glacier (Figure 2), there are several points of cultural and environmental interest. Among the sites of cultural interest in Bormio are the Church of S. Ignazio, Church of S. Vitale, Church of Ss. Gervasio and Protasio, Church of S. Antonio Abate, Podestà Palace, and Combo Bridge; further, sites in Valfurva are the Church of Santissima Trinità and Basilica of the Madonna of Mercy (red points A–I in Figure 2). Sites of environmental–geological–geomorphological interest include a very wide spectrum of attractions such as geoheritage sites, also included in natural reserves. Since all these types of POIs are widespread in the study area, we had to select a few sites so as not to burden the cyclists' journey with countless breaks. We chose only the most exemplary and most-studied POIs: for example, when considering geoheritage, we selected a landslide and a glacier. The former represents a fine example of a moving geosite [28], while the latter is paradigmatic of the effects of climate change [29]. Therefore, we selected Reit Ridge, Ruinon Landslide, "Tresero–Dosso del Vallon" Reserve, Forni Valley, and Forni Glacier (red points 1–5 in Figure 2). Only Reit Ridge and Forni Glacier are currently catalogued as geosites in the provincial and regional inventory of geosites [30]. In the following subsections, we describe in detail these five sites of environmental–geological–geomorphological interest, taking into account the link between geoheritage and eco-geo-tourism (e.g., [31]).

3.2.1. Reit Ridge

Along the "E-bike" path, e-bikers can enjoy the landscape surrounding Bormio and, in particular, the Reit Ridge (point 1 in Figures 2 and 3) and can admire an exemplary site of geoheritage. The Reit Ridge is an important geological element as it is an imposing rocky slope that dominates the northeastern side of the Bormio basin. As reported in [30], from a geological point of view, it is a single, huge outcrop of the Main Dolomite of the Noric Age.

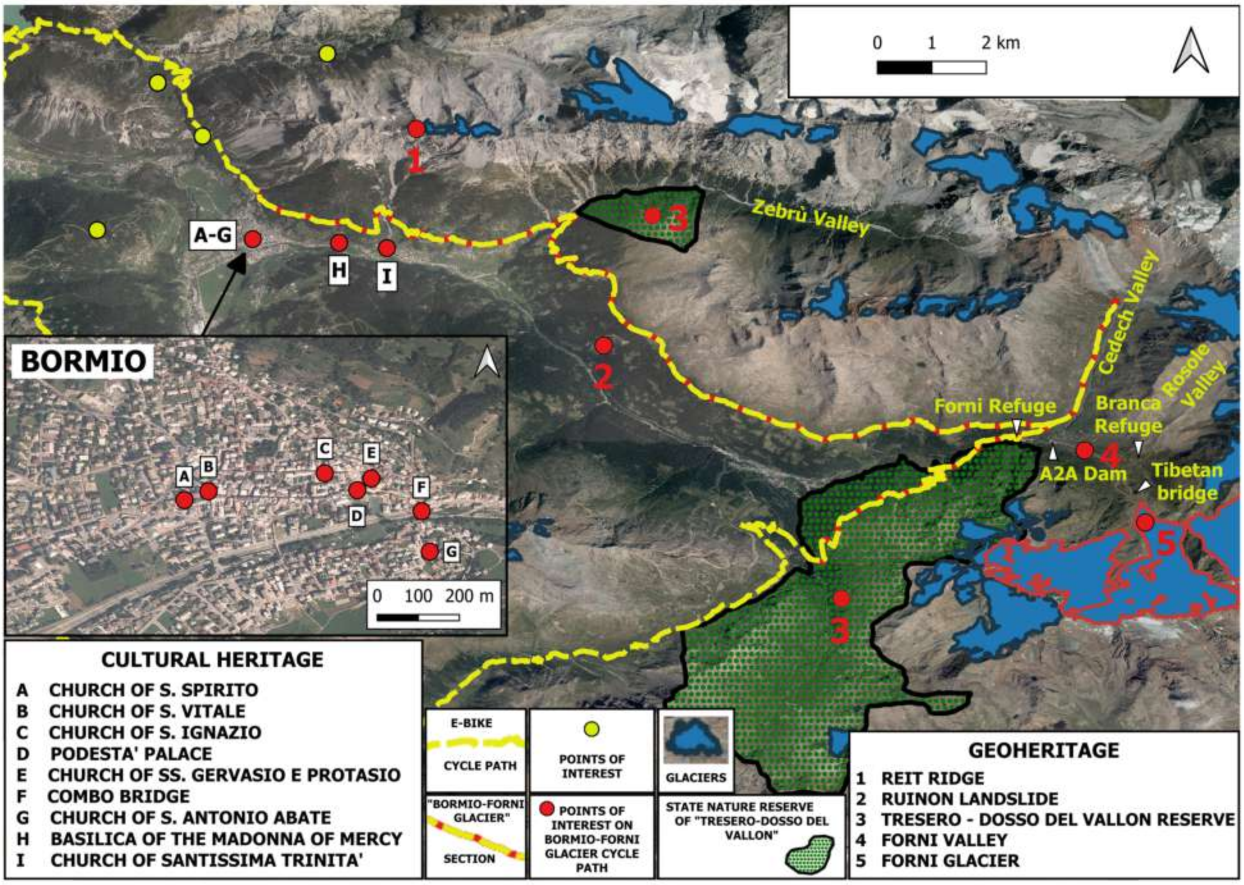

Figure 2. The locations of all the points of interest in the Bormio–Forni area listed in the "E-bike" project (red dots). The ones outside the considered area are shown as yellow dots.

Figure 3. The Reit Ridge (point 1 in Figure 2) (photo credits: Lombardy Region).

Another aspect that can arouse interest in e-bikers is that these rocks, and in particular the stratigraphic and structural aspects, are responsible for the peculiar characteristics of the thermal water of Bormio [32].

Riding along the path, it is also possible to observe the most widespread gravity-induced landforms (i.e., talus and debris flow deposits, e.g., [33]).

Along the e-bike trail, the Reit ridge is visible as a very steep rock wall connected to its lower portion by a gentler slope, on which the Pedemontana trail runs. The Pedemontana trail is an easy path that can be crossed by walking or cycling all year long, except when weather conditions increase hazard scenarios, mainly due to extreme precipitation events that sometimes trigger debris flows.

3.2.2. Ruinon Landslide

Another element of geodiversity is the Ruinon (literally, "huge ruin") rockslide (point 2 in Figures 2 and 4), representing a fine example of a moving geosite [28]. It is one of the most active landslides in the Alpine range [34], and therefore it has been extensively studied (e.g., [35–38]). It is located on the right flank of the steep valley of glacial origin incised by the Frodolfo River.

Figure 4. The Ruinon landslide (point 2 in Figure 2) (photo credits: Lombardy Region).

As reported in several studies (e.g., [39]), since it is currently active and its continuous movements affect an estimated volume of rock of 30 million cubic meters, the Ruinon landslide represents a possible hazard for the valley inhabitants and a threat to socioeconomic activities in the area. If it collapses, it could impact and interrupt the road connecting the well-known tourist resorts of Bormio and Santa Caterina Valfurva, and most importantly, it could dam the Frodolfo stream, with potentially heavy consequences downstream also. In 2019, for instance, several closures of the road between Bormio and Santa Caterina Valfurva were necessary. Since 1996, the Lombardy Region has started monitoring the slope. Currently, a complex detection and alarm network allows for the collection and processing of movement data at a rate of over 900,000 measurements per year, in order to follow the evolution of the landslide and raise the alarm in time before it blocks the road below [40].

The landslide is not directly visible from the "E-bike" path that runs above it, but it can be observed from the opposite valley's slope. By viewing this geological feature, e-bikers can become aware of the fragility of the territory they are crossing and understand how this type of hazard and risk can be monitored.

In addition, the "E-bike" path runs along the tree line limit, a spectacular landscape that also helps to perceive the ongoing upward shift of tree vegetation limits under the changing climate conditions [41].

3.2.3. "Tresero–Dosso del Vallon" Reserve

The "E-bike" path crosses the National Natural Reserve "Tresero–Dosso del Vallon" (points 3 in Figures 2 and 5), where e-bikers can observe a paradigmatic example of bio- and geo-diversity. In fact, one of the objectives of its Reserve Plan is the conservation of all components of the area: fauna, flora, vegetation, geology, hydrology, ecosystem, and landscape. In this way, laypeople can be made aware of the need for the sustainable management of a mountain environment where different aspects of landscape coexist in the same area.

Figure 5. The National Natural Reserve "Tresero–Dosso del Vallon" (points 3 in Figure 2) (photo credits: Lombardy Region).

Moreover, the peculiarity of this site is that it corresponds to scattered sites of interest as they are not localized in a single point, but they are included in a reserve, included in the Stelvio National Park, which covers an area of 30.63 km^2. In addition, according to administrative limits, the reserve is divided into two subunits (there are two points in Figure 2 with number 3). The larger one (28.27 km^2), called "Tresero", is located on the upper right side of Valfurva and extends from the plain of Bormio (1217 m a.s.l.) in a NW–SE direction up to the plain of Santa Caterina (1732 m a.s.l.). The second subunit of the Reserve, called "Dosso del Vallon" (2.37 km^2), is located at the entrance to the Val Zebrù and branches off, on the orographic right, to about half of Valfurva, extending initially in a SW–NE direction (where the Reserve is located) and then turning in a W–E direction. The presence of a reserve distributed inside a National Park allows for highlighting the different legislative constraints and helps e-bikers better understand that a POI can be not only a single point but also an extended and widespread area.

3.2.4. Forni Valley

Crossing the Forni Valley (point 4 in Figures 2 and 6) (from the name of the glacier at the valley head), eco-tourists can appreciate several natural and cultural values.

Figure 6. The Forni Valley (point 4 in Figure 2).

This POI has a great scientific value in terms of geoheritage as it can be considered a landscape view or a complex geomorphosite (i.e., group of landforms related to more than one dominant genetic process, sensu [15,42]). It is mainly composed of glacial landforms that document the ancient and recent glacial history. In fact, glacier fluctuations have been described in detail since ancient times, from the climatic transition 4000 years BP to the Late Glacial period and the upper Holocene, with the identification of a glacier advance around 2800 years BP similar to the maximum of the Little Ice Age, and the following minor advances and retreat up to the annual monitoring of the most recent terminus retreat [43].

Moreover, the scientific and global values are enhanced by tree vegetation that is re-colonizing the glacial foreland and the slopes [44]. In fact, the deglaciated valley, crossed by the Frodolfo stream, is now largely colonized by larches and firs, conferring to such a geomorphosite a relevant ecologic support role. Therefore, other natural aspects have been investigated in order to analyze the impact of climate change on the high mountain environment (e.g., tree line, soils, and melting waters).

In addition, many other values can be appreciated by the e-bikers, such as the historical documentation of the first World War, whose remnants (trenches and huts) are scattered around. Their cultural value is evidenced by the huge volume of literature and iconography and is important for glacier variation reconstruction. Moreover, the educational value is supported by the easy accessibility, by the trails network, and by immersive videos produced in this area [45]. Finally, the economic value is attested to by the huge number of visitors and by the spectacular landscape.

3.2.5. Forni Glacier

In front of Forni Glacier (point 5 in Figures 2 and 7), eco-tourists can observe one of the most representative glacial geosites with a high scientific value. It is known as the “white giant” of the Stelvio National Park. In fact, it is one of the largest Italian glaciers (10.5 km^2, data from 2016 [46]), second in area only to the Adamello–Mandrone complex.

Figure 7. The Forni Glacier seen from the Branca hut (point 5 in Figure 2).

Glaciers can be considered as geoheritage sites, as reported by Pelfini and Gobbi (2005), for example [47]. In fact, glaciers are widely recognized as the best witnesses of climate changes [48], making them of relevant scientific and cultural value. Moreover, they are included on the watch list as degrading natural assets, since they are affected by rapid changes (that a tourist can well appreciate), particularly in the related hazard scenarios. These could have important implications for tourism in glaciated and proglacial areas [49,50]. In fact, here the impact of climate change is particularly evident: the widening of proglacial areas and changes in surface processes (e.g., hydrological, mass movements, etc.) are creating new hazard and risk scenarios for tourists. However, an easier accessibility to the glacier area can also lead to new impacts on flora and fauna [20].

In particular, Forni Glacier is paradigmatic of the effects of anthropogenic activities, as it has retreated by 2 km in 150 years due to the increase in air temperature. Another consequence of climate change is the well-known and global-darkening phenomenon as the supraglacial fine debris cover is expanding, especially on the glacier tongue [27,51]. In addition, it can be considered an archive of chemical data regarding air and water quality as it stored all the pollutants (e.g., DDT and VOC emitted even from very distant sites) and macro- and micro-plastics [52]. Finally, its scientific value is enhanced by the presence of the first supraglacial automatic weather station that, since 2005, has been acquiring crucial meteorological data to assess meltwater release and glacier conditions [53,54].

In addition, tourists can easily observe, at safe distance, large crevasses (i.e., fractures in the glacier body) and ogives (i.e., folds of white ice alternating with gray and blackish ice). These are fragile and ductile deformations, clear evidence that Forni Glacier is not a static element in the landscape but moves a few tens of meters a year [27,55].

The whole area of the glacier tongue and, above all, of the terminus represents one of the best Alpine examples of the transition from a glacier system to a paraglacial one (sensu [56]), characterized by an intense reworking of the glacier debris by the meltwater and gravity [49]. In the areas surrounding the tongue, eco-tourists can observe the changes in the glacial foreland: widening of the deglaciated area, the characteristics of the glacial stream, and the tree colonization [57]. Moreover, they can notice the moraine systems deposited by the previous expansion phases, in particular that of 1965–1985 with very evident ice cores, which originate phenomena of instability such as mud flows and debris flows, dominated by the imposing lateral moraine, often sharp, of the Little Ice Age, with pseudo-badland forms of erosion [58].

From the geo-cultural heritage point of view, the huge amount of glaciological and naturalistic data confirms the scientific value of Forni glacier. The cultural and historical attributes again focus on the anthropic remnants that frequently emerge from the shrinking glacier and on cultural elements coming from arts and literature.

4. Discussion

The geodiversity of a region is also highlighted in specific geodiversity sites (sensu [59]), which, if characterized by a relevant scientific value, could be labelled as geosites becoming object of protections and also promotion, as elements of the geoheritage. Geoheritage sites, in particular in situ features, can become precious georesources of a territory.

The ways to connect geoheritage sites within a region can be different depending on the aim of the travel: by car, to get to a specific site and then move rapidly to another; on foot, if specific geotrails have been equipped to link sites only along, for example, mountain trails [13]; and by bike, which can be considered an in-between type of mobility. All these specific forms of tourism may be considered in the framework of geotourism. The discrimination among such practices, according to [60], could be related to the preference towards sustainable forms of geotourism, considering also the actual impacts of such activities on the geoheritage and on the ecosystems of geotourism areas (e.g., [61]). Pickering et al. (2010) [62], for example, observed for Australian study sites that different mountain bike riding styles (cross country, downhill, free, and dirt jumping), equipment, destinations, and slope characteristics, especially steepness, involve different impacts and related severity.

Moreover, the identification of virtuous forms of management of geotourism practices and the involvement of stakeholders and local communities represent another challenge [44].

Considering bikes as a form of sustainable means of transportation, in the view of geotourism, recent proposals have been made based on the use of bikes [63,64]. Escher et al. (2014) [64] underlined how, among the main goals of sharing best practices and experiences among the geoparks participating in networking projects, there is a specific point for addressing sustainable mobility based on the use of public transportation or bikes, and the specific case of the e-bike, for which specific services should be granted (e.g., charging infrastructures).

Focusing on our study area, the geoheritage sites located along the analyzed "E-bike" path can be visited in different ways, sometimes by car, in other locations only by walking and by bike. Using e-bikes and e-mountain bikes allows tourists to enjoy beautiful landscapes while reaching them with little effort and in an ecofriendly way.

The "E-bike" path crosses different types of trails and routes characterized by various widths, steepness, and surface materials and passes through forests, grasslands, and bare soils at the higher altitudes, highlighting the need to inform e-bikers about possible situations of risk and difficulties in travelling along the itineraries [65,66]. As the "E-bike" path was designed using existing trails, no new infrastructure affects the valley slopes. Moreover, modestly steep sections are present, and this reduces the possibility of increased erosion; the latter is also limited by the low velocity at which the e-bikers move.

Moreover, the "E-bike" path allows travelling along other routes and observing further geomorphological sites of interest (e.g., the nearest valleys as Val Zebrù, Valle di Cedech, and Rosole Valley, crossed by hiking trails and characterized by a meaningful glacial landscape, as well as interesting ecological aspects, Figure 2). Moreover, the local trail network permits tourists to come back on the opposite valley's slope. In this way, the proposed geoheritage sites can be observed from different point of views, as in the example of site 2 in Figure 2 (Ruinon landslide).

Finally, the tourism facilities suggest some deviations that allow tourists to admire more in detail the upper portion of the valley, as in the case of Forni Valley (point 4 in Figure 2). Here, for example, e-bikers can reach the Branca hut through different trails or through the dirt road also used by off-road vehicles and admire the Forni Glacier more closely (point 5 in Figures 2 and 7). To visit the Forni Valley and reach the proglacial plain, it is in fact possible to climb from the driveway that connects the Forni Refuge (at 2100 m a.s.l.) to the Branca Refuge (at 2493 m a.s.l.) and from there take a well-marked path, on foot, that through a spectacular Tibetan bridge will lead to the terminus of the glacier (Figure 2). Alternatively, the lower glaciological itinerary starts from the A2A dam (Figure 2) and continues along the Forni stream in the long deglaciated valley [67]. This second possibility allows tourists to better appreciate the naturalistic peculiarities of the area along a path not accessible to Jeeps and off-road vehicles. A third possibility is the high glaciological trail, where it is possible to enjoy an even more spectacular view, meet the remnants of a ruin of the fortifications built during the First World War, and appreciate morphological details such as roches moutonnées.

5. Conclusions

The “E-bike” project is an example of a project that aims to allow even unexperienced and untrained tourists to get closer to local geodiversity, geoheritage, and cultural heritage in a sustainable way. Thanks to this project, it is possible to discover a hundred sites of cultural and environmental interest, with a focus on geological topics. In fact, the territories crossed by the “E-bike” path are rich in geodiversity, biodiversity, and cultural elements, including both tangible and intangible goods. To discover and learn about all these treasures, audio guides are available, to listen to while cycling, for example, or online written descriptions, to be read before leaving in order to better organize the tour. In this way, this approach shows the strict link existing between outdoor sports and educational opportunities. From an educational point of view, the analyzed path highlights also that a point of interest is not necessarily localized in a single point but can also be scattered in a wider area (as in the case of “Tresero–Dosso del Vallon“ reserve).

In summary, the “E-bike” path represents a great opportunity to visit and enjoy the mountain landscape, even for inexperienced bikers. The path route winds through places rich in naturalistic and cultural values, and the project set up allows visitors to implement knowledge from different disciplines of academic research. The interdisciplinary approach allows visitors to identify the sites of interest and export the structure of the project in different environmental and human contexts. This in turn contributes not only to the valorization and promotion of different regions but also to an increased understanding of the landscape and its evolution in relation with natural changes, especially climate change, human impact, history, and activities.

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