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Kranjska Gora Pilot Action Region: Environmentally-Friendly Construction of the Planica Nordic Centre

Jurij Beguš, Janez Mertelj and Samo Škrjanec

Abstract

The Municipality of Kranjska Gora was chosen as a Pilot Action Region (PAR) due to its location in the Slovenian Alpine area, its extensive forest cover and its important role in tourism and sport activities. As an example of best practice in the implementation of ecosystem-based risk management, the environmentally-friendly construction of the new Nordic center in the Planica Valley is presented, with an emphasis on the role of various stakeholders in the fields of forestry, environmental protection and natural hazard management. The article also presents the forest and forestry in Slovenia and in the PAR, as well as the role of protective forests and other forest functions.

Keywords: protective forest, protective function, forestry, sport centre, cooperation, environmentally-friendly construction

1. Introduction

Several factors contributed to the selection of the Municipality of Kranjska Gora as a PAR area within the GreenRisk4Alps project. The municipality lies in the central area of the Slovenian Alpine region with distinct valleys and steep slopes. The majority of the area is covered with forests, many of which are protective forests that protect buildings and goods against various natural hazards. As one of the main activities in the municipality, tourism is closely connected to forests and their functions. As the host of world-class events, the municipality is also strongly represented in various sport activities, particularly Alpine skiing and Nordic sports.

As an example of good practice related to forest, the environment, tourism, sport and natural hazard management, the world-famous Planica Valley with its newly built Nordic centre was chosen. The centre represents the logical continuation of almost a century of sport and tourism activities in this environmentally sensitive area, where forest, particularly protective forest, plays an important role. Several decision-makers were involved in the siting of the new centre, each of whom contributed to the successful completion of the task from their respective field of expertise.

2. Description of the Kranjska Gora PAR

2.1 General data

The Municipality of Kranjska Gora lies in the northwest of Slovenia, in the three-border area of Austria, Slovenia and Italy, at the foot of the Julian Alps and the Karavanke range, in the narrower area of Triglav National Park, and almost entirely covers the so-called Upper Sava Valley area. It was established as an administrative unit in 1995. It covers 256 km² and has about 5,200 inhabitants. The central settlement in the municipality is the village of Kranjska Gora, which dates back to the 14th century; it is the municipal centre and the largest settlement of the Upper Sava Valley (**Figure 1**).

Kranjska Gora is a world-famous winter sport centre [1]. Every year, it hosts the Alpine Ski World Cup on the ski course in Podkoren, and in Planica, it hosts the Nordic Skiing World Cup (ski flying, cross-country skiing) and several other sporting events. In addition, due to its favourable location and rich tourist offer, it is a popular destination for hikers, cyclists, adrenaline enthusiasts, nature lovers and other visitors.

Besides tourism and related activities, other important economic activities include agriculture (livestock breeding, pastoralism and the production of milk and milk-based products), forestry, the timber industry and craft activities (service activities, construction, etc.) [2].

The area of the Municipality of Kranjska Gora is characterised by varied relief with steep slopes, which means that there is a high risk of rapid and intensive natural processes of displacement of materials that could cause material damage to infrastructure, residential and commercial facilities. Many such facilities are situated in the municipality, i.e. roads, cycling trails, mountain trails, ski courses, ski jumps, settlements and hotels, to name just the most important. Due to tourism, these natural risks further endanger human lives, and therefore the municipality is constantly looking for innovative approaches to mitigate these dangers.

Climatologically, the municipality lies in the alpine climate zone. This climate is characterised by long and snowy winters and short, relatively cool summers [2].

The beginnings of tourism date back to 1904. Summer tourism, such as hiking and mountaineering, developed first, followed by winter tourism during the period



Figure 1.
Ski resort in Kranjska Gora (photo: Jurij Beguš).



Figure 2.
The Jasna recreation area near Kranjska Gora is a popular recreational and vantage point (photo by Jurij Beguš).



Figure 3.
The Peričnik waterfall (photo: Jurij Beguš).

between the two world wars. This included sledding, skiing and ski jumping in Planica. Besides the already mentioned Planica Valley, the main tourist attractions are the road over the Vršič Mountain Pass with the Russian Chapel, Zelenci (the source of the Sava Dolinka River), the Peričnik Waterfall in the Vrata Valley, the Martuljek Waterfalls, Lake Jasna, the Ajdovska Deklica (Pagan Girl) (a natural feature), the Slovenian Mountain Museum in the village of Mojstrana, and the summit of Tromeja (three-boarder point) on the border with Austria and Italy (**Figures 2 and 3**).

2.2 The main issues and activities in dealing with natural hazards

The area of Kranjska Gora is highly diverse due to various ecological and geomorphological factors. It is a distinctly mountainous area with the Karavanke Mountains in the north (dolomite rock base) and the Julian Alps in the south

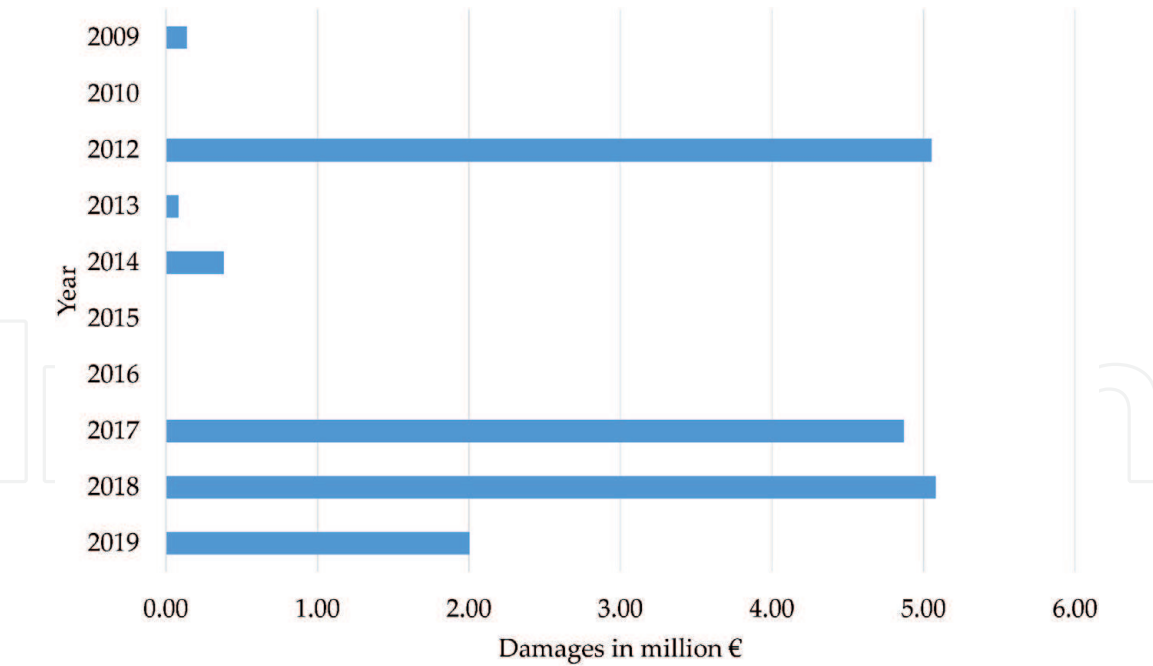


Figure 4. Damage (in euros) to infrastructure in the PAR caused in the last decade, mainly by storms and wind [3].

(limestone rock base), separated by the flat land of the Sava Dolinka River valley. Due to the steep slopes and high precipitation (1628 mm/year, 2007–2016), the most common natural hazards are torrential riverbeds. Problematic areas can be found throughout the area of the Karavanke Mountains and the Julian Alps. Here, due to material slippage and heavy rainfall, material, which often derives from erosion hotspots, moves along the riverbed and threatens lower settlements and infrastructure. The frequency and economic impact of extreme weather events have been increasing in the past decade (**Figure 4**). Windthrow events, often followed by bark beetle outbreaks (including at higher altitudes), and floods are becoming more frequent. Landslides and rock-falls are particularly dangerous and threaten public and forest roads. In the winter, they are accompanied by avalanches due to the large amount of snow and the long-lasting snow cover.

In addition to technical measures (concrete walls, flood barriers, avalanche galleries, snow protection devices, snow bridges), biotechnical measures in protective forests (preservation of high tree stumps, preservation of fallen trees at a certain angle to the slope, afforestation) have proven to be effective (**Figure 5**).

In the case of extreme events, the Municipality of Kranjska Gora has the authority to activate the Civil Protection Headquarters, which leads the intervention. The Civil Protection Headquarters activates the local fire brigades and subcontractors operating in the field of forestry and infrastructure. Operating within the Municipality of Kranjska Gora is the Kranjska Gora Public Utility Services, which has pre-prepared intervention means and materials for taking quick action (sand, anti-flood bags, rocks, boards, square cross-section timber), and subcontractors are determined in advance (contracts). The intervention system is set up and functions very well. The action follows the already established scheme “prevention – preparedness – response – intervention – restoration”.

2.3 Forest and forestry

In order to obtain a clear picture of forests and forestry in the Kranjska Gora PAR, it is necessary to present some basic facts about forests and forestry for the country as a whole (**Figure 6**).



Figure 5.
System of torrent barriers on the Suhelj torrent (photo: Jurij Beguš).

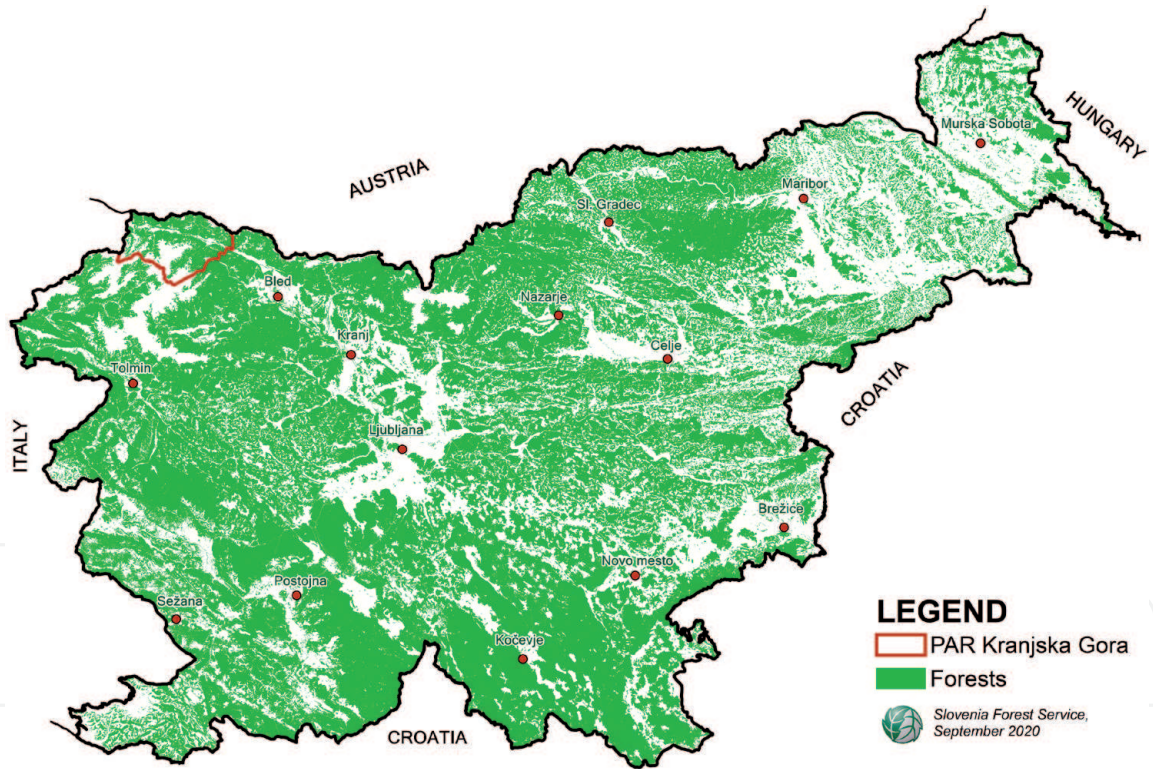


Figure 6.
Slovenian forests and the location of the Kranjska Gora PAR [4].

2.3.1 Forests and forestry in Slovenia

Slovenia is one of the most forested countries in Europe. More than 1.1 million hectares of forests cover more than half (58%) of its territory [4]. There exist more than 70 different forest types in the county, but most forests lie within beech, fir-beech and beech-oak forest sites (70%), which have a relatively high production capacity [5].

Forest management in Slovenia is regulated by the Forest Act [6] and the Slovenian National Forest Programme (SFNP) [7], a fundamental strategic

document. The protection function of forests is part of all the main legislation. The Slovenian SNFP contains, among other things, the main strategies for maintaining and strengthening the role of protective forests. Forest management in all forests, irrespective of ownership, is committed to respecting three main principles: sustainability, the close-to-nature concept, and multi-objective forest management. The main tool for the implementation of these principles is the forest management planning system, using a participatory process to address the relevant public (forest owners, municipalities, different organisations, the public). Increasing demands for a vast array of ecosystem services have emphasised the importance of multi-objective forest management. As a solution, the integration model of multi-objective forest management has been practiced, and represents an important management tool to implement the concept of forest functions [5].

According to data on forests collected by the Slovenia Forest Service [4], the growing stock of Slovenian forests amounts to 357 million m³ or 303 m³ per hectare. Coniferous trees account for 45% and deciduous trees for 55% of the growing stock. The annual increment is 8.8 million m³ of wood per year or 7.5 m³ per hectare. In recent years the annual cut in Slovenian forests has totaled between 5.0 and 6.3 million m³ of trees.

In Slovenia, 76% of forests are privately owned, 21% are owned by the state and 3% are owned by local communities. Private forest estates are small, with an average area of only 3 ha. They are typically fragmented into several separate plots and are becoming even more fragmented as the number of forest owners is increasing. According to the latest data, there are already 413,000 forest owners in Slovenia [4].

In addition to damage caused by weather (wind, ice, snow), Slovenian forests have recently been threatened by insects (mainly bark beetles), which are the most common reason for sanitary cutting. On average, sanitary cutting ranges from more than 50% to as much as 70% of the entire annual cut.

2.3.2 Forests and forestry in the Kranjska Gora PAR

Forests represent the most extensive and important landscape category in the PAR (**Table 1**), as forest cover more than half of the area. Due to the alpine conditions, protective forests account for 45% of the entire forest cover in the PAR, which is relatively high compared to typical Slovenian conditions.

According to ecological and vegetation conditions, beech forest types predominate. **Table 2** presents the share (as a percentage of the total forest area) of the most important forest types, based on European forest types [10], among managed and protective forests.

	Surface area (ha)	Share of the surface area of the municipality (%)
Area of the municipality	25,631	
Commercial forest	7,926	31
All forests (forest and other forest areas)	14,578	57
Protective forests	6,652	26

Table 1.
Share of forests in the Kranjska Gora PAR area [8, 9].

Forest type	%
Managed forests	
3.1 Subalpine larch-arolla pine and dwarf pine forest	4
3.2 Subalpine and montane spruce and montane mixed spruce-silver fir forest	6
3.3 Alpine Scots pine and black pine forest	3
5.8 Ravine and slope forest	1
6.4 Central European submontane beech forest	10
6.4 Central European submontane beech forest	2
7.4 Illyrian montane beech forest	74
12.1 Riparian forest	1
Protective forests	
3.1 Subalpine larch-arolla pine and dwarf pine forest	25
3.2 Subalpine and montane spruce and montane mixed spruce-silver fir forest	1
3.3 Alpine Scots pine and black pine forest	9
6.4 Central European submontane beech forest	3
6.4 Central European submontane beech forest	1
7.4 Illyrian montane beech forest	61
8.8 Other thermophilous deciduous forests	1

Table 2.
The share (as a percentage of the total forest area) of the most important European forest types – managed and protective forests [9–11].

Although beech forest types predominate, and consequently beech is expected to be the predominant tree species, the leading tree species is still spruce, which is more or less due to a historically conditioned approach to forest management. Spruce accounts for more than half of the growing stock, followed by beech and larch (**Figure 7**).

Most forests are privately owned. The average estate totals 15.8 hectares, which is far above the Slovenian average. In turn, this means that guidance and forest management is easier to implement and more economical here. Forest owners are responsible for forest management (**Table 3**).

Wood production takes place mainly as manual felling and tractor harvesting, while in steeper areas, cable logging is performed (**Figure 8**). Forestry infrastructure, forest roads and skid trails are adapted to these methods.

The average growing stock in the PAR forests totals 373 m³/ha, and the average increment totals 7.4 m³/ha. The majority of the growing stock consists of conifers (69%) (**Table 4**).

Forest management guidance is prescribed by forest management plans for all types of properties (private, state-owned, municipalities), which is the task of the Slovenia Forest Service. Forest management planning is also an important tool which enables the transfer of scientific knowledge into everyday use. Thus, models and maps developed in the framework of scientific research are included in forest management plans. For example, models for determining protected forest areas prepared within the GreeRisk4Alps project and management strategies for protected forests are included in forest management plans. Furthermore, the results

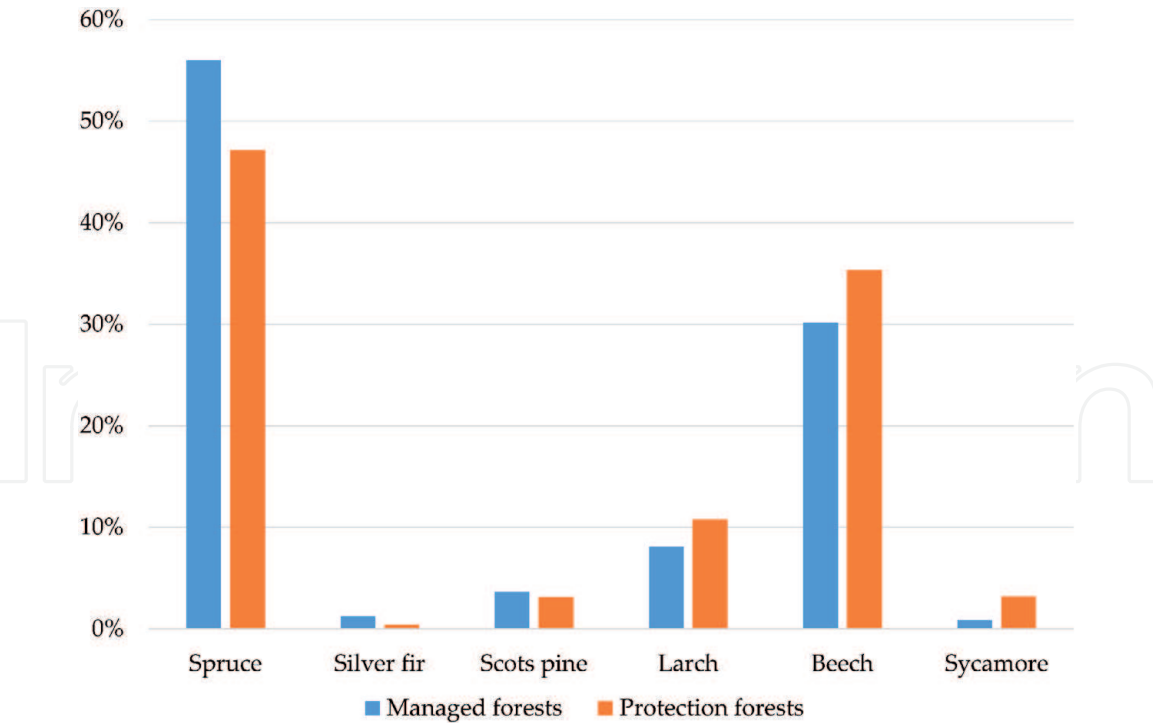


Figure 7.
Shares of the main tree species (%) in the total growing-stock – Managed and protective forests [9].

	Ownership			
	Private	State	Local community	Total
Forest area (ha)	13,300	1,193	85	14,578
Share (%)	91	8	1	100

Table 3.
Forest area in the Kranjska Gora PAR by form of ownership [8].

of research and guiding principles from forest management plans are transferred to the operational level to reach all interested parties.

2.3.3 Natural hazards and forest protection in the light of climate change: Kranjska Gora PAR

Records on the annual cut (regular cut, sanitary cut, ...) for the period 1995–2019 show that until 2003, the share of the regular cut was between 90% and 70%. In 2003, the sanitary cut due to windthrow amounted to more than 40% of the annual cut. Later, in the period 2008–2011, the sanitary cut increased due to a bark beetle outbreak in the aftermath of a windthrow (**Figure 9**).

Major disturbances in the forests continued in the Kranjska Gora PAR with a massive amount of trees felled and damaged by an ice storm in 2014, which was followed by bark-beetle infestations and windthrows. This increased the sanitary cut up to almost 80%. The effects of climate change are clearly visible after 2014, and this has greatly affected forest management in the PAR (**Figure 10**).

2.3.4 Forest functions/ecosystem services in the Kranjska Gora PAR

In Slovenia, multi objective forest management following an integrative approach is applied, and forest functions are used as a main tool. The Slovenian



Figure 8.
Cable logging (photo: Jurij Beguš).

Forest category	Area (ha)	Growing stock (m ³)			Increment (m ³ /year)		
		Conifers	Broadleaves	Total	Conifers	Broadleaves	Total
Managed forests	7,926	2,055,547	973,750	3,029,297	34,670	16,068	50,737
Per hectare		259	123	382	4.4	2.0	6.4
Forests with special purposes ¹	567	53,954	32,760	86,714	710	470	1,180
Per hectare		95	58	153	1.3	0.8	2.1
Protective forests	6,085	706,850	455,147	1,161,997	9,460	8,269	17,730
Per hectare		116	75	191	1.6	1.4	2.9
All forests	14,578	2,816,351	1,461,657	4,278,008	44,840	24,807	69,647
Per hectare		193	100	293	3.1	1.7	4.8
%		66	34	100			

Definition from the Slovenian Forest Act (Section 44):
Forest in which there is a special emphasis on the research function, hygiene-health function or the function of the protection of natural and cultural heritage;
Forest in which there is a special emphasis on the protection, recreation, tourist, educational, defence or aesthetic functions;
Forests in areas that have been declared natural features of interest according to the regulations on the protection of natural heritage.

Table 4.
Basic forestry data for the Kranjska Gora PAR [8, 9].

Forest Act defines 17 forest functions classified into social, ecological and productive functions. The importance of each function is ranked according to three levels: in the first level, the function determines the management regime; in the second level, the function influences the management regime; and in the third level, the function has no significant influence on the management regime. Two forest functions are closely connected to the protective role of forests: 1)



Figure 9.
Bark beetle attack close to the village of Mojstrana (photo by J. Beguš).

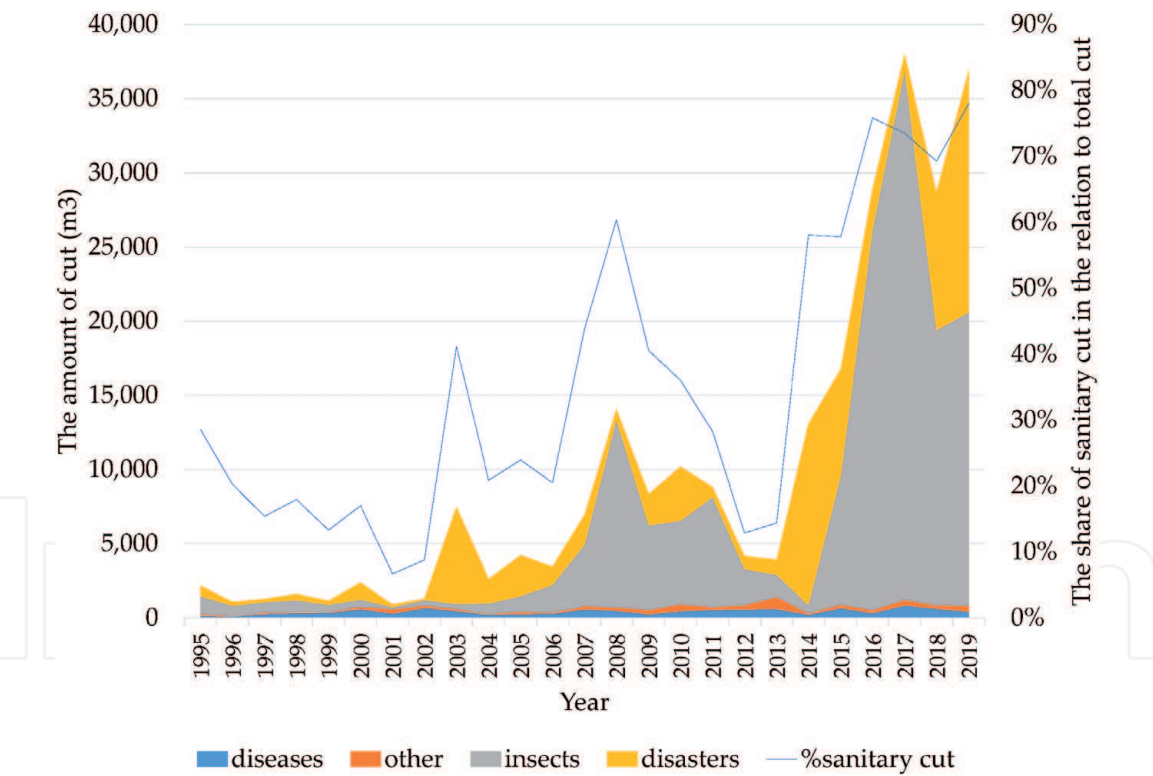


Figure 10.
The amount of sanitary cut in the Kranjska Gora PAR by year [4].

protecting forest soil and stands, hereafter the “indirect protective function”, and 2) protecting people, assets and properties, hereafter the “direct protective function”. Additionally, forests that during extreme ecological conditions protect themselves, the surrounding site and the land below them, as well as forests with a significant role in any other ecological function (e.g. biodiversity conservation function), are declared by the Forest Decree as a special category of “protective forests”. The majority of forests with indirect or direct protective functions are included in this category [8].

In the Kranjska Gora PAR area, many of the functions and interests that need to be considered in forest management are intertwined. In terms of area covered, ecological functions are the most extensive, followed by production and social functions. Among the ecological functions with the first level of importance, the largest area is covered by the function of the protection of forest lands and forest stands, which is set at almost 70% of the forest area, and the function of biodiversity conservation, which is set at 17% of the forest area. The hydrological function has the first level of importance at 12% of the forest area. Among the social functions with the first level of importance, the function of the protection of natural values predominates with 47% of the forest area. This is followed by the recreational function and the research function [7].

2.4 Promotional and extension activities dealing with protective forests

Through promotion and extension activities, relevant stakeholders in forestry are addressed to make sure they are well and properly informed about the importance of the protection functions of forests. To achieve this, different ways of extension (direct contact or at a distance, individually or in groups), different methods (counselling, workshops, training, etc.) and all possible information and education channels (media, internet, training, lectures, etc.) are used. Thus, two main goals are achieved: 1) the content of the statutory regulations and policies in the forest management plans has to be transferred to the stakeholders and 2) scientific results are transferred to users.

A good example is the workshop on “Forestry Operations in Protective Forests with an Emphasis on Rockfall Areas”, which was developed under the RockTheAlps project (November 2016 – October 2019) and is also part of dissemination activities under the GreenRisk4Alps project in Slovenia. The main goal of this workshop is to transfer scientific results and legal policy to those who need such knowledge in their everyday activities – knowledge about rockfall problems, the importance of the protective role of forests in Alpine space, and knowledge about the management of such forests, with an emphasis on performing forestry operations. The workshop consisted of a theoretical and a practical part (in the field) and is a part of the extension activities of the Slovenia Forest Service.

3. The new Planica Nordic Centre – An example of good practice in the Kranjska Gora PAR

The valley of ski jumps, as Planica could be called, lies near the settlement of Kranjska Gora in the extreme west of the PAR area and has been the scene of Nordic sport activities at the highest international level for almost a century. At the end of the last century, sport facilities in Planica became somewhat outdated and dilapidated, and it was not easy to follow the requirements of modern sport. In the year 2000, the decision was made to reconstruct and upgrade the existing facilities with the new Planica Nordic Centre (hereafter “Nordic Centre”) and to modernise the implementation of existing activities and supplement them with new ones. Today, the offer not only includes ski jumping, but also cross-country skiing, and both activities can be carried out throughout the year (**Figure 11**) [12].

The reason that the construction of the Nordic Centre was chosen as an example of good practice in the Kranjska Gora PAR lies in the fact that the construction in all its phases was carried out in an environmentally-friendly way. The Nordic Centre investors were well aware that without proper cooperation with various stakeholders and institutions, they would not be able to carry out this task successfully. In doing so, it was necessary to respect Slovenian legislation, which is very strict with

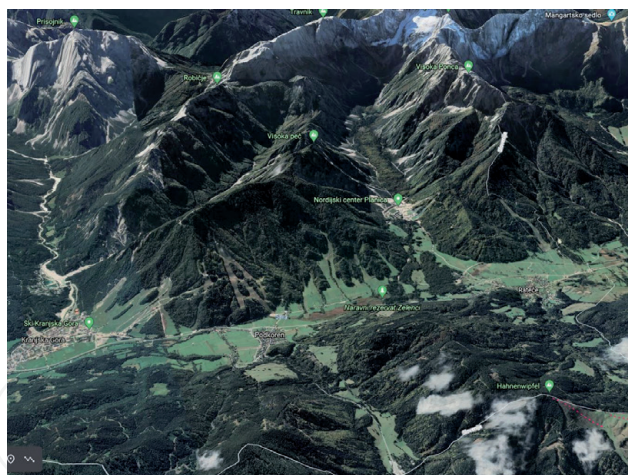


Figure 11.
The location of the Planica Valley [13].

respect to nature interventions. Such an intervention as the construction of the Nordic Centre has an impact on the forest, on other natural values, on the water regime with an emphasis on the regulation of torrents, and on the aesthetic image of the natural environment. With the right approach to the planning and construction of the Nordic Centre, the above have not been affected, the impacts of natural hazards have not increased, forest functions have been preserved, and that the Nordic Centre is very well positioned in the landscape.

3.1 General information

The Planica Valley is a typical glacial valley in the northwestern part of the Julian Alps. It is approximately seven kilometres long and stretches from the settlement of Rateče to the “Dom v Tamarju” mountain hut. Except for the village of Rateče, the valley is surrounded by mountains. The varied valley bottom of the Planica Valley is covered by glacial moraines and screes that are swept away by torrents. In the lower part of the valley, the forest is intertwined with hayfields. The upper part of Planica is dominated by forests.

At the beginning of the central part of Planica Valley, at the foot of the Ponce mountain group, a series of Planica ski jumps are the most important facilities of the Nordic Centre. The border of Triglav National Park, the only national park in Slovenia, runs just above these jumps. In the winter, the lower part of the valley is interspersed with regulated runs for cross-country skiing and walking.

3.2 History

Already in 1926, cross-country skiing competitions were organised in Planica. The valley was becoming a popular destination for tourists and nature lovers, and the ideal conditions for winter sports activities attracted an increasing number of athletes, which gave birth to the idea of a modern ski jumping and cross-country skiing centre. This was made possible by favourable winter conditions and the proximity of the railway line, which led to the inauguration of a modern and year-round supplied guesthouse in 1931.

Based on Stanko Bloudek’s¹ plans, the Bloudek Giant ski jumping hill in Planica was built in 1934. Even then, the first of many world records was set on the hill.

¹ Stanko Bloudek (11 February 1890–26 November 1959) was a Slovenian aeroplane and automobile designer, sportsman and sport inventor, designer, builder and educator.



Figure 12.
The forests are also important for wind protection (photo: Jurij Beguš).

In 1936, the ski jump was enlarged, and the first man jumped beyond the magical 100 m mark. Thus, Planica became the cradle of ski flying. In 1969, a new, larger ski jump was built based on the plans of the Gorišek brothers², and in 1994 the 200 m mark was eclipsed. Despite the centre's worldwide fame, the dilapidation of some of the facilities led to the persons responsible considering a thorough renovation and establishment of a modern Nordic sports centre in Planica.

3.3 Forests and natural hazards in the Planica Valley

The forests in the area of the Nordic Centre and in the entire Planica Valley have, in addition to their production role, other functions that are very important for the operation of the Nordic Centre. One of the most important is the protective role of the forest, which is significant around the Nordic Centre due to the protection of buildings and structures against rockslides and falling rocks, avalanches, torrents and water erosion. These are also the most important natural hazards in the vicinity of the Nordic Centre.

The forests in the vicinity of the Nordic Centre are also important for wind protection, which is crucial for the implementation of competitions and for carrying out training on the ski jumps, especially the giant Planica ski jump. The forest creates an extremely important microclimate with favourable wind and thermal conditions (**Figure 12**).

The aesthetic function of the forest is also very important, as the forest irreplaceably complements the beautiful backdrop of the structures themselves and the entire valley.

Therefore, it is even more important that this landscape component was taken into account as much as possible in the construction of the Nordic Centre and that the forest was encroached upon with filigree precision (**Figure 13**).

² Janez Gorišek (born September 13, 1933) and Vlado Gorišek (4 January 1925–2014 June 1997) were Slovenian civil engineers, builders and architects. Their work consisted mainly of the design and construction of ski jumping and ski flying hills worldwide.



Figure 13.
The view of the forests towards mount Jalovec above the Planica Valley (photo by J. Beguš).

3.4 The construction process of the Planica Nordic Centre

The central idea in the construction of the new Planica Nordic Centre was to modernise the sports centre to bring it in line with international standards, which would benefit sports, the state and the municipality, as well as the local population. The idea was to establish a one-stop-shop centre for Nordic disciplines, i.e. ski jumps, cross-country skiing tracks and a covered training centre which would allow the use of the facilities throughout the year, as well as the possibility of recreation and entertainment for other visitors.

The necessary steps were (1) to develop a conceptual plan and apply for European funds; (2) to purchase the land; (3) to adapt the relevant legislation; (4) to establish fair cooperation between the municipality and the local population; (5) to invite all stakeholders – formal and informal – to cooperate; (6) to establish a construction committee; (7) to hold an architectural competition and select the appropriate solution; (8) to obtain all necessary consents and guiding principles from the relevant stakeholders – nature conservation, water protection, forestry, municipality, Triglav National Park, etc.; (9) to carry out construction; and (10) to put the Nordic Centre into operation.

The first activities related to the construction of the Nordic Centre began in 2007, namely with the purchase of land by the Government of the Republic of Slovenia. The Municipality of Kranjska Gora played an important role in this, transferring its land to the state free of charge, thus giving the signal to other landowners that it supported the idea and the project, and thus enabling the purchase of land to take place fairly smoothly. The municipality has actively participated in other ways and is still an important partner of the Nordic Centre. When the Planica Nordic Centre Act was adopted, the foundations were laid for the Planica Institute (established within the framework of the said Act) to prepare all the relevant documentation and apply for funding from the EU Regional Development Fund.

As a coordination body for the construction of the Nordic Centre, a special committee was established, consisting of experts from various fields from the Ministry of Education, Science and Sport; the Planica Institute of Sports of the Republic of Slovenia; and the Ski Association of Slovenia. The committee made a significant

contribution to improving the programme and the implementation solutions developed through the architectural competition. A representative of the ministry took care of the financing from the European Regional Development Fund, while the management of the investment and later the management of the new infrastructure were entrusted to the representatives of the Planica Institute of Sports of the Republic of Slovenia.

3.4.1 Legal framework and institutional involvement in the planning and construction process

For the purposes of the construction and management of the Nordic Centre, the Government of the Republic of Slovenia adopted a special Planica Nordic Centre Act (in 2010), which further determines the area and management of the Nordic Centre and the implementation of the spatial interventions necessary for its construction. In 2000, the Municipality of Kranjska Gora adopted the ordinance of the management plan for Planica and in 2012, the ordinance on amendments and supplements to this plan. The management plan is a spatial implementation act, which determines in more detail the criteria and conditions in terms of function, design, infrastructure and protection for regulating and equipping the area in question, and which is the basis for issuing a building permit. Individual articles stipulate the regulation of torrents in the forests alongside the ski jumps, the protection of areas against erosion, the protection of natural heritage and environmental protection.

Based on Slovenian legislation, the following institutions were involved (as approving bodies responsible for forestry, water and nature protection) in the process of constructing the Nordic Centre:

- The Institute of the Republic of Slovenia for Nature Protection (ZRSVN), whose mission is to preserve the natural environment of Slovenia. It strives for the lasting harmonious coexistence of nature and people and the rational use of renewable and non-renewable natural resources. The area in question falls under the responsibility of the Kranj Regional Unit.
- The Slovenian Water Agency, which performs professional, administrative and development tasks in the field of water management in accordance with the regulations governing waters at the national level. The Upper Sava sector is responsible for the area in question; they were mainly responsible in the regulation of the Nadiža watercourse and the Ciprnik alluvial cone.
- The Triglav National Park Public Institution (hereinafter referred to as (TNP) manages the only Slovenian national park, which was established in 1981. The basic goal and purpose of Triglav National Park is to preserve exceptional natural and cultural values and to protect autochthonous flora and fauna, ecosystems and characteristics of the inanimate world.
- The Slovenia Forest Service is the central Slovenian institution in directing the development of forests in Slovenia. It is divided into 14 regional units, and the Bled Regional Unit (hereinafter SFS) is responsible for the forests in the Municipality of Kranjska Gora.

3.4.2 Architectural solution and construction

The public tender for the selection of the most professionally suitable solution for the comprehensive design of the Nordic Center and architectural and landscape architectural solutions was completed in autumn 2009. The special investors'



Figure 14.
The position of ski-jumps at the bottom of Ponce ridge (photo: Jurij Beguš).

commission assessed the proposals on the basis of the attitude towards the entire environment of Planica, including the placement of facilities in the landscape. The selected solution was prepared by Studio AKKA (**Figure 14**).

The Nordic Centre is located in the landscape such that the lines of the ski jumps and slopes meet at one point, and the centre also does not interfere with the view of the mountain landscape. Construction took place from 2011 to 2015. During this time, the following facilities were reconstructed or built: Bloudek's Giant ski jump, three children's ski jumps, two youth jumps, the Gorišek Brothers' ski-flying hill, the Čaplja service facility, a central cross-country skiing facility with a viewing platform, a preparation facility at the top of the ski-flying hill, and cross-country ski trails with a total length of 40 km.

The Čaplja service facility is intended for controlling the operation of the ski jumps, changing rooms, ski servicing, storage of equipment and socialising among the athletes. The facility also has a pumping station for an artificial snow system, ski jump irrigation and central control system.

The central cross-country skiing facility with a viewing platform has two functions. During competitions, it offers all the infrastructure for the implementation of competitions at the highest level, and in the remaining time it serves as the central facility, housing all the programmes intended for visitors to Planica outside the events.

The construction was placed such that all the vegetation was preserved or was supplemented with new plantings. The facilities are multi-functional, and their use takes into account the latest standards of environmentally-friendly energy use. In addition, some temporary access routes and the Macesnovec-Drnice forest road were built to provide access to construction sites.

3.5 The role of individual approving bodies and major stakeholders

3.5.1 The municipality of Kranjska Gora

The Municipality of Kranjska Gora was actively involved in the construction of the Nordic Centre from the very beginning. In order to ensure that construction

would run smoothly, and above all, in order to be able to obtain all the necessary permits, it was necessary to adopt certain municipal acts and to ensure that specific legislation was adopted. In 2000, the municipality adopted a management plan for the Planica area. It also participated intensively in the adoption of the Planica Nordic Centre Act, which finally removed all administrative obstacles to the construction of the Nordic Centre itself.

The municipality played a very important role in convincing landowners to sell their land to the state. Setting an example to all, the municipality transferred its land to the state free of charge, thus giving a clear signal to landowners that it supported the construction of the Nordic Centre, and that the construction of the Nordic Centre was a good investment. For this purpose, the municipality organised meetings with landowners, where it also supported the planned project and actively participated in all steps of planning and construction of the centre.

The municipality was clearly aware that such a centre is not only a sport and tourist attraction, but also a great opportunity to promote the place itself, especially in terms of a tourist destination, providing new jobs and earnings for the locals. In addition to tourism and visits to the ski flying competitions, a large part of the earnings is represented by the training of athletes throughout the year. The centre also offers cross-country skiing training in the summer in the covered part of the central building. Thus, according to the centre, 200,000 training units are performed annually, of which 11,000 represent foreigners from 23 countries, which not only means earnings for the Nordic Centre itself, but also earnings for providers of hotel and other tourist services.

3.5.2 Institute of the Republic of Slovenia for nature protection (ZRSVN)

The role of the ZRSVN in the siting of the Nordic Centre was mainly in the formal inclusion of the project in obtaining environmental and nature protection consents with an expert opinion, which were the basis for issuing a building permit.

The ZRSVN prepared several expert opinions and proposed several mitigation measures and recommendations to reduce the negative impacts of the construction on the environment, which were mostly summarised in its decisions by the Slovenian Environment Agency (ARSO). With the investors, the ZRSVN coordinated at meetings and field trips investors' wishes with actual opportunities in nature. During the construction, the investors respected all key mitigation measures and recommendations prepared by the ZRSVN. Since the completion of the construction of the Nordic Centre, this cooperation has been less intense, though it still exists. It focuses on individual questions by the Nordic Centre operator about individual specific measures that must be implemented during operation.

3.5.3 Slovenian water agency

During the preparation, planning and construction of the Nordic Centre, the Water Management Office was still operated within the Slovenian Environment Agency (ARSO). The Slovenian Water Agency (DRSV), and thereby the administrative, professional and development tasks in the field of water management, began its work in early 2016. The entire field of work thus passed from ARSO to the DRSV.

With the decision of the Government of the Republic of Slovenia, all land in the area of the Nordic Centre is owned by the Republic of Slovenia, regardless of the type of use, and managed by the Planica Institute of Sports of the Republic of Slovenia, including lands with water and lands with watercourses on them. In the spatial planning procedures, the field of water management was involved in obtaining guidelines and opinions in the field of spatial legislation. Specifically, water consents were issued for individual phases of the intervention as prescribed by law.



Figure 15.
Regulation of the Nadiža torrent at the foot of the Planica ski-flying hill (photo: Jurij Beguš).

Water permits were also issued for special water uses, such as snowmaking and heat recovery.

The building designers and the Nordic Centre had to pay special attention to the water flow of the Nadiža (Beli potok), which was already regulated by the Nordic Centre, and it was necessary to ensure that flood and erosion conditions would not worsen (**Figure 15**). In doing so, the DRSV participated as an administrative body, also giving advice and recommendations for the implementation of measures that were still acceptable. Upstream of the giant ski jump, the existing flood barrier was raised, restricting the transport of sediments across the regulated section through the Nordic Centre. The Nordic Centre also implemented stabilisation and protection measures on top of the alluvial cone below Ciprnik, which could directly threaten part of the Nordic Centre area during storms, i.e. the central building, the giant ski jump's landing strip, part of the parking lots and the cross-country ski tracks.

The provider of the obligatory state commercial public water management service in the Upper Sava area, as well as for the entire area, also monitors the condition of the watercourses, torrents, lands with water and lands near banks and water facilities, as well as water infrastructure in the area of the Nordic Centre.

3.5.4 Triglav National Park Public Institution

The Triglav National Park Public Institution (TNP) was involved in the process of obtaining nature protection consent for the said intervention as part of the siting of the Nordic Centre. Although the entire intervention was planned and carried out outside the area of the national park, the Public Procurement Agency was included in the procedure by the Slovenian Environment Agency, which conducted the procedure for issuing nature protection consent due to the area of intervention.

Namely, the Nordic Centre was planned directly on the border of the park; therefore, it was estimated that the existing and planned facilities and infrastructure arrangements would lead to a significant increase in the number of people visiting the protected area throughout the year.

Pursuant to the Triglav National Park Act, the TNP participates in the procedures for obtaining consents in the field of the construction of facilities and interventions in space with a mandatory expert opinion. In its expert opinions, the TNP directed the investor to strictly observe the protection regimes of the national park and thus to withdraw interventions from the immediate vicinity of the national park border.

3.5.5 Slovenia Forest Service

The Slovenia Forest Service (SFS) participated in the Nordic Centre project from the very beginning, first as an approving body and subsequently by making a number of proposals and solutions, especially in terms of forest management in the narrower but also in the wider centre area and in connection with the preservation and strengthening of the forest functions in this area.

As some forests on the construction site of the Nordic Centre were proclaimed protection forests by law, the investor had to obtain the positive opinion of the Ministry of Agriculture, Forestry and Food.

An important role of the SFS in the construction of the Nordic Centre was to assist in constructing (mostly forest) infrastructure that provided access to construction sites. In this area, the Macesnovec-Drnice forest road was built. The forest road is important for forest management and for the construction, operation and maintenance of facilities in the Nordic Centre (**Figure 16**). The conceptual route and course of the zero line of the planned forest road was prepared by the SFS in 2009, taking into account the optimal relationship between the needs of forest owners inside and outside the Nordic Centre area and the requirements for access to facilities (**Figure 17**).

In the same year, the chairlift connecting the bottom of the ski jumps with the top of the ski-flying hill was completed, and from the intermediate station, there is access to the Bloudek ski jump inrun. In order to implement the chairlift route, the SFS selected trees for felling in the width envisaged by the project, but it was



Figure 16.
The Macesnovec-Drnice forest road enabled access to the construction site (photo: Jurij Beguš).

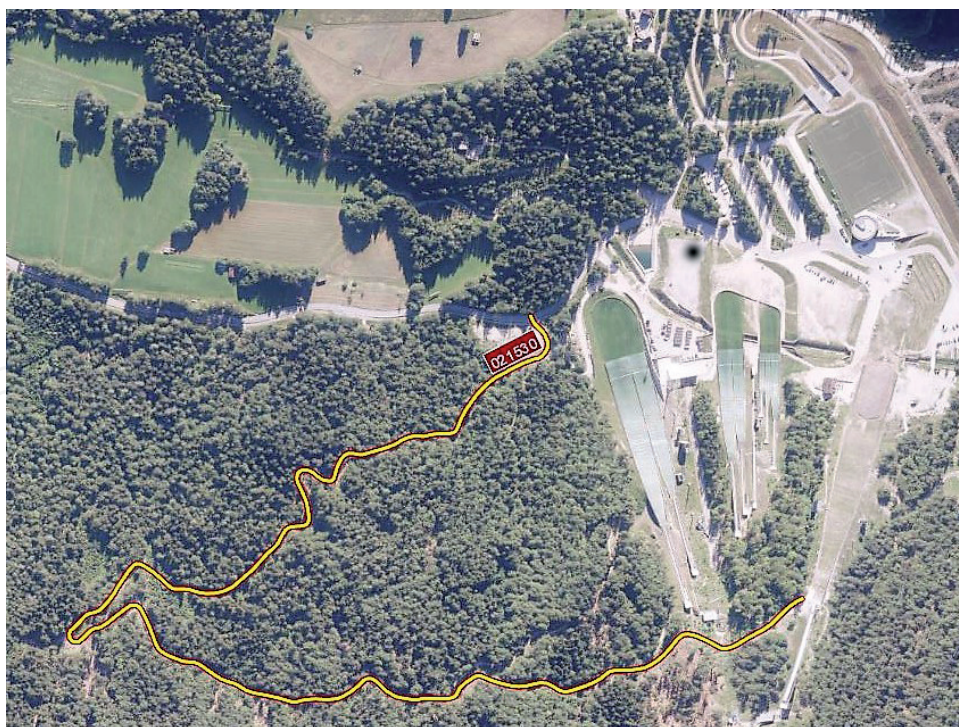


Figure 17.
The position of the Macesnovec-Drnice forest road [4].

necessary to pay attention to the stability of the edge trees so that these trees would not later endanger the facility itself.

Wherever necessary, the SFS participated in the selection of trees that needed to be removed due to the construction of the facilities, as well as in the tracing and siting of smaller or temporary transport roads. After the completion of works, most of these paths were reconstructed and the terrain was levelled, grassed over and in some places replanted.

In the final phase of construction, the cross-country ski tracks were built and the final arrangement of the Nordic Centre was carried out. In the first part, the SFS together with other professional services (ARSO, TNP, ZRSVN), managed to provide an optimal solution for the forest and forest area, as well as for the planners of the cross-country ski trails, especially in terms of complexity and the sports and technical parameters of the tracks. In the final arrangement of the Centre, the SFS prepared guidelines and technical requirements for planting (the selection of tree and shrub species and herbs with an emphasis on indigenous and habitat-appropriate plant species) on the basis of the forest management plan of the Kranjska Gora forest management unit and associated silvicultural plans. The time, manner and spatial distribution of planting were also determined.

Due to the construction technology and the gradual construction, and despite the absence of a special integrated logistics plan, practically all of the functions of the forest stands have been preserved. This was facilitated by the exemplary and proactive cooperation of all stakeholders, both the SFS and forest owners, but above all those responsible for project management, in which the stakeholders always had a correct and interested interlocutor.

4. Conclusion

An important focus at the conclusion is that a disregard for legal, professional and aesthetic frameworks in the construction of the Nordic Centre could

have irreparably encroached on sensitive natural ecosystems and the picturesque Alpine landscape. The founders of the Nordic Centre were well aware that without proper cooperation with various stakeholders (especially forest owners and the Municipality of Kranjska Gora) and institutions, they would not have been able to perform this task well – in fact, they would not have been able to perform it at all, because Slovenian legislation is very strict in the field of nature intervention. Such an intervention has, of course, an impact on the forest, on other natural values, on the water regime with an emphasis on the regulation of torrents, and on the aesthetic image of the natural environment.

The correctly managed construction of the Nordic Centre is a success story regarding environmental protection and placement of facilities in the landscape. This was the main reason why the Planica Nordic Centre was chosen as good practice in the Kranjska Gora PAR.

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