

## NARROW-GAUGE RAILWAY BETWEEN KROŚCIENKO, SZCZAWNICA, PIWNICZNA, STARA LUBOVLA AS AN INSTRUMENT OF SUSTAINABLE DEVELOPMENT AND INTEGRATION FOR TOURIST MUNICIPALITIES IN POLAND AND SLOVAKIA

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### Summary

The paper describes the project of European initiative EUREKA “Ecological mountain railway as an element of the sustainable development of a tourist region in Poland” joining the spas of Piwniczna with Szczawnica. After presentation of the project scope and the partners, the municipalities which serves and links planned narrow-gauge railway have been characterized. Reflection of an idea for the railway in the existing strategic and planning documents has been identified. Functions of the railway and its situational and altitude alignment of its route are specified. The vehicles of the railway and the rules and examples for creating of schedules are generally characterized. The rules for construction of prognostic passenger flows by rail are described and selected results are quoted. The conclusions from the analysis of the environmental impact of the railway and the result of financial and economic analysis are presented. List of the expected main effects of the project and its potential impact on the development of transport technology is given. An idea of enlargement the territorial scope of the narrow-gauge railway project with proposal for its internationalization is presented. This includes extension of the route from the Szczawnica spa to the Krościenko spa and the branch route from the Obidza pass to the Stara Lubovna town in Slovakia. For this purpose an initiative will be taken to apply a research project of the European Union.

### Keywords

local public transport • narrow-gauge railway • functional and spatial integration • tourism • spa municipalities

### 1. General project information

This paper briefly presents the project E!2652 RAIL MOUNT “Ecological mountain railway as an element of sustainable development of tourist region in Poland” which concerns narrow gauge railway connecting Piwniczna with Szczawnica, which was elaborated in the years 2001–2003 as a part of the EUROTURISM program of the

European Initiative EUREKA [Ecological mountain railway... 2003]. This program is a form of strategic activity, aiming to implement new technologies for maintaining the importance and further development of the touristic and recreational industry, as well as for life improvement of the EU citizens.

The project partners were:

- Cracow University of Technology (Institute of Rail Vehicles, Institute of Road and Railway Engineering, Institute of Landscape Architecture),
- Jagiellonian University (Institute of Public Affairs, Department of Management in Tourism),
- the city and municipality of Piwniczna Zdrój,
- the city of Szczawnica,
- Stadler Bussnang AG (Switzerland),
- Thyssen Krupp AG (France).

A. Tułeczki from the Institute of Rail Vehicles was the project manager.

In the year 2000 an agreement has been made between the municipality of Piwniczna-Zdrój and the city of Szczawnica, in order to define the cooperation in preparing the ground for realization of the project: "Touristic railway Piwniczna-Szczawnica".

The scope of the project was divided into six work packages:

1. Regional development strategy against the macroregional (voivodeship) development.
2. Location and environment.
3. Technical study of the project, taking into account the line infrastructure, means of transport, technical facilities and control systems, along with traffic organization and management.
4. Analytical works, covering transport analysis, investment cost and operating costs analyses along with human resources analysis.
5. Shaping of touristic product.
6. Analysis of financing and economic effectiveness evaluation of the project.

## 2. Characteristics of localities planned to be serviced by the railway

A chance for realization of the concept of railway between Piwniczna and Szczawnica arises from the attractiveness of both places, which attract significant tourism, spa, summer resorts and ski activities, so – to visualize it – they will be characterized in this regard.

Piwniczna Zdrój is an urban and rural commune, located in the district of Nowy Sącz by Poprad River in the Poprad Landscape Park between the mountain ranges of Radziejowa and Jaworzyna Krynicka in Beskid Sądecki, near the Slovakian Border.

The city is crossed by the national road no. 87, leading to Slovakia, district road no. 971 leading to Krynica-Zdrój and a railroad line that has been in use since 1876. Many small-scale production plants are located in Piwniczna.

Due to its location on the historic trade route from Krakow to Hungary, Piwniczna received city rights already in 1348. At the end of the 19<sup>th</sup> century first mineral springs were discovered in Piwniczna, which, along with later boreholes, cure the diseases of the digestive and respiratory systems (in the year 1967 the municipality became a health resort). The city neighbors with numerous other Poprad health resorts (including Kokuszka, Głęboke, Młodów, Wierchomla, Łomnica and Zubrzyk, all within the municipality).

Piwniczna, aside from its health resort functions became a large summer resort and a place for summer camps, as well as one of the biggest winter sports resorts in Poland. Currently, there are 16 ski lifts in the municipality (10 in Wierchomla, 3 in Sucha Dolina and Kosarzyska, 3 in Kokuszka) servicing numerous slopes. Other tourist attractions in Piwniczna include boat and canoe trips as well as rafting on Poprad river. Piwniczna is a hub for many trails leading to both parts of Beskid Sądecki; it also has horse and bicycle trails (including downhill) and an extensive resort park on Kiciarz. Every year Piwniczna-Zdrój hosts a few cultural festivals, including performances of artistic groups. The new offer of Piwniczna includes religious tourism [Ministerstwo Gospodarki... 2003], with pilgrim routes leading to Putnicke Mesto in Slovakia, and from Sucha Dolina via Eliaszkówka to Litmanowa.

**Szczawnica** is located in the district of Nowy Targ by Grajcarek stream and Dunajec river, on the southwestern outskirts of Beskid Sądecki (mountain range of Radziejowa) and in the foothills of Pieniny (especially mountain range of Małe Pieniny), and on the south it borders with Slovakia. Szczawnica is a popular health and tourist resort, characterized by a mild climate. It is one of the oldest Polish health resorts with at least 200 years of tradition and two resort parks. 12 sources of mineral water were discovered within the boundaries of Szczawnica, mostly used in curing the diseases of air-passages. Szczawnica became a town in the year 1962. In 2008 the status of Szczawnica was changed from an urban municipality to an urban-rural municipality, after the housing estates of Jaworki, Szlachtowa, Biała Woda and Czarna Woda were detached from the city as separate villages (or parts of villages).

Szczawnica offers good conditions for sports, such as: canoeing, biking, hang gliding and paragliding, hiking and winter sports such as skiing and snowboarding.

Main tourist attractions of Szczawnica include: a raftsmen pier where the Dunajec raft trip ends, kayak slalom track, horse and bike trails (also leading to Slovakia), mountain trails to the mountain range of Radziejowa and Pieniny (also leading to Dunajec River Gorge, Homole ravine and Biała Woda ravine), a ski lift on Palenica (a ski slope with FIS homologation, a half-pipe and mountain coaster), paragliding training opportunities and fishing areas. Szczawnica also hosts music and folklore festivals (with local group performing) and museum education meetings. The recently renovated Guest Station will soon become an important cultural center.

Selected statistical data regarding the characterized municipalities are presented in Table 1.

The total number of nights is greater than in position 7, as the statistics do not include individual accommodation objects (e.g. in Szczawnica private guesthouses offer about 1400 beds).

**Table 1.** Statistical data for the municipalities of Piwniczna and Szczawnica

ID	Municipality characteristics	Piwniczna	Szczawnica
1	Population (thousands), including city	10.7 6.0	7.4 6.0
2	Area [km <sup>2</sup> ], including city	126 38	88 33
3	Forest cover [%]	63	67
4	Budget (millions zloty): – incomes, – expenses, including investments	37.0 40.3 12.1	31.2 32.2 15.8
5	EU financial support (millions zloty)	7.1	11.3
6	Number of places in mass accommodation objects, including health resort objects*	1414 200	2832 1087
7	Number of nights in mass accommodation objects (thousands), including health resort objects*	160 57	338 196

Source: Urząd Statystyczny w Krakowie 2013 and [www.stat.gov.pl](http://www.stat.gov.pl)

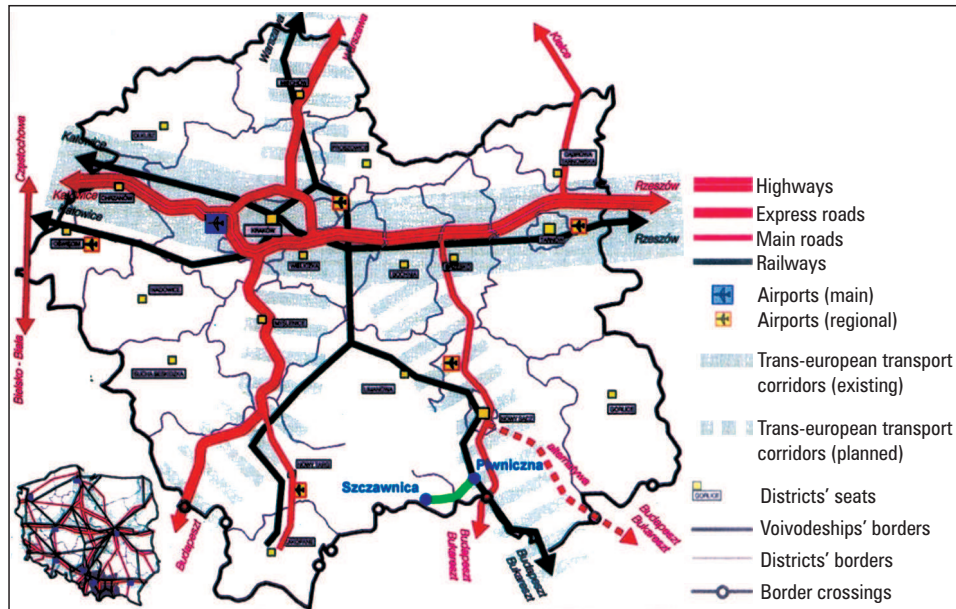
\* The data in positions 6 and 7 was recorded in 2012, the rest in 2011

### 3. The concept of Piwniczna – Szczawnica railway in strategic and planning documents

The regional documents do not explicitly mention the railway from Piwniczna to Szczawnica (probably due to its local character), however, there are references to this kind of transport solution. The “Spatial management plan of Małopolska Voivodeship” from the year 2003, which is currently in force, in point 6.6.5. entitled “Passenger transit – regional public transport” contains the following statements:

“Multiple actions are assumed in order to improve the regional public transport, among others by railway transport – intensification of regional and local railway traffic by integration and by participation of various railway companies supported financially by local authorities, as well as by railbus service”. Figure 1 presents the location of Piwniczna – Szczawnica railway in the target transportation network model included in the “Spatial management plan of Małopolska Voivodeship” [Uchwała nr XV/174/03].

In the year 2011 the “Development Strategy of Małopolska Region for 2011–2020” was adopted [Uchwała nr XII/183/11], whose key actions include “Supporting conditions for the ecological transport development” and “The actions carried out in the field of transport should be aimed at creating a coherent and balance transport system, having a value of user-friendliness, while also creating conditions favourable for development processes and contributing to reducing the negative impact on the environment”. Moreover, the inclusion of the actions in favor of sport and touristic infrastructure development in Beskidy in the Strategy creates an opportunity of receiving EU financial support for the purpose of railway construction.



Source: Uchwała nr XV/174/03

**Fig. 1.** Piwniczna – Szczawnica railway (shown as the green line) in the model of an integrated transport network presented in the “Spatial management plan of Małopolska Voivodeship”

In the enacted local development plan of Szczawnica within the area and the mining area “Szczawnica” in Chapter 5 “Communication”, in section 10 there is a following text: “Hereby the route of the proposed Mountain Ground Tourist Train Piwniczna Zdroj – Szczawnica is determined from the eastern boundary of the development plan to the existing cable car to Palenica – on the south side of the proposed KDZ decompressive road in its dividing lines, and then to the final stop ‘B’ KK1 under the slopes of Huliny, along existing walking – cycling path to Leśnica. Detailed setting of the course will come out from the railway construction project”. The Szczawnica City Council declares the compliance with the arrangements of the draft plan “Study of conditions and directions of Szczawnica spatial management”.

However, in the arrangements of the text of Municipal Local Zoning Plan for Piwniczna – Spa in 2006 [Uchwała nr XLIII/332/06], for the structural unit “City” as well as in the update of the 2009 [Uchwała nr XXXIII/225/09] there are no records of the railway Piwniczna – Szczawnica. Also, in the strategy of socio-economic development of Municipal Piwniczna – Spa for 2008–2015 [Uchwała nr XIX/111/08] there is no mention about it.

However, local government plans expressed in the list of the most important investments to support the development of the tourism economy by 2015 and cited in [Ministerstwo Gospodarki... 2003] in the scope of infrastructure include the railway Piwniczna Zdroj – Szczawnica.

#### 4. Functions of the railway

The planned railway will be able to perform various, numerous communication, development and integration functions, including:

1. Increasing the touristic attractiveness of the region.
2. Providing an insight into the mountain landscape.
3. Allowing the disabled to access the mountains.
4. Shaping ecological communicational behaviors.
5. Shortening the communicational connection between Piwniczna and Szczawnica. The straight-line distance between these two cities is 17 km, while currently, the shortest driving route, via Stary Sącz is 60 km long, so the elongation factor equals 3.5. Kosarzyska on the outskirts of Piwniczna and Jaworki on the outskirts of Szczawnica lie only 8 km apart, but the shortest driving route is 70 km long, ergo the elongation factor equals 8.8!
6. Connecting the main tourist attractions in Szczawnica:
  - raftsmen pier on Dunajec,
  - mouth of Dunajec River Gorge (Pieniny road, Słowacja, Sokolica),
  - city center (health resort, Palenica ski lift station),
  - Jaworki (Homole ravine, Biała Woda ravine, music club *Muzyczna Owczarnia*).
7. Connecting the main tourist attractions in Piwniczna:
  - city center and main health resort objects,
  - ski lift complex in Sucha Dolina,
  - Kosarzyska (recreational objects).
8. Allowing a direct access to mountains areas – Obidza pass and the mountain trail hub in the mountain range of Radziejowa.
9. Better accessibility of a pilgrimage place near Eljaszówka, in Slovakia (3 km from Obidza); currently a 47 km drive away from Szczawnica.
10. Other local connections related to work and other social and living purposes of the locals and the tourists.
11. Integration of the health resort functions: possibility to access and use complementary therapies in health resorts (such as equine therapy) and in special cultural services (e.g. international musical workshops) as well as touristic services (e.g. water park, horse tourism).
12. Integration of the transport system realized by regional connections, including the planned high speed railway: Krakow – Podłęże – Piekiełko – Nowy Sącz – Piwniczna (the PKP stop will be joined with the narrow gauge railroad stop)
13. Integration of the railroad with the local infrastructure, including:
  - bus station in Szczawnica,
  - parking lots (Szczawnica by Dunajec river, Kosarzyska, Sucha Dolina),
  - bike router (leading to Slovakia),
  - chairlifts (Palenica, Jaworki, Sucha Dolina),

- planned elevator connecting the PKP (Polish National Railway) stop with the market square in Piwniczna.
14. Relieving traffic congestion, especially between Szczawnica and Jaworki (dense local traffic, narrow roads in densely built-up areas).
  15. Parking space deficit mitigation in centers of cities and resorts, by ski lifts and in the proximity of national parks.
  16. Contributing to the creation of the new center in Szczawnica and spatial order.

## 5. Situational and elevation shaping of the route

The main factors determining the route of the railway were: the hydrographic network, terrain shape, buildings, roads and reserve areas designated in local spatial management plans for roads. Figure 2 presents the approximate route and Figure 3 presents its simplified longitudinal section.

In Piwniczna, the route originates from the track system of the railroad stop Piwniczna Zdrój along the railroad line running in southwest direction, towards the place where Czercz creek joins Poprad River. Then, the route runs west, along Czercz creek and Szczawnicka Street in the settlement of Kosarzyska. In the parking area, the route climbs to the mountain ridge, near Sucha Dolina settlement hotel, leaving the ski lifts on the left. Next, it follows the high voltage lines steeply uphill towards Obidza settlement and the Slovakian border, reaching the Obidza pass and then the trail hub on the southern mountain ridge of Wielki Rogacz. The route runs westwards, and then southwards, on the hogback separating the Czarna Woda creek valley and Rogacz creek valley, and then to the west. Then, it descends via Rusinowski Wierch to the Biała Woda creek valley, to Jaworki, passing through the center of the village. Next, the route runs along Grajcarek creek, leaving the mouth of Homole gorge on the left. Then, the route runs along Szlachtowska Street (on some parts of the course – with minor deviations from the street) leaving the village of Szlachtowa on the right. Before entering Szczawnica, the route diverts into a corridor reserved for the bypass of Szczawnica. The route follows this corridor (which orographically runs on the left side of Grajcarek creek), at the feet of Jarmuta and Palenica to the Palenica chairlift station. Passing to the right side of Grajcarek creek, the railway composes itself into the recently built promenade, which runs along the creek. The project assumptions of this promenade [Pracownia Badawczo-Projektowa... 2007] provide spatial and technical conditions for the future narrow gauge railway along Grajcarek. The route ends at the parking lot by the raftsmen pier, near the place where Grajcarek creek joins Dunajec River.

The route is endangered by many geomorphologic hazards, i.e. landslides (7 places), areas predisposed for landslides (4 places), coastal erosion (14 places), steep slopes (4 places), wetlands (5 places).

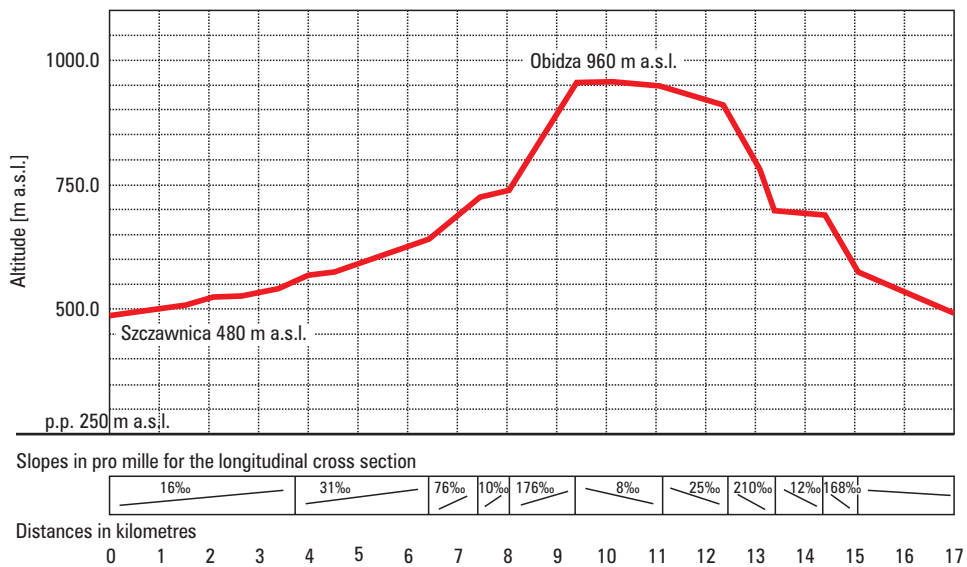
Selected railroad route parameters:

- route length – 23 km (elongation coefficient 1.2),
- rack equipped tracks – three sections, total length of 5 km,



Source: Assessment of building... 2001, Ekologiczna kolejka górska... 2003

Fig. 2. The approximate route of narrow gauge railway Piwniczna-Szczawnica



Source: Assessment of building... 2001, Ekologiczna kolejka górska... 2003

Fig. 3. The western and middle part of the simplified longitudinal profile of the railroad



- track gauge – 1000 mm (or 1435 mm),
- trackway width – 5 m (with ditches on both sides), 3 m (in street section),
- maximum slope for longitudinal cross section: 21% on rack equipped sections, 5% in the remaining parts,
- number of: stops – 18; passing loops – 3,
- platform dimensions: length – 30 m, width – 3 m.

Finally, it is worth mentioning that the first tourist trail in Beskid Sądecki was marked already in the year 1906, between Piwniczna and Szczawnica. In the second half of the 1960s, the concept of finishing the so-called Carpathian Road, including the Piwniczna-Szczawnica section, was taken up. However, due to the potential natural hazards, it was abandoned in the following years.

## 6. Characteristics of the railway as a means of transport

The basic parameters of the vehicles:

- drive: combustion engine, preferably natural gas powered; traction power: 500 kW,
- operating speed: maximum  $60 \text{ km} \cdot \text{h}^{-1}$ , up to  $20 \text{ km} \cdot \text{h}^{-1}$  uphill,
- dimensions: length ~16 m, width ~2.40 m,
- low floor height: 0.30–0.35 m above the rail head,
- vehicle capacity: 35 seated, 35 standing,
- panoramic windows for maximum field of view (Figure 4).



Source: Assessment of building... 2001, Ekologiczna kolejka górską... 2003

**Fig. 4.** Train visualization

## 6. Traffic forecasts

The traffic forecasts aimed to estimate the number of potential passengers, taking into account the location of origins and destinations of journeys as well as seasonal differences (summer, winter, weekend, working day) and time of day. The estimation of passenger flow was preceded with an analysis of traffic growth indicators for roads, PKP railway, tourist trails (walking, biking and skiing), as well as a survey of tourists and inhabitants. The forecasts were also based on the development strategies of the involved municipalities, the region and the whole country, taking into account the border traffic with Slovakia and the expected socio-economic development indicators. The simulation calculations of the passenger flow for the Szczawnica-Piwniczna railway were performed according to the following procedure:

- the density of potential road traffic in the analyzed area was determined using Vomberg's method, properly calibrated in order to adjust it to the Polish conditions,
- the division of transit tasks (which is the distribution of journeys among the considered means of transport) was performed using logit model, time of journey being the dominant influence factor,
- proportions in the traffic between particular months were assumed based on the statistical data regarding the use of accommodation resources, with a correction in winter months due to winter sport activity in the analyzed area,
- the daily journey distribution was assumed based on own traffic measurements in two scopes: Szczawnica – Jaworki and Piwniczna – Kosarzyska, both during winter and summer,
- during the estimation of passenger flow more distant in time it was assumed that the traffic will increase by 2.5% annually in the years 2007–2017 and 1.5% in the years 2017–2027 and that the annual and daily tourist traffic distribution will not change with respect to the present state.

As in Poland there are no methods of forecasting recreational traffic in public transport that would be useful for the purposes of the project, the calculation procedure was authors' suggestion.

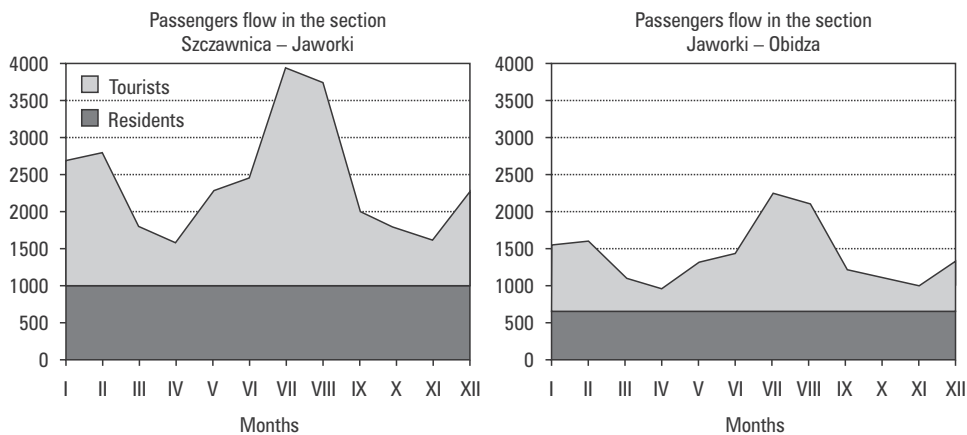
Figure 5 presents exemplary passenger flows for the railway (for one of the time horizons) for the sections of Szczawnica – Jaworki and Jaworki – Obidza pass.

## 7. Timetable

The rules of timetable elaboration were based on the following assumptions:

- The train capacity is 70 or 140 (for two railbuses) people. In order to provide the highest comfort for the passengers, the tendency is to provide seating places for as many passengers as possible, which results in oversupply of places.
- The shortest possible interval between departures is 20 minutes (a shorter interval is not possible due to the placement of passing loops and the necessity of keeping a time buffer in order to keep the desired punctuality level).

- The longest interval can be 30 minutes (a longer interval could lead to perception of the railway as unreliable means of transport).



Source: authors' study

Fig. 5. The prognosed passenger flows for two sections of the tourist railway, for the year 2027

Table 2. An exemplary timetable for the Piwniczna – Szczawnica railway

Summer	Trains with the capacity of 140 people: – during the heaviest traffic (i.e. between 8 am and 8 pm) every 20 minutes, – in the remaining hours (6 am to 8 am and 8 pm to 10 pm) every 30 minutes.
Winter	During the peak hours (9 am to 4 pm) trains with the capacity of 140 people depart every 20 minutes. During medium traffic (8 am to 9 am and 4 pm to 7 pm) trains with the capacity of 70 people (single railbus) depart every 20 minutes. During the lowest traffic (6 am to 8 am and 7 pm to 10 pm) trains with the capacity of 70 people depart every 30 minutes.
Outside the tourist season	A train with the capacity of 70 people departs every 30 minutes.

## 8. Environmental impact

The ecological and environmental impact of the planned project was subject to research.

The analysis covered the influence and the possible effects of the project on such elements of the environment as: groundwater, surface waters, earth surface, landscape, people's health, animals and plants, taking into account their correlations. Special attention was paid to the evaluation of the route and its functioning in the aspect of landslides and other geomorphological hazards as well as securing the conditions for natural environment protection.

Because the analyzed area is an important part of nature in European scale, the consequences of the investment were not only considered on the local scale but also with respect to European structures EKONET and NATURA 2000. The analysis included the effects on the hitherto spatial management of the terrain and for provided to management in the arrangements in force, of local development plans made for municipalities Piwniczna and Szczawnica and Protection Plan Guidelines prepared for the Poprad Landscape Park.

Conclusions resulting from the environmental impact prognosis:

- the Piwniczna-Szczawnica railway impacts the natural environment to different degrees on particular route sections,
- the railway impacts the environment the least in the sections passing through urbanized areas of Piwniczna and Szczawnica, where it is significantly transformed anthropogenically,
- a positive aspect of the railway in this area is the possibility to limit the communicational inconveniences (air and noise pollution), as it is a much more ecological alternative for a car between Piwniczna and Kosarzyska as well as Szczawnica and Jaworki,
- in the section from Obidza to Jaworki, the railway enters and open natural space, which may lead to weakening the structures important for the functioning of nature, as well as individual elements of the biotic environment that make up these structures,
- in wildlife areas, the train passes areas with high landscape exposure. The general rule for the railway composition into the landscape should be keeping the investment elements below the horizon line and limiting the number of capacity objects in this area,
- in order to limit the negative impact on the biotic environment, the suggested solution is to limit the investment program in the wildlife zone as much as possible, while investing more in the areas transformed anthropogenically and neighboring with areas designated for investments (in current local development plans and studies of conditions and directions of spatial development).

The Workshop For All Beings took a very critical stand against the construction of railroad [Pracownia na rzecz Wszystkich Istot... 2008], arguing that such investment will destroy wildlife refuges, including protected and endangered species.

## 9. The result of financial and economic analysis

The financial and economic analysis was preceded with an estimation of investment and operational costs as well as prognosed incomes. Using the approved schedule of spending the investment resources (for preparation of investment, infrastructure, rolling stock and facilities) a financial evaluation of the project was performed. Then, assuming specified levels of the so called external transport costs, an economic evalua-

tion of the project was performed. The estimation of the basic financial and economic indexes of the project was supplemented with a sensitivity and risk analysis, taking into account the costs of acquiring and servicing the capital.

Construction of the tourist railway Piwniczna – Szczawnica is an infrastructure Project, characterized by big capital and long period of return on investment. The analysis assumes that the investment costs will be partially covered by a commercial investor, and the remaining part will come from non-repayable aid funds (European Union, budget). The cost of the whole investment is estimated to equal 172 million zloty, including line infrastructure (along with engineering objects) – 20 million zloty, and means of transport (8 carriages) – 32 million zloty.

Under such assumptions the investment is effective: annual incomes exceed operating costs and the period of return on investment is 25 years (which is a good result for infrastructure investments).

## 10. Expected effects of the project

The purposefulness of the investment was supported by studies related to socio-economic processes in the region and the state of transportation technology and tourism development. The basic effects of the project include:

- a complex analysis of the factors determining the construction of mountain railroad as a touristic product,
- evaluation of the effect of the investment on the sustainable development of the region and reception sites,
- development of models for analyses and prognoses of transportation needs,
- innovational technical solutions in transportation, facilities, control systems and infrastructure,
- base of the knowledge in the field of the regional railroad transportation regarding the service of traffic which results from the health resort and touristic functions of the place as well as internal migrations,
- proving the positive role and attractiveness of the transport connection in the integration of the health and recreation resorts.

Expected technical development involves:

- line infrastructure being built in mountains conditions,
- railroad means of transport fulfilling high ecological requirements,
- transport process logistics, platforms connecting road and railroad transport (standard gauge, 1435 mm tracks) with mountain railroad,
- transport system management,
- integrated passenger service system.

The project bases on the European experiences regarding construction and operation of mountains railroads (mainly Switzerland).

## 11. The concept of extending the territorial range of the railroad project and a proposition of its internationalization

With respect to the aforementioned concept covered by EUREKA project, it is suggested to expand it by extending the line from Szczawnica to Krościenko (by 5 km) and adding a section leading to Slovakia from the Obidza pass via Litmanowa to Lubowla (Figure 6). It will allow connection of areas attractive for tourists and spa visitors as well as pilgrims.

Krościenko is located at the outlet of Krośniczanka creek to Dunajec, along the vojvodship road 969 leading from Nowy Sącz to Nowy Targ, along a medieval communicational tract. It is a health and recreation resort having the population of 3.5 thousand people and offering over 40 thousand beds annually. Krościenko is a very important starting point for hiking trips to Pieniny, Gorce and the mountain range of Radziejowa of Beskid Sądecki. It hosts many recreational and folklore events. The municipality of Krościenko has very good microclimatic conditions. The historic market square is surrounded by four houses, more than hundred years old and a gothic-baroque church from the 14th century. Krościenko is also an ending point of Dunajec raft trip. The incomes and expenses of the municipality of Krościenko are about 18 million zloty in the plan for the year 2013.

The development strategy for the municipality of Krościenko for the years 2008–2020 [Strategia Rozwoju... 2008], apart from the basic priority No 1 “The development of tourism among others through the development of tourist facilities and cultivating regional traditions” took priority No. 5 relating to the improvement of transport infrastructure through the implementation of the operational object I.5 “Improving transport accessibility of areas and facilities for tourist movement, including the construction and upgrading of roads, bicycle paths and parking areas, cooperation in the modernization of district and provincial road networks to ensure availability to areas of tourist activity in communes and the organization of public and mixed transport systems” and the operational objective II.2 “Improving standards of public transport by supporting all efforts leading to increase number of courses in public communications, improve the status and image of the stops and creating new lines, including tourist connections for increasing the availability of community and the comfort of the residents and visitors”.

Ergo, the construction of the railroad, although not mentioned in any of the strategic and planning documents, fits the development priorities and operational objectives of the municipality. Especially by taking over a part of the people travelling by cars, it will contribute to decreasing the traffic congestion between Krościenko and Szczawnica, as well as making public transportation in this direction more attractive.

The Slovak part of the railroad route begins at Obidza pass (938 m a.s.l.) and then descends to the creek of Wielki Lipnik, and after 4 kilometers it reaches a stop next to the sanctuary – a place of pilgrimage located on Zvir clearing. Then, after 6.5 km the route reaches Litmanowa, bypassing the village on the east.

Then the route of the railway runs along the road leading through the valley of Litmanowski Stream and further – along the Mały Lipnik creek, by the outskirts of the village Jarabina (11.5 km) to the train station Lubowla (15 km) entering the station northern track. In the vicinity of the railway station there is the bus station.



Source: authors' study

**Fig. 6.** The route of the railway according to the idea of extending its territorial scope

The railway would make accessible by the way one of the most frequented places of pilgrimage in Slovakia (Litmanova became famous after 1990 of the revelations and the Greek Catholic center of Marian devotion) and natural attractions: Litmanowskie Skałki, reserve of Litmanowski Potok valley, Jarabiński gorge, as well as the ski area on the slopes of Litmanova. However, the main attraction of the railway would be monuments of Lubovňa.

Lubovňa (Slovak *Stará Lubovňa*) lies in a valley at an altitude of 550 m above sea level at the foot of Spiška Magura. It is a seat of the district and has about 16 thousands inhabitants and has an area of 31 km<sup>2</sup>. By Lubovňa run roads: no. 77 from Bardejov to Poprad and no. 68 from Presov to the border crossing Mniszek – Piwniczna. There is a railway line from Poprad to Nowy Sacz through the border crossing Pławiec – Muszyna. The revised budget for the year 2013 of the revenue expenditure is about 9.6 million Euro [Kontrola plnienia... 2013].

The most important monuments of the city are:

- well-preserved Lubovňa castle built in the late fourteenth century,
- open-air museum of folk architecture with objects transferred from various places in the north-east Spiš,
- the Gothic church of the thirteenth century, rebuilt in the seventeenth century in the Baroque style, and in the nineteenth century in the classical style,
- medieval town square with Renaissance and neoclassical town houses.

Extension of the concept of the railway of Slovak part enriches to the significant extent the features mentioned in point 3 of the integration of border areas, providing scenic attractions on the Slovak side, a place of pilgrimage in Litmanowa and monuments of Lubovňa.

## 12. Planned activities for the research project of the European Union for the renovation and expansion of the railway design

The concept of territorial extension of the railway design and the inclusion of the area in Slovakia requires a work-study phase of the project before investing. The work will include actualization of the route, verification of transport needs and capital expenditures and the evaluation of the effectiveness and the development of financial engineering project. Developed in the new version of the feasibility study will give an answer to the desirability of the investment phase of the project.

In recent months, the Cracow University of Technology began to develop the work undertaken to prepare a memorandum on the project of mountain railway construction and the Research Task Force was appointed by the Vice-Rector (December 2012). Catalog of projects for the coming period is including:

1. The creation of an international consortium to implement the new concept of the project under the European Initiative EUREKA with the participation of Polish local governments (Piwniczna, Szczawnica, Krościenko) and Slovakia (Stara Lubovňa), Cracow University of Technology, University of Zilina, ThyssenKrupp AG, Stadler Bussang AG (Newag SA Nowy Sącz) with the signing of letters of intent.
2. Elaboration of the Eureka Project Form Document being the basis for conferring the status of international project.
3. Elaboration of the application to the National Research and Development Centre NCBiR concerning financing of the project.
4. Introduction of the project into the spatial land management plans, development strategy, territorial and regional contracts.
5. Initial assumptions of financial engineering, and taking steps to attract investors and business partners for the project.
6. Promotion of the project, organization of conferences, meetings, publication of results of the project.
7. Preliminary works on the preparation of the investment phase of the project.

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