



CASE STUDY

## Recreational mountain biking - a new tool in rural development

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**Abstract** – Rural development should lead to improved quality of life and economic prosperity of regions without burdening ecosystems and all landscape components. Recreational activities or tourism have a significant influence on the development of the regions but also represent important pressure on the natural environment. Only such recreational activities that are geared towards sustainability in the cultural landscape should be supported. We present one example of the sustainable recreation form – mountain biking – and efforts to establish the mountain bike destination close to the City of Pisek in the Czech Republic. The decision on the existence or the absence of the project by the City of Pisek was supported by a feasibility study carried out by the expert team from Mendel University in Brno. The socio-economic impact assessment of the project was based on the Cost-Benefit Analysis. The values of the indicators for evaluating the effectiveness of investments reached the levels at which the project could be recommended for the realization. Results of the economic evaluation refers to the excess of the positive effects of the project over its negative consequences. Despite these positive results of the study, the Council of the City of Pisek decided not to support the project of this mountain bike destination.

**Keywords** – tourism, socio-economic impact assessment, cost and benefits, feasibility study, single trails

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### Introduction

Central Europe landscape has been used by humans for many centuries. Balanced cultural landscape provides numerous services from which recreation becomes more and more important. One of the recreation forms is still increasingly popular mountain biking (Marrion & Leung, 2001; Taylor, 2010; Koemle & Morawetz, 2016). Mountain bike destinations are placed in the landscape to provide this form of short-term recreation. There are some examples of these destination in the Czech Republic (e.g. Singltrek pod Smrkem as a first Singltrek brand MTB destination in the Czech Republic, Rychleby trails, Cyklo arena Vysocina, Singletrail Moravský kras) (Konecny, Dohnalkova & Kozumplikova, 2018).

Close to nature trails (singletrails) represent one-way trails in width for one bike. These singletrails go around natural obstacles such as trees, stones, rocks and take advantage of the natural landscape modelling. Singletrails compared to conventional roads and paths blend with the surrounding terrain and present undisruptive element in the landscape. Singletrails are

constructed from natural materials, the pavement is formed from materials permeable for water in the Czech Republic. The driving along these trails has its own rules to prevent possible dangerous situations and user collision. Singletrails allow the managed recreation with minimal negative impacts on ecosystems and user conflicts (Kvasnicka, 2008).

In 2015, the intention to implement a destination for mountain biking near the city of Pisek in the natural park of Pisecke hills was presented to the representatives and citizens of the City of Pisek. The representatives of the city of Pisek addressed an expert group from the Faculty of Regional Development and International Studies, Mendel University in Brno to prepare a feasibility study of the mountain bike destination intention. The partial results from this feasibility study - financial analysis and socio-economic impact analysis - are presented in this paper.

In conclusion, despite all positive results of the feasibility study the intention of the mountain bike

destination on the territory of a natural park Pisecké hills was rejected by the Council of the City of Pisek in 2016.

## Material and Methods

### Study area

The intention of mountain bike destination was localized in the South Bohemian Region to the northern part of Pisecké hills near to the city of Pisek with the area 6 326 ha and 29 966 inhabitants (Fig. 1). The locality is a part of the natural park (protected by the Czech Act No. 114/1992 Coll. within the general territorial protection). The natural parks are established for the protection of typical landscape character – for natural, historical and aesthetic values.



**Figure 1. Localization of the study area – Pisecké hills region.** Source: based on ArcCR500 in Kozumplíková, Konečný, 2017.

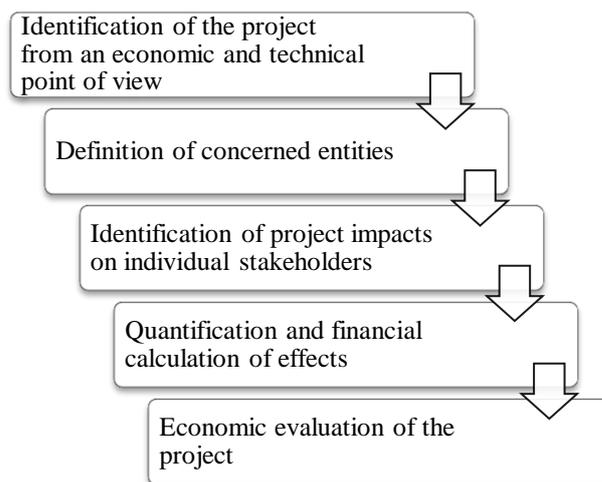
### Intention description

The aim of the mountain bike destination plan was to create a network of close to nature trails (singletrails) in the Pisek hills as the part of the natural park. The final destination was supposed to represent the sustainable tourism product especially inviting for short-term and medium-term visits to the region. All singletrails should consist of interconnected circuits with graded difficulty available for users of all ages in the total length of 40-80 km. The aim of the project was to create a destination in the city of Pisek which could be used actively by all the inhabitants for immediate recreation.

### Methodology

The socio-economic impact assessment of the project was based on the Cost-Benefit Analysis (CBA) which is commonly used to evaluate the net economic impact of public sector projects (Boardman et. al 2006). The objective of the analysis is to determine whether the project is beneficial to the society through the sum of discounted economic costs and revenue (EC, 2014). The main advantage of CBA compared to other traditional techniques for financial evaluation is that it also takes into account externalities and observed price distortions. Each project, public in particular, affects by its existence

a variety of subjects seemingly not involved in the project. In the case of the project implementation the consequences of the existence of the product will have impact not only on the investor and the users of the trails (the main actors of the project inputs and outputs) but also on the citizens of the town and adjacent municipalities, forest and game management, local business entities, region, state, etc. The substance of CBA is to transfer these externalities to finances and to incorporate these effects into overall economic evaluation. The cost-benefit analysis for the project consists of the following steps (Fig. 2).



**Figure 2. Individual steps of the cost benefit analysis of the project.** Source: Kozumplíková, Konečný, Chmelíková, et al. 2016.

## Results and discussions

### Identification of the project from an economic and technical point of view

Considering the project includes a wide range of effects and stakeholders it has to be evaluated not only from the city of Pisek point of view but from a broad all-society perspective. Only then the positive and negative impacts on all affected subjects can be taken into account.

From the technical point of view, the project includes the construction and operation of approx. 60 km of singletrails, a destination center and access infrastructure (road, utility network). The lifetime period is planned for 20 years and all realization activities can be divided into 3 phases. The first implementation (construction) phase represents the realization of a project documentation and own process of construction. In terms of the time value of money to the economic evaluation of the project it is assumed that the construction phase will take place in year 0. The second operating phase should last 20 years and includes the most important phase of the project's life cycle - the operation of trails. The project takes into account the situation where the destination centre finances with its operation the maintenance of trails

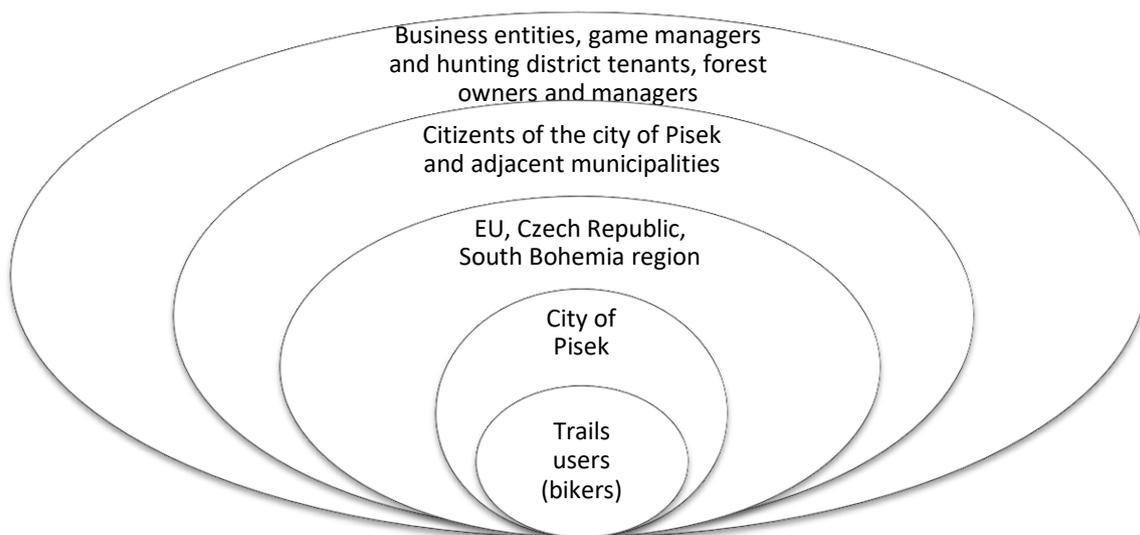
(private entity - operator). Therefore, the investor has no longer any additional expenses with the project operation. The final post-operational phase includes the completion of the project which involves the costs for demolition of the destination centre.

**Definition of concerned entities**

The main stakeholders for inputs and outputs of the project are the city of Pisek (investor) and bikers (consumers). The investor can use public resources from municipal, regional, state or European investment budget. Therefore, all levels of government are included among the concerned entities. Citizens of the city of Pisek and the adjacent municipalities have to be involved into the economic evaluation. The existence of trails near

their residence will mean a change in the quality of their housing for them. Concerned business entities in the area will also be significantly affected as they are expected to have increased demand for their services and products. These are mainly the restaurant services and accommodation services sector as well as construction companies during the construction period and, last but not least, the operator of the destination centre.

Hunting districts tenants in the area should be also include among concerned subjects. Some repayment of damage caused by game can be claimed by the owner or lessee of the surrounding land.



**Figure 3. Entities concerned with project impacts.** Source: Kozumplíková, Konečný, Chmelíková, et al. 2016

**Identification of project impacts on individual stakeholders**

Individual stakeholders can be influenced by the project by the different intensity and different stages of the project life. In the first implementation phase, the city of Pisek will be affected by the costs associated with the design works, the actual realization of the trails and other

infrastructure (Table 1). The implementation of the project will bring several jobs to the region. For completeness, any deduction for permanent land abandonment from the agricultural land fund (destination centre construction) is included among the costs.

**Table 1. Identification of project impacts on individual stakeholders in the implementation phase**

IMPLEMENTATION PHASE		
<i>Concerned subjects</i>	<i>Negative impact</i>	<i>Positive impact</i>
City of Pisek South Bohemia Region Czech Rep. EU	Project documentation costs	Job opportunities in the region
	Trails construction costs	
	Construction of transport infrastructure - about 1 km	

Business entities	Construction of the destination centre	Increased earnings of local construction companies
	Costs of permanent land abandonment from the agricultural land fund	

Source: Kozumplikova, Konecny, Chmelikova, et al. 2016

Most of concerned subjects will be affected in the second phase of the project and most of effects of the project will be reflected in the surrounding (Table 2). The project will have an impact on public budgets both in positive and negative terms. An increase in tax revenue due to the higher income tax collection for both natural and legal persons that will respond demand for construction, accommodation, hospitality and destination centre can be consider as a benefit of the project in relation to public budgets. The fall in unemployment and thus the reduction in public finances that is generally associated with this decline are expected due to the creation of new jobs (destination centre and tourism). The significant benefit of the project and its main product is the profit of visitors (bikers) from the consumption of the goods (trails). The inhabitants of the city of Pisek and adjacent municipalities belong among subjects affected in both positive and negative direction.

Significant negative impacts are not only the increased number of visitors in the forest but also the increased number of visitors to the city which can lead to more noise and air pollution and in extreme cases to the loss of an identity with an original character of the city. On the other hand, the project can improve the attractiveness of their residence place as a result of the expansion of leisure activities as well as the extension of the portfolio of available services at the place and business opportunities.

The existence of the project will mean an increase in the demand for the business production and create prerequisites for higher profits (hospitality,

accommodation, retail business and destination centre). Their costs in connection with the existence of the project will represent the costs of maintenance and promotion of trails.

Damages caused by the game push from forest on surrounding agriculture land in one of the negative impacts of the project. Landowners with damaged crops may claim the payment of damage to tenants of the hunting district. This issue is difficult to identify in practice, nevertheless it must be included among the project costs.

The specific concerned business entity is a forest management company (Forest of the City of Pisek Ltd.) The project can have predominately negative impacts on this company (territory occupation, increase number of visitors etc.). On the other hand, the implementation of the project can expand the portfolio of activities within the forest recreation function in a modern way. The elimination of hunting and the subsequent decline in income from this activity can be expected due to the increased movement of people in the area. In addition to the decline in revenue, the dampening in hunting can be projected into the overpopulation of game and the related increased costs of feeding and protection of the forest against browsing. In the event of a change of forest category from economic to special purpose forest (with a preferred recreational function) the income associated with logging will decrease. Similarly, the income from timber extraction may fall.

**Table 2. Identification of project impacts on individual stakeholders in the operating phase**

OPERATING PHASE		
<i>Concerned subjects</i>	<i>Negative impact</i>	<i>Positive impact</i>
City of Pisek South Bohemian Region Czech Republic EU	Cost of road maintenance during the winter	Reduce unemployment  Increase in income tax for natural and legal persons
Product users (bikers)		Benefit from consuming offered service
Citizens in City of Pisek and adjacent municipalities	Increased concentration of people in the area resulting in higher noise, air pollution and loss of identity	Higher attractiveness of residence due to better leisure possibilities
	Increased concentration of people in forest territory	Wider range of services at the place of residence

Business entities	Trails promotion	Increased earnings of subjects in accommodation and hospitality
	Trail maintenance	Increased earnings of the entity at the destination centre
Tenants of hunting districts	Damage caused by game displaced from the territory to the surrounding agricultural land	
Forest of the City of Pisek Ltd.	Increased tourism activities in forest areas	
	Increased costs of forest protection	
	Change of the forest category from economic to special purpose forest Financial loss due to the impossibility of processing wood during calamities	

Source: Kozumplikova, Konecny, Chmelikova, et al. 2016

The last phase of the project concerns only the operator of the destination centre (manager of trails) (Table 3). If at this time the entities concerned do not want to continue the trail in operation, it would be necessary to

demolish the acquired assets. The costs associated with the demolition will be borne by the operator of the destination centre.

**Table 3. Identification of project impacts on individual stakeholders in the final phase**

POST-OPERATIONAL PHASE		
<i>Concerned subjects</i>	<i>Negative impact</i>	<i>Positive impact</i>
Business entities	Trails demolition costs Destination centre demolition costs Putting the site in its original state	

Source: Kozumplikova, Konecny, Chmelikova, et al. 2016

#### **Quantification and financial calculation of established effects**

This step of CBA is the most affected by the rate of subjectivity of the valuing individual effects. The most objective ones are those items whose valuation can be made on the basis of realization prices (e.g. initial investment costs, final demolition, foreseeable losses of a forestry enterprise). The problem occurs with items whose effects are not expressed in money and are not traded on any market. In such case the shadow price which should correspond to the value of the project impact related on the perfect market (if such marked

exists) should be determined. Most commonly, two concepts Willingness to Pay (WTP) for positive and Willingness to Accept (WTA) for negative effects are used for these purposes. The WTP and WTA concepts should provide information on the amount that the consumer is willing to pay (WTP) / receive (WTA) for the impact that exactly matches the level of consumer benefit change resulting from the impact. If consumers decide between buying the given output for the amount according WTP and holding this purchase, it would be indifferent.

**Table 4. Quantification and financial calculation of established effects for each phase of the intended project**

IMPLEMENTATION PHASE – value of the effect is given in thousands. CZK per year before the start of the project						
<i>Concerned subjects</i>	<i>Negative impact</i>	<i>Method of valuation</i>	<i>Thous. CZK per year</i>	<i>Positive impact</i>	<i>Method of valuation</i>	<i>Thous. CZK per year</i>

City of Pisek South Bohemian Region Czech Republic EU	Project documentation costs	Implementation price	<b>4 500</b>	Job opportunities in the region	Estimate the wages of workers involved in the realization of investments	<b>2 296</b>
	Trails construction costs	Implementation price	<b>30 000</b>			
	Construction of transport infrastructure - about 1 km	Implementation price	<b>7 000</b>			
Business entities	Destination centre construction costs	Implementation price	<b>8 000</b>	Increased earnings of local construction companies	Estimation based on established average profit margin in construction and expected sales of construction companies	<b>3 960</b>
	Payment for permanent land exclusion from agricultural land	Implementation price	<b>1500</b>			
<b>OPERATING PHASE</b>						
value of the effect is given in thousands. CZK per year before the start of the project						
City of Pisek South Bohemian Region Czech Republic EU	Cost of road maintenance during the winter	Actual expenditure	<b>162</b>	Reducing unemployment rate	Elimination of public sector costs associated with unemployment - estimated by the Research Institute of Labor and Social Affairs	<b>1 000</b>
				Increase in income tax for natural and legal persons	Expected increased tax revenue due to higher business profits and higher employment	<b>274</b> <b>after 3<sup>rd</sup> year</b> <b>548</b>
Business entities	Trails promotion	Estimate of wage and material costs	<b>370</b>	Increased earnings of subjects in accommodation and hospitality	Difference in economic results - estimated based on survey of visitor behavior at other functioning destination	<b>420</b> <b>after 3<sup>rd</sup> year</b> <b>840</b>
	Trails maintenance	Estimation based on experience from other locations	<b>600</b>	Increased earnings of entities in destination centres	Difference in achieved business results - estimated based on the experience of the operator of the destination centre in a similar destination	<b>750</b> <b>after 3<sup>rd</sup> year</b> <b>1 500</b>
Tenants of hunting districts	Compensation for damage caused by game being pushed out of the territory to the surrounding land	165 CZK/ha (estimates based on published data)	<b>247</b>			

Citizens in City of Pisek and adjacent municipalities	Increased concentration of people in the area resulting in higher noise, air pollution and loss of identity	WTA	<b>3 600 000</b>	Higher attractiveness of residence	WTP	<b>379 800</b>
	Increased concentration of people in forest territory	WTA	<b>1 800 000</b>	Wider range of services at the place of residence	WTP	<b>360 000</b>
Visitors (bikers)				Benefit from consuming the offered service	WTP	<b>3 000</b> <b>after 3<sup>rd</sup> year</b> <b>6 000</b>
Forest of the City of Pisek Ltd.	Increased tourism activities in forest areas	The difference in the market price of hunting districts	<b>500</b>			
	Increased costs on forest protection (game effect)	Expert estimation	<b>500</b>			
	Change of the forest category from economic to special purpose forest	Decrease in incomes from production	<b>1 280</b>			
	Financial loss due to the impossibility of processing wood during calamities	Expert estimation	<b>500</b>			
<b>POST-OPERATIONAL PHASE</b>						
value of the effect is given in thousands. CZK per year before the start of the project						
Business entities	Trails demolition costs and place restoration	Implementation price	<b>0</b>			
	Destination centre demolition costs and place restoration	Implementation price	<b>150</b>			

Source: Kozumplikova, Konecny, Chmelikova, et al. 2016

It is evident in the table that the estimation of negative impacts on citizens from the existence of the project does not reach the real values. The appraisal of these effects ranges in units higher than all other project implications. A median citizen prefers an amount CZK of 5.4 billion as an annual compensation for the existence of trails in this area. In other words, the citizen is indifferent to the situation where the citizens of the

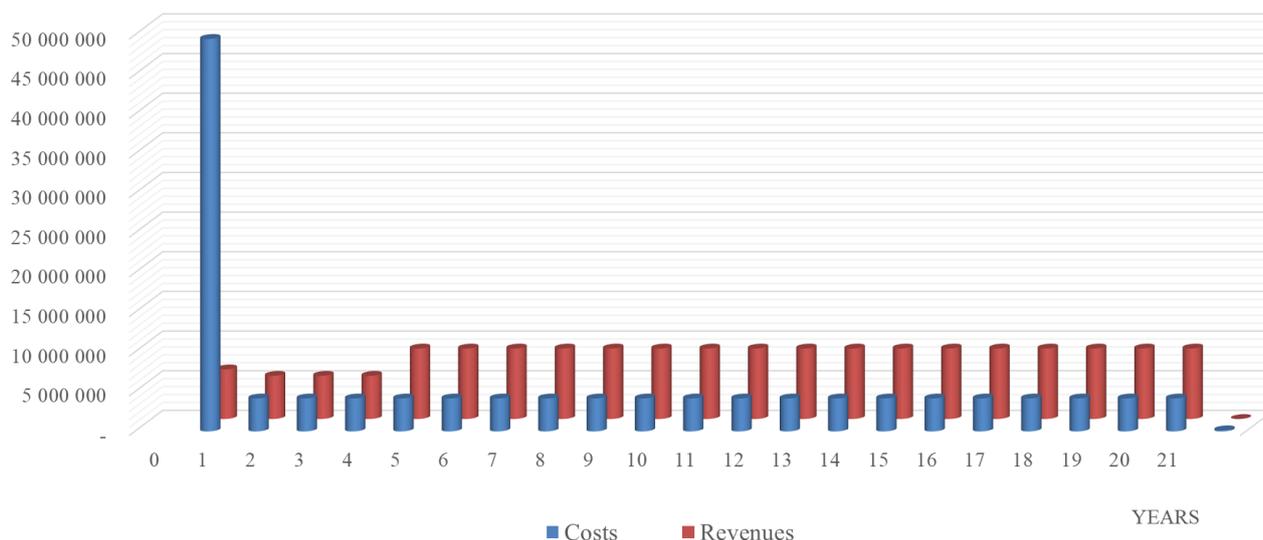
city will allocate CZK 5.4 billion each year and will suffer the existence of trails or the project will not be realized. It is obvious that the obtained information is not valid and it is not possible to count this amount into the calculation of the project's economic efficiency.

The impacts of positive and negative effects, as identified by the pilot questionnaire survey, must

therefore be excluded from the final evaluation of the project's economic efficiency. However, it is clear from the results of the pilot survey that citizens perceive the project negatively and the damage they associate with the existence of trails far outweigh the benefits they expect. Examples of similarly functioning projects show that local people do not mind the paths, on the contrary, they evaluate their impacts positively. The perception of the inhabitants may change before and after the implementation and the time of operation. What is perceived negatively today can be perceived positively after a specific experience.

**Economic evaluation of the project**

The economic evaluation of the project is based on the comparison of the revenues and costs that the project brings in the individual years of lifecycle (except for the valuation of the preferences of the citizens of the city of Pisek and adjacent municipalities) (Figure 4). In order to accept it, it is necessary for the social benefits to outweigh the costs. The following effects can be expected from the project during its lifecycle.



**Figure 4. Expected costs and revenues (in CZK) of the project in years 0-21 of its lifetime.** Source: Kozumplikova, Konecny, Chmelikova, et al. 2016

Similarly, to financial projects, in public beneficial goods all inputs and outputs are affected by time as well. For this reason, it is necessary to re-calculate the future effects to be comparable with current ones - to discount them. The determination of the discount rate is crucial for assessing the cost-benefit ratio of the project for a longer period of time. The discount rate is set by the European Commission for the evaluation of public beneficial projects at the current level of 5 % to discount all project effects. The two basic methods for evaluating the effectiveness of investments to evaluate the economic efficiency of the investment in the project are:

- Net Present Value (NPV)
- Internal Rate of Return (IRR)

**Net Present Value (NPV) of the project**

Net present value is a dynamic method of evaluating the effectiveness of investment projects resulting in the

difference between discounted investment returns and discounted costs in individual years (Table 5). The following formula was used to calculate the net present value:

$$NPV = \sum_{t=0}^{21} \frac{V_t}{(1+i)^t} - \sum_{t=0}^{21} \frac{N_t}{(1+i)^t},$$

Where: t is the time index (t = 0 means the year of construction start of the project with the lifecycle 21 years), Vt represents the aggregate annual returns (financial appreciation of the positive effects of the project) in years from t = 0 to 21 and Nt represents the aggregate annual cost (financial evaluation of the project's negative effects) in year from t = 0 to 21.

**Table 5. Net present value calculation**

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
<b>Cost</b> (mil. CZK)	51	4	4	4	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	0	<b>103</b>
<b>Revenues</b> (mil. CZK)	6	5	5	5	7	7	7	6	6	6	5	5	5	5	4	4	4	4	4	4	3	0	<b>108</b>

Source: Kozumplikova, Konecny, Chmelikova, et al. 2016

The difference between discounted all-society revenues and costs is approximately CZK 5 million. The net present value of the project is positive and the project is suitable for acceptance from an economic point of view.

### **Internal Rate of Return**

The internal rate of return is appropriate for illustration the quality of the project. The Internal Return Rate method gives the answer to the question: "What is the expected return rate of the evaluated project?" It seeks a level of discount rate that will ensure that the present value of the expected cash flows is the same as the investment-induced expenditure. This equality can be calculated for the project according to the following equation:

$$0 = \sum_{t=1}^{21} \frac{(V - N)_t}{(1 + i)^t}$$

where all symbols have the same meaning as at the net present value method

The resulting internal rate of return is 6.06 % after financial expression of positive and negative effects of the project. The internal yield rate in excess of the required discount rate (5 %) points to a project suitable for implementation.

It should be noted that the economic impact assessment of the project has been calculated with the worst possible variants of possible negatives and their associated costs. Some of them probably do not occur at all as show other similar projects in the Czech Republic (increase of damage caused by game to agricultural land, forest category conversion from economic to special purpose forest).

### **Final summary of the economic impact assessment of the project**

The values of the indicators of the methods for evaluating the effectiveness of investments reach the levels at which the project can be recommended for the realization. Positive NPV refers to the excess of the positive effects of the project over its negative consequences. This conclusion is also confirmed by the

established value of the internal rate of return which is higher than the calculated social discount rate. Due to the impossibility of reflecting the preferences of citizens of the city and adjacent municipalities on the economic evaluation of the project this conclusion cannot be considered definitive. The pilot survey has shown that citizens perceive potential project implementation as a threat rather than an opportunity, with a very significant difference. The economic analysis should be complemented by the findings of a proper opinion poll.

### **Conclusions**

Despite positive results of the feasibility study, the representatives of the City of Pisek decided not to support this project and listen to the wishes of local inhabitants. Nevertheless, the efforts of bikers and other groups in the City of Pisek at least for the realization of partial parts of the project continue.

For the realization of similar projects in the cultural landscape, the following measures can be recommended:

- Realization of a destination with interconnected paths with graded difficulty for a broad target group of users (from beginners, families with children to advanced bikers).
- Choosing a destination center in a convenient location that will allow concentrating accompanying services to generate profits for the operator and creating funds for operation and maintenance.
- Ask design project contractors with appropriate references, not only with regard to price. Deficiencies in the design phase reflects in the quality of the entire product (unsustainability of trails, negative environmental interventions).
- Realization of the project in the field by an experienced company under the professional supervision of the investor and the designer.
- Divide project implementation into time-separated stages. In particular, for the purpose of evaluating the project's specific impacts on the site, tourism, forest management, hunting, nature protection, user profile, runway operations, operation of the risk management system, stakeholder cooperation, maintenance, etc.

- Set up risk management effectively, which is another prerequisite for a successful project. Management should take into account the internal and external risks associated with the movement in nature.
- Put together effective rescue system for quick secure any injured persons, simple localization of the injured, schedule access corridors for emergency services.
- Ensure regular monitoring of the condition and maintenance system of trails and provide current information about the state of the trail to all users.
- Clearly identify which entities and how they will be financially involved in the operation, management and maintenance of trails. Cooperation among the investor, the land owner, land manager and the operator of the destination is considered. Promote mutual understanding arrangements or take other appropriate method for the declaration of agreed rules.
- Specific ways of maintaining and repairing trails must be designed by a competent person to supervise their implementation. Improper interventions could degrade paths and compromise safety and reduce the attractiveness of the product.
- Product promotion should be carried out by a qualified person with experience in this field, offering a connection with the trails operator.

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