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The Infrastructure for the Development of Ecotourism Potential at Degrading Natural Objects: The Case Study of the Smotrytsky Canyon

Abstract. The need for conservation and protection of natural ecosystems from the consequences of non-rational exploitation is a key issue for all industries. Tourism depends strongly on the quality of environment, but it can contribute to degrading or saving vulnerable ecosystems. The development of infrastructure for ecotourism is a way of mitigating the negative consequences of human activity and solving a range of related problems in the local labor market as well as improving living standards. The authors describe a series of actions aimed at developing ecotourism, which have been partially implemented in the Smotrytsky Canyon. In addition to presenting characteristics of the ecological and cultural value of the canyon, the authors analyze how it is affected by the existing anthropogenic factors. A list of necessary actions for environment restoration is presented, with special emphasis on erosion control, including plans for their implementation. Finally, the authors consider economic problems of developing ecotourism infrastructure and ways of minimizing their financial costs.

Keywords: ecotourism, infrastructure, environment condition

1. Introduction

Normally, tourism is considered to be an activity with a relatively neutral impact on the environment. The need to preserve the environment has given rise to alternative types of tourism, in particular to ecological tourism. It is estimated that

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by the end of the 20th century ecotourism accounted for up to 7% of the global market for tourism services [Chizhova 1997] with a stable annual growth rate of 5% [Petruk et al. 2016].

The term "ecotourism" was first used by the Mexican environmentalist Hector Ceballos-Lascurain (currently the Director General of the Program of International Consultancy on Ecotourism and a Special Advisor on Ecotourism to IUCN (The World Conservation Union), and the World Tourism Organization) at the beginning of the 1980s [Pysarevsky, Pogasiy & Pokolodna 2008]. In the professional (as well as in academic) environment there are several idealistic definitions of ecotourism, similar in content.

In general, ecological tourism is responsible for nature, contributes to its protection, enhances the ecological culture of travelers, performs an educational function, and respects and cultivates traditions and culture of local populations. Ecotourism is a form of travel that focuses on preserving the natural environment, establishing relationships with local communities and authorities, which are beneficial to the region and its natural systems. A similar definition is given by the the International Ecotourism Society: "responsible travel to natural areas that conserves the environment, sustains the well-being of the local people, and involves interpretation and education" [TIES 2015]. Ecotourism involves trips to places of relatively unspoilt nature, to valuable natural objects seeking aesthetic pleasure from the contact with nature, recreation and acquisition of new knowledge about the natural environment [Wyshnevsky 2015]. In other words, ecotourism is sustainable and nature targeted tourism and recreation [Lindberg, Wood & Engeldrum 1998].

The Polish sociologist K. Przecławski defines tourism in similar terms, stating that tourism must involve a personal contact with the natural, cultural and social environment [Przecławski 2008].

Over a quarter century, experts have not reached a consensus on the definition of ecological tourism, which is referred to as "eco," "natural," "green," "soft," "rural," etc., or even classified as cognitive travel (adventure travel). But it is obvious that the term "ecological" reflects not only the product offered by tour operators, but the idea of observing nature and other people with their traditions without threatening them.

Regardless of the approach, ecotourism concerns objects with a scientific, cognitive, aesthetic, recreational value. These are areas with unique natural monuments, mountains, virgin forests, mineral springs, valleys of rivers and streams, habitats of rare species, etc.

Therefore, unlike other area where free movement of tourists prevails, ecotourism is often confined to ecological and scientific trails in order to prevent damage to natural objects.

At the same time, ecotourism activity does not mean that it can be organized without any preparation or infrastructural development. One of the major requirements for ecotourism is the proper arrangement of trails, zones and recreation areas, preparation of advertising and information activities, provision of a range of quality services, creation of the recreational and tourist infrastructure. At the present stage, ecotourism in protected areas should become a powerful catalyst for the preservation of the environment, rather than its further destruction [Petruk et al. 2016]. The acquisition of environmental knowledge by tourists must not cause damage to local communities. On the contrary, the creation of recreation zones should provide opportunities for:

– a decline in unemployment in the countryside and a growth in self-employment among the rural population, especially young people,
– the sale of on-site farm products,
– improvement of rural homesteads, streets, and rural settlements in general,
– revival, preservation and development of local folk crafts, monuments of historical and cultural heritage,
– a rise in the cultural and educational level of the rural population.

Ecological education is an effective way of fulfilling all these tasks. It typically involves excursions to get acquainted with nature. To facilitate this task, ecological trails are developed, which provide an educational context in the natural environment. During an ecological trip, tourists have an opportunity not only to relax and admire the views, but also to get acquainted with the flora and fauna of the area, to learn the rules of behavior in contact with nature, to learn about environmental problems of a given area and about possible solutions. This is important for local citizens and tourists: for the former it is a chance to learn how they can personally contribute to degrading or conserving the natural facility, while for the latter it is an opportunity to learn about potential consequences of irrational exploitation of nature and ways of improving the situation.

The aim of the article is to analyze the potential of ecotourism in the Smotrytsky Canyon, identify the most important environmental problems facing this area and develop a plan to halt environment degradation processes at the site.

2. Issues of developing ecotourism and its infrastructure

First of all, it should be mentioned that valuable natural formations are very challenging objects for tourism development, mostly, because of their vulnerability and fragile environmental balance. Even at the beginning of the 20th century the

question of promoting tourism at protected areas faced considerable opposition from leading environmentalists in Eastern Europe, but the experience of the US has showed the efficiency of this practice. Leading scientists have supported the idea (D.N. Katpkarov, I.I. Puzanov, V.P. Makarov, D.N. Kashkaroya, G.A. Kozhevnikov, F.F. Shillinger). Since then, there has been a considerable growth in the number of tourists in protected areas, which was, unfortunately, accompanied by a considerable degradation of natural ecosystems by the end of the previous century. Thus, we can now summarize the most typical disadvantages of traditional tourism, which are valid for ecological tourism:

– erosion and the rise of dangerous exogenic geological processes,
– accumulation of waste,
– tramping and structural soil degradation,
– loss of valuable species and reduction in biodiversity,
– declining ethnic diversity,
– infrastructural degradation,
– loss of interest in natural monuments.

As a result, modest incomes provided by ecological tourism is decreasing even more and local communities and authorities are losing interest in supporting tourism. It is still widely accepted that issues of nature conservation might be solved after gaining economic benefits from its exploitation, while, in fact, ecotourism needs infrastructural investments just like other types of tourism [Kekushev, Sergeev & Stepanitsky 2001]. Even if these investments are not very high, the payback period is much longer, compared to traditional recreation. So, ecotourism needs a well-developed implementation plan to provide long-term benefits.

3. Methods and materials

The authors propose the following sequence of actions to facilitate the development of ecotourism and infrastructure at natural objects of interest:

– develop detailed characteristics of the natural association as a background for tourism,
– define natural and cultural attractions and develop theoretical assumptions for tourist routes,
– assess environment conditions in a given area, define vulnerable elements and complexes, identify major threats,
– develop a plan for environmental protection and degradation control,
– develop a plan for infrastructural development and an information campaign addressed to the local community,
– distribute information among members of the local community,

– solve or mitigate existing environmental problems,

prepare the area of interest: measures aimed at preventing and controlling erosion, cleaning, improving safety, road and transport infrastructure, providing hotel services,

– create land route: prepare and mark trails, install signs, create visitor centers,

– define an acceptable (permissible) number of visitors, develop the code of conduct for visitors,

– train local guides and trackers, educate local citizens about ways of providing supporting services,

– form an ethnic network to support interests of tourists and visitors.

An acceptable (permissible) number of visitors is determined as part of the recreational capacity of a tourist site. The recreational capacity is the number of visitors that will not harm the stability of the local ecosystem. In the case of the Smotrytsky Canyon, the stability of the local ecosystem basically equals erosion stability of this natural formation. Recreational capacity is typically determined as follows:

$$V = \frac{N \times S \times C}{D_i}$$

where:

V – denotes the area's recreational capacity, the number of persons,
N – the standard of recreational impact on the area measured in persons/km^2,
S – area in km^2,
C – duration of recreational period in days,
D – average duration of tourists visits in days [Melnyck 2005].

3. The assessment of environment conditions

These steps will enable stable development of ecotourism and ensure its stable quality if they are supported with continuous campaign among the local community on the prevention of overexploitation of local resources and environmental pollution with domestic waste etc. On the other hand, member of the local community may be involved in supervising tourists to ensure compliance with the rules and an inappropriate use of natural resources. Given the number of actions to be taken, it is necessary to allocate a sufficient amount of time, staff and financial investments, which could be partially provided by the involvement of the local community.

The proposed sequence of actions is currently being implemented in the Smotrytsky Canyon, Khmelnytska oblast, Ukraine. The canyon is a valuable natural object, located within a major historical site, but is undergoing degradation as a result of non-rational exploitation by the local community. The first five steps were implemented by the authors during 2016, and included analysis of information in the available literature, on-site route observations in June-August 2016, an assessment of the results and development of action plans in autumn 2016 – winter 2017. The authors also determined the potential recreational capacity based on data obtained from the literature analysis and on-site observations.

The on-site tour included a visual assessment of the geomorphological features, the status of exogenic geological processes (erosion, landslide activity, stability of the river banks and canyon elements, etc.), the sanitary condition of the canyon and the surrounding area, soil quality (morphological parameters, especially the presence of inclusions, physical and mechanical parameters), land use practices and botanic description of the area.

4. Description of the Smotrytsky Canyon

The Smotrytsky Canyon is a geological monument of nature of national importance, protected by the state by virtue of being registered as a National Historical and Architectural Reserve "Kamyanets." It is located within the National Nature Park "Podilsky Tovtry." The canyon is located in the western part of Ukraine (in the south of the Khmelnytsky region), 48°25'N, 26°32' E longitude in the southwestern part of the town of Kamyanets-Podilsky, at an altitude of 200 meters above sea level. The length of the canyon is 9 km. The Smotrytsky Canyon stretches over an area of 81 hectares (the right bank of the Smotrich River is 27.7 hectares, the left – 52.3 hectares), with 528 inhabitants; it is also part of a residential area known as "Old Town". The canyon is also a wetland of international importance protected by the Ramsar Convention and in accordance with the Law of Ukraine.

The Smotrytsky Canyon begins at the town limits at the new housing estate Zhovtnevy in the north and stretches along the river to the village of Zubrivka in the south. It was formed as a result of the destructive action of the Smotrych river. The area of the Smotrych Canyon features unique natural elements. It bears a certain similarity to external geological features of rocky ridges in the United Kingdom and the United States.

The uniqueness of the object is also manifested by a harmonious combination of natural (omega-shaped canyon, river, rare flora and fauna) and anthro-

pogenic (historical settlement, unique fortification, hydrotechnical, communication structures) values.

The gorgeous shores of the canyon feature a very interesting complex of ancient geological deposits (Paleozoic), including Silurian, and rich and specific Paleozoic flora and fauna. The wildlife reflects the most widespread representatives of the local fauna, including 1 species of fish, 6 species of butterflies listed in the Red Book of Ukraine, 4 species of reptiles and 33 species of birds listed in the Bern Convention. The local fauna can boast of a number of bat populations (6 species) that inhabit the natural depths of the canyon cliffs [Nature census of the National Nature Park "Podilsky Tovtry" 2016].

The plant world, in addition to rich local diversity, includes relict plants that have grown here since ancient times and survived glaciations, and endemic species that live only in a limited area of the Podillia – all subject to different levels of international and European, national and regional protection. Among them, Shiverekiya Podolsky (*Schivereckia podolica* (Besser) Andrz. ex DC.) is a tertiary relict species, endemic to only two habitats.

Within the canyon there are nature monuments of national significance: a historical part of the town of Kamyanets-Podilsky, the Kamyanets National Reserve, the Kamyanets-Podilsky Botanical Garden (natural monument of national significance), the Kamianets-Podilsky Park (park-monument of local and landscape art), as well as the gardens of Jan de Witte [Nature census of the National Nature Park "Podilsky Tovtry" 2016] .

For this reason, the canyon of the Smotrych River is regarded as an object of the world's natural heritage. Kamyanets-Podilskyi has the potential to be one of the most attractive tourist centers, not only in Ukraine, but also in Europe on account of its unique natural landscape, mild climate, convenient location and proximity to its natural features. However, in the absence of information, most tourists are interested in visiting historical monuments and tend to ignore this valuable natural formation. This is the result of a bad tourist policy and the attitude of the local community, who neglects the tourist value of the canyon and focuses only on the natural resources it provides. This attitude has led to a considerable degradation of the canyon environment.

5. Environmental problems of the Smotrytsky Canyon and their causes

Today, the environmental situation within the Smotrytsky Canyon is difficult. The main factor contributing to the continuing deterioration is anthropogenic

pressure: quarry development, garbage accumulation, farming on the slopes of the canyon. As a result, the main environmental problem of the area is water and wind erosion, whose combined effects enhance the processes of destruction. However, recently, domestic waste accumulation has become the biggest threat to the state of this ecosystem. Local plants are covered with garbage, sewage waters or are burnt out. The most typical problem is the mechanical destruction of ecotops: land ploughing, the planting of coniferous trees, which block sunlight and cause steppe species to perish.

Human activity triggers anthropogenic (accelerated) erosion. Studies conducted in the area reveal a large variety of anthropogenic factors: transport related, zoological, agrotechnical, chemical and technogenic, all of which contribute to the formation of anthropogenic landscapes.

Quarries are the most typical example of such landscapes. There are three quarries in the Smotrytsky Canyon: Pudlivtsi and Kubachivsky belong to the factory of building materials, Zyubpivsky – to the asphalt factory, which has the equipment to produce rubble from extracted stones. Destruction of rocks accelerates almost all types of erosion, especially deflation. The chaotically abandoned stone is moved by the wind, fine fractions are spread over a considerable distance, and as a result the plants in the area are covered with a thick layer of dust. Long term exposure to this dust is harmful to human and animals health as well. Water erosion in the area is caused by intensive rains and snow melting. The disrupted integrity of the rocks causes a threat of rockfalls.

The worst situation can be observed in the village of Tsybulivka. 25 years ago, a quarry was opened at this site for the extraction of construction stone. Now the banks of the Smotrych river within one kilometer range are destroyed. It is also the main habitat of the above mentioned endemic species – Shiverekiya Podolsky. For many years the botanist M. Krutskevich has been trying to convince the local authorities of the need to preserve this unique coastal strip. Unfortunately, today this area is covered by concrete slabs and asphalt of private garages.

Another major problem faced by the Smotrytsky Canyon is the illegal accumulation of domestic waste along local settlements. Garbage piles are located on the river banks at the angle of 30°. Under the influence of gravity, this waste constantly slips into the Smotrych River, exposing the unprotected Chornozem, where other types of erosion (water, wind) begin. In the area of the Zhovtnevy, Polish and Russian Homestead (folwark) districts, the Old Town, vast zones are covered with waste. And all this contributes to the growth of weeds, and the degradation of the environment.

On the banks of the Smotrych River, there are still remains of chemical stocks of the "Electroprylad" plant. Saturated with various chemical pollutants, the soil layers have not decontaminated and still remain in the coastal zone.

Within the canyon, there are also discharges of municipal and domestic wastewaters from the settlements without a centralized sewage system, which also leads to soil pollution. There is even one new rock formation within the New fortress, where this sewage has reacted with the limestone and formed a peculiar yellowish-blue color salt flow.

On the slopes of the Smotrych River (villages of Tsybulivka, Kubachivka, Tataryska, Podzamche, Pudlivka), local inhabitants cultivate private gardens, which are not only located on level land but also on steep river slopes. The population conducts various agrotechnical works, which change the soil structure and trigger the destruction of soil by water streams and wind erosion.

The annual destruction of bushes, vegetation, which recover very slowly, leads to the formation of wide naked areas devoid of natural plant communities. For instance, on the slopes in the area of Polish and Russian Homestead districts there are areas where the herbaceous coverage has decreased to a critical level – 5-15%. Consequently, the progress of erosion is also threatening the species composition of the vegetation and is another factor contrubuting to its degradation.

6. Plan of environment protection and restoration actions

Based on the author's analysis of the condition of the environment it was established that the following elements of the plan for environment protection and degradation control are of primary importance: erosion control and prevention, waste removal and disposal, closure of the quarry, limitation of household activity, restoration of natural vegetation cover.

The most important and complicated part of the plan to develop and implement is the control of erosion processes. Results of a survey conducted by the authors indicate that the following measures are required:

– slopes of the canyon and the banks of the river and plantations need to be regulated and stabilized,

– waste mounds generated by household activity of the inhabitants need to be removed,

– illegal and disharmonious buildings and structures should be demolished,

– sewage collection and drainage from the area of the New Town need to be improved,

– traffic on the slopes has to be regulated.

Table 1. Characteristics and methods of combating erosion

Geological (natural) erosion		
Type of erosion	Characteristics	Countermeasures
Sidewall	Destruction of the slopes of the river valley. It causes migration of the channel, drainage, formation of river meanders, river valley expansion.	– preserve forest plantations in the floodplain – consolidate the banks with the help of special hydraulic engineering
Wind	Arises under the influence of strong winds blowing soil away	plant protective arboreal associations
Anthropogenic erosion		
Transport	It is a consequence of vegetation destruction by vehicles; it occurs throughout the area of the canyon	– improve road coverage – develop an optimal road system in the area – erect fences – impose fines for violating the rules governing the use of resources in the area
Zoogenic	Mechanical destruction and relocation of soil by animal hoofs on the slopes as a result of increased pressure on the limited area of pasture	– allocate special places for pasture – impose justified grazing restrictions
Technogenic	Destruction of soils and parent material by technical equipment used in the quarries, explosive works	– close quarries – undertake reclamation measures – strengthen the slopes
Chemical	It is a consequence of the accumulation of certain chemical components in the soil (mineral fertilizers, pesticides, products of wastes decomposition, etc.). It violates the processes of soil functioning and development, prevents normal activity of living organisms	introduce a ban (partial or complete) on: – application of „carpet" fertilization and treatment with pesticides – application of highly soluble pesticides and mineral fertilizers – plowing and the destruction of shrub or herbaceous vegetation on sites vulnerable to erosion – chemical melioration – provision of sewage treatment
Agrotechnical	Destruction of soil cover, its displacement along the slope by agricultural machinery during the preparation of soil for cultivation of agricultural plants	– prohibit ploughing and destruction of shrub or herbaceous vegetation on sites vulnerable to erosion – improve farming systems, methods of soil cultivation – improve land use depending on terrain conditions – develop complex plans for landscape management and development (taking into account ecotourism development) – introduce measures to facilitate snow-holding, cracking and molding of soil, flat planes cultivation, slopes terracing, application of organic fertilizers, narrow-rowed grass seeding – promote soil mulching

Sources: Davedenko, Bilyavsky & Arsenyuk 2007; Tarariko 2007; Zabaluev 2004; Zubets 2007.

To stabilize the canyon slopes, taking into account the experience of other countries, we have proposed to implement a series of measures, which could be divided into organizational, agrotechnical, hydrotechnical and land reclamation (Table 1).

Organizational and economic measures must include the determination of land use types only according to land stability and environment condition. Land owners and users must implement anti-erosion activities in the area, introduce crop rotation as a measure of soil protection, and impose grazing restrictions. Anti-erosion agrotechnical measures contribute to increasing the absorption capacity of the soil, its resistance to water and wind erosion, reduce surface runoff and destabilization of rocks. For example, it should be forbidden to plough slopes with a steepness of more than 7° (except for forestation and implementation of soil protection measures). Placement of crops on slopes with a steepness from 3 to 7° must be limited, as stated in the regulations.

To improve microclimatic conditions, it is important to implement measures aimed at retaining snow and counteracting the effects of wind erosion, by supporting the development of forests and meadows. Agrotechnical methods of controlling soil pollution with heavy metals include liming and the application of organic fertilizers. The most polluted areas need to be allocated for forestation and the cultivation of ornamental plants [Davedenko, Bilyavsky & Arsenyuk 2007].

It is understandable that not all recommended actions can be performed. The implementation of the action plan has started in summer 2017 with the support of a range of non-governmental organizations and the authors of the plan. Based on the agreement with the local authorities the following measures are to be undertaken until the end of the year:

– improve road coverage along the canyon,
– erect fences along the road to prevent off-road movement,
– allocate new area for pasture,
– prohibit ploughing and destruction of shrub or herbaceous vegetation on sites vulnerable to erosion,
– demolish temporary illegal structures along the canyon.

At the same time the NGO "The Wind of Change" and students of the National Aviation University were involved in an information campaign aimed at local inhabitants to provide the information about the potential of ecotourism in the area and benefits it might bring in comparison with traditional farming activity. The results of this work will be seen in the future, but most local inhabitants already agreed to participate in cleaning the canyon from garbage in October 2017. The local quarries cannot be closed, but they have agreed to provide vehicles for the removal of collected waste. The quarries' administrations have been informed about fines for off-road movement of technological equipment.

7. Perspectives for the development of ecotourism infrastructure in the Smotrytsky Canyon

Taking into account the available attractions, it is possible to plan several ecological routes inclusing the Smotrytsky Canyon, one of which lies within the town of Kamyanets-Podilsky and one which includes the town and its surroundings. The first ecological trail "The Smotrytsky Canyon" runs along the right bank of the Smotrych River within Kamyanets-Podilskyi (total length of the route is 2 km, duration of the walk is 2 hours). It is a walking route and includes 5 stops. It starts at the office of the National Nature Park "Podilsky Tovtry", and then leads to the Smotrych Canyon. The first stop is planned near the Kushnir tower, where tourists get acquainted with the Smotrytsky Canyon geological landmark of national significance and can admire the canyon landscape. The walk continues to the Smotrych River and the historic monument of the Polish Gate, where the hydrometeorological post is located. The trail continues to the source of Grotto, and ends near the historical architectural monument – the Armenian well, the first source of drinking water for the Old City.

The second variant of the route includes 7 main stops (length of the route - 5.3 km). The route also starts at the office of the National Nature Park "Podilsky Tovtry". Then the trail leads to the Kamyanets-Podilsky fortress, and from there – to Novoplanovsky town, where the geological nature monument of national significance "The Smotrytsky Canyon" is located. The best place to admire the river is from under the bridge connecting the shores of the canyon at the altitude of 38 meters, the river Smotrych, which is flanked on both sides with steep cliffs. The history of the ancient Silurian Sea and the geological history of our planet are depicted on the walls of the rocks: tourist can observe prints of Silurian algae, trilobites and corals that existed over 400 million years. Located in the vicinity is a waterfall and watchtower from the 16th century called "Potter's." The path leads to a small bridge and a collection of the arboretum of the Kamyanets-Podilsky Botanical Garden, which includes 2500 species of plants, including relic and endemic species from around the world. The trip ends near the "Running Lan" bridge, where, on the canyon's terrace, tourists can see the relic of world significance – Shiverekiya Podolsky and other rare species of plants, birds and butterflies.

To ensure ecological trails can be used effectively, it is necessary to mark the routes, install information boards that will navigate tourists along the route and provide information in the absence of a guide, facilities for recreation and collection of domestic waste.

The estimated capital costs of infrastructure investments are approximately 40 000 EUR, including: ground road construction – 20 000 EUR; construction of service buildings (visitor center, storage, garage) – 15 000 EUR; maintenance equipment – 1500 EUR; fencing of the area 1800 EUR; erection of signs – 1000 EUR. Some of these costs might be covered by the National Nature Park "Podilsky Tovtry," whose staff could also perform works related to fencing and the erection of signs, provide maintenance works and the necessary equipment, while ground road construction is included into the perspective plan of Kamyanets-Podilsky municipal area development. As a result, the necessary investments might be lower.

Running costs (per month) are not very high and amount roughly to over 500 EUR: information support (printing information material) – 200 EUR; provision of visitor center activity – 200 EUR; route maintenance – 150 EUR. Additional costs should be allocated for guides training – on a regular basis or one time before the launch of active exploitation.

The payback period for these investments depends on the number of visitors and the system of admission fees for visitors. The number of tourists depends on the effectiveness of the information campaign, advertising activity and is limited by the area's recreational capacity.

According to the regulatory indices of permissible recreational pressure on natural complexes of Ukraine, river complexes have the lowest levels of 50-80 persons/km^2 [Safranov 2010], which means that the total number of visitors, accounting for the reducing index of erosion susceptibility of the Smotrytsky Canyon, during the summer season (May-September) may range from 7800 to 15 000 persons. Even if the actual number of tourists is minimal, a reasonable financial policy (minimal entrance fee), the funds invested may be recouped within 4-6 years. Thus, the project for the development of ecotourism infrastructure is environmentally and economically beneficial.

8. Conclusions and discussions

The development of ecotourism is a new and efficient instrument in the protection and restoration of degrading ecosystems. Nevertheless, it needs well-planned preparation and implementation of a specific sequence of actions. One of the most important issues is the improvement or creation of tourist infrastructure, which will provide comfort and enhance the experience for visitors.

Using a step-by-step plan specially developed for this purpose, we studied the Smotrytsky Canyon during on-site visits from the point of its tourist attractive-

ness, environment stability and the condition of the infrastructure. The results of the study indicated a pre-critical condition of the ecosystem due to intensive natural and anthropogenic erosion, waste accumulation and non-reasonable household activity and small farming.

To counteract the major environmental problems, we developed a list of erosion control measures, restoration actions and organizational solutions. It takes into account the high cost of environment improvement activities and the low probability of a complex implementation of the entire list of actions. However, an information campaign in the local community and increased interest on the part of authorities might bring good results even if the available funding is limited, as can seen from the case study of the Smotrytsky Canyon.

The crucial element in the development of efficient ecotourism is the creation of infrastructure, which requires time and money. The total budget calculated for the Smotrytsky Canyon is rather large for such a small municipality and it is unlikely to be fully realised. So, the best solution is to implement the measures with a maximal effect and minimal financial support. But this is only possible with the support from local inhabitants and the local administration. Therefore, ecological education, the distribution of environment-related information and target campaigns are the most important preconditions not only for the development of ecotourism but also for nature conservation. In an effort to perform these tasks, we designed two educational routes within the Smotrytsky Canyon.

A draft plan of infrastructural development has also been prepared for further activity, which, obviously, can still be improved. The financial issues, namely investments and the payback period, are characterised by a high level of uncertainty, given that ecological tourism is still in its initial stage of development in Ukraine. There are some major obstacles to further progress: lack of support from local and national authorities, absence of branch specific regulations and an unclear system of admission fees for visitors. But symptoms of positive dynamics can already be observed.

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Infrastruktura na potrzeby rozwoju potencjału ekoturystyki obiektów naturalnych ulegających degradacji na przykładzie Kanionu Smotryckiego

Streszczenie. Potrzeba ochrony naturalnych ekosystemów przed skutkami nieracjonalnej eksploatacji to kluczowe zagadnienia dla wszystkich gałęzi gospodarki. Branża turystyczna jest silnie uzależniona od jakości środowiska, ale również sama może przyczyniać się zarówno do degradacji, jak i do ochrony zagrożonych ekosystemów. Rozwój infrastruktury ekoturystycznej jest jednym z mozliwych sposobów łagodzenia negatywnych skutków ludzkiej działalności oraz rozwiązywania wielu powiązanych problemów na lokalnym rynku pracy i poprawy warunków życia. Artykuł opisuje działania mające na celu rozwój potencjału ekoturystyki w miejscach o walorach naturalnych, które zostały częściowo wprowadzone w życie w Kanionie Smotryckim. Opisano charakterystyczne cechy Kanionu, istotne dla ekologii i kultury, oraz wskazano na istniejące czynniki antropogeniczne. Analizie poddano analizie konieczne działania zmierzające do zachowania środowiska naturalnego, szczególnie w zakresie kontroli procesu erozji, oraz opisano sposoby ich wdrożenia. Przedstawiono również ekonomiczne kwestie rozwoju infrastruktury ekoturystycznej oraz możliwe sposoby ograniczenia kosztów takich działań.

Słowa kluczowe: ekoturystyka, infrastruktura, warunki środowiska naturalnego