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**Models for mapping tourists
(regarding surrounding)**

The main aim of this paper is to give a review of the methods used for monitoring visitors in a tourist destination in Slovakia. According to the research findings, it can be assumed that the monitoring system of visitors is not comprehensive and unified in Slovakia and requires much more attention. The article is mainly focused on quantitative methods of data collecting aimed on number of tourists and their movement in specific area. Based on these data, it is possible to assign additional information to territory of the destination, which creates the base for successful management and development of the destinations.

Keywords: visitor's monitoring, tourist destinations, counting of visitors

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Introduction

Monitoring of the tourists in the protected areas has a long-term tradition, mainly in the areas with the highest level of protection. The monitoring itself has been introduced with the purpose to preserve the surrounding and to protect the plants and animals themselves. Monitoring of the tourists for the needs of planning the tourism is not the most important issue. In many countries, there is no systematic long-term monitoring and we have only some basic information about the movement of the tourists from the secondary sources. This is particularly true for the situation in most European countries, where visitor monitoring, if at all done, is usually organised on an ad-hoc basis without systematic planning. Very often, results from improvised one-day countings are being extrapolated and used for management decision without consideration of the significance of the results (Muhar et al, 2002). Visitors monitoring in the protected (nature) areas has been discussed by various authors (Kajala, 2007; Pichlerová et al, 2013; Jaarsma et al, 2002).

However, it is needed to monitor also the areas without the highest level of protection, we should monitor all places with the possible negative impact of tourists on living nature in order to prevent the harm (Molokáč et al, 2014; Sehnálková et al, 2013).

Suggestions for monitoring projects have been based on criteria of the organization, financial background, with the effort to depict the most frequently visited places, mainly during the top season. These monitoring projects have been rather short-term – only a few days in a year. It is important to monitor several facts, not only the number but also the structure of the tourists and it has been revealed that the visitors' flow is also a very important factor (McVetty, 2002). All these aspects are really essential for the optimal regulation of these areas regarding not only the protection of the areas but also the tourism itself (Gätje et al, 2002; Muchová & Pavolová, 2011; Derco & Pavlišinová, 2016) and the protection of the tourists themselves (Compl'ová & Rybár, 2011).

Classical monitoring techniques

For the visitors monitoring it is important to realize that a number of visitors do not walk only in the natural surrounding but also in the urban-city areas, or possibly they use the communication to move between the two places.

There have been various traditional methods to monitor the visit rate in the recreational areas. (Muhar et al, 2002), which have been completed by methods suitable for monitoring of the visitors also in city areas:

Direct methods

Interviews, public inquiries, questionnaires: from interviews, public inquiries and questionnaires it is possible to gain a lot of important information about the goals of the tourists, their background, needs, habits and chosen destinations in the areas.

Direct observation:

- Roaming observers – In many national parks, rangers can be seen to count the number of people they meet during their inspections in the area.
- Fixed counting stations – Specific counting stations are usually only set up for short observation periods where information is gathered through information and souvenir shops.

Indirect observation:

- Cameras: Video recordings and photographs are an excellent source of information for visitor monitoring. There are many advantages as for example a precise monitoring of the number of visitors or of the type of a route the visitors have chosen
- Aerial, satellite imagery: Air photos can only be used for the detection of users in open areas such as lakes, meadows, beaches and roads.

Counting of access permits and tickets: records from the tickets bought by the tourists might serve us very well. We talk about commercial facilities as for example ferries, cable cars, and restaurants. Another option is to use induction and photoelectric counting devices, working on the basis of infrared light. A big disadvantage of most of these devices is that they usually only record the number of visitors but not their direction.

Visitors registering:

- Trail registers –there are 2 types of similar registers. They are more common in American system, where during the visit of a park or possibly a hiking trail you will buy an entrance ticket, it might be a self-registering device– situated regularly after some special distances. This system is less common and not very frequent in European countries, however it can be placed for example in climbing routes or at the end of the most difficult sections. These registers help to gather information about the group and route, in case of emergency, they offer valuable information for the rescue team.
- Summit books – it is a tradition in some Central Europe countries which doesn't serve for monitoring of the visit rate, but rather as a "book of guests".
- Accommodation lists – in many parts, staying somewhere for a night is the only source of information about the visitors. We usually monitor the background of the tourists and the length of their stay.

•Lists at the airports – lists of arrivals and departures, these are similar to the accommodation lists bringing information about the visitors, the length of their stay, however they provide no information about the „flow“ of the tourists or about the places they have visited.

Indirect methods

With the indirect methods, we monitor the signs showing that the visitors „have been here“ and have left some “footprints” in the country, however it is obvious that it is not easy to make any generalisations.

Here we can add.:

- Garbage – rubbish can be seen in the dustbin, however it can be found anywhere scattered on the ground
- Destruction of the trails and vegetation– means a long-term effects of the recreational use
- Footprints – most often used for monitoring of the biodiversity, not only of the tourists but also wild-life, for example in the areas without people or in areas with only a few human footprints.
- Counting of Cars – counting of cars within the monitored area, it describes the number of visitors indirectly, sometimes they might be no visitors themselves but only people who use the place for transit.

Modern monitoring techniques

Automatic cameras, time-lapse videos – are a suitable source for monitoring the tourists. In the past era, there was a problem with the data processing, which was solved thanks to a time-lapse video. Nowadays, there is a tendency to link automatic cameras with the software detecting of the face, which would make a time-consuming video processing faster. This way, the processed information provide facts about the visitors and their routes.

Gates + Devices counting of cars – this system has been used in various European countries for example : paying for highway tax. The system enables car registering after passing certain gate and it will also note when it left the monitored area. This way, we can separate the home and foreign cars and we can find out if it is just a transit or tourists themselves.

Aircraft research thanks to drones – a similar principle to the aircraft research, its advantage is in a chance to be used in more difficult areas, its disadvantage is a short time of flying

Counters

Light barriers, active or passive infrared sensors, linked with data loggers are very useful counting devices. Their energy consumption is relatively low, therefore they can be installed as battery-supplied counting stations evening remote locations. A big disadvantage of such counting devices is that it usually record only the number of the tourists however not their route and direction.

Pressure sensitive devices (Pneumatic tubes, mats): Various types of pneumatic tubes and other pressure sensitive devices have been developed, mainly for the detection of road traffic. When used for counting hikers, there is again a need for a good calibration to infer a real number of people from the number of signals.

Inductive loop sensors: These devices are extensively used for the monitoring of road traffic. Regarding the fact that the signal is triggered only by the movement of metallic objects, their application makes sense merely for counting vehicles within a recreational area.

GPS chip + counting portals – system consisting of GPS chip is suitable only to the places where it is possible to catch the signal, for example in open nature and countryside, where it is possible to observe the visitors during their whole stay in the monitored area. We see a problem in places with no GPS signal. This difficulty might be partly overcome by portals catching the signal nearby. Another setback is hidden in the fact that we need to provide such devices for the tourists, but not everyone will agree to use them.

Smartphone and their applications – these days, mobile phones and their advantage for the visitors monitoring is undeniable, it is mainly for the fact that everyone has an own high-tech device and there is no need to use another one. All we need is just a suitable application (for example virtual guide or navigation), which would push the visitor to use it, this way we can monitor a huge number of visitors regardless of the surrounding, for example also in mountain resorts where visitors want to be monitored for the sake of rescue service.

Reduction cards – one of the benefits is undoubtedly the pro-client or pro-visitor approach offering service directly to the visitors. Reductions motivate the tourists to use such cards everywhere where it is possible. At the same time, this is a way how we can monitor the tourists, the flow, the places they visited... Furthermore, registration is needed, so we get Access to other valuable information about the visitors. This system is suitable mainly for urban places with developed infrastructure.

Information portal– information kiosks are popular in destinations with developed tourism, we mean mainly the entrance to the destination, as for example airports, railway stations, information centres or places of accommodation. Thanks to these portals it is possible to find

out the number of visitors, intensity and the most popular places on a particular destination. This is a similar system to the one that monitors web sides focused on the destination.

Tab. 1 Overview of monitoring techniques

		Urban environment	Natural environment
Traditional methods	Interviews	X	X
	Direct observation	X	X
	Indirect observation		X
	Counting of access permits	X	
	Trail registers		X
	Summit books	X	
	Lodging guests	X	X
	Arrivals list	X	
	Mapping of traces of use		X
Modern methods	Automatic cameras	X	X
	Automatic counting of cars	X	X
	Aerial imagery by Drones		X
	Automatic counting devices	X	X
	GPS chips + portals		X
	Smartphones with apps	X	X
	Discounts Cards	X	
	Informational Portal	X	

Preparation of the model for the monitoring of the visitors

For the choice of a suitable model, the input info must be provided, we need to come up with the answers for the following questions:

1. What should be monitored – the number of the tourists, density, direction
2. Who should be monitored - tourists, cars, cyclists, groups of tourists
3. Where should they be monitored – entrance or access into the protected areas (destinations, attractions, important landmarks...)
4. When will we realize the monitoring process - frequency- every hour, daily, monthly, yearly, seasonally.

Ideal state: if the questions from the previous part were answered in a detailed way- for example - If we check the number of the tourists and the direction of their journey, we would need the info about the length of their stay as well. All input info would be monitored constantly. This type of monitoring would be ideal however ineffective (mainly from the financial point of view).

We will try to come closer to an ideal model of monitoring. Let's differentiate the input data from these points of view:

1. Where is the destination of the monitoring: natural/ urban
2. Who is the participant of the method: the younger generation can use modern IT Technologies such as smartphones and their applications, for the older generation that is suitable to choose easier methods
3. Privacy protection vs. Tourist motivation to participate in the monitoring process

Model A. Urban surrounding

Monitoring techniques:

- automatic cameras equipped with a high-tech software for the detection of the visitors
- smartphone+apps – young generation
- reduction cards
- info portal in Information offices, at the airports, hotels – older generation
- cooperation with the guides + travel agencies

Advantages:

- number, direction, stops of the tourists, their „flow“
- tourists are motivated by reductions and online applications
- privacy protection is provided
- nonstop monitoring everywhere in the destination
- higher investment at first, later only minimal
- minimal needs for labour

Risk:

- possible duplicate counting when we use more devices – elimination by the use of the tourist identification –for example registration at the devices, face detection

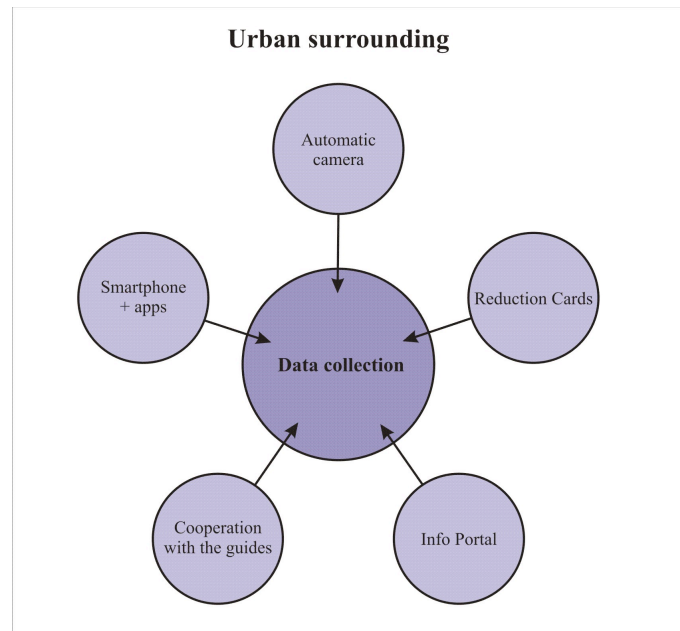


Fig. 1 System of collecting data in urban surrounding

Model B. Natural surrounding

Monitoring techniques:

- automatic cameras equipped with a high-tech software for the detection of the visitors
- Aircraft research by drones
- smartphone+apps – younger generation
- GPS chip with a possibility for reductions + counting portals – older generation
- cooperation with the guides

Advantages:

- number, direction, stops of the tourists, their “flow“
- tourists are motivated by reductions and online applications
- privacy protection is provided
- nonstop monitoring everywhere in the destination
- higher investment at first, later only minimal
- minimal needs for labour

Risk:

- Possibility of losing a GPS signal /for example a forest – elimination thanks to counting portals

- Possibility of duplicate counting of tourists when we use several devices - elimination by an identification of the tourist - for example registering at the devices.

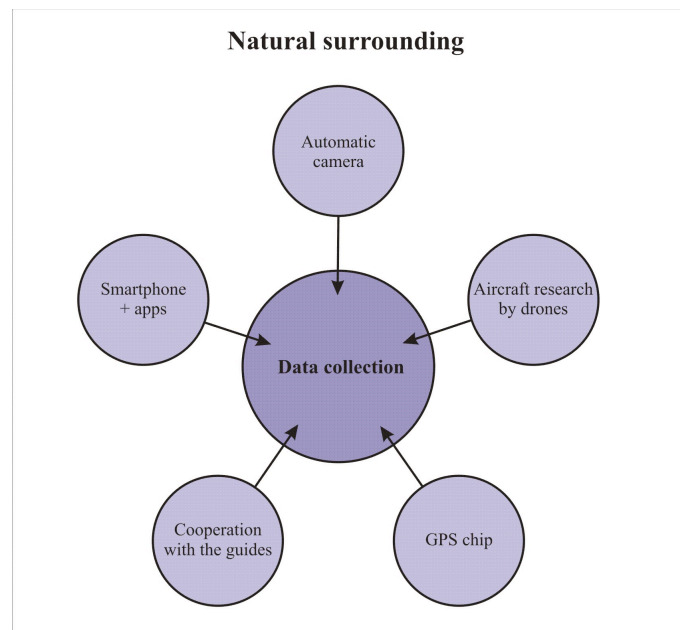


Fig. 2 System of collecting data in natural surrounding

Discussion

In this section we will discuss the way in which this information proved to be useful in the planning and management of the specific areas. The models prepared this way provide opportunities how to monitor the visitors and are aiming at the introduction of the modern monitoring devices suitable for user- visitor. Both models we talked about use the most modern methods for counting the tourist but to prove the data it would be suitable to use classical methods, where a possible mistake would be determined.

The models are literally tailor-made for the particular destination. We can adjust the model in a way that is suitable for our monitored target group.

Their obvious advantage is a possibility for processing of an enormous number of data, almost immediately. By using the modern fully automated systems we got rid of the difficulties by the data processing, as well as we reduced the time, human and financial sources needed during the process. Unfortunately, modern technologies attract the attention of the vandals; this is the fact that should be considered by the choice and the installation of the models.

Thanks to these systems it is possible to monitor the visitors in a long-term experiment and to see the change in the visit rate during the year, by seeing the seasonal changes, the best plans can be prepared. The data acquired and processed this way will serve not only for the council of the destination itself but also for local and regional offices. Valid

data about the number of visitors are important for the protection and for the planning of management, however we should indeed evaluate the economical effectively and the profit of the tourism.

Conclusion

A huge number of techniques and methods have been developed to monitor the visitors. Modern monitoring methods have outnumbered the older ones for their obvious advantages. From our point of view, there exist 2 models, which consider the monitored surrounding as well as the visitors skills to use the modern hi-tech devices and technologies we can easily apply. In close future, it would be suitable to apply the created models in the chosen destinations and to prove their suitability. Here, it must be pointed out that any monitoring method mentioned previously interferes with the privacy of the tourists. From the ethical point of view, it is advisable to inform the visitors about the systems and maybe motivate them by showing its positive side. For example, in our close future, the areas monitored this way will bring services on higher level with no negative impact.

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