



# REPORT ON MONITORING WORKPLAN IMPLEMENTATION

D.T2.4.3 - Public Institution Nature Park  
Medvednica (PP09)

Ver. 1.0  
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## 1. Introduction

Medvednica has an exceptional value for the City of Zagreb, not only from an ecological aspect (erosion soil protection, preventing floods, impact on climate, air and water quality) but also from aesthetic, recreational, health and tourist aspect. Due to its exceptional natural beauty and proximity to the capital, it has become a favourite excursion destination of Zagreb citizens.

Since Medvednica has traditionally been exceptionally well-visited, in the Park have developed numerous and varied facilities for visitors - from educational trails and programs to information centres and major tourist attractions such as Zrinski mine, Veternica cave and the old medieval Medvedgrad fortress.

The highest peak of Medvednica, Sljeme is a famous ski resort with organized and well-equipped tourist facilities. Sljeme is the host of FIS Ski World Cup race “Snow Queen Trophy”, both men and ladies slalom race.

Issues of the Pilot area are primarily related to the overload of the number of visitors and in this regard to the generated traffic, especially during the weekend in spring and autumn and ski season, resulting in environmental problems within the Pilot area as well as in the surrounding area - “buffer zone”.

During the winter the peak area is particularly attractive due to the ski centre that further attracts tourists from the area of city of Zagreb, Zagreb county and Krapina-Zagorje county, but also from the wider area. In addition to the recreational skiers, ski competitions are also organized in this area that additionally generate number of visitors. Artificial snowmaking also allows longer skiing season, which lasts about 4 months (from November/December to March/April depending on weather conditions).

Lack of parking spaces and a large amount of traffic causes clogging of the road leading to the Pilot area and causing problems in wider area of the Nature Park. An excessive number of vehicles represents a problem because of ecological, aesthetic and safety reasons, and has a negative impact on the experience of staying in the Park.

Due to the above-mentioned problems, the need for monitoring the area arose to determine the exact condition of the Pilot area and to try to find the best solution to the problems. During the CEETO project, Public Institution “Nature Park Medvednica” will try to improve the existing visitor problem based on traffic flow management which were established and tested on the Pilot area. Further actions were guided by the Sustainable Tourism Action Plan, which emphasized the stakeholders being crucial for the implementation of the CEETO Project and the Action Plan.



## 2. Pilot Action(s) Implementation

The CEETO Deliverable D.T1.2.1 Inventory of Planning/Management/Monitoring Tools and Success Stories for Sustainable Tourism in Protected Areas provided different choices of methodologies for monitoring tourist flows. Public Institution “Nature Park Medvednica” decided on using surveys, counting cars and cameras as methodology.

Visitor survey - includes quantitative and qualitative research on types of visitors, their habits, opinions, the way, frequency, reason for visiting and with constant monitoring of tourism flow as project progresses.

Relevant stakeholders - an important part of the CEETO project. During the development of monitoring workplan, all the relevant stakeholders were included in Forum meeting and discussions about traffic flow management. Based on workshops held with the stakeholders, some of their suggestions and ideas were inserted in a part of monitoring workplan/pilot action plan.

Installing car counters and cameras - monitoring number of vehicles that arrive to the Park as well as monitoring of traffic flow and observe the condition of the main road and parking areas via two car counters and three cameras located on different locations.

Monitoring indicators - monitoring of specific indicators of the impact of visitation on nature and the environment. The results of these monitoring activities are not to be included in Report on Monitoring workplan implementation (D.T2.4.3). To be able to collect correct and exact data, monitoring needs to be conducted in those specific months and will be carried out in the Pilot area, some specifically on ski slopes and its buffer zone. Results will be included in deliverable D.T2.5.1 - Pilot Action Final Report.



## 3. Monitoring design and setup

### 3.1. Monitoring Activities

Since D.T2.2.3 Sustainable Tourism Action Plan proposes activities aimed at ensuring the continuation of the development of tourism and recreational activities, taking into account the natural values of the Medvednica Nature Park with carrying out educational activities, the visitor structure survey is designed to gather information on:

- visitor habits related to the way and frequency of arrival to the peak zone and getting information on the condition of the ski resort
- visitor perception of Medvednica as a protected area and the role of the Public Institution in management of this protected area
- visitor views on the existing way of organization of arrivals and possible solutions for improvement
- visitor structure with regard to age, work status and place of residence.

The visitor survey was conducted in January and February 2019 during ski season.

Car counters were planned to measure the number of vehicles that pass through the park and the Pilot area, while the cameras were planned to observe the condition of the main road, parking areas and the traffic flow. The monitoring began in November 2018 and will continue until the end of the project. Since weekends are the most visited, especially during ski season, Public Institution “Nature Park Medvednica” employees monitor the situation on the field using cameras and car counters. The photos from the cameras are usually archived on Saturdays, Sundays and holidays for all three cameras while the car counting programme (Traffic analyzer) has the possibility to store number of cars and to calculate the data.

It is important to mention that since February 2018 due to the construction of the cable car, the main road from Bliznec to the Pilot area has been closed for traffic during the week from 9 a.m. until 4 p.m. The only vehicles that can pass through in the mentioned time are construction vehicles and public transportation (bus). That being said, the results are comparable only during the weekend when the roads are open. All the relevant documentation regarding the closing of the road is available in the Public Institution “Nature Park Medvednica”.

Monitoring of the specific indicators of the impact of visitation on nature and the environment was carried out in specific time depending of the indicator.

### 3.2. Monitoring Equipment

The visitor structure survey was conducted on a sample of 406 respondents:

- by direct questioning (field surveying i.e. oral surveying at a frequent location within the Pilot area)
- by indirect questioning (on-line surveying, gathering surveys by distribution at other locations where area users are gathering (ski clubs and catering facilities)

During the Workshop on the spot, Public Institution “Nature Park Medvednica” presented to all the relevant stakeholders the plan for purchasing the thematic equipment as a method of solving the identified problems of the protected area. All the stakeholders agreed that buying and installing the car counters and cameras



is a good strategy for trying to manage the traffic and tourist flow. Public Institution “Nature Park Medvednica” installed two car counters and three cameras on different locations of the protected area.

### 3.3. Monitoring Systems Setup

The visitor structure survey was conducted by direct (field surveying) and indirect (on-line surveying and gathering surveys on different locations like ski clubs and catering facilities) questioning on two occasions.

Field surveying was carried out in the period from 26 January 2019 to 17 February 2019, targeting the periods when the peak area is most frequently visited (weekends, night skiing, competitions). The number of surveyed respondents was equally divided according to days of surveying with the expected lower number during the working day, and in total 56% of respondents' samples were included.

After examining the way of use of the peak area and the location of user gathering, field survey location was determined - at the viewpoint, next to the catering facility, the ski equipment rental and the trail leading to the ski slopes. In this way, the survey covers those users who purposely come to the peak area.

Surveys were distributed at one ski club (which is also a member of the Stakeholder's Forum) and at one catering facility. That resulted in involving mainly the users of the peak area who purposefully and deliberately come there in the winter period (ski schools, competitions and similar) and make up 27% of respondents.

In order to collect data on the structure and views of a wide group of visitors who potentially also come to the zone covered by the Pilot area but are not exclusively connected to the same, an on-line survey was made which included 17% of respondents' sample.

During November 2018 two car counters and three cameras were installed on planned locations within Medvednica Nature Park area. It was decided that the data would be collected since December 2018 until the end of the project. Public Institution “Nature Park Medvednica” had had car counters installed from 2008 until 2012, and the data was included in the Visitor structure report in 2009 and 2012. Due to the construction of the cable car, the main road from Bliznec to the Pilot area has been closed on work day from 9 a.m. until 4 p.m. so the results will only be comparable of the weekends.

All the collected data, from car counters and cameras, is and will be used to regulate access to the Pilot area. With the daily collected data, Public Institution “Nature Park Medvednica” is trying to regulate access to the peak area when traffic reaches the level of congestion and all the parking spaces are filled. Regulations could be made with re-scheduling the timetable of the bus (public transportation) driving visitors, i.e. with increase number and frequency of the buses.

#### Car counters

Car counters were installed on two separate locations. First car counter was installed near the headquarters of Public Institution “Nature Park Medvednica” at Bliznec. The main reason for choosing this location is that the car counter is set at the Park's main entrance on the main, one-way road leading to the Nature Park's peak area.

The location of the second car counter is near the skiing slopes at meadow Hunjka, also on the main two-way road which leads to the Krapinsko-zagorska county on the other side of the Park.

Two car counters work on radar sensors and are equipped with GSM/GPRS modem so data is easily collected through mobile phone application and special programme named “Traffic analyzer”.

Goal is to record the number of vehicles entering the area of Medvednica Nature Park leading to the pilot area (ski resort and peak area).

### Cameras

Public Institution “Nature Park Medvednica” also installed three cameras for external assemblage with live transmission (via programme EasyLive) and with remote control (both horizontal and vertical usage) on three different locations. Two of them monitor parking areas, first one located at the main entrance to the Park near Info center “Bliznec” and second one near the hotel Tomislavov dom in the Pilot area.

Third camera is placed on the busiest intersection in the Pilot area leading to three different directions, where people often park their cars along the road which can lead to traffic jams. That single camera provides information both on traffic congestion and parking.

Goal is to observe the condition of the main road, parking areas and the traffic flow to be able to detect when all the parking spaces are occupied, so that the stakeholders can intervene and try to prevent car jams. This way visitors could get proper information on time, and maybe plan a different route or different type of transportation to the Park (from 2021 cable car is planned to operate from the main entrance to the peak zone).

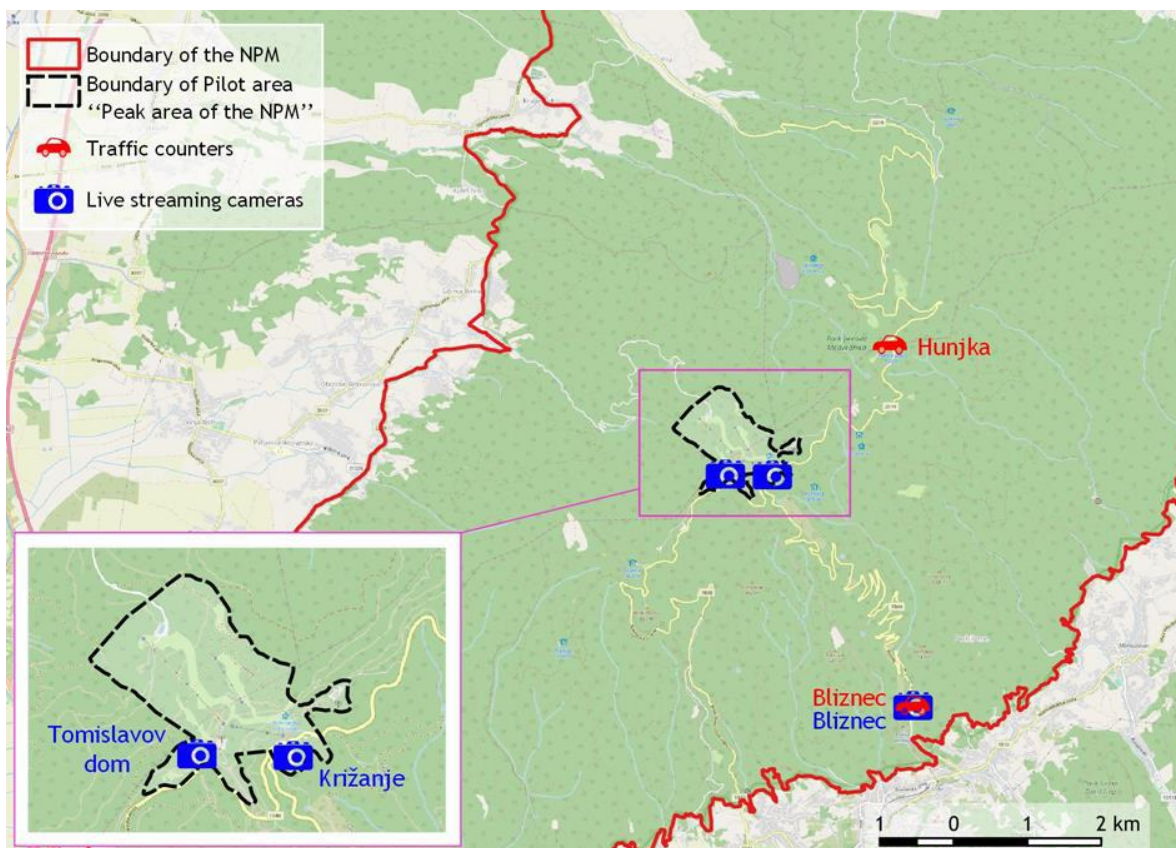


Figure 1. Locations of the traffic counters and live streaming cameras



### 3.4. Implemented managerial activities

Public Institution “Nature Park Medvednica” sought approval from the Ministry of Environment and Energy and the city of Zagreb for the installing the car counters and cameras on planned locations and notified the Ministry of the Interior about installing the equipment and their locations.

### 3.5. Education on the use of equipment

The company which installed the car counters and the cameras educated Public Institution “Nature Park Medvednica” employees how to use the equipment via EasyLive application and Traffic Analyzer programme.

### 3.6. Monitoring system tourist information campaign

Public Institution held Medvednica Open Days where they presented CEETO project and brand. The theme of the Open Days was accessibility and inclusiveness (dedicated to vulnerable groups with a focus on people with disabilities). Participants were different associations and institutions which help people with disabilities who represented their work to people with disabilities. Part of the program was a walk through the Bliznec Forest Trail for disabled people and lectures on the Veternica Cave. Also, PU NPM held a presentation on the subject of Sustainable Tourism Action Plan in Nature Park Kopački rit within 8th International Symposium Kopački rit „Yesterday, today, tomorrow “- 2019. Also, leaflets were exhibited within poster section.

### 3.7. Expected results

Monitoring workplan (D.T2.4.1) defined locations and necessary equipment for Sustainable Tourism Action plan implementation. The existing traffic problem tried to be improved through conducting surveys, installing car counters and cameras, and especially involving all the relevant stakeholders.

The goal was that Installing car counters within Medvednica Nature Park would provide quantitative data about visitors. In the end, data gathered through the survey not only provided quantitative data about visitors, but also the possible solutions to the traffic problems. Also, that installing cameras would ensure constant surveillance of the Park’s parking areas and improve stakeholder’s knowledge about the availability of parking spaces in the parking zones, which would help to regulate and respond to traffic jams better.

It was expected that the Installing car counters within Medvednica Nature Park would provide quantitative data about visitors, while installing cameras would ensure constant surveillance of the Park’s parking areas and improve stakeholder’s knowledge about availability of parking spaces in parking zones, which would help to regulate and respond to traffic jams better.

### 3.8. Use of Collected data

The acquired data from the survey was analysed and based on the results, Public Institution „Nature Park Medvednica “will be able to use it in the implementation of the Sustainable Tourism Action Plan. Some of the possible solutions to the problems, discussed with the stakeholders are:





- Re-scheduling the timetable of the ZET's buses according to the congestion periods, i.e. increase number or frequency when the parking spots are full
- Evaluation of the option of transportation by mini bus to the peak zone.
- Defining the number of parking spaces and adequately marking them
- Enable the road in the peak zone to be two-way (from Tomislavov dom to the Dom Željezničar)
- Earlier coming of snowploughs from the road maintenance service in order to make the road safe for early morning arrival to the ski resort

And many more.

Data from the car counters is still being analysed and it will be used to predict the time of the possible rush hour/traffic jam and from the cameras to see the conditions on the road and the capacity of parking spaces to inform the relevant stakeholders and the general public in time so they can possible chose a different route or type of transportation.

### 3.9. Monitoring Workplan Final Version (TimeLine)

Monitoring activities	11. 2018	12. 2018.	01. 2019	02. 2019	03. 2019	04. 2019	05. 2019	06. 2019	07. 2019	08. 2019	09. 2019
Installing car and cameras											
Distribution of questionnaires											
Collecting snow and water samples*											
Analysis of the snow and the water results*											
Collecting water samples											
Analysis of water results											
Research, soil and edaphic indicators											
Water testing - microbiological parameters											
Climate indicators											



Fauna of streams and springs - <i>Austropotamobius torrentium</i>												
Fauna of streams and springs - <i>Bombina variegata</i> and <i>Triturus dobrogicus</i>												
Vegetation recording												
Invertebrate indicators - <i>Rosalia alpina</i> and <i>Morimus funereus</i>												

\*Snow and water sampling done in January and April is an annual monitoring activity for the PI NPM and these activities are not financed by the CEETO project



## 4. Data Collection and Analysis

With data collected with the survey, Public Institution “Nature Park Medvednica” has been given the insight into visitors’ opinion on the problems in the Park, (especially in the Pilot area) and how would they feel if certain measures would be taken to try to solve the problems, for example them having to pay for a parking spot.

As for the reasons for coming to Medvednica, it is noticeable that the main reason for the arrival is recreation and stay in nature, followed by gastro offer. Smaller number of visitors come exclusively for skiing, while some also visit Medvednica for other reason, mostly for visits to Medvedgrad.

The results showed that most visitors use personal cars as the mean of transportation. Small amount of them take the public transportation (bus) or use organized transportation (ski schools, employees and hiking group). It can also be noticed that arrival by personal cars prevails at those visitors which were surveyed directly, since the field survey used visitors who mostly recreationally and independently come to the Pilot area for skiing. On the other hand, data obtained by indirect interviewing shows that other visitors come by foot (on-line surveys) or organized (ski clubs), and among them is a great share of those who use public transport compared to the recreational skiers - individuals.

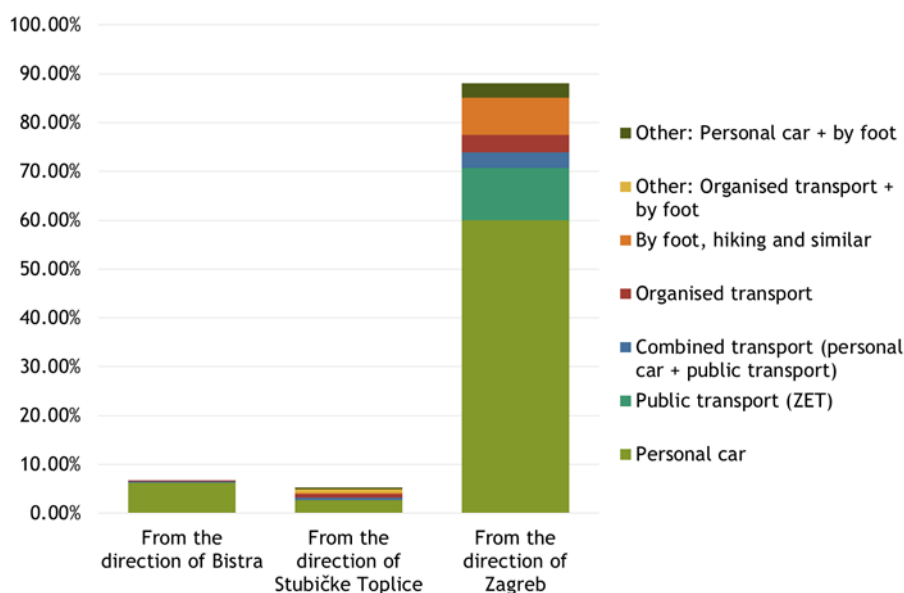


Figure 2. Directions and methods of arrival of visitors to the Pilot Area „Peak area of the NPM“

The results also showed that the reason for the chosen arrival mode is because it is the simplest or most practical way and because it is faster and more efficient. Therefore, those respondents who choose to use personal cars do it because of speed, comfort or because they come from far, with children and/or they carry equipment, and because they have no other option since there is no cable car or because they consider the public transportation to be poorly organized. Those who choose public transportation claim that is cheaper and more accessible because they have nowhere to park in the peak zone and the consider that the cars don’t belong in the Park.

When asked where they park their cars, almost half of the visitors claimed they park their car along the road, and complained about it, especially if they have to park at a longer distance. Other visitors park their car in the peak zone but only if they come there very early, otherwise they wouldn’t be able to find a



parking spot. Visitors rarely use the parking place in the at the foot of Medvednica. They also use the parking lots under Red slope and Krumpirište and within catering and accommodation facilities as Hunjka, Puntijarka, Snježna kraljica, Tomislavov dom or Grofica.

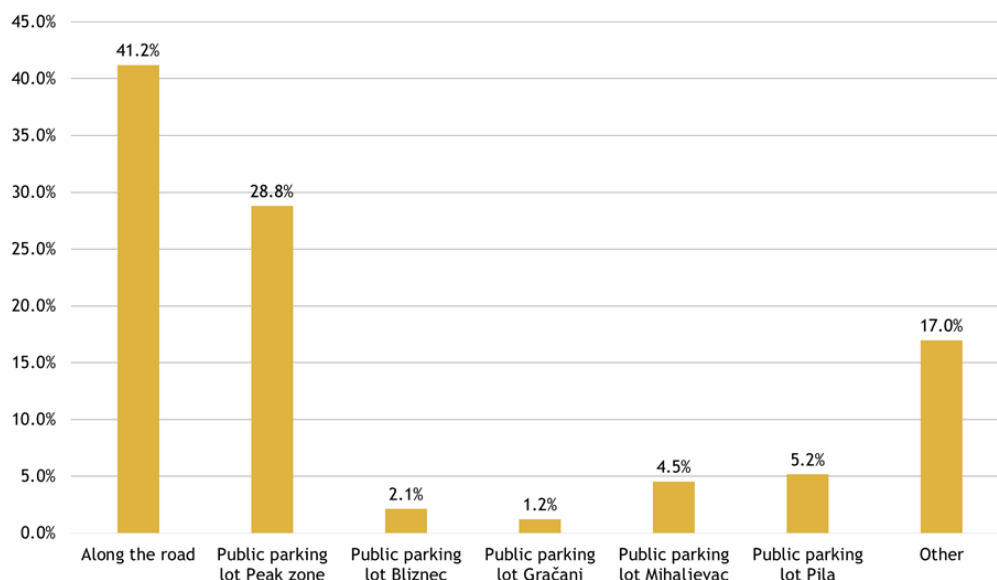


Figure 3. Parking place

## 4.1. Pre-Management (baseline) Collected Data

As part of the CEETO project, four Stakeholder’s Forum meetings have been held so far, including a workshop with selected stakeholders, which was also the 21<sup>st</sup> meeting of Medvednica Nature Park Stakeholder’s Forum. The aim of the workshop was to develop the Sustainable Tourism Action Plan in Medvednica Nature Park, with an emphasis on defining the role of individual stakeholders (institutions) in the project, identifying problems and possible solutions and ultimately proposing specific measures. The area problems as well as suggested solutions were defined at the workshop.

Public Institution “Nature Park Medvednica” identified three crucial goals which correspond to the European Charter for Sustainable Tourism in Protected Areas:

- First goal: Protection of natural and cultural values
- Second goal: Manage visitation
- Third goal: Communication with the stakeholders

For the purposes of the preparation of this Action Plan, research has been conducted with the aim of gathering information on the habits and views of the Pilot area visitors, primarily the ski resorts, and also other peak zone contents, as well as their perception of influence on the natural values of Medvednica Nature Park and the role of the Public Institution which manages the NPM within its competencies. The main theme and template of the survey was prepared by the Public Institution and coordinated with the stakeholders at the workshop of the Stakeholder’s Forum held in July 2018, after which the survey was amended, and the final version was made. The survey was conducted in January and February 2019 on a sample of 406 respondents by direct and indirect questioning.



Public Institution “Nature Park Medvednica” also conducted two surveys in 2009 and 2012 and the results were included in the Sustainable Tourism Action Plan. They also conducted research on the number of vehicles in the Park with car counter, located on the Bliznec, near info point, since 2008 until 2012.

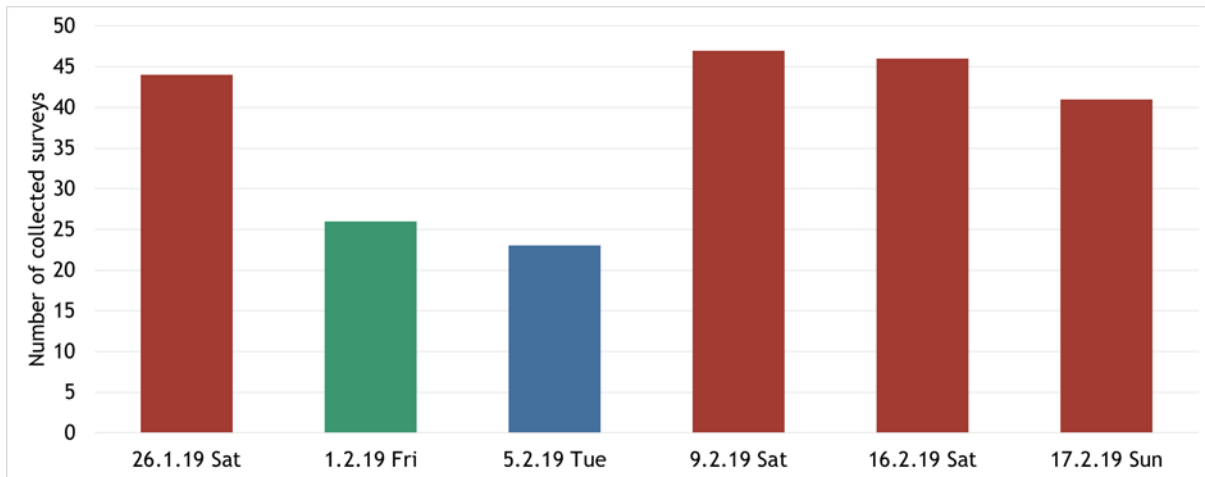


Figure 4. Number of collected surveys during on-field surveying per days (red: weekend, green: day skiing, blue: night skiing)

## 4.2. Sin-Post Managing Collected Data

In the survey, visitors were offered seven possible solutions to improve the organization of the Pilot area and at the same time increase the pleasure and visiting experience, but also reduce the negative impact on the Park’s natural values. Generally, it can be concluded that the visitors reacted positively to the offered solutions, mostly to the construction of cable car and additional parking spaces at the foothill with the organization of transport to the peak zone, but also to solutions that relate to better providing of information about the condition at the ski resort, peak zone and access roads, website or mobile application.

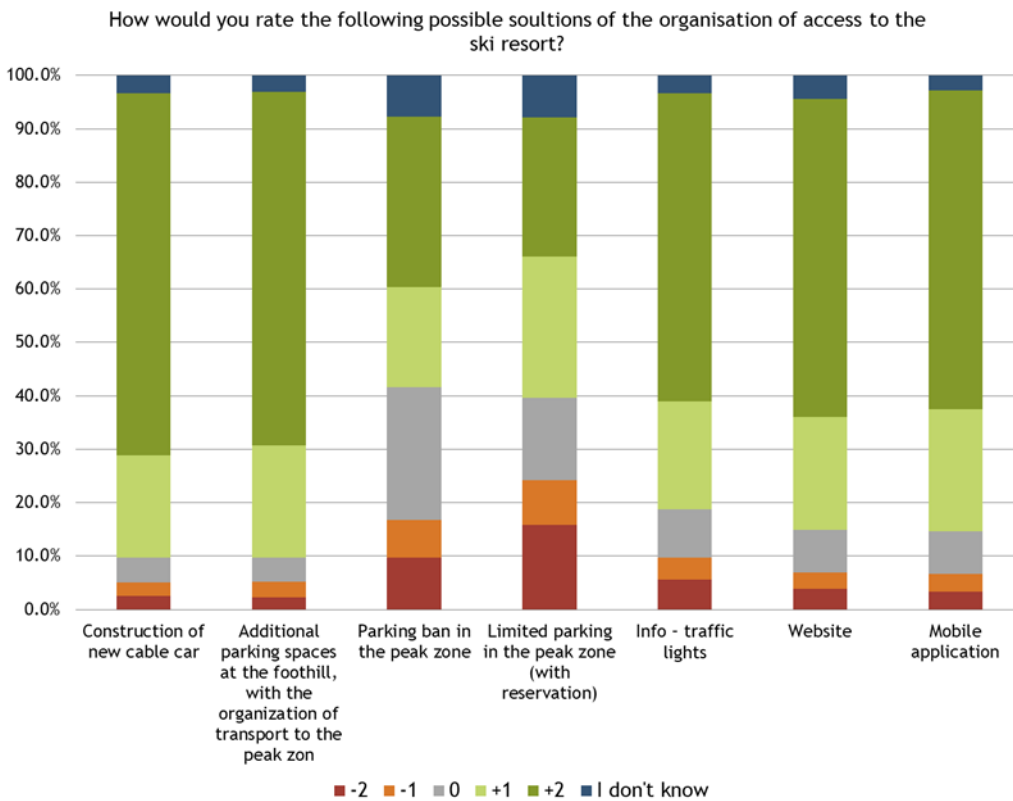


Figure 5. Attitudes of the respondents regarding the usefulness of possible future solutions of the organization and access to the ski resort and the Pilot area

On the other hand, even though reactions regarding parking solutions in the peak area are mostly positive, these offered solutions also received the most negative reactions. Some respondents believe that prohibition of parking in the peak area will not be useful as well as limited parking with reservation. However, when asked if they are willing to pay and how much they would be willing to pay for reservation of parking space in the peak zone, less than half of the respondents said they would be willing to pay for it.

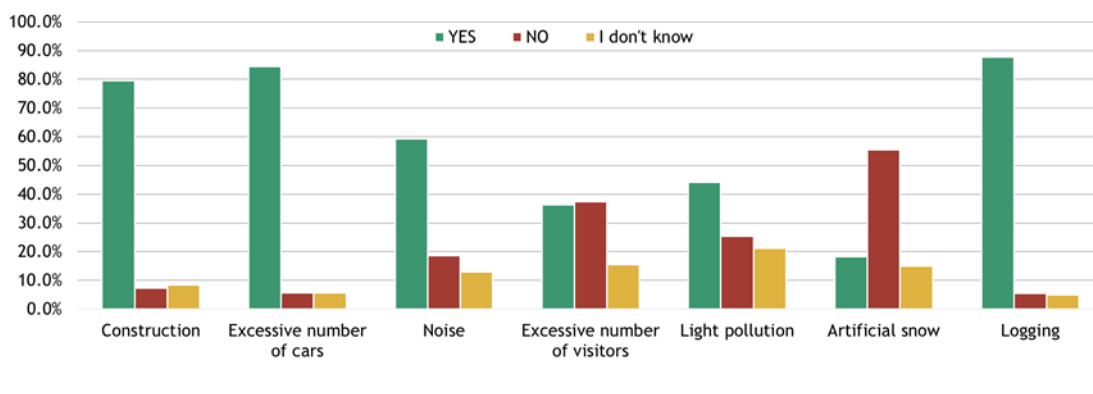


Figure 6. Opinions of the respondents about the impacts from which is necessary to protect Medvednica

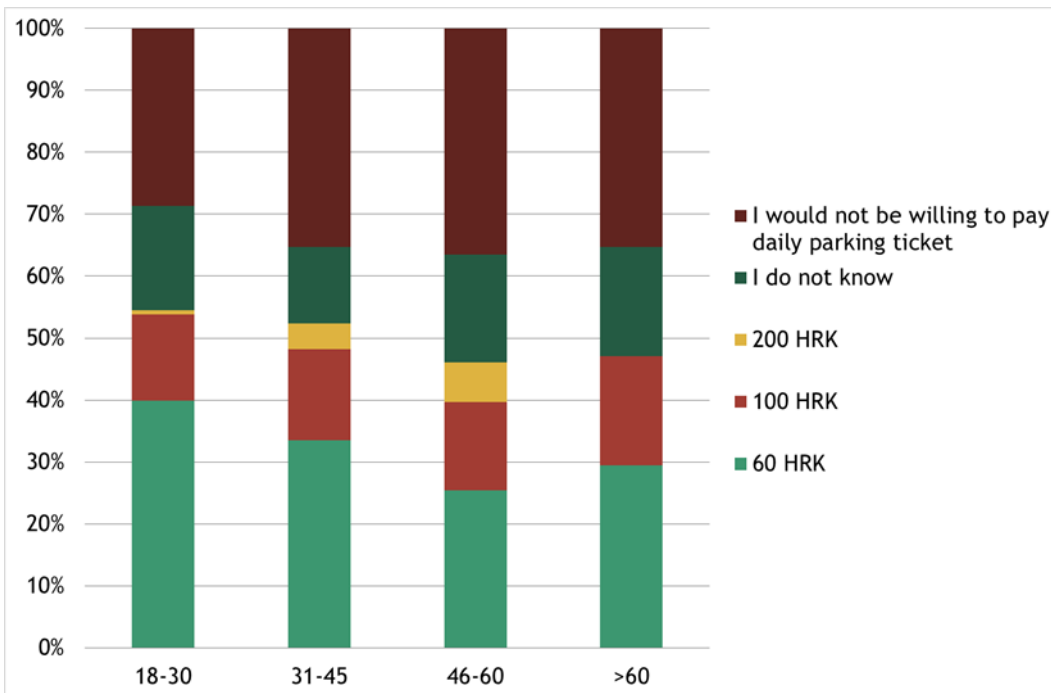


Figure 7. Willingness to pay a reserved parking space in the Pilot area - according to the age of the respondent

In the period from November 2018 until September 2019, the first car counter located on Bliznec recorded 275.410 vehicles. The largest number of vehicles was recorded in December 2018 and in January 2019 with approximately 2500 vehicles a day. The results were expected because of the ski season and Snow Queen Trophy and also because in that time the main road wasn't closed during the week.

Second car counter located in the Pilot area recorded 61.854 vehicles with the monthly average of 5.623 vehicles. The same as the first counter, the largest number of vehicles was recorded in December 2018 and in January 2019.

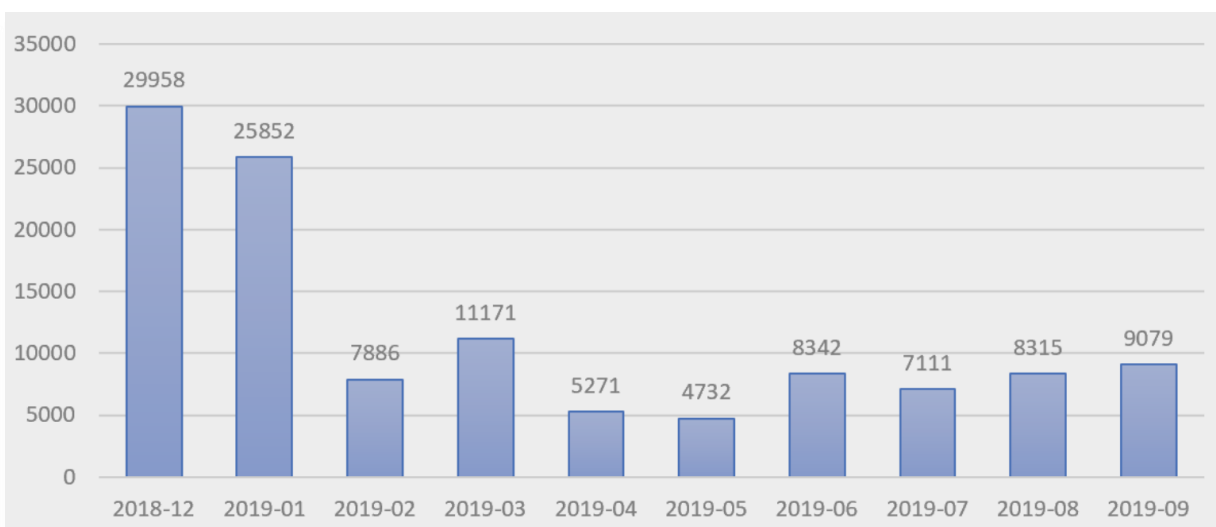


Figure 8. Number of the vehicles recorded by the first car counter on the weekends

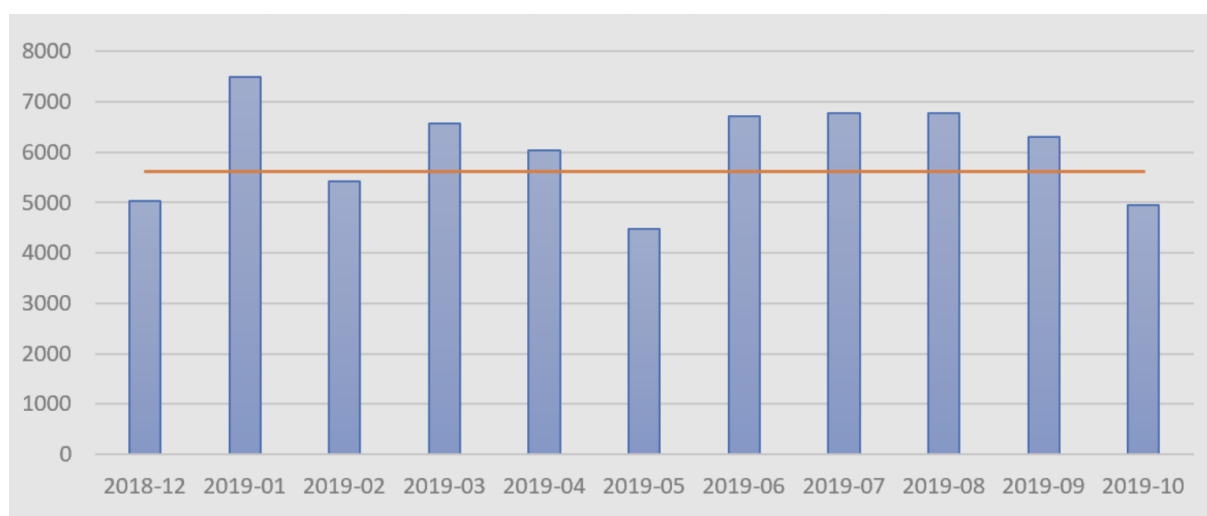


Figure 9. Number of the vehicles recorded by the second car counter on the weekends

### 4.3. Deviations

During the Pilot Action implementation, Public Institution “Nature Park Medvednica” has encountered a few technical difficulties. Taking into consideration the positioning of the Park, there were problems with the mobile reception, which caused the car counters not to transfer data regularly. There was given a thought to move the counters to another location but the previously chosen locations were most suitable. Due to this and other technical difficulties, the equipment was adjusted a few times accordingly.

Also, since February 2018, due to the construction of the cable car reduce the pressure and the number of the vehicles in the Park, the main road from Bliznec to the Pilot area has been closed for traffic during the week from 9 a.m. until 4 p.m. The only vehicles that can pass through in the mentioned time are construction vehicles and public transportation (bus). That being said, in data analysis only weekends were taken into account because it was the most reliable data for comparison.

### 4.4. Data Analysis

#### Data processing (Survey)

The data were parallelly with surveying entered in the Excel table, from which further analysis was performed. There may be some inconsistencies in the results regarding certain questions due to non-completing the whole survey. The analysis only took into consideration the questions that were answered. In general, it can be said that most respondents have completed the whole survey, and unanswered questions are more frequent in an indirect questioning (on-line surveying or independent completing of the survey). The reason for this may be not understanding the question, insufficient time to complete, etc. Regarding questions which relate to parking habits if the respondents used personal car for transport, certain percentage of unanswered questions actually applies to those respondents who did not use personal car or combined transport so such responses were marked as “not applicable “

Even though the cameras and car counters are giving good results, there are still opportunities for further enhancement. There is an option of upgrading the equipment in the form of two-way counters but due to





the lack of funds, it was not possible to realize it in the given period. Also, it would be better for the purpose of monitoring if the cameras would have the option of storing the data for a period of time, since they only show current situation. Public Institution “Nature Park Medvednica” also bought GPS devices as possible tools for monitoring activities.

Also, given the fact that according to GDPR, the personal data is not available to the general public, the Public Institution “Nature Park Medvednica” has to see into the way to share the data recorded by the cameras with the stakeholders.



## 5. Use of monitoring data analysis

The data collected from a survey was used to draw up a Sustainable Tourism Action Plan. All the monitoring activities, as well as the Action Plan are the basis for the implementation of specific management activities.

### 5.1. Use of the data in the Pilot Action(s)

In November 2018 Public Institution “Nature Park Medvednica” installed two car counters and three cameras on different locations. In January and February 2019, the visitor survey was conducted which served as a basis for the developing of the Sustainable Tourism Action Plan.

### 5.2. Use of the data in the Action Plan Implementation

Crucially important for the implementation of the CEETO project and the Action Plan are the Stakeholders - members of the Forum who can within their competencies recognize the problems and act in a way that will in the future ensure implementation of tourism and recreational activities in sustainable matter. They are also users of the area, such as institution Sports Facilities Management, Sljeme Ski Resort, Croatian Ski Association, ski clubs or have the authority to manage roads, public transportation and others. The Action Plan was developed on the workshop which was a part of the 21<sup>st</sup> Stakeholder’s Forum. The goal was to develop the Action Plan with an emphasis on defining the role of individual stakeholders (institutions) in the project, identifying problems and possible solutions and ultimately proposing specific measures. The area problems as well as suggested solutions were defined at the workshop.

Preparation of the Action Plan included the following activities:

- Elaboration and conducting of research regarding the structure, habits and views of visitors of the Pilot area and their perception of PI NPM as an institution that within its competence deals with the management of the NPM area
- Analysis of the data obtained through research and results of the conducted workshops with the members of the Stakeholder’s Forum
- On the basis of the conducted data analysis was given a proposal of goals and activities to be implemented within its Action Plan in a period of 5 years, which was agreed with the members of the Stakeholder’s Forum and final goals and activities were defined.

A lot of problems were discussed in the meeting, such as Crowds in the peak zone due to inadequately parked cars along the main road, inadequately marked parking spaces at Tomislavov dom, insufficient capacity for reception of cars at the bottom cable car station Dolje, impassability and unsafety of the road due to snow, lack of facilities and shelters for future visitors that will come by cable car and more. Some of the solution to the mentioned problems are:

- Enable the road in the peak zone to be two-way (from Tomislavov dom to the Dom Željezničar)
- Limit the number of visitors to the peak zone
- Encourage the use of public transportation
- Earlier coming of snowploughs



- Ensure better communication between stakeholders as well as visitors in order to receive timely and accurate information from the field
- Develop additional facilities and shelter for visitors
- Enrich the summer offer of the NPM - adrenaline park, zip-line etc

And many more.

The results of the car counters, cameras and specific indicators will be explained in more detail in the D.T2. 5.1 Pilot Action Final Report.



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