ACTION PLAN

Winpol

Maribor, may 2021

WINPOL
Interreg Europe
European Union
European Regional
Development Fund
SNAGA
ČISTO
MOJE
MESTO

ACTION PLAN FOR THE REGION OF MARIBOR

Project: **WINPOL**
Partner organisation concerned: **Snaga, d.o.o.**
Country: **Slovenia**
NUTS2 region: **SI032**

Contact person: **mag. Darko Bečaj**
Email address: **darko.becaj@snaga-mb.si**
Phone number: **00386 (02) 620-58-43**

Contact person: **Špela Mlinarič**
Email address: **spela.mlinaric@snaga-mb.si**
Phone number: **00386 (02) 620-58-49**

You don't have to be great to start,
but you have to start to be great.
- Joe Sabah

1 POLICY CONTEXT

The Action Plan aims to impact:

- Investment for Growth and Jobs programme.
- European Territorial Cooperation programme.
- **Other regional development policy instrument.**

Name of the policy instruments addressed:

- Decree on the manner of performing the obligatory local public utility service for municipal waste management in the Municipality of Maribor.
- Waste management strategy for 2021–2025.

Further details on the policy context and the way the action plan should contribute to improve the policy instruments

The Municipality of Maribor adopted a new decree in April 2020, the content includes important elements and conditions about collection and removal of separately collected fractions in underground system.

A waste management strategy for 2021–2025 is currently being prepared and will include a new calculational system for separate waste collection and a complement to existing activities related to bulky waste.

One of the improvements relates to the calculation of waste collection and disposal. The current calculation of mixed municipal waste is based on the volume of the container and the frequency of removals, while the calculation of biowaste is based only on the volume of the container. The strategy will include a new calculation in relation to the collection of waste in underground containers using the "**Pay-as-you-Throw**" system. This means that the monthly household bill will be based on the number of waste entries in the underground collection point. One disposal of mixed municipal waste is equivalent to 60 L, one disposal of biowaste is equivalent to 40 L.

The second amendment relates to the introduction of a mobile collection point in the pedestrian zone, where users can drop off additional pieces of bulky waste once a year. We will write the plan into a strategy with the desire to make the event a permanent practice of every year. According to the existing regulation, each user can order free collection of bulky waste once a year up to a maximum of 2 m^3. With this vision, we will continue to expand our activities and thus reduce the existing number of removals.

2 DETAILS OF THE ACTIONS

2.1 ACTION 1

UNDERGROUND WASTE COLLECTION SYSTEMS

Relevance to the project

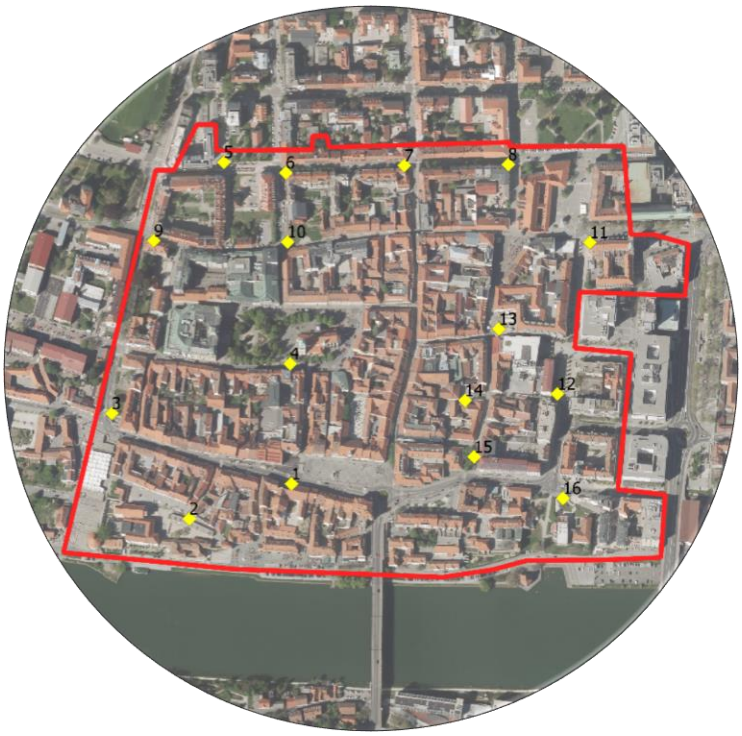
The inspiration for the implementation of the underground system was gained on the basis of data and identified good practices in the cities of **Gijon** (Spain), **Antwerp** and **Ghent** (Belgium), **Imola** (Italy) and during the presentation of the good practices by **ACR+** in Brussels. We also gained experience in system maintenance and cleaning at project partners in Antwerp. The results so far show the feasibility of implementing underground systems in the old city centre and semi-underground in the areas of partment buildings, tourist sites, cemeteries, etc. Also some cities in Slovenia (Ljubljana, Celje) followed the considerations of a technologically advanced waste collection and thus came to the idea of a clean and tidy city.

Nature of the action

The project of establishing underground collection points will improve the system of separate collection of fractions and mixed municipal waste in the city centre. It is necessary to pursue these goals:

- to aesthetically integrate the underground collection points into the urban environment, which have a recognizable cultural and economic significance,
- improving the urban appearance and traffic safety by removing existing collection points from traffic areas and
- facilitating access to assembly points for elderly and disabled people.

Semi-underground systems will be implemented in areas with apartment buildings, tourist settlements and industrial and craft zones. Given the boundary conditions, it is necessary to prepare a strategic implementation plan for the locations of the underground collection points in accordance with the renovation strategy for the old town of Maribor. The plan for the locations of the underground collection points must first be approved by the Municipality of Maribor, and only then can construction work begin. Followed by the installation of underground units in which sheet metal containers are installed. At the top there are above-ground units, around which walking platforms are installed. In the area of the planned renovation of the old city centre, where 2,460 inhabitants live, we have listed **16 locations of underground collection points** for the collection of municipal waste.



Up to six underground units are planned at each of the sites: two units for **mixed municipal waste** and one unit each for the following fractions: **biowaste**, **mixed municipal packaging**, **paper and cardboard packaging** and **glass packaging**. On the basis of population density and statistical data on quantities, we have determined the volumes of underground reservoirs.
The estimated volumes of the underground reservoirs are:

- **5 m³**: mixed municipal waste, mixed municipal packaging, paper and cardboard packaging, and
- **3 m³**: biowaste, glass packaging.

The most important factors in the choice of the locations of the underground points were the capacity of the waste and the length of the path that the user has to walk in order to dispose the waste. The maximum length of the path is 180 m. The waste capacity per user is calculated according to the existing weekly frequency of removals. We have taken several criteria into account when choosing the locations. In the case of underground collection points, the location in the area is of decisive importance. In addition to accessibility by municipal vehicles and functionality during emptying, which is important when implementing waste collection and disposal work processes, the economic, urban planning and architectural aspects of the city as well as user aspects (proximity and accessibility of the location) must also be taken into account.

At the existing location, as well as it will be at the locations following, the underground containers in which mixed municipal waste and biowaste are collected are equipped with a card system to control the number of entries. The volume limit of the drawers is 60 liters for mixed municipal waste and 40 liters for biowaste. For the future it is planned that the user will pay according to the »**Pay-as-you-Throw**« system.

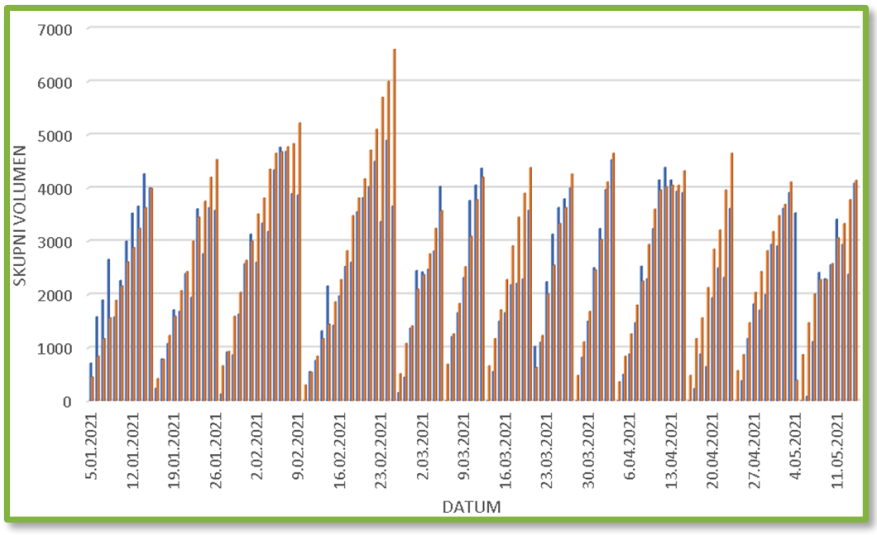
Awareness raising and information of the users involved is crucial for understanding the purpose of the underground collection points, the inclusion in the space, the correct separation and the proper use of the card system. In the autumn 2020 we planned an event, which unfortunately was canceled because of COVID-19 due to the need to prevent the spread of infection. After the distribution of the cards to the users involved, we removed the containers they were previously using. The **event** will be carried out after the installation of the next location, so we will then invite all the users currently involved and introduce to them the operation of the system.

Stakeholders

The main investor in the project is the Municipality of Maribor, within which the Office of Public Utilities, Transport and Spatial Planning is active, which is in charge of certifying the admissibility of locations. In addition to Snaga, other municipal utilities are also involved. They participate in the construction work and the inspection of underground pipelines at potential locations. Another stakeholder is the company responsible for the GIS area and the company Eko Lux d.o.o., which supplies the underground collection points and related equipment. In order to ensure control over the delivery of paid waste types, underground containers are equipped with a card system to control the number of entries.

Study results

Our stakeholder, Eko Lux, prepared a comparative analysis based on monitoring the fullness of underground containers with recording the number of entries with a limited volume of a single entry against the monitoring with sensors. The measurement period lasted from 15. 12. 2020 to 14. 05. 2021. Filling **sensors** were implemented at three existing collection points, also, a **system of locks** is implemented on the mentioned containers. The number of entries is constantly recorded and depending on this, the theoretical fullness is calculated. E.g. the biowaste container has a volume of 3000 L, 1 input is 40 liters, so 10 inputs is 400 L, which equals to 13% fullness. The mixed municipal waste show the linear filling, while in the BIO it is necessary to make adjustments and measure over a longer period of time. Each time a certain type of waste was dropped, we assumed that the maximum possible volume was deposited (60/40 liters.).



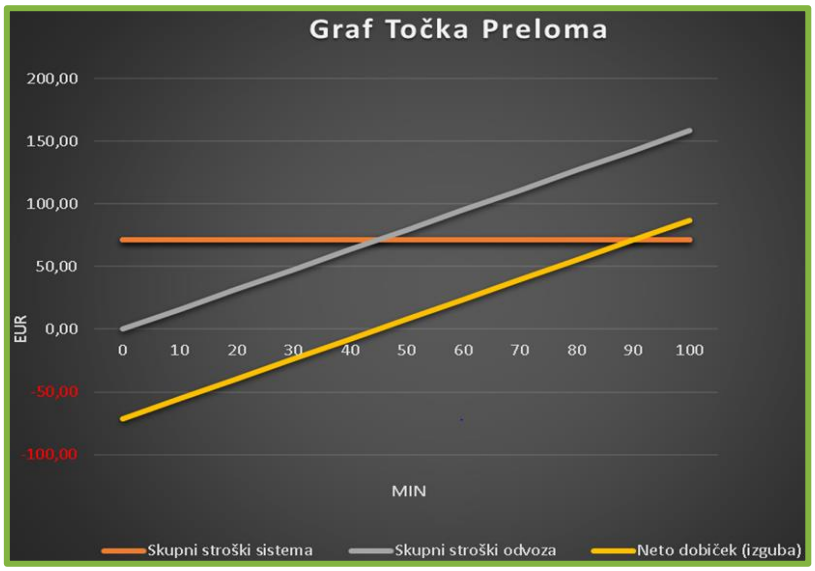
Through analysis we came to the conclusion that it is necessary to change the hypothetical volume of waste that the user discards at each insertion, so we changed a single intake of mixed municipal waste to 30 L and biowaste to 10 L. The graph on the left shows that the volumes in both measurement methods overlap nicely.

- fullness level based on the sensors
- fullness level based on the number of entries

Logistics and optimization are becoming increasingly important tools in reducing costs. With new technologies emptying trips can be planned efficiently and completely on demand, which can reduce emptying trips. Waste trucks drive only the route along the containers, which must be emptied. Not only do waste disposal companies and municipalities use the full capacity of their containers, but they also save considerable time and resources. This way the future concept of the **Smart City** is becoming a reality. Shorter and targeted disposal trips also reduce the CO_2 emissions and the associated noise levels caused by emptying. Not only waste disposal companies, but also citizens and environment benefit from the technologies of the global player.

We confirmed that both monitoring systems are suitable and, above all, useful as a tool in optimizing emptying. We found out that the more remote the location is, the more justified the implementation of fullness monitoring systems is. In terms of reliability, based on our months-long monitoring, we could even conclude that the counting system is even more reliable than the sensor system. The study also includes cost analysis based on the **break-even point**, which is a point where there's no loss or profit.

Based on the above data, the break-even point between the cost of sensor/month and the cost of waste collection logistics is at **45,13 minutes**. From this we can conclude that if we have one waste collection container and one sensor for measuring the fullness level, we achieve the cost justification of the system, if with the logistics of emptying we save more than 45,13 minutes per month due to the implementation of the sensor. On the other hand, given that the counting system is part of the locking system, the cost of this fullness measurement system is in our case zero. Namely, we need a lock, as certain types of waste are chargeable, so access is only possible with an RFID card.



In the final conclusion we must include many other influencing factors, such as: **location distance**, **number of locations**, **amount of waste** and **types of the existing systems.**

Given that the study was conducted at a location 2 kilometers away from the company and we are already close to the breaking point, we can say with certainty that the implementation of a fullness monitoring system at more remote locations is cost-effective. When we have a small number of locations periodic emptying is not cost-effective, so emptying should be based on fullness monitoring. In the case of a larger number of locations we must also take into account their distance from the waste collector headquarters as well as the density of underground collection points in a given area. For the locations that are at completely different ends and are several kilometres apart, it makes sense to empty according to the "call" or the fullness monitoring. However, if we have several locations of waste collection points that are quite together, it makes sense that when we empty one location, we also empty the others, because in this case it would be completely inefficient to empty one location and return the other day to empty an adjacent location. We can conclude that if we spend less time emptying the neighbouring location than returning to the company's headquarters and then coming back to the location again, it makes sense to empty the neighbouring locations. Depending on the amount of waste, when there's a small amount it is cost-effective to empty according to the fullness monitoring. In our case the amount of biowaste is so small that emptying has to be done due to the hygienic and ecological standards before the container is full. However, if the actual amount of waste is so large that you would have to empty the collection points daily, you would not need additional systems. About the existing systems, as we mentioned above, the counting system is aready part of our equipment. So we can very easily use this as an aid to logistics because we have established that technologies are completely comparable.

We have found that the implementation of such systems can actually reduce the number of emptying, which in turn means reducing emissions, reducing the resources required for individual emptying and of course reducing logistics costs. It is clear that by setting up larger waste collection points and filling monitoring systems, we can actually reduce the number of emptying and thus help reduce CO_2 emissions, which is currently one of the biggest global environmental challenges.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
zap. st	Naselj	Ulica_upor	H.Š.	Naziv_upor	PN	št.	Naselje	Ulica_plac	H.	Naziv_plac	OM	zapor	RFID stevilka kar	X	Y
1	MARIBOR	KOROŠKA CESTA	6	Ime priimek	STANINVEST	1	MARIBOR	Gregorčičeva ulica	19	Staninvest d.o.o.	54640	1	8ca3ff5200000000	549743	157298
2	MARIBOR	KOROŠKA CESTA	6	Ime priimek	STANINVEST	2	MARIBOR	Gregorčičeva ulica	19	Staninvest d.o.o.	54640	2	8ca4035200000000	549743	157298
3	MARIBOR	KOROŠKA CESTA	6	Ime priimek	STANINVEST	3	MARIBOR	Gregorčičeva ulica	19	Staninvest d.o.o.	54640	3	8ca1b47200000000	549743	157298
4	MARIBOR	POŠTNA ULICA	3	Ime priimek	STANINVEST	4	MARIBOR	Gregorčičeva ulica	19	Staninvest d.o.o.	54640	4	8ca1017200000000	549800	157342
5	MARIBOR	POŠTNA ULICA	3	Ime priimek	STANINVEST	5	MARIBOR	Gregorčičeva ulica	19	Staninvest d.o.o.	54640	5	8ca4075200000000	549800	157342

For the purpose of this project the **maping** of the users in the city centre was prepared. The table above shows what our database of users looks like, next to which the consecutive number of the user's card with the corresponding RFID code is assigned.

Timeframe

The implementation of underground systems at previously approved locations depends on the renovation strategy of individual districts and the planned budget of the Municipality of Maribor. The integration of underground collection points is coordinated in Snaga with selected design and architectural offices.

After the **approval of each location**, the construction work can begin. At first they pit a hole and arrange a drainage system. Then a concrete block is installed, within which a sheet metal container is inserted. Following the installation of an above-ground unit, which differs depending on the type of fraction and lastly, the arrangement of the walking platform.

The first underground collection point was installed as part of the renovation of the **Main Square** in September 2020.

The supplier has delivered the required number of user cards to Snaga, which we distributed among the users of the above mentioned site. One card belongs to each household. As part of the project, *we* prepared and edited a user database, which must be imported into the Mawis software tool. All users of the underground collection point must be registered in the Bass Information System, which we use for working with the users.

The installation of locations at **Vojašniški square** and at the junction of **Koroška** and **Strossmayerjeva street** are planned for **this year**. In period until autumn **2022**, locations at **Gregorčičeva street** (four locations planned) and **Slomškov square** will follow.

Costs and Funding sources

For the realization of all underground collection points at 16 locations (6 units/location) in the Old Town, the investor must reckon with the cost of acquiring the underground collection points amounting to € 732,000.00.

The cost of software is € 8,500.00 and the costs of annual maintenance, hosting and data exchange amounts to € 6,016.80 per year. The purchase of cards for the estimated number of households (1,500) amounts to an additional € 4,800.00. To perform transhipment manipulations and transport logistics of the waste collection, the purchase of a special vehicle is necessary, whose value is estimated at € 300,000.00. These costs will be covered by the public utility company (Snaga, d.o.o.). Prices are approximate, as they were obtained from offers that have a short period of validity, due to momentary changes in commodity prices in the market.

2.2 ACTION 2

POP-UP CONTAINER

Relevance to the project

The idea of implementing a pop-up container in the local area (in the old town of Maribor) came to us during a visit to the city of Antwerp as part of the good practices of the WINPOL project. We were convinced of the practical use and positive effects of this type of collection. Following the example of the City of Antwerp, the pop-up container will be intended for citizens living in the city centre, where access for cars is not allowed.

Nature of the action

The measure of placing pop-up containers has advantages for the citizens of the city centre, who have movement restrictions due to the urban design and traffic restrictions in the pedestrian zone. With the impact of soft awareness methods, better results of separation at source will be achieved. The project will have an impact on reduced emissions into the atmosphere as we will bring waste delivery closer to the citizens without visiting the civic amenity sites. Reuse will also be organized as part of the event. With the reuse campaign, we will encourage people to donate or exchange items.

We also see an advantage for municipal policy makers, as people will be more satisfied with the services provided by a municipal company. Residents in the area will be able to dispose certain types of waste free of charge, on foot or by bicycle.

The following fractions will be collected at pop-up container:

- **small bulky waste**
  (toys, bicycles, sports equipment, small household equipment, ironing boards, clothes horses, ...),
- **waste of electrical and electronic equipment**
  (small household appliances mixer, shaver, microwave oven, heater, fan, iron, vacuum cleaner, ...),
- **textiles** and
- **books and magazines**.

Disposal of construction waste and larger bulky waste will be prohibited. The user will be able to dispose up to 2 m^3 of waste. Our employees will be present at the station to help citizens sort the waste and other reusable products into the right containers, and also to make them aware of the importance of correct separation.

To monitor the records, we will upgrade the system with technology to digitally record the users and the different types of waste they bring to the pop-up container. This system would automatically store the data in the program, which means that the data would always be up to date and ready for further analysis and raising awareness among the users of our services. The data is also important for preparing a reward scheme for conscientious citizens.

Stakeholders

Our stakeholder on the project prepared a study on the digitalization. They worked on how to automate the registration of users who bring a certain type of waste, including the creation of a list of individual types of waste.

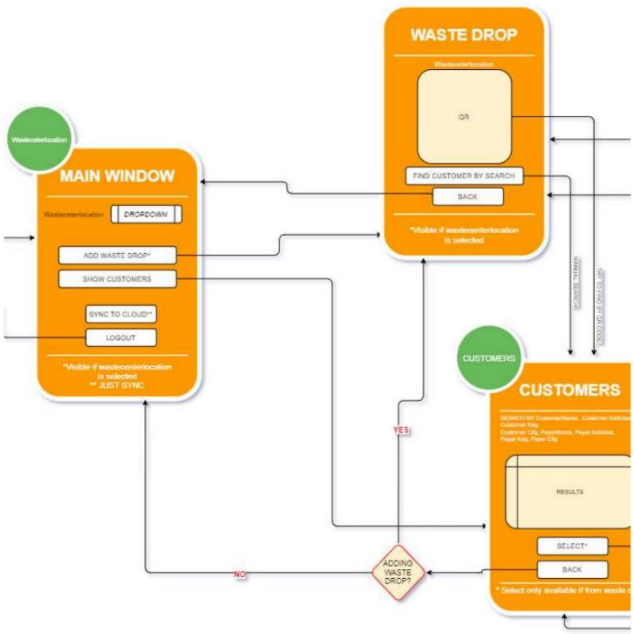
Study results

A stakeholder in the project, Narvis d.o.o., developed a model for recording users and types of waste using a hand-held reader. Snaga prepared a database of users of our services who live in the pedestrian zone and a list of waste that can be handed over at the location of the pop-up station. The user who brings something to the collection station will be identified with an ID card and an invoice of the Snaga.

The solution consists of four units, namely a cloud service with a web interface, a mobile solution for Android tablets, a data exchange system between the ERP system and the cloud and a data exchange system between the mobile device and the cloud. The data structure includes employees who will operate the mobile device, device data, a defined area of operation covering the user area, the location where the mobile device will be used, the type of waste to be collected and customer data. The special challenge was to determine a unique key that would identify the user. In the case of apartment buildings, we are not sending the invoices directly to the users, but to the building managers. The **unique key** includes the code of location where the waste bins are and users and payers identification code. From the QR code on the invoice, number of the invoice and the payers id code are read and then paired with the same info in the database.

```
"WasteCenterCustomer":

"ExternalId1": "unikatni ključ na strani erpa", /*OM*/
"ExternalId2": "unikatni ključ na strani erpa", /*IDupor*/
"ExternalId3": "unikatni ključ na strani erpa", /*IDplac*/
"WasteOperationAreaId": "0", /*GR*/
"CustomerName": "Igor Novak",
"CustomerName2": "",
"CustomerAddress": "Nova ulica",
"CustomerHouseNumber": "11",
"CustomerCity": "Maribor",
"CustomerPostalCode": "2000",
"PayerName": "Igor Novak",
"PayerName2": "",
"PayerAddress": "Nova ulica",
"PayerHouseNumber": "11",
"PayerCity": "Maribor",
"PayerPostalCode": "2000",
```



In the case of apartment buildings, when the user cannot be identified by a unique key, manual entry is still required. Therefore, in the future it is necessary to obtain information about users living in buildings under building managers and distribute QR codes to all users of our service, though which they could be identified.

Hand-held reader scans the QR code from the invoice, through which the system will find the right user. At the drop off, the location of the pop-up station will be recorded, as also the type and weight of the waste. This data will then be written to the Snaga information system via a server. The study represents a new step in the direction of digitization and offered us several ways where this system could be useful, e.g. collection of waste at civic amenity sites. By keeping records of disposed waste, we will have control over exceeding quantities per user, so we will prevent access to those who abuse the service.

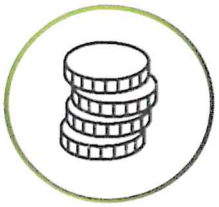
Timeframe

The implementation of the pop-up container is organized as a one-time event, which will take place for the first time this year, depending on the possibilities of the COVID-19 situation. In order to allow as many citizens living in the pedestrian area as possible to attend in the event, it is expected that the event will be organized on Saturday between 8 a.m. and 4 p.m. If the event proves to be successful, we will organize it on an annual basis and, if necessary, provide additional locations.

Our current activities include the purchase of a tent and other equipment for the purpose of the event. We anticipate that we will be able to carry out the event in the June. We will distribute the notifications to all residents of the pedestrian zone and invite each of them to attend the event. Preparations are also underway in the direction of user identification - updates to the list of users are underway, we are testing an application through which the QR code will be read. During the study, we found that we need to obtain data on residents living in buildings where there are managers. The share of apartment building in comparison with detached houses in Maribor is around 60 %. This is our first step, which we have to complete, followed by the distribution of QR codes (they will receive cards) to all our users. With the cards, they will be able to use our services such as pop-up containers, civic amenity sites,...

Costs and Funding sources

The costs associated with organizing a one-day event (from 8 a.m. to 16 p.m.) are divided into fixed assets, staff, costs related to vehicles and further waste processing. The cost of staff is estimated at €550.40 and the cost of purchasing fixed assets (folding tent, plastic boxes and a 20 m^3 container) at €4,850.00. The cost of two vehicles for transport and handling is estimated at € 570.40 and the cost of further waste processing at € 226.00/ton. These costs will be covered by the public utility company (Snaga, d.o.o.). So altogether, we expect costs of € **6,196.80** for the organization of a one-day event. Prices are approximate, as they were obtained from offers that have a short period of validity, due to momentary changes in commodity prices in the market.



Director
mag. Franc DOVER

SNAGA
SNAGA, d.o.o.
Nasipna ulica 64,
SI-2000 Maribor

Let's be wise, keep green and stay healthy!

WINPOL
Interreg Europe

SNAGA ČISTO MOJE MESTO

European Union
European Regional
Development Fund

ENDORSEMENT

Date: 26. 07. 2021

Name of the organisation: MESTNA OBČINA MARIBOR

Legal representative: ALEKSANDER SAŠA ARSENOVIČ

Signature and stamp:

WINPOL
Interreg Europe

SNAGA ČISTO MOJE MESTO

European Union
European Regional
Development Fund

ENDORSEMENT

Date: 07.07.2021

Name of the organisation: NIGRAD d.o.o.

Legal representative: MATJAŽ KREVELJ

Signature and stamp:

Nigrad
Nigrad, komunalno podjetje, d.o.o.
Zagrebška cesta 30, 2000 Maribor

WINPOL
Interreg Europe

SNAGA ČISTO MOJE MESTO

European Union
European Regional
Development Fund

ENDORSEMENT

Date: July 13, 2021

Name of the organisation: MARIBORSKI VODOVOD, javno podjetje, d. d.
Legal representative: Miran Jug, Managing Director
Signature and stamp:

MARIBORSKI VODOVOD
JAVNO PODJETJE d. d.
MARIBOR, Jadranska c. 1

Miran Jug
miran.jug@mb-vodovod.si
+38641558671
Signed By: mSign
Issued By: SIGEN-CA G2
Date: 14.07.2021
09:55:30 CEST

WINPOL
Interreg Europe

SNAGA ČISTO MOJE MESTO

European Union
European Regional
Development Fund

ENDORSEMENT

Date: 17.7.2021

Name of the organisation: Javno podjetje Energetika Maribor d.o.o.

Legal representative: mag. Alan Perc

Signature and stamp:

ENERGETIKA MARIBOR
Javno podjetje Energetika Maribor d.o.o.
Jadranska cesta 28, 2000 Maribor

WINPOL
Interreg Europe

SNAGA ČISTO MOJE MESTO

European Union
European Regional
Development Fund

ENDORSEMENT

Date: 12.07.2021

Name of the organisation: EKO LUX D.O.O.

Legal representative: DAVORIN DOBRAJC

Signature and stamp:

EKOLUX d.o.o.
EKO LUX

WINPOL
Interreg Europe

SNAGA ČISTO MOJE MESTO

European Union
European Regional
Development Fund

ENDORSEMENT

Date: 13.07.2021

Name of the organisation: APLAST d.o.o.

Legal representative: MATEJ MOŽINA

Signature and stamp:

APLAST
Aplast d.o.o. | Ložnica pri Žalcu 37 | 3310 Žalec | Slovenija 4

WINPOL
Interreg Europe

SNAGA ČISTO MOJE MESTO

European Union
European Regional
Development Fund

ENDORSEMENT

Date: 8.7.2021

Name of the organisation: NARVIS D.O.O.

Legal representative: BOJAN KUZMIČ

Signature and stamp:

narvis
informacijske rešitve