






TAKING  
**COOPERATION**  
FORWARD

-  Regions and Cities Fostering the Circular Transition #4 / 28th march 2022
-  Pilot project - Piloting circular solution in the domain of waste management and reuse in Varazdin, Croatia
-  CE1515/ CITYCIRCLE/DAN/Nikolina Žigmund / Croteh ltd/ Prof.dr.sc. Gregor Drago Zupančič

# PILOT: „BIOECONOMY IN VARAŽDIN”

- Pilot core objective:
- Boosting local economy through innovative approach to waste management and reuse. Innovating new business opportunities originating from waste recycling through public-private co-creation.
- Successfully implemented, the pilot project is representing a valuable blueprint for policymakers who want to stimulate the progression from a linear towards circular economy.



# PILOT: „BIOECONOMY IN VARAŽDIN”

Through this pilot Varaždin has tested how the concept of CE works on the model of the city company Gradska tržnica d.o.o.

The aim was to raise the awareness of the City Market tenants about the need for waste sorting, which resulted in a reduction in the amount of municipal waste generated at the market. Separately collected organic waste is processed in a biogas plant where digestate is produced and used as fertilizer on a hazelnut plantation owned by the City Market.





# ACHIEVEMENTS FOR LAST PERIOD:

*At Gradska Tržnica ltd - City market company*





## At Gradska Tržnica ltd - City market company

At the City Market, mesh banners have been set up at the sorted waste disposal site. Banners contain textual and visual instructions for proper waste separation as part of education activities.

As part of the Green Day event "Green Day", held at the City Market in Varaždin on March 26, 2022, educational and promotional activities on waste sorting were conducted.







The pilot project is promoted in the media at the local event of the CITYCIRCLE Final Conference in Varaždin on 23th of March, 2022.



# PILOT: „BIOECONOMY IN VARAŽDIN”

- Calcificate spreading on hazelnut plantations and
- Digestate spreading on hazelnut plantations performed



*Calcification of hazelnut plantations*





# AT HAZELNUT FARM FIELD

Plates marked with the CITYCIRCLE project label on the farm field.

At the hazelnut plantations, label signs were placed to distinguish treated area from the area that has not been treated with digestate and calcificate.



*CITYCIRCLE label sign at the hazelnut plantation*







# THE MAIN PILOT STAKEHOLDERS:

*Čistoća ltd* - Waste management company



Varaždin  
**Čistoća** d.o.o.





# MONITORING AND SEPARATE WASTE COLLECTION SYSTEM IMPLEMENTED AT CITY MARKET

Each month, records were kept on the amount of separately collected waste during the pilot project.

RECORDS ON REPORTED DISPOSAL, BY TYPE OF WASTE, FOR THE MONTH OF FEBRUARY																															
DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
MIXED MUNICIPAL WASTE				X							X							X								X					
STYROFOAM						X							X								X				X						
PLASTIC		X				X				X			X		X			X			X					X					
PLASTIC BOXES			X		X								X											X							
WOOD																															
PAPER				X																				X							
BIOWASTE				X							X							X									X				
PLEASE ENTER X IN THE CORRESPONDED FILELD ON THE DAY WHEN THE COLLECTONOF A CERTAIN WASTE IS REPORTED																															



# MONITORING AND SEPARATE WASTE COLLECTION SYSTEM IMPLEMENTED AT CITY MARKET

	Initial waste quantity prior to implementation of pilot project	Average waste quantity during the implementation of the pilot project (7/2020-2/2022)	Waste reduction/increase in reference to initial waste quantity
Mixed municipal waste	65,9%	39,4%	40% reduction
Biowaste	21,7%	34,0%	56,8% increase

Table 1. Comparison of data on waste quantities prior and during the implementation of the pilot project

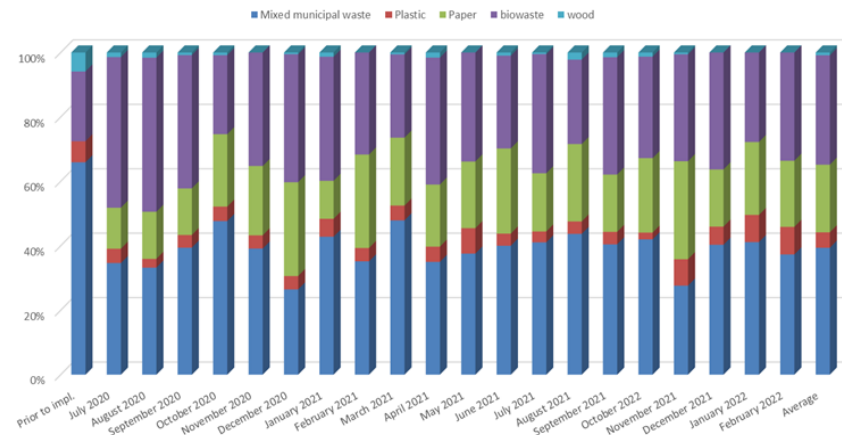


Table 2. Fractions of separately collected waste throughout the pilot

Average reduction of mixed municipal waste quantities of up to 40 %;  
 Average increase of separately collected biowaste quantities by 50 %;  
 The efficiency of separate waste collection is stagnant in the last period;





# TREATMENT OF BIODEGRADABLE WASTE IN THE BIOGAS PLANT FAMILY FARM VRČEK



 OPG VRČEK

Waste is collected separately in accordance with the instructions. Čistoća d.o.o transports the collected biodegradable waste for treatment in the biogas plant OPG Vrček.

The produced digestate has been transported to the hazelnut farm twice / year.





## OTHER PILOT STAKEHOLDERS:

4. *Development Agency North - DAN ltd*

5. *City Municipality of Varaždin*

6. *Croteh ltd*

7. *Partners from scientific community*

All stakeholders are members of CE HUB in  
Varaždin.



**croteh**

  
VARAZDIN  
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# THE LESSONS LEARNT:

- ✓ The use of bio waste for energy and then by-product fertiliser in hazelnut farming is a viable option;
- ✓ The difference between fertilised and unfertilised plantation is small but visible - it is necessary to continue the practice as planned for several years in order to achieve full potential of harvest;
- ✓ In all steps of the project people engagement and participation was of outmost importance and had crucial effect on successful implementation;
- ✓ Established waste monitoring system after using of separated bins on the City market Varaždin is already applied on the other markets in the region or are in the early stages of implementation.



# PILOT ASSETS:

✓ As part of the Pilot activity 1.2. Public procurement, 83 waste bins were procured by public procurement. Each set contains 4 waste bins for efficient separation of waste.

✓ Educational materials on proper waste sorting produced.

### V KOJU KANTU KAJ IDE

PLASTIKA	BIOOTPAD	PAPIR I KARTON	STAKLO
<ul style="list-style-type: none"> <li>✓ Čista i prazna plastična ambalaža (boce od jestivih ulja, octa, majke, vode, sokova, šampuna, deterdženta, jednokratne posude za kafača i šerava...)</li> <li>✓ Plastične vrećice i folije, tetrapaki i ostale višenajne ambalaže</li> <li>✓ Ambalažni strpor</li> </ul> <ul style="list-style-type: none"> <li>✗ Plastična ambalaža od bitnih tvari (povrtnički, broj, lakovi, otapala...)</li> <li>✗ Ambalaža od nestabilnih ulja i maslaca, plastične gračice</li> </ul>	<ul style="list-style-type: none"> <li>✓ Kuhinjski otpad od pripremanja hrane i ostali hrane (ostaci hrane voća i povrća, uske juhe, salag od kreme, vrećice od kafe, ostaci kruha, bitni salati, biljne, kupači i sl.)</li> <li>✓ Vrtol zeleni otpad (ovomato, cvjetovi, vijetilo šljike, travo, štrkva i sl.)</li> <li>✓ Ikorirane papirnatc maramice</li> </ul> <ul style="list-style-type: none"> <li>✗ Mesu, riba, kosti i koža</li> <li>✗ Vlasa i usni</li> <li>✗ Ambalaža hrane (kartonika, staklena, plastična...)</li> <li>✗ Dvoni otpad</li> <li>✗ Opusti od cigareta</li> <li>✗ Organski otpad s tekućina deterdženta</li> </ul>	<ul style="list-style-type: none"> <li>✓ Novine, časopisi, prospekti, katalogi</li> <li>✓ Bilježnice, knjige, ulavnicke</li> <li>✓ Ploči i fotokopirni papir, plošna, srednje tekućine, papirnate omotice</li> <li>✓ Hape, kartonski facijali, valovita (povrća, kartonske kufrije) čine: štrpove, stakle, plastične, strpora i sl.)</li> </ul> <ul style="list-style-type: none"> <li>✗ Indigo papir, vjetrovi papir, fotografije i fotokopirni papir</li> <li>✗ Ugi i prajeri papir, gumene omotice, perioni i sl.</li> <li>✗ Ikorirane papirnatc maramice</li> </ul>	<ul style="list-style-type: none"> <li>✓ Čista i prazna staklena ambalaža</li> <li>✓ Čijne staklenke i boce bez čepova i poklopaca (od piva, namaza, obovica...)</li> </ul> <ul style="list-style-type: none"> <li>✗ Staklo za prozore, automobilske staklo, kristalno i specijalno staklo, amirano staklo, staklena vana</li> <li>✗ Žarjaci i fluorocentna razvijača</li> <li>✗ Porcelanski i keramički predmeti</li> </ul>
✓ ODLAŽE SE	✗ NE ODLAŽE SE	<small>Ovaj znak označava stvarne autore. Obradbačke strane 07/2019/2019 programa nisu odgovorni za način na koji se te informacije mogu koristiti.</small>	



# FOLLOW-UP ACTIONS :

*Established waste monitoring system on the City market Varaždin*

can be used to other open markets in Croatia ;

be replicable in Schools and Kindergartens in the City of Varaždin or in any other public institutions in the city of Varaždin where such collection is required;

and to

improve the waste separation within the public service of collection and transportation of mixed municipal waste and biodegradable municipal waste.

## *Bio waste treatment*

the result of anaerobic treatment in a biogas plant - „biogas” can be used to produce electricity as natural gas substitute or as transport fuel. Such renewable energy source production from waste can contribute to increasing the energy sustainability of the Republic of Croatia

by product - digestate can be used as fertilizer on agricultural land or as a soil cover in parks / gardens / graveyard owned by the City of Varaždin.



# THANK YOU FOR YOUR ATTENTION



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CITYCIRCLE



PROF. DR. SC. GREGOR DRAGO ZUPANČIČ  
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