REPAiR

REsource Management in Peri-urban AReas: Going Beyond Urban Metabolism

D5.8 Eco-innovative solutions for Pécs

Version 1.6

Author(s): Cecília Mezei (RKI), Viktor Vadkerti Tóth (RKI), Viktor Varjú (RKI)

Contributors: Tamás Szabó (RKI), Csaba Vér (BIOKOM), Andrea Suvák (RKI), Arianne Acke (OVAM), Ágnes Óvári (RKI)

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Contact of responsible author:	mezeic@rkk.hu

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Acronyms and Abbreviations

AMA	Amsterdam Metropolitan Area
EIS	Eco-innovative solution
EU	European Union
GDSE	Geo-design Decision Support Environment
KT	Knowledge Transfer
NGO	Non-governmental Organisation
OECD	Organisation for Economic Co-operation and Development
PET	Polyethylene terephthalate
PLA	Polymerised lactic acid
PULL	Peri-Urban Living Laboratory
RDF	Refuse-derived fuel
UB	User Board
WP	Work Package

Table of Contents

Publishable Summary

This document presents the Eco-Innovative Solutions (EIS) that have been co-produced for the follow-up case of Pécs.

The methodology of developing the EIS was created by the REPAiR in the Peri-Urban Living Labs (PULLs) facilitated within the pilot cases of Amsterdam and Naples, and is described in the Deliverable 5.4, Handbook: How to run a PULL (Amenta et al. 2018). This handbook describes the development of a Co-creation process, a methodology in five phases, namely Co-Exploring, Co-Design, Co-Production, Co-Decision, Co-Governance.

Together with the stakeholders in the Pécs case study area, the choice was made to focus on developing EISs for the flows of organic waste (including food waste and green gardening waste parts), plastic waste, residual (mixed) waste and wastescapes.

The EISs presented in the current document are developed alongside the following two different paths. They are mainly based on co-design process with local stakeholders, students, experts at the PULL events and on other forms of direct communication (emails, interviews, questionnaires). Other types of solutions come from the literature and the pilot cases' EIS catalogues supplemented by the experiences gained at the knowledge transfer events.

Both paths are influenced by the knowledge and expertise of the REPAiR research team, the partners and the advisory board. The activities were performed on the basis of the identified challenges and objectives of the Pécs case study area, learned and understood from the process model analysis (Varjú et al. 2018: D3.7 Process model for Pécs) and the co-exploration phase in PULL. The methodology applied to select, adapt and elaborate the EIS was described in Amenta et al. 2018: Deliverable 5.4.

A total of 15 solutions for the Pécs case study area were formulated during the PULL workshops (see Chapter 3), and during the KT event, another three EISs have been selected as potentially transferable to Pécs, with some limitations and specialised circumstances (see Chapter 4).

1. Introduction

The Deliverables D5.8 "Eco-Innovative Solutions for Pécs" presents a list of Eco-Innovative Solutions (EISs) elaborated by the stakeholders of Peri-Urban Living Laboratory (PULL). All EISs in this catalogue aim to solve a concrete local problem of waste generation, waste treatment or resource efficiency within the specialised local context of the Pécs case. The Pécs case is one of the follow-up case study areas of the REPAiR project.

The pilot cases' EIS lists (for Amsterdam (Remøy et al. 2018: D5.2) and for Naples (Russo et al. 2018: D5.3) served as guide for this EIS catalogue.

The work on the EIS catalogue started with the identification of challenges in the concrete case study area (based on the teamwork within the WP5, relying on and with the help of WP6 and WP7).

The specific target locations for developing the EISs were defined as enabling contexts or possibility contexts. These spaces are such areas for which it is more urgent to develop Eco-Innovative Solutions, or where it is easier to start the process of EIS implementation, or where the EIS is expected to be relevant.

As such, 'enabling contexts' were determined to develop solutions with a spatial approach for

- the problem areas of organic waste, plastic waste and residual waste flows;
- the specific social, economic, environmental and spatial context of the Pécs Agglomeration;
- the complex waste and material flows of the case study area.

Development and refinement of the EISs for Pécs were made possible through the inputs gained from:

- interviews with potential stakeholders (actors of the waste sector, public administration, NGOs);
- the PULLs;
- knowledge transfer events;
- student's work;
- EIS catalogues of the REPAiR pilot cases;
- and literature reviews.

Looking through the WP6 report on (very centralised) governance in Hungary and in Pécs (Obersteg et al. 2017: D6.2), the process model (D3.7) for Pécs, and the low level waste conscious behaviour (c.f. D3.7 and Varjú et al. 2019: D3.8) that stakeholders (with high commitment (c.f. D3.8) have to face, and additionally, based on the PULL workshops: the one can realise that eco-innovation is really context specific, that means the solutions for Pécs cannot be seen very innovative in general, however they are innovative in the Hungarian (Pécs) context. The reason is the mentioned limitations both on household level and environmental policy on governmental level (c.f. OECD 2018 report in D3.7).

2. The Pécs PULL process

2.1. The PULL workshops

Pécs is the last of the follow-up cases in the pipeline of PULLs in the REPAiR project, hence, its organisation of PULL events was behind compared to the others, however, due in time.

The first steps were focused on the identification of challenges and the construction of a first list of objectives. The identification of challenges and objectives were carried out through individual interviews with stakeholders, meetings with experts and discussion within the first PULL workshop.

As we focused on the waste flows managed by the public service provider of Pécs, we tried to concentrate on the local actors, who are interested in the municipal waste flows. First, we analysed the policy documents and the legislative framework in order to find the potential actors. Based on the policy document analysis, we made a first list of potential stakeholders, and we made interviews with them. The interviews were conducted between 08 August 2017 and 21 November 2017. We organised the first PULL workshop on the 28th of November 2017 in Pécs with the participation of numerous local/regional waste experts, practitioners and stakeholders.

The aim of this first PULL workshop was the first identification of challenges and objectives of the case study area. We managed the next steps of PULL workshop organisation (see Table 6.) based on the results of this first PULL. The participants listed many challenges and problem areas, and we integrated and categorised them into four main groups according to their connections with the main waste flows.

At the second PULL workshop we asked the participants to prioritise the challenges/objectives identified by the actors of first PULL and by the interviewees. We presented them all listed items and tried to concentrate on their potential to turn the challenges into objectives (we asked the participants to draw up in a pretty exact way the potential objectives based on the listed challenges). This was the most popular event, with 38 participants, all eager to present their own opinion (Figure 1). This resulted in a very colourful, almost chaotic output. From this point the Pécs team made efforts to narrow the scope of the further PULLs. For this reason, following the 2nd PULL the RKI and BIOKOM team organised some internal meetings to finalise the list of problem areas of the Pécs Agglomeration (Focus Area in the Pécs case). In this way the Pécs team delimited 8 problem areas for organic, 5 for plastic, 7 for residual waste flows, 11 for overall waste generation problems and 7 for the wastescapes located in the researched area (see Table 1-5.).

For prioritising the importance of challenges (and objectives) we asked stakeholders to give a grade (range from 1 to 4 , where 1 means: "not at all important" … and 4 means "very important"). For the stakeholder's evaluation we provided an online platform showing the challenges to be graded (using Limesurvey software). This allowed each stakeholder to grade all challenges anonymously without seeing or being influenced by the other stakeholders' grades. We have sent the link for the grading to 63 recipients (to all the potential stakeholders identified during the first phase of the PULL, co-exploration) from which 17 have graded all of the challenges.

The average point (value) of the items resulted a priority rank (see Table 1-5) of the challenges concentrating on one of the 5 waste sectors (organic, residual, plastic, overall and wastescapes). During the organisation of further PULL meetings, the Pécs team decided to integrate the five waste sectors into the investigated four waste flows/areas (organic, plastic, residual, wastescapes) and the overall problem areas (Table 1) was integrated into all of them.

Figure 1. Second PULL meeting at University of Pécs, Faculty of Engineering and Information Technology, Pécs (15.01.2019)
Source: Own contribution

Challenge/Problem	Objective	Rank	Average
The public service charged to customers does not cover the further development of the waste management infrastructure	7% of the income should be a part of a development fund (Up to the amortization part).	1	3.75
The involvement of relevant actors is inappropriate, when elaborating urban development plans (currently it does not exceed the compulsory minimum level)	All relevant actors shall be invited to take part in the urban development plan creation.	2	3.72
The legislation does not encourage households to participate in selective waste collection.	More encouraging legislation.	2	3.72
The waste collection practice of CDW is incorrect and therefore a large amount of construction and packaging waste is mixed.	During construction and demolition work, 100% selective collection is realized	3	3.61
Relevant stakeholders have insufficient information on urban and regional plans, strategies, and development programs.	All the actors involved shall reach the information through differentiated (formalized?) channels	4	3.44
Decisions on development and operation are not made locally, therefore slow and cumbersome decision-making hinders local actors (local government, public service, etc.) in implementing eco-innovative solutions.	Municipal associations' proposals for development and operation	4	3.44
The actors involved do not receive clear information on the methods of collection or disposal. about the location of collectors and junkyards, and on the benefits of environmentally conscious behaviour	All actors involved shall reach the information through differentiated (formalized) channels	5	3.33

The garbage collector islands are regularly scanned by dumpster divers, and therefore they are messy and dirty-	The environment of waste collection islands is clean and tidy	6	3.22
Some preferential schemes (e.g. „Tüke card") and non-governmental organizations (e.g. Pécs Green Circle, TreeMission) promoting local consumption and / or environmentally-conscious behaviour are too isolated, and because of their small size, the benefit they reach cannot alone convince the majority of the population that it is worth to change the established bad habits.	Integrate as many rewards and promotions as possible through a common platform, thus increasing the potential for the usage of rewards and discounts.	7	3.17
There is a lack of meaningful foreign language information (e.g. thousands of foreign students, tourists have no information on the principles according to which the waste collection system works, where are the collector islands, or the meaning of the different colours).	Full foreign language information.	8	2.94
Low density of the collector points/collector islands network.	It should be possible to place extra quantities on rare occasions (Christmas) in separate bags	9	2.72

Table 1: The preliminary challenge and objective list of the overall waste generation area (with the average priority and rank given by the stakeholders)
Source: Own construction based on the PULLs and questionnaires

After the second PULL workshop a Hungarian language website - http://repair.rkk.hu/ was established in order to continuously inform the stakeholders about the results (preliminary EISs, challenge list) of the PULL workshops. Additionally, in order to concentrate more on the solutions - the PULL leaders decided to organise the following PULL workshops around the flows we investigate.

On the 25th of March 2019 the 3rd PULL workshop was organised around the wastescapes of the Pécs case. The Pécs Team presented the categories of wastescapes with the idea of starting a collaborative process aimed at the collective updating the map. During the meeting the participants discussed the previously identified challenges and objectives of the wastescapes (Table 2). As a result, a finalised map of wastescapes of the Pécs case study area was completed (Figure 2).

During the workshop it appeared, that although Pécs had some wastescapes, especially relating to the former mining sites, most of them are under regeneration and there is a continuous thinking on how to use these areas. It also meant that wastescape in Pécs case was not as cardinal as it was in Naples.

Challenge/Problem	Objective	Rank	Average
Remediation of soil and groundwater contamination of industrial sites and areas	Remediation of an area for recycling from an urban development perspective.	1	3.73
Removal and disposal of industrial waste, contaminated building structures and technological equipment of industrial sites.	The most possible, but at least 50% expansion of rehabilitated areas.	2	3.6
The number of illegal landfills of building debris is too high.	The number of newly discovered illegal dumps will decrease by 4% year by year.	3	3.63
The CDW of asbestos has not been resolved, even though there are several businesses in Pécs in Baranya that are capable of professional asbestos removal, treatment, transport and even disposal capacity for asbestos waste in the region (Marcali).	CDW must be 100% asbestos-free.	3	3.63
There is no complete recultivation of urban mines / old landfills	Recultivation must be completed everywhere.	4	3.44
The change of function of other brownfield places has not been completed	Function change for all brownfields.	5	3.31
Creating industrial infrastructure (road networks, water utility and power lines, works of art) to maximize the recyclability of spatial rehabilitation and new non-polluting land use in the brownfield area adapted to settlement development considerations.	The renovation of the existing road or utility networks requires at least 20-30% less cost than creating new networks.	5	3.31

Table 2: The preliminary challenge and objective list of the wastescapes (with the average priority and rank given by the stakeholders)
Source: Own construction based on the PULLs and questionnaires

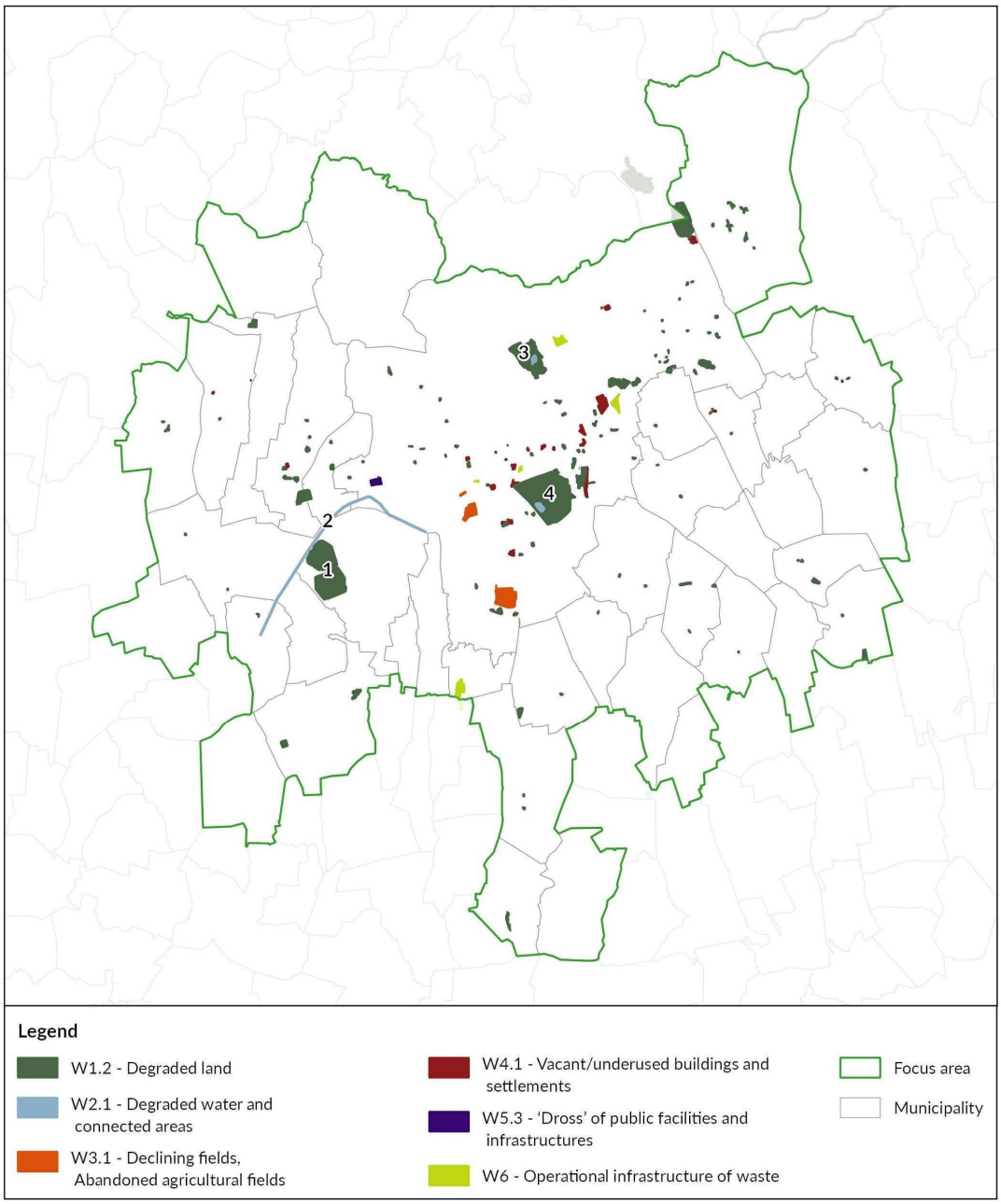
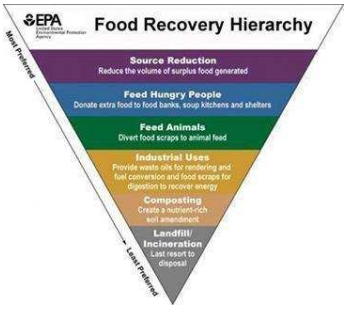


Figure 2: The final list of Pécs case's wastescapes
Note: 1) Slop reservoir for the former uranium mining; 2) Pécsi-stream; 3) Carolina openwork; 4) Tüskésrét.
Source: D.3.7. (REPAiR, 2018) p. 56.

On the 4th of April 2019 the main topic of the 4th PULL workshop was 'organic and biodegradable waste'. At the beginning of the meeting we described the problems we have already revealed during the previous workshops (Table 3).

Challenge/Problem	Objective	Rank	Average
Household food waste (except for cooking oil and grease) and green garden waste collection is virtually unresolved and therefore typically go to mixed waste, or partially into the sewer network and occasionally into containers for separate collection of waste, rarely rendering it unsuitable for processing.	This food recovery hierarchy shall be dominated by the higher levels. 	1	3.69
There is too much food waste in public catering, where recipients of free meals do not indicate absence (no financial incentive) and this significantly increases the amount of food waste (about 60% of pre-prepared food will be wasted).	In the public catering, the prepared food portions should not get into the trash.	1	3.69
Too much food waste is generated in the households,	Within five years the amount of food waste shall be reduced from 68kg/year/person to 38kg/year/person.	2	3.63
Too much food waste generated in the catering sector	The food from the catering sector should not enter the trash	2	3.63
The burning of green waste from the gardens has a health and environmental impact.	At least half of the garden green waste currently burned shall be composted.	2	3.63
PLA (polymerized, lactic acid-based, biodegradable) packaging materials are not popular in Hungary.	The proportion of PLA packaging materials among food packaging materials should be increased to 50% within five years	3	3,.6
The separate collection / recovery of PLA packaging material is unsolved, as PLA will only decompose under the influence of heat (at 60° C, after five days), but this temperature is not present under natural conditions or at the landfills, so recovery is only possible in a composting plant typically of industrial size. (retail composting is not suitable for this purpose).	To increase a scale of separate collection of PLA (non-biodegradable and non-degradable plastics) to et least 90% within five years.	4	3.5

Households do not have separate, odourless collection of organic, plant-derived kitchen waste within the apartment.	At least half of the households shall resolve the problem of collecting odourless food waste inside the apartment.	4	3.5

Table 3: The preliminary challenge and objective list of the organic waste (with the average priority and rank given by the stakeholders)
Source: Own construction based on the PULLs and questionnaires

The next PULL workshop was held in Pécs on 25.04.2019 about the plastic wrapping waste. The two-hour workshop started with the presentation of the problem areas (Table 4). The flow charts and the previously collected problem list were used to illustrate these.

Challenge/Problem	Objective	Rank	Average
There are too many plastic bags used for packaging.	Reducing the current use at least by 50%.	1	3.88
There are too many plastic bags used for shopping.	Reducing the current use at least by 50%.	1	3.88
There are too many plastic bottle used (PET).	Reducing the current use at least by 50%.	1	3.88
Too much plastic foil is used.	Reducing the current use at least by 50%.	2	3.87
More intensive support of the selective collection (Dormitories and Campus) by the University.	Selective waste islands shall be available at all university locations	3	3.5

Table 4: The preliminary challenge and objective list of the plastic waste (with the average priority and rank given by the stakeholders)
Source: Own construction based on the PULLs and questionnaires)

The subject of the 6th PULL workshop, held on the 8th of May 2019 was the residual waste. At the beginning of the meeting the problems identified so far were presented. In the demonstration section we also examined the map of the residual waste material flow within the researched area of Pécs Agglomeration.

Challenge/Problem	Objective	Rank	Average
80% of urban waste is still mixed	Reducing the proportion of mixed urban waste to 20%, 80% shall be collected selectively (over 5 years).	1	3.8
Currently 30-50% of municipal solid waste is landfilled.	Less than 15% of municipal solid waste should be deposited into landfills.	2	3.75
Household waste incineration (in mixed fired boilers) has a harmful effect on health.	The amount of waste incinerated by households is halved within five years	2	3.75
The current market regulation of second raw materials does not motivate waste management organizations in the high extracting of high quality secondary raw materials.	The household charges shall cover the costs of collecting and preparing waste for recycling.	3	3.53
Volume of domestic demand for secondary fuels is insufficient (only about half of the RDF produced can be marketed).	The volume of domestic demand for secondary fuels shall cover the total amount of RDF produced.	4	3.4
Removal of electronic waste from households and institutions is not solved	Electronic waste does not appear in mixed waste	5	3.29

Table 5: The preliminary challenge and objective list of the residual waste (with the average priority and rank gave by the stakeholders)
Source: own construction based on the PULLs and questionnaires

With the help of the PULL workshops (Table 6), the local stakeholders developed several possible eco-innovative solutions for Pécs.

PULL Workshop Participants were asked to respond to the following questions in order to identify the operative relevance of the selected EIS for the case of Pécs:

1. According to your expertise, which are the positive aspects of this EIS?
2. And which are the negative aspects of this EIS?
3. What is missing in this EIS?
4. Is this solution correctly addressing the main criticality of the case study area?
5. Is this solution improving the spatial/environmental/social quality of the case study area appropriately?
6. Who – in your opinion – are the actors to be involved?
7. Whom do you think would be willing to cooperate with whom?
8. For whom could this solution be a possible business model?
9. Could you mention other possible sources of funding?

A total of 15 solutions were formulated during these PULL workshops (see Chapter 3), and another three EISs have been selected as a potential solutions/idea to transfer for Pécs, with the need for 'translation' to the local circumstances (see Chapter 4).

Event Type	Date of PULL	Scientific Community	Industry	Civil Society	General Public	Policy Makers	Media	Investors	Other
1. PULL WS	28.11.2017.	8	9	6	4	4			
2. PULL WS	15.01.2019	18	5	1			1		
3. PULL waste-scapes	25.03.2019	6	2	2		2		1	
4. PULL organic	04.04.2019	5	2	2		2			1
5. PULL plastic	25.04.2019	6	2	2		2			
6. PULL resi-dual	08.05.2019.	4	2	2		2			
7. PULL – know-ledge trans-fer event	18.06.2019.	14	3	2					

Table 6: List of Pécs PULLs and the number of participants by categories (person)
Source: own construction based on the participant lists of PULLs

The aim of the Knowledge Transfer (KT) PULL Workshop held on 18th June 2019 was to present EISs from the pilots to the local participants and discuss the adoptability of them to Pécs. Beforehand, the Pécs REPAiR group selected two solutions from Amsterdam and

two from Naples (c.f. D7.1 - Dąbrowski et al. (2018) and D7.2 (Varjú and Dąbrowski 2019) about KT events), that potentially seemed the most adaptable solutions. EISs were presented separately in the two groups and evaluated for their applicability for Pécs within a 30-minute discourse per EIS. Two colleagues from the pilot cases' team (Amsterdam, Naples) helped this working process by presenting the EIS and answering the issues that arose.

Knowledge Transfer PULL Workshop participants were asked to respond to the following questions, in order to understand to what extent are the solution(s) identified from the pilot cases transferable to Pécs:

1. Is this EIS transferable to your region?
2. Where, at which location could be this EIS applied in your region (location)?
3. What are the barriers for transferability of this EIS?
4. What adaptations, adjustments are necessary to enable transferring it to your region?
5. Who should be the actors involved?

We have discussed 4 different potentially transferable EIS:

1. **Bio-seasonal parking (from AMA EIS Catalogue)** A temporary parking solution using a biodegradable structure (see Remøy et al. 2018. pp. 55-64);
2. **Online marketplace from CIRO+ (from Naples EIS Catalogue)** Creating Integrated Center for Optimal Reuse of durable goods (see Russo et al. 2018. pp.73-78);
3. **Food rescue platform (from AMA EIS Catalogue)** Creating a food sharing platform between the great distribution of supermarkets and social organisations (NGO) (See Remøy et al. 2018. pp. 217-221);
4. **WASTE: transformable resources for community spaces (from Naples EIS Catalogue)** The aim is "recycle" material, natural, economic and social resources in order to regenerate the abandoned space which were taken away from the community (see Russo et al. 2018. pp. 116-129).

The first three EISs were accepted with modifications as a part of Pécs EIS catalogue (see Chapter 4) based on the opinion of the PULL participants. The 4th one, the "**WASTE: transformable resources for community spaces**" divided the workshop participants. This EIS was developed by UNINA, exactly for "critical points" related to infrastructures, both in terms of accessibility and in terms of agricultural land fragmentation. The solution aims to "recycle" material, natural, economic and social resources in order to regenerate the space which was previously distracted from the community, and so create a new place for the transformation of products, ideas and behaviours, alongside with a network of ecological connections and paths. The first step consists of reconsidering the waste products released by industries, and then reusing them in a new way. As a result, a land reclamation ensues, the area can recover to a productive agricultural park where people can grow typical local products and transform them into finished products within cooperation networks together with other actors, such as confectionery companies and restaurants. These productive agricultural parks are host a centre of environmental education and research on recycling issues. The remediation of wastescapes stimulates a new and more circular economy that contributes to social inclusion process educating

people to take care of the surrounding environment and the related social problems" (Russo et al. 2018. pp. 116-129).

The adaptation background within the Pécs case study area showed different pictures within the two working groups. The two groups produced two different views on EISs. One group seemed to be adaptable to EIS in its present form in Pécs, similar initiatives have already been taken in the city (Tüskésrét). Phytoremediation can be used as an idea in various contaminated areas, as this has already been the case (planting of energy grass, acacias) at other places as well. However, for these options, the first step would be to assess and map the status of current brownfield sites (what kind of contamination is present etc.).

In addition to identifying brownfield sites, illegal landfills, former mining sites could be added to the EIS. However, the legal environment may be an obstacle for a successful implementation. The questions also arise: Who owns the area? When can the site be reclassified? When has the site been contaminated and, if so, can it not be used for agricultural purposes? For successful adaptation, it would be important to find and survey the affected areas, contact the Environmental Inspectorate and assess the existing local community areas. Within the EIS framework, the Environmental Inspectorate may relate to the municipality, local businesses, the thermal power plant and the mining authority, and not least the public who will be occupying the public spaces in the future. A special idea at this EIS was the creation of an eco-park around the current „tüskésréti" sports grounds by damming the small river „water of Pécs".

The other group considered the solution difficult to adapt and, in any case, emphasised the importance of finding plants that are viable under arid conditions. Only after that, the agricultural use of the land by non-food crops would be feasible.

They see the agricultural design as feasible on the Mecsekérc tailings cassettes (Pellérd) and other heaps. It is important to emphasize that the Pécs area has a different climate from that of Italy, so it is important to find a crop that can survive in the designated area. Another problem was the question of mechanisation and the size of the areas. It is difficult to establish a small community area in Pécs. Regarding the issues mentioned above, afforestation of designated areas may be a possible solution.

2.2. List of final Eco-Innovative Solutions for Pécs

During the series of PULL workshops organised in Pécs 15 EISs were co-created with the stakeholders. Additionally, three EISs have been taken into account as a transferable solution to adapt to the local context. After the short list a detailed catalogue of the solutions can be found in the following chapters.

Organic waste

1. **Public catering turbo**
   Better quality and quantity (portion) of school and hospital meals, with an on-time management of actual demand, and the possibility of the use of leftover portions for charity aims.
2. **Packaged meal redirect**
   The use of left-over portions from the public (and potentially the total local) catering services for social/charity catering aims.
3. **Homemade compost**
   Campaign for homemade composting practice of households.
4. **Green waste shredder service**
   Some usable shredder machines should be purchased by the public service provider for renting them households to help shredding and composting the green waste at home.

Plastic waste

5. **Own Bottle Program**
   Make an advertising campaign to the drinkable tap water against the bottled mineral water and make an application for the tourist and citizen about the drinking wells locations around the city.
6. **City canvas bag**
   Municipality offer own (discount or free) canvas bag/reusable shopping bag for the families in order to reduce the usage of plastic packaging bags.
7. **Awareness-raising towards less use**
   The increase the social sensitivity to environmental protection, with creating a more attentive population that produces less waste in the long run with the help of campaigns and the change of habits within the stores.
8. **Environmental education for employees**
   One education (like the usual fire protection, occupational safety educations for incoming employees) for the employees before starting the work for pro-environmental behaviour and better waste selection practice.

Residual waste

9. **Minimize waste burning**
   Providing families in need free raw material with the opportunity to use other fuels than waste and informing children and parents in schools about the dangers of waste burning.
10. **Full Information on Selective Collection**
    Provide comprehensive multi-channel information to the public on selective collection.
11. **Checking garbage cans**
    The aim is to check the garbage at flats and staircases. This may be a random check by an inspection body or a check on waste when it is disposal. If there is no selective sorting of the waste, the user will be penalized (or the waste not delivered by the operator).

Wastscapes

12. **Soccer Complex**
    With the development of the brownfield area would be suitable for setting up an academy with the adjacent football field. On the other hand, with this solution the city can continue the bike-road from "Kertváros" district to Kovácstelep district.
13. **Energy-insensitivity**
    With the regeneration of this area it can be a great place for some new industrial company. The new planted factories would give the city opportunities for further development.
14. **Leather Factory with new functions**
    Give this place some new artistic and cultural functions with the regeneration project.
15. **Asbestos deposit/placed facility for individuals**
    Make an informative campaign to deliver the right knowledge about asbestos: Where they can find companies who can remove asbestos materials?

EIS adopted by knowledge-transfer events

16. **Bio-seasonal parking (from AMA EIS Catalogue)**
    A temporary parking solution using a biodegradable structure (see Remøy et al. 2018. pp. 55-64)
17. **Online marketplace from CIRO+ (from Naples EIS Catalogue)**
    Creating Integrated Centre for Optimal Reuse of durable goods (see Russo et al. 2018. pp. 73-78)
18. **Food rescue platform (from AMA EIS Catalogue)**
    Creating a food sharing platform between the great distribution of supermarkets and social organisations (NGO) (See Remøy et al. 2018. pp. 217-221)

For the GDSE, based on the stakeholder's information, on researches and on engineering estimate team members of RKI draw up the recent and the expected processes of the

solutions assessing the percentage of different flows from activities (NACE) (also c.f. D3.7) and assessed the changes as well. These figures are also presented.

3. Eco-innovative solutions – Pécs

3.1 Public catering turbo

Addressed challenge or objective
There is too much food waste in public catering, where recipients of free meals do not indicate absence (no financial incentive) and this significantly increases the amount of food waste (about 60% of pre-prepared food will be waste). On the other hand, canteen food is not always tasty, and this discourages the target groups (e.g. students) to go to the canteen, they buy food in the buffet instead.

Potentially affected area
Schools and hospitals with canteens around Pécs Agglomeration.

Intervention proposed
- Expanding the supply of school canteen, A-B daily menu to provide choice for the consumers;
- Serving a proper portion for them;
- Accurate assessment of the number of people who eat in the canteen;
- Rethinking the system of state supported canteen food supply (creating a more appropriate legal background).

Key activities related to the solution
- Keep good quality and adequate quantity of the food;
- Up-to-date needs assessment in the canteen (how many portions and how much food are needed?);
- Consumption of left-over food from canteens.

Expected impact
Food waste prevention. Better quality of the food in schools and hospitals, more participants in the canteen system. Less wasted food in the canteen system.

Key actors to be involved
Families, schools, hospitals, food services

Owner of the EIS
Living Laboratory of Pécs

Description of the EIS
Currently, the quality and quantity of meals served in public catering, school meals and lunches are inadequate. Because of this, in schools, children often buy lunch in the buffet, so pre-ordered but not consumed hot food is put in the trash. In addition, parents do not give up the ordered food when the child does not go to school (for example due to illness). There is an, at least one day delay due to the catering system's information gap (they work from the previous day's list of names), but many of the families (with low income, with more than two children, etc.) are entitled to free meals, so they are not interested to

cancel their pre-order in the catering system. (In this way, the state support generates a given amount of food waste). There is another form of state supported free meals for the children. That is the food (milk, cocoa, apple, apple juice, yogurt, etc.) coming from the so called “School milk”, “School fruit” programmes, where local milk/fruit producers provide portions, items for each chide (but many from them hate or are intolerant to products made from milk/fruit). As a result, portions of the food are shipped/serviced, but at the end of the day food waste is generated from it. Based on expert and consumer estimations about 60% of pre-cooked food will be food waste (Figure 3).

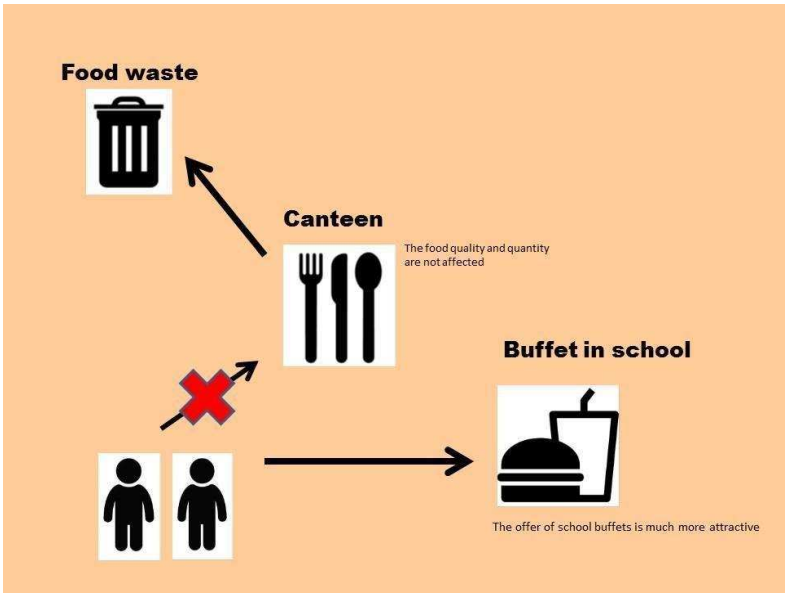


Figure 3: Status quo at school canteens
Source: Own construction

On the other hand, once the food has been delivered, it cannot be offered for charity meals. There is currently no statutory (health) framework for this. This side also requires the modification of the regulatory framework, or the development of a suitable management system (based on infrastructure development projects of canteens e.g. separated entrance for outsiders, or an online application for delivering the left-over food for other users, etc.).

As part of the eco-innovative solution called "Canteen development", the goal is to reduce the amount of food waste generated in the public catering. Therefore canteen catering development EIS can be significant because of its potential to prevent the generation of larger amount of food waste from catering in schools and hospitals.

The EIS would remedy the problem at source, preventing the production of waste (Figure 4). To this end, it is designed and intends to change the quality and quantity of meals currently served and gives the chance of selecting meals.

There are more ways to do this:

• Serve better and more aesthetic dishes;
• Improving the quality of food served in school canteens, a possible choice between A-B menu;

• Appropriate, personalised portions;
• Rethinking the financing of the catering system (state supported free menu, state supported catering system)
• Rethinking the system of other free food systems (school milk, yogurt, fruits)

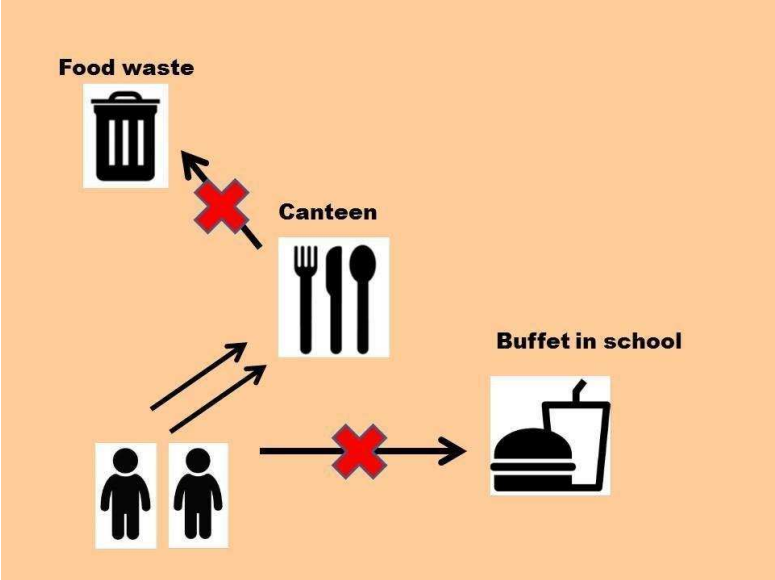


Figure 4: Expected result from canteen development EIS
Source: Own construction.

In addition to the options mentioned above, it is crucial to make parents conscious and interested to cancel pre-ordered food forthwith when they are certain that their child will not go to school on a given day. To this end, an online application could be used to signal the need for meals every morning (which is much easier and less time-consuming than calling). Otherwise, penalties shall be applied.

Another problem is the availability of buffets, food and drink vending machines in schools. These unhealthy foods/drinks are often more attractive to children, so they prefer to have lunch here. To prevent this scenario the supply of buffets, vending machines shall be regulated and awareness among teachers raised.

As regards left-over food, which can be offered for charity meals, an appropriate storage and shipping method and system should be set up.

The successful operation of the EIS would require the involvement of several participants. As a first step, the institutions involved in catering and the service providers should be addressed. It would then be important to inform families and educators about the new system.

Related flow(s)
food waste

The flow charts within the GDSE model

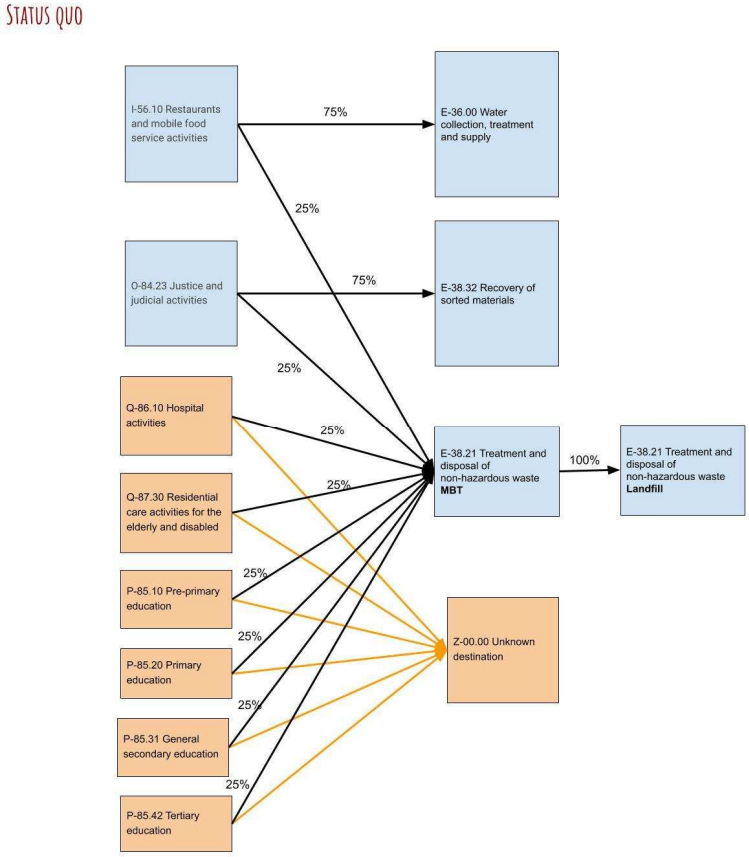


Figure 5: Status quo flow chart from the GDSE for canteen development EIS
Source: Own construction

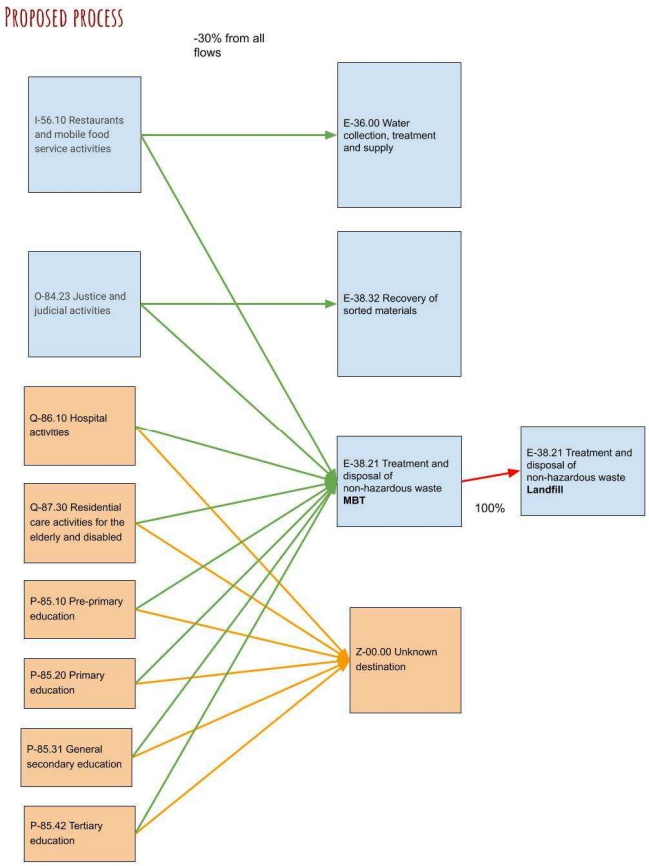


Figure 6: Flow chart of the proposed process from the GDSE for canteen development EIS
Source: Own construction

3.2 Packaged meals redirect

Addressed challenge or objective
Too much food waste is generated in public catering (e.g. schools and hospital), around 60% of packaged and cooked meals became food waste.

Potentially affected area
Schools and hospitals with canteens around Pécs Agglomeration

Intervention proposed
- To inform stakeholders about alternatives (communication platform for network members);
- To modify special rules for public catering places.

Key activities related to the solution
Local government acts towards public institutions and catering service providers in order to integrate the social organizations to collect and distribute left-over food.

Expected impact
One third of unused food will be redirected

Key actors to be involved
Municipality
Institution with public catering functions
Catering service providers
Food waste collectors
Social organizations

Owner of the EIS
Living Laboratory of Pécs

Description of the EIS
Currently, the quality and quantity of meals served in public catering, such as school meals and lunches are inadequate. The situation is similar in hospitals. As a result, portions of the food are shipped/serviced, but at the end of the day food waste is generated. Based on expert and consumer estimations about 60% of pre-cooked food becomes food waste (Figure 7).

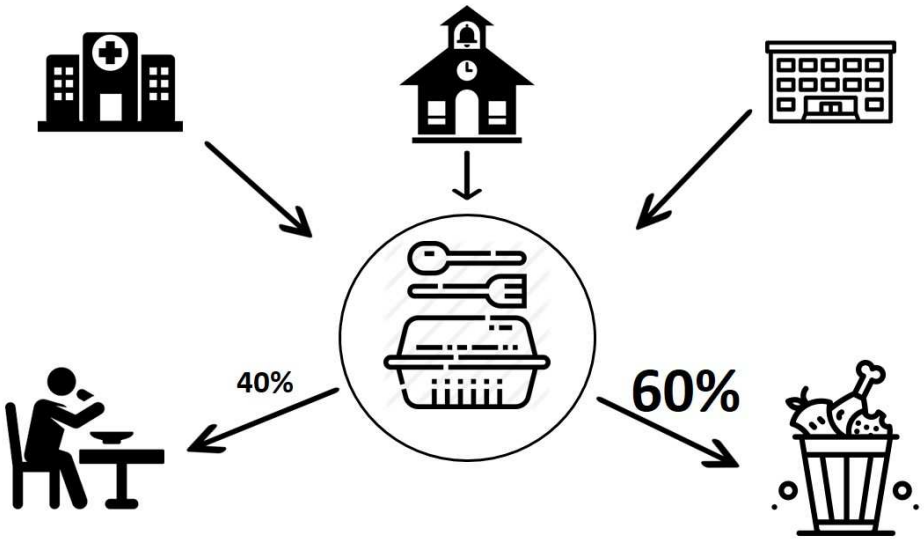


Figure 7: Recent process of packaged meals
Source: Own contribution

On the other hand, once the food has been delivered, it cannot be offered for charity purposes. However currently there is no statutory (health) framework for this and therefore it requires the change of the regulatory framework or / and the establishment of a suitable management system (based on infrastructure development projects for canteens e.g. separated entrance for outsiders, or an online application for delivering the left-over food for other users, etc.).

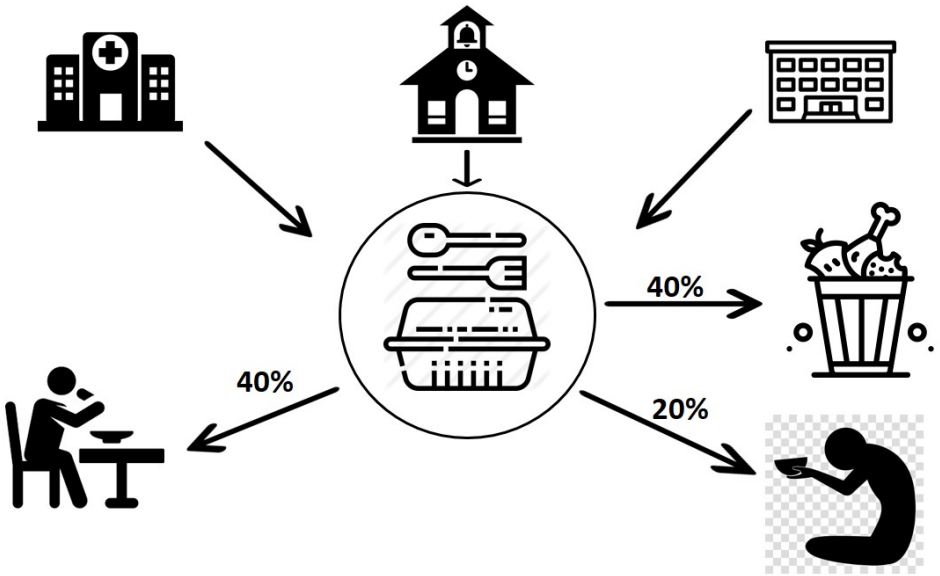


Figure 8: Expected process of packaged meals
Source: Own contribution

The EIS advices a regulatory change allowing for the service providers to collect the left-over portions and give them for social/charity organisations. Other interactions are also needed from the delivery and network side. This EIS needs a good and on time communication platform (an application or a network system) for the donors, the (charity) transporters and the social/charity organizations, which can distribute the food between needy people. This platform can provide knowledge on the amount of meals, the potential transporters and the potential consumers.

With a good local campaign of the Municipality this system could be extended to the local restaurants, bars and other catering providers.

The use of leftover foods from the catering system can minimize the amount of food waste generated within the agglomeration of Pécs.

Related flow(s)
food waste

The flow charts within the GDSE model

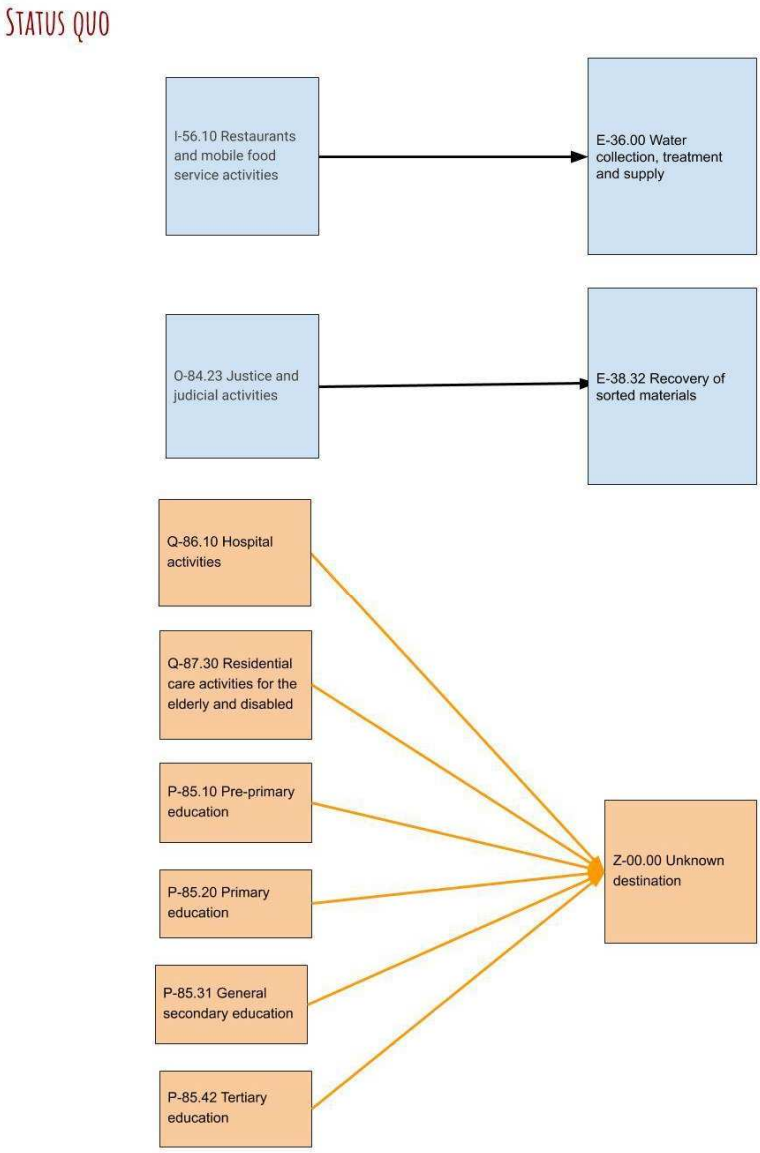


Figure 9: Status quo flow chart from the GDSE for Redirected meals EIS Source: Own construction.

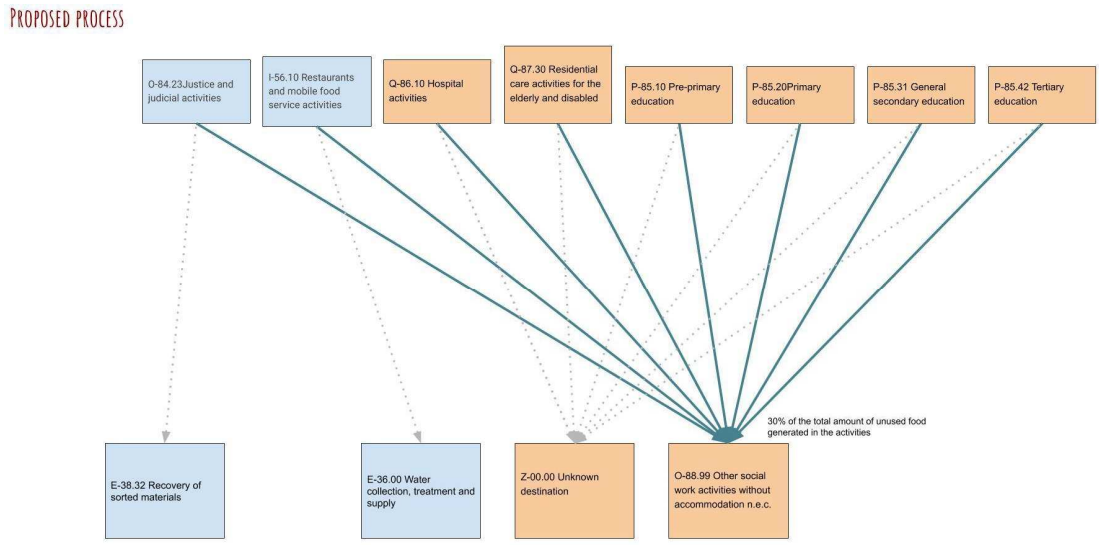


Figure 10: Flow chart of the proposed process from the GDSE for Redirected meals EIS
Source: Own construction

3.3 Homemade compost

Addressed challenge or objective
Ineffective and inadequate treatment of green waste generated in households

Potentially affected area
Districts with family houses, suburbs

Intervention proposed
- Teaching people about the possibilities of collecting green waste and composting at home, thus reducing the burden on the service provider and waste management;
- Free distribution of composting boxes among those interested;
- To tell people: Why is it useful? What can they put into the compost?

Key activities related to the solution
- Create a campaign for home composting;
- To teach people by leaflets, videos, how it works, and what are its benefits;
- Free compost bundle sharing;
- Promoting "kitchen pig" and supporting it in homes.

Expected impact
Households pay more attention to the waste generated. Less waste in the waste yards.

Key actors to be involved
Households (with family houses)

Owner of the EIS
Living Laboratory of Pécs

Description of the EIS
Nowadays, small garden households generate too much garden green waste, which is often incinerated by owners (and that pollutes the air) or is not properly treated (alternatively it is filled into residual waste bins, from there it goes to the landfill). This problem can be observed in the city of Pécs in the suburban areas and on the side of the Mecsek (hilly area).

By implementing the "Homemade compost" program we want to achieve that at least half of the household green waste is composted (Figure 11, 12). The aim of this EIS is to teach households how to compost at home, what ingredients can be composted, and why this is useful for a family home (Figure 13). Within the EIS, free compost bins would be distributed for volunteers.

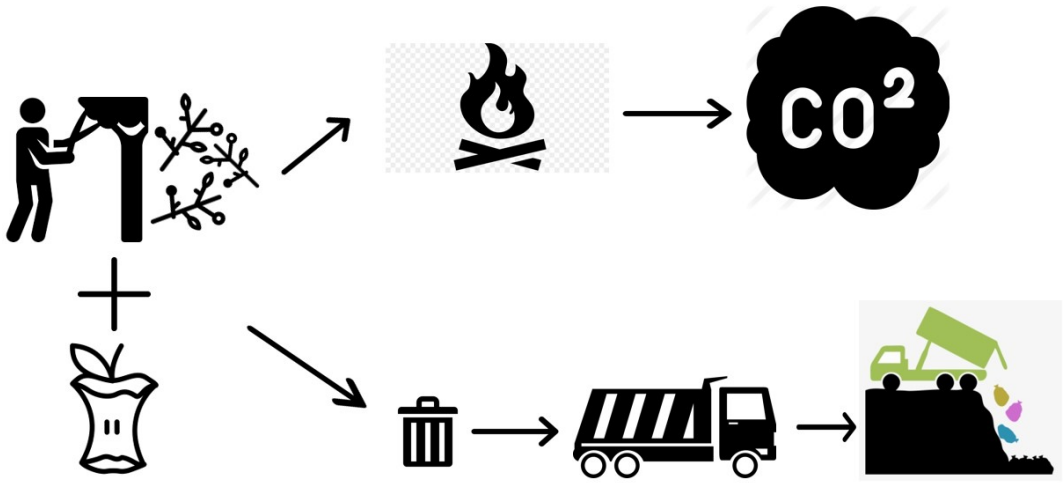


Figure 12: The recent process of home gardening
Source: Own contribution

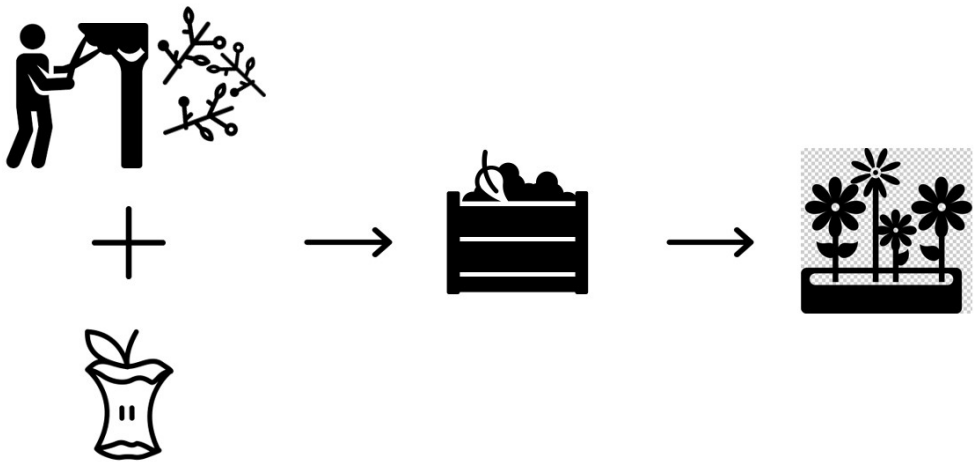


Figure 13: The expected process of Hommade Compost
Source: Own contribution

The prerequisite for a successful program is to reach the appropriate social interest and to reach as many households as possible. As a result of the program composting at home in the affected areas will increase, resulting in less littering in waste treatment yards and reducing /eliminating illegal incineration.

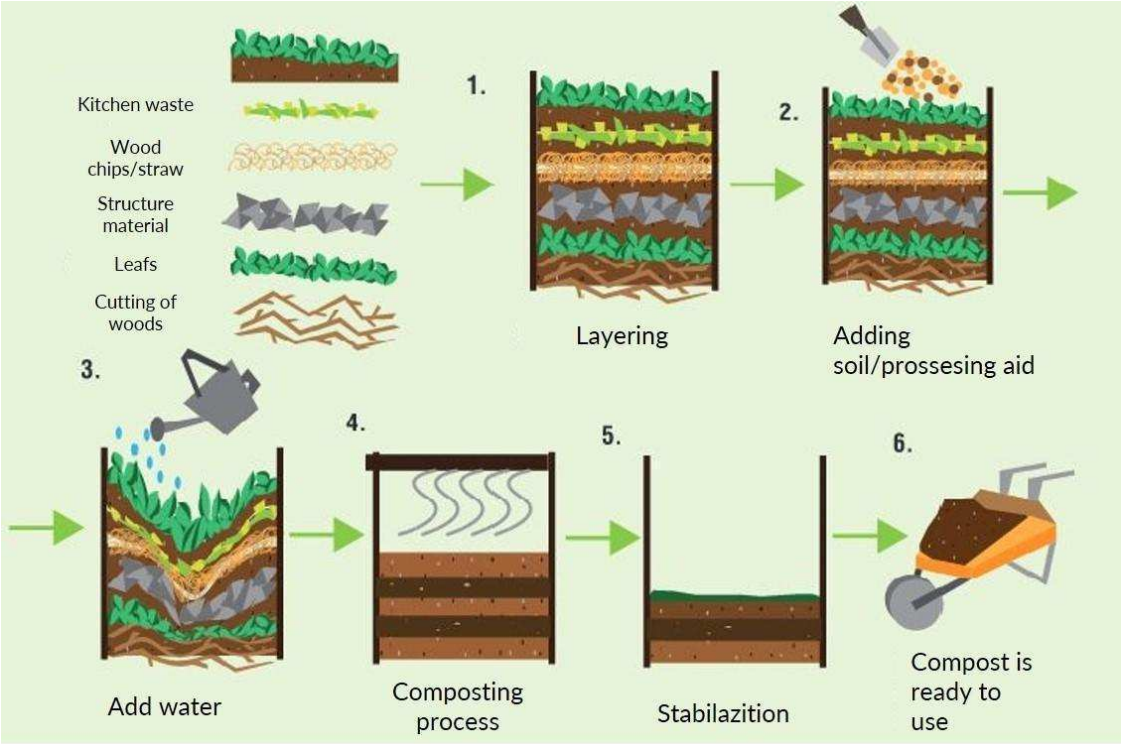


Figure 14: Composting process.
Source: Own construction based on www.tisztajovo.hu/kornyezetvedelem/2013/10/18/vas-megye-komposztal (Accessed: 08.04.2019.)

Related flow(s)
green waste, food waste, (organic waste)

The flow charts within the GDSE model

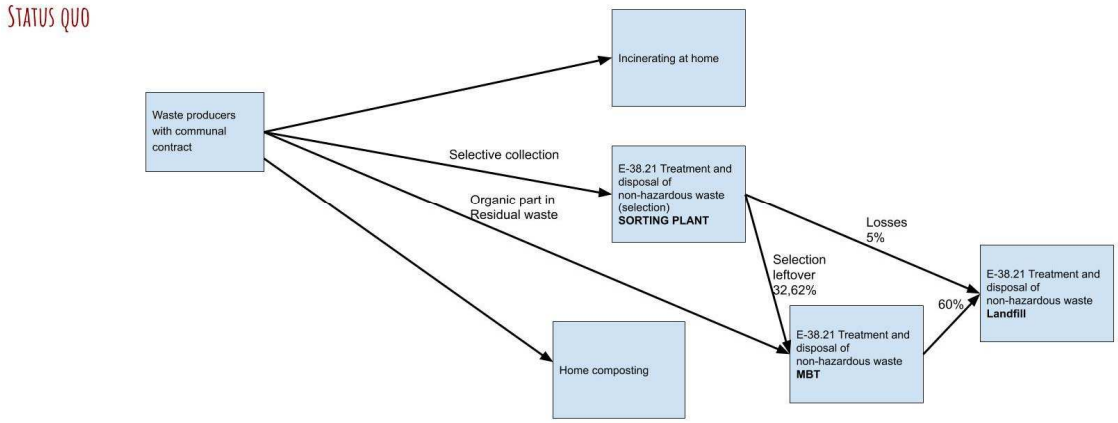


Figure 15: Status quo flow chart from the GDSE for Homemade compost EIS
Source: Own construction

PROPOSED PROCESS

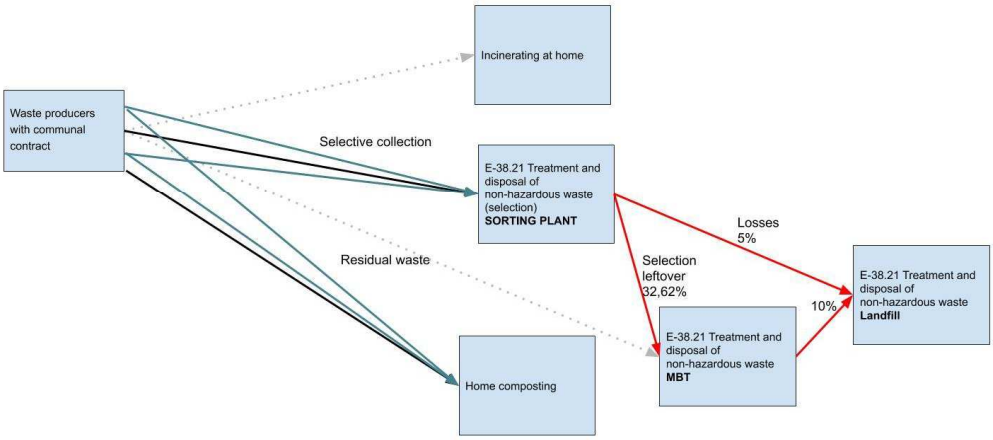


Figure 16: Flow chart of the proposed process from the GDSE for Homemade compost EIS Source: Own construction.

References

www.tisztajovo.hu/kornyezetvedelem/2013/10/18/vas-megye-komposztal (Accessed: 08.04.2019.)

https://blog.provident.hu/wp-content/uploads/2018/01/compost-419261_1280-768x512.jpg (Accessed: 01.10.2020)

3.4 Green waste shredder service

Addressed challenge or objective
Treatment of green waste generated in households (usually in suburbs). Prevent burning of green waste.

Potentially affected area
Pécs Agglomeration

Intervention proposed
- Make green waste shredder machines available to the general public for free or for rent;
- With those even larger tree branches can be easily composted at home (or delivered to green trash cans);
- The machines can be rented from the operator (of the waste management company with professional person on request).

Key activities related to the solution
- Promotion of this possibility is necessary;
- Appropriate machines should be purchased for rent (with higher capacity, mobile, and professional assistance).

Expected impact
Preventing illegal green waste incineration. Make composting a popular activity.
Reducing green waste in the waste yards.

Key actors to be involved
Households, city self-government, waste management company

Owner of the EIS
Living Laboratory of Pécs

Description of the EIS
Nowadays, small garden households generate too much garden green waste, which is often incinerated by owners (at the same time polluting the air) (Figure 17). (The home incineration of garden waste has become illegal since November, 2019, concerning the degree of local government of Pécs). This problem can be observed in the city of Pécs in the suburban areas and at the hills of the Mecsek Mountain (hilly area). Another problem area are larger tree branches, since due to the inconvenience or lack of home composting, it is not too easy to deliver them to the waste yards or put them into the green waste trash cans. The most obvious solution is burning in the gardens.

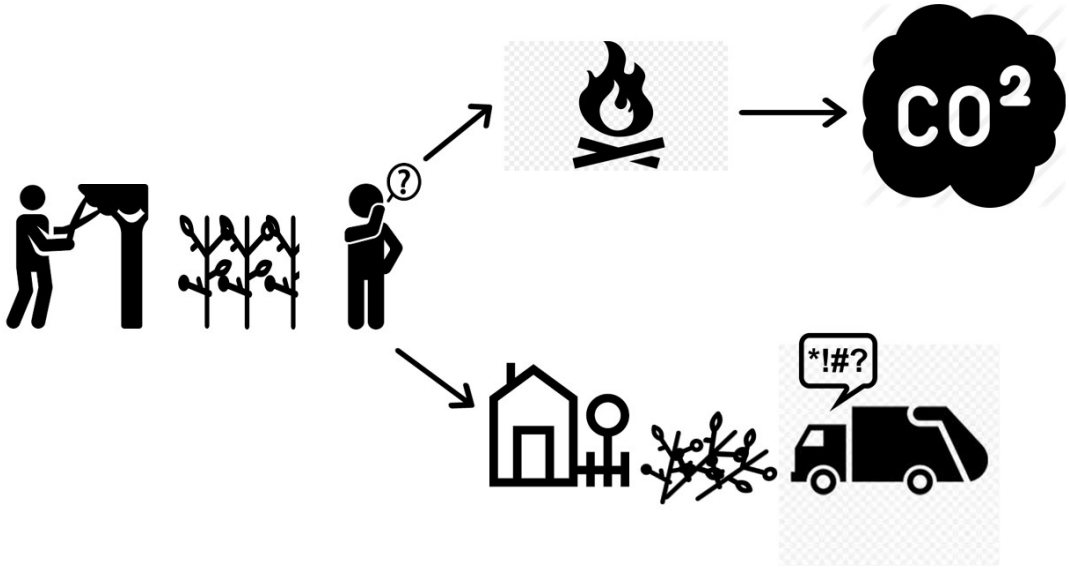


Figure 17: Recent (and from November, 2019, also illegal) process of garden waste
Source: Own contribution

The EIS makes shredder machines (Figure 18) for crushing green waste available for rent to the population. So can larger tree branches be easily composted at home (or delivered to green trash cans). The machines can be rented from the operator (of the waste management company) with professional person on request.

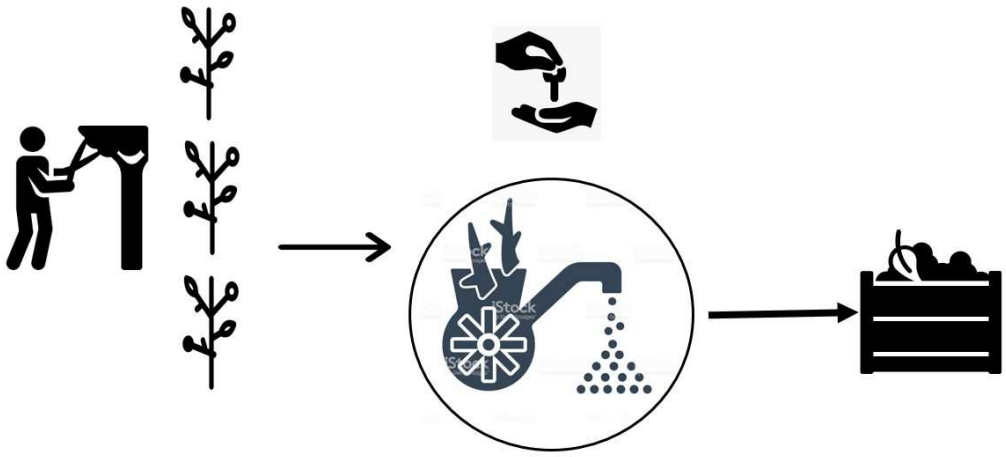


Figure 18: Expected process with garden waste
Source: Own contribution

Related flow(s)

green waste (organic waste)

The flow charts within the GDSE model

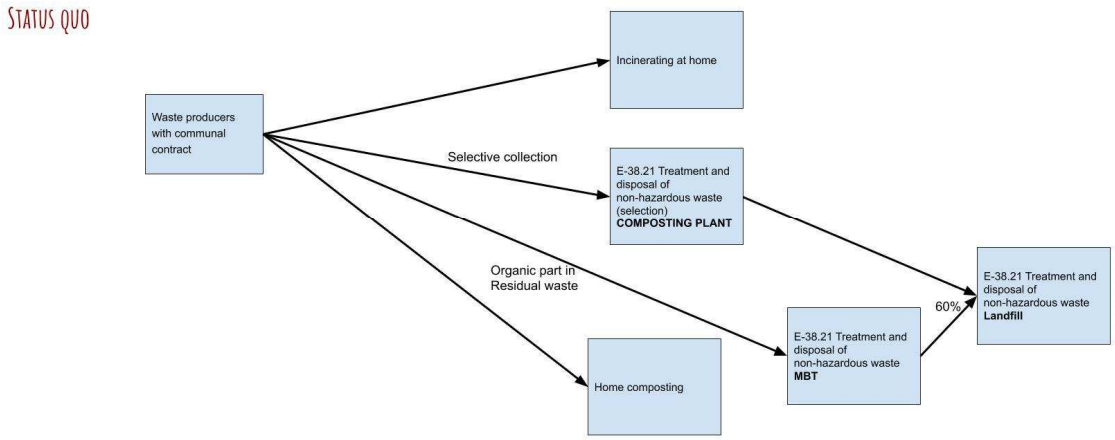


Figure 19: Status quo flow chart from the GDSE for Green waste shredder EIS
Source: Own construction

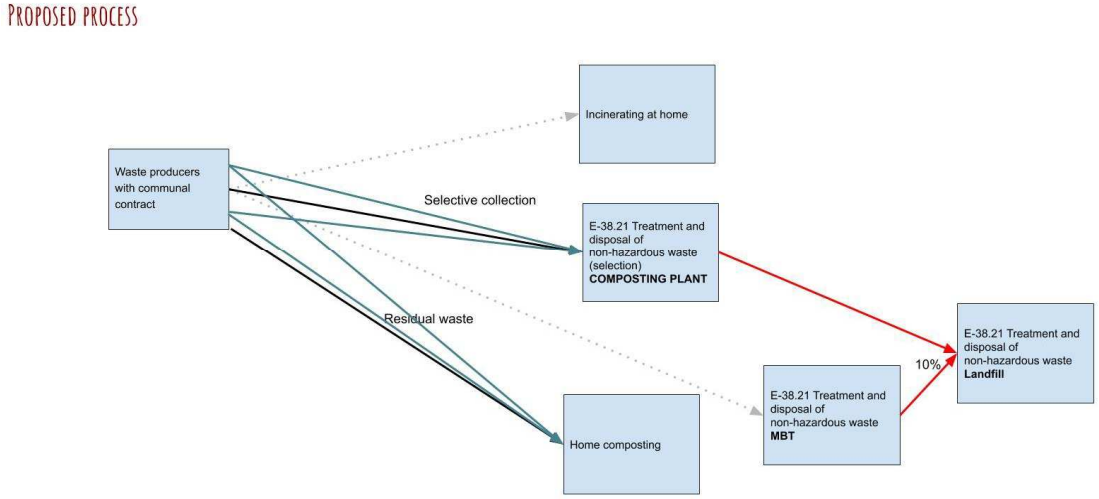


Figure 20: Flow chart of the proposed process from the GDSE for Green waste shredder EIS
Source: Own construction

References

https://static.landwirt.com/6239-ca78f0d4cb58169414ca1b8ab68c93c3-1321075-0vb.jpg (Accessed:19.01.2020)

3.5 Own Bottle program

Addressed challenge or objective
Too much plastic bottle (PET) used for packaging.

Potentially affected area
Pécs Agglomeration

Intervention proposed
Encourage the population drinking great quality tap water instead of bottled soft drinks (mainly the mineral water) from shops.

Key activities related to the solution
- Facilitate an advertising campaign for drinkable tap water, which convinces of its proper quality;
- Make campaign for reusable bottles/bottles;
- Create an application for tourists and citizens: "Where you can find drinking water wells in the city?"

Expected impact
Less plastic bottles in the waste and tap water will be popular.

Key actors to be involved
City government, local community

Owner of the EIS
Living Laboratory of Pécs

Description of the EIS
The city consumes too much plastic to drink bottled water and accordingly generates extra-waste. This problem occurs among the urban population as well as among tourists visiting the city. The reason for this is that people do not know where the drinking fountains are located around the city, and there is a fear of bad quality of the drinking water. (In Hungary there is a strong habit of the population to drink bottled mineral water instead of tap water.)

In this EIS we aim to encourage the people to switch from commercially available plastic bottled soft drinks to drinking water. Distribute reusable bottles and provide information on the location of drinking fountains in the city via a GIS based mobile application for dwellers and for tourists.

Figure 21: Reusable bottle for everyday use
Source: http://nutriwebshop.hu/img/93946/NS237042_altpic_1/530x700,r/NS237042_altpic_1.jpg?time=1575401742 (Accessed: 01.15.2020)

The most important activity associated with this EIS would be the promotion of drinking/tap water. To do this, its quality and purity shall be advertised and reusable bottles/cans distributed and advertised (Figure 21). On the other hand, creating an mobile application/map for tourists as well as for the urban population highlighting the sites of available drinking fountains. The prerequisites for the realization of EIS are to raise appropriate social interest; the production of bottles and to develop the application. The main stakeholders in the EIS are the population of the focus area, the municipality and the "Tettye Spring House" Water Company (the tap water public service provider). In order to reach the right indicators it is important to have the right amount and intensity of promotion. This requires the involvement of public actors of the city and the creation of a large-scale advertising campaign.

With the success of EIS, the group expects to reach more than one impact: improved perception of drinking water consumption, resulting in higher consumption, and a reduction of in-store soft drinks, less plastic waste.

Related flow(s)
plastic (packaging) waste

The flow charts within the GDSE model

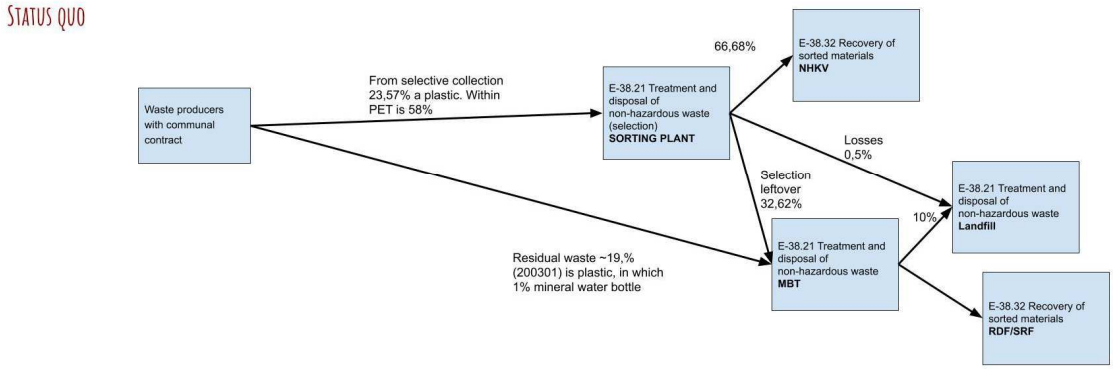


Figure 22: Status quo flow chart from the GDSE for Own bottle EIS
Source: Own construction.

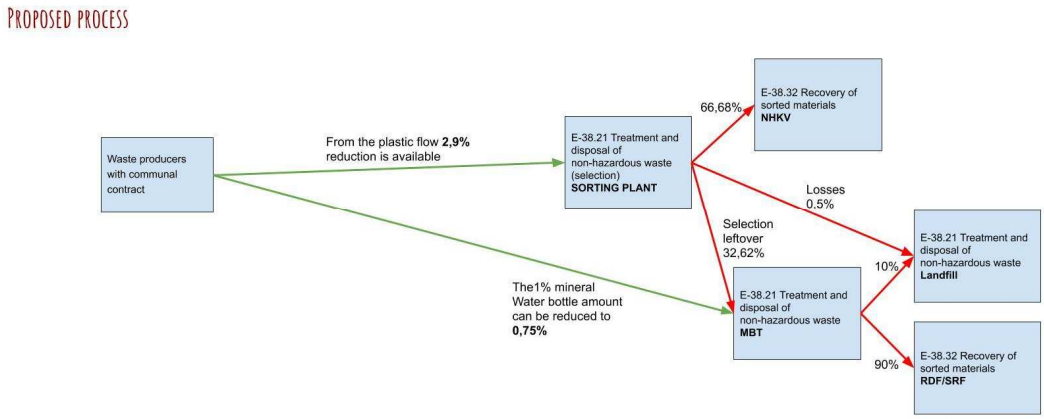


Figure 23: Flow chart of the proposed process from the GDSE for Own bottle EIS
Source: Own construction.

References

http://nutriwebshop.hu/img/93946/NS237042_altpic_1/530x700,r/NS237042_altpic_1.jpg?time=1575401742 (Accessed: 01.15.2020)

3.6 City canvas bag

Addressed challenge or objective
Reduce burning and less plastic waste generation.

Potentially affected area
Pécs Agglomeration

Intervention proposed
The city releases its own "canvas bag" and use reusable shopping bag. Local stores can give discount for those using these grocery bags.

Key activities related to the solution
Creating a canvas bag or canvas storage with the city's own logo and distributing it at a reasonable price/free of charge to the residents, encouraging them to use less plastic.

Expected impact
Less plastic bags and packaging waste

Key actors to be involved
Households, Municipality, market actors

Owner of the EIS
Living Laboratory of Pécs

Description of the EIS
Currently too much plastic bag are in use in the focus area (Pécs and its agglomeration) in local shops and major shopping malls. Each product is packaged separately by the people as there is currently no other common practice. That is why an overwhelming number of plastic bags are used for packaging, and therefore the high use of plastic shopping bags is a challenge of the case study area.

Producing canvas bags (Figure 24) and linen bins with the logo of the city and distributing them to residents at an affordable price or free, encouraging them to use less plastic.

Figure 24: Reusable shopping bags with the logo of Pécs's eco-initiative programme
Source: Own photo

Several steps or tasks are needed to make this EIS successful:

- Creating an urban gift package that will appeal to residents;
- The promotion of using them (discount in shops, etc.);
- Informing consumers about the cost of producing plastics and the environmental damage they cause;
- The prerequisites for successful implementation are that the linen bag is put on the market at a low production cost, is of appropriate quality and attracts people's attention.

Upon successful implementation, once the canvas bags and reusable packaging materials are used by larger circles of people, plastic packaging or shopping bags will no longer enter the material flow.

Related flow(s)
plastic (packaging) waste

The flow charts within the GDSE model

STATUS QUO

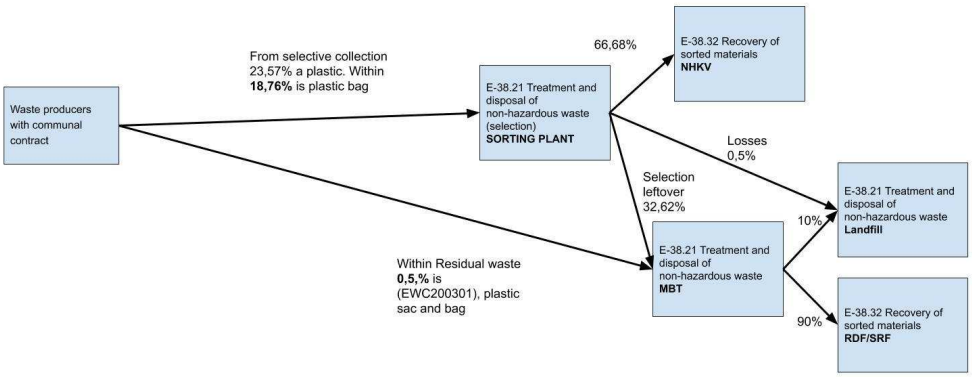


Figure 25: Status quo flow chart from the GDSE for City canvas bag EIS
Source: Own construction.

PROPOSED PROCESS

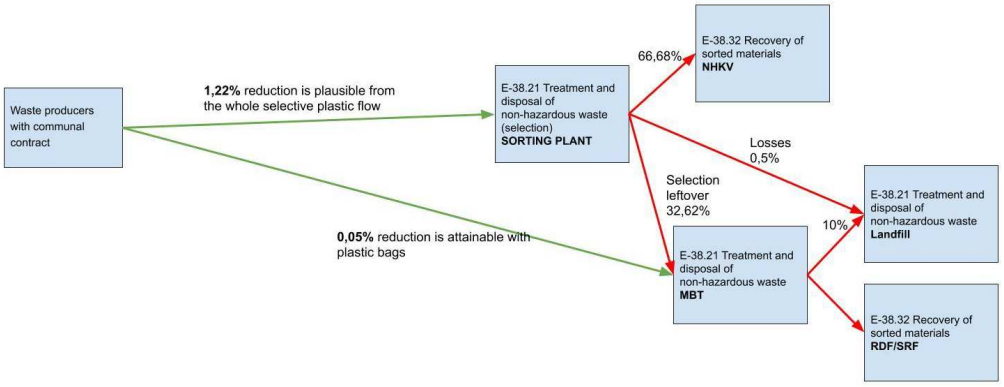


Figure 26: Flow chart of the proposed process from the GDSE for City canvas bag EIS
Source: Own construction.

3.7 Awareness-raising towards less use

Addressed challenge or objective
Too many plastic bags are used for packaging

Potentially affected area
Pécs Agglomeration

Intervention proposed
- Awareness-raising activity in which people are reminded not to use plastic bags/packaging materials;
Information about the ecological hazards of plastic (production, degradation) is available in department stores;
- Encourage the use of canvas and reusable bags.

Key activities related to the solution
- Encourage buyers to buy from the snack counter (preferably in delicatessen), not the packaged products;
- Informing people at point of sales about the problem of wasting;
- Involving vloggers/media personalities who can talk to people on the web.

Expected impact
Reduced use of plastic in stores and markets, preventing the plastic waste formation

Key actors to be involved
Waste management, local community, shopping centres, vloggers

Owner of the EIS
Living Laboratory of Pécs

Description of the EIS
The indicated problem can be attributed to the material flow of plastic packaging waste. Currently, there is too high amount of packaging waste generated in stores, shops and local producers in the test area.

The "Awareness-raising towards less use" eco-innovative solution is an awareness-raising activity in which people are reminded not to use plastic bags/wrappers. To do this, information on the ecological hazards of plastics (production, decomposition) are posted in stores. Encouraging the use of canvas and reusable storage together with the promotion of other solutions.

The prerequisites for successful implementation are the availability of linen bags in shops and supermarkets, especially for weighed vegetables or bakery items. Encourage customers to buy from the delicatessen rather than the ready-to-pack products. Engage the right vloggers/media influencers who are capable of convincing people on web channels. The willingness of supermarkets and local producers to switch is also required.

The expected impact of a successful EIS is to increase the social sensitivity to environmental protection, thus creating a more attentive population that produces less waste in the long run.

Related flow(s)
plastic (packaging) waste

The flow charts within the GDSE model

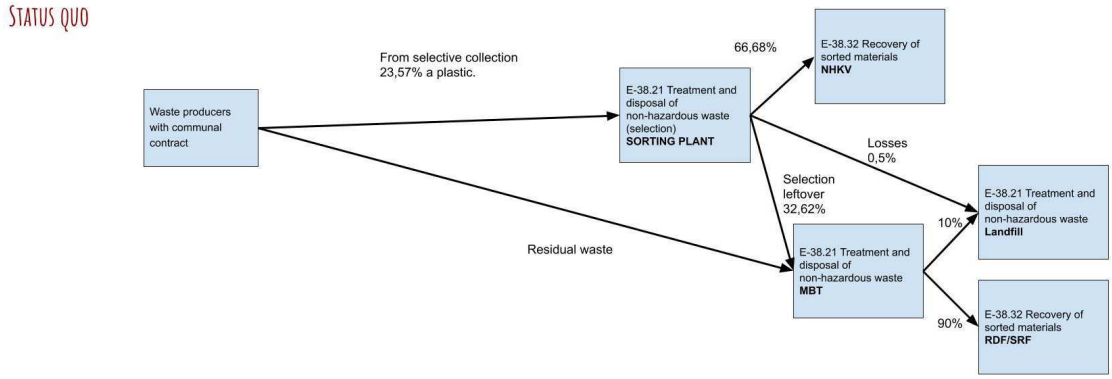


Figure 27: Status quo flow chart from the GDSE for Awareness-raising EIS
Source: Own construction.

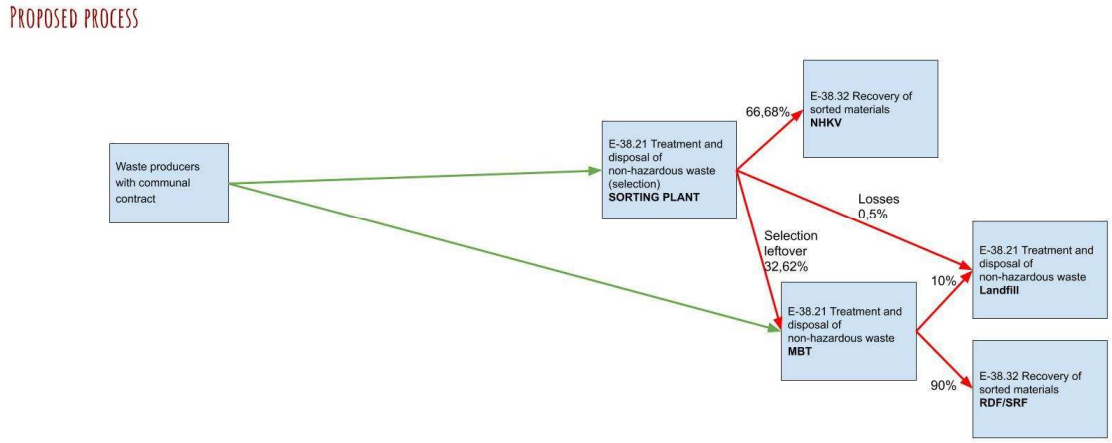


Figure 28: Flow chart of the proposed process from the GDSE for Awareness-raising EIS
Source: Own construction.

3.8 Environmental education for employees (in the corporate sector)

Addressed challenge or objective
More support at companies for selective collection (and at University of Pécs).

Potentially affected area
Pécs Agglomeration

Intervention proposed
Compulsory training (like the usual fire and workplace safety training for incoming employees) for employees before entering the job, how to act/live in an environmentally conscious way, what to pay attention to at work, at home, so as not to waste unnecessarily.

Key activities related to the solution
- Facilitating a training in a gradual system;
- Not only for the company/university employees, but also for the subcontractors;
- DÉL-KOM (public service provider) shall try to engage of companies, the university and other institutions through training materials, campaigns, provision of lecturers).

Expected impact
More attention at the workplace for selective collection. Less waste.

Key actors to be involved
Companies, University of Pécs, public service providers (BIOKOM, DÉL-KOM)

Owner of the EIS
Living Laboratory of Pécs

Description of the EIS
A common problem is these days that, at the workplaces, even though selective collection is carried out, when collecting trash inside the building, the fact of separate collection is often ignored when throwing everything in a common container outside the building. To solve this problem, the RKI PULL group has come up with an eco-innovative solution called "Environmental Education for Employees". In this EIS for employees, a training is suggested prior to entering the job on how to act/live environmentally, what to look for in the workplace, at home, to avoid unnecessary waste, greater support in the sphere for selective collection (public buildings, dormitories, campuses).

The condition of implementation is setting up a training in a gradual system, not only for the own employees of the company/university but also for its subcontractors and partners. The most important stakeholders/actors are the various companies as well as the university.

Following the successful implementation, the selectively collected waste at institutions and major emitters will not be returned to the mixed collection system, thus facilitating the waste manager's work.

Related flow(s)

plastic waste (trash separation)

The flow charts within the GDSE model

STATUS QUO

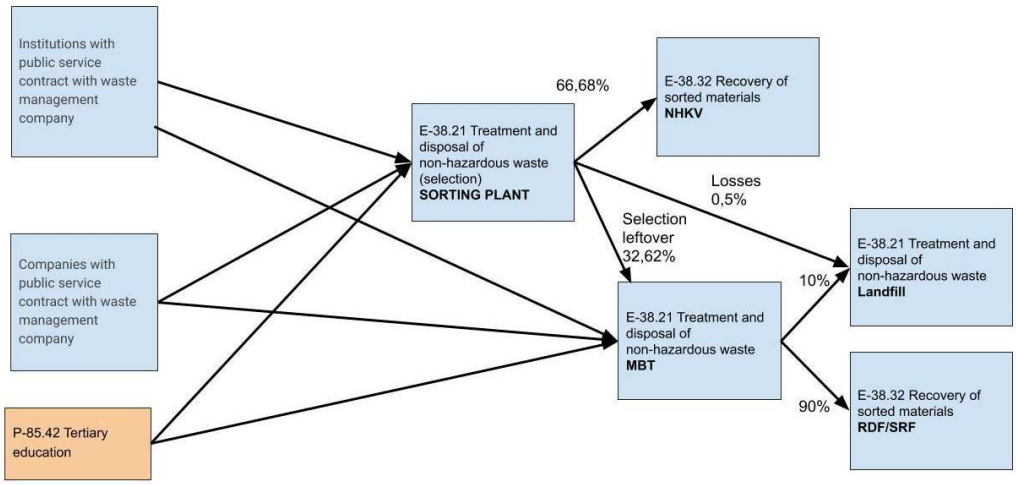


Figure 29: Status quo flow chart from the GDSE for Environmental education EIS
Source: Own construction.

PROPOSED PROCESS

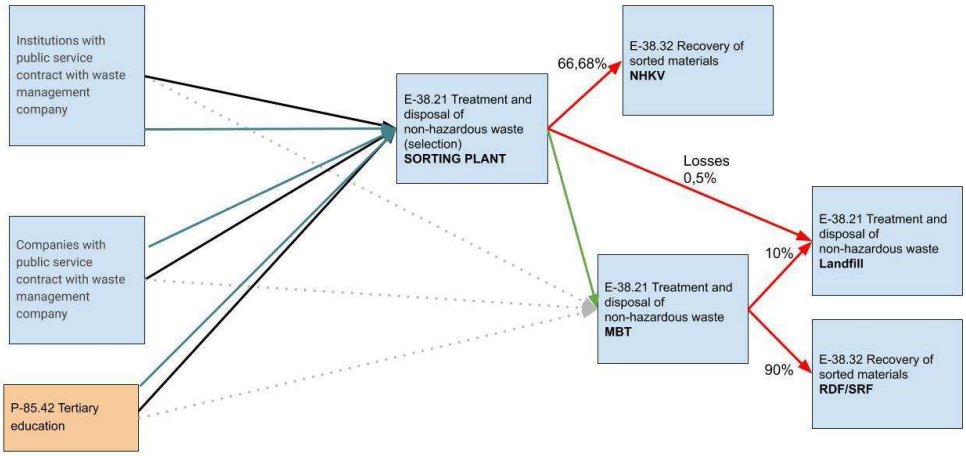


Figure 30: Flow chart of the proposed process from the GDSE for Environmental education EIS
Source: Own construction.

3.9 Minimize waste burning

Addressed challenge or objective
Reducing the burning of plastic or other waste. For the families who living at peripheral areas, waste is still considered as the primary fuel in the co-fired boilers. Unfortunately, not only clothing (textile) and paper, but also plastic and other waste is burned in mixed-fuel boilers that have a health-damaging effect.

Potentially affected area
Pécs Agglomeration

Intervention proposed
- Providing families in need with the opportunity to use other fuels than waste;
- Provide free raw material (e.g. wood waste residual from field maintenance and city park gardening);
- Informing children and parents in schools about the dangers of waste burning;
- Attach actors to this information campaign who are in daily/weekly contact with the affected families (Nurses, Church, Family Services);
- Providing campaign-like measurement and control of ash;
- On-site rapid control test of ash in the households located in affected areas;
- Following the measurement there are two possible sanctions or consequences: 1) On-the-spot penalty of smaller amount; 2) Fine following a laboratory measurement.

Key activities related to the solution
- Conservation and development of infrastructure elements
- Laws, background field work, laboratory measurements (infrastructure);
- Finding and communicating stakeholders, organizing the allocation;
- Building an appropriate information network;
- Addressing the affected families;
- Finding the right "Influencers"/advertising faces to create a complete campaign.

Expected impact
Subsequent to the campaign families are expected to use the mixed-fired boilers in a correct way. Less waste will be burned in mixed-fired boilers. Less health damage will be caused and air pollution will be lower in the concerned area.

Key actors to be involved
Local community, Local government, green NGOs

Owner of the EIS
Living Laboratory of Pécs

Description of the EIS
Nowadays, incineration in a mixed-fired boiler in areas near (surrounding) Pécs causes a serious health impact, and people are not always aware of its danger (see also in D3.7 and 3.8). The RKI PULL group identified during the workshop the challenge that incineration

of household waste (in mixed-fuel boilers) has a health-damaging and environmental impact. This problem was classified as a mixed waste stream. We investigated the problem area within the territory of Pécs and its agglomeration, and the RKI PULL working group came up with an eco-innovative solution in this area. EIS is still a primary fuel for families living at the periphery. Unfortunately, not only textiles and paper but also plastic and other wastes are burned in mixed-fuel boilers causing a health-damaging effect.

Figure 31: Burning waste at home in a co-fired boiler
Source: http://kornyezetbarat.hulladekboltermek.hu/res/img/1447/fustolo-kemeny-muanyag-egetes.jpg (Accessed: 01.19.2020)

Several factors are required for a successful EIS:

- Enable families in need to use real fuels other than waste.
- Provide free of charge fuel materials (e.g. wood waste from landscaping).
- Informing schoolchildren and parents about the dangers of incineration.
- Involve actors who are in daily/weekly contact with affected families (nurses, Church, Family Support Services) in this information campaign.
- Organizing distribution of alternative fuels for families with law income.
- Creating an appropriate formal Information Network of potential stakeholders, potential alternative fuel providers, the laboratories, etc.
- Advertising and making a full campaign.

A negative aspect of EIS has also been raised during the conversation: Some "entrepreneurs" take advantage of this free opportunity (the alternative fuels) and collect it in large quantities and sell it as a "distributor".

Related flow(s)
residual waste

The flow charts within the GDSE model

STATUS QUO

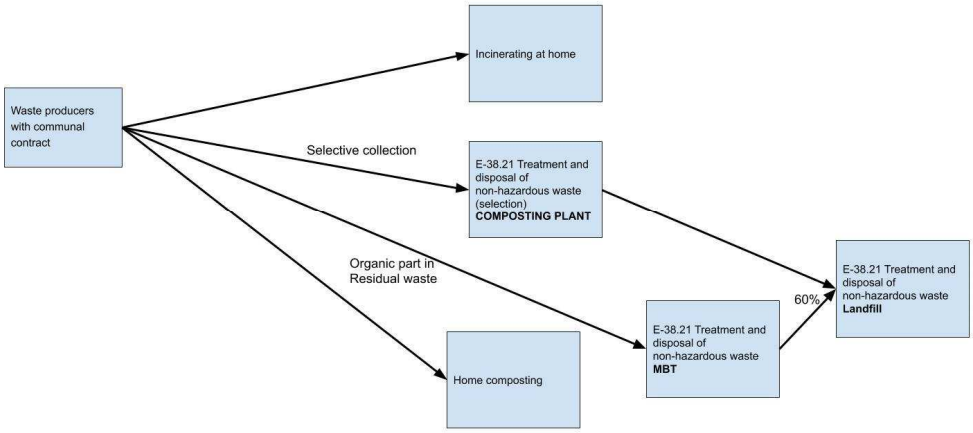


Figure 32: Status quo flow chart from the GDSE for Minimize the waste burning EIS Source: Own construction.

PROPOSED PROCESS

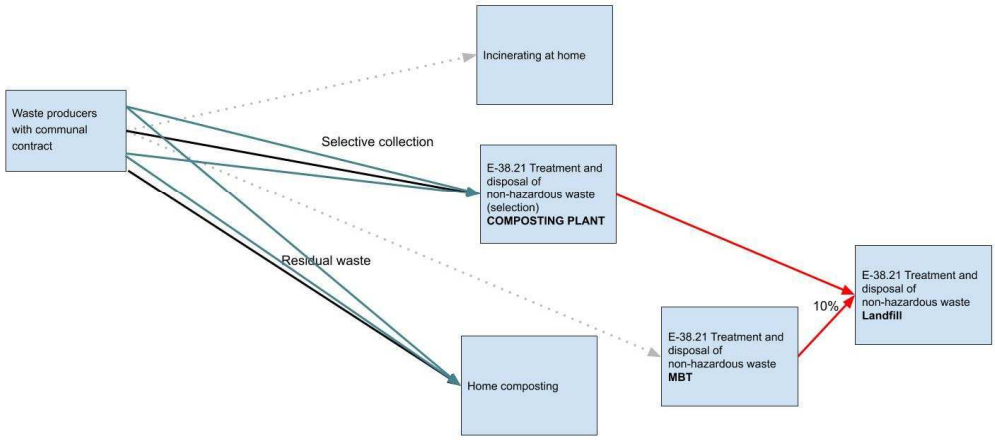


Figure 33: Flow chart of the proposed process from the GDSE for Minimize the waste burning EIS Source: Own construction

References

http://kornyezetbarat.hulladekboltermek.hu/res/img/1447/fustolo-kemeny-muanyag-egetes.jpg (Accessed: 01.19.2020)

3.10 Full Information on Selective Waste Collection

Addressed challenge or objective
The rate of diversion from landfilling is too low (currently 30-50% depending on the time period), 80% of waste generated in the city is still mixed

Potentially affected area
Pécs Agglomeration

Intervention proposed
Provide comprehensive multi-channel information to the public on selective collection. Tell its benefits and the ways of easy implementation at home.

Key activities related to the solution
- Increasing environmental sensitivity in people with a comprehensive unified campaign;
- Involving public actors, local producers and large shopping centres in this campaign;
- Campaign of the right size, appropriate media personalities;
- Involving volunteers for selective collectors and help people to learn what to throw where.

Expected impact
Increasing selectivity of collected waste

Key actors to be involved
Local community, influencers, celebrities, waste management company, foreign students, tourists

Owner of the EIS
Living Laboratory of Pécs

Description of the EIS
Beyond several attempts the city still has a high percentage of mixed waste. This value may vary with time.

We intend to reduce the rate of diversion of waste from landfill within the "Full Information on Selective Collection" EIS. Currently, depending on the time, 30-50% is dumped and 80% of the waste generated in the city is still mixed (Figure 34).

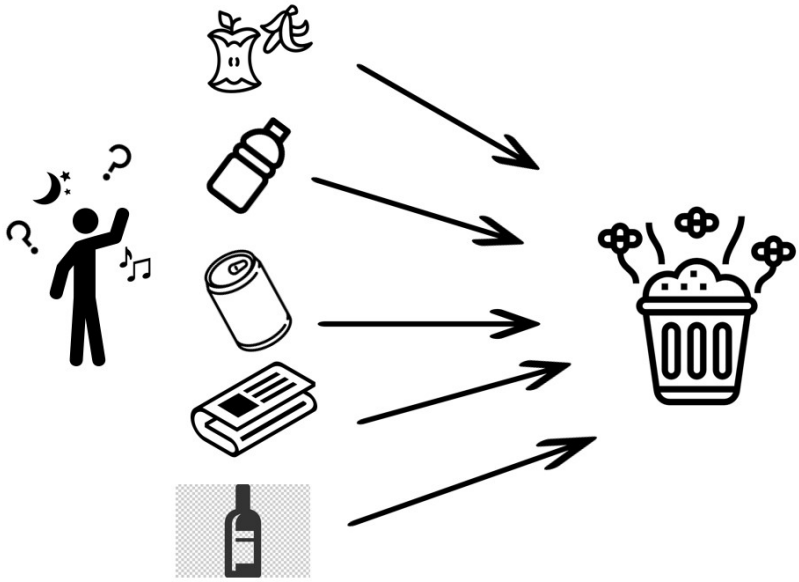


Figure 34: A very often recent process of waste treatment in Pécs
Source: Own contribution

Under "Full Information on Selective Collection" (Figure 35), the aim is to provide the general public with comprehensive information on selective collection through multiple channels. As a target group, not only the local population but also foreign students are important. Plastic packaging waste and mixed waste were marked as the main material stream during development.

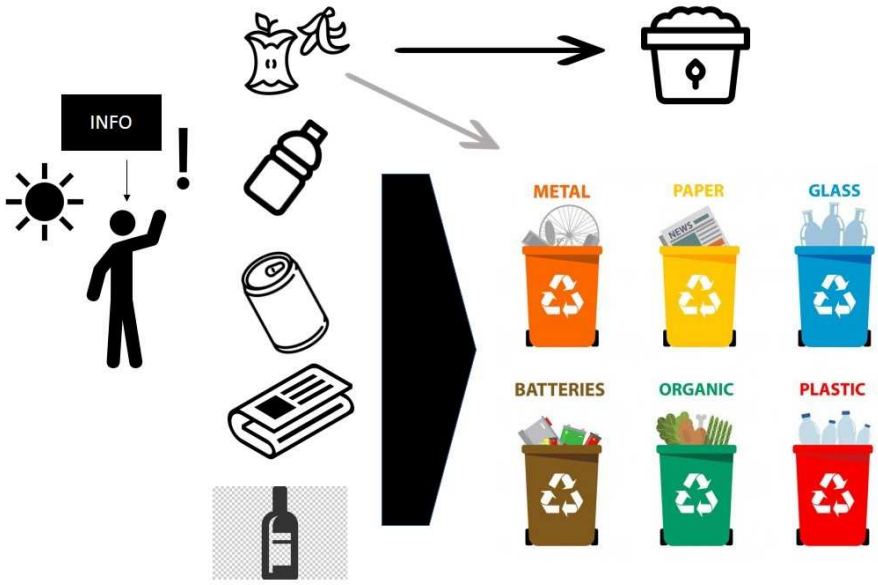


Figure 35: Expected process in the case of 80% in Pécs
Source: Own contribution

The goal is to increase the environmental awareness of the population through a comprehensive campaign. In addition to this, it is important to involve more public actors and make local producers and shopping centres interested. Involving more media personalities during the campaign would be important to address people properly. Alongside the selective collectors the outside volunteers tell the people, who walk them "what to throw where".

By the end of a successful campaign, the population will not only move towards selective collection, but will also consider it important to reduce waste generation.

Related flow(s)
residual waste (trash separation)

The flow charts within the GDSE model

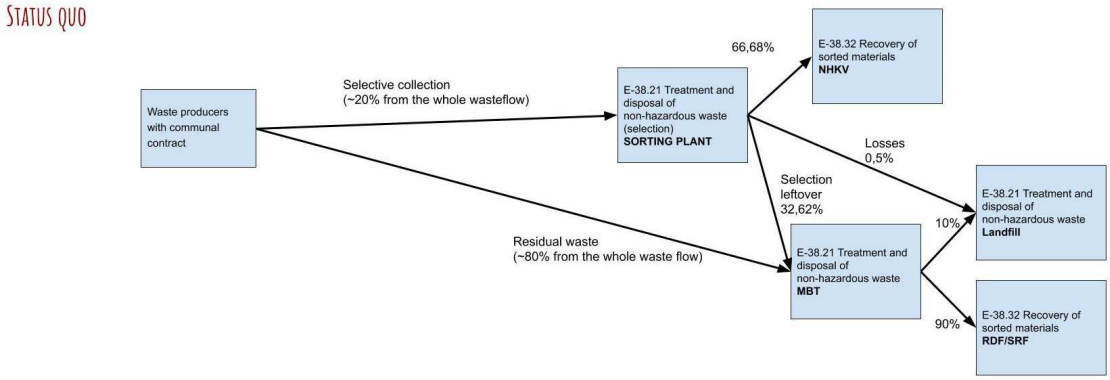


Figure 36: Status quo flow chart from the GDSE for Information about selective collection EIS
Source: Own construction.

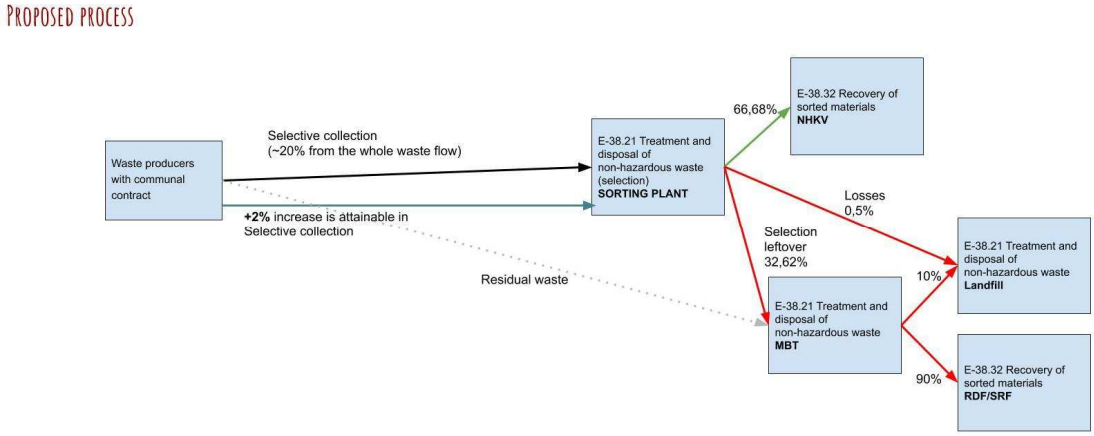


Figure 37: Flow chart of the proposed process from the GDSE for Information about selective collection EIS
Source: Own construction

3.11 Checking garbage cans

Addressed challenge or objective
About 80% of urban waste is still mixed

Potentially affected area
Pécs Agglomeration

Intervention proposed
The aim is to regularly inspect the garbage of households (apartments or/and houses) and staircases. This may be a random check by an inspection body or a check on waste when it is disposed. If there is no selective sorting of the waste, the user will be penalized (or the waste not delivered by the operator).

Key activities related to the solution
- Informing the public about sanctions;
- Setting up a formal control organization;
- Creating background regulations for waste collection.

Expected impact
Less mixed waste and more efficient selective waste collection

Key actors to be involved
Local community, waste management company

Owner of the EIS
Living Laboratory of Pécs

Description of the EIS
Currently, 80% of the waste generated in the city's agglomeration is still mixed.

In the EIS, the trash generated by households will be checked directly at the venue (in the homes and staircases). These checks may be random checks carried out by a control body or checks during the transport of garbage. If the households/blocks of flats do not separate the waste selectively, sanctions will be imposed. This may be a fine or another type of sanction handled by the operator. In the event of improper collection, a warning label shall be affixed to the vessels, with subsequent penalties.

The successful implementation requires the full information to the population, the creation of an appropriate legal environment, setting up a new body and the introduction of sanctions. In addition, a monitoring organization should be set up equipped with the necessary facilities and staff. Successful implementation would require a sufficient time and finances, proper information to the public and the creation of a legal background for selective collection.

The benefit to the public of the selective collection is that the size of the mixed bin will be reduced and so is the garbage disposal fee. The disadvantage of this system is that it is hardly possible to prove (except flagrante delicto) who disposed the waste in the wrong way, and thus the wrong person may be fined.

Related flow(s)
residual waste

The flow charts within the GDSE model

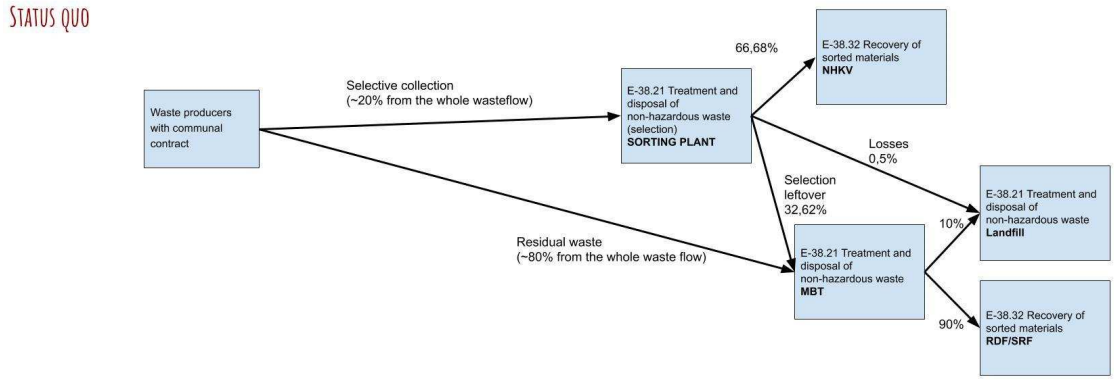


Figure 38: Status quo flow chart from the GDSE for Checking garbage cans EIS
Source: Own construction.

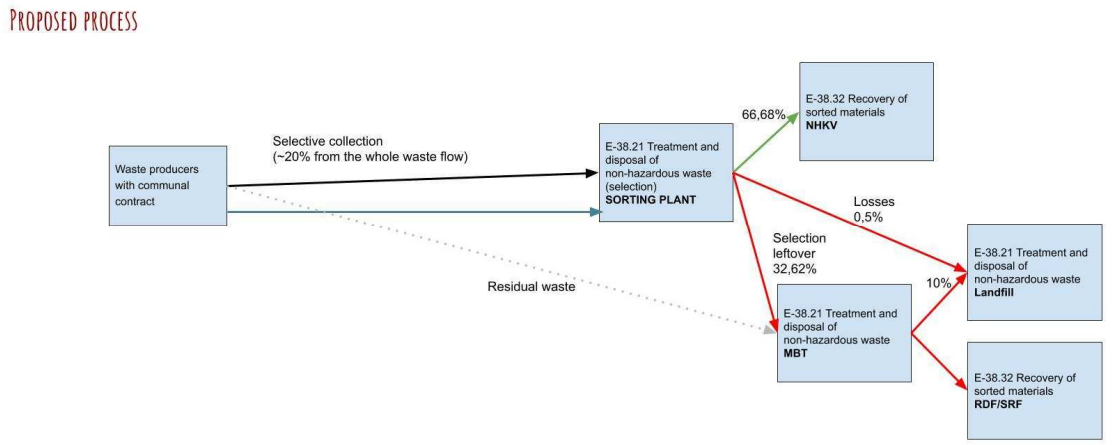


Figure 39: Flow chart of the proposed process from the GDSE for Checking garbage cans EIS
Source: Own construction

3.12 Soccer complex

Addressed challenge or objective
Large brownfield area next to the sports field. Lack of function change in this area.

Potentially affected area
Pécs

Intervention proposed
The area would be suitable for setting up a soccer academy with the adjacent football field. On the other hand, with this solution the city can continue the bike-road from "Kertváros" to Kovácstelep district (Figure 40).

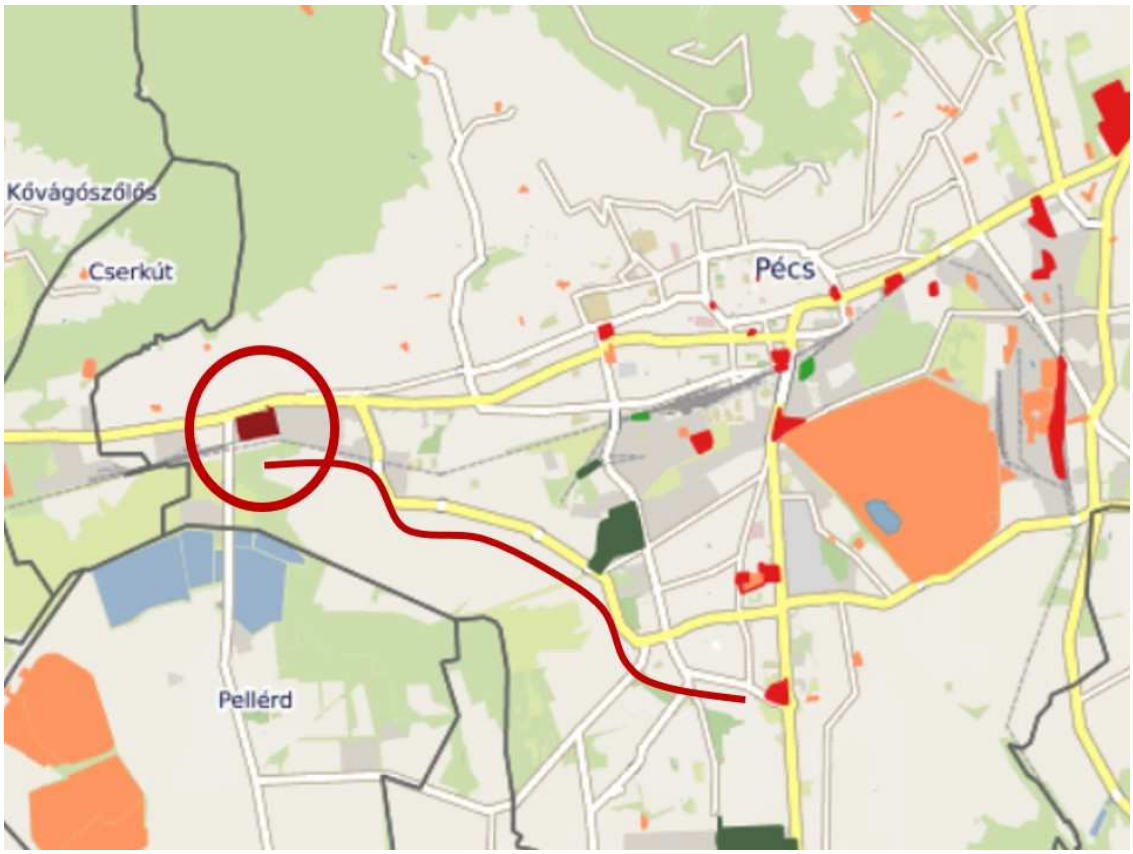


Figure 40: Kovácstelep development area and the planned bike route in the EIS from "Kovácstelep" district to "Kertváros" district.
Source: GDSE map with own contribution

Key activities related to the solution
Infrastructure development

Expected impact
Possibility of creating small hobby teams, the recreation of the site

Key actors to be involved
Local community, owner of the site, local football club

Owner of the EIS
Living Laboratory of Pécs

3.13 Revitalisation of brownfield

Addressed challenge or objective
Large brownfield area with an old mud holder. Lack of function change in this area.

Potentially affected area
Pécs (Tüskésrét)

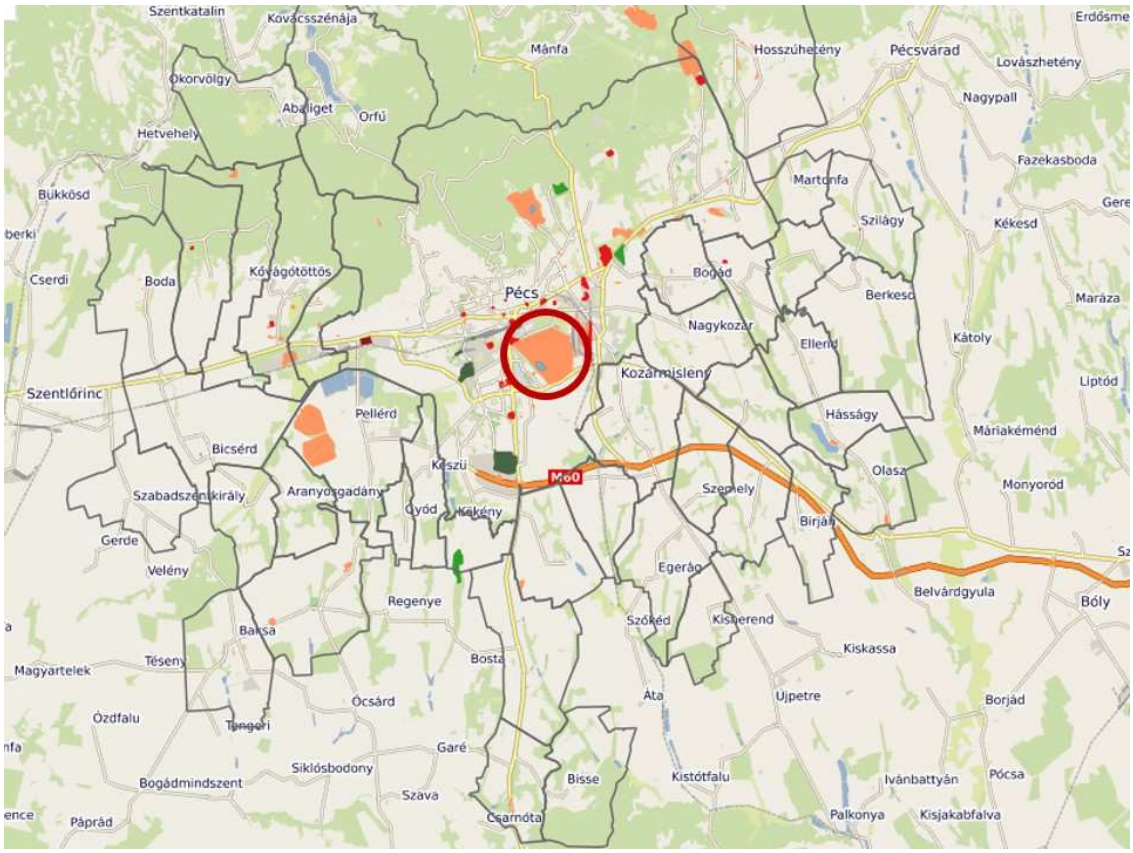


Figure 41: Tüskésrét target area for development
Source: GDSE wastescape

Intervention proposed
This area can be a great place for some new industrial company. The newly planted factories would give the city opportunities for further development. This EIS is needed governmental supports, tenders, tax incentives, etc.

Key activities related to the solution
- Local property development regulation;
- Purchase of private property by the self-government;
- The city receives state support for urban development;
- Damage assessment, planning;
- Conservation and development of infrastructure elements;
- Recycling of construction and demolition waste;
- Implementation of sustainability-based development.

Expected impact
Economic benefits,
Better use of land,
Utilization of existing values, buildings and infrastructure,
Stopping the spread of environmental hazards and pollution,
Developing a healthier urban environment for the surrounding population,
The orderly effect of the ordered condition,
The structural improvement of the city, the possibility of improving urban management,
Creating new jobs,
Raising capital

Key actors to be involved
Owners of the territory
Municipality
Investors (potential)
State Institutions Enforcing Investment Opportunities in the Field of Valuation

Owner of the EIS
Living Laboratory of Pécs

3.14 Leather Factory with new functions

Addressed challenge or objective
The fields of the former Leather Factory of Pécs with monument buildings are a brownfield close to the city centre (within 2 km) (Figure 42).

Figure 42: Entrance of the former leather factory in Pécs
Source: Google Street View

Potentially affected area
Pécs

Intervention proposed
- Give this place some new artistic and cultural functions;
- This EIS needs governmental supports, tenders, tax incentives, etc.

Key activities related to the solution
- Local property development regulation;
- Involving some of the private property into municipal ownership;
- The city receives state support for urban development;
- Damage assessment, planning;
- Conservation and development of infrastructure elements;

- Recycling of construction and demolition waste;
- Implementation of sustainability-based development.

Expected impact
Creating a new social and cultural space in and around the monument buildings.

Key actors to be involved
Owners of the territory
Municipality
Investors (potential)
State Institutions Enforcing Investment Opportunities in the Field of Valuation

Owner of the EIS
Living Laboratory of Pécs

Related "flow(s)"
Wastescapes (see Figure 1. W4.1 wastescapes category: Vacant/underused buildings and settlements)

3.15 Asbestos deposit/dumping site facility for individuals

Addressed challenge or objective
The disposal of asbestos-contaminated construction waste is not solved. The people don't have enough information on asbestos materials.

Potentially affected area
Pécs Agglomeration

Intervention proposed
- Make an information campaign to deliver the right knowledge about asbestos: Where they can find companies who can remove asbestos materials?
- Survey of affected areas;
- Provision of exchangeable elements;
- Treatment of asbestos-contaminated construction waste (hazardous waste) after demolition.

Key activities related to the solution
- Local property development regulation;
- Involving some the private property into municipal ownership;
- The city receives state support for urban development;
- Damage assessment, planning;
- Conservation and development of infrastructure elements;
- Recycling of construction and demolition waste;
- Implementation of sustainability-based development.

Expected impact
Prevention of health damage.
Avoid of illegal landfill.

Key actors to be involved
Local community
Specialized companies

Owner of the EIS
Living Laboratory of Pécs

Related flow(s)
Wastescapes

4. Solutions from knowledge transfer events

4.1 Bio-seasonal parking

Owner of the EIS
TUD group

Actors to be involved
Twan Goossens and Elena Rossoni (TUD)

Flow
Wastescapes, food waste

Location of the good practice (originally)
Schiphol Airport, AMA

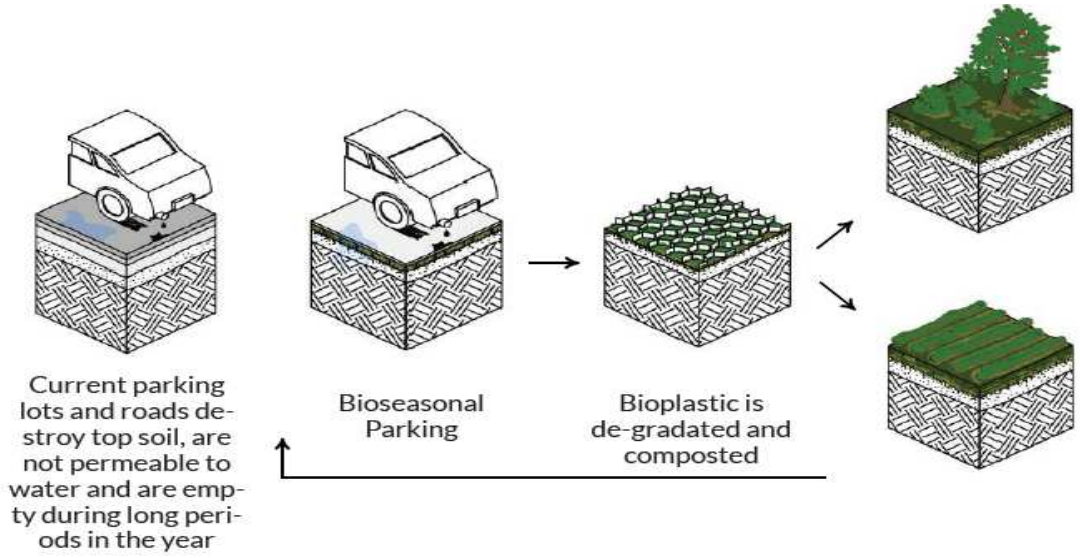


Figure 43: Idea diagram
Source: Geo-design for a CircularEconomy in Urban Regions (TU Delft, 2018)

Description of the EIS
Open and fertile land is deeply affected by paved surfaces. Water absorption is slowed down, salinization of the soil is increased and removing the top layer of the soil speeds up erosion. In the Netherlands, coastal areas and low polders are very vulnerable to these processes.

One of the most dramatic examples are the seasonal parking lots around Schiphol airport, in which big portions of agricultural land are covered by parking lots (Figure 43). Even though we will focus on this area, bio-seasonal parking could be applied in many other areas and situations, such as festivals, sport events or the parking areas that result of the summer exodus to the beach. Except for the season with highest demand, a given

proportion of these parking lots remain empty. Moreover, societal changes and technological developments will change the amount of parking lots needed. Co-riding, carsharing and autonomous driving will all contribute to the reduction of the parking spots and a redundancy of numerous car parks. This EIS aims by making this underused land available for other functions by allowing water drainage and regenerating the topsoil. Bio-seasonal parking will already prepare this soil for a quicker transition to cultivable lands.

This EIS proposes to provide temporary parking grounds using a bioplastic structure that will degrade and compost the land when parking is not needed.

This will at the same time regenerate the topsoil and prepare it for other uses when parking is not needed, be it seasonally or permanently.

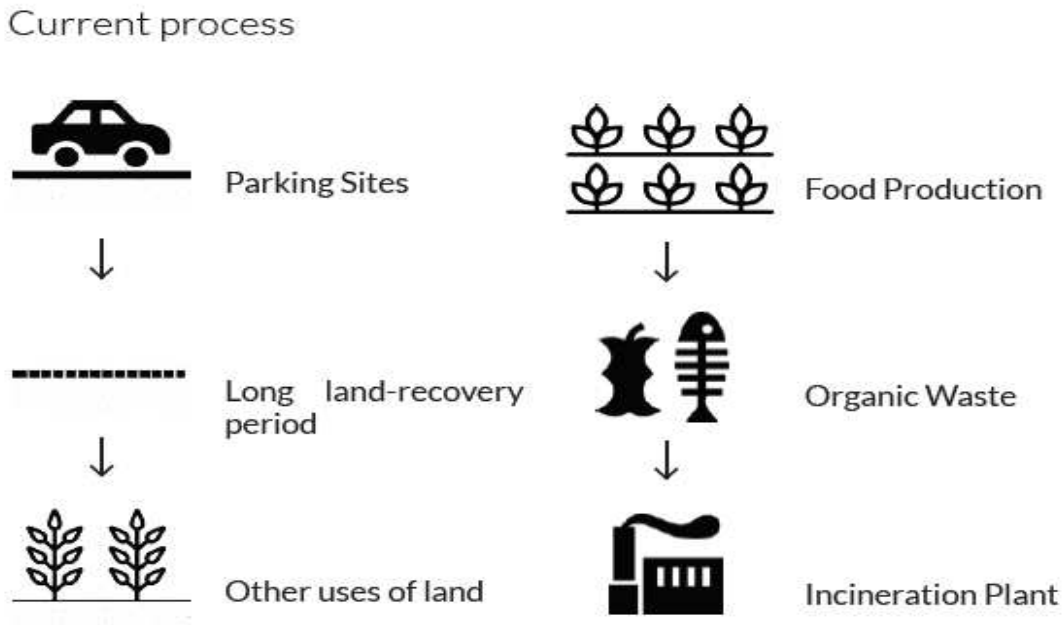


Figure 44: Current process diagram.
Source: REPAiR EU H2020 project. Based on Geo-design for a Circular Economy in Urban Regions (TU Delft, 2018)

Bio-seasonal parking acts on two different waste flows within the AMA. The first one was already mentioned. Land captured for parking purposes is underused and needs long recovery periods for the soil to allow productive uses. Parking pavement usually blocks water infiltration and fosters erosion of the soil, making the transition difficult and slow. The second flow is related to food waste. The bioplastic paving material can be processed out of starch and vinegar. These can be acquired from farms which grow fruits, vegetables or potatoes, or companies processing potatoes, starch or vinegar. If the demand for bio-seasonal parking grows, supermarkets or households generate also significant amounts of food waste. Most of this waste is usually incinerated, producing energy in the process.

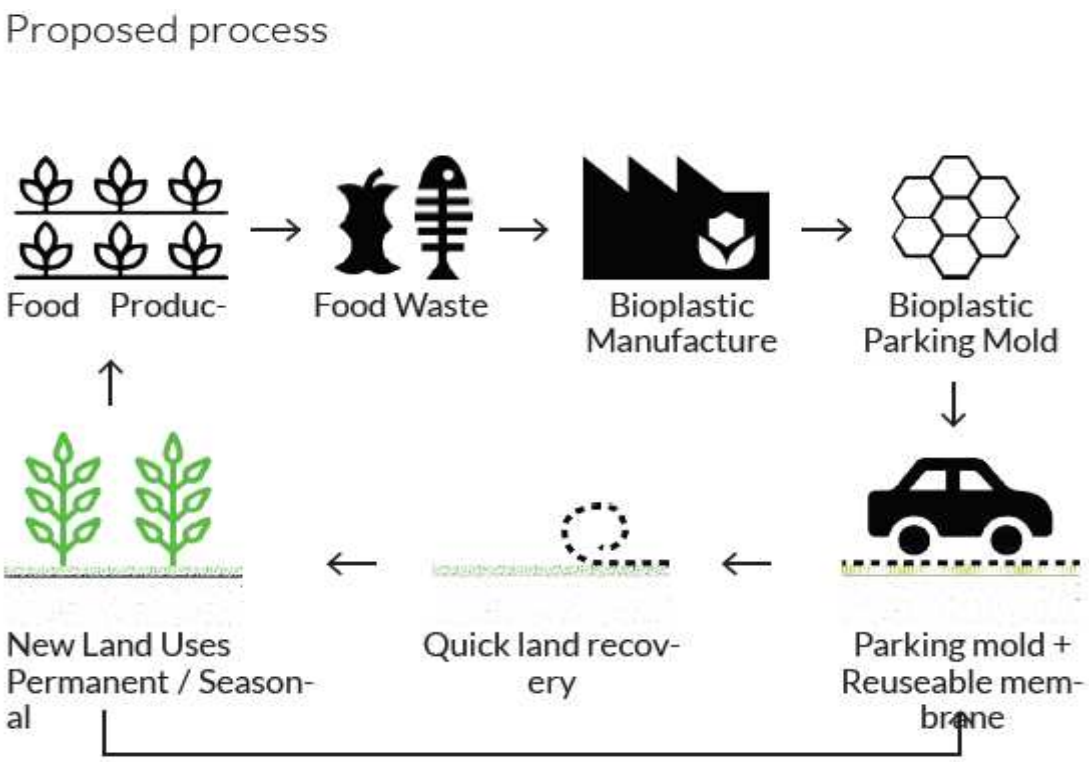


Figure 45: Proposed process diagram.
Source: REPAiR EU H2020 project. Based on Geo-design for a Circular Economy in Urban Regions (TU Delft, 2018)

Bio-seasonal parking aims at closing the loop by connecting these two flows (Figure 45). A new bioplastic industry would use food waste (starch and vinegar) to create the parking mods. The installation of the parking pavement would occur during times of high parking demand such as June, July and August. Pieces are placed on plain soil and are water permeable. A layer of biodegradable membrane (possibly nanofibrillated cellulose hydrogel) is placed on top of the paving mold in order to prevent harmful substances from contaminating the soil, like dripping oil from the cars. This layer is hydrophilic, therefore allowing water infiltration. When the parking grounds are no longer needed, the top layer is removed and the pavement gets composted on site, acting as fertiliser for the soil beneath. Aerated static compost does not require any mechanical assistance. Within a short time, the soil is ready to be cultivated until the next high parking demand period. Since food could only be grown during winter and spring, vegetables which are more suitable for this season would be preferred: carrots, cabbage, rocket or Brussel sprouts.

Indicators allow us to assess the positive changes the bio parking implementation will cause, but also to present the immense implications, losses and dangers the ecosystem and the economy face currently.

The main problem seasonal parking creates nowadays is related to the lack of flexibility of the land. Parking spaces hold the land “hostage” and don’t allow for other activities to take place. This is particularly negative during low season, in which many of those parking

lots are not used for parking either (Figure 45). From an economic perspective, it prevents the land to create potential jobs and income.

Food production is an important matter in the Netherlands, where a surface 15 times its own land is needed in order to provide resources for its population. Having more surface for agriculture production would bring a positive change in the AMA. Moreover, food transportation costs and the environmental footprint would also be reduced. In order to allow for agriculture production, soil needs to be prepared. Levels of soil pollution will have to decreased, and the top layer restored, so water infiltration is allowed. Bio-seasonal parking would be applied in seasonal cycles also with this purpose: preparing the land for productive uses. Ultimately, this process would increase the chances for more biodiversity in these areas.

Parking wastescapes and urbanisation in the AMA generate big gaps between protected and intensely vegetated areas, preventing green dense areas in the country to connect environmentally with the coast.

Water permeability is critical for soil's future erosion and potential to be cultivated. Any land in the peri-urban area of Amsterdam does not allow for water to infiltrate. Asphalt should therefore be avoided if possible, allowing for the topsoil restoration and permeability. Indicators are organized into two categories (impacts): economic and environmental. All of them could be measured and tested before and after the implementation of the bio-seasonal parking, according to the specific site of the project. From an economic perspective, bioplastics production would probably rise, promoting a more eco-friendly industry than concrete.

The use of food waste would also create new flows on producing and managing waste, promoting a new industry and stimulating job opportunities. The same would happen if land is used throughout the year, creating new jobs during harvest and growing seasons. Bio-seasonal parking will allow for a shorter cycle of land restoration. This will maintain a higher land quality value through time and will decrease the costs of keeping paved surfaces too long in time. By providing quality to the soil, this EIS will also give flexibility to the land, being able to switch to other uses easily).

Companies that grow fruit, vegetables or potatoes, as well as those which process starch or vinegar, are key to the proposal. Its close location to industrial land where bioplastics can be produced will ease the production of the parking molds. Polluted land in the AMA is located mainly where industrial activity takes or took place (e.g. port of Amsterdam) and in some areas of the peri-urban area, including land around Schiphol airport that is currently used as parking space. This area of the AMA is also a potential bridge to create an environmental corridor between the forests, marsh lands and the coast, allowing for biodiversity to run through the area. The abundance of seasonal parking lots in Schiphol area makes this an excellent location to test this EIS. Its proximity to farms and companies that could provide resources to produce bioplastics also helps for this purpose. Using Schiphol parking lots as a pilot project, bio-seasonal parking could then be implemented in other areas of the region.

Disclaimer: Here, we also have to emphasis a problem relating to this solution. A problem of a lot of bioplastics is that they take a very long time to degrade. On the other hand, cars compact and pollute the soil, which is detrimental for soil health. Furthermore, we have to note, that the solution in the case of AMA is a move towards circularity once the organic waste is not incinerated but used as a resource for a new product, that is move an upper level in waste hierarchy.

Adaptability for Pécs

The PULL members of Pécs Knowledge Transfer Event found this EIS useful and adaptable to Pécs. The solution could be used for periodic green spaces in the city (festivals, circuses, hillside areas), as well as in areas with temporary storage facilities for various raw materials (depots, construction sites). However, minor issues have arisen for the full adoption of the EIS:

- Raising interest in residents
- Finding manufacturers
- Financing issue
- Soil structure, preparation for laying
- Vegetation
- Purchase items to be dumped
- The issue of collecting organic matter

The successful implementation of this EIS in Pécs would require the involvement of the municipality, the commercial companies and the organizers of events with a strong interest in the issue. It was also raised during the discussion that those who use bio-seasonal parking in their area could receive different discounts (lower rent, tax reduction) in order to be interested in the technology. It is also important to involve the company responsible for parking in the city (BIOKOM). During the teamwork, both teams interested in the cost per m^2 of cells to be installed and the duration of degradation, as well as the appearance of any disturbing effects or odours were repeatedly found by both teams. Both groups came up with the idea that if the project were successful in certain test areas, the existing concrete-covered parking lots could be replaced with Bio-plastic cellular parking lots.

We have to note here that as in the case of Pécs, organic waste is not incinerated like in the AMA case, creating bioplastic from it is not a CE solution. The issue that is not CE related just appears as environmental protection is the protection of soil from trampling damage.

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4.2 CIRO+ Integrated Center for Optimal Reuse of durable goods

Owner of the EIS
Campania Region Authority and UNINA group

Actors to be involved
Campania Municipalities with more than 25000 Inhabitants, ASIA, Confartigianato Napoli, Naples Fab Lab network, Fab City Global Initiative, Design Students

Flow
Wastescapes, CDW

Location of the good practice (originally)
Wastescapes in the Focus Area of Naples

Description of the EIS
CIRO is an Action introduced by CRA in Campania Integrated implemented plan for waste prevention (2013) but never activated. CIRO action intends to provide a service of collection to citizens who want to deliver bulky waste and WEEE. The objective of this action is to prevent the downgrading of a product into waste through recovering not too damaged durable goods, fixing them and selling of reconditioned products.

UNINA teamwork implemented this action proposed by CRA is embedding the accepted flows from Selective Demolitions and adds it up with the Fab Lab for upcycling works. Fab Labs are small scale workshops that make spaces and tools available for digital fabrication. Customizing goods, giving them new design, is the way that would allow CIROs to find a broader market to sell its products and to spread the idea of waste as resource, to overcome mistrust in recycled products. Thus, CIRO+ Integrated Center for Optimal Reuse of durable goods is a Strategy that aims to recover all the bulky waste from households (as old furniture) and a selection of construction system's technological components (like windows, doors, hygiene, electrical etc.) by fixing and upcycling them.
CIRO+ FabLab is a place where durable goods from households and from selective demolition activities can be upcycled and transformed into something new.

Current situation
In MAN, ASIA deals with the disposal of bulky waste that doesn't belong to the normal cycle of separated collection. Bulky goods belong to MSW. Currently they can be freely disposed in two ways: bringing them to fix Ecologic Points or bringing them to mobile Ecologic Points in some places of the city, according some time slots and according the two types accepted: household appliances (RAEE; EWC 16 02) and bulky waste (EWC 20 03 07).

Materials that can be carried to household appliances EcoPoints are:

- intact small household appliances,

- batteries,
- toner,
- ink cartridges,
- TV-Monitor.

Materials that can be carries to bulky waste EcoPoints are:

- Christmas Trees.
- Medicines.
- Fridges and air-conditionings.
- Bulky goods as: furniture, couches, mattresses, suitcases, shelving, pallets, wooden, iron, fiberglass and hard plastics things.
- Plates and big glasses
- Intact small household appliances as: telephones, clocks, computer, printers, battery-powered toys, ceiling lamps, video-recorders, remote controls and any battery-powered object. (ASIA NAPOLI, 2017)

This service seems not be sufficient to manage all these flows in MAN focus area.

During Afragola PULLs workshops on wastescapes, local actors detected several wastescapes all over the sample area generated by unauthorized landfills. After plenary discussions, participants to Homogeneous Ecological Center worktable focused on the current situation, and pointed out causes of wastescapes generation as follow:

- illegal dumping of building materials from small renovations, abandoning of appliances, tyres, resulting materials from farming activities;
- impossibility of deliver CDW in existing Homogeneous Ecologic Island as private;
- illegal burning of agricultural waste, often in locality Cantariello (Municipality of Afragola);
- lack of environmental education (Figure 46).

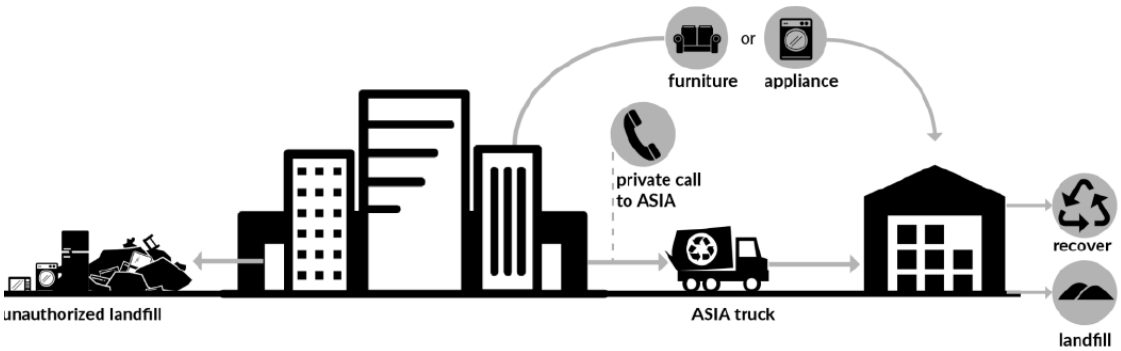

Figure 46: Current Situation of wastescapes generation in Naples focus area.
Source: UNINA Team, 2018.

This causes seem to be connected with the lack of homogeneous ecological centres, where citizens can dispose bulky waste and CDW intact components, as windows or doors components.

In the last Afragola PULL workshop, Campania Regional Authority took part in this worktable and presented a set of actions, including CIRO (in Italian Centro Integrato per il Riutilizzo Ottimale di beni durevoli - Integrated Center for Optimal Reuse of durable goods). This action has similar functions as the homogeneous ecological centres, aims the reuse of RAEE, wood, metal, bulky waste and textiles. CIRO has been introduced in 2013 in the "Integrated implemented plan for waste prevention" (Piano attuativo integrato per la prevenzione dei rifiuti), and after in 2016 in Regional Urban Waste Management Plan (Piano Regionale per la Gestione dei Rifiuti Urbani, PRGRU) as part of a set of 14 actions to address the reduction of specific waste product fractions and to ensure "environmental mainstreaming", but it has never become effective. As the core objective of this action is avoiding waste production and preventing wastescapes generation, UNINA Lab integrated this proposal to the one resulted from Homogeneous Ecological Center worktable (Beyond Inertia Strategy, circular supply chain for CDW) for their common ground and developed it.

Two main products have resulted from the shared work of UNINA with Campania Region:

- the embedding of flows accepted in CIRO+ with that part of flow of CDW from Selective Demolition;
- the extension of a CIRO+ Fab Lab, containing functions to operationalize circular economy and to enable the Action to innovative social and economic processes, that qualify an EIS.

Future Situation

The Strategy creating a regional network of CIRO+ FabLab is designed to intercept a part of durable goods before they become waste, with the ultimate goal of avoiding the formation of wastescapes.

CIRO+ provides for little works of fixing and repair to let disposed damaged goods to be reintegrated into the market. When these actions are not possible, operators in waste sector will direct the flow toward specific recover or disposal operations. A Fab Lab is a center that is equipped according international requirements defined in the FabLab Charter (the set of rules of global Fab Lab network, drawn up by MIT Lab "Center for Bits and Atoms" (CBA). Makers are artisans, architects, designers, engineer, programmers and anyone who want to share talent and knowledge to create custom objects using new technologies mixed to traditional processing, bypassing limits of economies of scale. Recovering waste parts of materials and goods is an inner tendency of makers. CIRO+ Fab Lab has the specific objective to use goods and appliances from Homogeneous Ecological Centers, which would otherwise have been disposed in landfills. The Laboratory production of refurbished goods and custom design objects, according a Circular Business Model, could guarantee self-sustainability of the EIS, employment and spreading a positive perception of recycled products. A network of CIRO and CIRO+ Fab Labs (this last connecter to Fab City Global Initiative) can operationalize circular economy and prevent many wastescapes.

Campania Regional Authority has planned to start-up CIROs in Municipalities with more than 25000 inhabitants. Some 53 Municipalities would be able to express interest to

CIRO action, four of which are in MAN focus area (Napoli, Casoria, Casalnuovo di Napoli and Caivano).

Considering the typology of services offered and in accordance with regional rules, CIRO+ Fab Lab, as CIRO regional action, will be located adjacent to existing Homogeneous Ecological Center, Collecting Points of Bulky Waste (when possible), to optimize and centralize the service.

Thus, CIRO+ Fab Lab works as a free collection point and, at once, it is a Laboratory to upcycle any appliance and durable good (Figure 47).

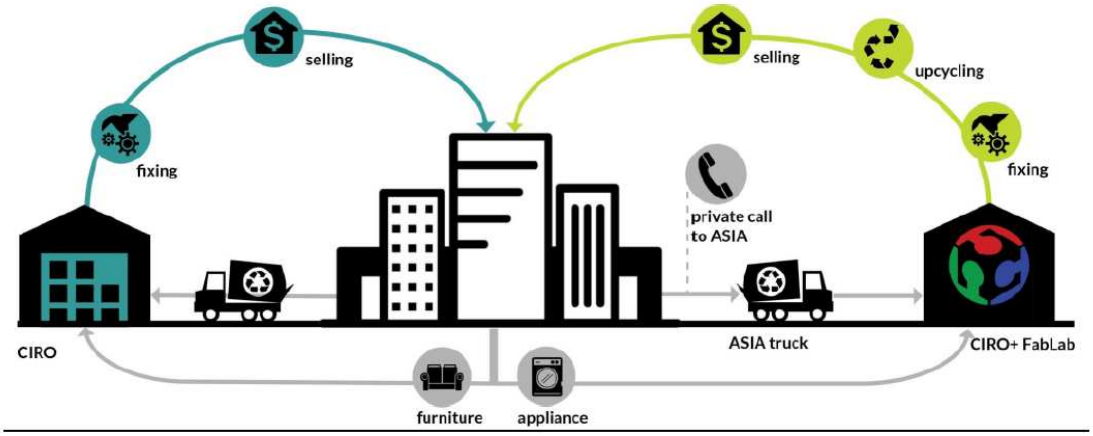

Figure 47: Systemic section of CIRO Fab Lab. Eco-Innovative Solution
Source: UNINA Team, 2018.

This proposed EIS shall be implemented with local stakeholders, association and public actors, in the next co-design phase of the Naples PULLs.

Adaptability for Pécs

This EIS could be successfully adapted in Pécs, but not completely/with some modifications. It is important to note that similar systems already exist in the country but do not have a uniform framework. One of the big problems with this solution would be the renovation and sale of electrical equipment, as they are subject to strict regulation. The issue of transport costs is unclear, which was considered a sensitive point by both working groups of Knowledge Transfer PULL, but the option of home delivery is a very practical idea. For realization, the brownfield areas in the city would be ideal, such as the old Leather factory area (see EIS 15). Both groups came up with the idea of an add-on that could not only be a direct sale of refurbishments, removals, reselling, but also an online marketplace where items of interest for everyone are easy to find.

Successful implementation of CIRO+ would also require the involvement of several actors. It would be important to involve the University of Pécs and vocational schools. The former would be due to the proper marketing and design work, and the latter would gain

the appropriate placement in FABLab. Furthermore, the involvement of BIOKOM and the municipality would be important.

The meeting also raised the idea of multi-functional collection points, the possibility of a collection route for the collection of hazardous waste, and the issue of the current disposal of waste in Pécs and the emergence of stakeholders in parallel.

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4.3 Food rescue platform

Owner of the EIS
Food Rescue US (https://foodrescue.us; https://www.instock.nl/en/food-waste/)

Actors to be involved
TUD group

Flow
food waste

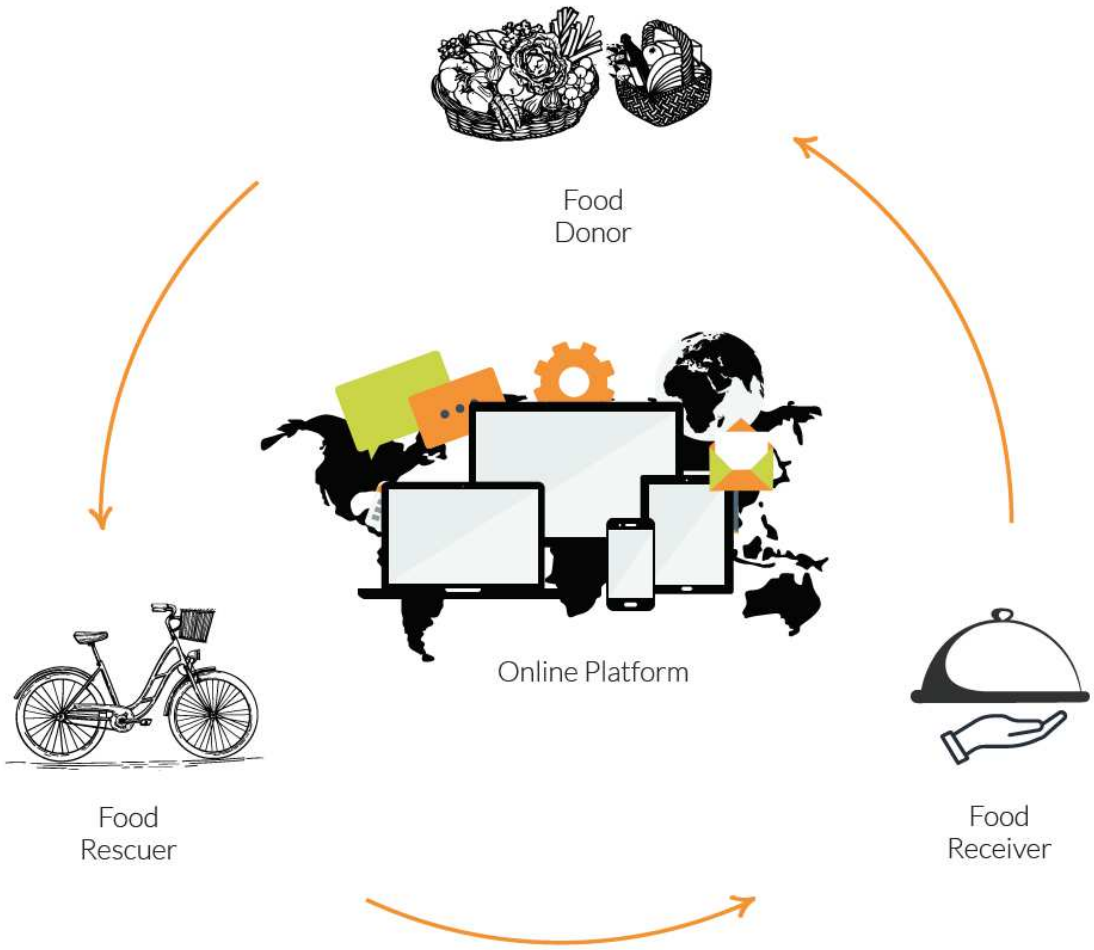

Figure 48: Idea diagram.
Source: REPAiR EU H2020 project

Idea

Reducing food waste is a key sustainability challenge for the food service industry. According the Dutch organisation Instock around 14% of the total organic food wastage

takes place in restaurants, cafés, bars, hotels, and so on. Much of this wastage is a consequence of large portions, strict food safety demands, inadequate stock acquisition. Based on the idea that there is not yet a food shortage in the Netherlands but a food logistic problem.

Food rescue online platform, aims to take excess fresh food from food service industries and delivers them to NGO or other social organisations related to the food sectors via an online web application. It's an innovative and elegant solution for our busy, on-demand world. The online platform streamlined scheduling system offers participants the option to pick-up, drop-off, or receive fresh food at their convenience, alleviating the rigidity of normal food rescue schedules With the online platform three types of actors can select three types of actions associated with their roles in the AMA:

Donate: If you're a restaurant, cafes, bars, etc., you can prepare a list of surplus food that you would like to donate.

Deliver: If you are a volunteer with a vehicle, see the complete schedule of food rescues and choose deliveries that work for you.

Feed: If you are a social organisation or NGO such as a community kitchen or food pantry, you could post your needs and find food to match them.

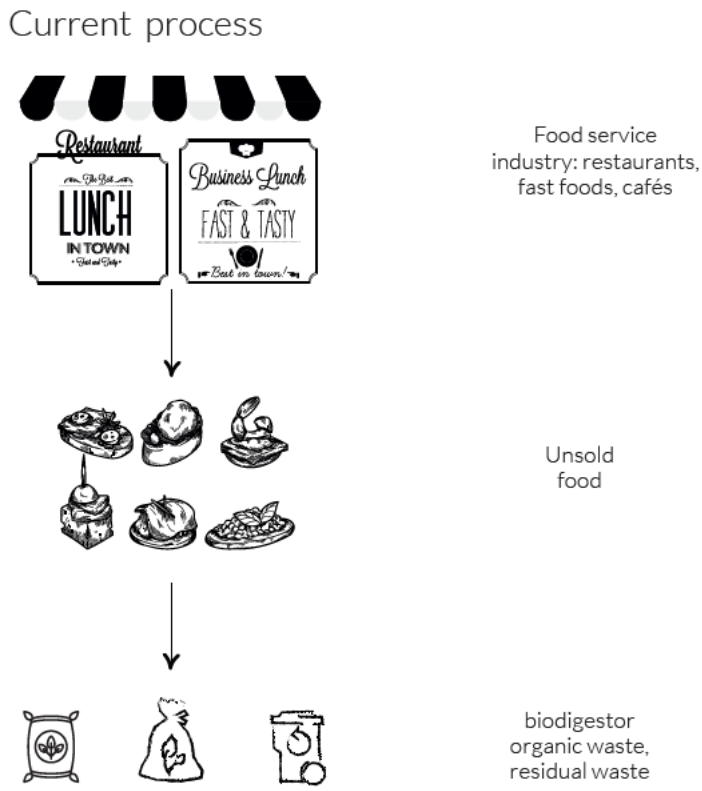

Figure 49: Diagram of current situation.
Source: REPAiR EU H2020 project

The Dutch food-service industry is composed of the following six sub-sectors: full-service restaurants, fast food outlets, cafés/bars, self-service cafeterias, 100% home delivery/takeaway and street stalls/kiosks (Pinckaers, 2016) .

Each food service industries generate waste differently. One primary factor, especially in the grocery industry, is the aesthetic addiction to perfect looking food and store food. A second factor is the obligation is to follow expiration dates. Thirdly, restaurants frequently over-prepare or over-purchase food to ensure they have enough product to feed their customers.

Generally, the organic food waste is designated to landfill and\or the biodigestor-composter.

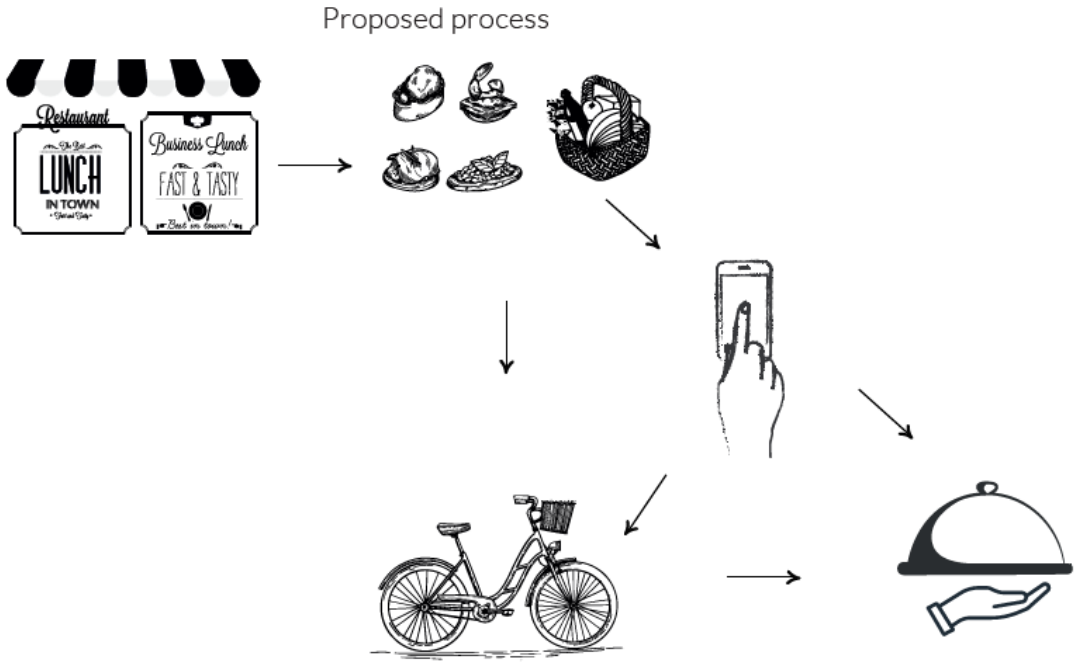

Figure 50: Diagram of proposed process.
Source: REPAiR EU H2020 project

The proposed platform advices a different approach to avoid food loss produced by the food industrial sector and to allow the redistribution of unsold food.

The solution connects volunteer food rescuers with receiving agencies and food donors. Its streamlined scheduling system offers participants the option to pick-up, drop-off, or receive fresh food at their convenience, alleviating the rigidity of normal food rescue schedules.

1) Donors like restaurant, cafés, bars, etc. can easily upload on the platform the type quantity of food that would like to offer and the location of the food service activity.

2) When the availability of the food is online, food rescue volunteers and/or NGO volunteers can collect the required food either by bike or by electric van. Then the food

could be redistributed to organisation in need and/or organisation that ask for specific service.

On average, it takes about few minutes for our food rescuers to respond. In addition, an automatic email system inform can inform donors and feeder on the quantity of available food.

3) Through the platform social organisation or NGO such as a community kitchen or food pantry could easily ask for a delivery service, and see surplus availability of food waste.

Relevance
Local stakeholder expressed:
•the urgency of reducing food waste,
• the reduction of GHG emissions,
•providing food/nutrition for those with little access to it.

In this respect the platform provides a good use for surplus food, also from an ethical and reputation perspective. Moreover, this solution could serve all relevant stakeholders (suppliers, logistics and end-users), taking account of the different data needs.

Adaptability for Pécs
Both PULL member groups agreed that the idea could be transferred to the Pécs area, but the importance of defining the type of food was raised everywhere. The application area could be identified anywhere in the agglomeration where there is food residue or demand. The current legal environment in Hungary is an obstacle. Strict regulation of cooked foods containing milk, eggs and meat, as well as cooked foods, can generally pose a health risk if not properly stored or distributed in a timely manner.

The participants suggested some small changes / ideas for successful application. Firstly, risk mitigation measures to protect the actors involved. In the second step, we need to know and consider the rights and obligations of pizza couriers as current food carriers. Finally, a distribution order must be established for who can receive the food.

We could group and select the participants according to the three tasks:

- Donors: Market Hall, Market, major vegetable growers
- Transportation: Public benefit work of university students and high school students
- Charities, churches who manage the system

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https://foodrescue.us ;

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5. Conclusions

The Deliverable D5.8 presents Eco-Innovative Solutions (EISs) of Pécs. 18 EISs have been developed: A total of 15 solutions were formulated for the Pécs case study area during the Peri-Urban Living Laboratory workshops and another three EIS derived from the knowledge transfer processes. The pilot cases' EIS catalogue books (Remøy et al., 2018, Russo et al., 2018) helped our work of collecting the local stakeholders' ideas, and thereafter to structure them into this transferable and usable Eco-Innovative Solutions' collection.

These developed EIS are different in their affected material-flows, actors and processes involved. The three main investigated flows of Pécs case study area were organic waste, plastic waste and residual waste flows. The identified wastescapes (based on Varjú et al., 2018) were also researched and tested during the PULL workshops.

All the EIS from this catalogue aim to solve a concrete local problem of waste generation, waste treatment or resource efficiency within the specialised local context of Pécs Case. Pécs Case is one of the follow-up case study areas of REPAiR project. The Eco-Innovative Solutions (EIS) aim to transform material and territorial waste into resources and to prevent the waste generation of waste, within the Pécs Agglomeration. In the catalogue this approach suggests alternative and innovative ways to redirect waste or eliminate it from the stream.

The results of EIS developing process highlights the importance of the exploration of the potential stakeholders and involving them into the planning and decision-making processes. This EIS formation process also demonstrates the limitations of the circumstances (current technological, political and legal systems) of Pécs Agglomeration. The involved stakeholders come from different sectors. There are academic actors, members from higher education, business actors, civil partners, experts from waste sector, colleagues from public service providers, local and central decision makers. The communication and interactions between these actors help to deepen the level of understanding and increase awareness of the Pécs context and its specific needs and limitations in the transition towards circular economy.

Based on the PULLs it can also be realised that the space and the built environment have determinative effects on the ability and the success of the transition towards circularity. Each EIS within this catalogue seeks to generate spatial focus or potential sites in which solutions may be developed and eventually implemented as well as potential actors to be involved. The current catalogue examines the feasibility of each included EISs, making clear how to make interactions/steps towards the foreseen aims of the given solution.

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