REPAiR

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

D6.4 First application of the decision model in all case studies

Version 2.5

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Grant Agreement No.:	688920
Programme call:	H2020-WASTE-2015-two-stage
Type of action:	RIA – Research & Innovation Action
Project Start Date:	01-09-2016
Duration:	48 months
Deliverable Lead Beneficiary:	TUD
Dissemination Level:	PU
Contact of responsible author:	andreas.obersteg@hcu-hamburg.de

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 688920.

Change control

VERSION	DATE	AUTHOR	ORGANISATION	DESCRIPTION / COMMENTS
1.0	22-03-2018	Alessandro Arlati, Thomas Fraser, Andreas Obersteg	HCU	First draft version
1.1	04-04-2018	Arianne Acke	OVAM	Ghent case study
1.2	05-04-2018	Alessandro Arlati	HCU	Hamburg case study
1.3	03-05-2018	Erwin Heurkens	TUD	Amsterdam case, first version and comments
1.4	04-05-2018	Gilda Berruti, Maria Federica Palestino	UNINA	First draft of 3.2 (Naples case study)
1.5	07-05-2018	Alessandro Arlati	HCU	Comments on Naples part
1.6	08-05-2018	Cecília Mezei	RKI	Pécs case study
1.7	15-05-2018	Gilda Berruti, Maria Federica Palestino	UNINA	Revised version of Naples case study. Prioritisation of objectives
1.8	22-05-2018	Gilda Berruti, Maria Federica Palestino	UNINA	Naples case. First catalogue of solutions and next steps
1.9	22-05-2018	Gustavo Arciniegas	GEO-COL	General comments, alignment with work of WP2 and WP5
2.0	22-05-2018	Sue Ellen Taelman	UGent	Revising of 1.8 version
2.1	23-05-2018	Alessandro Arlati	HCU	Methodology and Conclusion
2.2	23-05-2018	Konrad Czapiewski	IGiPZ PAN	Łódź Case. Full description.
2.3	29-05-2018	Erwin Heurkens	TUD	Amsterdam case, final version
2.4	29-05-2018	Alessandro Arlati	HCU	Publishable summary, introduction, and conclusion, final version
2.5	31-05-2018	Andreas Obersteg, Alessandro Arlati	HCU	Hamburg case study final version, general formatting

Acronyms and Abbreviations

ACEN	Associazione Costruttori Edili Napoli (Neapolitan Builders Association)
AEB	Afval Energie Bedrijf (Waste and Energy Company)
AMA	Amsterdam Metropolitan Area
AMS	Amsterdam Institute for Advanced Metropolitan Solutions
A/N	Author's Note
ANT	Actor Network Theory
AP	Application Point
ASIA	Azienda Servizi Igiene Ambientale Napoli (Hygienic and Environmental Services Company in Naples)
AS-MFA	Activity-based Spatial Material Flow Analysis
ATO	Ambito Territoriale Ottimale (Optimal Territorial Area)
BdB SH	Bund deutscher Baumschule Schleswig-Holstein (Tree Nursery Association Schleswig-Holstein)
BKG	AMA Central Administration
CE	Circular Economy
C2C	Cradle-to-Cradle
CDW	Construction and Demolition Waste
CIRO	Centri Ottimali per il Riuso Ottimale dei beni durevoli (Integrated Centres for Optimal Reuse of durable goods)
CRA	Campania Region Authority
CRW	Construction and Renovation Waste
DTs	Decision Thresholds
e.g.	exempli gratia
EIS	Eco-Innovative Solutions
FA	Focus Area
GDSE	Geodesign Decision Support Environment
GDSE VC	GDSE Visualisation Chart
HCU	HafenCity Universität
i.e.	id est
ŁARR	Łódzka Agencja Rozwoju Regionalnego (Łódź Regional Development Agency)
LCA	Life Cycle Assessment
ŁOM	Łódzki Obszar Metropolitalny (Łódź Metropolitan Area)
MAN	Metropolitan Area of Naples
MCA	Multi-Criteria Analysis
MFA	Material Flow Analysis
MSW	Municipal Solid Waste
NGO	Non-Governmental Organisation
NUTS	Nomenclature of Territorial Units for Statistics of EU
OW	Organic Waste

PA	Public Administration
PULL	Peri-Urban Living Lab
PULL-M	PULL Meeting
PULL-WS	PULL Workshop
R&D	Research and Development
RDF	Residue Derived Fuel
SA.P.NA	Environmental System Province of Naples
SDSS	Spatial Decision Support System
SIN	Sites of National Interest
SRH	Stadtreinigung Hamburg (Waste management company of Hamburg)
SWC	Separate Waste Collection
SWOT	Strengths, Weaknesses, Opportunities and Threats
TUD	Delft University of Technology
UNINA	Università degli studi di Napoli Federico II
USAID	United States Agency for International Development
WM	Waste Management
WP	Work Package

Table of Contents

List of Figures

List of Tables

Glossary

Circular Economy_it is referred to a broad and slightly recent concept included in several fields of operation:

a. Circular Economy is an economy based on renewability of all resources – energy, materials, water, topsoil (for food production) and air – while retaining or creating value, promoting positive systemic impacts on ecology, economy and society, and preventing negative impacts.
b. Circular Economy accommodates resources to flow through man-made and natural systems in renewable ways, creating or retaining value through "slowed, closed or narrowed loops", rather than rapidly destructing value through the creation of waste. This value can manifest itself in monetary principles as well as other social, ecological or economic principles, taking account of potential trade-offs. Important in this notion is the establishment of production-consumption-use systems built on restorative resources in optimal flows. Optimal flows imply that cycles are closed or connected at spatially and temporally favourable conditions i.e. where and when most appropriate (highest possible value). Moreover, changes in one part of the system should not incite negative externalities. Of particular interest for REPAiR in this respect are impacts on spatial quality. From that perspective REPAiR also includes the notion of waste-scapes (open spaces as well as built form) into the equation (European Union 2017; Ellen MacArthur Foundation 2013).

Closed loops_through recycling, the loop between post-use and production is closed, resulting in a circular flow of resources (Bocken et al. 2016).

Eco-innovative solutions (EIS)_The definition of an EIS will be provided soon in the Deliverable 5.4.

Living Lab (LL)_LLs are physical and virtual environments, in which public-private-people partnerships experiment with an iterative method to develop innovations that include the involvement of end users. In LLs different areas of expertise from diverse partners are needed for a good development of the activities, with the aim to meet the needs of the stakeholders by innovation (ENoLL).

Peri-urban_is the area of an urban region, where built and unbuilt patterns intermix (Forman 2008: p.7). Peri-urban areas have not the features of urban compact city nor the suburban village ones; their features, often unprecedented, are in turn defined as: urban sprawl, dispersed urban development, widespread city (città diffusa), territories in-between, etc. These are "areas where new functions, uses and lifestyles arise as a result of the ongoing interaction of urban and rural elements. They cannot solely be explained as an intensification of urban functions in the rural environment, but have specific spatial and programmatic features that set them apart" (Wandl et al. 2014). Moreover, because of (former-round, widespread, increasingly polynucleated) structure of contemporary urban regions, peri-urban areas are not matching with the intermediate areas around the city. Then, peri-urban is a specific condition of contemporary settlements in the urban regions; it has a widespread and scattered nature and can be recognized both by landscape readings both by quantitative analysis. The landscape-reading shows territories characterized by high fragmentation, lack of urban and ecologic continuity, hybrid (not-rural, not-urban) condition, dispersion of sense of places caused by continuous overlapping of sectorial elements

and flows. That is a not–isotropic spatial structure; it is determined by iterations, rips, spatial accumulations of scattered uses and buildings. From a quantitative point of view, peri-urban settlements can be recognized by way of several indicators: someone depending on physical features (number of buildings and surface they cover, built-up volume, parcel fragmentation, etc); other ones deriving from the way in which target areas are used (inhabitants, workers, infrastructures and their uses) (Own 2017).

Resource_a source of supply or support (Merriam-webster). Within REPAiR, 'essential resources' can refer to: energy, materials, water, topsoil, food, and air.

Slowed loops_through the design of long-life goods and product-life extension (i.e. service loops to extend a product's life, for instance through repair, remanufacturing), the utilisation period of products is extended and/or intensified, resulting in a slowdown of the flow of resources (Bocken et al. 2016).

Sustainability_the balanced and systemic integration of intra- and intergenerational economic, social, and environmental performance (Geissdoerfer et al. 2017).

System_an interconnected set of elements that is coherently organised in a way that achieves something. A system must consist of three kinds of things: elements, interconnections and a function or purpose (Meadows 2008).

Value_the regard that something is held to deserve; the importance, worth, or usefulness of something (Oxford Dictionaries). Value can, amongst others, be expressed in material or monetary units.

Waste_any substance or object that the holder discards or intends or is required to discard (European Union 2008).

Wasteland_an unused or neglected area of land that has become barren or overgrown (Oxford Dictionaries).

Wastescapes_patches of landscape related to waste-cycles both by functional relations and because they are "wasted lands", areas not included in the peri-urban development scenarios, becoming neglected spaces. Therefore, with the term 'wastescapes' we refer to peri-urban elements of urban regions known both as Drosscapes and Operational infrastructure of waste (UNINA Team 2016).

Publishable Summary

REPAiR develops, tests, and implements strategies for improved urban metabolisms in six peri-urban living labs (PULLs) in the case study areas of Amsterdam, Ghent, Hamburg, Łódź, Naples, and Pécs. In the frame of REPAiR, a geodesign decision support environment (GDSE) will be developed and first tested in the PULLs.

REPAiR's Work Package 6 "Developing and implementing decision models" will analyse decision making processes and develop decision models for all six case studies to be implemented in cooperation with stakeholders of each area, feeding into the GDSE.

This document aims at collecting the first information from all partners for what concerns the application of the PULL methodology about the decision model delineated in D6.3. It represents the result of a joint effort between the WP6 teams of every case study and the contribution and overseeing of other WPs responsibles. The output of the present Deliverable is, therefore, the status quo on objectives, Activity-based Spatial Material Flow Analysis (AS-MFA), and solutions derived from the application of the PULL methodology. Moreover, comments and suggestions on the decision model outlined in D6.3 are collected.

After the introductory chapter, this deliverable presents the organisation and some of its methodological aspects. Chapters three and four present the information on objectives, AS-MFA, solutions, and comments on the model from the two pilots (Chapter 3) and the four followers (Chapter 4) respectively. The last one presents the conclusion on the results obtained so far.

Since one of the issues arisen regarded the correct phrasing of the problems and the objectives, an Appendix has been attached including an example of this activity.

1. Introduction

This deliverable contains information on the first application of the decision model in all case studies.

First of all, it must be said that the title of this document has been changed from the original. Indeed, the title from the Grant Agreement was the following: "Decision models follow up studies". However, during the consortium meeting in Warsaw, the WP6 Team agreed on the existence of an unique decision model, described extensively in D6.3 (REPAiR 2018b), which retraces the GDSE organisation in D2.1 (REPAiR 2017a). For this reason, it has been decided that this Deliverable could be used to test at early stages the decision model developed in D6.3.

The main aim is to collect feedback on the GDSE Visualisation Chart (GDSE VC) designed in the previous deliverable D6.3 (REPAiR 2018b). Moreover, this deliverable aims at providing a systematic description of the PULL meetings or workshops, which are happening in all cases from a methodological perspective in the context of the decision-making theory.

The document is divided into four main parts: the first provides a brief insight on the methodology used; the second presents the pilot cases; meanwhile the third discusses the follow-up cases; the last part contains the conclusion derived from them all.

2. Document organisation and methodological aspects

This Chapter aims to present few elements related to the purpose of this Deliverable and to the way in which it has been conceived.

First of all, it is important to give some definitions of the terminology used, hence what problem, objective, solution and action mean. These definitions are to be found in MDF (2005), which contains the explanation of the Problem and Objective Tree methodology (see also REPAiR, 2018b).

A problem is intended as the reason why a project or a process starts. It defines a current situation for which the necessity of being improved has been stated. Different kinds of problems exist and D6.3 briefly describes them. Problems can be identified during the process or stated at its beginning. The formulation of a problem should be detailed enough to be addressed later on by specific solutions and actions (MDF 2005: pp.2-3).

An objective is the translation of the problem in a realised positive state, i.e., as the description of a hypothetical scenario planned to be established in practice in the future. Therefore, an objective should be formulated as a statement as it would be already the reality (MDF 2005: p.3).

Solutions are the way to reach the objectives by tackling the problems. Actions (or means) are instead the steps to create such solutions. Therefore, many actions can compose a solution. These solutions can represent an Eco-Innovative Solution (EIS) if it reflects certain characteristics: an updated definition of EIS is given in D5.4, not available at the moment.

For methodological reasons, a good formulation of these elements is required.

For what concerns the content of this document, the information included here recalls the following structure. At first, concerning the GDSE Visualisation Chart (REPAiR 2018b: p.64), the partners were asked to indicate in which phase their PULL events are located, by the submission of the present deliverable. Secondly, a description (follow-up cases) or update (pilot cases) of the PULL meetings and workshops conducted by the deadline of the present document is proposed for each partner. Following the main goal of this deliverable (Chapter 1), it dedicates a section to the explanation of challenges encountered during the process in regard to the GDSE Visualisation Chart. Within this document, space has been left for possible suggestions coming from the partners to improve the model.

In addition, the partners were asked to provide the list of key stakeholders' objectives (follow-ups) and the prioritised one (pilots). Where possible, first results on the AS-MFA, and the first catalogue of solutions. In this case, beside the content, it was important for the WP6 team to understand which methods were used to collect such information, i.e., how the research teams of every case study reached the contents that

they described. The three sections below provide a more detailed explanation on the information asked to the partners for drafting the present document.

In addition to these constraints, the partners have had freedom to insert other elements they considered important. For instance, many of the research teams have included a section with the next steps they intend to implement.

2.1 PULL meetings and/or workshops description

In this Subchapter, the main questions posed to the partners are the following:

- How were the participants contacted and why?
- How many people were present during the PULL events and from which sector?
- Which activities have been conducted in the PULL events?
- How long did the PULL events last?
- Is there any other information or reflections coming from the research teams, such as attitude and behaviour of participants and other remarkable elements?

2.2 Key stakeholders' objectives

In this part, the partners were asked to insert information on the objectives of their stakeholders. For what concerns the pilots, the information that they should provide is the updated list with the prioritisation, since the list of objectives was already a result of in D6.3 (REPAiR 2018b). As for the follow-up cases, this is the first occasion for them to refer to the objectives. Again, the focus of this document does not just lie on the content, but rather on the methodology by which these objectives have been obtained and/or prioritised.

Attached to this Deliverable there is an example taken from Amsterdam case of how objectives should be phrased (Appendix A - Example of Problems and Objectives phrasing).

2.3 AS-MFA and first catalogue of solutions

This section aimed to collect information from all partners regarding the Material Flow Analysis and the generation of the first catalogue of solutions. Hence, the focus is on understanding the way in which AS-MFA has been performed, and how the catalogue of solutions was first reached.

It is important to explain at which extent the stakeholders outside the research team have contributed to the determination of these elements, as it is relevant for the decisional process.

It must be recalled that not all the cases are the same and therefore, differences are inevitable. Moreover, not all the partners have the same deadlines for the same task. Thus, some partners have provided more information than the others.

3. Pilot cases

3.1 Amsterdam

In the AMA region, two main PULL workshop events[1] have been organised so far in 2017 and 2018 (see Table 3.1.1). The 1st AMA PULL workshop focused on identifying the key CE challenges and objectives of stakeholders. The 2nd AMA PULL workshop was used to verify and prioritize the objectives and to generate a first draft of Eco-Innovative Solutions (EIS) that address these objectives. The 3rd AMA PULL workshop is planned for September 2018. In reference to the GDSE Visualisation Chart in REPAiR (2018b: p.64), the PULL events by now conducted are situated in between the PULL-M-Cognitive and the PULL-WS-Status Quo. In addition to or parallel to the two main PULL workshops, a number of other PULL meetings took place to support decision-making and preparing for the PULL workshops, with different participants (see Table 3.1.2). The following section focuses mainly on describing results from the two main AMA PULL workshops.

Table 3.1.1 - Overview PULL events, Amsterdam (TU Delft Team 2018).

EVENT TYPE	DATE	N. OF PARTICIPANTS	DURATION
1st AMA PULL Workshop	12 September 2017	21	5 hours
2nd AMA PULL Workshop	19 February 2018	44	5 hours
3rd AMA PULL Workshop	September 2018	Unknown as of yet	5 hours

3.1.1 The PULL meetings and workshops (update)

The 1st AMA PULL workshop was organised for the key stakeholders in the region. The participants were invited by email, and selected on the basis of their previous (through interviews) or direct involvement in the REPAiR project (either research institutes, municipalities, companies), followed by some additional invitations of consulting and research institutes with the ability to add specific knowledge about and sharing ideas on circular economy and resource management challenges in the Amsterdam Metropolitan Area. In total, 21 participants attended the workshop (see Table 3.1.2). Before and in parallel to the workshops, a series of meetings with the local project partners as well the Dutch user board member were held. The aim of these meetings was to predefine the focus areas, scope existing CE- initiatives as well as to prepare and for and reflect on the PULL workshops.

[1] NB: these workshops did not consider the use of the GDSE, in contrast of what written in D6.3 (REPAiR 2018b: 35). This because the programme was still not technically operative by the time of these events.

The first workshop began with a brief introductory presentation by the TUD REPAiR team on the workshop goals and connection to the subsequent workshops. This was followed by a keynote address by Noor Huitema on collaboration tips, and a presentation by the TUD REPAiR team on the results generated so far through stakeholder interviews and preliminary workshops on the challenges of AMA. The main activity conducted during the first PULL workshop included identifying and discussing the various challenges related to establishing circular peri-urban region with regard to the three waste categories. By using note cards participants could position various critical aspects of challenges on a problem tree for each waste category. This was followed by a second group session in which participants were asked to contribute to another challenge tree. The outcomes of the group sessions on the problem trees were reported back to group by the TUD REPAiR team. The general attitude of the participants was very constructive, and the 'challenge tree' method was considered useful and practical.

In the months following the 1st PULL workshop, a WP5 PULL report was written and discussions about the generated challenge trees within the TUD REPAiR team took place. These discussions, also fuelled by the methodological implications raised in the D6.3 report, led to a reformulation of challenges into objectives.

Table 3.1.2 - List of participants in the 1st and 2nd PULL meetings, Amsterdam (TU Delft Team 2018).

SECTOR	PARTICIPANT	
	1st	2nd
Municipality	5	6
Waste management	0	3
Universities, research and consulting institutions	5	15
National/regional government	0	3
REPAiR-team and PULL-team	11	12
Construction/food companies	0	5

The 2nd AMA PULL workshop was organised for a broader public, including various stakeholders active in the field of circular economy in the region, and had as purpose to verify and rank identified objectives and develop initial sketches and ideas about possible eco-innovative solutions to address the objectives within the Amsterdam Metropolitan Area. A total of 45 participants were present, including some new interested stakeholders in the fields of construction and demolition waste, and food waste, as well as representatives from regional and national government (see Table 3.1.2).

The workshop programme consisted of a brief introduction to the REPAiR research and objective and structure of the parallel sub-workshops on 1) Wastescapes (Schiphol and Amsterdam harbour area), 2) Food waste, and 3) Construction and demolition waste. Prior to the introductory presentations, participants were asked to fill in a pre-workshop

survey, in which they were asked to 1) identify workshop expectations, 2) identify participants' preferred aspects of eco-innovative solutions, 3) rank/prioritize CE objectives in the AMA, and 4) identify preferences for knowledge transfer. During the workshop participants were asked to discuss, define, describe, map and sketch preliminary eco-innovative solutions on a template form. The initial solutions showed a wide scope, ranging from detailed technical solutions to systemic approaches, and social and political initiatives. The main results of each of the parallel sub-workshops were presented and discussed in a plenary session with all participants at the end of the programme. This was followed by a demonstration of the GDSE including the newly developed web application for conducting Activity-based Spatial Material Flow Analysis (AS-MFA) as one of the innovations, raising questions form the workshop participants on data availability and accuracy. The programme ended with the completion of a post-workshop survey by the participants that evaluated the workshop on a few aspects, namely the participants' impressions, their perceptions on knowledge transfer in of eco-innovation, and their assessment of the workshop effectiveness. The second AMA PULL workshop proved to be a very productive one, generating prioritised stakeholder objectives and a first catalogue of solutions for CE in the AMA.

In the period following the second workshop a WP5 PULL workshop report was written with concise information on the results, which were also presented and shared during a WP3, WP5 and WP6 presentation at the REPAiR consortium meeting in Pécs, Hungary (16-18 April 2018), and further used as input for MSc student workshops at the TU Delft.

Table 3.1.3 - Overview of activities conducted and methods used in the PULL workshops and meetings, Amsterdam (TUD Team 2018).

PULLS NAME AND DATE	ACTIVITY CONDUCTED	METHODS
Internal kick-off meeting, 31 August 2016	meeting with Dutch partners and user board members	brainstorm session
2. Consortium meeting Amsterdam, 3-4 November 2016	first ideas of area definition and challenges	workshops
Internal meetings with partners (every 2 months), January 2017 - July 2017	area definition, data collection, definition of stakeholders and challenges	brainstorm sessions
Stakeholders interviews (deliverable 6.1), February 2017 - April 2017	defining stakeholder challenges/objectives	semi-structured interviews, literature reviews
1st AMA PULL Workshop, 12 September 2017	challenges/objectives exploration/identification	Soft-Delphi (note cards, challenge trees)
Internal meetings with partners (every 2 months) September 2017 - May 2018	objectives definition, first sketches EIS	brainstorm sessions, literature reviews
2nd AMA PULL Workshop, 19 February 2018	objectives verification, prioritisation (individual ranking during Pull), EI-	survey (start Pull), Ranking overall objectives with excel calculations (after Pull), EIS

	solution generation (during Pull)	sheets (discussions/definitions/descriptions/mapping)

3.1.2 Problems emerged and suggestions

With regard to both the timeline and sequence, and alignment of the various activities from WP2, 3, 4, and 6 with WP5 PULL workshops, several observations can be made. The first two AMA PULL workshops have to the best of their ability included data and methods generated or prescribed by various WP3, 4, and 6 activities and deliverables. However, it proved to be difficult to generate and process data on the AS-MFA for instance at this point in time, due to the limited availability of the data. Another example is the development of the GDSE, which has been modelled to a great extent, but requires further and more detailed data input from various work packages in order to be used fully within the WP5 workshops at a later stage. As of yet the GDSE in the AMA PULLs we have used a paper analogue method that simulates the GDSE, which allows for a smooth implementation at a later stage in the PULLs. A suggestion for the responsible WP5 and WP6 TUD REPAiR members is to monitor and check if the various work packages can deliver sufficient data to the PULL workshops according to what is prescribed in the visualisation chart, and to decide collectively prior to PULL workshops which should be included, adapted, or left out in order to reach PULL workshop goals.

17

With regard to the data collection and analysis methods prescribed by WP6 for selecting and interviewing stakeholders, generating verified data on stakeholder challenges, objectives, their prioritised objectives, and developing a first catalogue of solutions, it is fair to say that not all methods and techniques can be defined in advance completely. The methods should allow enough room for the specificities of the local PULLs, which in general has been the case, illustrating the interdependencies between the work packages. For instance, a solid WP6 ‘matrix’ method, technique, tool or template that enables the confrontation of prioritised objectives with generated eco-innovative solutions, for the following WP5 PULL workshop could improve the alignment of WP5 and WP6. A suggestion would be to keep monitoring if the PULLs follow prescribed or suggested methods and techniques for data, and to discuss whether local PULL circumstance might allow for alternative methods or deviations from these methods.

In general, the GDSE Visualisation chart is useful, as it provides insight into the steps and relationships between activities and data needed from the various work packages into the PULLs. A further suggestion is to link the various activities to expected work package deliverables as well, as these deliverables are round off documents that in practice turn out to be sources of input for other work package activities and deliverables.

3.1.3 Key stakeholders’ objectives prioritised

Based on the consensus reached with the key stakeholders in the 1st AMA PULL Workshop, and the decision made within the 2nd REPAiR Consortium Meeting to focus on three waste categories, the identified challenges were reformulated into ten verified

collective actor objectives (see REPAiR 2018b, p.49). Three objectives, developing guidelines for information sharing about material flows among stakeholders; creating trust and collaboration among stakeholders in the AMA; and introducing tax incentives to change waste behaviour among households and companies; are considered to be applicable to each of the waste categories. The other seven objectives are waste-category-specific, and therefore together with the three overall objectives need to be prioritized accordingly per waste flow category.

For each of the waste flow categories, the participants in the 2nd AMA PULL Workshop were asked to rank the verified CE objectives accordingly. The results of this objective ranking are shown in Tables 3.1.4, 3.1.5 and 3.1.6, generated by a simple excel formula calculation method. From these tables various preliminary conclusions can be drawn.

First, in terms of Wastescapes, introducing tax incentives to change the behaviour of actors seems most important, indicating that actors owning or using wasted landscapes in the Schiphol airport of Amsterdam harbour should be fiscally incentivised to more productively use these spaces.

Table 3.1.4 - CE objective priority ranking for Wastescapes (Schiphol, Amsterdam harbour) (TUD Team 2018).

CE OBJECTIVE	RANK
Introduce tax incentives to change waste behaviour among Households and companies	1
Re-use/re-program polluted wastescapes in the Amsterdam Harbour	2
Re-develop wastescapes around Schiphol within construction restrictions	3
Develop guidelines for information sharing about material flows among stakeholders	4
Create trust and collaboration among all stakeholders in the AMA	5

Second, also in the Food Waste category, the highest ranked objective is the introduction of tax incentives for households and companies, which indicates once again that fiscal-financial measures need to be applied in order to stimulate a transition towards CE practices in the AMA.

Table 3.1.5 - CE objective priority ranking for Food waste (TUD Team 2018).

CE OBJECTIVE	RANK
Introduce tax incentives to change waste behaviour among households and companies	1
Create trust and collaboration among all stakeholders in the AMA	2
Develop guidelines for Information sharing about material flows among stakeholders	3
Collect and reuse organic and food waste flows from households and companies	4

Third, for the Construction and Demolition waste flow, the table results suggest that highest priority should be given to more consistently fiscally sanction building industry partners to urge them to re-/upcycle and reuse construction and demolition material, as well as fiscally incentivise such waste reducing behaviour and actions. Another interesting finding on CDW objectives is the emphasis put on creating trust and collaboration among stakeholders.

Table 3.1.6 - CE objective priority ranking for Construction and Demolition waste (TUD Team 2018).

CE OBJECTIVE	RANK
Introduce tax incentives to change waste behaviour among households and companies	1
Create trust and collaboration among all stakeholders in the AMA	2
Reduce amount of waste and negative impacts generated in the Building Refurbishment Process	3
Introduce circularity criteria into building decree allowing room for experimentation	4
Develop guidelines for information sharing about material flows among stakeholders	5
Introduce circularity criteria into Building Tendering Procedures	6
Incorporate circularity into Spatial Planning Law (Omgevingswet) and its implementation	7

Additionally, when comparing the three waste objective rankings, it is noticeable that 'developing guidelines for information sharing about flows among stakeholders' is not necessarily a priority to the participants, and that the introduction of tax incentives to change household and company waste behaviour is ranked as a top priority in all waste flow categories.

Finally, the objectives that have been prioritised are often quite general, non-technical and on a systemic level. They are not specific, technical, local, or even spatially-, activity-, indicator-, and impact-related. In addition, it might be argued that some objectives can also be considered as a solution. For instance introducing tax incentives can be seen as a solution to the underlying objective of changing household and company waste behaviour, rather than an objective in its own right. In addition, user board members during the WP6 presentation during the Consortium Meeting in Pécs expressed their surprise about the high rankings of tax incentives objectives. Therefore, at this point there is an ambiguity in the formulation of the objectives which need to be resolved. Due to the importance of resolving this issue and the limited time available for resolving this matter for deliverable D6.4 deadline, it has been decided to solve this in the following WP6 deliverable, by the TUD team in collaboration with the AMA user board members.

3.1.4 AS-MFA

As for the Activity-based Spatial Material Flow Analysis (AS-MFA) the WP3 TUD

REPAiR team collected and analysed data from multiple sources, including approaching stakeholders for delivering data. Some stakeholders were willing to share and provide data, other stakeholders could not provide requested data due to privacy matters, and some stakeholders could not provide up-to-date data in case of which assumptions have been made for generating results for the AS-MFA. The results of the AS-MFA are presented in D3.3 report, but have not yet been used as input for the 2nd AMA PULL workshop.

3.1.5 First catalogue of solutions

The 2nd AMA PULL workshop resulted in a first catalogue of eleven solutions with regard to the different waste categories in the AMA (see 2nd AMA PULL Workshop Report), which are listed and briefly described hereinafter per waste flow.

Wastescapes

1 - Reuse areas within noise and safety contour from airport, port, railways and roads, increase the quality and quantity of natural green areas (biodiversity): Transformation of small urban design and ecological interventions, leftover spaces like green buffer zones along or within industrial areas and adjacent to infrastructures to 'ecological refugia' or 'islands for biodiversity', as part of ecological infrastructures, assuming the role of flood control, water purification, energy production and mitigating urban heat island effects. Reuse of such areas is a resource for transformation: from Wastescapes to 'green pockets' in the built environment. This idea relates to Wastescapes as shared spaces, with the potential to have multiple uses for a multiple public. Walkers, ecologists, or different people can share spaces for different purposes.

2 - Concentrating green houses, reuse other green-houses: Redesign and reuse of abandoned greenhouses outside the airport noise contour for housing purposes. Reuse of greenhouses within the noise contour area to optimize energy and material flows and to efficiently connect with existing infrastructures. The majority of greenhouse locations considered are directly connected to natural resources, energy and road infrastructures. Therefore, the functioning of greenhouses and possible transformations are composed of interacting natural, built, socioeconomic, cultural, and technological layers and subsystems. This system of connections requires that stakeholders, researchers and designers understand how the various territorial systems and subsystems are related with each other and how this interrelation can facilitate new uses.

3 - New use for polluted soil: Human actions depreciate an ecosystem, reducing the structure and functional dimensions of the land. To do nothing could be a solution. The soil may recover through natural processes, while the land can temporarily host above ground energy systems, like Solar Panels or Carbon Capture Utilisation or other compatible uses. Another option is to restore or rehabilitate the former non-compromised system. By adaptation of urban design strategies to technical soil reclamation projected through time, different forms of rehabilitation have been developed, transforming injured land in several kinds of public space. A systemic approach to regenerate polluted soil involves: 1) reclamation of soil and ensuring a high level of biodiversity, and 2) reuse (in a compatible way) of the polluted areas by making

them more attractive to people.

Food Waste

4 - Alternatives to the predetermined (big) portions at supermarkets: Offer smaller food portions through legislation of financial instruments. Smaller packages or packaging-free options can offer the correct portions to the consumer because of the lack of portion-restriction through packaging. Consumers should be made aware of the food waste problem to choose both consciously and sustainably. An app to access a network with people that have a surplus of food to exchange can help battle food waste in small households.

5 - Smart biorefinery: Create a smart biorefinery that includes tracing and tracking the collection and separation of food waste flows through a blockchain technology. The smart biorefinery connects with relevant players; suppliers of OW can communicate with the refinery when/how much/where/what kind of OW is available and an algorithm will allocate the waste streams. It resembles a smart grid for OW. It should be possible to directly reuse food for consumers. The tricky thing is to know who gets how much when and how to buffer the flows. Using real-life tracking and tracing, algorithms can be developed to oversee the system.

6 - Separation of plant-based and animal-based Organic Waste: Separate plant-based and animal-based (in company waste), to avoid OW to go to incineration because of animal-based waste pollution. Animal based streams must go to incineration and plant-based streams can be turned into biogas, compost, biochemicals and fodder. A check is needed about what the current legislation of animal waste into organic waste/swill is.

7 - Rethinking the chain - start with the requirements for the end-product: Start from requirements of the final use of an end-product, like high-quality compost for rooftop/urban agriculture. Go through the reverse logistics steps necessary to create the product that meets those requirements. Then, supply and demand can be matched. Example; rooftop gardening: What kind of requirements would rooftop gardeners ask from their soil/nutrients (certain nutrients and structure for growing good quality food). Then trace back this material flow - where are the sources of these (waste) streams (Households, companies in the agro-food chain and other wholesalers)? Map out per sector the composition of the waste and its pH-value. Combine that with the demand (rooftop garden soil) and the collection points. This is matchmaking with the demand and (waste-to-resource) supply.

Construction and Demolition Waste

8 - CE Business models: Develop feasible CE Business models for individual organisations and the construction sector chain. Develop a series of ‘best practices’ on business cases applied in projects, defining common business models that are sector overarching, with conditions such as transparent financial information. The business cases are needed for economies of scale level for urban development areas. Attention should be paid to customers, users, and clients, and should be attractive for developers. The best practice business cases should define clear success indicators (e.g. feasibility,

contribution to transparency, contribution to improving circularity), focusing on public-private and business to business solutions. This solution requires transparency, data sharing, collaborative business model interesting for all parties.

9 - Circular tendering: Public-private (urban area) development: Develop new requirements for tendering in the construction sector to support the development of a circular economy, such as shared responsibility and aims, sharing of property, and a collaboratively developed idea of circular asset or urban area development. The most effective scale for implementation most likely is the neighbourhood level. The flows considered are building material and water, energy, and sharing data about these flows. Activities include a collective setting of ambitions, before starting a competitive dialogue, with open source sharing of innovation. To implement the solution requires process agreements, production agreements, space for experimentation, experimenting within clear boundaries, developing a material bank, developing an adaptive process where the product definition can be adapted throughout the process, flexibility, clear system context, and trust between the parties.

10 - Open and secure material exchange: Develop an open and secure material exchange to shift the construction and demolition economy towards the 'inner loop'. Propose a systemic change to distribute value in the whole chain. To achieve this systemic change, new legislation, regulation and policy are needed. The proposed solution focuses on developing a material exchange interface, and regulations for sharing real data. The solution should shift the economy towards the inner loop. Open and secure data availability and a data platform are required. Using BIM (Building Information Modeling) in a pre/post situation could help to develop trustworthy data sources, and should include financing and legal aspects. The system should collect information about materials' financial and environmental value, using an LCA (Life Cycle Assessment). An open interface should be developed to give information about where materials can be found.

11 - Cross sectoral material and process platform: Develop a cross-sectoral material and process platform for exchanging material information across sectors on an area level. The platform should be cross sectoral, and include information about building materials, and other materials, from clothing to agricultural. The platform should be a system of 'what is where', including only materials that can be reused cross sectorally. Madaster provides a starting point for this platform. The system should show the future value of materials, quantitatively and qualitatively. The cross-sectoral material and process platform will contribute to developing bigger markets for materials, and reduce storage time.

This generated first catalogue of solutions raises some questions regarding the usefulness and incorporation into the GDSE model. First, it might be useful to make a distinction between solutions that cannot be modelled technically and spatially and those that can. Here, it makes sense to exclude policy or legislative solutions from the GDSE if these solutions extend the peri-urban regions decision-arena, and treat them as conditional for making decisions within the AMA. Second, these solutions most probably need to be further specified and substantiated with sustainability indicators,

possible impact categories to be useful to make decisions upon.

Parallel to the solution development by stakeholders and in order to test and develop methods of systemic regional design, spatial visions and strategies for the transition of the AMA towards CE have been developed in university course:

Research and Design Studio: Spatial Strategies for the Global metropolis: Geodesign for Circular Economy in Urban Regions

A summary of the results is presented on the REPAiR webpage: http://h2020repair.eu/project-results/research-design-studio/

3.1.6 Next steps

For WP5, D.5.2., 'Catalogue of solutions', the next step are namely to: 1) organise a workshop with the Dutch consortium and advisory board members for further developing and detailing the proposed solutions; 2), based hereupon, develop briefs for students and the research team at TU Delft as assignments, 3) using the detailed solutions developed by the students as input for the next REPAiR Amsterdam PULL workshop. Following these 3 steps, solutions that can be implemented and tested in the GDSE will be developed.

For WP6, the idea is to confront the generated eco-innovative solutions with the ranked objectives (for each waste flow category), by asking stakeholders to identify to what extent such solutions would help address which objectives. Through this, we will be able to provide the regional decision makers with an overview of which objective and which related solutions are considered important by different types of stakeholders as well as where there is agreement and disagreement on challenges and solutions.

The coming months will be used to discuss and decide upon these matters amongst WP2, 3, 4, 5 and 6 (TUD) REPAiR team members and the stakeholders, to allow for necessary activities of the different work packages to take place effectively. Special attention is then paid to the 3rd AMA PULL workshop which will focus on both assessment and comparison of the set of generated solutions, and the modelling of the GDSE and methodology for implementing a GDSE in a PULL workshop (REPAiR 2018c).

3.2 Naples

The focus area is part of the territory of the Metropolitan City of Naples and consists of eleven municipalities: Napoli, Casoria, Afragola, Acerra, Casalnuovo, Caivano, Cardito, Crispano, Frattaminore, Volla, Cercola.

The three waste flows on which the research focuses are: organic waste (OW), construction and demolition waste (CDW), wastescapes.

In the Metropolitan area of Naples (MAN), eight PULL events have been held so far, from April 2017 to April 2018, and another workshop is planned for the end of May 2018 (see table 3.2.1). The first four PULL events had as objective to open up the debate

around circular economy topics by constructing a shared knowledge among stakeholders and REPAiR team on the objectives of the project. Critical issues of the waste management cycle were deeply analysed, then two meetings focused respectively on organic and construction and demolition waste were promoted, according to the **co-exploration phase** of the GDSE Visualisation Chart. During the PULL meetings, the involved stakeholders challenged the REPAiR team to work on some critical areas (mainly wastescapes) in their territories in search for innovative solutions.

There is no sharp separation between PULL meetings and workshops. The PULL Meetings - Cognitive revealed to be important not only for their social role, but also for the progress of the project. Starting from stakeholders' claims, in fact, a smaller sample within the focus area was selected, including five municipalities, and a new cycle of PULL workshops started (PULL Ws- Status quo MFA), mainly focused on wastescapes and their regeneration through eco-innovative solutions. At the moment, we are working towards the definition of the initial eco-innovative solutions. The outcome of the next PULL WS, planned in July[2], should be the first catalogue of solutions.

Table 3.2.1 - Overview PULL events, Naples (UNINA team 2018).

EVENT TYPE	DATE	N. OF PARTICIPANTS	DURATION
1st MAN PULL Meeting	10 April 2017	37	1.40 hours
2nd MAN PULL Meeting	31 May 2017	24	4 hours
3rd MAN PULL Meeting	14 November 2017	30	2.30 hours
4th MAN PULL Meeting	29 November 2017	20	2.30 hours
5th MAN PULL Workshop	14 February 2018	39	3 hours
6th MAN PULL Workshop	07 March 2018	51	3 hours
7th MAN PULL Workshop	28 March 2018	61	3.30 hours
8th MAN PULL Workshop	23 April 2018	33	3.30 hours
9th MAN PULL Workshop	July 2018	-	-

3.2.1 The PULL meetings and workshops (update)

The PULL events were collectively organized by UNINA team with the support of Campania Region. In the first four PULL events, participants included representatives of regional, metropolitan and local governments and policy makers, waste management administrators, local companies' representatives and UNINA and CRA REPAiR teams.

[2] The decision to postpone to July next PULL WS, initially planned in the end of May, was due to the city council election in Afragola, which will be held on June, 10th and 24th, 2018.

From the fifth PULL event (first Workshop) on, social organizations and active citizens were involved, due to the focus on the real problems of their territories.

In particular, the first PULL event had as main objective to construct a shared knowledge on REPAiR Project and CE objectives between stakeholders and the REPAiR team. The second PULL event, after explaining LL methodology, focused on the main critical issues of the waste management cycle in the focus area and the regeneration projects carried out by the municipalities. During the PULL event, the possibility to involve people from companies and social organizations was explored. In the third PULL event, we decided to focus on organic waste, giving a report on the implementation on organic waste policies, with respect to both the industrial composting plants and the community composters. Stakeholders from Campania Region (CRA Director of ecobals disposal department and the President of Waste Observatory) and the Neapolitan company for waste collection gave their speeches, stimulating the discussion among the participants. The 'problem tree' was the methodology adopted for the interaction stage. The fourth PULL event was focused on construction and demolition waste. After a presentation on CDW in the Campania Region headquarter, a round table was organized with contributions by Neapolitan Builders Association (ACEN) and Campania Region representatives describing how the waste register is organised and what the role of Waste Observatory is. The following animated discussion pointed out critical issues on CDW and some hints for envisioning innovative solutions.

At this phase, in order to allow a better interaction with local stakeholders, it was considered useful to work on a sample of the focus area. Starting from the challenges proposed during the previous meetings, particular attention was mainly paid to wastescapes. The sample was composed of five municipalities (Acerra, Casoria, Casalnuovo, Afragola, Caivano), characterized by similar problems on the waste cycle and belonging to the same Optimal Territorial Area (in Italian, Ambito Territoriale Ottimale, ATO) as for the waste management. At the beginning, we decided to investigate the sample through three PULL workshops[3], respectively focusing on wastescapes, on solutions coming from previous plans, policies or projects by the public sector or social organizations, and on the possible eco-innovative solutions. Soon it became clear that two further workshops were needed, as an animated discussion developed on these issues. Our plan was to hold the workshops in the new high speed station in Afragola, as a neutral ground for the 5 municipalities, but we did not succeed to issue the formal permit by the Italian railways company for security reasons. Then, we held the workshops in the Municipal Library in Afragola. Particular effort was given to involve also social organizations and active citizens coming from the 5 municipalities, treasuring from UNINA team's previous researches and adopting snowball method.

[3] NB: these workshops did not consider the use of the GDSE, in contrast of what written in D6.3 (REPAiR 2018b: p.35). This is due to fact that the software was still not technically operative by the time of these events.

Table 3.2.2 - List of participants in all PULL meeting, Naples (UNINA Team 2018).

SECTOR	PARTICIPANTS							
	1ST	2ND	3RD	4TH	5TH	6TH	7TH	8TH
Municipality	9	6	4	2	1	5	1	
Waste management	0	1	1	0	0	0	0	0
Universities, research and consulting institutions	0	0	1	3	5	9	39	7
REPAiR-team and PULL-team	14	11	9	12	14	14	14	11
Regional/Metropolitan City authority	14	6	13	3	3	5	4	7
Social organizations or active citizens	0	0	0	0	11	16	3	7
Companies	0	0	2	5	2	1	0	0
Others	0	0	0	0	5	2	0	0

The fifth PULL event was focused on wastescapes. After a presentation on Waste Management in the five municipalities by CRA, participants' round presentation was carried out and each of them identified a critical wastescape in the sample map. UNINA team had prepared a form on wastescapes useful to collect information. Participants filled the form and localized the suggested wastescapes on the map that had been nailed to the wall. The categories of wastescapes on which the research group was working were presented with the idea of starting a collaborative process to collectively update the map. Two parallel focus groups were organized to work on the map and its legend. In each focus group there was a facilitator from UNINA team and a group leader from local organizations or active citizens. A productive environment among participants was created.

The sixth PULL event focused on solutions for wastescapes. After an introduction on what an eco-innovative solution is (by UNINA), and on innovative solutions coming from agricultural policies (by CRA), participants' round presentation was carried out and their suggestions on solutions were asked. After this first interaction stage, participants were divided into three worktables, each one focused on a territorial project to carry out together, responding to a critical issue regarding wastescapes. Each group worked on his territorial project, with the aim of understanding which could be the site specific eco-innovative solutions to the investigated wastescapes.

In the seventh PULL Workshop, our objectives were to reason on proposals coming from the previous workshop, and to highlight which actions were needed for each territorial project. Two interaction stages have been conducted in the worktables already experimented in the sixth PULL event. New participants decided which worktable to join. For each worktable there were a leader, a facilitator and a CRA representative. In the first stage, the proposed territorial projects have been studied by explaining: 1) which problems they aim to solve; and 2) through which actions each idea can be implemented. All these activities were carried out in the first stage. In the second one,

the actions proposed by the participants in the worktables have been classified according to the waste flows and a first prioritisation on actions was made. Participants reasoned on short, medium and long-term actions.

The eighth PULL workshop started with a speech on constraints and opportunities coming from programmes and policies by CRA representatives. An interesting discussion started on the concrete possibility of funding the actions coming from the three worktables. After the discussion, participants were divided into the three groups and started to work together on the proposed actions. They also filled a form prepared by UNINA team in order to understand how the proposed actions could be carried out, who is available to support them, and if there is someone interested to collaborate. Prioritisation of the actions was included in the form, and the involved waste flows as well.

Table 3.2.3a - Overview of activities and methods adopted in the PULL meetings (UNINA team 2018)

PULLS NAME AND DATE	ACTIVITY CONDUCTED	METHODS
PULL M_01_ 10.04.2017	1. Explanation of the REPAiR Project 2. Presentation of the Focus Area (FA) 3. Participants´ presentation 4. Debate	1. PowerPoint presentation 2. PowerPoint presentation 3. Sequence of participants' speeches (mayors and representatives of the metropolitan city) 4. Discussion *Mayors and representatives of the Metropolitan City*
PULL M_02_ 31.05.2017	5. Presentation of REPAiR's main objectives 6. Focus on LL methodology 7. Presentation of critical issues on waste in the FA municipalities 8. Debate	1. Speech by UNINA Coordinator 2. PowerPoint presentation 3. Mayors' pecha kucha 4. Discussion *Mayors and representatives of the Metropolitan City, Optimal Territorial Area*
PULL M_03_ 14.09.2017	*Focus on organic waste* 9. Speech by CRA director of eco-bales disposal department 10. Speech by the sole director of ASIA 11. Speech by the president of CRA Waste Observatory 12. Debate to identify problem causes, effects, and solutions	1. Speech 2. PowerPoint presentation 3. Speech 4. Problem tree

PULL M_04_ 21.11.2017	*Focus on Construction-Demolition Waste (CDW)* 1. Introduction by UNINA and CRA 2. Presentation on CDW (UNINA) 3. Round table: - Speech on CDW by ACEN (Neapolitan Builders' Association) - Speech on how is Regional Waste Register organised (CRA) - Speech on the role of the Waste Observatory by the president of CRA 4. Debate	1. Speeches 2. PowerPoint presentation 3. Round table 4. Discussion *Mayors and representatives of the Metropolitan City, enterprises, representatives of the Neapolitan Builders' Association*

Table 3.2.3b - Overview of activities and methods adopted in the PULL workshops (UNINA team 2018).

PULLS NAME AND DATE	ACTIVITY CONDUCTED	METHODS
PULL W_05_14.02.2018	*Focus on wastescapes. Sample area, 5 Municipalities.* 1. Introduction by UNINA coordinator 2. Presentation of the Waste Management in the 5 Municipalities (CRA) 3. Participants' round presentation and their individuation of a wastescape (facilitated by UNINA) 4. Individual Work on wastescape form / Localizing wastescapes /WS) on the map 5. Speech on the categories of wastescapes by UNINA team 6. 2 parallel worktables on wastescapes	1. Speech 2. PowerPoint presentation 3. Round presentation 4. Filling the form and localizing the WS on the map (post-it) 5. Synthetic speech to orientate the public within categories of wastescapes 6. Parallel focus groups on the WS map to update it *Groups, associations and Municipalities directors or councillors* *Participation of RKI PULL leader*
PULL W_06_07.03.2018	*Focus on wastescapes, Sample area, 5 Municipalities.* 1. Report of 5th PULL (UNINA + 2 leaders) 2. Speech on what an Eco-Innovative Solution (EIS) is (UNINA) 3. Speech on EIS coming from agricultural policies (CRA) 4. Participants' round presentation and their suggestions on EIS 5. Division in groups and identification of 3 EIS to work on	1. Speech 2. PowerPoint presentation 3. PowerPoint presentation 4. Round presentation 5. Work group 6. Speech *Groups, associations and Municipalities directors or councillors*

PULL W_07_28.03.2018	1. Report of 6th PULL and programme of work (UNINA) 2. 1st interaction in the 3 worktables on EIS / problems-objectives-actions 3. Report of the 1st interaction by worktable leaders 4. 2nd interaction in the 3 worktables on EIS / Individuation of actions and their prioritisation	1. Speech 2. 3 parallel focus groups 3. Speeches 4. 3 parallel focus groups (assessment of the short, medium and long term actions) 5. Discussion *Groups, associations and Municipalities directors or councillors* *Participation of AMA PULL leader*
PULL W_08_23.04.2018	*Focus on wastescapes, Sample area, 5 Municipalities.* 1. Speech on constraints and opportunities coming from public programmes and policies (CRA) 2. Discussion 3. Interaction in the 3 worktables on the proposed actions to carry out the site specific project / what to do, with whom?	1. Speech 2. Discussion 3. 3 parallel focus groups (filling the form on actions)

3.2.2 Problems emerged and suggestions

This section discusses which are the problems and suggestions coming from the decisional process, together with observations on participants' attitudes and behaviours.

29

Last November, after the fourth PULL meeting, we observed that the municipalities took part in the meetings only if they foresaw some regional funds for a specific project in their area of interest. This was one of the main reasons that drove the selection of a sample area on which municipalities would be interested in working. The choice of the sample revealed to be useful and respondent to our objective of also involving social organizations and active citizens. An atmosphere of trust and cooperation, which characterized PULL events so far, made the work productive. Only sporadic tense moments occurred, due to the legacy of the struggles against the waste emergency and the incinerator, but they were quieted by UNINA facilitators pointing out the objectives that the shared work could help to reach.

During the PULL meetings, impressive efforts were made towards the goal of constructing a common knowledge on some technical issues concerning waste management in Campania region. As for knowledge basics, we deduced from the PULL events that municipalities often ignore how the ATOs and the waste management system planned by L.R. 14/2016 should work. The waste management is still perceived as something to solve at a local level. Evidence for this is given also by the constant absence of the presidents of the two ATOs included in Naples' focus area in the PULL meetings, even though we invited them. On the other hand, the ATOs are still in standby as the technical directors are not yet appointed. The ATOs do not have an operative role so far de facto and even in the imaginaries of local mayors and councilors. Thus, the transition stage from the old governance system of waste and the new one is still ongoing.

The problem of knowledge disparity between PULL meetings participants revealed itself as an issue to be managed. For instance, the knowledge by public sector's actors must become a means to support the worktables' proposals and not an obstacle to their creative process of design. This is important not only with respect to the outcomes of the process, but also to the conflicts arising among actors. In the eight PULL events held so far, only two episodes of knowledge disparity occurred. Thus, these two episodes were discussed within the REPAiR team in order to prevent similar conflicts from taking place in the future.

One of the most interesting issues was the common work made by the different WPs responsible in order to design and manage the PULL events. The interaction among WP6, WP3 and WP5 allowed to put to work the outcomes of the research so far and to test them in the PULL events. For instance, the work made to collectively update the map of wastescapes and its legend enhanced spatial analysis. At the same time, the discussion in the PULL events reinforced the value of some social issues in the spatial analysis.

The shared work made by UNINA team with the CRA representatives for organizing the PULL events was very important as well, not only for the possible outcomes of REPAiR project but also to trigger a collaboration among separate regional department, in order to plan integrated measures. Interinstitutional work was also promoted, especially thanks to the suggestions by CRA representatives to municipalities about funding or programmes to implement concerning wastescapes.

As for the prioritisation of objectives, the presence of many people from social organizations or active citizenship, which often do not have the necessary attitude to deal with too abstract elements, made it difficult to adopt the soft delphi methodology and pushed us to adjust it to circumstances. The adopted method will be extensively explained in the next Section 3.2.3. At the beginning of the process, after the WP6 survey and the first PULL meetings, we had our list of objectives of the key stakeholders. Then, all the participants in the PULL workshops worked on three site specific projects responding to critical issues regarding wastescapes and the selected waste flows, with the objective of pointing out eco-innovative solutions. They deconstructed these projects into actions, from which it is possible to deduce objectives, which might in part correspond to the previous list of objectives and in part integrate it. Participants prioritised actions, not objectives, because communities of actors are more likely to engage in concrete actions than general objectives. The REPAiR team has the duty to report the actions coming from the three worktables to stakeholders' general objectives. In order to assign numerical values to the objectives prioritised to support decision on solutions, it will be useful to take into account the opportunities offered by regional funding or programmes.

3.2.3 Key stakeholders' objectives prioritised

Stakeholders taking part in the PULL events worked hard to figure out how to respond to some critical issues coming from the wastescapes identified in the sample area. Each worktable focused on a territorial project with the aim of understanding which the eco-innovative solutions to the investigated wastescapes could be, and identified which

actions were needed in order to implement it.

It was not possible at this stage to talk about objectives, due to the composition of our public. For this reason, stakeholders prioritised actions, instead of objectives, as actions were easier to understand.

From the list of actions and the relative discussions coming from the three worktables, it was possible to deduce stakeholders' objectives that were compared with the previous list of objectives (D6.3), so to revise and integrate it.

Hereafter, the relationship between objectives and actions is summarized in three tables (3.2.4a, b, c), respectively focused on wastescapes, organic waste, and construction and demolition waste.

Table 3.2.4a - Relationship between Objectives and Actions for Wastescapes (UNINA Team 2018).

OBJECTIVES	ACTIONS
waste is not illegally disposed in the streets	• protection and safeguard of territories • reuse of confiscated lands • reuse of former landfills or wastelands • implementation of CDW collection centres in which legal recognition is not required by law • incentives for depositing CDW in collection centres • activation of a communication campaign on the new public services
planning processes of urban change shared by different actors	• activation of multi-actor co-design processes • involvement of private actors • reuse of confiscated lands • activation of synergies with pivot actors • open public call for the entrustment of waste collection centres • linear forestation along infrastructure
organized crime is not implicated in waste management	• introduction of measures that allow CE processes to be implemented • natural surveillance actions along infrastructure • incentives for waste collection centres
citizens and institutions are aware of environmental issues and the functioning of the administrative machine	• construction of a sense of belonging to places through the direct care of public spaces • experimentations on sustainability principles at landscape, urban and design scale • enhancement of public knowledge on the waste management cycle
existing environmental projects at a stalemate are resumed	• recovery and completion of the green infrastructure between Acerra and Pomigliano • protection from hydraulic risk along the Regi Lagni • reuse of the PIP area in Acerra with ecologic finalities

citizens' trust towards institutions improved	
waste management responsibilities, mechanisms and roles are understood and executed	
ecobales are correctly disposed	

Table 3.2.4b - Relationship between Objectives and Actions for OW (UNINA Team 2018).

OBJECTIVES	ACTIONS
sustainable organic waste management	• incentives for implementing OW collection centres • OW collection and transformation centres (remains of pruning and trimming)
organized crime is not implicated in the waste management	• introduction of measures that allow CE processes to be implemented
acceptable locations for new composting plants are found	
EU mandated composting plants are opened	
citizens trust towards institutions improved	
waste management responsibilities, mechanisms and roles are understood and executed	
Campania Region compost quality is higher	
planning processes of urban change shared by different actors	• activation of synergies with pivot actors
citizens and institutions are aware of environmental issues and the functioning of the administrative machine	• design of an educational path on how to recycle OW

Table 3.2.4c - Relationship between Objectives and Actions for CDW (UNINA Team 2018).

OBJECTIVES	ACTIONS
CDW is accepted for reuse	• CDW recycle in public projects • realization of integrated centres for optimal reuse of durable goods (CIRO) based on CDW
organized crime not implicated in waste management activities	• introduction of measures that allow CE processes to be implemented • incentives in public tenders for companies specialized in CDW recycle • opening of CDW collection centres in which legal recognition is not required by law

citizens and institutions aware of environmental issues and the functioning of the administrative machine	
waste management responsibilities, mechanisms and roles are understood and executed	
citizens' trust towards institutions improved	

As for the ranking, after reconstructing the link between objectives and actions, and taking into account the prioritisation of actions coming from the worktables in the PULL ws, UNINA team worked to count how many times each objective was mentioned, including not only the PULL events but also the outcomes of interviews to stakeholders.

At this stage, the results of the ranking of objectives according to each waste flow can be read in the three following tables (3.2.4d, 3.2.4e, and 3.2.4f).

Table 3.2.4d - Objective priority ranking for wastescapes (UNINA Team 2018).

OBJECTIVES	RANK
waste is not illegally disposed in the streets	1
planning processes of urban change shared by different actors	2
organized crime not implicated in waste management activities	3
citizens and institutions are aware of environmental issues and the functioning of the administrative machine	4
existing environmental projects at a stalemate are resumed	5
citizens' trust towards institutions improved	6
waste management responsibilities, mechanisms and roles are understood and executed	7
ecobales are correctly disposed	8

As for wastescapes, the most important objective is solving the issue of abandonment and illegal deposit of waste along the streets. However, there is also a strong demand for inclusive decision-making processes concerning urban changes, where different actors can work together, each one coming into play with his/her competences. Then, finding solutions able to keep organized crime away from the management of waste is also considered important.

Table 3.2.4e - Objective priority ranking for OW (UNINA Team 2018).

OBJECTIVES	RANK
sustainable organic waste management	1
organized crime not implicated in waste management activities	2
acceptable locations for new composting plants	3

EU mandated composting plants are opened	4
citizens' trust towards institutions improved	5
waste management responsibilities, mechanisms and roles are understood and executed	6
Campania Region compost quality is higher	7
planning processes of urban change shared by different actors	8
citizens and institutions are aware of environmental issues and the functioning of the administrative machine	9

In terms of organic waste, the overriding objective is to overcome the organic waste emergency from occurring in the future. Another issue at stake is to oust organized crime from waste management. Then, finding acceptable locations for the new planned composting plants, thus overcoming the Nimby effect, also has to be taken into account.

Table 3.2.4f - Objective priority ranking for CDW (UNINA Team 2018).

OBJECTIVES	RANK
C&D waste is accepted for reuse	1
organized crime not implicated in the management of waste	2
citizens and institutions are aware of environmental issues and the functioning of the administrative machine	3
waste management responsibilities, mechanisms and roles are understood and executed	4
improved trust of institutions	5

Finally, overcoming the suspicion on the re-use of construction and demolition waste is an important objective to reach, finding the way to make the recycle of such a waste possible also in public projects. The control on the infiltration of organized crime in the waste management is a persistent objective, as well as the importance of a shared knowledge among the different actors involved in the process on environmental issues concerning waste.

It is evident that in Naples the most pressing objectives are those concerning wastescapes that strongly affect environmental perceptions and inhabitants' quality of life.

3.2.4 AS-MFA

As mentioned before, some outcomes of the spatial analysis were tested and updated in the PULL workshops. The map that analytically describes wastescapes was nailed to the wall during the 5th PULL workshop and was revised and updated by participants' suggestions. Also the legend of the map was revised thanks to CRA representatives and the PULL participants. In the sixth PULL the new updated map was shown and became the base for the following interaction activities. In addition, suggestions coming from

the PULL workshops were useful to update the spatial analysis by also taking into consideration some social indicators (see REPAiR 2018a, D3.3). For this reason, the composite indicator of urban suffering, stemming from the Prin research Postmetropolis and its web atlas of post-metropolitan territories, was introduced in order to indicate urban areas in socio-economic suffering that is advanced or affected by filtering phenomena.

The PULL worktables often referred to the map of the planned expansion area and of priority areas (where public owned areas and plots are mapped together with wastescapes), both belonging to spatial analysis (REPAiR 2018a).

Instead, the results of MFA have not been adopted so far as inputs for the PULL workshops.

3.2.5 First catalogue of solutions

Some of the actions listed and prioritised in the PULL workshops can be identified as a first catalogue of solutions with regard to the three waste flows selected in the REPAiR research. Hereafter there is an initial list, to be discussed and defined in the next PULL meeting in the sample area:

- reuse of confiscated lands and buildings, former landfills and other wastelands;
- free access to CDW collection centres (no legal recognition required);
- incentives for implementing OW collection centres;
- incentives for depositing CDW in collection centres;
- realization of integrated centres for optimal reuse of durable goods (CIRO) based on CDW
- activation of synergies with pivot actors in the recovery of wastelands;
- treasuring existing projects and plans;
- measures that allow the reuse of CDW in public projects;
- natural surveillance actions along infrastructure;
- enhancement of information and education on the waste management cycle.

3.2.6 Next steps

In the coming months UNINA Team's efforts (WP6, WP5, WP3) will be directed to:

- testing the prioritization of objectives through public discussion in the next PULL event;
- constructing and specify the first catalogue of eco-innovative solutions, through an interaction session in next PULL event;
- organizing meetings with institutional stakeholders in order to better define the way to implement the projects coming from the three worktables developed in the PULL WS.

4. Follow-up cases

4.1 Ghent

The focus area for the PULL Ghent is defined as the city of Ghent and the neighbouring municipality Destelbergen. The area covers two municipalities, each legally responsible for the implementation of its municipal waste policy. However, they both delegate power to the inter-municipal organisation IVAGO as far as the collection and treatment of waste is concerned.

The focus area covers urban, peri-urban and more rural areas. Based on the typology used by OVAM, Ghent is considered as a large and regional city, Destelbergen is considered as a more rural, medium-sized municipality with mainly industrial activities.

The PULL Ghent focuses on bio- and residual waste. Because residual waste contains a vast amount of bio-waste, it is important to increase separate collection of bio-waste to improve the valorisation potential (e.g. from incineration to digesting/composting). While there is overall agreement among stakeholders about the general objective, i.e. to further decrease the total amount of residual waste by further reducing the amount of bio-waste in the residual waste, there are fewer consensuses on the means/actions needed to achieve such goals. Not only separate collection of waste and better valorisation are pathways worthy of exploration, but also prevention and reuse strategies are investigated. In the transition to a circular economy all steps of the value chain will need to be taken into account. However, focus is still on those actors of the value chain that are available in the focus area or region.

The upcoming revision (2019) of the ***Flemish regulations for the sustainable management of material cycles and waste*** will change the context for the management of bio-waste for households. As of January 2019 the definition of green-fruit and garden waste will be broadened to kitchen waste. In the coming years, the separate collection of kitchen waste, food waste and former foodstuffs will also become compulsory for companies.

Table 4.1.1 - Overview PULL events, Ghent (OVAM 2018).

EVENT TYPE	DATE	N. OF PARTICIPANTS	DURATION
1st PULL meeting	1st March 2018	23	3.30 hours
2nd PULL meeting	5th June 2018	-	-

This will impact the total amount, collection and treatment schemes for bio-waste and opens opportunities for eco-innovative solutions. According to the GDSE visualisation chart in D6.3 (REPAiR 2018b: p.64), the current stage for the Ghent case is located at

the PULL-M – Cognitive phase.

4.1.1 The PULL meetings and workshops

At present, one PULL meeting has been conducted. The first PULL meeting for the Ghent focus area took place the 1st of March 2018 in the Faculty of bioscience engineering of the University Ghent, in the city centre. We received 29 registrations and welcomed 23 participants, representing different sectors involved or affected by material management.

Table 4.1.2 - List of participants in the first PULL meeting, Ghent (OVAM 2018).

SECTOR	PARTICIPANTS	EXCUSED
Municipality	4	1
Waste management	4	1
Universities, research and consulting institutions	6	1
National/regional government	2	
REPAiR-team and PULL-team	6	1
others	1	2

The participants were invited based on their involvement in waste management and Circular Economy, especially dealing with bio- and residual waste, in the focus area. Apart from the key stakeholders participating in the REPAiR project, the stakeholders interviewed for D6.2 and those indicated as possible interesting stakeholders for the follow-up research, we identified stakeholders from the broader region who are involved in other projects in related fields, such as CE, urban planning, as inspiration for similar challenges in other neighbouring cities, or to learn from experiences in ongoing innovative projects.

The objective of the first PULL meeting was to explain the REPAiR project and its potential as a tool for the city of Ghent and its neighbouring municipalities to plan and experience eco-innovative solutions to better valorise their bio-waste flows in first place. This occasion was an opportunity for stakeholders from different disciplines to get acquainted and to engage in the project.

During the plenary session the context of the REPAiR project was set: its objectives, the approach and work in the different WPs: from data collection, over sustainability analysis to the development of eco-innovative solutions and strategies, the interdisciplinary collaboration and participatory approach.

The PULL focused then on the context of the focus area, with particular attention to the current waste management practises, some innovative and participative initiatives to prevent waste, and the challenges set by the municipality of Ghent to become a climate neutral city by 2050 (key speaker: Tine Heyse, municipal councillor of environment, climate and energy of the city of Ghent).

To prepare the round table debates, an overview was given of current challenges as

formulated during the stakeholder interviews (REPAiR 2017b). Beside some general challenges that concern the entire region (Flanders), specific challenges for the management of bio- and residual waste in the focus area were listed, with regard to processes , actors, policy and regulations.

The event was divided into two interactive Round Tables, each taking 45 minutes. During the two Round Tables, three working groups were created, each having its own moderator and a person in charge of taking notes. The groups were formed by the REPAiR PULL team, to foster the interdisciplinary character of the discussion.

The first Round Table session looked at challenges of the current waste management situation (‘as is’). In each group the participants were asked to address the following questions:

- Does the analysis of challenges correspond with your experience;
- Are some aspects underexposed or missing;
- How do you prioritise the different challenges?

During the second Round Table session, the participants discussed hypothetical theses representing challenging future scenarios which were developed by the PULL team. The objective was to have them reflect on priorities, look at new settings and contexts, and create a mind-set for innovative ideas. As a result, the following two theses were proposed:

1. As of 2020 all organic waste, collected in the focus area, is treated locally.
2. As of 2020 organic waste is no longer incinerated. We opt for the highest possible valorisation.

While the first Round Table mainly focused on opportunities to optimize existing practice and address current problems, the second session created a more open debate on new approaches, bold choices and innovative solutions.

Table 4.1.3 - Overview of activities conducted and methods used in the PULL meetings, Ghent (OVAM 2018).

PULL EVENT NAME AND DATE	ACTIVITY CONDUCTED	METHODS
1st PULL Meeting Ghent 01/03/2018	General presentation REPAiR Challenges for bio-waste in focus area First catalogue of solutions	Plenary Presentations Round table debate based on challenge tree
2nd PULL Meeting Ghent 05/06/2018	Objectives verification Objectives prioritisation Catalogue of eco-innovative solutions	

Overall, the participants were enthusiastic about the presentations, the participatory and

interdisciplinary workshops. Although the meeting did not come to the definition of a clear set of priorities, the debate was rich and many ideas for solutions were exchanged.

The next PULL workshop will take place on the 5th of June and will focus on the verification and prioritisation of objectives and a first debate on eco-innovative solutions.

4.1.2 Problems emerged and suggestions

While the interdisciplinary approach is an essential part of the REPAiR project and a real added value for the Living Lab, it also brings specific challenges to the debate. Different levels of knowledge, interests and expectations among the stakeholders need to be taken into account. Getting to know each other makes part of the participatory process.

A participatory process is also a time-consuming activity. A fine balance needs to be found between the need for participation and debate among stakeholders and the need to advance in the process. Careful time management, planning of the different steps and involvement of the stakeholders is essential. The PULL team has an important role to play in this process.

During the first PULL meeting it has been chosen not to interrupt the animated round table debate. As such, participants were not able to prioritise challenges and objectives. This will be addressed later on in the process.

For the round table sessions the participants were divided in advance in smaller groups as to guarantee the interdisciplinary composition of each group. The goal was to prevent participants from only engaging in debates related to their own field of expertise. For the creation of eco-innovative solutions, it is essential to create an open debate, where new ideas can be developed, free from any pressure of long-time traditions and regulations or established interest groups.

Also interesting to understand were the expectations of the stakeholders related to the overall outcome of the REPAiR project. At the end of the 1st PULL meeting, it became clear that some stakeholders visualised a real implementation of all investigated eco-innovative solutions during the REPAiR project. Transparency and clear communication on the GDSE tool as such seemed not sufficient; in addition, it is necessary to more clearly communicate about the level of practical implementation of eco-innovative solutions within the project's duration. Because of financial, legal, or other constraints, most eco-innovative solutions will be 'only' hypothetical, and not implemented before the end of the project. However, the GDSE tool will show the benefits and drawbacks of each suggested eco-innovative solution, which may lead to real implementation in the future, beyond the REPAiR project.

Another challenging aspect is the identification, mapping and characterisation of wastescapes for the region of Ghent; this is because land destinations are fixed for longer periods and even for the future plans are already made to use land for certain purposes. Also, the lack of participating local stakeholders with strong expertise in the field of spatial analysis contributed to the fact that wastescapes were not the core of

discussion during the 1st PULL meeting.

4.1.3 Key stakeholders' objectives

The PULL Meeting for Ghent focussed on the identification and verification of key challenges in the focus area. Based on the results of the Living Lab and the interviews done with local stakeholders (WP6), the PULL-team Ghent will identify the main objectives. The stakeholders will be consulted to verify and prioritise the objectives in the next PULL meeting, which will take place in June 2018.

4.1.4 AS-MFA

The AS-MFA was not discussed during the first PULL meeting. The REPAiR PULL team Ghent is currently collecting material and energy flow information (in quantitative form) within the region, linked to the waste management of residual and bio-waste, on the basis of mainly primary data obtained by meetings with local stakeholders. The first findings are expected to be presented in the 3th PULL meeting (date still to be announced) in Ghent to ask the participants to correct/add information on the material flows.

4.1.5 First catalogue of solutions

During the debate on challenges at the first PULL meeting, several examples of existing solutions and initiatives were mentioned. Some of the solutions might be further developed during the 2nd PULL meeting on eco-innovative solutions.

4.2 Hamburg

The focus area in the context of REPAiR is the Pinneberg County in the federal state of Schleswig-Holstein and the city-district Hamburg-Altona within the federal state Free and Hanseatic City of Hamburg. The Pinneberg county has a population of 307.471 inhabitants (31st December 2015) and covers an area of 664 km², the city-district Hamburg-Altona has 270.263 inhabitants (31st December 2016) and covers an area of 77,4 km² (Statistikamt Nord 2017).

The focus area Hamburg-Altona and County of Pinneberg is characterized by a very diverse structure of built areas (e.g. villages centers, detached house areas, social housing, retail, logistic) and open spaces (agricultural land, largest European area of tree nurseries, garden plant production, recreation areas, and natural preservation areas). It comprises urban, peri-urban and rural areas (REPAiR 2017b).

In both cases, the waste flow tackled is the bio-waste concerning agricultural waste for the tree nurseries in Pinneberg and kitchen and garden waste for the district of Altona.

According to the GDSE visualization chart in D6.3 (REPAiR 2018b: p.64), the current stage for Hamburg case study is located in the PULL-M - Cognitive phase.

The Table 4.2.1 below provides an overview of the PULL events conducted and planned in Hamburg for the near future. By the delivery deadline of the present document, only the 1st PULL meeting for the Pinneberg case will have describable results. The 1st PULL meeting for Altona district is planned too close to the deadline: for this reason, no information will be provided in this deliverable.

Table 4.2.1 - Overview PULL events, Hamburg (HCU Team 2018).

EVENT TYPE	DATE	N. OF PARTICIPANTS	DURATION
1st PULL meeting - Pinneberg	06.02.2018	17	2 hours
1st PULL meeting - Altona	22.05.2018	9	2 hours

4.2.1 The PULL meetings and workshops

In the case of Hamburg, the meetings occur in two different lines as regarding two separate projects: tree nurseries in Pinneberg and organic waste from households in Altona.

4.2.1.1 Pinneberg

First PULL meeting

The first PULL meeting occurred on the 6th of February, 2018. To this event, 17 people in total were present coming from diverse sectors: various owners of tree nurseries, the County, the local waste management company, representatives of the Tree Nursery Association, the Association of Gardening and Landscaping enterprises and the Chamber of Agriculture (see Table 4.2.2) and three from the PULL team. The participants were contacted through the Tree Nursery Association Schleswig-Holstein (Bund deutscher Baumschule Schleswig-Holstein, BdB SH), which also provided the venue for the meeting.

This meeting aimed at convincing the local stakeholders to participate in the further steps of the project. As this was the first time that tree nurseries owners and representatives were directly involved in a project-related meeting (previous contacts were held mainly by the BdB SH) a certain amount of introduction, discussion and question time were allocated. The total duration of the meeting was about 2 hours.

Table 4.2.2 - List of participants in the first PULL meeting Pinneberg, Hamburg (HCU Team 2018).

SECTOR	PARTICIPANTS	EXCUSED
Municipality (County)	2	
Waste management	1	
REPAiR-team and PULL-team	3	
Associations, Chambers	4	
Enterprises (Tree nurseries)	7	

Hence, the presentation was divided into five parts: 1) presentation round; 2) AS-MFA presentation; 3) geolocation of activities; 4) problems and objectives identification and ranking; and 5) eco-innovative solutions. Some exercises related to the problems and

objectives trees, the geolocation of activities, and the ranking of objectives were also programmed. Particular effort was invested in the first part to raise the chance of an agreement on participation, together with as simple as possible wording and visual effects.

At the very beginning of the presentation, time was dedicated for the mutual introduction of the participants. This also helped to 'break the ice' and create a more comfortable atmosphere among the guests. After a short description of the project, the team explained the reasons for the participants to be present at the meeting,

The second part consisted in the presentation of the MFA scheme shown in Figure 4.2.1 (see Subsection 3.2.4). This draft scheme was developed by the research team based on information gleaned from the interviews with the County of Pinneberg and the BdB SH: the scheme was presented in a simplified way and served as a basis to gather comments and corrections on its accuracy from the assembled experts.

It has been quickly established that the scheme was not reflective of all the realities of the case, which, therefore, opened the conversation immediately for discussion. The participants not only argued with the research team but also conversed between themselves. With that, questions about how the different tree nurseries deal with various problems and solutions were posed by the participants (e.g. 'how do you get rid of the bio-waste?'). This led to cross talk about potential solutions and regulations that affect some but not all of the producers, and the variability of experiences.

Since this exchange and discussion lasted for the entire duration of the meeting, it was not possible to proceed with the other planned points of the presentation and the exercises. However, the results were satisfying since the collaboration and willingness to participate in the project were reached. Moreover, a first list of problems, a draft collection of the stakeholders' objectives, first ideas for solutions and additional information about the MFA were acquired.

The individuated problems are the following:

- The law that allows the tree nurseries to dispose (incinerate, stock) their green waste on their sites might be changed in the future and will then confront them with the problem of green waste management
- The price for green waste collection and treatment offered by service companies grew rapidly and became an economic factor
- The conflicts with neighbors of the tree nurseries caused by the on-site green waste incineration grew considerably, due to the increase of settlements in the areas
- Tree nurseries use relatively small amounts of compost. The green waste material and following materials (compost, wood) that they produce need to be used elsewhere
- If tree nurseries should use compost in the future, this compost needs to be of very high quality due to the risk of plant illnesses

The next PULL meeting will include geolocation of MFA, analysis of problems and

objectives, a ranking of these objectives, and generation of first eco-innovative solutions. Because the peak of the working season for the tree nurseries starts in February and ends in May, the next meeting for the Pinneberg case study has been planned for June 2018.

4.2.1.2 Altona

Two pre-PULL meetings took place on the 24.10.2017 and 26.03.2018 with SRH, various representatives of the Altona district administration. These meetings consisted of a preliminary discussion between the stakeholders about the development of the project REPAiR and were aimed to explore the commitment of the stakeholders on the problematic of improving waste management and urban planning towards more circularity. All participants decided to combine the work of the REPAiR project in Altona with the development of the Climate Action Plan Altona. This plan is being developed by the district and consultants in a participatory process involving citizens and civil society actors. It comprises five action fields, of which one is about sustainable consumption, waste, and circularity. The plan is supposed to be developed until autumn 2018, and it will include objectives for the different action fields and a list of project ideas. Projects listed in the Climate Action Plan of Altona will not have direct funding, but easier access to funding. In addition, the implementation of projects will be supported by a manager for climate mitigation employed by the district.

The cooperation between the REPAiR project and the Climate Action Plan of Altona creates synergetic effects for both sides: REPAiR can offer its analytical results and first ideas for solutions that can be used for the development of the plan. In return, REPAiR can benefit from the results of the citizen participation and the collection of information on existing initiatives and planned activities.

The HCU team was invited on the 28th of March to a public participation workshop in the frame of the development of the Climate Action Plan of Altona. During this public event, experts and local activists from environmental initiatives discussed with citizens about needs and ideas for a more climate-friendly future development of the district. One of the topics tackled during the meeting was waste management and sustainable consumption. HCU could take part during the roundtable discussion on this topic and can make use of the results.

The PULL meeting as in reference to the GDSE Visualisation Chart took place on the 22nd of May. Due to time restrictions, it is impossible for the Research Team to prepare a full description of the event by the submission of this deliverable.

In total, nine people attended the meeting with two excused (see Table 4.2.3 below). The meeting lasted two hours and was organised as follows:

- Presentation of the REPAiR project
- Presentation of the MFA for feedback
- Presentation and discussion on the problems

Table 4.2.3 - List of participants in the first PULL meeting Altona, Hamburg (HCU Team 2018).

SECTOR	PARTICIPANTS	EXCUSED
Municipality (district)	1	
Waste management	3	
Universities, research and consulting institutions	1	
National/regional government	1	
REPAiR-team and PULL-team	2	
Housing companies / neighbourhood management	2	2
NGOs		2

Other topics, such as objectives and eco-innovative solution generation where prepared, but due to time issues, they were not presented. However, the results were satisfying since the collaboration and willingness to participate in the project were reached. Moreover, a first-list of problems, a draft collection of the stakeholders' objectives, first ideas for solutions and additional information about the MFA were acquired.

The 2nd PULL meeting Altona is planned to happen in September 2018. A brief discussion followed the presentation of the problems in which the stakeholders started to confront on possible actions towards the resolution of the problems.

The individuated problems are the following:

- 38% of the bio-waste is thrown in the residual waste bin and therefore is incinerated instead of being used for biogas and compost production
- In areas with detached houses, bio bins are mainly filled with garden waste, not with kitchen waste
- Not all households have bio tons respectively other separate tons due to the lack of place in densely build areas
- There is the risk of lowering quality of collected biowaste with a growing quantity of collected bio waste. Keeping the quality of the bio waste is necessary, because of the danger of its pollution with plastic
- Generally, there is not enough appreciation for the improvement of waste management among the citizens and some stakeholders like housing companies
- Generally, there is a lack of communication and cooperation between spatial planning and waste management
- There is a lack of education on the waste problem matter in school and Kindergarten
- The key messages on improving the waste management are rather complex. This complicates the communication with citizens and stakeholders.
- The incentive for citizens especially tenants why they should separate their waste is not clear enough respectively not high enough.
- The separation of bio waste has a bad image among many citizens ("bio waste stinks") therefore they prefer to throw it into the residual waste (although this stinks as well)

- There is a lack of social control in housing communities to avoid the wrong separation of waste
- Public containers parks and sometimes areas with tons in larger housing estates are polluted, and further waste (bulky waste) is placed there. This lowers the acceptance of using them for separated waste collection and badly influences the quality of public / semi-public spaces
- Public container parks sometimes lack accessibility for elderly and disabled persons
- Public container parks sometimes not placed in an optimal site for users
- Green waste from public green usually is not delivered to the waste management company to include it into the bio-waste processing (biogas, compost production)

Between the 19th and 22nd of June, HCU will hold a student workshop during which eco-innovative solutions will be developed by the students. This event is part of the methodology, and the local stakeholders demonstrated their interest in participating at the final presentation done by the students. More information about the workshop is to be found in the Subsection 4.2.5.2.

4.2.2 Problems emerged and suggestions

4.2.2.1 Pinneberg

In the case of Pinneberg, the simplicity of the presentation together with the clear statement that the audience did not represent simply a passive listener, but rather active participants to the project, played a relevant role in gaining their interest. Moreover, the team clearly expressed the necessity of the stakeholders' knowledge in the project: this helped to raise the self-confidence of the audience. Since this event represented the first moment in which different tree nurseries set together to discuss about a common project in the field of waste management, the meeting had to be focused more on a cognitive basis rather than practical. When referring to the GDSE visualization chart in D6.3 (REPAiR 2018b: p.64), it might be the case that the tasks expected to happen in the first meeting are too many to be resolved in one single event. Moreover, the cognitive PULL meeting covers an important role: it might be necessary to split it into several steps, according to the complexity of the case and the number of stakeholders involved. An introduction round at the beginning of each PULL event should be considered as well, in case new stakeholders jump into the project.

Finally, if on one side the first application point corresponding to the first PULL Workshop presents too many activities expected to be performed, it became clear that the ranking of objectives can be achieved immediately after the objectives identification within the same event. This is achieved because these objectives and their importance are clear to the stakeholders once discussed with the problem and objective trees method.

4.2.2.2 Altona

Several Pre-PULL meetings were held with the main stakeholders at the district of

Altona and SRH (see previous Subsection 4.2.1.2). The first PULL meeting has been held on the 22nd of May: due to the proximity with the deadline of the present deliverable, only selected results can be described.

Generally, the impression from the Research Team on this first PULL meeting was positive: the stakeholders demonstrated an interest in the project and the finding of solutions. The representatives of SRH contributed with a presentation of their quantitative analysis on waste separation of households in different types of neighbourhoods.

As for Pinneberg, the schedule that the GDSE VC foresees is too dense. As well as for Ghent, the stakeholders are at the moment pushing for a concrete result from the project, a necessary condition for them to participate in the process.

4.2.3 Key stakeholders' objectives

4.2.3.1 Pinneberg

The Based on the discussion during the first PULL a draft list of the stakeholders' objectives was generated:

- The collection and treatment of green waste from tree nurseries is organized to avoid on-site incineration and to make use of the green waste for production of energy and compost, respectively for reuse of wooden material.
- The newly organized collection and treatment has a moderate price and is feasible from a logistic point of view for the tree nurseries.
- The compost that will be produced during the process is of high quality avoiding the risk of plant illnesses when it is used in tree nurseries.

This list of stakeholders' objectives will be discussed and ranked during the next PULL event, which is planned for summer 2018. However, the planned methodology for this activity has been already delineated and prepared for this event and is presented below.

4.2.3.2 Altona

For what concerns the objectives for the PULL Altona, a first list has been drafted by the Research Team based on the interviews and pre-PULL meetings with the local stakeholders. The research team merged the initial list with additional objectives that were generated out of the discussion during the first PULL event on 22 May 2018.

- The list of objectives includes the following items:
- The amount of collected biowaste is higher
- The collected biowaste is of high quality (no pollution with other waste types)
- Citizens separate bio-waste correctly
- All households have a bio bin
- The waste topic is taken into account by urban planners since the early planning phases

This list will be discussed as the first step in the next PULL meeting.

4.2.4 AS-MFA

4.2.4.1 Pinneberg

As already explained in Subsection 3.2.1, a simplified AS-MFA was performed and presented during the first PULL meeting and illustrated in Figure 4.2.3. The analysis was drafted according to the information gathered from the BdB SH and the County of Pinneberg. The representation of the flows was done with icons to render a more straightforward picture. No quantities are present due to the absence of data. The material flow analysis shows that tree nurseries receive peat (*Torf*) from outside Germany, mainly from a Baltic country. Moreover, this material is a non-renewable resource. These two facts tell that this practice diverts from CE principles. Internally, these producers generate three types of waste: wood waste, green waste, and plastic waste. Wood is directly incinerated on the ground, a practice still allowed by law. The green parts are reused to create compost on site. External companies are in charge of collecting plastic waste, after stipulation of contracts with the single tree nursery. The products of the nurseries are sent to wholesalers or to retailers to be sold: the unsold ones and the rests are brought back.

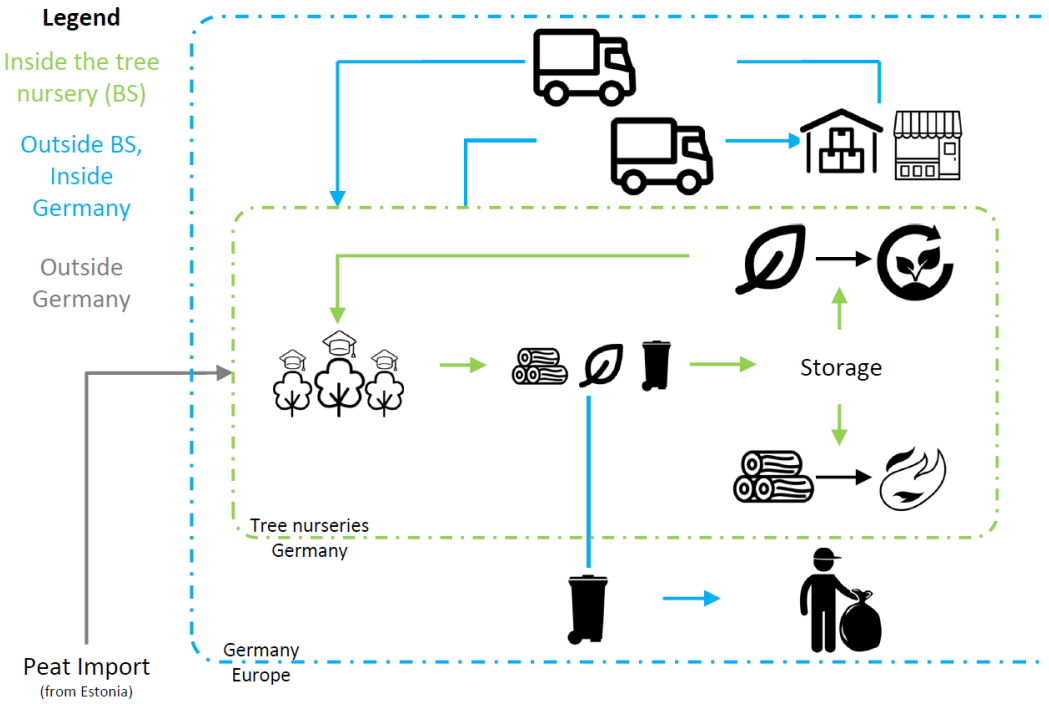

Figure 4.2.1 - Simplified AS-MFA for the tree nurseries in Pinneberg (HCU Team 2018).

The results from the meeting depicted a much more complex situation, as well as underlined mistakes.

Green waste is not used to generate compost on site, because it does not entail the necessary quality to be used for the soil and it can attract insects which can spread illnesses to the plants. This waste is instead incinerated on site, or it is collected and treated by specialized companies contracted by the individual tree nurseries.

The type of waste produced from the tree nurseries does not stop to these three

categories but includes other materials, such as pots. Although these are not part of the organic waste, they represent significant challenges for the tree nursery owners.

Tree nurseries have a rather low demand for compost, and they rather use other material e.g. sand. Furthermore, they use almost no peat.

4.2.4.2 Altona

A rough MFA has been drafted for the meeting (see Figure 4.2.2). This has been developed starting from the interviews with the local stakeholders and from a document analysis. This scheme was presented to the stakeholders during the meeting. Besides few wording mistakes, the MFA was accepted.

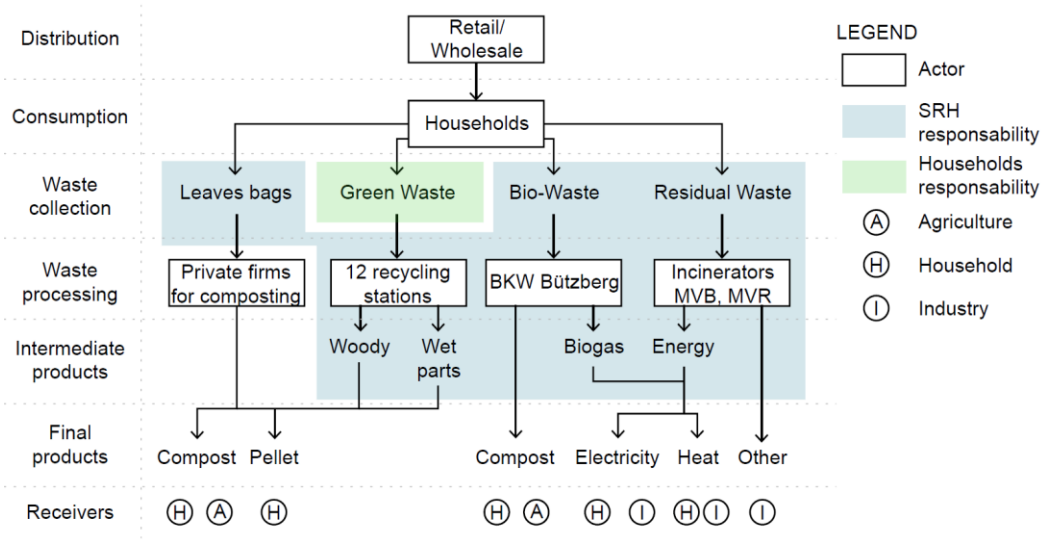

Figure 4.2.2 - Simplified AS-MFA for the households OW in Altona (HCU Team 2018).

The MFA for Altona refers exclusively to organic waste (OW) produced by households. The scheme shows clearly that a part of this waste is collected together with the residual waste, which is then incinerated: this results in a loss of potential compost and biogas production. A more precise MFA with all quantities will be drafted for October 2018, as reported by the project timeline.

4.2.5 First catalogue of solutions

4.2.5.1 Pinneberg

Due to the focus on the discussion of problems, there was not a specific discussion on solutions during the first PULL meeting in Pinneberg. However, some first ideas for solutions occurred during the meeting and cited in the following:

- The tree nursery owners expressed the wish of a central collection of their green waste. Some had the opinion that the public-private waste management company that is responsible for waste collection and treatment of the waste of private households in the Pinneberg County would be the ideal candidate for the collection of the green waste from the tree nurseries.
- Some arguments in favour of this solution were given: the company is located in

the centre of the county and of the tree nursery area; furthermore it already has a bio-waste treatment plant which potentially could also receive the organic waste coming from the tree nurseries.

- The association of gardening and landscaping companies in Hamburg has created some years ago its own composting plants to collect and treat the green waste produced by its member companies and to provide good quality compost. This example could be used as a model for the tree nurseries in Pinneberg County.

4.2.5.2 Altona

As During the first PULL, the stakeholders mentioned some possible actions with the aim to overcome the problems (see subsection 4.2.1.2). These actions can be thought as a first attempt to generate solutions and are considered as a basis for further discussion.

- Digitalisation as an opportunity: a ton that communicates. Generate attention during the physical transfer of waste (e.g., giving feedback to the citizens)
- dea to organize actions: bio-waste collection day. A reward for the community. Waste is weighed and sighted. Connected with an explanation, pedagogic and teachings aspects.
- Actions also conceivable as a competition between houses, neighbourhoods
- Collection of possible parameters / starting points how all the different actors could influence the achievement of the objectives

In the summer term 2018, a student course is conducted at HCU linked to the PULL Altona. The course aims to collect information on bio-waste (but not only) in the district of Altona which can be used for the geolocation of the MFA. The output of this course is the generation of eco-innovative solutions. The course is connected to a student workshop in June (19th - 22nd) during which students from HCU and TU Delft will be engaged in the generation of eco-innovative solutions for the four hotspots in the area of Altona (Figure 4.2.3).

Figure 4.2.3 - The four hotspots in the area of Altona object of the student workshop: 1) Rissen; 2) Blankenese; 3) Osdorfer Born; 4) Ottensen and Mittel Altona (HCU Team 2018).

The local stakeholders will get involved in the student workshop. The eco-innovative solutions generated during the workshop and at the end of this course will serve as a base for discussion on the solutions for the project REPAiR for what concerns Altona.

4.3 Łódź

The Łódź Metropolitan Area (abbreviated as ŁOM, in Polish: *Łódzki Obszar Metropolitalny*) is located in central Poland and consists of 31 local self-government units (communes) of five districts: the City of Łódź, Brzeziny County, Łódź–East County, Pabianice County and Zgierz County. One of the primary objectives shared by these 31 communes is to promote socio-economic development of the Łódź Metropolitan Area through ITI Association (Integrated Territorial Investment). The total population of this area is approximately 1.1 million. The region is responsible for a number of policies in the field of economic development and public transport, as well as certain aspects of spatial planning related to suburbanisation, infrastructure and waste management.

Based upon workshops conducted with key regional stakeholders and preliminary territorial studies, the focus area within the Łódź Metropolitan Area was selected to be the north-eastern part of the ŁOM – communes located within two suburban belts – national road 14 and 72, with a particular attention to communes of Stryków and Brzeziny.

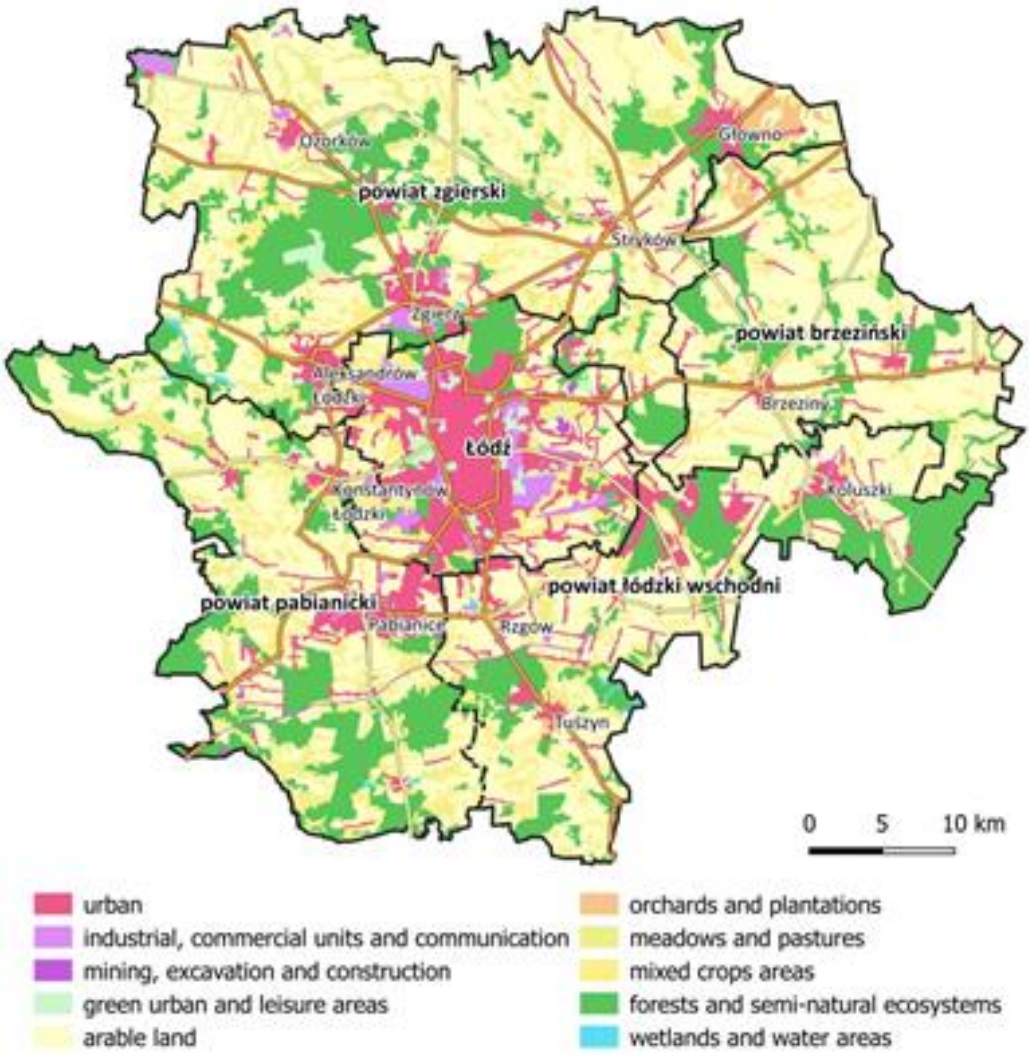

Figure 4.3.1 - Łódź Metropolitan Area, CORINE Land Cover, 2012.

The new regulations came into force in 2013 as an aftermath of introducing the Waste Management Act (14th of December 2012). Implementation of this law has reformed waste management in all aspects. According to the Act, municipal waste should be collected selectively and local self-governments are responsible for compliance with the principles adopted by the Act. Local self-government authorities are therefore in charge of managing the processes related to local waste management; they also make the most important decisions regarding forms and methods of their implementation.

The main key flow identified in Łódź peri-urban area concerns municipal solid waste (MSW). The main focus would be on the composition of MSW, the process towards a more selective waste system and extraction of biodegradable waste out of the MSW.

According to the GDSE visualisation chart in D6.3 (REPAiR 2018b: p.64), the current stage for the Łódź case study is located in the PULL-M - Cognitive phase.

Table 4.3.1 below provides an overview of the PULL events already conducted and planned in Łódź in the near future. The PULL events are intended to be organized in the city of Łódź or adjacent communes and certainly not in Warsaw (IGiPZ PAN

headquarter). The first two PULL meetings (held in February 2017 and May 2018) were organized in Łódź at the premises of Łódź Regional Development Agency (ŁARR) and this seems the most neutral place for future gatherings. However, the meeting can be also organized at the Łódź University or in the communes, which have been selected as focus areas (Stryków or Brzeziny).

Table 4.3.1 - PULL Events Overview, Łódź (IGiPZ 2018).

EVENT TYPE	DATE	N. OF PARTICIPANTS	DURATION
1st PULL meeting	1st February 2017	18	4h
2nd PULL meeting	14th May 2018	27	5h
3rd PULL meeting	October 2018	-	-
4th PULL meeting	December 2018	-	-
5th PULL meeting	March 2019	-	-
6th PULL meeting	June 2019	-	-

4.3.1 The PULL meetings and workshops

Until now, two PULL meetings have been conducted. The first PULL meeting for the Łódź focus area took place on the 1st of February 2017 and the second on the 14th of May 2018. We registered 18 participants at the first meeting and 27 at the second.

Table 4.3.2 - List of participants at the first PULL meeting, Łódź (IGiPZ 2018).

SECTOR	PARTICIPANTS	
	1st PULL	2nd PULL
Municipality	3	1
Waste management	4	6
Universities, research and consulting institutions	2	5
National/regional government	2	9
REPAiR-team and PULL-team	7	6

Identification of potential participants for the PULL meetings was initiated once the REPAiR project commenced - several target groups were recognised at that time, characterised by necessary knowledge and tools for implementing developed solutions. The basic groups of participants included: representatives of local and regional self-government institutions, waste collection companies, non-governmental organizations (NGO's), academia and research communities as well as environmental agencies. At the preliminary stage, about 40 institutions were selected. At the subsequent phase of the project, the contact database was enriched by means of face-to-face conversations, suggestions made by individuals with whom in-depth interviews were conducted, participation in important regional events (e.g. the European Economic Forum Łódzkie 2017 or European Bioeconomy Congress Łódź 2017) and promotion of the REPAiR project in the region. A crucial role in this activity was played by the Pheno Horizon

company, who has established contacts with local stakeholders of diverse fields prior to project commencement. Selection of individuals invited to the meetings results directly from their interest in the subject considered within the REPAiR project. In both cases, the meeting participants were invited by sending traditional postal letters, by e-mail (double reminder) and by phone.

The purpose of the first PULL meeting was to present the REPAiR project assumptions, to become acquainted with all participants and to identify the main problems of the Łódź Agglomeration in the field of waste management and spatial planning. The agenda of the first PULL meeting is represented in the following Table 4.3.3.

Table 4.3.3 – Order of the day for the 1st PULL Meeting, Łódź (IGiPZ PAN and PHH 2018).

TIME	ACTIVITY
10:00 – 10:15	Welcome of the participants
10:15 – 10:30	Presentation of REPAiR assumptions
10:30 – 11:30	Problem solving workshop – identification of problem areas for conducting research in the Łódź Metropolitan Area
11:30 – 11:45	Problem solving workshop round-up
11:45 – 12:30	Lunch

The aim of the second PULL meeting was a brief reminder of the overriding idea behind the REPAiR project and previously diagnosed challenges facing the Łódź Metropolitan Area in the field of waste management. Initial proposals towards developing the circular economy in the region were gathered and solutions from the metropolitan areas of Amsterdam and Naples were presented. A significantly larger group of stakeholders attended the second PULL meeting in comparison to the first one. Furthermore, a considerable increase in the number of participants from regional institutions was noticeable: Marshal Office of the Łódzkie Voivodship (various departments), Spatial Planning Office of the Łódzkie Voivodship, Łódzkie Voivodship Association of Landscape Parks or Regional Directorate for Environmental Protection in Łódź. The agenda of the second PULL meeting was as follows:

Table 4.3.4 – Order of the day for the 2nd PULL Meeting, Łódź (IGiPZ PAN and PHH 2018).

TIME	ACTIVITY
10:30 – 11:00	Registration of the PULL meeting participants
11:00 – 11.30	What is the REPAiR project about and what do we already know by dint of the project?
11.30 – 12.00	What sort of functionality and practical tools will the institutions acquire from this project?
12.00 – 13.30	Sub-Workshop 1 - What are the main issues related to waste management in the Łódź Agglomeration?
13:30 – 14:30	What eco-innovative solutions can be implemented in order to solve these problems in the Łódź Agglomeration (especially in the construction sector and spatial planning)?

14:30 – 15:00	What conclusions can be drawn from the meeting and what will be the next activities in the project?

The following activities and methods of working with stakeholders were used during the PULL meeting (Table 4.3.5).

Table 4.3.5 - Overview of activities conducted and methods used in the PULL meetings, Łódź (IGiPZ PAN and PHH 2018).

PULL	ACTIVITY CONDUCTED	METHODS
1st PULL (1.02.2017)	1. Presentation of REPAiR project 2. Participants' presentation 3. Debate to identify problems and objectives 4. Moderating discussion	1. Speech 2. Powerpoint presentation 3. Problem Tree analysis 4. Discussion 5. Round table
2nd PULL (14.05.2018)	1. Presentation of REPAiR project 2. Participants' presentation 3. Introduction to geodesign 4. Presentation of examples from Amsterdam and Naples 5. Debate to identify problems and objectives 6. Debate to identify eco-innovative solutions 7. Discussion in small focus groups	1. Speech 2. Powerpoint presentation 3. Discussion 4. Round table 5. Group work 6. Voting

4.3.2 Problems emerged and suggestions

Both meetings proceeded in a friendly atmosphere - the participants were extensively involved in the issue of waste management, in general they perceived this subject as a challenge for proper management of the Agglomeration and recognize benefits for Łódź being involved in this project.

However, one can point out several problems that the workshop organizers encountered or were reported by the participants of the meeting. The first one is the lack of findings from the WP3 "Process models", which could be presented to workshop participants. The deliverable in this field will be completed in few months and in the shared opinion of the IGiPZ PAN and PHH team, it would be valuable to objectively present the condition of waste management before discussing the problems and challenges regarding this matter in the Łódź Agglomeration. Secondly, the workshop organizers were not able to present the full functionality of the GDSE application, whereas such would certainly bring the participants closer to the applicative nature of the REPAiR project. Thirdly, the lack of empirical material often led to more general discussions or induced workshop participants to over-specify when describing a represented institution and its area of operation. Fourthly, the participants of the meetings emphasized that the project is ambitious, however the research team may encounter obstacles in reaching

relevant and complete data. At this point, it should be emphasized that gathering representatives of diversified environments and communities in one place can on the one hand lead to certain misunderstanding and diverse levels of discussion, but on the other, it provides opportunities to exchange knowledge between different groups, which in turn leads to arising the added value.

4.3.3 Key stakeholders' objectives

During the first PULL meeting three main problems were identified as an outcome of the moderated discussion and problems trees method: 1) devastation of natural resources and changes in the landscape, 2) excessively low reuse of waste, and 3) too bland education of the society in the light of Poland's changing waste management model. The Table 4.3.6 below presents the most important causes contributing to arising a given problem and the consequences following observed challenges.

Table 4.3.6 - Identified causes and consequences of three most important problems related to waste management in the Łódź Agglomeration (IGiPZ PAN and PHH 2018).

	PROBLEM 1	PROBLEM 2	PROBLEM 3
CAUSES	Expansion of road infrastructure (highway course) Poor condition of agriculture, quality of land, agricultural wasteland Unused and abandoned land Areas particularly endangered by the effects of nitrates Low awareness of authorities and society concerning environmental processes Inadequacy of current planning system Land price	Sorted waste are not collected properly Citizens and stakeholders do not treat waste as resources Shifting responsibility Scrap purchase incorporated in waste No recycling control Incompatible regional waste management plans Low number of waste incinerator plants Maladjustment of the system - problem with regulations No ideas for sewage sludge - energy-related and environmental use	No responsibility for producer Low level of social knowledge and awareness No facilities for segregation High cost of segregation for citizens
CONSEQUENCES	Dynamic change in land use vs. inertia of spatial planning Landscape change Climate change, vibration Local migration Local nuisance Declining level of biodiversity Intensive individual residential development Creation of independent local communities (double-edge-sword)	Penalties for communes for not achieving desired recycling levels Communes' initiative for constructing waste management plants without an overarching waste policy Introducing adverse solutions to comply with regulations	Lack of segregation in accordance with expectations of segregating plant Political game among the city councils

During the first PULL meeting the stakeholders were not asked for either the assessments or the ranking of the diagnosed problems. However, clear priority has been given to social awareness, in particular concerning environmental aspects. Participants also emphasized that more focus in the project should be directed towards proper waste management rather than spatial development of the wastelands.

Figure 4.3.2 - Problem Tree Analysis conducted at the first PULL meeting (IGiPZ PAN and PHH 2018).

During the second PULL meeting, due to the relatively long time since the first meeting (15 months), greater acquaintance of the IGiPZ PAN and PHH teams with the current findings of the REPAiR project, and an altered group of participants, it was decided to re-conduct the discussion on the main problems in the field of waste management in the Łódź Agglomeration. The discussion was moderated by Maciej Kowalczyk (PHH) and Konrad Czapiewski (IGiPZ PAN), while Małgorzata Grodzicka-Kowalczyk (PHH) wrote down all relevant conclusions regarding problems and objectives. The discussion was carried out in a manner that allowed all participants to the meeting to contribute, not only the most active participants. As a result, a collection of over 30 examples of problems and challenges related to waste management in the Łódź Agglomeration was successfully compiled. At the end of the workshop, the discussed issues were grouped into five main blocks - (1) Social Attitudes, (2) Spatial Planning, (3) Technology, (4) Legislation, and (5) Finance. At the subsequent stage of the meeting, each participant received five voting cards and could freely distribute them within a given category – beginning with the most egalitarian variant (sticking one voting card to each of the five thematic blocks) to the most elite option (giving all votes to one category). Due to the fact that prioritization of problems and challenges took place within the framework of the same workshops as their collection, it was not possible to rank individual challenges and thus the organizers decided to indicate groups of problems. A group of specific issues will be selected for the next PULL meeting, which will be assessed in-depth.

The problems and challenges indicated by the participants of the meeting within the five main groups are listed below.

Group of problems and challenges "Social Attitudes" - 37 votes

- Low social awareness, including decision-makers regarding the need to support waste management processes;
- Lack of social acceptance for local-use solutions, for instance concerning construction of micro-incineration plants;
- Often the constraint is the lack of acceptance for necessity of incurring the costs of waste collection, since they potentially are a valuable resource - for further commercial use;
- There have been registered numerous illegal incinerations of household waste;
- There is still a problem of attitude towards waste segregation (as a challenge) in contrast to the societies of Western Europe, where waste segregation is the norm;
- It is necessary to conduct educational, pro-environmental activities;
- Lack of social courage to counteract undesirable behavior;

Group of problems and challenges "Finance" - 22 votes

- Limited financing possibility for waste management processes implementation;
- Lack of business models allowing for improving waste management processes;
- It is necessary to enforce new economic approach towards waste - as an actual resource that can be re-used for the production of goods;
- Inappropriate use of waste management funds (e.g. too low product subsidies) - business models to be verified;

Group of problems and challenges "Legislation" - 17 votes

- Lack of reliable analyzes/simulations regarding actual needs in terms of providing waste management infrastructure;
- Lack of responsibility in terms of organic waste management;
- Lack of possibility for rational sewage sludge management;
- The existing legislative solutions in the field of environmental protection, maintaining cleanliness and waste management are not respected;
- Unregulated legal conditions affecting difficulties regarding arranging space for activities related to waste management;
- Lack of effective control methods for processes being conducted;
- Lack of a well-functioning, effective flow monitoring system (this system should consider large-scale processes);
- Lack of transparent waste management system in the Łódź Agglomeration (division into sub-regions); the Agglomeration does not have a dedicated Regional Communal Waste Management Facility (so-called RIPOK)

Group of problems and challenges "Spatial Planning" - 15 votes

- The problem lies in the lack of ensuring the development of infrastructure related to waste management in the planning documents (areas explicitly indicated for the location of facilities such as waste sorting plant accepted by

local community have not been included);

- The processes of suburbanization in the Łódź Agglomeration significantly affect the increase of costs related to waste management (e.g. costs of waste collection) which is a factor hampering the functioning of enterprises in this sector;
- The problem in the Łódź Agglomeration - especially in areas of high environmental assets - are the effects of "dispersed tourism" - significant pollution of green areas (e.g. landscape parks). Illegal waste often becomes a deadly trap for wild animals living in the area;
- Dramatic contamination of waters (e.g. retention reservoirs) resulting from uncontrolled location of zoonotic waste;
- Pollution of valleys' rivers – resulting from agricultural activity in the region;
- In the areas of downtown development (Łódź inner-city) or central parts of small towns - difficulties in finding sufficient space for collecting waste;

Group of problems and challenges "Technology" - 11 votes

- Individual studies on processes related to management of municipal and production waste should be considered;
- Lack of technological lines allowing for improvement of waste management processes;
- Not entirely harnessed opportunities resulting from energetic potential of waste – in this cases regulations at state level are required (use of waste in the energy sector);
- The use of central heating systems by the means of waste incineration processes is worth considering;
- An attempt must be made to enforce the method of controlled waste incineration, thus avoiding the cases of "uncontrolled fires";
- There is a need to limit the use and thus production of non-recyclable materials (e.g. certain types of plastics);
- Lack of commercial biogas plants that could contribute to solving the problem of organic waste management;
- Post-production waste problem related to zoonotic waste;

Figure 4.3.3 - Participants during the PULL workshop (PHH and IGiPZ PAN 2018).

Both the first and the second PULL meetings proved that the most important problems within the ŁMA when it comes to waste management relate to social attitudes. These result from low pro-environmental awareness, old habits, disrespectfulness towards the landscape, but also from a misunderstanding the idea of circular economy. Residents do not see significant benefits in waste segregation, because either (1) they do not perceive waste as a resource, or (2) they do not see economic benefits behind such approach (collection costs for segregated and unsegregated waste are very similar) or (3) they claim that they should receive remuneration for selecting waste and currently they are charged for doing so. Therefore, all participants of the PULL workshops agreed that the basic key flow that should be analysed within the REPAiR project in the Łódź Agglomeration is municipal solid waste.

4.3.4 AS-MFA

The AS-MFA was not discussed during the first two PULL meetings.

4.3.5 First catalogue of solutions

During the 2nd PULL Meeting, thirty several problems and challenges in the field of waste management in the Łódź Agglomeration were identified. Subsequently, these were divided into five main groups, which were subjected to voting and ranking by the workshop participants. As decided by gathered stakeholders, the largest number of votes was assigned to problems and challenges within the groups "Social Attitudes" and "Finance". Workshop participants were randomly divided in half, sat at tables and discussed problems and challenges from these two groups attempting to find solutions to

them. To each group was given a set of "eco-innovative cards" that participants or the moderator could fill in. Due to the common consent for concentrating research efforts upon municipal solid waste, individual types of waste were not discussed, but within the frames of two most important groups of indicated problems and challenges. This part of the PULL workshop lasted about an hour and ended with a gathering in a dozen or so ideas (Table 4.3.7).

Table 4.3.7 Identified eco-innovative solutions aimed at tackling the main problems of waste management in the Łódź Agglomeration (IGiPZ PAN and PHH 2018).

NO	SOLUTION	MEANS OF IMPLEMENTATION	FINANCING
1	Establishing a financial system in which fees for waste disposal are directed to the general budget	Establishing a linkage - from the producer to the state budget, streamlining the system of fund flow	Altering the state budget management model
2	Simplification of actions related to recycling process, then gradual expansion in this field	Enhancing process efficiency	-
3	Conducting educational activities among youth	Working out desired habits for future life	State and regional measures (also EU funds)
4	Applying subsidies to products using re-used resources	-	New business models
5	Waste co-incineration	Increasing the use of recovered resources	State and regional measures (also EU funds)
6	Extension of product warranty	Reduction of waste by extending the life of product	-
7	Establishing flexible waste collection system (giving away waste by phone)	Facilitating the process, engaging local community in the joint problem and developing the sense of shared responsibility	-
8	Allowing re-use of objects (e.g. clothing) in a systemic manner	Reduction of waste by extending the life of product	-
9	Establishing a system of returning packaging at points of purchase - "bottle return machines" rewarding with the issuance of a lottery ticket (attractive prize randomly, for example, once a year - a car)	Presenting the process of segregation and return of raw materials as an attractive and lucrative process - increasing the number of people involved in recycling, "closing" the circulation of raw materials	-

10	Developing socially accepted methods of informing about improper behavior regarding handling of raw materials (e.g. acceptance for informing the services about illegal landfills)	Reducing unwanted incidents, organizing waste management, forming social pressure	State and regional measures (also EU funds)
11	Pointing out the benefits of selective collection - rewarding local communities for desired attitudes (e.g. awarding them in form of an attractive development of common space)	Presenting the process of segregation and return of raw materials as an attractive and lucrative process - increasing the number of individuals involved in recycling	New business models (funds saved in the process)
12	Implementing energy and waste management system in the city with significant public participation (including the use of online tools)	Enhancing social awareness, transferring knowledge on instructions about the process	State and regional measures
13	Establishing a system-based solution for the education of children	solid development of desired habits in future adults, indirect involvement of whole families	State and regional measures (also EU funds)
14	Change of legislative conditions and attitude of individuals responsible for planning documents, basing decisions upon balance sheets and forecasts of needs in the field of waste management infrastructure, obligation to appoint places of infrastructure related to waste management	Enabling space management, considering the principles of sustainable development in a manner allowing for implementation of waste management processes, enabling management of waste in each administrative unit	State and regional measures (also EU funds)
15	Dissemination of the idea related to waste incineration, construction of incinerators in commune's areas	Waste disposal	State and regional measures (also EU funds)
16	Raising the level of social awareness regarding possibilities of waste management	Increasing the efficiency of selective waste collection process	State and regional measures (also EU funds)

4.4 Pécs

In the case study area, the FA is the City of Pécs. Pécs is located in South-West of Hungary. There were 144.675 inhabitants at the end of 2016 (KSH 2017). Pécs belongs to the NUTS2 statistical region of South-Transdanubia, one of the less developed areas of Hungary and the European Union.

The FA contains only the territory of the municipality of Pécs which is a LAU2 unit in Hungary. This administrative entity seemed like a good scale for the modelling phase

(with a lot of local data). According to the classification in Wandl et al (2014) the case study area covers urban, peri-urban and rural areas (Figure 4.4.1). The waste management system of Pécs must handle this territorial diversity and the morphological problems as well (Pécs is a mountainous, hilly area).

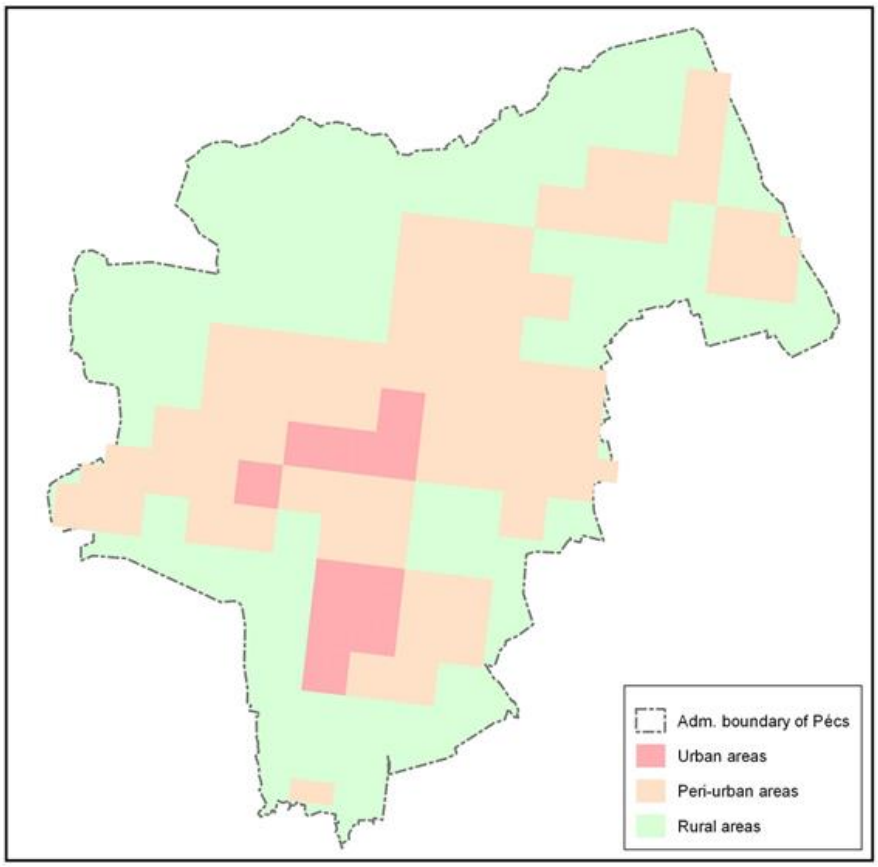

Figure 4.4.1 - Urban typology of Pécs (designed by RKK Team 2018).

Taking into account the governance levels of Hungary, more or less all are involved in the organisation of waste management system of Pécs. The State and the state administration organisations have the most important role in the waste management, as it manages and controls the main actors of the sector (e.g. authorities, public service providers, local governments (who are the order of the service)), and the rights and obligations of these actors. Due to a new regulation came into force in 2017, the State is the owner of the secondary raw materials collected by the public service providers. Regarding to the NUTS3 territorial level, county governments have only indirect effects on the waste management processes by their development and spatial (physical) planning roles.

Until 2017, the waste management company of BIOKOM Nonprofit Ltd. - owned by the city of Pécs - was the public service provider of the city and its surrounding area. Since the selective collection system started in Pécs in 1995, BIOKOM became a very well-known organization in the region with a 'hallmark' of selective waste collection. From 2017 the new waste public service provider of Pécs and Pécs's region is Dél-Kom Ltd. - 100% owned by the BIOKOM Nonprofit Ltd.

Having regarded the EU ISPA/CF fund allocation and their development activities in waste management, the Mecsek-Dráva Municipality Association was created to manage the Mecsek-Dráva Project Area. This project area encompasses 313 municipalities within the region of Pécs. Due to the legislative change BIOKOM's previous waste manager function was transferred into a property manager of the Mecsek-Dráva Municipality Association's assets, sites and infrastructure.

According to the GDSE visualisation chart in D6.3 (REPAiR 2018b: p.64), the current stage for Pécs case study is located out of the PULL section, because only one pre-PULL event was organised. The reason is that Pécs case is at the end of the timeline of PULL organisation among the follow-up case studies.

4.4.1 The PULL meetings and workshops

Table 4.4.1 below provides an overview on the PULL events planned and organised in Pécs in the near future. By the delivery deadline of the D6.4 only one pre-PULL for the Pécs case is indicating some evaluable results.

Table 4.4.1 - Overview PULL events, Pécs (RKK Team 2018).

EVENT TYPE	DATE	N. OF PARTICIPANTS	DURATION
pre-PULL Meeting - Pécs	28th November 2017	31	1.5 hours
1st PULL Meeting - planned	October 2018	-	-

The pre-PULL of Pécs focused on the municipal solid waste system, the selective waste collection and the general waste management questions of the city and the surrounding region. The PULL events of Pécs will concentrate on the following types of waste: biowaste (biodegradable), plastic waste and municipal waste (MSW). The main focus would be on the composition of MSW, the process towards a more selective waste system, and the extraction of biodegradable waste out of the MSW.

The pre-PULL meeting (with the title of 'Waste or Resources? - Potential Roads of a City Towards Circular Economy') of Pécs was organised in 28th of November 2017 (see Table 4.4.1) as part of the 2017 so called 'Science Month' of the Hungarian Academy of Sciences. During the morning plenary session the workshop participants heard presentations about the significance of the Circular Economy, the existing and the potential connections of Pécs with the CE, and three regional stakeholders' "waste as resource" stories. In the afternoon the REPAiR team organised a workshop around the local/regional waste management systems' challenges and the potential solutions.

From the 39 invited actors, 31 accepted the invitation and took part in the conference and the workshop. The researchers (universities, research institutions, REPAiR team members) were the dominant actors within the workshop team, but the business and civil sector had also high representation rate. It was a good turning point for the Hungarian REPAiR team, since during the first period of case study preparation we had some problems with the identification and activation of potential local stakeholders.

There were some non-regional actors, but all of the participants were connected more or less to the waste management questions (and had - at least - indirect connection to the elaboration of waste management in the case study area). All of the participants were invited based on the potential or existing involvement in the waste management and the recovery or recycling of waste. During the organisation of pre-PULL the REPAiR team focused on the municipal solid waste flows and the alternative uses of waste at local/regional level. The invited participants of pre-PULL came from the former interviewees of Pécs case and also based on the knowledge of the organizing team.

Table 4.4.2 - List of participants in the first pre-PULL meeting, Pécs (RKK Team 2018).

SECTOR	PARTICIPANTS	EXCUSED
Municipality	1	0
Waste management	2	0
Universities, research and consulting institutions	8	4
National/regional government	3	1
REPAiR-team and PULL-team	4	1
Business	7	2
NGOs	6	0

The workshop was divided into 3 sections, and the total workshop took 1,5 hours. Before the first part, after a short introduction of REPAiR project, the participants of the workshop were divided into 3 random groups by the Research Team according to the positions where the participants were sitting. Each group had one coordinator from REPAiR team. The participants more or less had knowledge about each other and the represented organisations. The coordinators managed the participants' short introductions and the first comments came from some 'leading' (partly insider) actors. The coordinators also paid attention to ask all of the group members at least once.

The first part of the workshop concentrated on problems and challenges of the waste management system of Pécs. We asked the participants to make a list from the relevant factors (problems and/or challenges). They did not have any keywords or hypotheses before or during the workshop, although there were some actors, who were already asked during the preparation of D6.2 stakeholder interviews. From the point of view of the participants, it was a free brainstorming without any predefined problem areas or the structure of them. All this has resulted in a problem list with nearly 30 elements and a solution list with 23 items, where the suggested points have some overlaps with each other. After the list-making the group coordinators asked the group members to make a priority rank from the problem areas by consensus (but not all groups did it because of time issue). In the next step we asked the 3 groups to make a brainstorming around the potential solutions in connection with the mentioned problematic issues, and then make a ranking from them. In the last section of the workshop, all of the groups had to make a presentation about the prioritized list (problems, solutions). During this section there were some professional discussion about given issues, but the participants were not able to make a discussed prioritized list of problems and solutions, because of the too wide

scope of the workshop and the lack of time for further discussions. However, the pre-PULL was a good basis for the organisation of PULLs in the near future.

4.4.2 Problems emerged and suggestions

It was a very important element that REPAiR-team had preliminary knowledge about the stakeholders and the local/regional waste issues (based on stakeholder interviews in the Task 6.1). However, it was a great challenge to identify the potential stakeholders of the research area. The invited participants of the pre-PULL came from different cities and regions with various connection to the case study area (although the local actors were dominants), from various organisations, and from diverse sectors. However, the REPAiR Research Team believes that this asset of people was not the final set of potential stakeholders for the future PULL events.

After the pre-PULL event, three lists of problems and three lists of (not necessarily) eco-innovative solutions were generated, but it is not the final prioritized problem areas and solutions for the region. Further efforts to refine the results came from the pre-PULL are needed, together with the necessity to narrow the focus both of flow(s) and territory.

The representatives of the pre-PULL came from different sectors, with different sectoral and knowledge background, interests, network, local/regional and embeddedness in connection with the local waste management and resource flows. It took a lot of time to find a common platform for discussion due to the different viewpoints and mentalities of the stakeholders involved.

Mostly, the local actors of the pre-PULL of Pécs did not have previous experience in participating at decision making or participatory processes. More effort should be put in the involvement activities for the future PULL events as occasions for the stakeholders to collect experiences in this kind of processes.

4.4.3 Key stakeholders' objectives

As mentioned previously, result of this first meeting are three lists of problems and three lists of solutions, which do not represent the final ones. Therefore, the generation of such lists will be afforded in the next events, where the problem tree method will also be used.

Below are the defined problem areas during the pre-PULL:

Group 1:

- Lack of R&D connections
- Unused local knowledge
- Lack of political will (to solve the waste related problems)
- Huge amount of food waste generated by the actors
- Unused food waste
- Bad practice of households' selective metal waste collection
- Illegal waste collection from trash (it is a loss for the service providers, because the tradable "goods" flows are going out from the system)

- Low rate of the reused waste
  - Low quality (high chlorine content), the amount and the reused proportion of RDF
  - Insufficient sewage sludge treatment
- Unused industrial by-products (ie. after the biogas production of sugar factory (at Kaposvár) the by-product of sugar beet is not utilized)
- The municipal waste-water management could also be circular, but it is a partly used potential at the moment (there is a biogas power plant on the waste-water treatment site but there are other development plans - theoretical one at the moment - towards circularity)

Group 2:

- The framework came from the too centralised regulation (centralization, monopolization etc.)
- Intensive realization of economic interests
- Lack of effective prevention
- Lack of effective communication
  - Problems with public information
  - Problems come from the information transfer
- Limited opportunities in the selective collection of waste (at the area of households' food waste and composting)

Group 3:

- Bad practice in the utilization of waste
- Burning of waste at households' level (poor families partly use waste for heating in winter time)
- The power plant's (of Pécs, 100% biomass based) inputs long-term sustainability (pros and cons) aren't visible
  - sustainable forest management needed
  - annual tenders needed
- The price of gas is still more competitive than the price of biomass
- Burnable communal waste needs large scale (industrial scale and industrial actor)
- Too high proportion of biomass within the renewable resources (where are the others?)
- Wasted areas create problem in terms of landscape
- Urban mines and old landfills
  - finished recultivation in some areas, but the external mining is still existing at small scale
  - by-product problem would arise from the re-opening of mines
- Presence of illegal landfills
- Uranium mining as potential threats (although they don't work now)
- Insufficient proportion of asbestos decontamination (first of all at houses)
- Sewage-water management and treatment problems
- Local climate problems
- Air pollution and traffic problems

- lack of electric cars and
- a law rate of public transportation

- Regulation, legal background (too centralized, hectic, unstable etc.) is needed to solve the selective collection at the schools and public institutions
- Not solved the transportation of communal waste from the non housing area

4.4.4 AS-MFA

Not discussed during the pre-PULL.

4.4.5 First catalogue of solutions

Defined solutions by the pre-PULL's working groups were:

Group 1

- Promotion of local biomass utilization at rural areas
- Use of Hungarian innovations, new technologies (i.e. wood chip boilers)
- Raise of awareness
- Sanctioning
- Use of real prices (including external costs)
- Effective use of green procurement
- Consequent implementation of city development strategies and concepts
- Implementation of financial incentives (toward SMEs and households)
- Ensure legal framework

Group 2

- Arousing needs or interests of people towards the selective collection method
- Marketing efforts encouraging the selective collection
- Obligate people to collect selectively by different tools (i.e. by rules; translucent/transparent trash; appropriate and available infrastructure)
- Seeking the best practices
- A kind of competition between the households (i.e. the best waste collecting district, area of the city)

Group 3

- Prevention (of waste generation in general)
- Management of ignorance and negligence
- According to waste collection: ensure legal framework, introduction of controls, awards
- Informative publications about the potential ways of reduction the waste, reuse the waste, the waste flows etc.
- Differentiated fees (waste collection)
- Shortening supply chains (i.e. 50 km diet)
- Pro-environmental education and awareness-raising
- Local resource based local economy as a potential
- Recycling of waste i.e. paper, food
- Burnable communal waste could be valuable and controllable with filters in a large factory or power plant

5. Conclusions

In this Chapter, some general considerations on the information provided by the partners are drawn.

First of all, the six cases present substantial differences: this is why the descriptions of the content and the methods used during the PULL events look diverse. Furthermore, due to the internal project schedule, some cases (such as for Pécs) have their PULL events planned for a later stage, and they were not able to provide detailed and complete information.

Generally, however, all cases have managed to hold at least a meeting related to the project with the local stakeholders so that they started entering the process. The following Figure 5.1 shows the progress of all partners according to the GDSE Visualisation Chart.

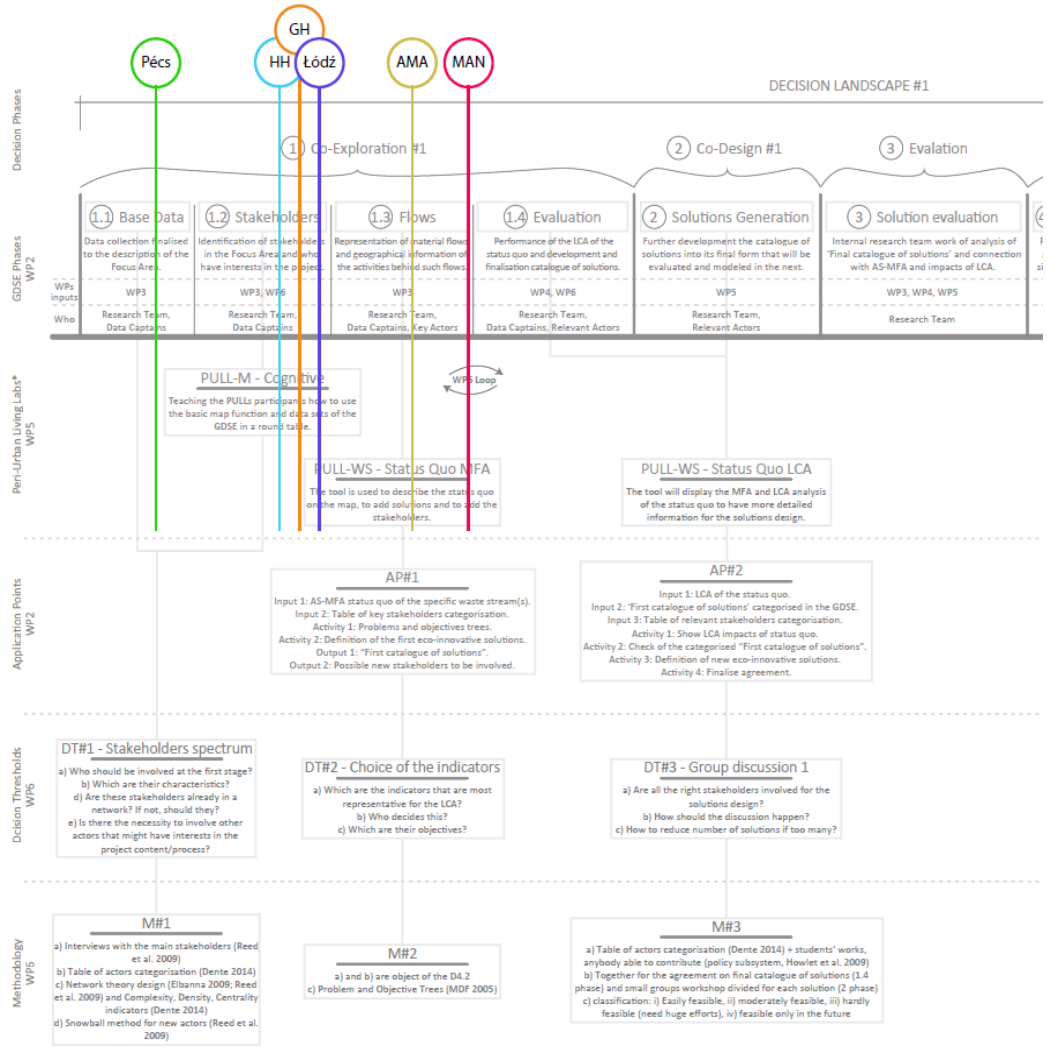

Figure 5.1 - Location of the partners along the GDSE Visualisation Chart (HCU Team 2018).

The characteristics of the meetings are rather diverse in terms of participants, duration, carried out activities, and even the number of the events conducted. These are due to the type of stakeholders involved and to the time at disposal for the meeting. For what concerns the pilots, for instance, Naples has conducted by now 8 different PULL events, while Amsterdam organised 7 PULL events. For Naples this is due to the issue, among others, of gaining the trust of citizens towards institutions. Therefore, a major effort was put on the citizens' involvement rather than directly jumping into the content. This is also the case of Pinneberg in Hamburg, Łódź, and Pécs. In the case of Amsterdam, the meetings and workshops have been organised with various stakeholders, with room for participation of various organisations. The focus was repetitively on exploring and defining the main waste flow categories, building a broad consensus about important decision-making aspects in the AMA, while unravelling the complexity of circular economy challenges within the peri-urban region. This information is provided in specific tables along the document.

Secondly, despite these differences, the type of stakeholders involved in the PULL events is generally diverse: the Research Teams have tried to have both private, public and research actors around the tables for discussion.

Thirdly, problems and objectives lists, indications on the AS-MFA, and a prior catalogue of solutions are also inputs to the present deliverable. While for the follow-up cases only the list of problems and, if available, of the objectives have been specifically asked, for the pilot cases it was asked to provide the list of objectives prioritised, since a simple list of objectives was already a content of the previous D6.3 (REPAiR 2018b). Concerning the lists of objectives, a problem with the formulation of these came out during the editing process. As already specified in the methodology Chapter of the present document, the correct phrasing of the objectives is rather imperative for the sake of the methodology. As a result, the partners agreed on rephrasing them within the document or before the next PULL event.

In addition, one of the aims of the present deliverable was to test the methodology developed in D6.3 (REPAiR, 2018b). For this purpose, a session for highlighting problems during the application of the methodology in the PULL events has been designated. Partners could also leave further suggestions for improvements. These have been divided into three categories: the ones related to the GDSE Visualisation Chart, the ones related to the PULL events, and others.

Comments on the GDSE Visualisation Chart

For what concerns the GDSE VC in REPAiR (2018b: p.64), main comments refer to the first Application Point (AP). In fact, having too many activities planned for this point is a shared opinion, because it is not always possible to keep the stakeholders in a meeting for a long time.

Linked to this, the PULL-M-Cognitive can be split into more than one meeting, as stakeholders generally do not have experience with participation processes. Therefore, big effort should be put on the organisation of the events and on the involvement of the local stakeholders.

Another comment suggests to add the information of the different deliverables and milestones in the GDSE VC to keep track of where it is possible to find which data.

Some critics have been directed to the AS-MFA, which is supposed to happen in the first AP. However, due to the difficulty in finding the required information, this activity is considered to occur too early. Nevertheless, it should anyway happen before the problems and objectives trees method, because the AS-MFA supports the identification of problems and objectives. A further point could be that in the context of the project, the GDSE programme is not ready yet (see "other comments" section).

Finally, the methods suggested in the GDSE VC should allow more freedom, since until now just one method per activity is suggested.

Comments on the PULL events organisation

The partners gave feedback related to organisational aspects of the PULL as well. For almost all of the Research Teams, the necessity of creating a common knowledge to start any activity is considered essential for achieving satisfying results. This is mainly due to the different backgrounds of the stakeholders taking part. Also, it is relevant to form groups which members are mixed, to fuel the discussion and generate interdisciplinary ideas. Because of this diversity, conflicts among the participants may arise (such as the case in Naples). To avoid these conflicts, the presence of a facilitator is also important. In general, to emphasize that the stakeholders must play an extremely relevant role in the process has helped in gaining their interest and collaboration in the project. Ultimately, PULL events have contributed not only to create a connection between the Research Teams and the local stakeholders but also within the Research Team itself. Due to the complexity of the project, it is difficult for the various work packages representatives to communicate with each other. These events have proved to be a good opportunity to jointly reach a common goal (cf. Naples case).

Regarding the difficulties, organising a participatory process requires a huge amount of time, effort and energy. Some partners have highlighted the challenge to identify the correct stakeholders to involve in the process. Lastly, it can be argued that the method of the problems and objectives trees can be slightly abstract to some stakeholders who do not dispose of field-related backgrounds. This element also points to the direction of a revision of the methodology proposed in D6.3.

Some consideration on the involvement of the stakeholders can be given at this point. Some partners highlighted that the stakeholders show a higher tendency to participate in the project as long as funds are present and if there is a concrete possibility of a real implementation of the project outcomes, avoiding mere intellectualism.

Other comments

Comments referring to other topics have been provided as well. It appears that the identification of wastescapes is still challenging. Another problematic related to the entire project is that all assumptions, methods and models are designed for, or at least are pointing to, the GDSE software application, which only will be ready for the

consortium for upcoming steps. The absence of such support tool has resulted, in some cases, in the lack of concreteness perceived both by the local stakeholders and the Research Teams. To compensate it, there is the possibility of generating an excel sheet for the main calculations as long as the GDSE is not ready, which will also represent a base for the software computation.

In general, positive comments about the GDSE VC have been made. The main merit that has been adduced to the Chart is the ability to provide an overview of the entire process by linking most of the WPs to each other. As a matter of fact, until then, an up-to-date organogram of the entire project was missing.

The Deliverable aimed also at collecting the various objectives from the case studies. Among all, it appears that one of the most frequently named objectives refers to the social awareness on waste and environment-related issues and citizens participation in the project. Moreover, the collection of data and the attempts in understanding the waste management system has not proved easy for the partners as well, due to the complexity of the topic and the technicality linked to it. This states clearly that dealing with waste is still a black box, knowledge of few, and a problem which is not perceived as such by many.

For what concerns the WP6, the next Deliverable 6.5 is planned for October 2019 and it will include the cross analysis of the achievements in the different case studies, always from a decision-making perspective.

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Appendix A - Example of Problems and Objectives phrasing

Here is an example, please acknowledge that these elements may not be correct given our lack of expertise on the area - it is just for explanation (*commentary is in italics*):

As written: Re-develop wastescapes around Schiphol within construction restrictions

Core Problem: The areas around Schiphol are underdeveloped

Causes and their individual sub-causes:

- 1. Noise restrictions limit possible uses
  - 1a. Zoning is highly restrictive
  - 1b. Code reflects older airport noise data
- 2. Greenhouses/farmlands are empty or abandoned
  - 2a. The land is no longer suitable for agriculture
  - 2a. The market is too competitive for successful business
- 3. Ownership is fragmented
  - 3a. Parcels are small
  - 3b. Ownership of some parcels is unclear
- 4. Air pollution restricts attractiveness of the area
  - 4a. The airport has sub-par pollution restrictions
  - 4b. Zoning is oriented towards industry and other polluters

This is ignoring the effects part of the chart, but we are concerned more with causes as these are where the opportunities for solution development present themselves. Now we flip the problems into objectives...

Core Objective: The areas around Schiphol are better developed *(the flip of the core problem)*

Means to achieve, and their individual sub-means:

- 1. Noise restrictions are loosened
  - 1a. Zoning is more flexible to varied uses
  - 1b. Code reflects actual airport noise data
- 2. Abandoned greenhouses/farmland are redeveloped
  - 2a. Land is suitable for agriculture
  - 2b. The businesses can compete on the market
- 3. Ownership is condensed
  - 3a. Parcels are larger
  - 3b. Ownership is clear
- 4. Air pollution effects are reduced
  - 4a. The airport has better pollution restrictions
  - 4b. Zoning reflects mixed use development

The sub-means can be broken down further, but this serves enough for an example.

From this point, we can now break down the means to achieve the objective into various sub-objectives. Not all of these will be equally feasible, and some will require far more significant changes to the system than others. This is where the ranking of objectives comes into play.

If there are going to be numerous "core objectives" identified in each waste stream, then the prioritisation ranking should take place with those core objectives. If one "core objective" is identified for each waste stream, then the means to achieve that (or the "sub-objectives") should be prioritised.

Important: When writing the problems and objectives, please keep these points in your mind and make sure your participants are aware of them:

- Describe the current situation for the problem individuation, do not forecast an implicit answer
- Be as specific as possible, avoid to be too general
- Always ask "why?" or "what causes this?" to clarify and understand sub-causes
- Objectives are outcomes, not the means to achieve those outcomes