REPAiR

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

D8.9 Exploitation Plan

Version 1.2

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Acronyms and Abbreviations

GDSE	Geodesign Decision Support Environment
GPLv2	GNU General Public License, version 2
LCA.	Life Cycle Assessment
LL.	Living Labs
PULL	Peri-Urban Living Labs
SC	Steering Committee
SP.	SharePoint
UB.	User Board
UoR	Use of Resources
WP	Work Package

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Publishable Summary

This deliverable describes the most relevant exploitable products of REPAiR, which are

- The Geodesign Decision Support Environment(GDSE) as whole or specific modules and manuals on installation, adaptation, and use;
- The sustainability assessment framework and the related open LCA module;
- The co-creation methodology implemented in Peri-Urban Living Labs and the related online handbook.
- The developed Eco-innovative solutions and the related online handbook;
- The knowledge transfer methodology and the related online handbook;

The deliverable provides a short description of the products and identifies both existing and potential exploitation routes for each of them. Furthermore, all relevant links to videos, image material, and other product documentation are presented to allow further exploitation by the REPAiR consortium and beyond.

1. Introduction

The purpose of Deliverable - D8.6: Exploitation plan - is to describe both (i) the key exploitable products of REPAiR and the (ii) most suitable exploitation actions for each product that have been undertaken to ensure the success and sustainability of its outcomes and results.

The consortium has identified the following key exploitable products:

- The Geodesign Decision Support Environment(GDSE) as whole or specific modules and manuals on installation, adaptation, and use;
- The sustainability assessment framework and the related open LCA module;
- The knowledge transfer methodology and the related online handbook;
- The co-creation methodology implemented in Peri-Urban Living Labs and the related online handbook.
- The developed Eco-innovative solutions and the related online handbook;

The exploitation plan is the project's guidance document for all project exploitation and has been developed by TU. Delft with the contribution of all project partners.

2. Exploitation Plan per Product

For this deliverable, we define exploitation as 'the utilisation of results in further research activities other than those covered by the action concerned, or in developing, creating and marketing a product or process, or in creating and providing a service, or in standardisation activities' (Ala-Mutka, 2017).

The next section describes each key exploitable product using the following aspects:

1. the title of the product;
2. a teaser to potential user;
3. A (link) to a video and/or an image to attract attention.
4. the target audience- a selection from and related possible exploitation pathways:
    - Public or private funding institutions
    - EU and Member State Policy-makers
    - International Organisations (ex. OECD, FAO, UN, etc.)
    - Municipalities and other public parties
    - Research and Technology Organisations
    - Academia/ Universities
    - Private Investors
    - Private companies
    - other
5. Result type - a selection from:
    - Policy Related Result
    - Scientific or Technological R&D Result including ICT Hardware
    - ICT Software Digital solution
    - Other Intangible Results
    - Services
    - Other
6. A short description of the product(s);
7. Links to further material and information;
8. examples of already happening exploitation (if the case).
9. The consortium members that will follow up the exploitation path.

2.1. The Geodesign Decision Support Environment as a whole and its modules

Title
Geodesign Decision Support Environment

Teaser to potential users
The GDSE is an online tool that allows creating integrated, place-based eco-innovative spatial development strategies aiming at a quantitative reduction of waste flows.

A (link) to a video and/or an image to attract attention
This video describes the key features of the GDSE:
https://www.youtube.com/watch?v=CgnAfbZNPDo&feature=youtu.be

Figure 2.1.1: The GDSE in action during a peri-urban living lab workshop session in Amsterdam

Target audience and possible exploitation pathways
The following user groups can and further use and develop the GDSE:

- *Municipalities* and other *public parties* in their process to develop circular economy implementation plans.
- *Private companies*, specifically consultancies in order to support the provision of their consultancy services in the process of developing circularity strategies, for public but also private parties.
- *Research and Technology Organisations* in a variety of fields of research that combine spatial development challenges with a metabolic (flow oriented) approach in a co-creational setting.

Result type
Software, digital solution

Short description of the product

The GDSE is an online tool designed for workshop sessions where small groups of participants in parallel cooperatively develop strategies for a more circular economy with a special focus on waste and resource management. In the REPAiR project the Peri-Urban Living Labs (PULL) provided these workshop series in which the GDSE was applied.

The GDSE has a spatial approach using maps as a key element for communication and strategy development. It also provides classic interactive Sankey diagrams and bar chart type representations of flow data.

The GDSE can also be used for workshop settings and research questions outside of the REPAiR project. It is designed as an open source tool. Therefore, it can be used free of charge. If necessary, it can also be modified by future users in order to meet their individual project needs.

Following the overall idea of a collaborative process of strategy development ("co-design"), the GDSE guides its users through five steps: (i) Study Area, (ii) Status Quo, (iii) Targets, (iv) Strategy, (v) Conclusions.

Links to further material and information

A detailed description of the GDSE as well as its modules can be found here.
Planners, researchers and decision makers interested in the geodesign decision support environment (GDSE) developed in the REPAiR project can choose from different descriptions of the tool.

- A short overview and first impression can be found here.
- The "Handbook for Geodesign Workshops" gives a general overview on how the GDSE can be used in a workshop setting aiming to develop strategies for the circular economy in a specific area.
- All details on how to prepare the GDSE for a project and its workshops and how to fill it with the data needed for a fruitful application are described in this manual on the GSDE modules .
- In addition, the technical documentation of the GDSE gives you all information on how to install your own copy of the GDSE on your server and how to modify it the way it fits best to your project needs.

As its development was funded by the European Research Program "Horizon 2020", the GDSE is open source, licensed under GPLv2 (GNU General Public License, version 2).

The GDSE and its source code can be found in the following GitHub repository: https://github.com/MaxBo/Repair-Web

A step-by-step instruction on

- how a future user can install your own copy of the GDSE on his or her own server for using it for his or her own projects and
- how a future user can modify and further develop the GDSE on his or her own

can be found in the technical documentation of the GDSE.

The following scientific publications relate to the GDSE and its application:

Arciniegas G., Šileryté R., Dąbrowski M., Wandl A., A.,Dukai, B., Bohnet, M., & Gutsche, J.-M (2019). A Geodesign Decision Support Environment for Integrating Management of Resource Flows in Spatial Planning. Urban Planning, Vol 4, No 3, p. 32-51 DOI: 10.17645/up.v4i3.2173 REPAiR 2019_08

Arciniegas, G., Wandl, A., Mazur, M., Mazurek, D. (In Press). Eliciting information for developing a circular economy in the Amsterdam Metropolitan Area. In Amenta, L., Russo, M, van Timmeren, A. "REGENERATIVE TERRITORIES. The Spatial Dimension of Circularity for Healthy Metabolisms. Two perspectives: Italian – Dutch learnings". Springer.

Cerreta M., Mazzarella C., Somma M. (2020) Opportunities and Challenges of a Geodesign Based Platform for Waste Management in the Circular Economy Perspective. In: Gervasi O. et al. (eds) Computational Science and Its Applications – ICCSA 2020. ICCSA 2020. Lecture Notes in Computer Science, vol 12252. Springer, Cham.

Obersteg, A., Arlati, A. & Knieling, J. (2020). *Decision models to support the development of circular solutions in cities*. Presentation to the CIRCULUS International Conference on Circular Economy (ICEC).

Ongoing exploitation

The H2020 funded project CINDERELA - New Circular Economy Business Model for More Sustainable Urban Construction, used and further developed the flow modul of the GDSE for flow mapping and as input for LCA studies (TUD).

The spin-off Geofluxus, founded by two PhD candidates from the REPAiR and CINDERELA projects is exploiting and further developing the flow module of the GDSE as a platform that maps, analyses and predicts where, how and which materials can be saved from becoming waste.

AMSTERDAM CIRCULAR ECONOMY STRATEGY - TU. Delft, used and further developed the flow module to contribute to establish the baseline of the circular economy strategy and implementation plan of the city of Amsterdam.

Consortium members that will follow up the exploitation path

GGR will be using the GDSE in its future research and consulting projects in the fields of "circular economy" and "waste as a resource". GGR will also use the GDSE's general framework as a technical and organisational blueprint for co-design tools and processes in future research and consulting projects in other fields of sustainable development with a spatial emphasis.

Geo-Col has demonstrated the GDSE on a number of occasions in several countries, such as Thailand, Colombia, Mexico, Chile, Australia, drawing a lot of interest and sparking all sorts of exciting discussions. Both the GDSE and the methodology to use it, are part of the toolkit utilised, rolled out, and offered by Geo-Col in ensuing consultancy projects, project proposals and assignments that involve circular economy, collaborative spatial planning, map-based co-creation, and spatial communication of information on flows of, for example, materials, resources, energy, biomass, food, all towards a quantitative reduction of waste. Notably, at the moment Geo-Col is involved in a recently launched H2020 project called FoodSHIFT2030, in which the GDSE will be adapted and applied to help modelling food resource flows in food systems and food value chains for nine European city regions. Likewise, Geo-Col has also been leading the recent adaptation and application of the GDSE within the INTERREG Deutschland-Nederland project BIVAC to model biomass flows in the Rhine Waal Euroregion, thereby helping the co-creation of biomass hubs in the region.

Usage of the GDSE beyond REPAiRin Hamburg. After the GDSE usage / presentation during the last PULL the representatives from the district of Altona, SRH and Senate Chancellery proposed that the GDSE should be presented to further experts. A first presentation of the GDSE to further experts from the department of waste management in the Ministry for the Environment, Climate, Energy and Agriculture and the Senate Chancellery was held in December 2020. It has been discussed how the GDSE could be used for follow-up projects and how to connect it with the existing data platforms in Hamburg. A further presentation is planned for early 2021.

2.2. The sustainability assessment framework and related aggregation model

Title

Comprehensive sustainability assessment framework

Teaser to potential users

The sustainability assessment framework and associated aggregation model is developed to analyse the social, economic and environmental impact of waste management systems in European cities.

A (link) to a video and/or an image to attract attention

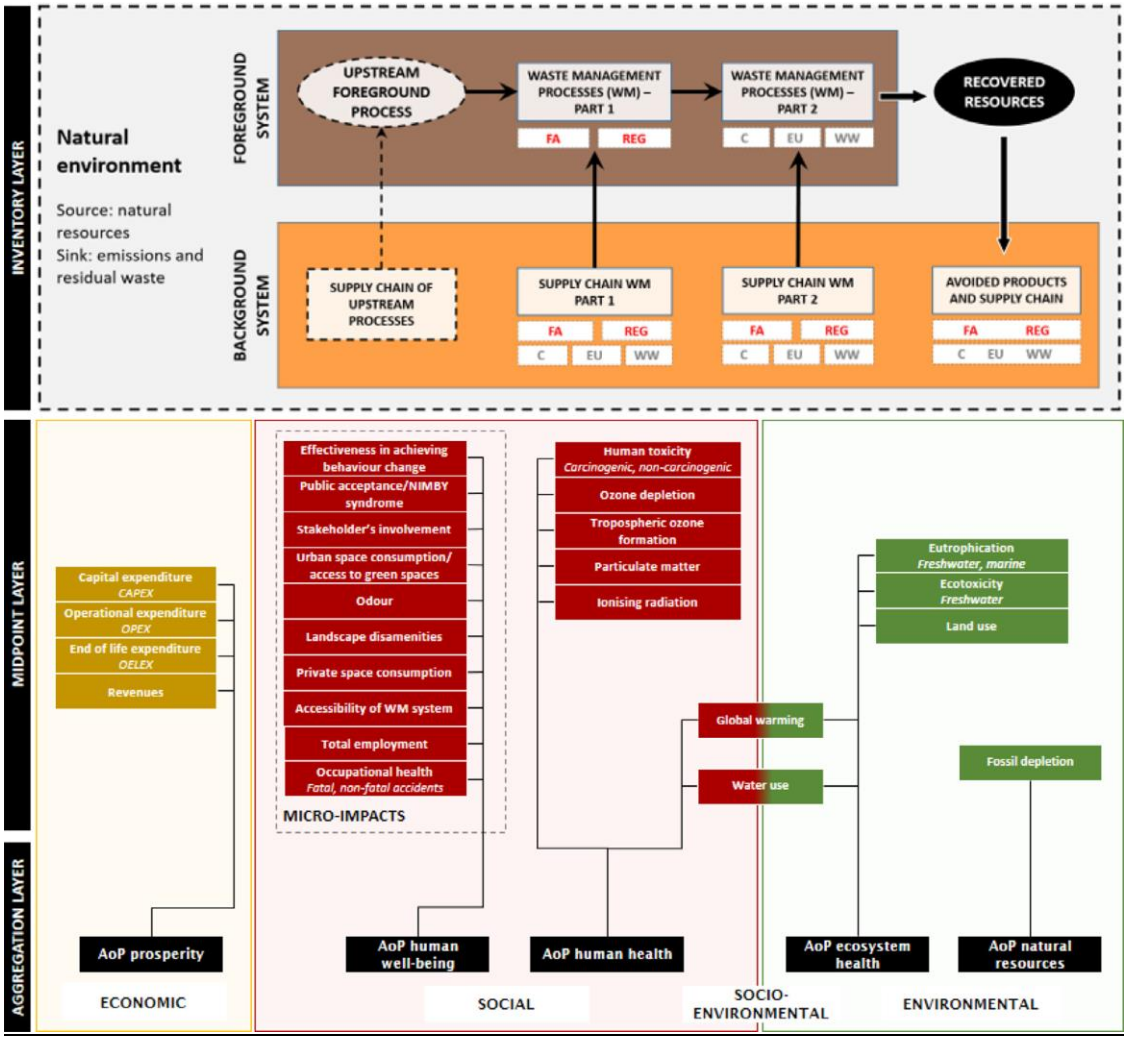

Figure 2.2.1: Diagram of the final operational sustainability framework. Waste management processes include all activities related to WM (e.g. collection, transport, landfilling, etc.). *FA=Focus area, REG=Region, C=Country, EU=European Union, WW=Worldwide*

Target audience and possible exploitation pathways

Municipalities and other *public parties* can further use the framework and aggregation model and apply it to current (or future) waste management practices within the city to understand the social, economic and environmental burdens and consequences of each of the scenarios. It can highlight the potential to improve the current practices and show how to move towards a more circular economy by tackling the processes having the highest impacts.

Private companies, especially those associated with the waste management sector, might use the framework and aggregation model to understand and quantify the effect of ongoing operations or for prospective reasons, to investigate whether a e.g. a new treatment process would be beneficial from a sustainability point of view. (cfr. social license to operate).

Academia/University and Research and Technology Organisations, as the framework development procedure is described in a transparent way and the aggregation model build-up is available (open access), these can be used by researchers to elaborate it further or to use similar approaches in another context.

EU and Member State Policy-makers, the application of the framework towards real case studies can be used to bridge the gap between science and decision- or policy-making.

Result type

Online open access publications (pdf), excel file (aggregation model), xml files (LCA indicator method)

Short description of the product

Assessing the sustainability of waste management systems (WMSs) is key to reduce the impacts incurred by human activities. The article presents the development of an operational sustainability framework for the assessment of WMSs involving stakeholders and experts from different fields. The operational framework presented achieves comprehensiveness by including multidisciplinary impacts (environmental, social, and economic impacts), accounting for spatial differentiation regarding the occurrence and magnitude of the impacts (local to global) and complementing well-established indicators used in life cycle assessment (LCA) with local impact indicators. Aggregation of the impacts is performed at five areas of protection; human health, ecosystem health, natural resources, human well-being and prosperity.

Links to further material and information

Deliverable D4.4; **http://h2020repair.eu/project-results/project-reports/** ; contains detailed information about the development of the sustainability assessment framework, provides a REPAIR method that contains LCA indicators to be implemented in LCA software (e.g. OpenLCA, Simapro). D4.4 also contains a link to an LCA method developed (containing all LCA indicators of the REPAiR framework) which is easily applicable in freely available LCA softwares such as OpenLCA: https://osf.io/myn8f/ ; https://osf.io/7x4dz/.

Taelman et al. 2020;
https://www.sciencedirect.com/science/article/pii/S0921344920302822 ; contains detailed information about the development of the sustainability assessment framework

Tonini et al. 2020;

https://www.sciencedirect.com/science/article/pii/S0921344920301749?via%3Dihub#sec0028 ; contains an application of the framework to the case of Amsterdam, providing policy recommendations for the valorisation of food waste and useful datasets based on primary data collected locally. It contains detailed information about the aggregation step (i.e. multi-criteria decision analysis, MCDA) applied in the framework alongside providing a user-friendly freeware excel-model (as supporting information)) for running the MCDA. Guidelines in the first tab of the excel file provide information on how to use the excel-model.

Ongoing exploitation

The Plasticity project, funded by the The Interreg 2 Seas programme, is analysing industrial and commercial plastic waste streams in different European cities. To address the sustainability of different scenarios, the researchers are starting from the framework developed within the REPAIR project and might slightly adapt it towards the objectives of Plasticity. https://www.plasticityproject.eu/nl/

Within the context of REPAIR, the framework has been applied to ongoing waste management practices in all cities involved in the project. Local governments are informed about the social, economic and environmental opportunities arising from the analysis of eco-innovative solutions and reflect on a practical implementation of specific solutions within their city.

The framework is currently being used by the Joint Research Centre and Technical University of Denmark (DTU) to assess the impacts of a number of food waste valorisation pathways across the EU, in the frame of the project SUSTENERGY (Danish Innovation Fund) and REPAiR.

The framework has been implemented in the waste-LCA software EASETECH patented by the Technical University of Denmark (DTU) as one of the methods available in the software to perform impact assessment studies.

Consortium members that will follow up the exploitation path

All consortium partners can use the sustainability assessment framework and aggregation model. Research institutes, academia, and consultancies (e.g. TUD, HCU, RKI, IGIPZ, UNINA, JRC) can use these exploitable materials and apply it to different cities to analyse the sustainability of other waste management systems or may further expand or adjust the framework/model towards other scientific goals. Companies and governmental organisations (e.g. IVAGO, BIOKOM, JRC, OVAM, GHM, SRH, P.H.H., GeoCOL) can apply the framework to analyse ongoing practices and propose improvements from the perspective of social, economic and environmental sustainability. The main advantage of the framework is that it provides a comprehensive overview of the impacts across the three pillars and, via the final aggregation, conveys straightforward messages to policy- and decision-makers. Equally, the user board city members (e.g. city of Ghent/Amsterdam/Lodz/BZURA Inter-Communal Association) will use the framework as it shows which solutions are worthy to further investigate and which can be implemented in practice. Especially in light of the political programmes (e.g.

Green Deal and New Circular Economy Action Plan), the application of the framework may be very helpful to quantify impacts of proposed policy targets and initiatives.

BIOKOM, the regional waste management company owned by the city of Pécs, is working in close cooperation with RKI and the University of Pécs to propose alternative solutions for the city, especially for biodegradable waste handling. Sustainability assessment performed in the REPAiR project clearly showed that an important potential lies both in prevention and anaerobic digestion of food wastes, generated by businesses and households. Prevention not only promises advantages in resource management, but also helps fighting against hunger through non-profit food saving activities. The assessment framework, the aggregation model and the xml file developed for environmental LCA are going to be exploited.

2.3. The knowledge transfer methodology and the related online handbook

Title

Online Knowledge Transfer Handbook

Teaser to potential users

The Online Knowledge Transfer (KT.) Handbook (in six languages) provides a step-by-step methodology for stakeholders/users to take and adopt an eco-innovative solution (or policy or strategy) in her/his city-region.

A (link) to a video and/or an image to attract attention

These three videos describe the barriers of KT, give tips, advice and inspiration about EIS transfer.

https://youtu.be/JiTvyVi62TY

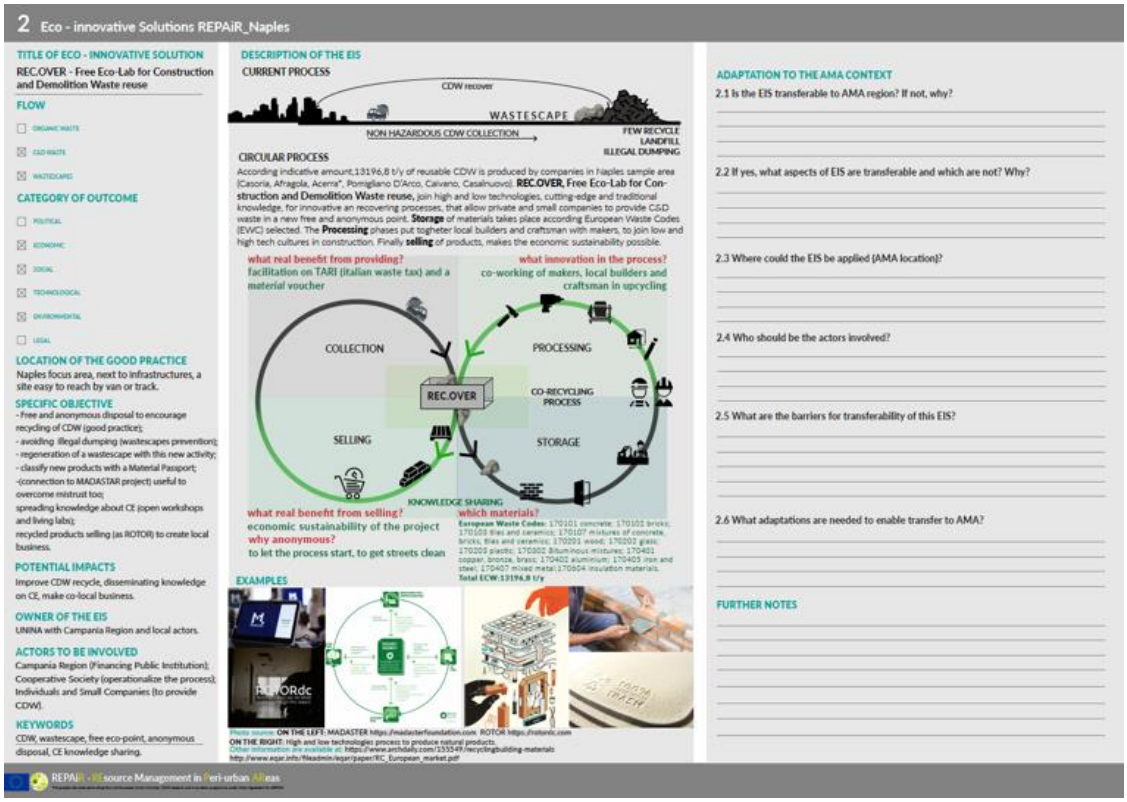

Figure 2.4.1: Knowledge Transfer sheet that was applied during the PULLs in order to identify the potential and challenges of adoption of an EIS.

Target audience and possible exploitation pathways

Municipalities and other *public parties* can use the KT handbook in the process of importing good examples, policies, strategies and EISs for their regions.
The handbook is most useful for *regional or urban practitioners* interested in transferring strategies and solutions in the waste management and circular economy policy field; however, it can also provide valuable methodological lessons and insights for knowledge transfer in territorially-focused policies promoting sustainable urban and

regional development.
Private companies - regardless of their sectoral focus - can use the KT handbook in importing EISs either in the topic of a circular economy or other topics. The steps can widely be used for adopting innovations.
Research and Technology Organisations in creation innovation can use the barrier list in order to take into consideration its most important elements in order to create an innovation that can be transferred the easiest to other territorial units. Additionally, the introductory part of the KT handbook summarises the research results, their advances and hiatus in the field of knowledge/policy transfer.

Result type
Online, step-by-step methodology; review of literature in the field; supporting videos

Short description of the product
The KT handbook provides regional and local policy actors with hands-on guidance and ideas on how to engage in knowledge (EIS) transfer in a way that helps to avoid the typical pitfalls of learning from foreign best practices. It is based on the experience of knowledge transfer 'events' and activities between six PULLs. This handbook aims to provide accessible step-by-step guidance and inspiration on inter-regional or inter-city knowledge transfer in the field of circular economy and resource management.

Links to further material and information

The theoretical model that is the basis of the handbook is written in Deliverable 7.1.

The online handbook can be found here.

A scientific paper,

Dąbrowski M., Varjú V., Amenta L. (2019) Transferring Circular Economy Solutions across Differentiated Territories – Understanding and Overcoming the Barriers for Knowledge Transfer. Urban Planning, Vol 4, No 3, p. 52-62. DOI: 10.17645/up.v4i3.2162 REPAiR 2019_09

about the experience of E.I.S./knowledge transfer in this project is here.

Other videos about its application during REPAiR can be found here:

https://youtu.be/lk5WcFPzOFc

https://youtu.be/rMRPKyqpnwc

Ongoing exploitation

Within the context of REPAIR, the steps described in the handbook have been applied to ongoing waste management practices in some cities involved in the project. Local governments and their relevant administrative units - via a dedicated KT event - are informed about the EISs co-created by other groups within the project and discussed their potential useability/adaptability in the recipient context.

Consortium members that will follow up the exploitation path

Any partners can use the online handbook. The most benefit can be achieved once the user board city members (Amsterdam, City of Pécs, Lodz, Campania region, Ghent, City of Hamburg, Bzura Inter-Communal Association) will use the handbook. Once they update their strategic plans, especially operative programmes going towards circularity, they can use the handbook to import EISs from other city regions and integrate it into their context to implement the solution.

2.4. PULL Methodology

Title

Co-creation methodology implemented in Peri-Urban Living Labs.

Teaser to potential users

The Peri-Urban Living Labs aims to co-develop and test Eco-Innovative Solutions and Strategies towards an improved metabolism of peri-urban areas for circular economy models.

A (link) to a video and/or an image to attract attention

At this link, you can find the 'Updated Handbook: how to run a PULL', in order to browse through all the steps of the PULL methodology as well as through the PULL results. Here you may find a video on Peri-Urban Living Lab methodology.

Figure 2.5.1: The co-creation process in REPAiR Peri-Urban Living Labs

Target audience and possible exploitation pathways

The aim of the PULL methodology explained in the online handbook is to share the PULL methodology widely, and to transfer it to researchers, public institutions and to all private parties, interested in implementing an Urban Living Lab.

The following user groups can further use and develop the PULL methodology:

- *Municipalities* and other *public parties* in their process to develop circular economy implementation plans.
- *Private companies*, specifical consultancies in order to support the provision of their consultancy services in the process of developing circularity strategies, for public but also private parties;
- *Research and Technology Organisations* in a variety of fields of research that combine spatial development challenges with a metabolic (flow-oriented) approach in a co-creational setting.

Result type
Online open access publications (pdf), online open-access handbook.

Short description of the product

The ultimate goal of REPAiR PULLs is the development of place-based Eco-Innovative Solutions (EIS), and Eco-Innovative Strategies for better management of material resources and Wastescapes in peri-urban areas, in order to move towards a more Circular Economy, and to activate processes of urban regeneration. The PULLs, as territorial laboratories of co-design, are focused on specific areas assumed as study cases, a significant part of peri-urban zones, for spatial and socio-economic conditions.

The Co-creation methodology implemented in Peri-Urban Living Labs methodology consists of five phases: Co-Exploring, Co-Design, Co-Production, Co-Decision, Co-Governance. In the open-access REPAiR Handbooks, each phase is investigated with regards to aims, expected outputs, required management and participatory activities (with links to useful materials), desktop research, use of the GDSE and critical lessons learned from the pilot cases. This last part is further investigated in a final comparison among pilot cases, stressing out their place-specificities that have had an impact on respective Living Labs.

Links to further material and information
A detailed description of the five phases of the PULL methodology step by step can be found here.

Planners, researchers and decision-makers interested in the PULL methodology developed in the REPAiR project can choose between two different Handbooks, varying in length and online or print version.

- A short overview of the five phases can be found here.
- The "Handbook: how to run a PULL" gives a general overview on the PULL methodology and it gives indications on how the co-creation methodology can be used in a LL aiming to develop strategies for the circular economy in a specific area. It can be found here.
- The "Updated Handbook: how to run a PULL" is an online handbook which gives all details on how to implement the co-creation methodology in a PULL can be found at this link.

As its development was funded by the European Research Program "Horizon 2020", the PULL methodology is open source.

The following scientific publication relates to the PULL methodology and its applications: Amenta, L., Attademo, A., Remøy, H., Berruti, G., Cerreta, M., Formato, E., … Russo, M. (2019). Managing the transition towards circular metabolism: Living labs as a co-creation approach. Urban Planning, 4(3), 5–18. https://doi.org/10.17645/up.v4i3.2170

Ongoing exploitation

The URBACT "Sub>urban. Reinventing the fringe" project (2015-2018) ran in parallel to REPAiR. It used Living Lab methodology to regenerate a wastescape in the UNINA focus area (Municipality of Casoria), co-creating with the institution and the community an urban public park (opened in 2019). Other wastescapes co-created in the process and already included in the URBACT Action Plan, will be implemented in 2021-23, through a program of European funds, with the scientific consultancy of UNINA.

UNINA's students have been experimenting with the Living Lab methodology within the Laboratory of Urbanism of the different Degree Courses of the Department of Architecture DiARC.

Consortium members that will follow up the exploitation path

UNINA will use the Peri-Urban Living Lab co-creation methodology in future research projects. Currently, UNINA has started spin-off research, called ECO_REGEN, that will spread REPAiR co-creation and general approach to another focus area in Campania Region territory.

2.5. The developed Eco-Innovative Solutions EIS and the related online handbook

Title

The developed Eco-Innovative Solutions EIS and the related online handbook

Teaser to potential users

The REPAiR team, with the support of the user board members, developed a catalogue, accessible online and open-source, of Eco-Innovative Solutions (EIS) which could be integrated into systemic and territorial Eco-Innovative Strategies to develop a more Circular Economy in peri-urban areas. A Strategy can include a systemic integration of two or more actions.

A (link) to a video and/or an image to attract attention

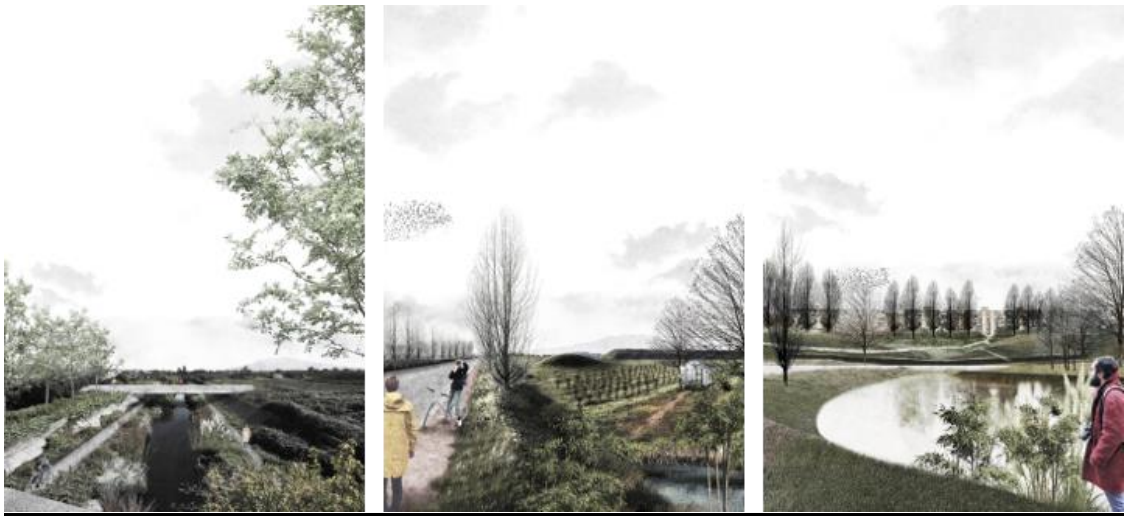

Figure 2.5.1:Towards Circular Territories. Strategies for the Metropolitan Area of Naples. Pictures by Luca Esposito.

Target audience and possible exploitation pathways

The online catalogue of EIS is to share the REPAiR Eco-Innovative Solutions widely and to transfer them to researchers, public institutions and to all private parties, interested in implementing them, even in different contexts. The EIS are site-specific elementary solutions, but they could also be transferred to different contexts.

The following user groups can further use and develop the REPAiR EIS:

- *Municipalities* and other *public parties* in their process to develop circular economy implementation plans.
- *Private companies*, specifical consultancies in order to support the provision of their consultancy services in the process of developing circularity strategies, for the public but also private parties.

- *Research and Technology Organisations* in a variety of fields of research that combine spatial development challenges with a metabolic (flow-oriented) approach in a co-creational setting.

Result type

Online open access publications (pdf), online open-access catalogue of solutions.

Short description of the product

The two REPAiR pilot cases and the four follow-up cases produced six catalogues of EIS. A selection of significant EIS per each case has been made, and a search engine is available to look for EIS organised per flows, per cases and keywords.

DIFFERENT APPROACHES TO ADDRESS COMPLEX PROBLEMS[2]		Are the problems and objectives defined?	
		YES	NO
Are the solutions defined?	YES	Optimisation	Negotiation
	NO	Innovation	Design

Position of REPAiR

FIG 2.5.2. The position of REPAiR in the matrix of solutions and objective when dealing with complex problems, source: elaboration of the TUD. Team-based on "Solution Strategies to address various complex problems", source: Land & Water Management in the Urban Environment (2009) Van de Ven, FHM, H. Gehrels, H. van Meerten, B. van de Pas, E. Ruijgh, D. Vatvani, N. van Oostrom and Th van der Linden, Deltares, Utrecht/Delft (p. 37).

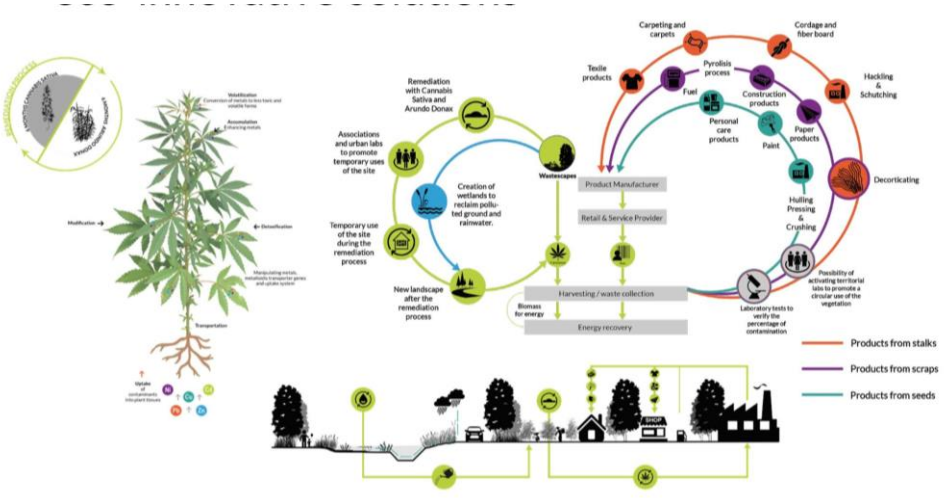

Fig 2.5.3: Circular process and life-cycle scheme based on the reuse of hemp cultivation during and after a remediation process within regenerative approaches for wastescapes.

An eco-innovative solution developed by Valentina Vittiglio with the support of Prof. Massimo Fagnano (Department of Agricultural Science) and Geol. Andrea Giugliuto (Environmental Resource Management - ERM).

Links to further material and information

REPAiR developed six catalogues of Eco-Innovative Solutions (EIS), for a total of more than 100 EIS, which you can find at this link.

The most significant EIS, among all the Eco-Innovative Solutions developed by REPAiR, have been selected and organised in the online catalogue of EIS, which you can find at this link. This search engine allows the reader to search for solutions according to Case-study Area, Waste Flow, Keywords, or PESTEL (Political, Economic, Sociocultural, Technological, Environmental, Legal) categories.

The following scientific publications relate to the EIS developed in REPAiR:

Rigillo, M., Amenta, L., Attademo, A., Boccia, L., Formato, E., Russo, M. (2018) Eco-Innovative Solutions for Wasted Landscapes. RI-VISTA 01 2018. Special Issue Out of waste landscapes. p. 146-159. http://dx.doi.org/10.13128/RV-22995 REPAiR 2018_05

Rigillo M., Amenta L., Attademo A, Boccia L., Formato E., Russo Michelangelo (2017). Eco-Innovative Solution for wasted Landscapes. In: Sixteenth International Waste Management and Landfill Symposium. p. 1-11, CISA Publisher, ISBN: 9788862650106

Dabrowski M., Varju V., Libera Amenta (2019). Transferring circular economy solutions across differentiated territories: Understanding and overcoming the barriers for knowledge transfer. URBAN PLANNING, vol. 4, p. 52-62, ISSN: 2183-7635, doi: 10.17645/up.v4i3.2162

M. Russo, L. Amenta ., A. Attademo., M. Cerreta., E. Formato., F. Garzilli, C. Mazzarella, M. Rigillo, V. Vittiglio (2019). SHORT SUPPLY CHAIN OF WASTE FLOWS FOR LANDSCAPE REGENERATION IN PERI-URBAN AREAS. In: Sardinia Symposium_ 17th waste management and Landfill Symposium. p. 1-11, PADOVA: CISA Publisher, ISBN: 9788862650144, Santa Maria di Pula (CA), 30 Settembre 2019 - 4 Ottobre 2019

RIGILLO MARINA, AMENTA LIBERA, ATTADEMO ANNA, BOCCIA LORENZO, FORMATO ENRICO, RUSSO MICHELANGELO (2018). Eco-Innovative Solutions for Wasted Landscapes. RI-VISTA. RICERCHE PER LA PROGETTAZIONE DEL PAESAGGIO, vol. 1, p. 146-159, ISSN: 1724-6768

VITTIGLIO, VALENTINA, Silvia Iodice, Libera Amenta, Anna Attademo, Enrico Formato, Michelangelo Russo (2018). Eco-innovative strategies towards peri-urban sustainability:

the case study of the Metropolitan Area of Naples.. EUROPA XXI, vol. 34, p. 23-40, ISSN: 1429-7132, doi: 10.7163/Eu21.2018.34.2

Ongoing exploitation

UNINA is using the strategies about Construction & Demolition waste flows in the Scenarios for the Recovery of Ischia Islands settlements after the 2017 earthquake. The Scenarios have also been the result of a university studio and have already been presented to local institutions. They can be the basis for the strategic masterplan in the future Urban Plan of the island.

Consortium members that will follow up the exploitation path

UNINA will use Eco-innovative Solutions and Strategies in future research projects. Currently, UNINA has started spin-off research, called ECO_REGEN, that will spread the REPAiR approach to another focus area in Campania Region territory. The solutions and strategies will then be evaluated with the settled community and then re-defined, according to site-specificities.

UNINA's students have been experimenting with the Eco-innovative Solutions and Strategies within the Laboratory of Urbanism of the different Degree Courses of the Department of Architecture DiARC.

At **TUD,** eco-innovative solutions and strategies for Construction & Demolition waste flows are at the base of research on circular building adaptation. Research by new PhD students focus on drawing lessons and implementing eco-innovative strategies through building adaptation in countries outside of Europe, like Saudi Arabia and Iran, and also aims at understanding societal aspects of these solutions, next to the mere waste flow. Moreover, the topic of eco-innovative solutions for Construction & Demolition waste is included in upcoming research proposals, like the H2020 call 'Green Deals'. MSc students have also been developing business models for implementation of eco-innovative strategies, on building and area level.

Hamburg (H.C.U. nad S.R.H.)

Implementation and testing of solutions by S.R.H. Stadtreinigung Hamburg in the frame of the project WiedergeBorn. SRH had the possibility to use funding from the Horizon2020 project FORCE to implement in a test phase the solutions **EIS1) Creating awareness about waste, EIS2) Rewarding good waste avoidance and separation behaviours and EIS4) Decentralised composting plant in kindergartens and schools,** in one of the REPAiR's sample areas, the large housing estate Osdorfer Born. The project WiedergeBorn is considered a success. SRH is now monitoring the effects over a more extended period and evaluating how comparable activities could be conducted in other areas. The composting project in the daycare centre already was replicated in a second daycare centre and met with great interest among other daycare centres. The district of Altona is very

interested in the outcomes and would like to support the replication in other comparable areas, also connecting such activities to the more strategic approach of integrated neighbourhood development.

Further development of the EIS3) Quarter Service Center. The EIS3 concept is further developed by SRH and could become part of a follow-up project. If this new project will be realised, it is planned to implement quarter service centres in at least 3 different urban neighbourhoods representing different urban typologies, just like it was planned in the initial EIS idea.

EIS5) Organic waste for urban gardening. A Master thesis is further developing this idea in the area of Ottensen. There is great interest by one local initiative idea to implement the solutions, once the concept is ready. The district of Altona proposed that the initiative should then demand funding from the climate action plan Altona for implementing the project.

EIS8) Planning guide for planners to address the waste management topic and EIS9) Design manual for spaces dedicated to waste bins and containers in large housing estates and public spaces. Two students finished their master thesis deepening the EIS. The thesis was developed in close exchange with SRH. During the PULL, both SRH and district Altona expressed interest that a presentation of the thesis should be given to experts in SRH and the district.

EIS7 Collection and processing of organic waste from tree nurseries, the implementation of this solution is still being negotiated between the tree nurseries and the public-private waste management company that is responsible for the collection and processing (fermentation and composting) of organic waste from private households.

Presentation of the EIS in front of the Committee for Climate Protection, Environment and Consumer Protection of the district of Hamburg-Altona. During the PULL the representatives of the district of Altona invited the HCU-team to present the relevant solutions (EIS 1, 2, 3, 4, 5, 8, 9, 10) in the Committee for Climate Protection, Environment and Consumer Protection of the district of Hamburg-Altona. The Committee is also responsible for monitoring the implementation of the climate action plan.

Bzura Inter-Communal Association

The Management Board of the Inter-Communal Association of Bzura adopted the scenario described in **EIS 3.13** as one of the possible solutions for the operation of the waste management system for 19 associated municipalities.

The EIS 3.13 model will be a solution for the submitted applications for co-financing under the Green Deal, as well as in the competitions of the Regional Operational Program of the Lodz Region.

This model was positively assessed by representatives of the National Fund for Environmental Protection and Water Management. It also gained positive opinions among entrepreneurs planning to undertake investments as part of the planned supply chain model.

The City of Łódź Office, which joined the REPAiR project as a User Board member, participated in many PULLs involving various units on its side. Among them, it is worth mentioning: the Department of Environmental Development, the Department of Environmental Protection and Agriculture, the Housing and Revitalization Office, the City Strategy Office, the City Architect's Office and the City Urban Studio.

The conclusions drawn from PULLs inspired a bolder approach to the issues of circular economy in many directions. The list of faculties shows the wide impact of the project conclusions for the partners in Łódź.

As a result, steps were taken to obtain funds, including in the Horizon 2020 competitions for testing and implementing the principles of circular economy as part of the management of the City of Łódź Office.

2.6. Add-on Exploitation Result

The prolongation of the project due to the CORONA pandemic but also due to the nature of the project were a decision for one case study are made in a PULL, which may not satisfy the needs of all participants led to collaborations among partners and stakeholder that went beyond the task described in other deliverables one of them is the conceptual model of an integrated Decision-Making Tool for designing in and measuring circularity inbuilt objects and their (peri-)urban context, which was developed by Delta and GHM and is presented in the following.

Title

IDMT: Integrated Decision-Making Tool for designing in and measuring circularity in built objects and their (peri-)urban context.

Teaser to potential users

The IDMT allows the user to adopt a step by step circular design team-based approach, in line with required circular procurement methodology, taking not only taking environmental and circularity parameters into account but also their financial ramifications for both CapEx and OpEx. This allows for a rational foundation for Circular Economy based Business Models.

A (link) to a video and/or an image to attract attention.

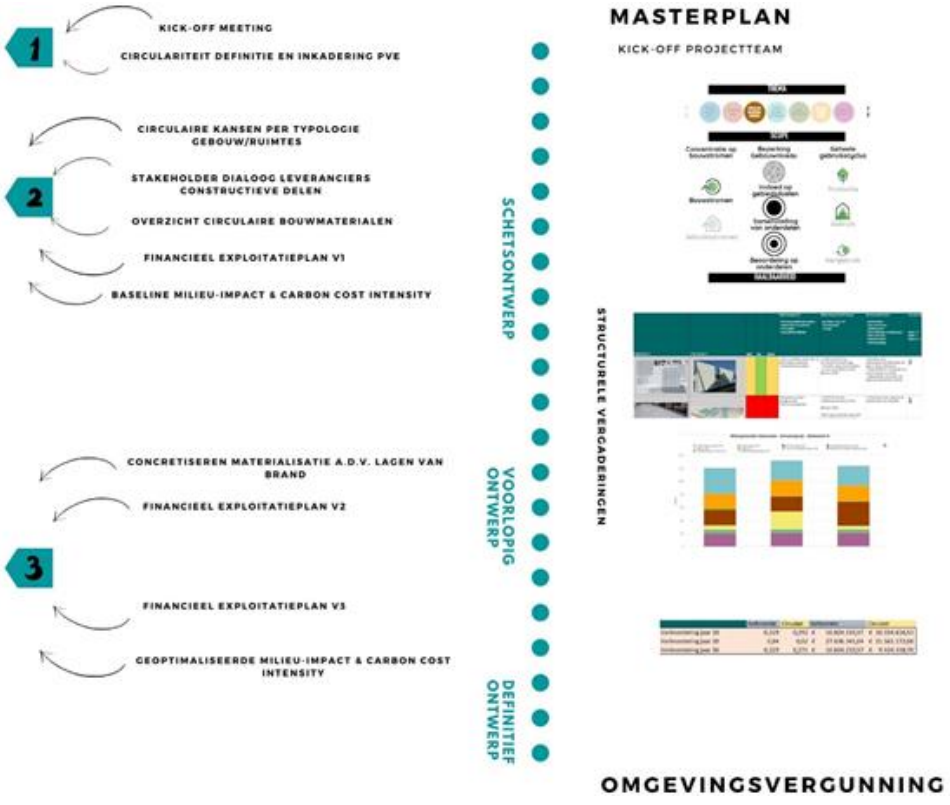

Figure 2.7.1The IDMT process

Target audience and possible exploitation pathways

- Public or private real estate developers
- Municipalities and other public parties
- Research and Technology Organisations
- Private Investors
- Private companies

Result type

A prototype concept that aims for:

- Policy Related Result: adoption of IDMT allows for policies on circular construction and procurement to gain traction and momentum faster
- Scientific or Technological R&D Result including ICT Hardware: optimisation of Circularity Parameters led to improved insights into how circularity demands can be translated into circular economy-based business principles
- ICT Software Digital solution: the integration of relevant customised and available databases on building materials and their environmental impact into one harmonised interface requires the development of new ICT tooling, which will benefit future integration efforts
- Other Intangible Results are: supports the required change in mindset towards Total Cost of Use (TCU) based financing and utilisation
- Services: an applicable tool is now available through Delta Innovations, Mandel Circular Buildings and Alba Concepts.

Short description of the product

The product consists of a planning tool, supported by a comprehensive dataset, which can be described by the following 6 process steps:

Step 1: Defining main parameters

- Defining ownership: private, public, investor, corporation, developer, etc.
- Defining type of transformation: new building, renovation, change of function
- Defining required typology: residential, industrial, utility
- Expected use cycle: temporary, several/many years, indefinite

Step 2: Defining ambition on the basis of three main strategies

- Material: minimisation, qualitative input over quantitative input (incl. social fairness)
- Environmental: production, logistics, use, maintenance, end of use
- Value based: future functional/material retention, technical 'life expectancy', optimisation of business model

Step 3: Defining concrete measures and material/product choices

- On the basis of Brand's layer model, expected use cycles are being adjusted according to whether they pertain to site, structure, skin, service, space or stuff

- Application of product database selective tool, allowing for the integration of LCA data with qualitative CE parameters

Step 4: Defining impact of design in light of existing frame of reference

- MPG, Building Code, Zoning plan, GPR: environmental impact, health impact, economic impact

Step 5: Defining impact on financial investment, the three main strategies as defined under 2, and thus the ROI, both qualitatively and quantitatively

- Minimalisation: how does a decision impact material use and waste production
- Input: how does the decision improve on physical and social sustainability of manufacturing processes involved
- Production, Logistics, (re)use-scenarios and longevity: impact on environmental footprints
- Several scenarios may now be generated, worst case, optimised case and best case, for evaluation based on financial viability and regulatory fitness

Step 6: Integrating material and energy decisions in a spatial model, establishing how they interrelate

- Establishing potential for disassembly and reassembly under minimal functional value loss
- Establishing potential for future adaptability

Links to further material and information

not yet available

Examples of already happening exploitation (if the case)

The application of the tool is now in its beta testing phase at two selected housing corporations.

References

Kirsti Ala-Mutka (2017). Dissemination and Exploitation in Horizon 2020, Presentation at the H2020 Coordinators' Day retrieved from https://ec.europa.eu/research/participants/data/ref/h2020/other/events/2017-03-01/8_result-dissemination-exploitation.pdf