



Integrating Geodesign workshops for improving waste and resource management in Amsterdam

REPAiR - REsource Management in Peri-urban Areas

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GEO | Design+BIM, 1-2 November, Amsterdam

Source: AMS Institute | Amsterdam Institute for Advanced Metropolitan Solutions

Content

- Geodesign in short
- The Circularity Gap
- The REPAiR Project approach
- The Amsterdam Metropolitan Area
Peri-Urban Living Lab



Geodesign in short

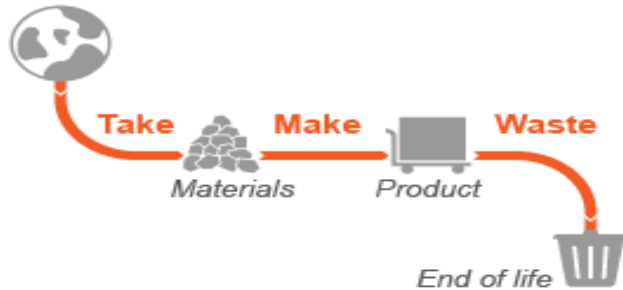
Geodesign in short: addressing six questions

- | | |
|--|-----------------------|
| 1. How should the area be described? | Representation models |
| 2. How does the study area operate? | Process Models |
| 3. Is the current study area working well? | Evaluation Models |
| 4. How might the study area be altered? | Change Models |
| 5. What differences might the changes cause? | Impact Models |
| 6. How should the study area be changed? | Decision Models |

The Circularity Gap: From a Linear to a Circular Economy

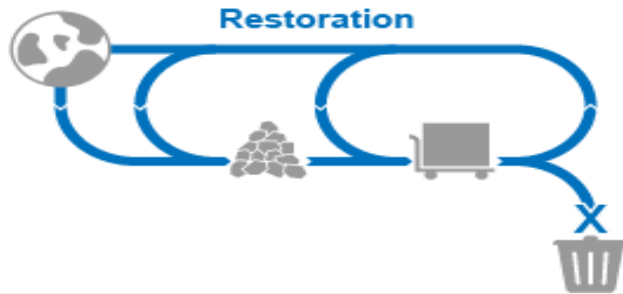
From a Linear to a Circular Economy

The linear economy



A linear economy converts natural resources into waste via production.

The circular economy



In a circular economy, there will be no loss of value and the net effect on the environment will be zero.

Circular Economy



The Ellen MacArthur Foundation's diagram: looking beyond the **take-make-dispose** extractive industrial model

The principles:

Design out waste and pollution

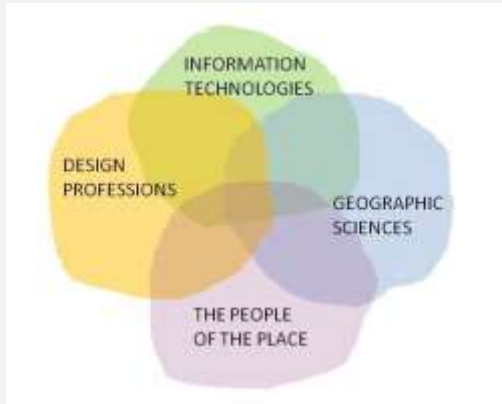
Keep resources in use

Regenerate natural systems

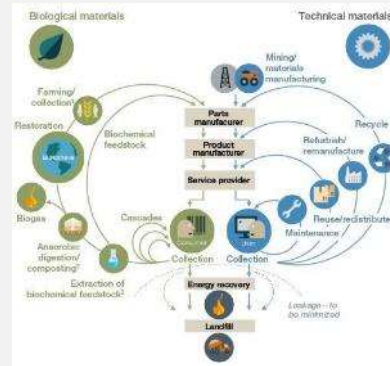
A thin, light-colored vertical line is positioned to the left of the text.

REPAiR project

REPAiR - REsource Management in Peri-urban Areas: Going Beyond Urban Metabolism



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REPAiR - REsource Management in Peri-urban Areas: Going Beyond Urban Metabolism

Horizon 2020

SOCIETAL CHALLENGES

topic Waste-6b-2015 Eco-innovative Strategies

Principal Investigator: Prof. Dr. Arjan van Timmeren

Scientific Coordinator: DI Alexander Wandl, MSc

Participant (Acronym)	Country
Delft University of Technology (TUD)	NL
Ghent University (UG)	BE
DiARC UNINA - University of Naples Federico II (UNINA)	I
HafenCity Universität Hamburg (HCU)	D
Institute for Regional Studies, CERS of HAS, MTA KRTK (RKI)	H
Institute of Geography and Spatial Organization Polish Academy of Sciences (IGiPZ)	PL
Joint Research Centre (JRC)	I
Geo-Col GIS and Collaborative Planning (Geo-Col)	NL
Delta Development Group (DELTA)	NL
BIOKOM Nonprofit Ltd (BIOKOM)	H
Gertz Gutsche Rümenapp Stadtentwicklung und Mobilität GbR (GGR)	D
OVAM - Public Waste Agency of Flanders (OVAM)	BE
Municipality of Haarlemmermeer (GHM)	NL
Campania Regional Authority (CRA)	I
Pheno horizon (PHH)	PL
Bauer Umwelt GmbH (BMU)	D/I
IVAGO (IVAGO)	BE
Stadtreinigung Hamburg (SRH)	D



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



Goal of REPAiR



To develop, test and implement a **geodesign decision support environment (GDSE)** for the development of **integrative spatial development strategies** that understand **waste** and related treatment processes as a **resource**.

REPAiR Approach

REPAiR integrates **life cycle thinking** and **geodesign** to operationalise **urban metabolism**



Framework of Geodesign (Steinitz 2012)

How?



Through the implementation of **living labs** in peri-urban areas across Europe in order to develop, test, implement and assess place-specific **eco-innovative solutions** for resource management to improve environmental and spatial quality and quality of life.

What are Urban Living Labs?



Living labs are “user-centered, open innovation ecosystems based on a systematic user co-creation approach in public–private–people partnerships, integrating research and innovation processes in real-life communities and settings”

Eco-Innovative Strategies

Alternative **courses of action** aimed at addressing both specific **objectives** and **challenges** identified within a **PULL** towards the development of innovation towards **circularity** in peri-urban areas.

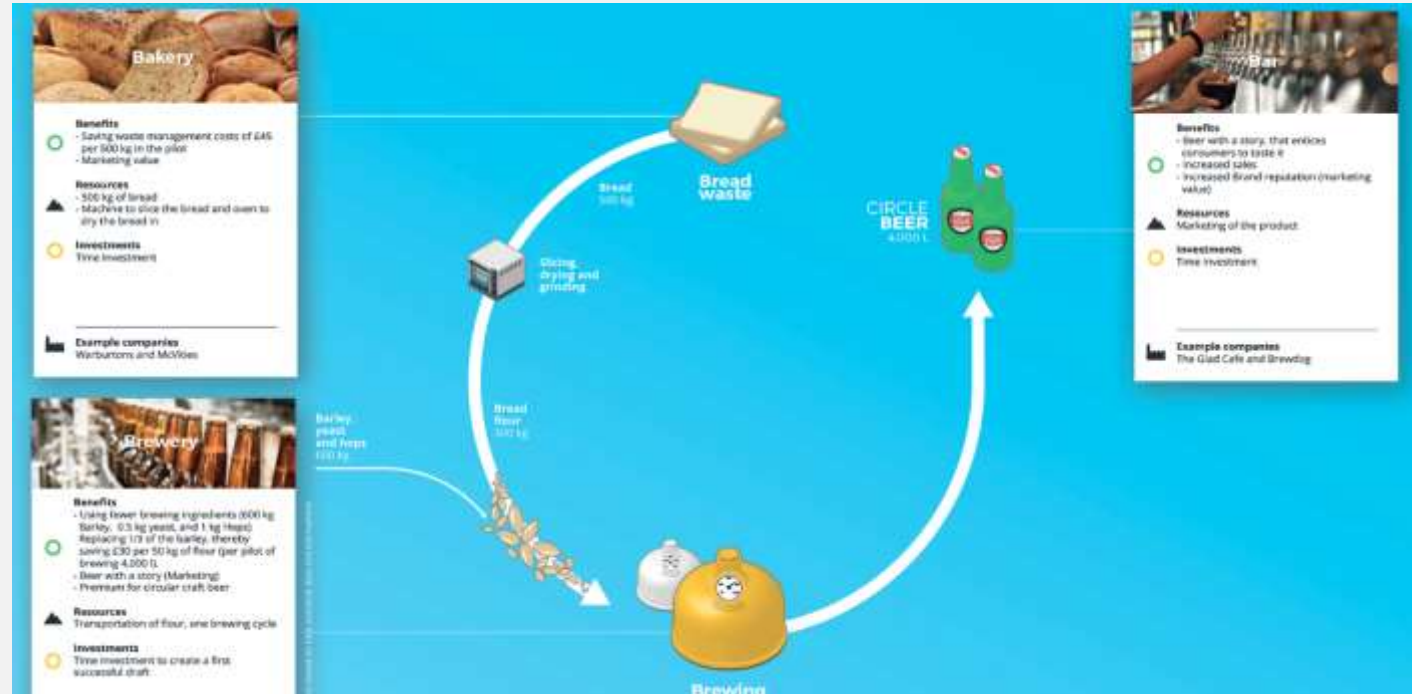
The Strategy can be composed of a systemic integration of two or more elementary actions, namely **Eco-Innovative Solutions** (EIS).



Eco-Innovative Solutions

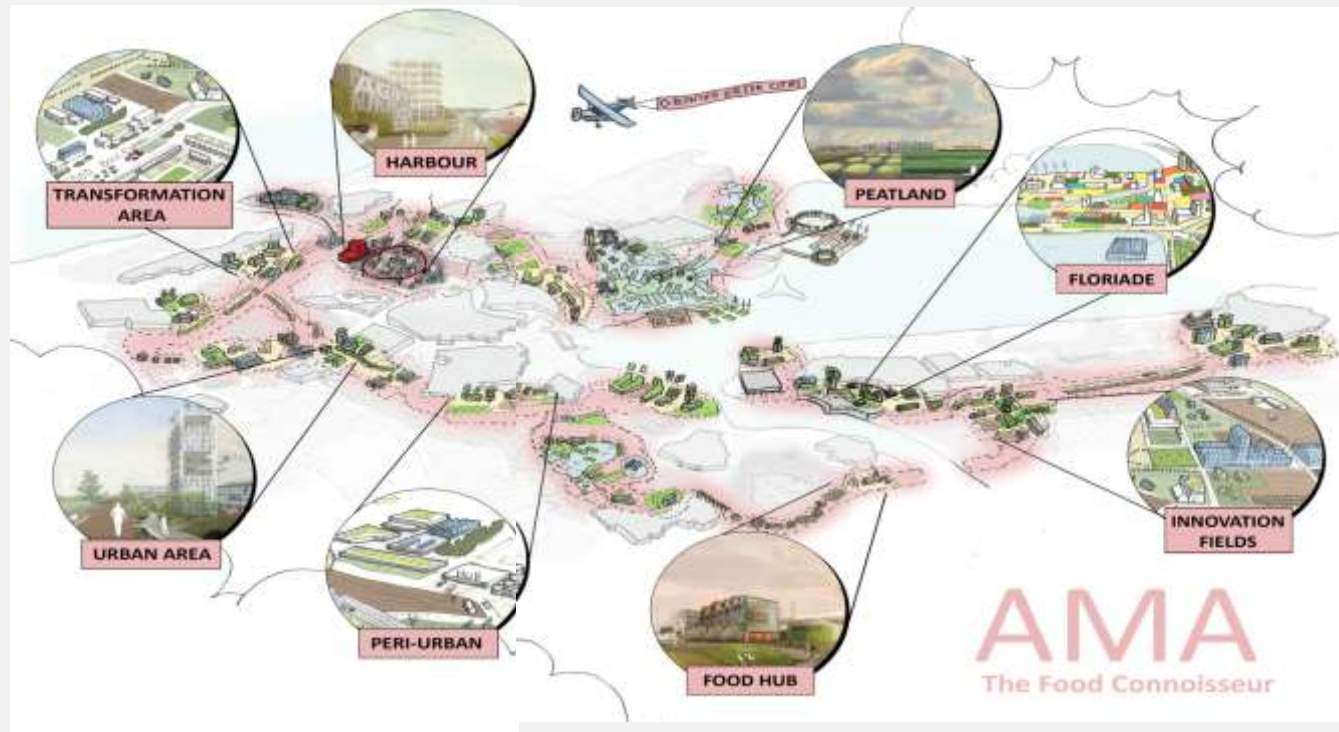
are creative and smart **ideas** aimed to innovate and improve a specific and fixed process in relation of the **management of waste as a resource**.

A simple Eco-innovative Solution From bread waste to Beer



Courtesy the Glad Café and Brewdog

Spatial Development Strategy Including Eco-innovative Solution

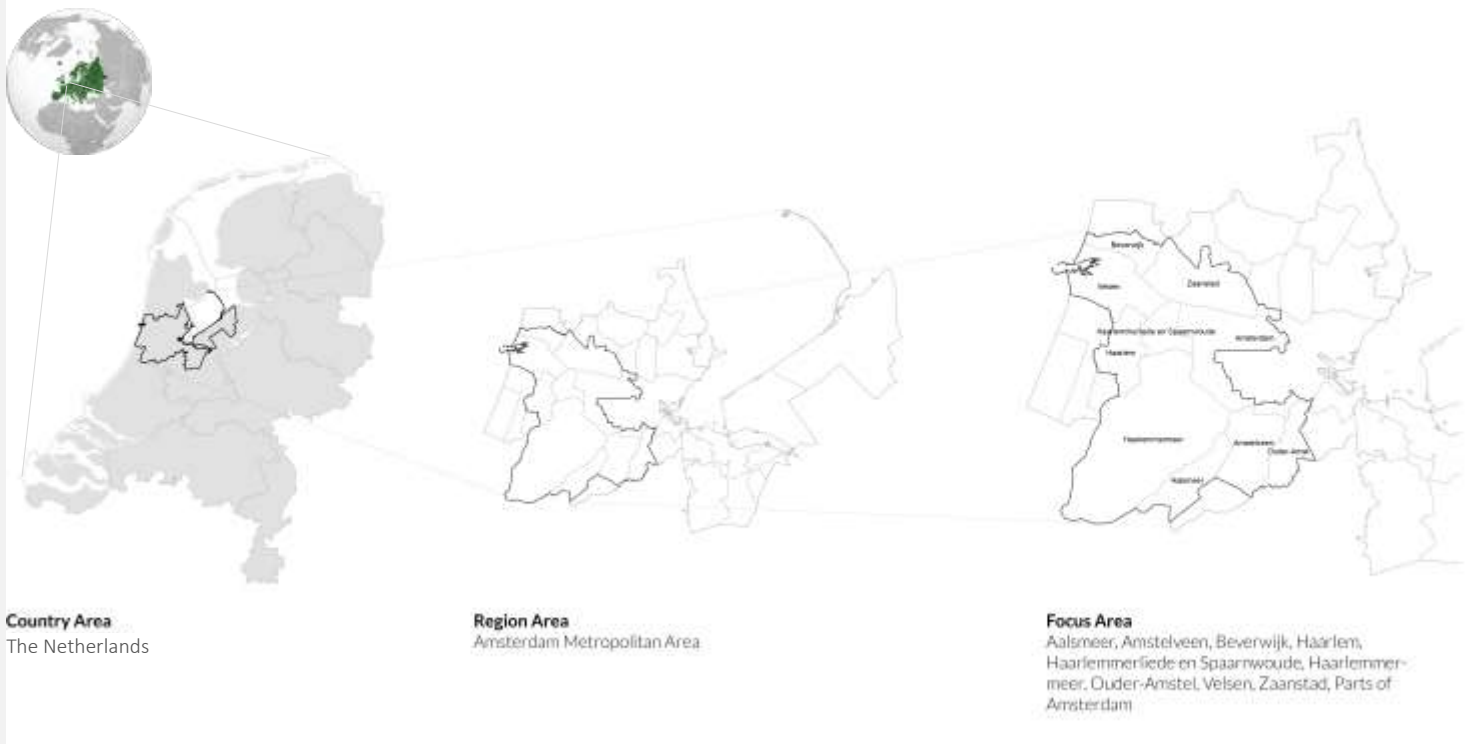


Courtesy: W. ter Hijden, W. Zonghao, D. Hegyi, B. Bathena TU Delft Students.



The Amsterdam Metropolitan Area Peri-Urban Living Lab

The Amsterdam Metropolitan Area





Peri-Urban Living Labs (PULLs)

Consist of meetings, each structured differently in terms of type and participants

- Each PULL involves a series of [workshops](#) with stakeholders from the field of waste and resource management who participate in a [co-design](#) process for [solutions and strategies](#)
- Providing these stakeholders with a common platform of information and solution design options is the core task of a computerized interactive communication tool: [Geodesign Decision Support Environment](#) (GDSE)
- The GDSE support the tasks in each [PULL workshop](#)



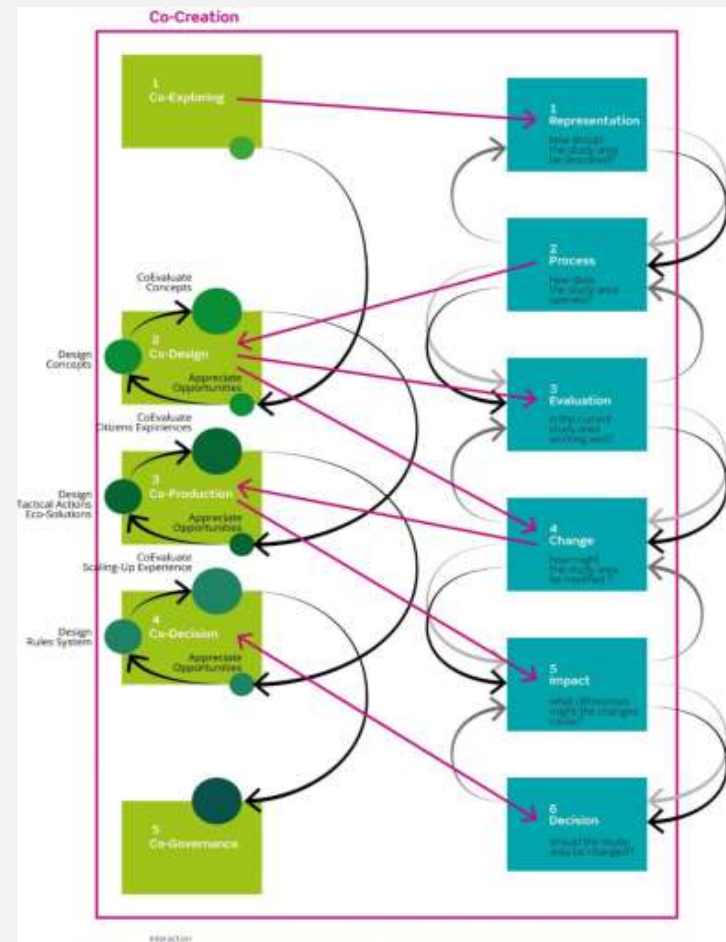
How are Eco-Innovative Solutions developed?

- CE **Challenges** are identified for **key flows in the AMA**
- Initial EIS are brainstormed in the first **PULL workshops**
- Selected EIS to respond to the challenges are collected:
 - **REPAiR** research team, partners and advisory board
 - **Literature and practice**: State of the art
 - **MSc Students**: industrial ecology, architecture, urbanism
 - **Stakeholders** at PULL workshops
- Final EIS are assessed and eventually modified using the GDSE

Peri-Urban Living Lab (PULL)

Five phases of PULL workshops:

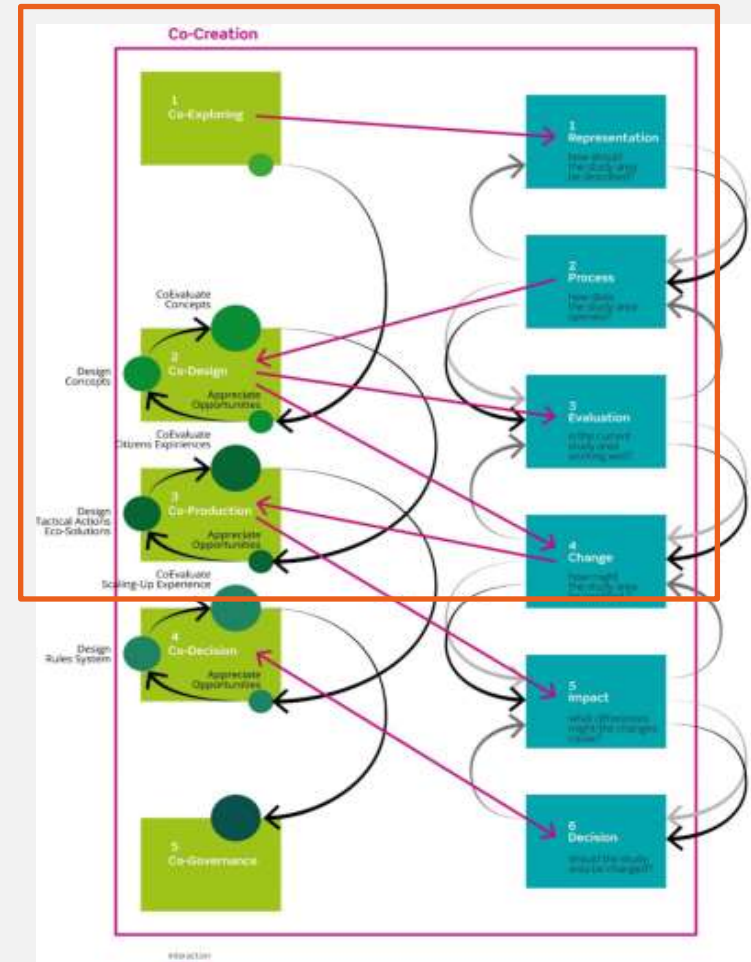
1. Co-exploration
2. Co-design
3. Co-production
4. Co-Decision
5. Co-Governance



Peri-Urban Living Lab (PULL)

Five phases of PULL workshops:

1. Co-exploration
2. Co-design
3. Co-production
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Geodesign framework

1. How should the area be described?
2. How does the study area operate?
3. Is the current study area working well?
4. How might the study area be altered?
5. What differences might the changes cause?
6. How should the study area be changed?

Representation models

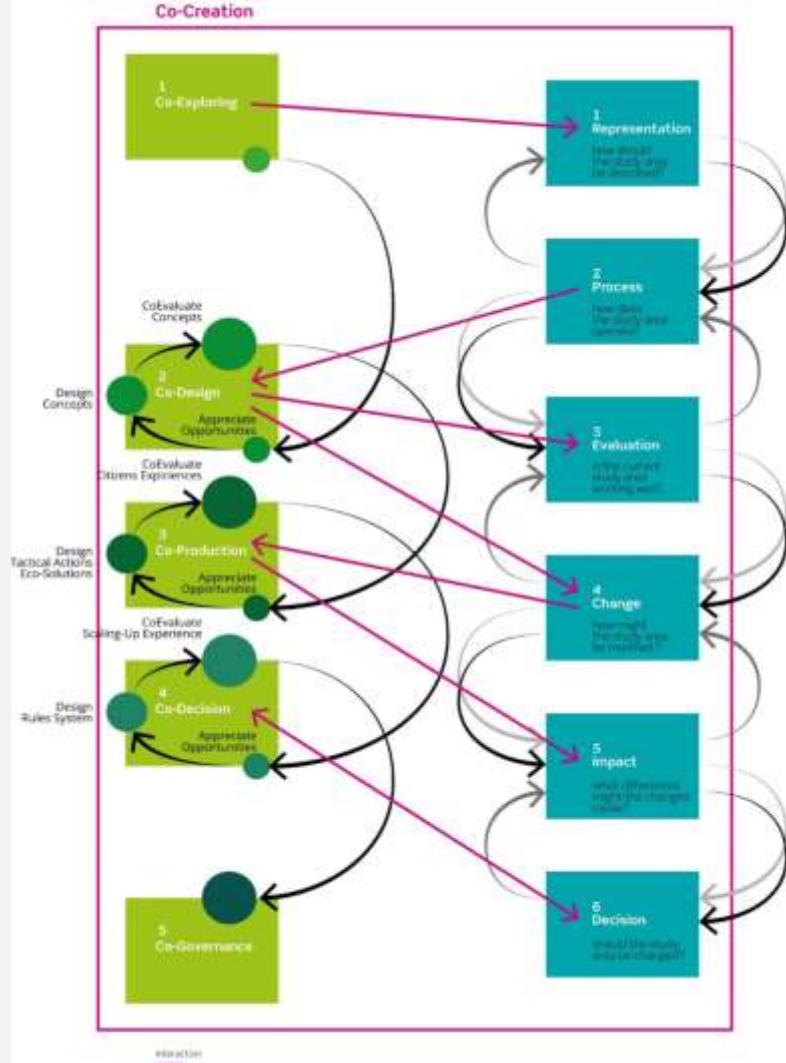
Process Models

Evaluation Models

Change Models

Impact Models

Decision Models



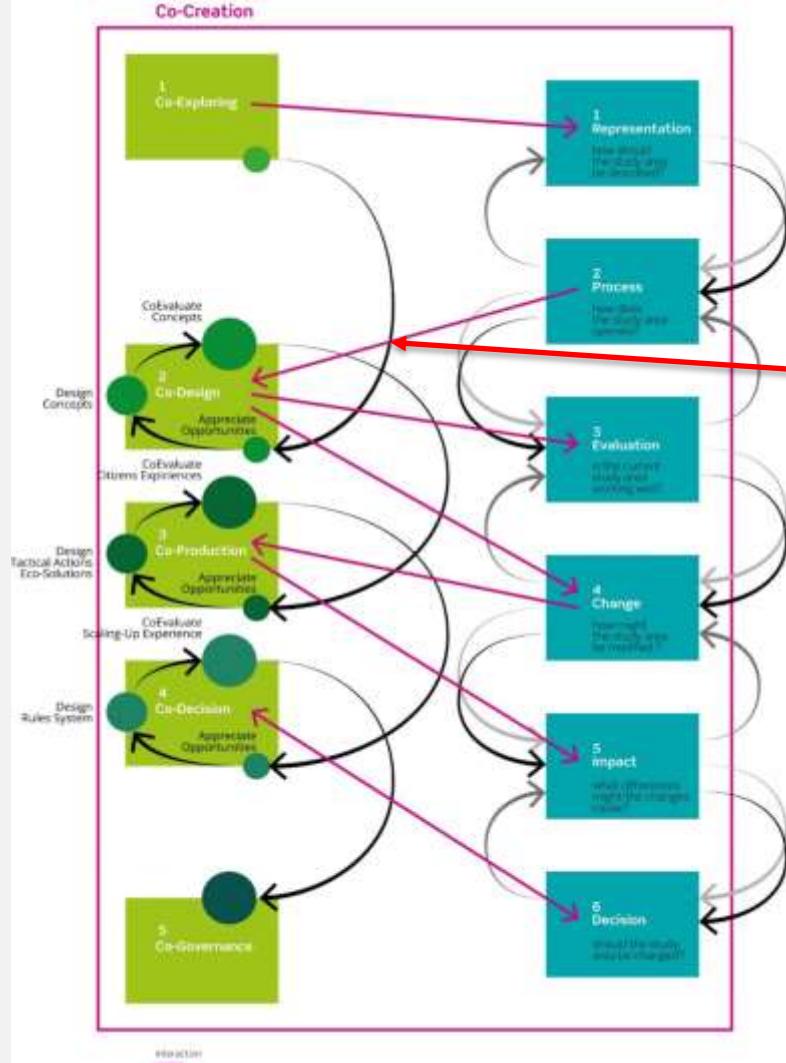
Geodesign in a PULL

Phase 1. Co-Exploration

Geodesign questions	Geodesign phases	Topics
How should the study area be described?	Representation Model	Definition and mapping of Region - Focus, and Sample Areas Definition and mapping of Wastescapes Definition of stakeholders and experts
How does the study area operate?	Process Model	Selection of key resource flows Definition and mapping of material flows and waste management system

GDSE Application Point 1

	Common understanding of the territory developed Categorized + defined main challenges / problems and objectives established
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Geodesign in a PULL



Study Area > Status Quo > Targets > Strategy > Recommendations



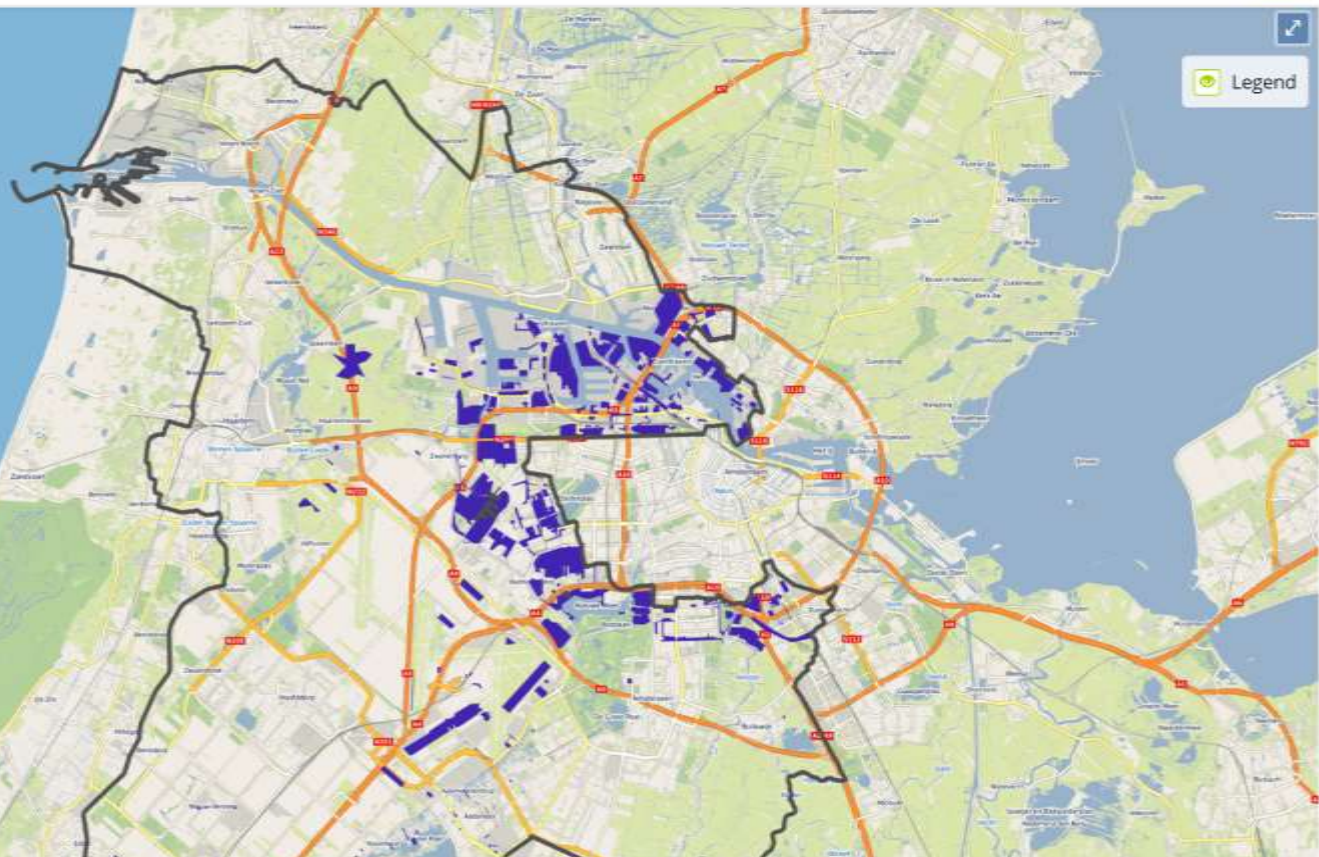
Welcome to the Peri-Urban Living Lab Workshop

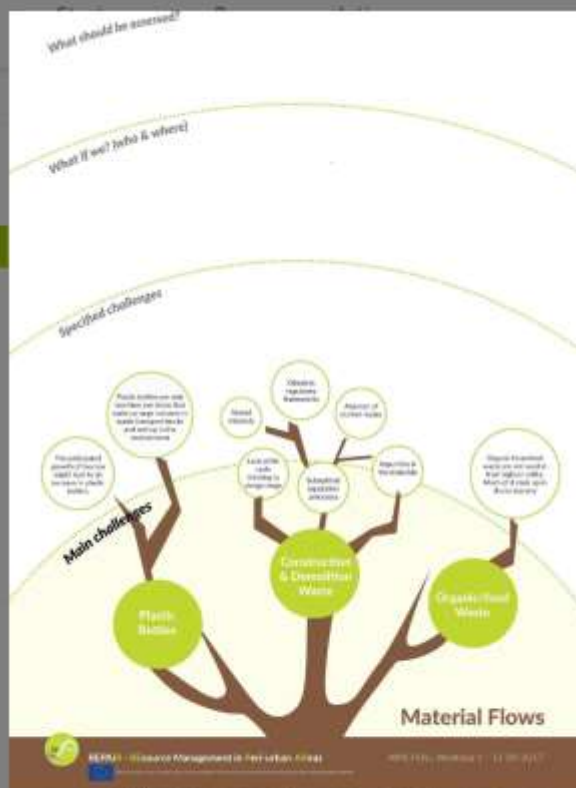




Layers ?

- ☒ Resource Areas (e.g. Wastescapes)
- ☒ Amsterdam Wastescapes
- ☒ Background Maps







Study Area > Status Quo > Targets > Strategy > Recommendations

Private

BPD

Arup

Metabolic

Delta Development Group

Albron

Public

City of Haarlemmermeer

City of Amsterdam

Omgevingsdienst Noordzeekanaalgebied

Rijksdienst voor Ondernemend Nederland

College van Rijksadviseurs



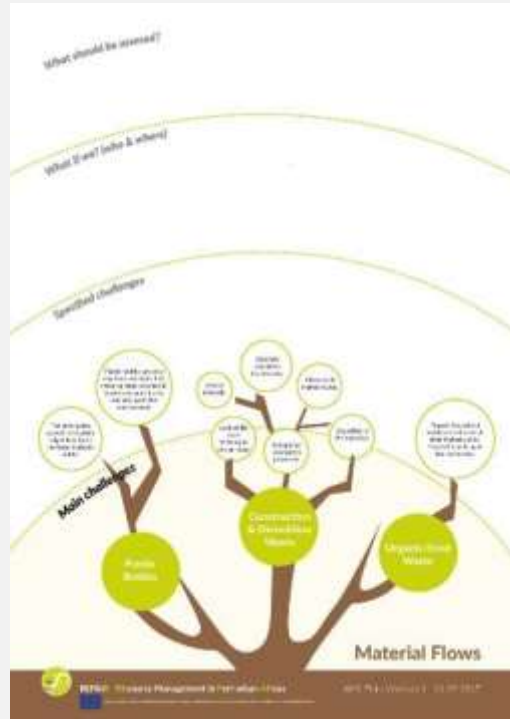
Workshop 1: Co-Exploration

Defining key challenges

- Verify challenges already identified
- Add new challenges
- Develop main challenges to detailed level
- Suggest solution paths



Materials: Challenge Trees - before and after



Challenge tree



Challenge tree with feedback

Results: CE challenges and solution paths

Challenge	Solution Path
Lack of data	Guidelines for information sharing
Mistrust between municipalities	More balanced governance / voice to smaller municipalities
Taxation: lack of incentives	Taxing waste production
Building regulations	Reform to allow use of circular materials
Spatial planning regulations	Make CE a goal in SP
Circular tendering: no criteria and experience	Agreement on alignment of municipal tendering rules to promote CE
Plastic Bottles	Reusing strategies / bioplastic
CDW: focus on refurbishment	Reduce waste and negative impacts
Organic/ FW: collection from actors and with different compositions	Separate collection of FW flows for better reuse
Wastescapes: buffer zones: Schiphol and Harbor of Amsterdam	Innovative ideas for wastescapes, mitigating risks for human health

Phase 2. Co-Design

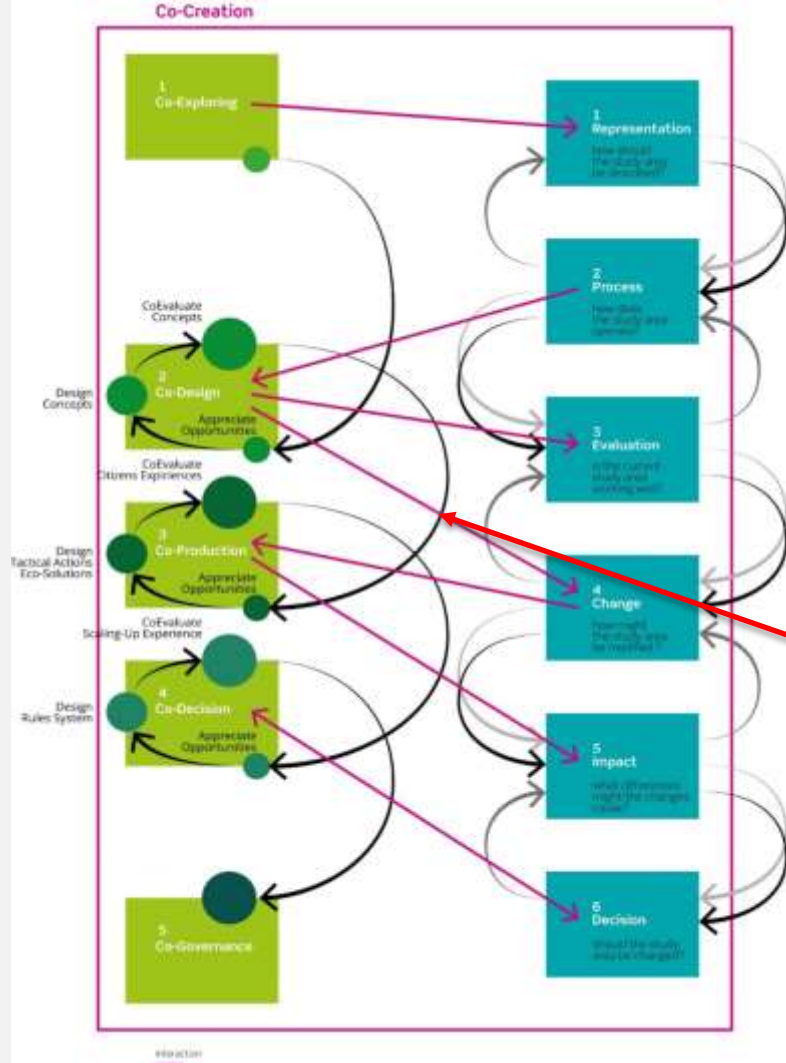
Geodesign questions	Geodesign phases	Topics
Is the current study area working well?	Evaluation Model	Sustainability assessment of the status quo
		Assessment of the status quo resource flow circularity
How might the study area be modified?	Change Model	Definition and common understanding of what constitutes an EIS
		Characteristics and effect of EIS on the process model

GDSE Application Point 2

Identified, mapped and visualized key activities and actors in the value chains that should be included into the discussion and development of EIS

Identified specific challenges and problems

Identified and mapped actor network for individual EIS



GDSE Application Point #2



Keyflow Food Waste ▾

View Companies ▾ ?

Level Activity Group ▾ ?

Wholesale and retail trade

Wholesale and retail trade -> Water supply, sewerage, waste management and remediation
6,382 t/year

Product

- 1.826% Non food grease & slime
- 3.376% Food grease & slime
- 31.625% Non food waste within GFT
- 10.776% Food waste within GFT
- 1.273% Food grease
- 21.007% Non food organic waste
- 6.758% Food waste
- 0.247% Non food grease
- 15.818% Non food slime
- 6.651% Food slime
- 0.642% Beer

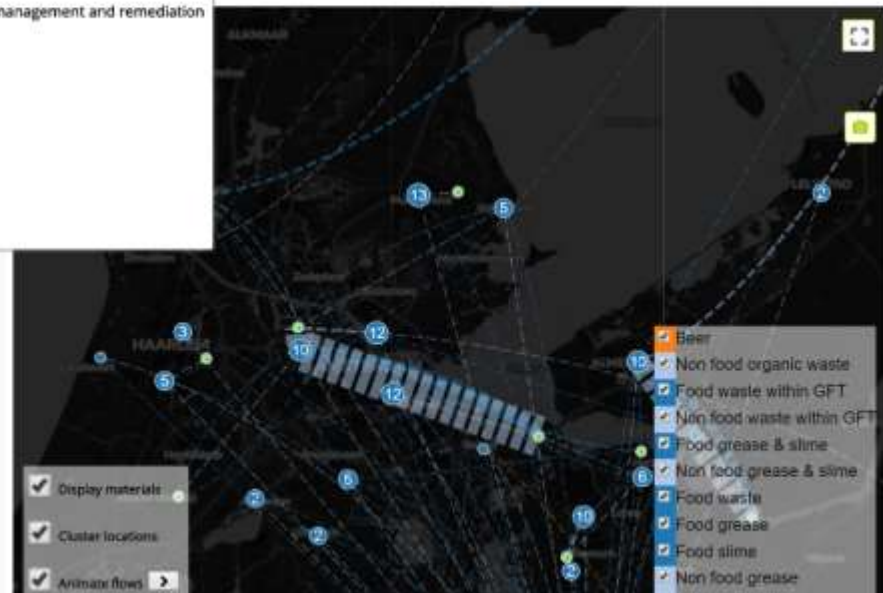
Accommodation and food service activities

Water supply, sewerage, waste management and remediation

Agriculture, forestry and fishing

Manufacture of food products, beverages and tobacco products

Transportation and storage

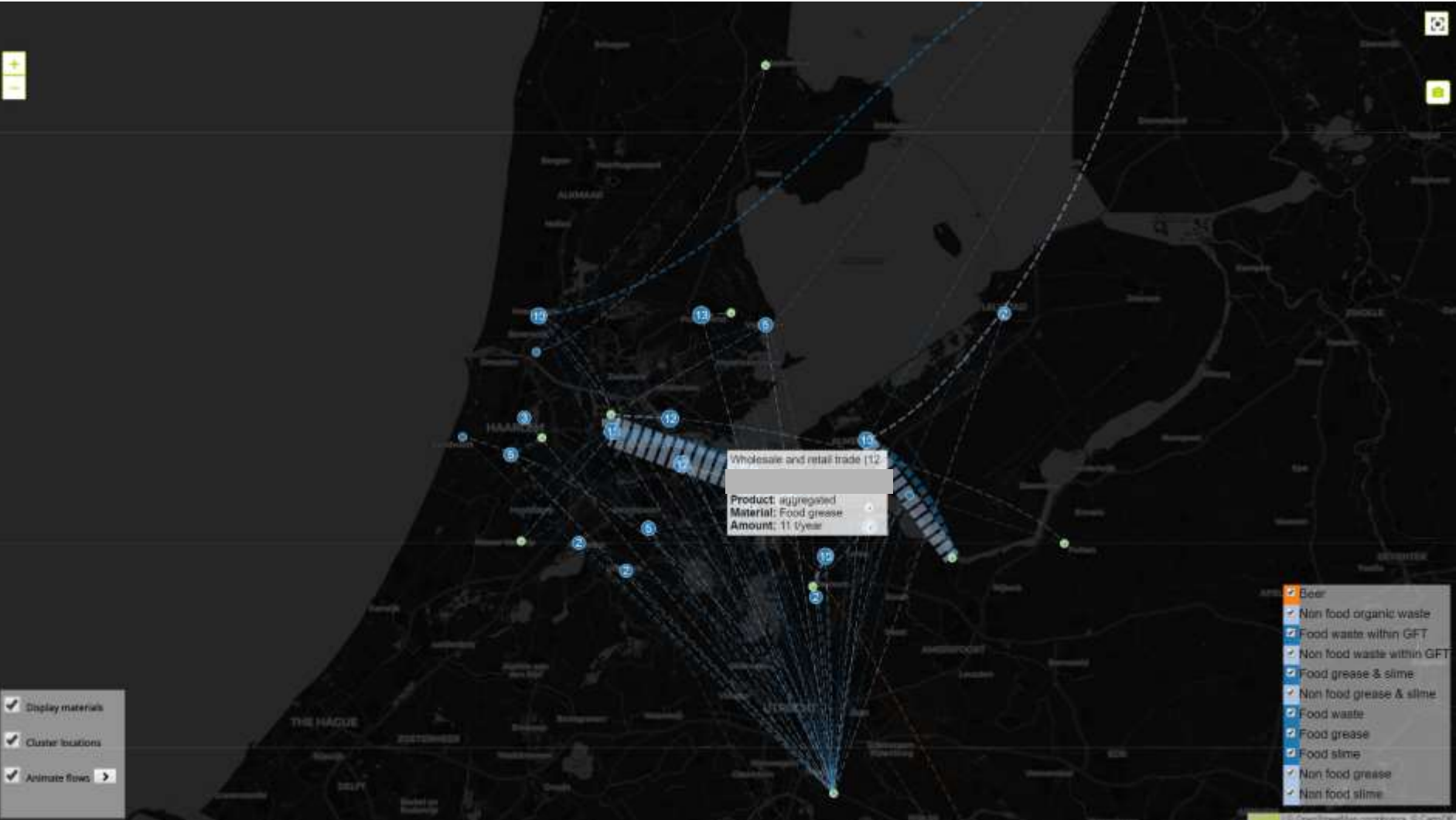




☒ Display materials

☒ Cluster locations

☒ Animate flows 



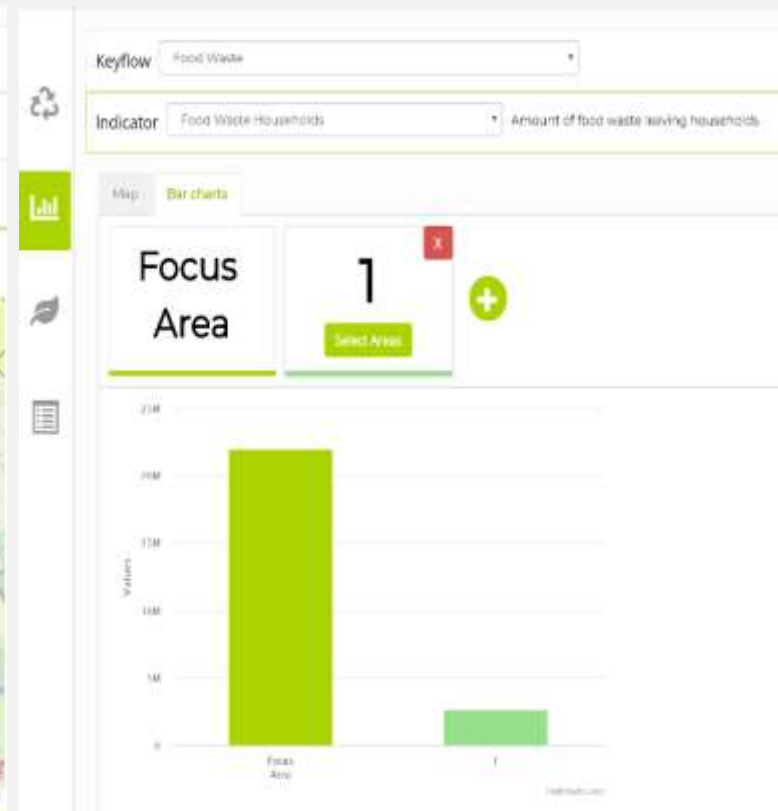
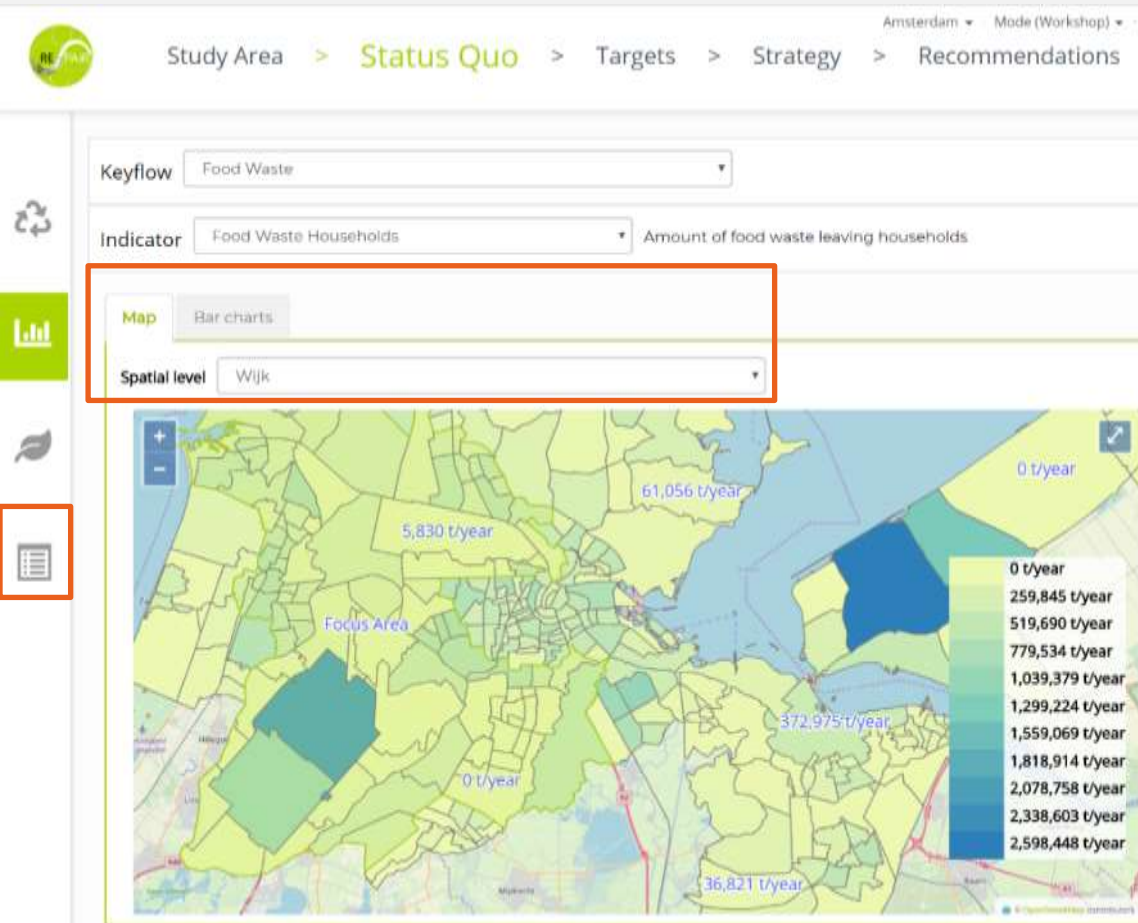
- ☒ Beer
- ☒ Non food organic waste
- ☒ Food waste within GFT
- ☒ Non food waste within GFT
- ☒ Food grease & slime
- ☒ Non food grease & slime
- ☒ Food waste
- ☒ Food grease
- ☒ Food slime
- ☒ Non food grease
- ☒ Non food slime



Wholesale and retail trade (10)

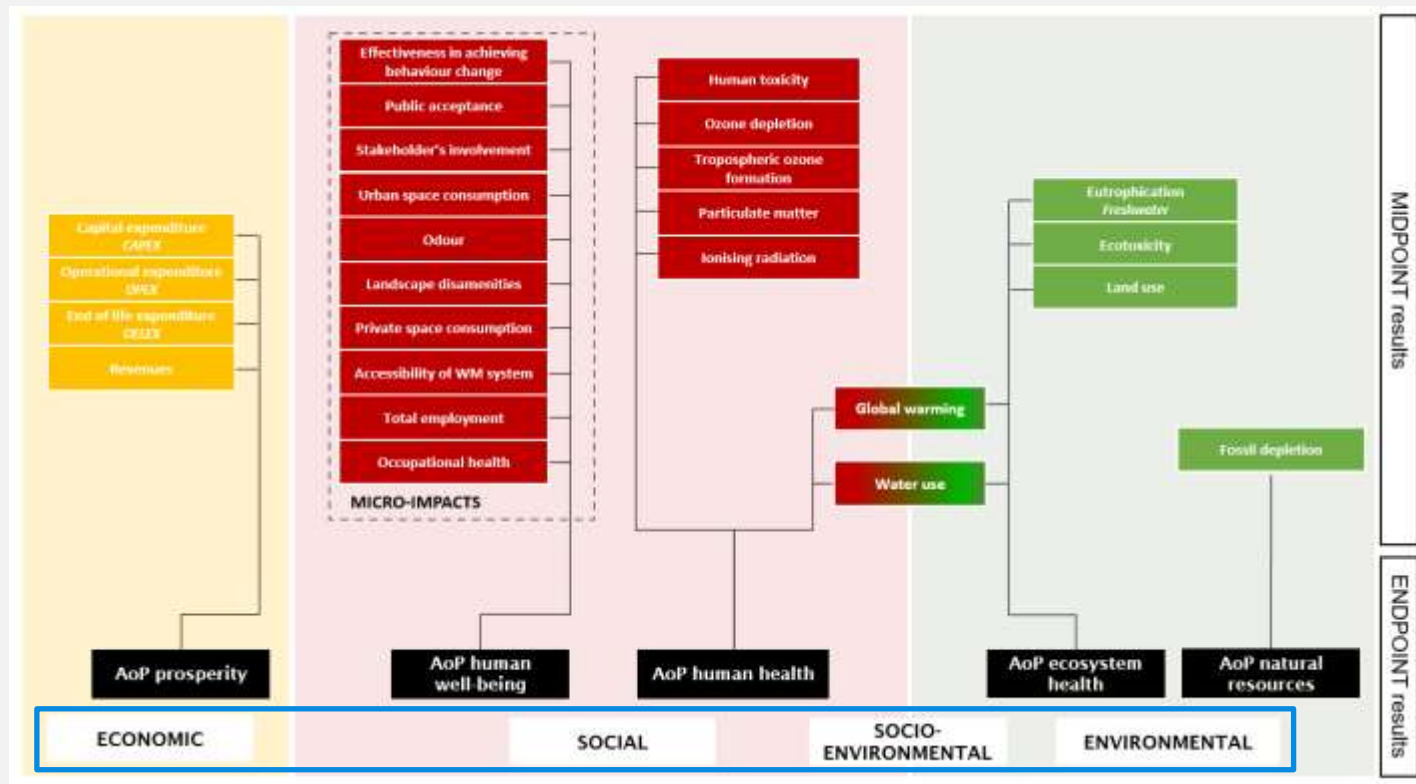
Product: aggregated
Material: Food waste
Amount: 2 t/year

- ☒ Beer
- ☒ Non food organic waste
- ☒ Vegetable, fruit and garden waste (GFT)
- ☒ Food waste within GFT
- ☒ Non food waste within GFT
- ☒ Food grease & slime
- ☒ Non food grease & slime
- ☒ Organic waste
- ☒ Food waste
- ☒ Food grease
- ☒ Food slime
- ☒ Non food grease
- ☒ Non food slime



Sustainability framework to assess EIS

Final set of impact categories selected





General ▸

Construction & Demolition Waste ▾

Challenges

Building regulations are too rigid, hindering experimentation with c...

CDW - focus on refurbishment process in the AMA in the next deca...

Wastescapes

Objectives

Re-develop wastescapes around Schiphol within construction restri...

Re-use/re-program polluted wastescapes in the Amsterdam Harbour

Reduce amount of waste and negative impacts generated in the Bu...

Food Waste ▾

Challenges

Taxation – lack of incentives for embracing CE by companies

Plastic Bottles: Re-using strategies and bioplastic strategies or get ri...

How to properly collect organic and Food waste from the various ac...

Objectives

Collect and reuse organic and food waste flows from households an...

Introduce tax incentives to change waste behaviour among househ...

Workshop 2: Co-Design

Developing first solution ideas

- Develop first set of solutions based on defined objectives
- Confirm / Rank objectives in the AMA



Materials: Eco-Innovation Sheet - before

Eco-innovative solutions (EIS) for Construction and Renovation Waste (Focus: Wood and Insulation Materials)

Solution Card

Group composition:
Names (affiliations):

Addressed Challenge:
(if focus area of the program challenge is not selected)

Title of the EIS:

Short Description of the EIS:

Scale:
☐ Region ☐ National ☐ Project

SOLUTION CARD

Guidelines to be considered:

Guidelines that should provide for EIS:

The solution EIS to:
Please select one or more:

☐ Political ☐ Technical ☐ Social ☐ Environmental ☐ Other

Solution Card – Phase 00 is the solution card.
Provide a title that expresses the eco-innovative solution;
List all people that were involved in developing the EIS;
Provide information on the activities and stakeholders involved.
The REPAIR team is going to support you if anything is unclear.

CE - Diagram

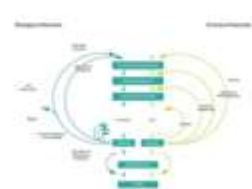
CURRENT STATE



CE DIAGRAM

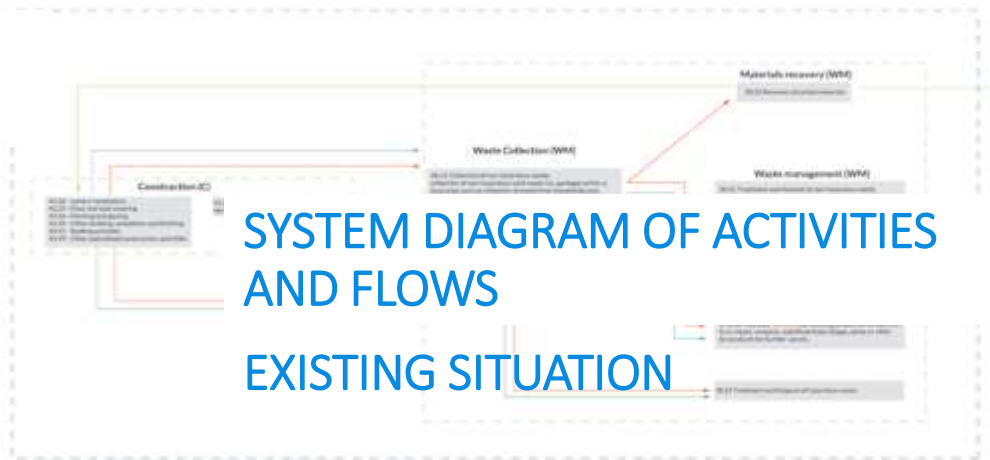
Icons indicate in the above diagram, which circular or new processes are describing the **current** situation of the **ref(s)** your EIS tackles.

Effect of EIS



Please indicate in the above diagram, which circular or linear process are describing the **future** situation of the flow(s) your EIS tackles, after the EIS has been implemented.

SYSTEM DIAGRAM OF ACTIVITIES AND FLOWS



The system diagram above shows the activity groups and single activities, and the flows between them for the existing situation.
Please draw on this diagram your eco-innovative solution. Do so by adding new and/or crossing out existing activities and flows that connect them. This way you can illustrate the systemic change your EIS will have. Keep in mind that solutions can be of political, economic, social, technical, environmental and legal nature, as well as combined.





Results: EIS developed and discussed

Eco-Innovative Solution

Reuse areas within noise and safety contour from airport, port, railways and roads, increase the quality and quantity of natural green areas (biodiversity)

Concentrating green houses, reuse other green houses

Alternatives to the predetermined (big) portions at supermarkets

Smart biorefinery

Separation of plant-based and animal-based OW

Rethinking the chain - start with the requirements for the end-product

CE Business models

Circular tendering: Public-private (urban area) development

Open and secure material exchange

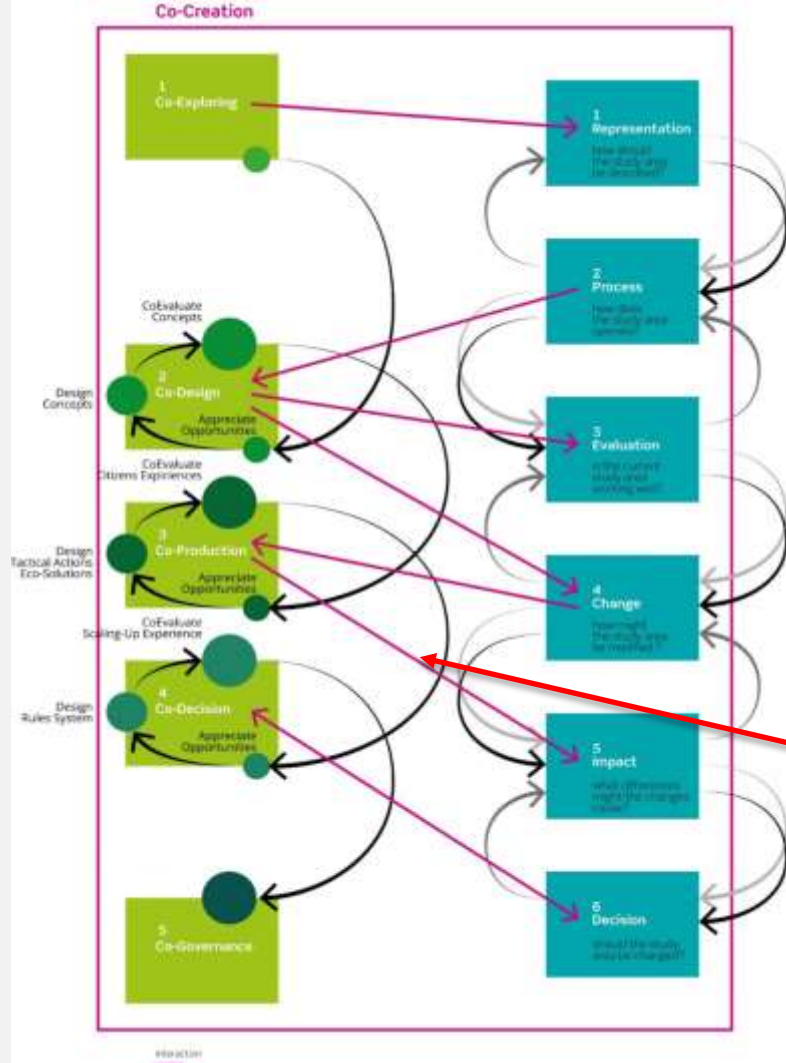
▪ Cross sectoral material and process platform

Phase 3. Co-Production

Geodesign questions	Geodesign phases	Topics
How might the study area be modified?	Change Model	EIS and Eco-Innovative strategies Expert meetings on EIS
How should the study area be changed?	Decision Model	Relating EIS to objectives Ranking of objectives Pairwise comparison of the relative importance of sustainability indicators Defining the targets

GDSE Application Point 3

	Ranked objectives
	Weights of the sustainability indicators
	Set and assessment of flow targets
	Selected EIS and defined Eco-Innovative Strategies



GDSE Application Point #3



Food Waste ▾



Ranking Objectives



Flow Targets



Sustainability Targets



Ranking objectives for the keyflow *Food Waste*

Below you find a list of objectives defined in the plenary discussion (see *Status Quo > Objectives*).

Try to find an agreement on their relative importance within your small group. Move the objectives by dragging and dropping them inside the list so that their order reflects your ranking: The objective most important to you should be on top. The least important at the bottom.

Collect and reuse organic and food waste flows from households and companies

#1

Introduce tax incentives to change waste behaviour among households and companies

#2



Food Waste ▾



Flow targets for the keyflow *Food Waste*

Collect and reuse organic and food waste flows from households and companies ▾

#1

... for us translates into the following flow targets:

+ Target

Ranking Objectives



Flow Targets



Introduce tax incentives to change waste behaviour among households and companies ▾

#2

... for us translates into the following flow targets:

+ Target

Sustainability Targets





Food Waste ▼



Sustainability targets for the keyflow *Food Waste*

Collect and reuse organic and food waste flows from households and companies ▼

F1

... for us translates into the aim of reaching a higher level of protection in these selected areas:

Human Health

Human Well-being

Prosperity

Ecosystem Health / Natural Resources

Ranking Objectives



Flow Targets



Introduce tax incentives to change waste behaviour among households and companies ▼

F2

... for us translates into the aim of reaching a higher level of protection in these selected areas:

Human Health

Human Well-being

Prosperity

Ecosystem Health / Natural Resources

Sustainability Targets





Solutions for the keyflow *Food Waste*

Solutions for Wastescapes

MYC Blocks: development of new bio-isolation materials

Bio-seasonal parking

Land rotation: an alternative way for temporary storage of CDW

Reuse / transform empty greenhouses (through policies, incentive and design for new entrepreneurs)

Transformation of outdated offices into housing for young people

Transforming vacant office buildings into areas for inclusive recreational activities to engage the local community

Transforming green buffer zones into leisure facilities

Transforming wastescapes into stepping stones for biodiversity

Solutions for Food Waste

Insect food-waste composter

Decentralised food waste collection and compost

From bread to beer

Peel-pioneer: from fruit peels to products

Fruit-leather: from fruit peels to leather

Bio-bean - energy from coffee beans

Zero waste or package free shop

Smart biorefinery

Creating a sharing platform between the great distribution of supermarkets and social organisations (NGO)

Solutions for the

Solutions for Wastescapes

MYC Blocks, Reusing

Bio-Insulation patterns

Sand rotation in a city

Reuse / transformation

Transformation of a

transforming waste

Transforming green

Transforming waste

Solutions for Wastescapes - MYC Blocks, development of new bio-isolation materials.

Overview

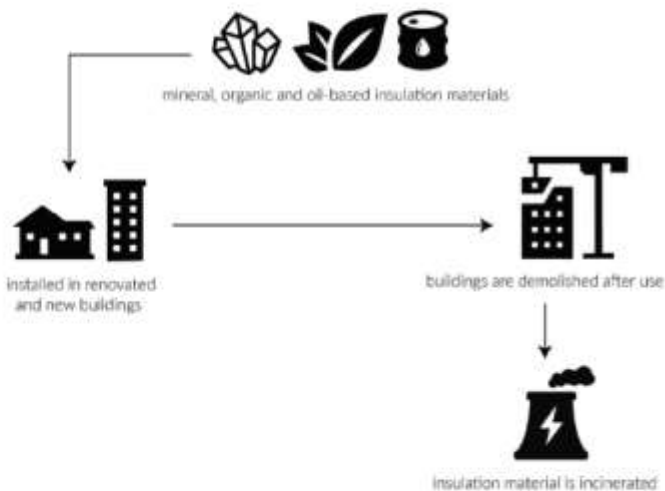
CE Diagrams

Activities

Actions

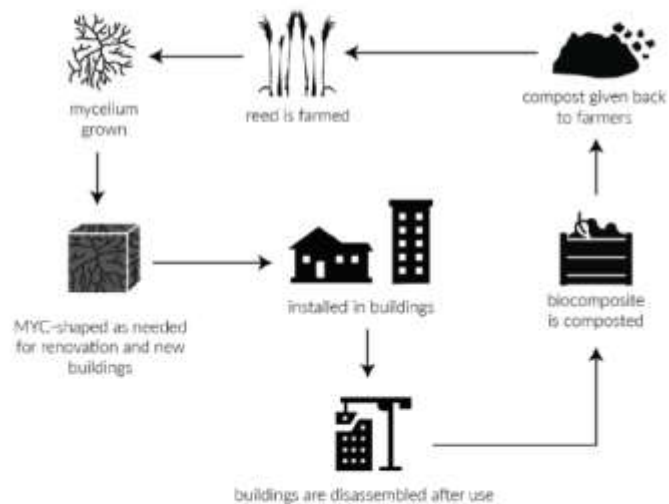
Current state

Current value chain of insulation material



Effect of Solution

Proposed value chain of insulation material



Solutions for the

Solutions for Wastescap

MYC Blocks, develop

Bio-seasonal parking

Land rotation: an alt

Reuse / transform

Transformation of ou

Transforming vacant

Transforming green

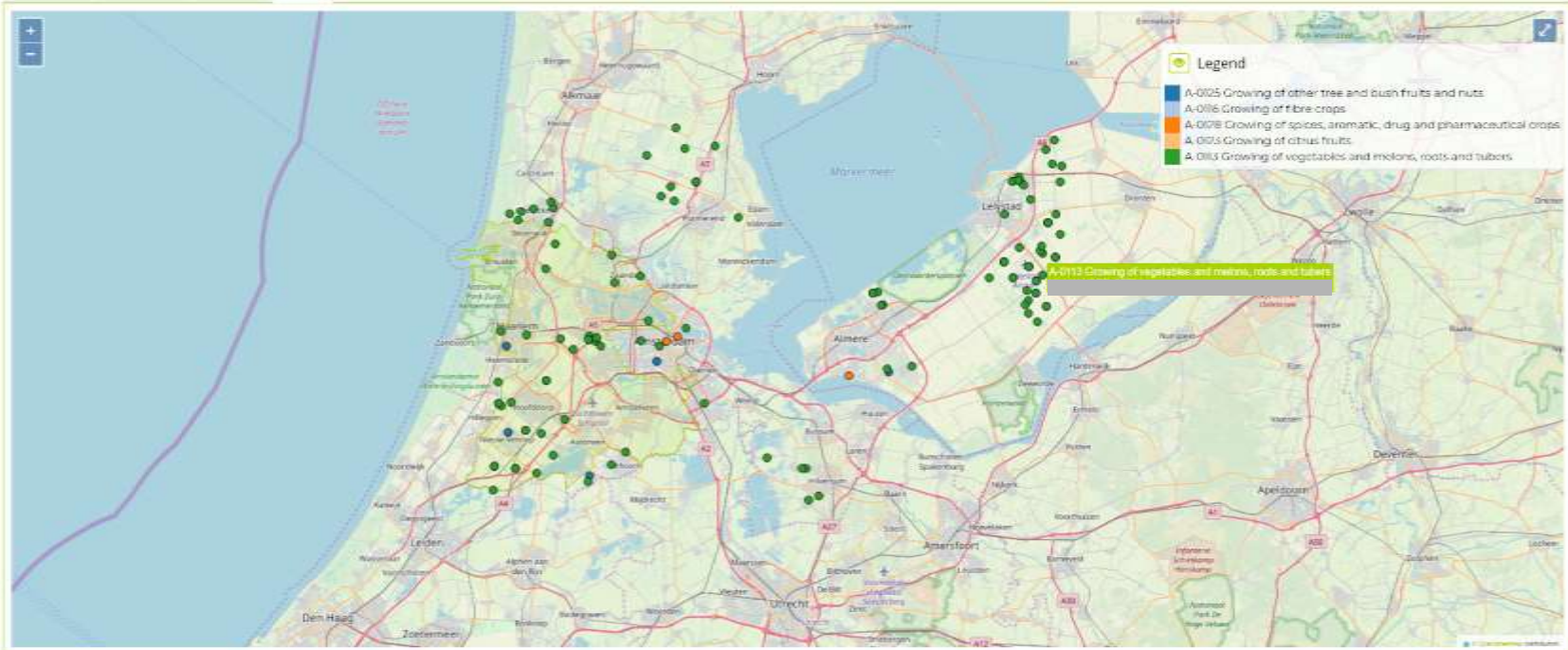
Transforming waste

Solutions for Wastescapes - MYC Blocks, development of new bio-isolation materials

Description

ICE Diagrams

Activities

Actions



Study Area > Status Quo > Targets > **Strategy** > Recommendations

Define your strategy for the keyflow *Food Waste*

Impressum/Info

Add solution

Solution

MYC Blocks, development o

Solutions for Wastescapes

MYC Blocks, development of new bio isolation materials

Bio-seasonal parking

Land rotation: an alternative way for temporary storage of CDW

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Zero waste or package free shop

Smart biorefinery

Creating a sharing platform between the great distribution of supermarkets and social organisations (NGO)



Study Area > Status Quo > Targets > **Strategy** > Recommendations

Define your strategy for the keyflow *Food Waste*

+ Implementation

MYC Blocks, development of n...



Quantity:

Implemented by: City of Amsterdam

From bread to beer



Quantity:

Implemented by: Metabolic, Albron...

Transforming vacant office bul...



Quantity:

Implemented by: City of Haarlemm...

Add solution

Solution MYC Blocks, development o

Solutions for Wastescapes

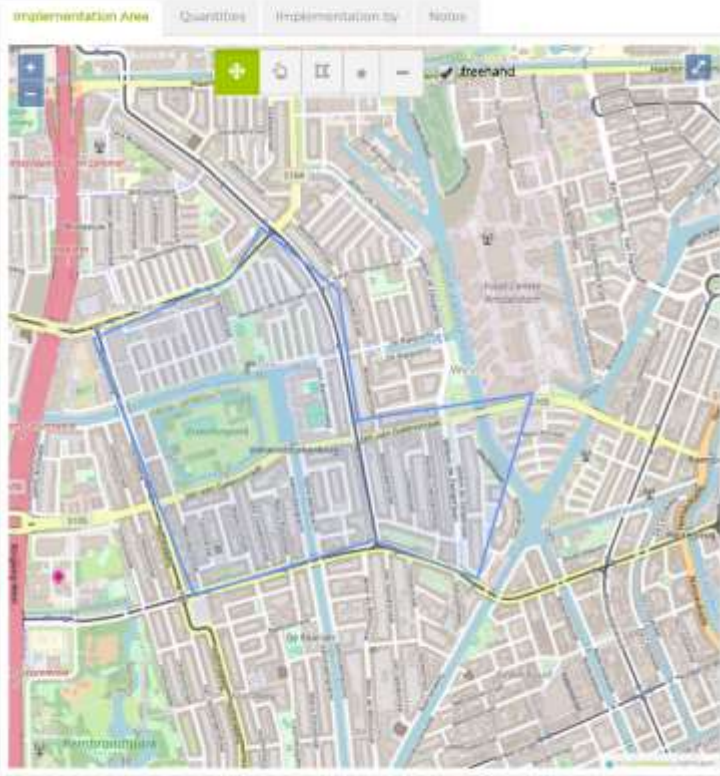
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Solutions for Food Waste

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- Fruit-leather: from fruit peels to leather
- Bio-bean - energy from coffee beans
- Zero waste or package free shop
- Smart biorefinery
- Creating a sharing platform between the great distribution of supermarkets and social organisations (NGO)



Edit the implementation of the solution *From bread to beer*



Cancel



Define your strategy

+ Implementation

MYC Blocks, developm



Quantity:

Implemented by:

Edit the implementation of the solution *From bread to beer*

Implementation Area Quantities **Implementation by** Notes

Stakeholders in charge of the solution's strategy in the strategy area:

Arup, City of Amsterdam

Private

BPD

Arup

Metabolic

Delta Development Group

Albron

Public

City of Haarlemmermeer

City of Amsterdam

Omgevingsdienst Noordzeekanaalgebied

Rijksdienst voor Ondernemend Nederland

College van Rijksadviseurs

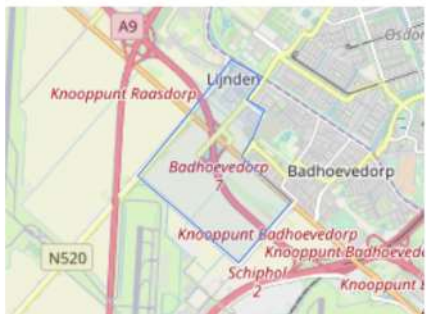


Define your strategy for the keyflow *Food Waste*

+ Implementation



MYC Blocks, development of n...



Quantity:

Implemented by: City of Amsterda...

From bread to beer



Quantity:

Implemented by: City of Amsterda...

Zero waste or package free shop



Quantity:

Implemented by: City of Haarlemm...

Workshop 3: Co-Production



Workshop 3: Co-Production

Co-develop EIS

- Develop EIS that follow a GDSE-friendly template, based on EIS initial set
- Match EIS with CE objectives
- Transfer EIS from Naples to AMA



Materials: GDSE



EIS sheets, partially completed



GDSE running on three computers



Results: Eco-Innovative Solution Sheet - after

Eco - Innovative Solutions REPAIR_Amsterdam

TRANSFORMING WASTESCAPES INTO STEPPING STONES FOR BIODIVERSITY

FLOW

- ☐ KNOWLEDGE
- ☐ CAPACITY
- ☒ MOTIVATION

CATEGORY OF OUTCOME

- ☐ ECONOMIC
- ☐ ENVIRONMENTAL
- ☒ SOCIAL
- ☐ POLITICAL
- ☒ CULTURAL
- ☒ EDUCATION

LOCATION OF THE GOOD PRACTICE

SPECIFIC OBJECTIVE

Transform green buffer zones into island for biodiversity.

POTENTIAL IMPACTS in the AMA

OWNER OF THE EIS

ACTORS TO BE INVOLVED

KEYWORDS

buffer zones, ecosystem service, biodiversity

DESCRIPTION OF THE EIS

This solution aims to shift the perception and role of green buffer zones and green vacant land in industrial zone, both culturally and administrative.

These types of land in cities aren't wasted space, they are resources in the urban areas.

Most people see vacant and abandoned green land as an eyesore, or being ripe for development, but it has a substantial ecological value in its own right. The abandoned land in a singularity can be worth hundreds of millions of dollars.

• All ecosystems provide us with free "ecosystem services": useful things that we would otherwise have to do ourselves. Forests clean the rivers that pass through them, providing safe drinking water, and growing plants remove carbon dioxide from the air, slowing global warming. That means wild ecosystems like rainforests have a kind of economic value, which can be estimated.

The solution aims to:

- map these spaces according to the flora and fauna present there.
- map the cooling effect of these area in relation with the urban spaces
- design with ecologists and botanists how to improve these space.

• solution: Turn wastescapes in places where biodiversity can bloom. These wastescapes need to be connected in one or another way.



ADAPTATION TO THE AMA CONTEXT

Relevance for practice

Biodiversity is more and more lost in the Netherlands. We have a lot of manufacturing farming. So we should look for ways in improving biodiversity.

Where is the waste produced?

The wastescapes are the waste. But it is broader than that. Also landscapes with functions seem like farmland can have impact: loss of diversity, etc. So this does also be a waste space in other sense.

Where can the solution be applied (AMA location)?

The best place would be places wastescapes that are water places with low biodiversity.

Who are the actors that need to be involved?

- municipalities
- waste management
- nature reserve organization
- people that want to turn free range chicken that lives on wastescapes.

For whom could it be a business model or what are other possible sources of funding?

- own economic benefits
- last option: let companies support this wastescapes with development for biodiversity, why should they do this? It's not in their interest of their company. Companies are not interested in biodiversity.

What are the policy changes needed to make it happen?

- for this solution there need to be a way to monitor biodiversity loss caused by companies.

Would you according to your professional role support the implementation of this EIS? And how?

- If one can come up with a way to measure biodiversity/water loss and could compensate by creating a wastescapes, then support a grow of biodiversity. It's not compensating in a stand off coming to a solution on the problem, but it's a start.

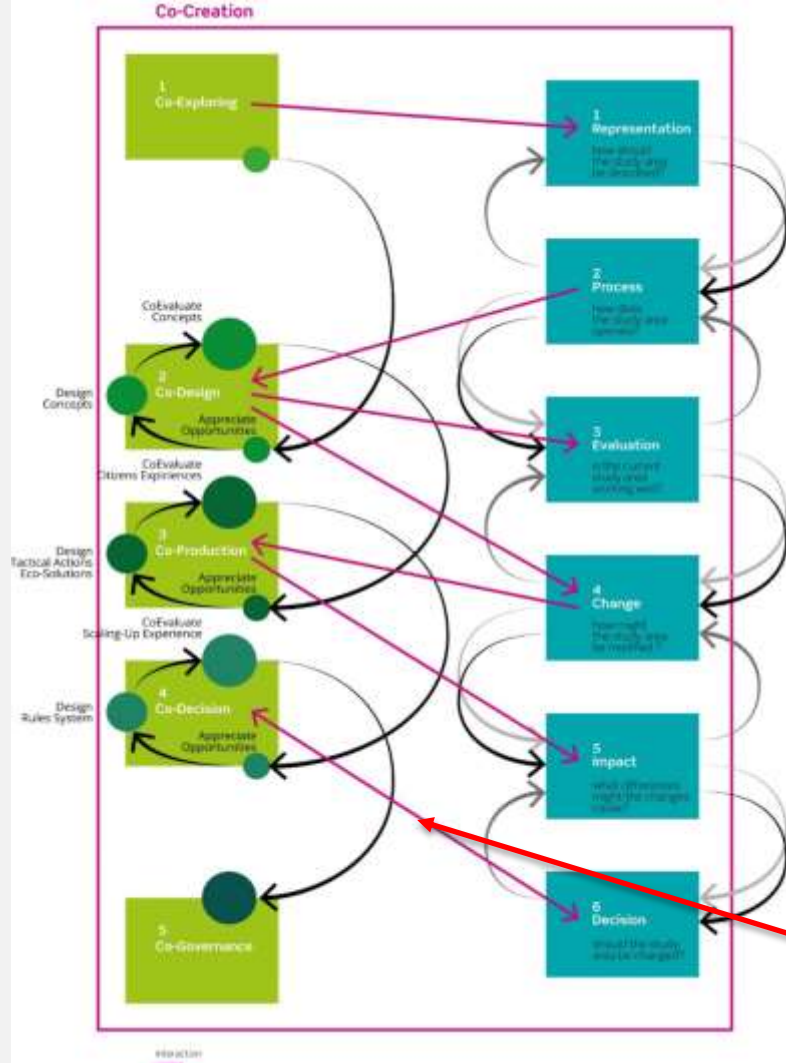
FURTHER NOTES

Look out! Do not create an environment where the transition process where the natural balance cannot be maintained.

Stef de Groot, Urban in Maastricht, Ghent.

Phase 4. Co-Decision

Geodesign questions	Geodesign phases	Topics
What differences might the change cause?	Impact Model	<p>Sustainability and flow assessment of Eco-Innovative Strategies</p> <p>Aggregation of sustainability indicators according to given weights into impact categories</p>
How should the study area be changed?	Decision Model	<p>Designing decision rules of system</p> <p>Establishing and documenting the agreements and conflicts between different interests and groups of decision makers</p> <p>Triggering future local development and supporting decision-making processes</p>

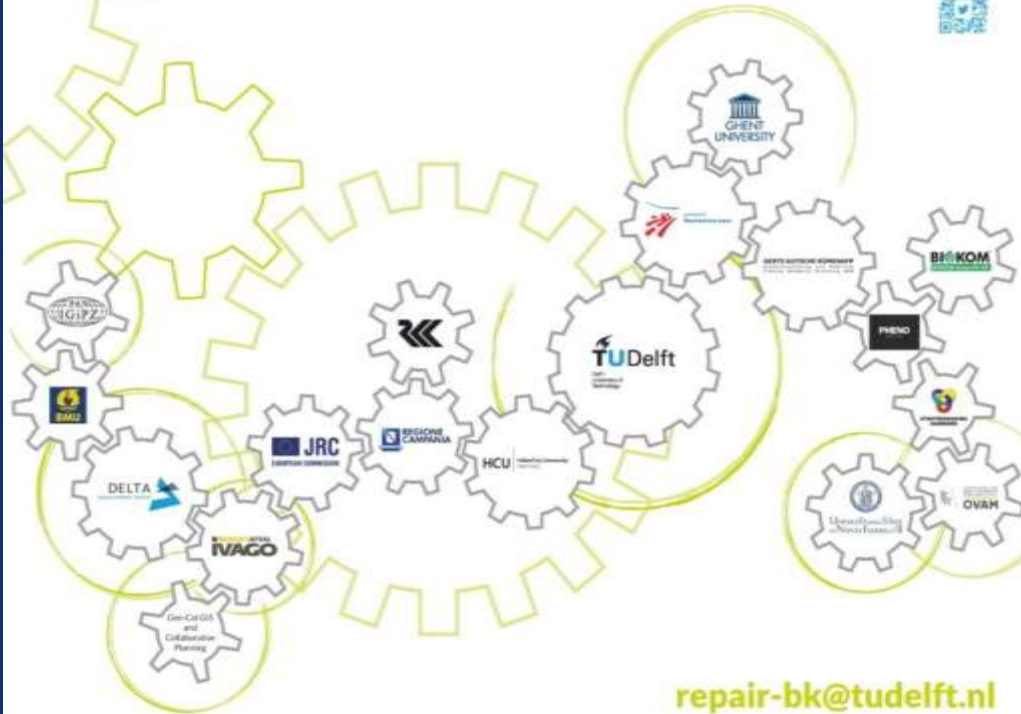


GDSE Application Point #4

Key messages of this lecture

- Geodesign can be used to structure the collaborative and iterative process of developing spatially-explicit place-specific EIS that promote CE in peri-urban areas
- REPAiR offers a GDSE (software + hardware + processware) to structure a PULL process that integrates geodesign, life cycle thinking, sustainability into a living lab
- With the GDSE, stakeholders work together on new EIS and get feedback on the sustainability effects of their proposed strategies

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Thank you!



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