Circular urban area development; Myth or reality?

P5 Presentation - Heleen Luijt - 25 June 2019

Who is often flying by **plane** to his/her holiday destination?

deVolkskrant

Ondanks klimaatverandering pakt Nederlander vaker het vliegtuig

De zorg om het klimaat valt nog niet af te lezen aan de vakantiebestedingen van de Nederlander. Het aantal vliegreizen naar een buitenlandse bestemming, voor vertier, steeg vorig jaar met 3 procent.

Peter van Ammelrooy 9 januari 2019, 6:00

Who is eating **meat** multiple times in the week?

De vloek van het vlees: slecht voor klimaat, milieu en mensheid

Milieu/impact Al meer dan tien jaar is duidelijk: vlees eten is slecht voor het klimaat, het milieu en de mensheid. De ene wetenschapper zegt: helemaal stoppen. De ander zegt: 20 gram dierlijk eiwit per dag moet nog wel kunnen.

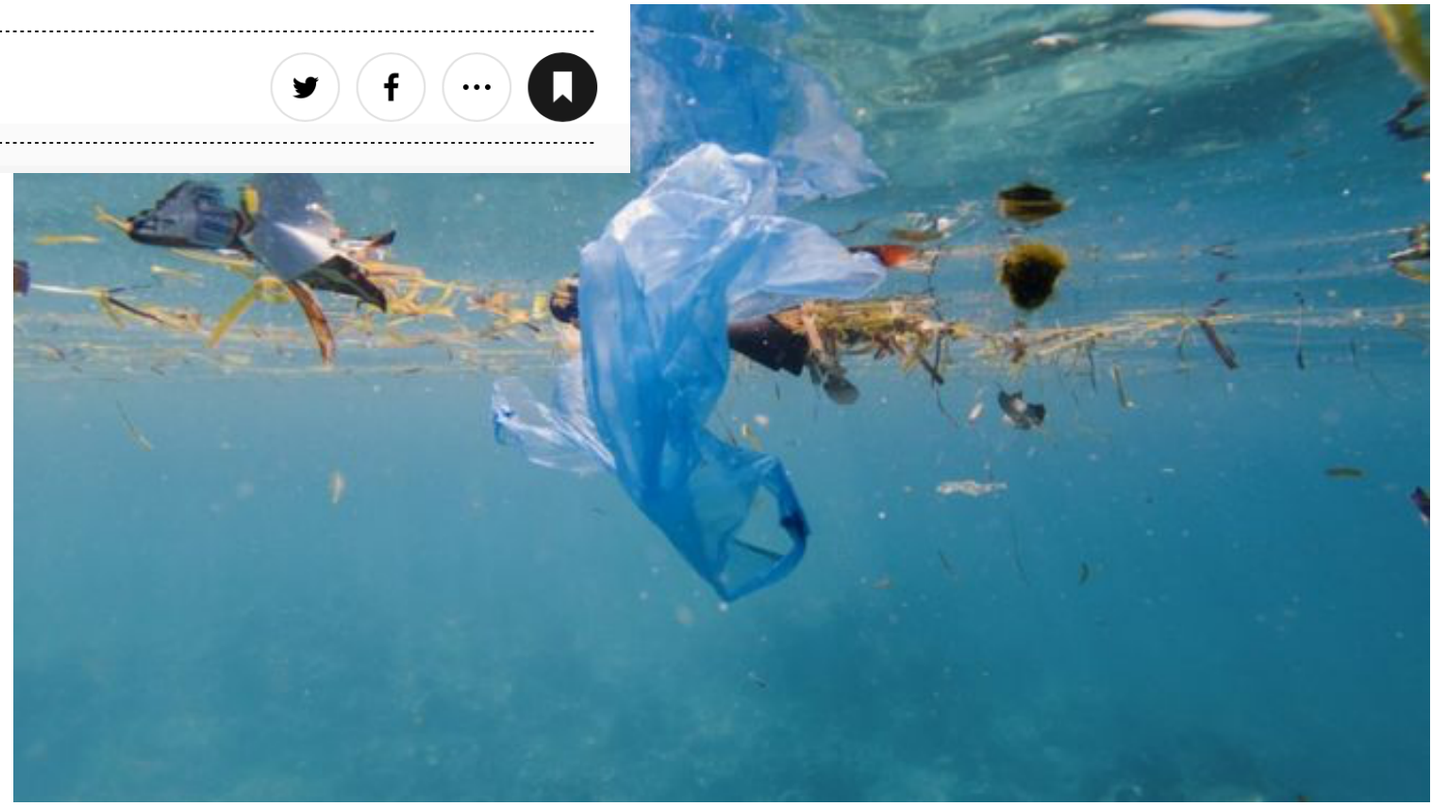
Marcel aan de Brugh 21 december 2018 Leestijd 6 minuten

Who is using **plastic** bags on a daily basis?

Kleine plasticdeeltjes zullen in de toekomst veel milieuschade aanrichten

Milieuverontreiniging Als plastic afval zich in de natuur blijft ophopen zal er over een eeuw zeker schade door ontstaan. Nu is die schade nog nauwelijks zichtbaar, stellen Europese onderzoekers.

Marcel aan de Brugh 10 januari 2019 Leestijd 2 minuten



Who is aware of **climate change**?

Op-ed Peter Kuipers Munneke in NRC

The question is not if the Netherlands will disappear below sea level, but when

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Sustainable development

"Standarts of living for current and future generations within the planet's carrying capacity (Hoornweg et al., 2016)"

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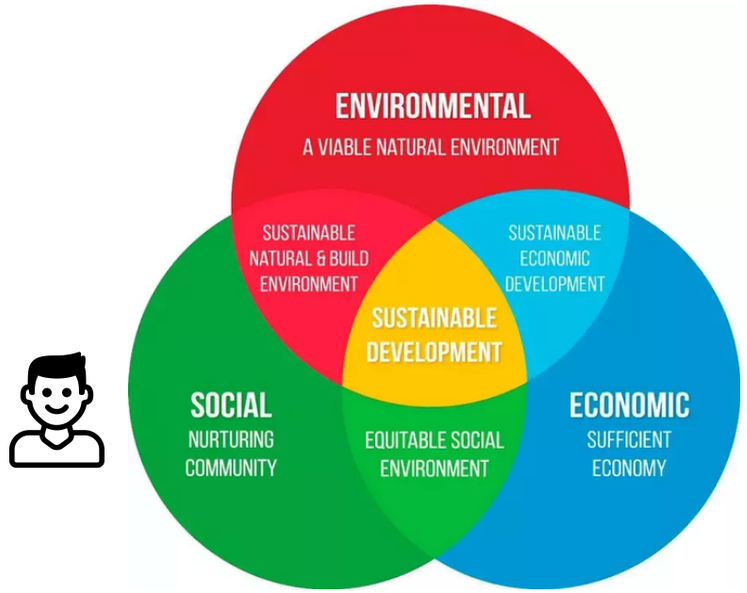

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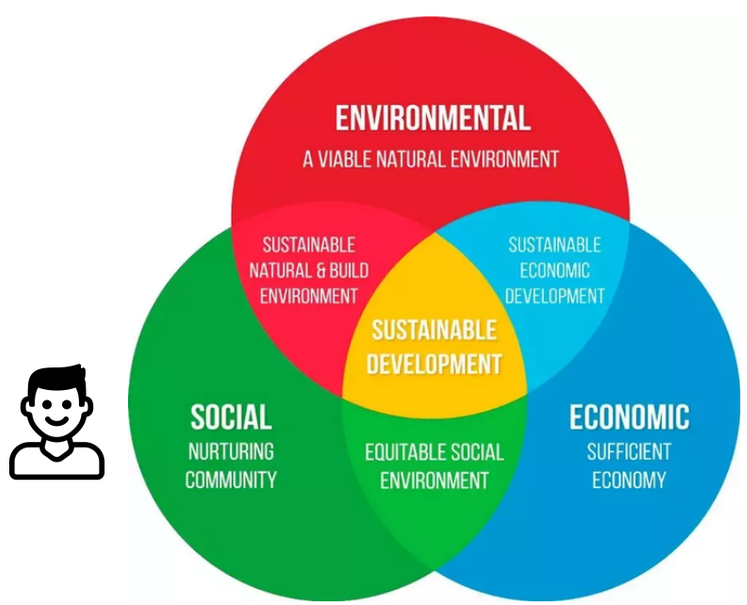

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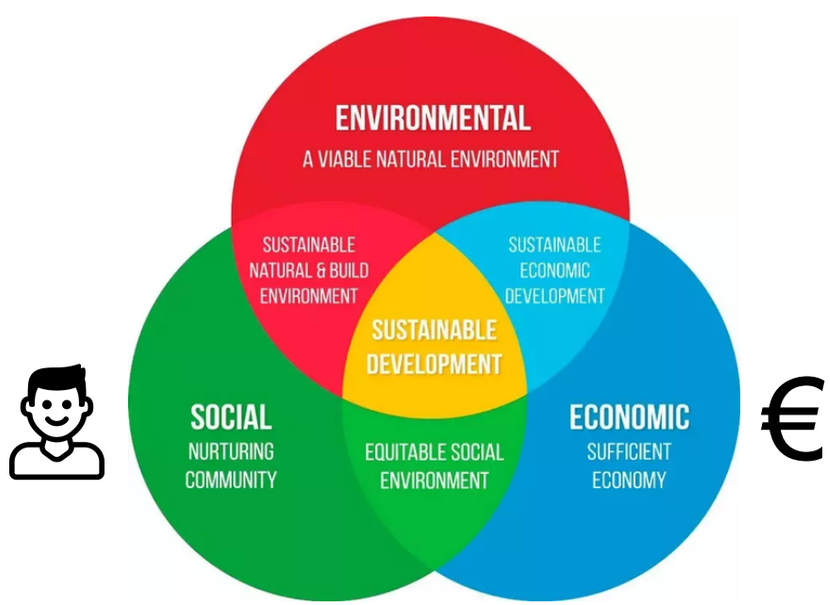
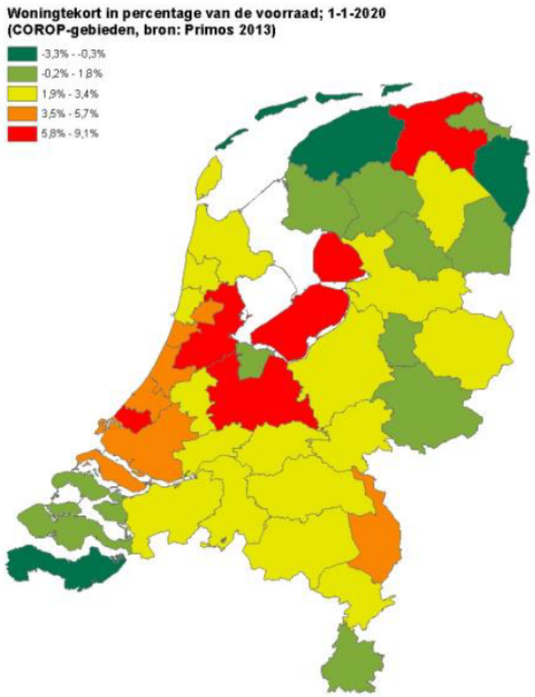
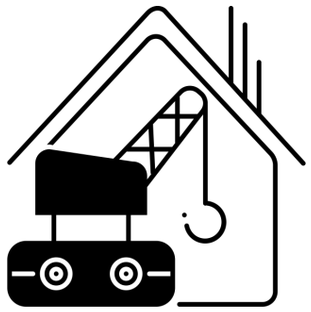




> 1 million dwellings



- 25% CO2 emmission
- 60% material demand
- 80% embodied energy production processes building materials

SUSTAINABLE DEVELOPMENT GOALS

NEDERLAND CIRCULAIR!

Circular urban area development; Myth or reality?

A research into the factors and management of circular urban area development in Dutch practice

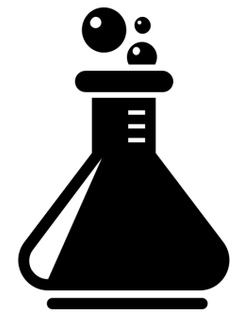
Problem statement

New concept!

No Consensus

Not feasible

Lacking scientific research



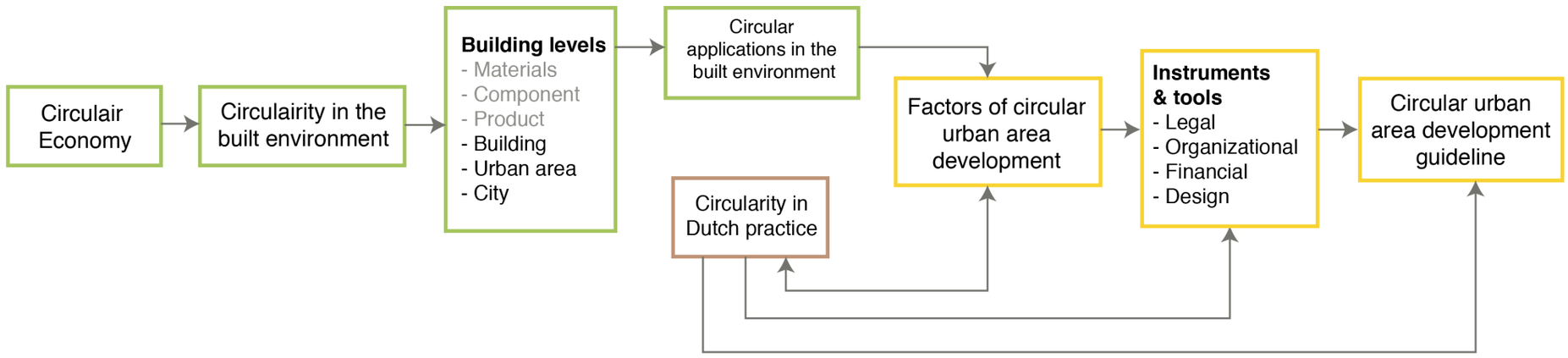
Research goal & question

Goal:

Define the **concept of circular urban area development** by identifying and explaining the **factors** of circular urban area development and the **management tools** that can be used to apply them in practice which are summarized in a **circular urban area development guideline.**

Question:

“What are the **factors** that contribute to the development of a circular urban area and how can these factors **be managed** in practice?”.



METHODS

Methodology

- Literature review
- Explorative interviews

Input

Literature review

Explorative interviews

Output

Factors of circualr urban area development

Input

Case studies

Output

Cross-case analysis

Input

Expert panel

Output

Circular urban area development guideline

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- Explorative interviews

- Draft: factors of circular urban area development

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Explorative interviews

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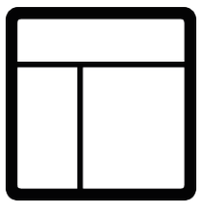

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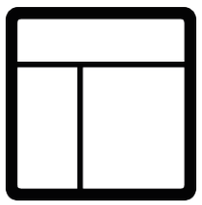

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- ‘Why?’
- Factors validated

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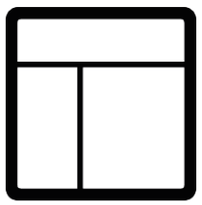

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- Applicability of factors in practice

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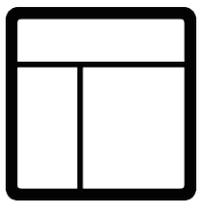

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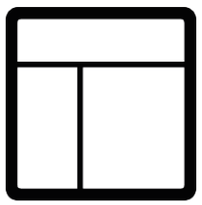

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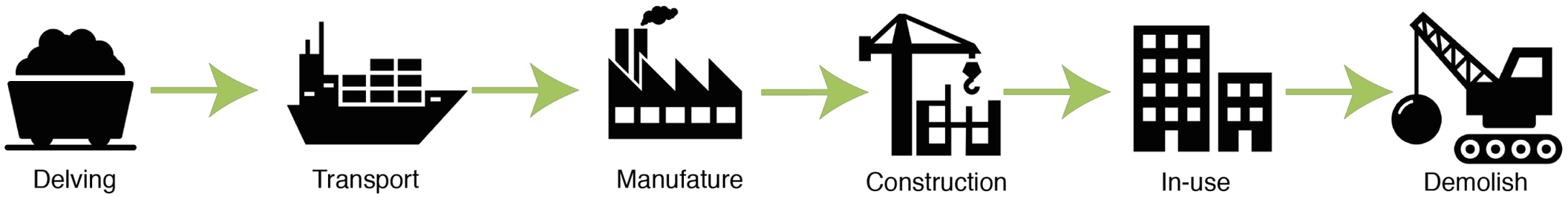
Circular urban area development guideline

THEORIES

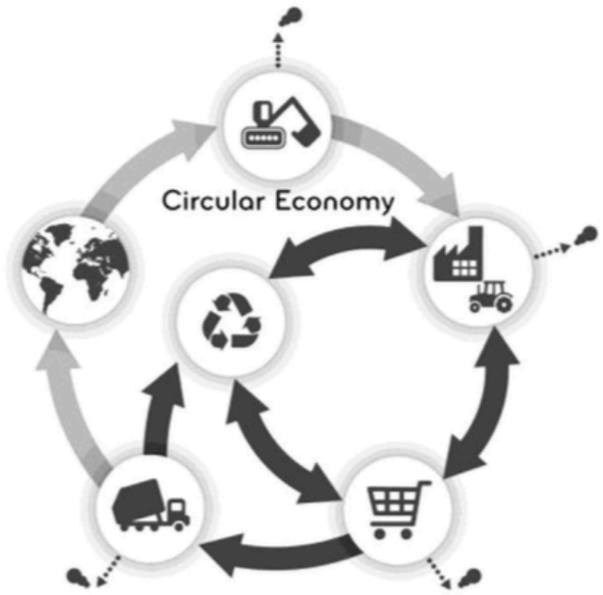
Theoretical framework

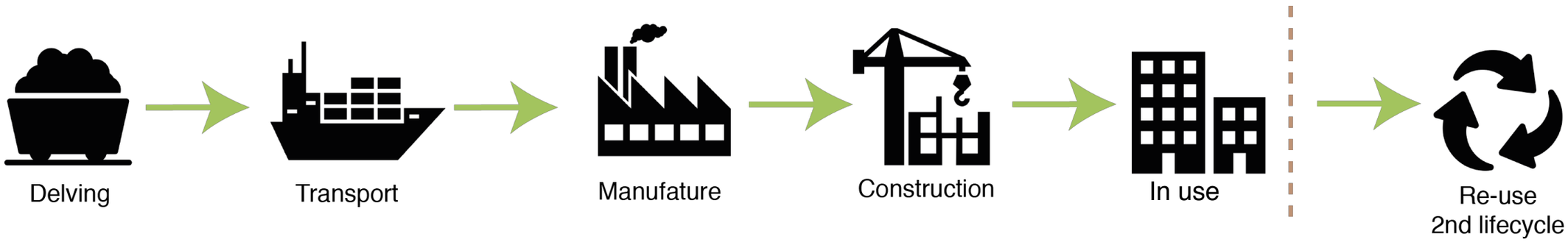
Linear economy



Theoretical framework

Circular economy





Theoretical framework

Circular economy

*In the circular economy there is a closed loop in the whole **economic system** where products and materials **retain the highest value** at all time. This means that there is no loss in value, efficiency or the effectiveness of these products and they are **maintained in the economy** for as long as possible without turning into waste.*

Main aim: gaining economic prosperity

Circularity

- Derivative of the circular economy
- Focus on the **environmental impact** of building materials and reducing their CO2 footprint
- Focus on the whole **production process**: delving > transport > manufacture > in use > 2nd lifecycle
- Focus on closing **resource**-cycles

Main aim: gaining environmental quality

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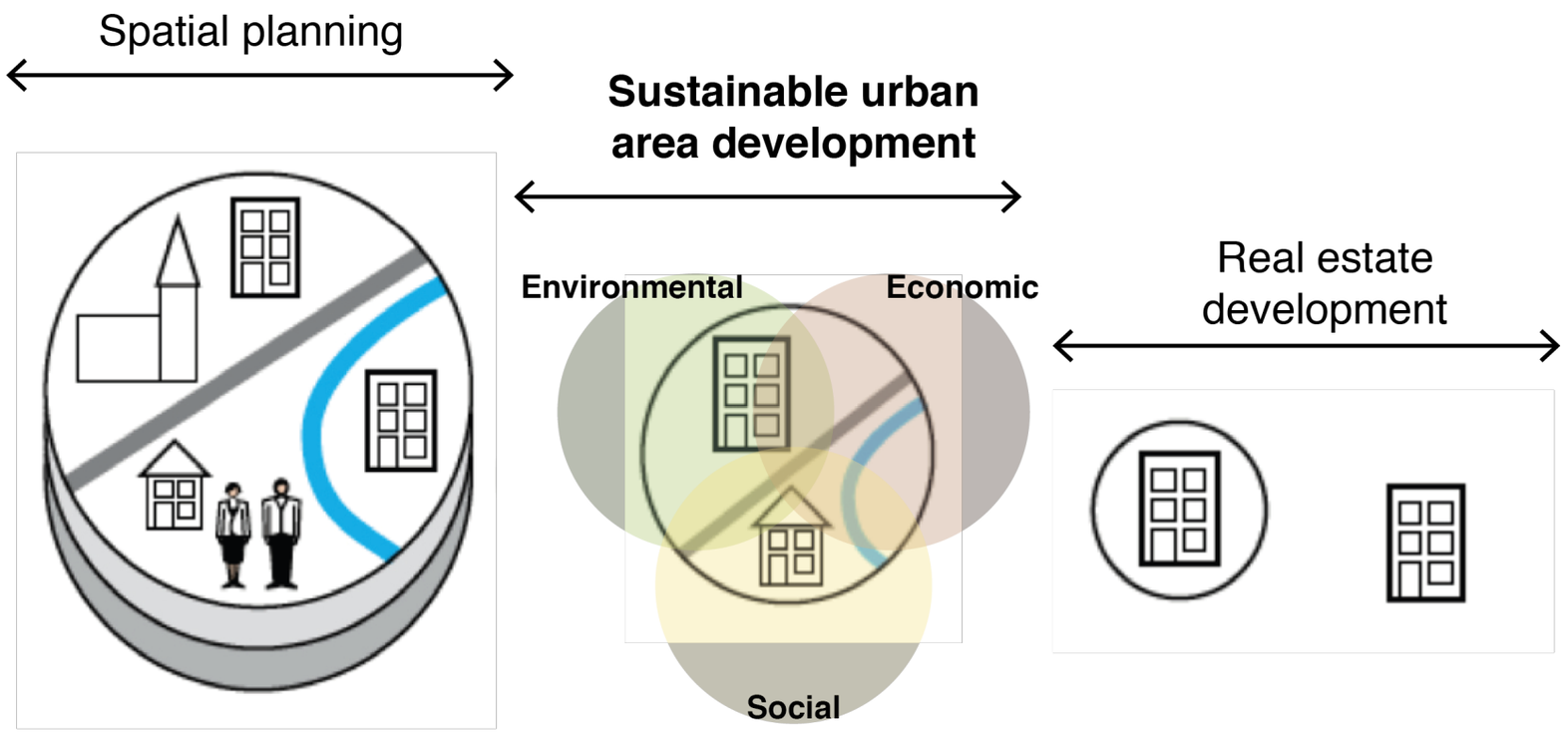
Sustainable development

“Standarts of living for current and future generations within the planet’s carrying capacity (Hoornweg et al., 2016)”

Theoretical framework

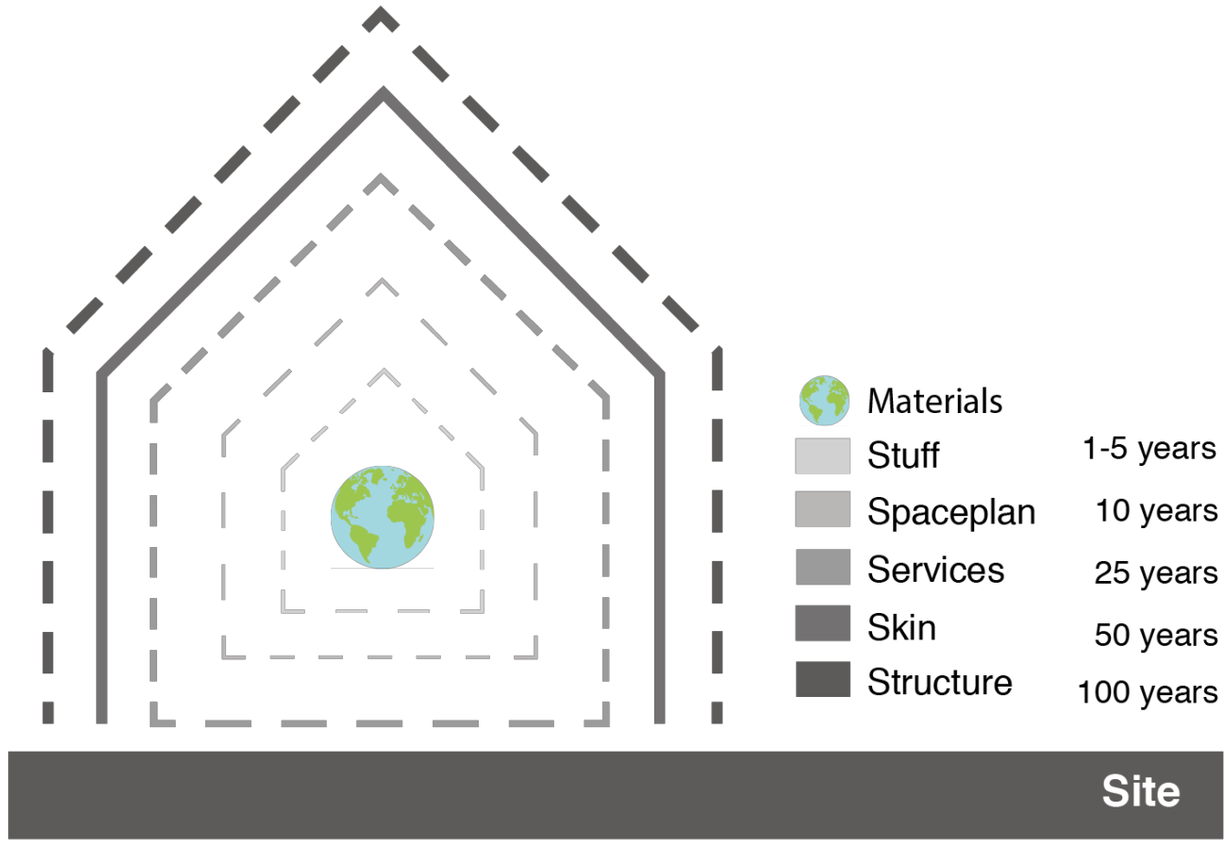
Sustainable urban area development



The **concept of circularity** is often seen as a **condition** for a sustainable development (Geisdoerfer et al., 2017)

Theoretical framework

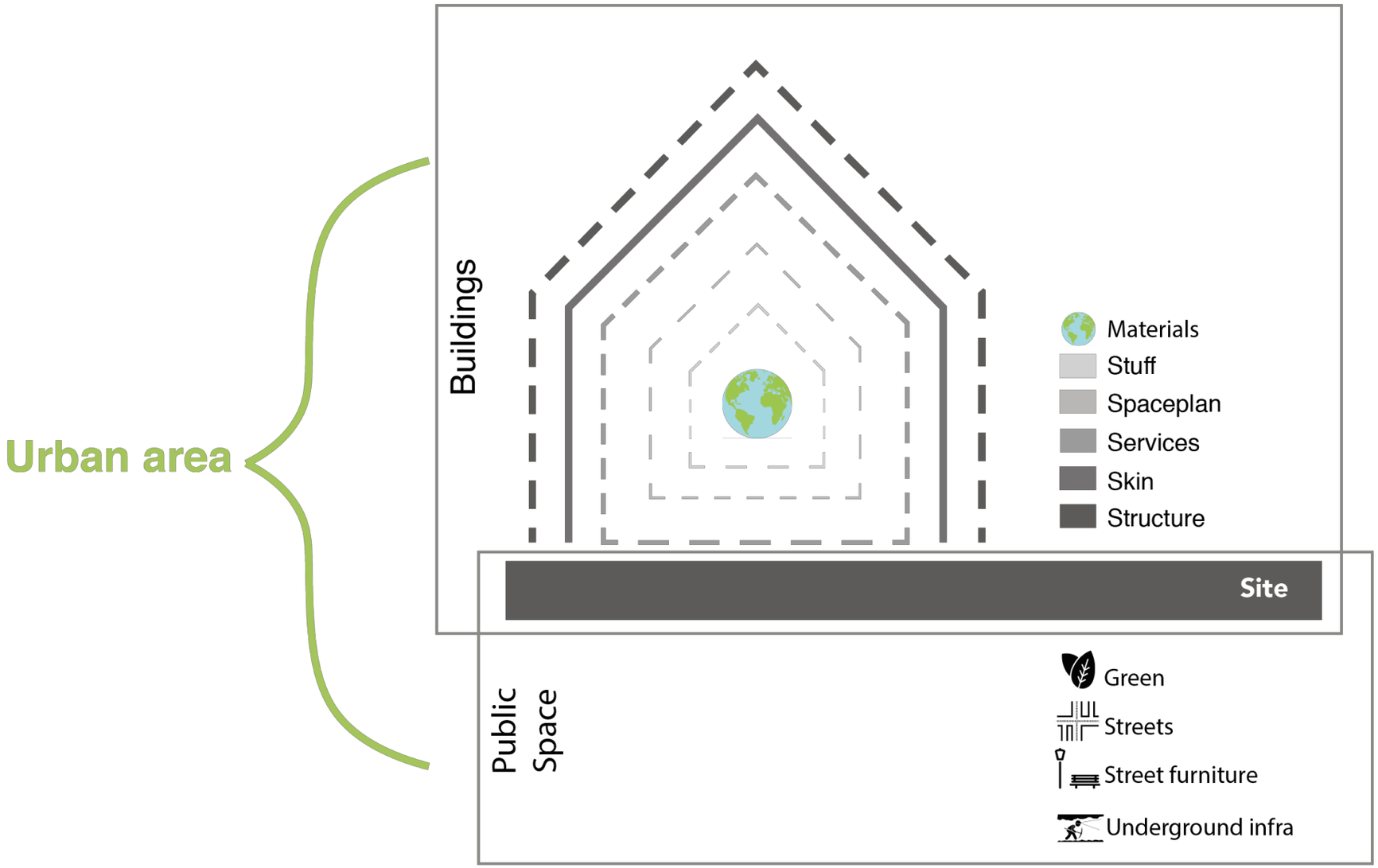
Adaptable buildings



(Brand, 1994)

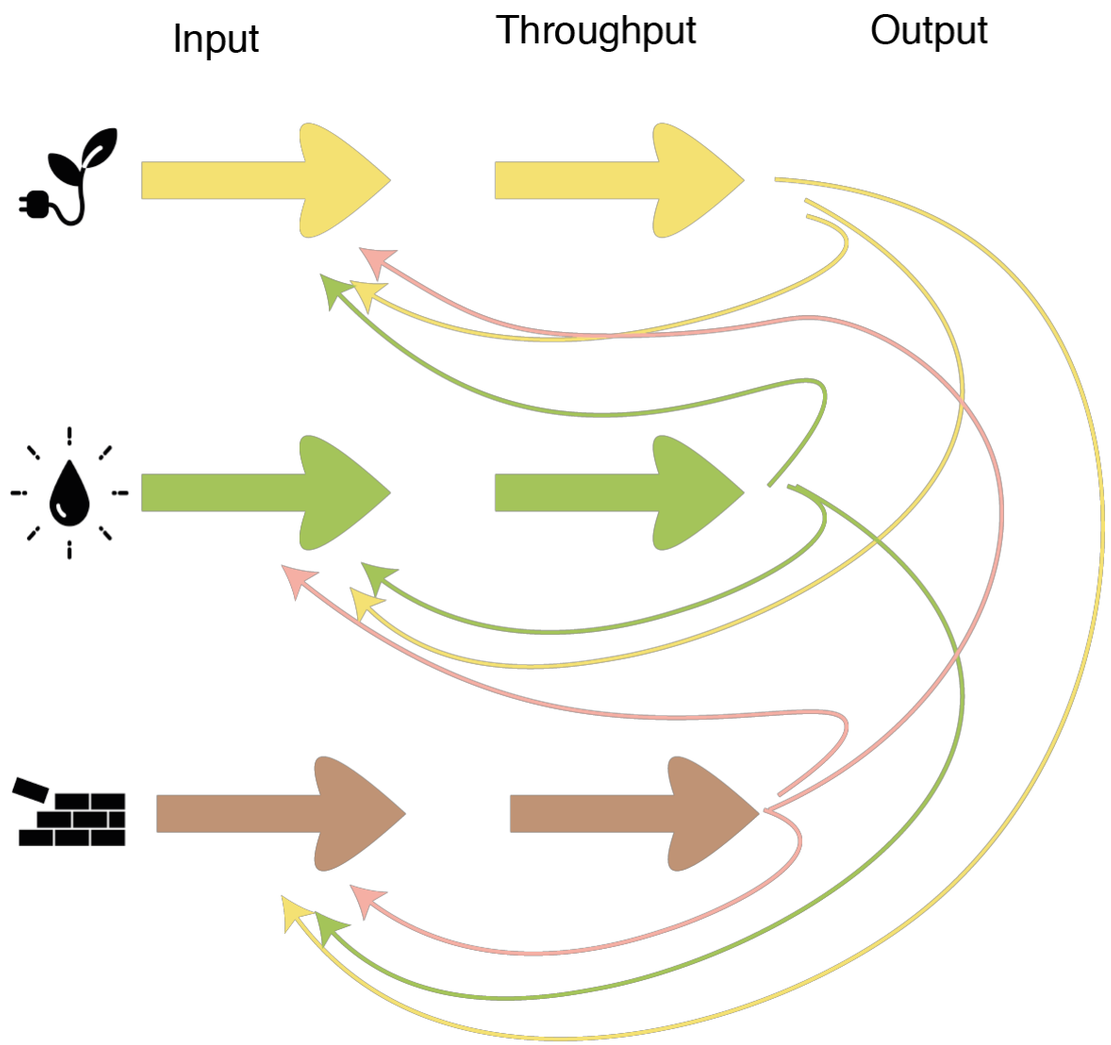
Theoretical framework

Adaptable urban area components



Theoretical framework

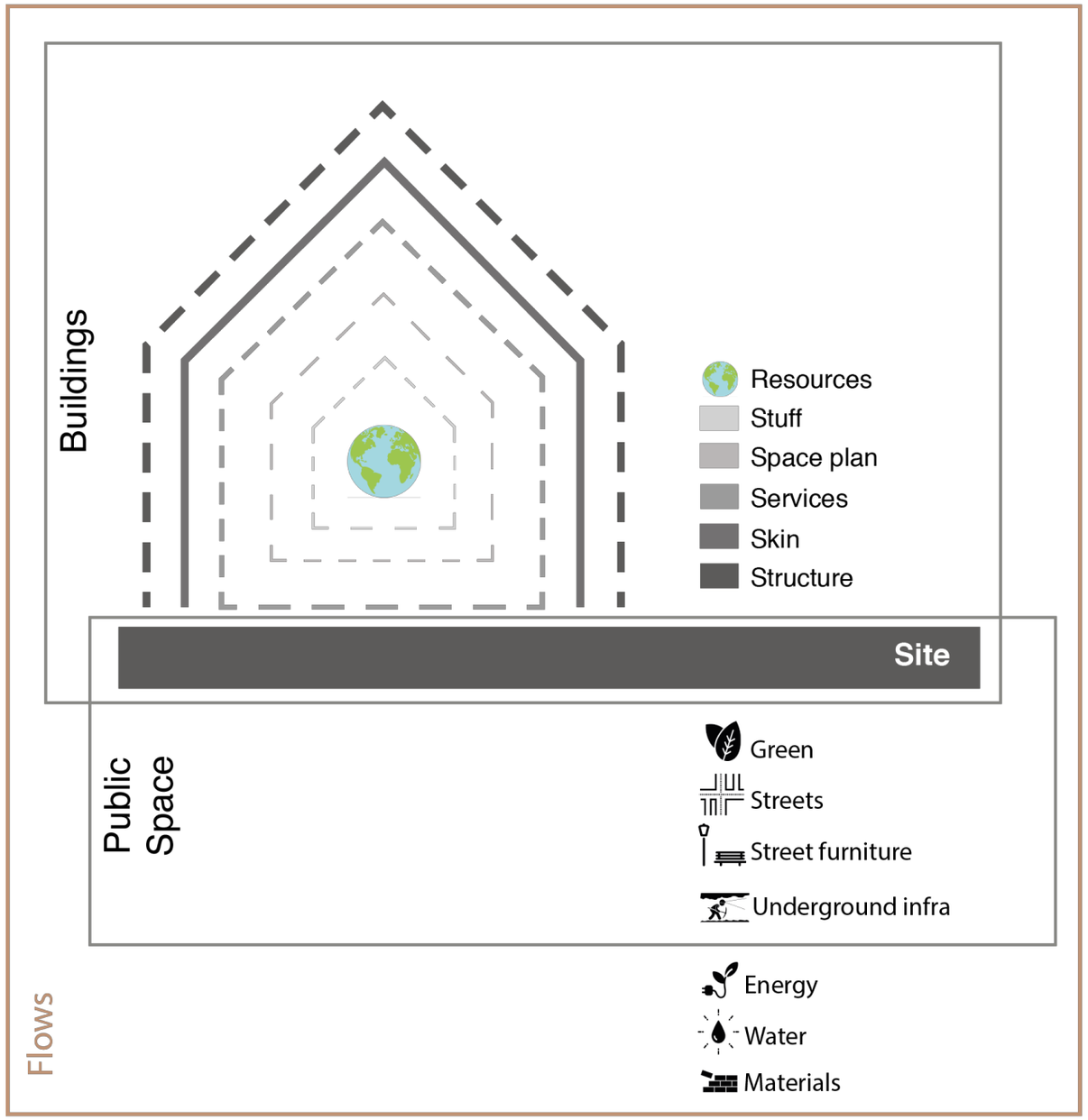
Ecosystem approach in cities



(van Bueren, 2012; EMF, 2013).

Theoretical framework

Components of a circular urban area



PRACTICE

Explorative interviews

Factors

Integral water & energy system

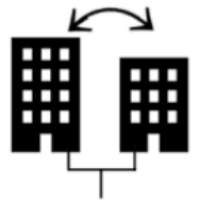
Materialflow between building and public space

Reusing waste in use-phase

Creating a community

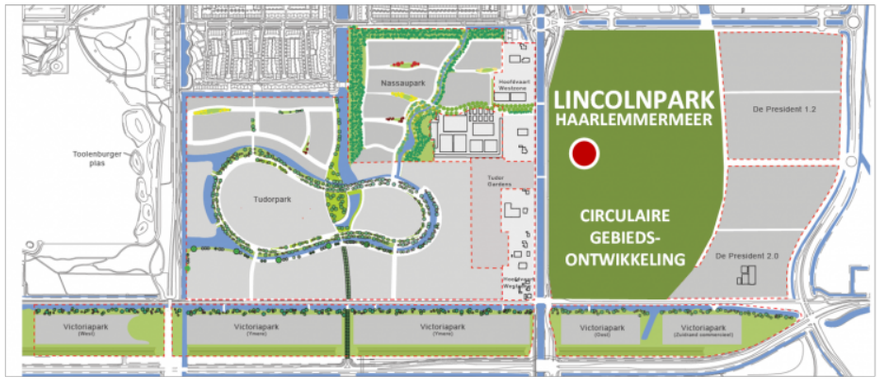
CO2 balance by creating green

Stimulating the local economy

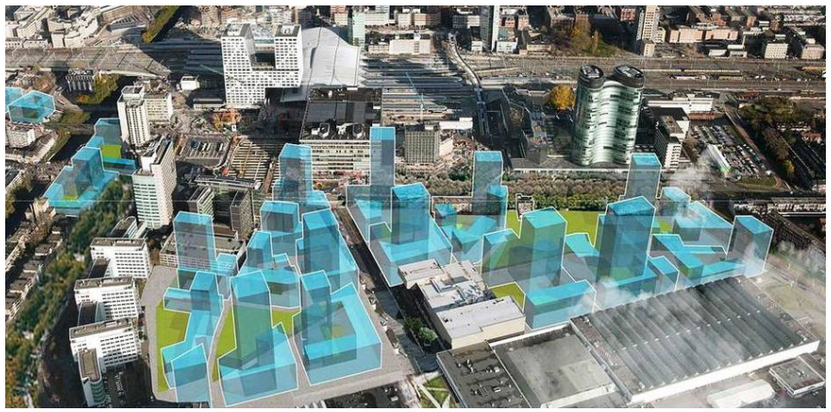


Urban area as an adaptive system

Case studies

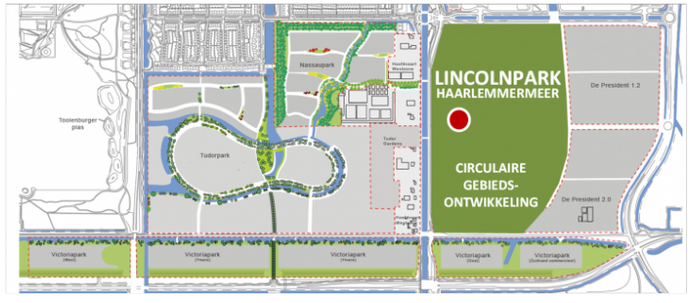


I: LincoInpark, Haarlemmermeer



II: Beurskwartier, Utrecht

III: Kabeldistrict, Delft

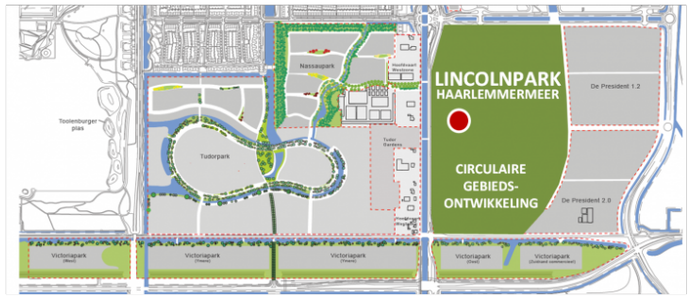


Case studies

I: Lincolnpark, Haarlemmermeer

- New built project
- Located in Metropolitan region Amsterdam
- Part of the large development “de Parken”
- 850 dwellings
- Last plot that is owned by the municipality

“Lincolnpark is called a circular urban area development, however it can be seen as a sustainable urban area development in which the principles of the circular economy are applied.”



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Closed water-system

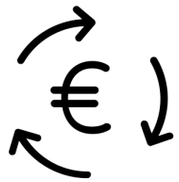
Tap-water, rainwater and wastewater are connected into one system

Building material flow

All physical urban area components can be re-used

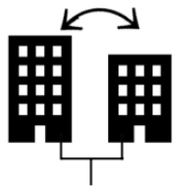
Re-use organic waste

Organic waste and biomass can be re-used on urban area scale



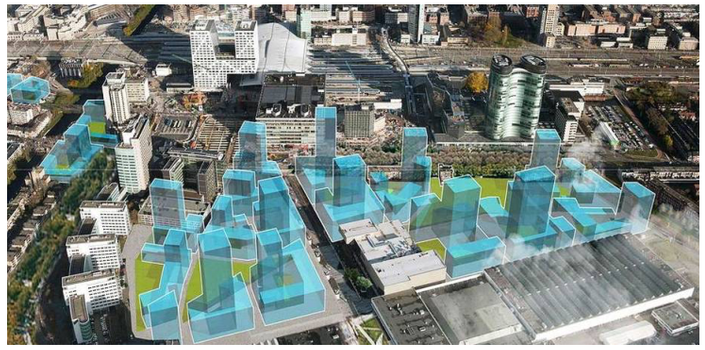
Stimulating the local economy

Repair and distribution of second-hand goods and selling of local products



Adaptive design principles

Use the shearing layers of change of Brand (1994) in the design



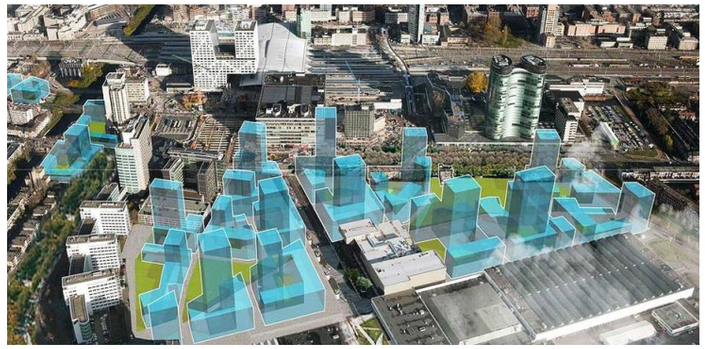
Case studies

II: Beurskwartier, Utrecht

- Municipality of Utrecht,
  + 70.000 new dwellings
- Redevelopment project
- Next to Utrecht Central Station
- 3.000 new dwellings, 50.000
  m2 workplaces, 10.000 m2
  facilities

“The circular economy is not the main aim of the development. The aim of the redevelopment of the Beurskwartier is to create Healthy Urban Living. The circular economy is used as a tool to organize society in such a way that it is sustainable.”

“Circularity is defined as creating an almost (zero) waste neighborhood”



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Circular building material cycle

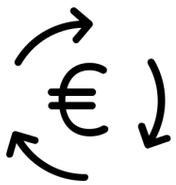
Phase 1: re-using existing materials

Phase 2: using re-usable materials

Re-use organic waste & separate collection

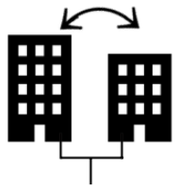
Organic waste is re-used in greenhouses,

Waste is separately collected at the source and logistics are smartly arranged.



Stimulating the local economy

Repair cafes, second-hand shops and sharing-economy. ‘Essence’ of Beurskwartier



Adaptive buildings & shared public spaces

Components with lifecycle under 50 years are removable, public space designed for multiple purposes

Case studies

III: Kabeldistrict, Delft

- Municipality of Delft
  + 15.000 new dwellings
- Redevelopment old Cable Factory
- First plot of large development
  “Schieoevers Noord”
- 3.000 - 4.000 dwellings,
  60.000m2 workplaces incl.
  manufacturing industry

“Schieoevers Noord is designated as a place where the principles of the circular economy can be applied on a large scale.”

“The old cable factory is a goldmine of material resources that can be upgraded and re- used in the new development”

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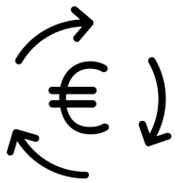
Re-using building material flow

Re-using all components of urban area, material hub and material passports

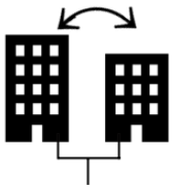
Re-use organic waste

Re-use organic waste and related to use-waster, separately collect other waste flows and recycle outside the area



Stimulating the local economy

Products circulate between households, companies and manufacturing industry



Urban area is spatially adaptive

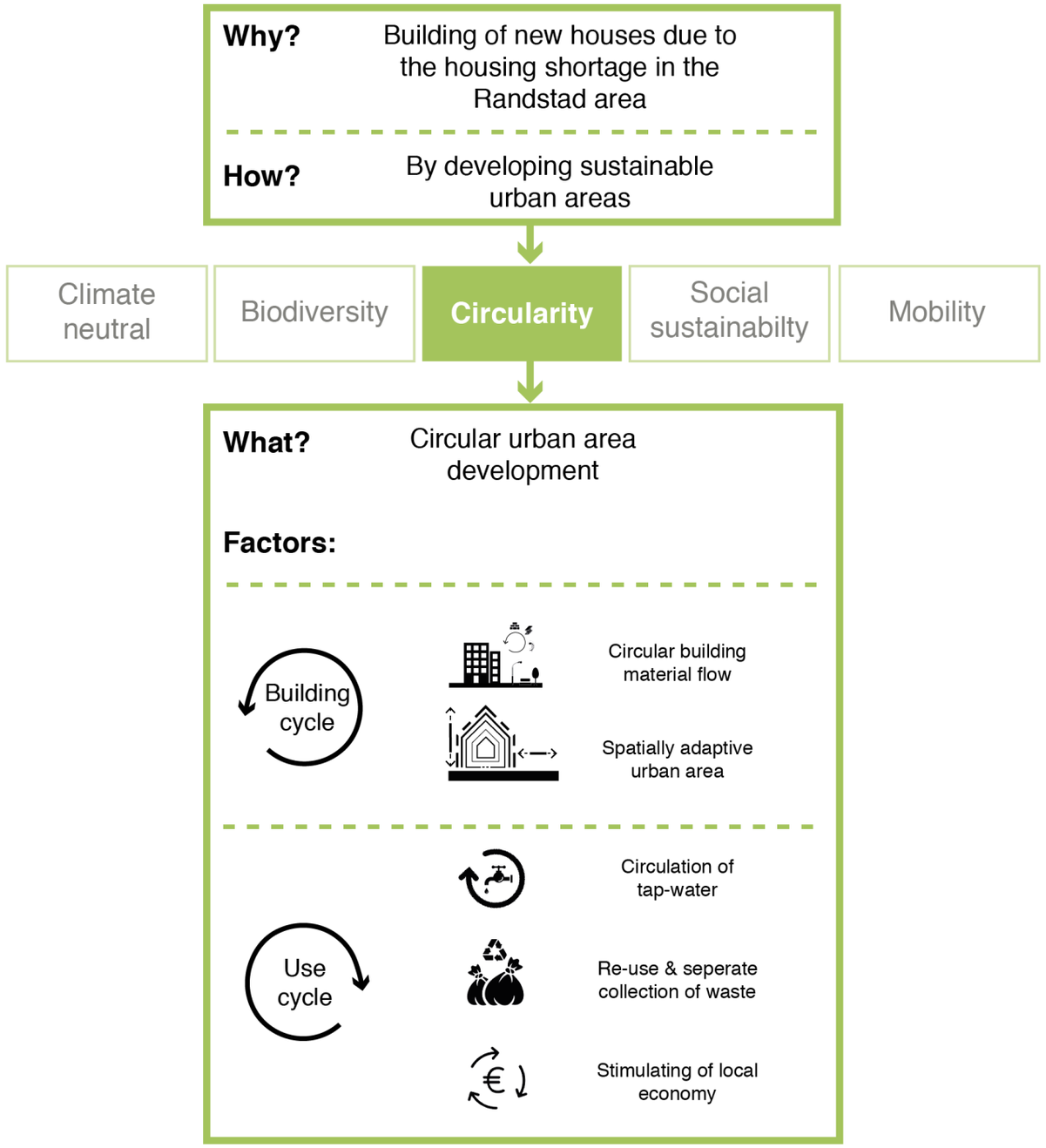
Use the shearing layers of change of Brand (1994) in the urban area design

Use-water cycle

Resource that is used on daily basis, can be closed on urban ara scale

Case studies

Cross-case analysis



- (Re)developments because of the **housing shortage** in the Randstad area
- **Sustainable** urban area developments which focus on several sustainability themes
- Circularity is used as **one of the means** (sustainability themes) to create a sustainable urban area
- When **circular principles** are used in the development, it can be called a **circular urban area development**

Expert panel

Question 1: In front of you, you can see the factors that contribute to the development of a circular urban area. Are you missing factors?

Expert panel

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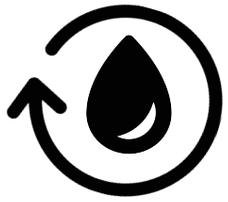
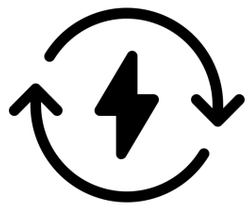


Closed water-system



Efficient energy-system

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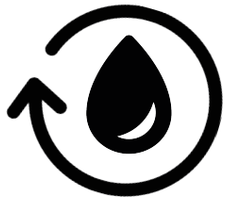

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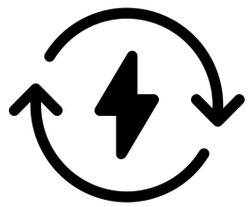

Efficient energy-system

Question 2: What preconditions for urban area development must be set to make a circular urban area development possible?

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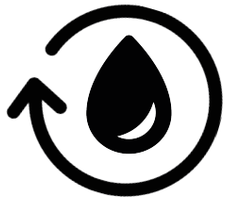

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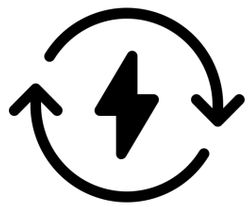

Efficient energy-system

Question 2: What preconditions for urban area development must be set to make a circular urban area development possible?

Define the boundaries of the circular urban area

Public space is key

Long-term perspective

Consensus is key

Create value in the design

CONCLUSIONS

Conclusions

Research question:

What are the factors that contribute to the development of a circular urban area and how can these factors be managed in practice?

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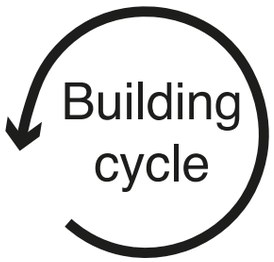
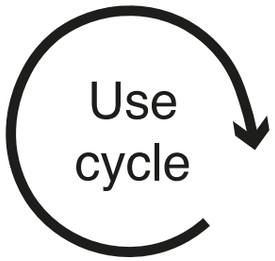


- Focus on building materials
- Are log and have long lifecycles



- Focus on resources and products used on a daily-basis
- Are volatile and have short lifecycles

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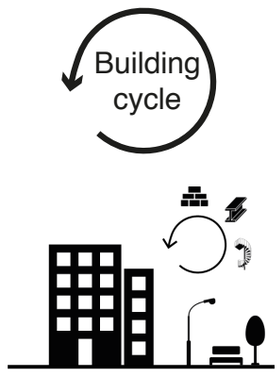

1. **Circular building material flow**

- High-quality re-use of all urban area components
- Store in nearby material hub
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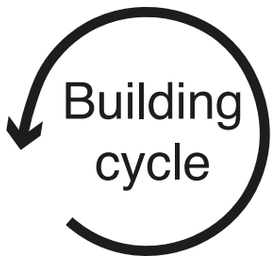

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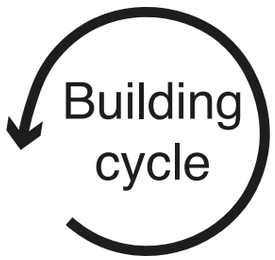

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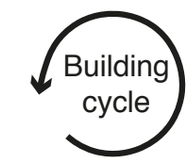

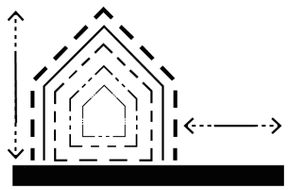

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   - Adaptable buildings & flexible public spaces
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   - < 50 years flexible
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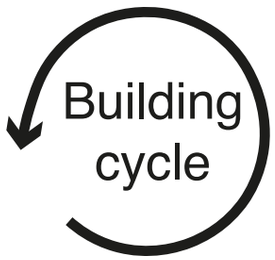

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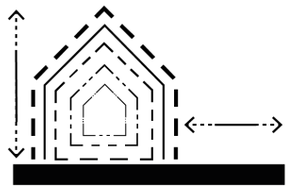

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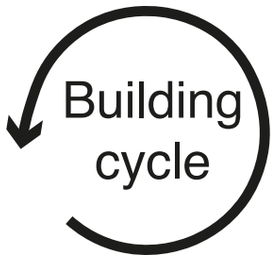

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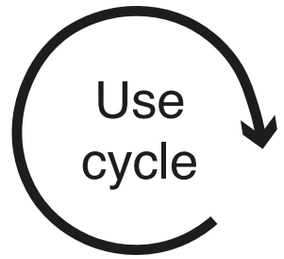

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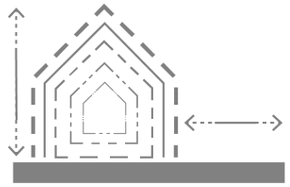

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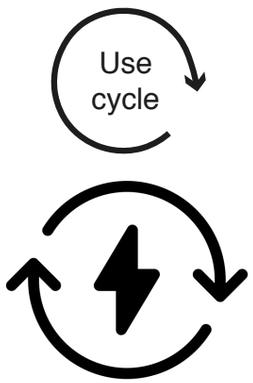

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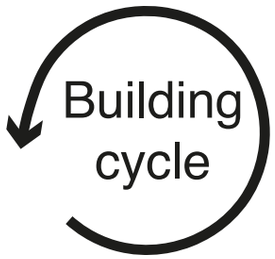

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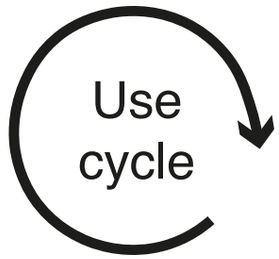

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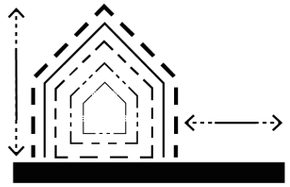

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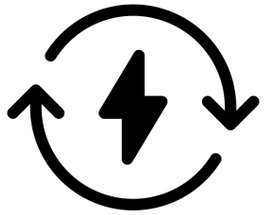

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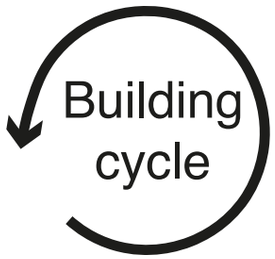

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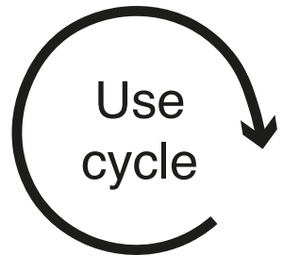

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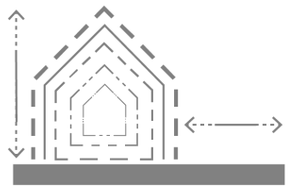

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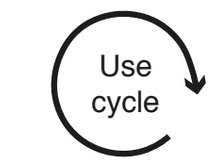

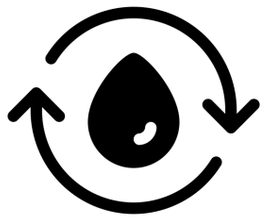

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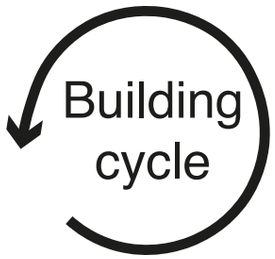

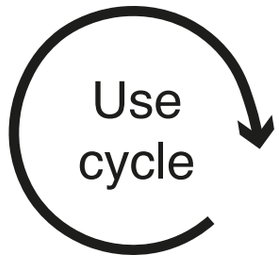

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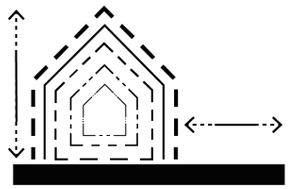

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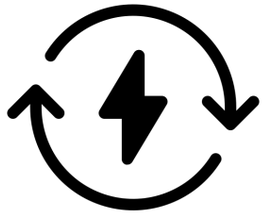

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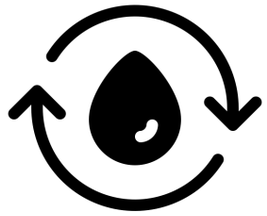

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Use cycle

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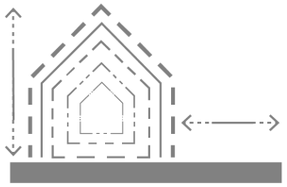

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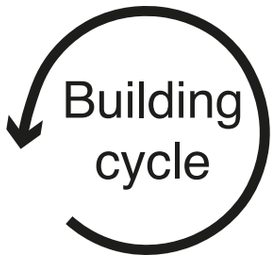

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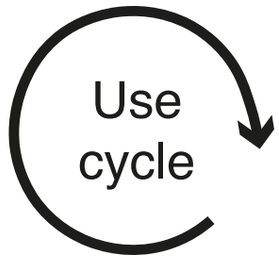

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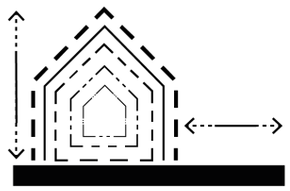

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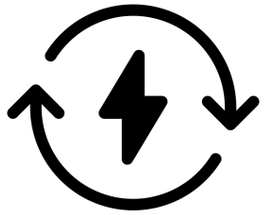

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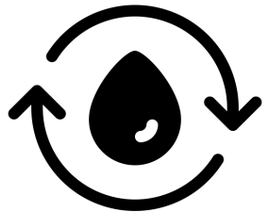

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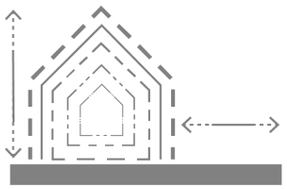

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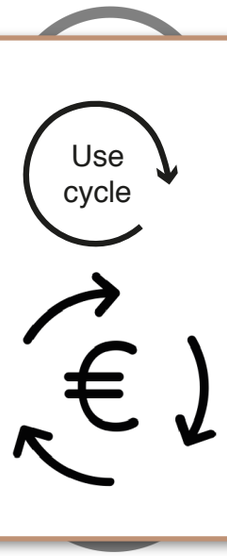

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6. Stimulating the local economy

- High-quality re-use of local products; repair cafes
- Sharing-economy
- Growing local products such as vegetables

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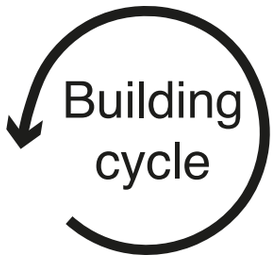

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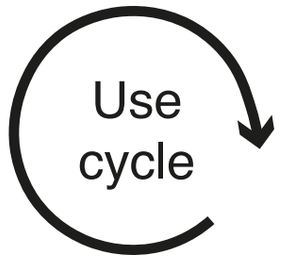

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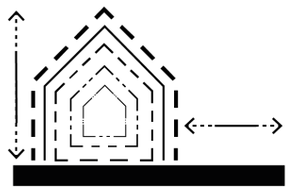

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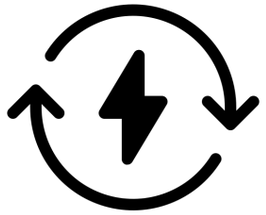
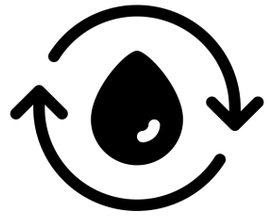


3. Efficient energy system

- Electricity for lightning or heating of water
- Environmentally system
- System linked with other areas
- Orientation of buildings

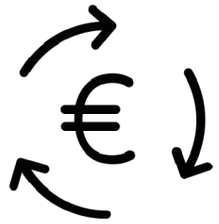


4. Closed water-system

- Tap-water, rainwater and waste-water in one system
- Re-used in economical way
- Relation with organic waste

5. Re-use, collection & logistics of waste

- Separate collection at the source of
  - Organic waste, paper & cardboard, PMD
- Organic waste re-used in urban ara
- Smart logistics system



6. Stimulating the local economy

- High-quality re-use of local products; repair cafes
- Sharing-economy
- Growing local products such as vegatables

Conclusions

Research question:

What are the factors that contribute to the development of a circular urban area and **how can these factors be managed in practice?**

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Instruments:

Legal instruments

Financial incentives

Organizational instruments

Design tools

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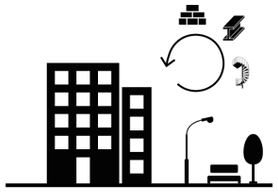

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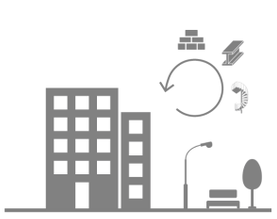

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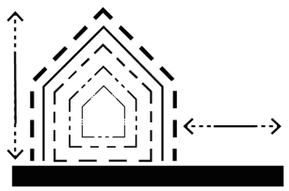

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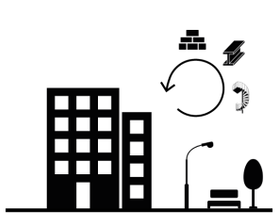

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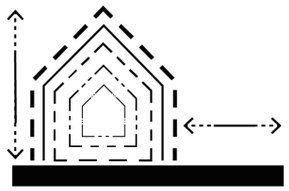

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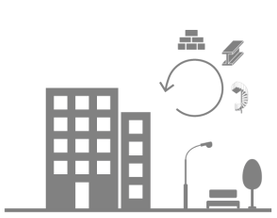

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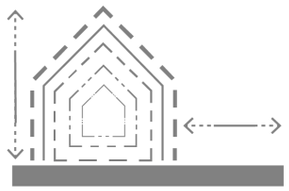

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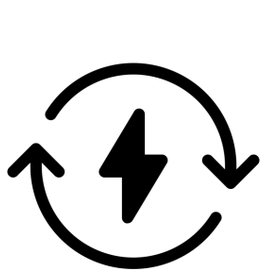

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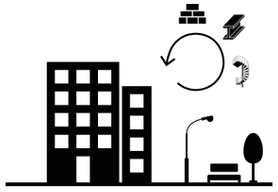

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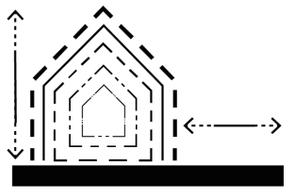

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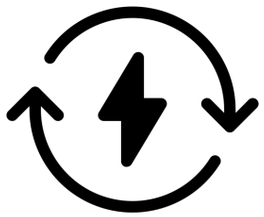

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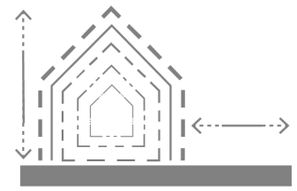

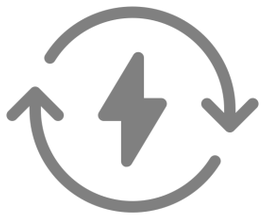

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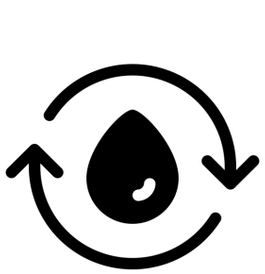

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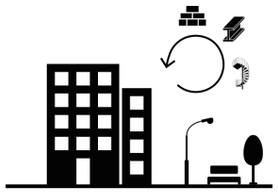

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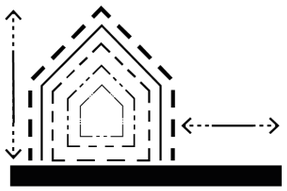

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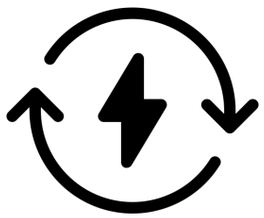

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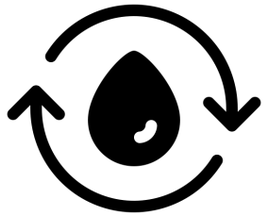

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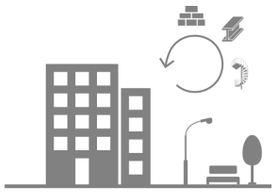

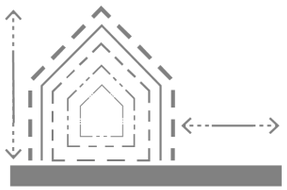

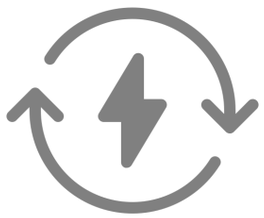

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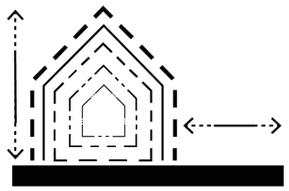

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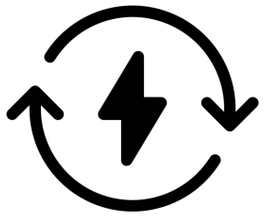

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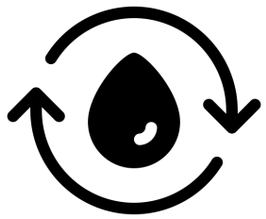

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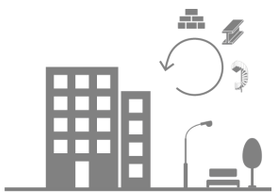

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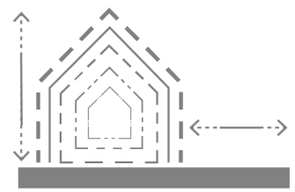

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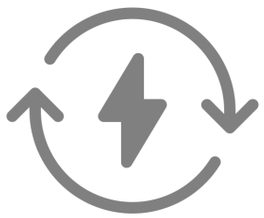

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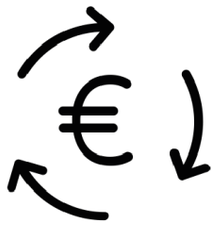

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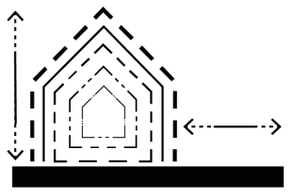

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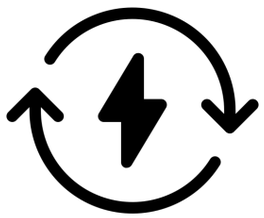

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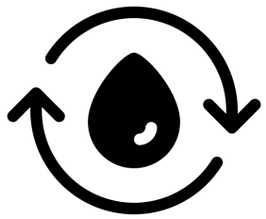

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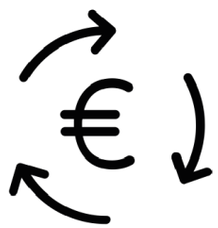

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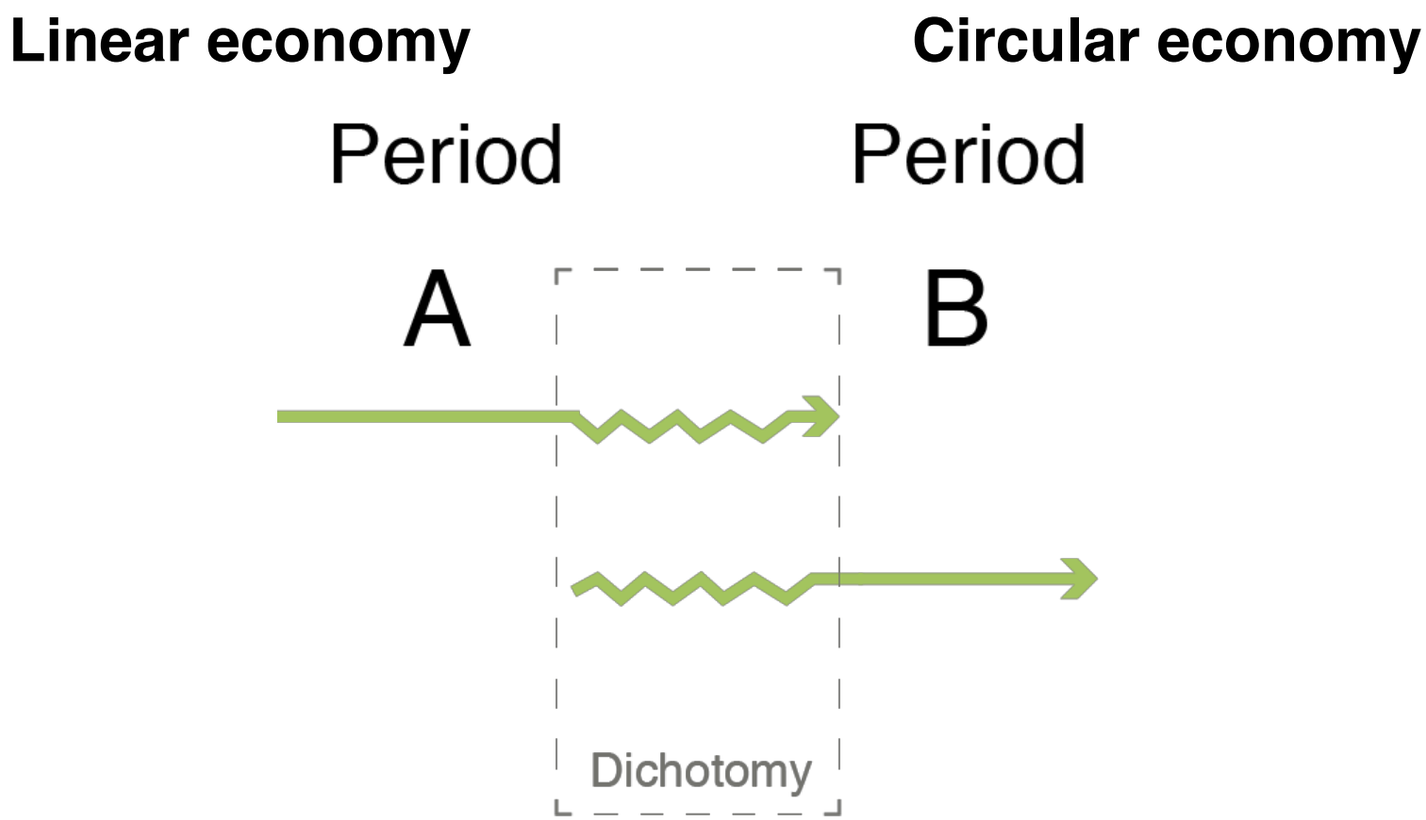
Guideline

Circular urban area development

	Factors		Measures
Building cycle		**Circular building material flow** High-quality re-use of building materials in the most environmentally friendly way. In redevelopment projects existing structures can be re-used for the new design or can be stored in a nearby material hub.	Material passports for all buildings Material passports for all materials in the public space Use online data tool to find existing materials to re-use in own developent
		**Spatially adaptive urban area** Creation of adaptable buildings and flexible public spaces. The concept of Brand (1994) can be used to define which urban area components need to be robust and which need to be flexible.	Use the Building Circularity Index of Alba Concepts to design adaptable buildings Use the term redundancy to optimize the design of the public space
		**Efficient energy system** An efficient and environmentally energy system can be selected based on the energy demand of the urban area. Energy generation and consumtion has is influenced by the orientation of buildings and public spaces.	Use EPC or BENG to measure the energy perfomance of buildings Use EMG to measure the energy perfomance of the urban area Apply a smart flow analysis to design a smart energy system
Use cycle		**Closed water-system** A closed water-system can be realised on the scale of an urban area. In this closed system, drinking-water, waste-water and the rainwater flow can be combined and connected. This watersystem has a strong relation with the flow of organic waste.	Change the 'hygiene code drinking water' to connect waste and drinking water Use crisis and recoveray law Introduce paying taxes over the amount of waste-water that is flushed into the sewer
		**Re-use, collection and logistics of waste** Households and companies producte waste on a daily-basis. Organic waste can be re-used in the urban area. Other waste flows, such as paper and plastics, need to be seperately collected in the urban area and can be recycled out of the area on a higher scale. The logistics of waste need to be organized in an efficient way.	Facilitate seperate waste collection is in the public space Change the law in Chapter 10 of Wet Milieu en beheer to make joint collection of residential and company waste possibble Set-up a VVE structure among the companies in the urban area to organize their waste disposal together
		**Stimulating the local economy** High-quality re-use of local products. In a mixed-use urban area places are created for repair cafes and the sharing-economy. Further, (roof) gardens can be designed to grow local products on that can be sold to local restaurants and shops.	Introduce less taxation over local products Calculate the environmental impact and pollution factor through the prices of products

Discussion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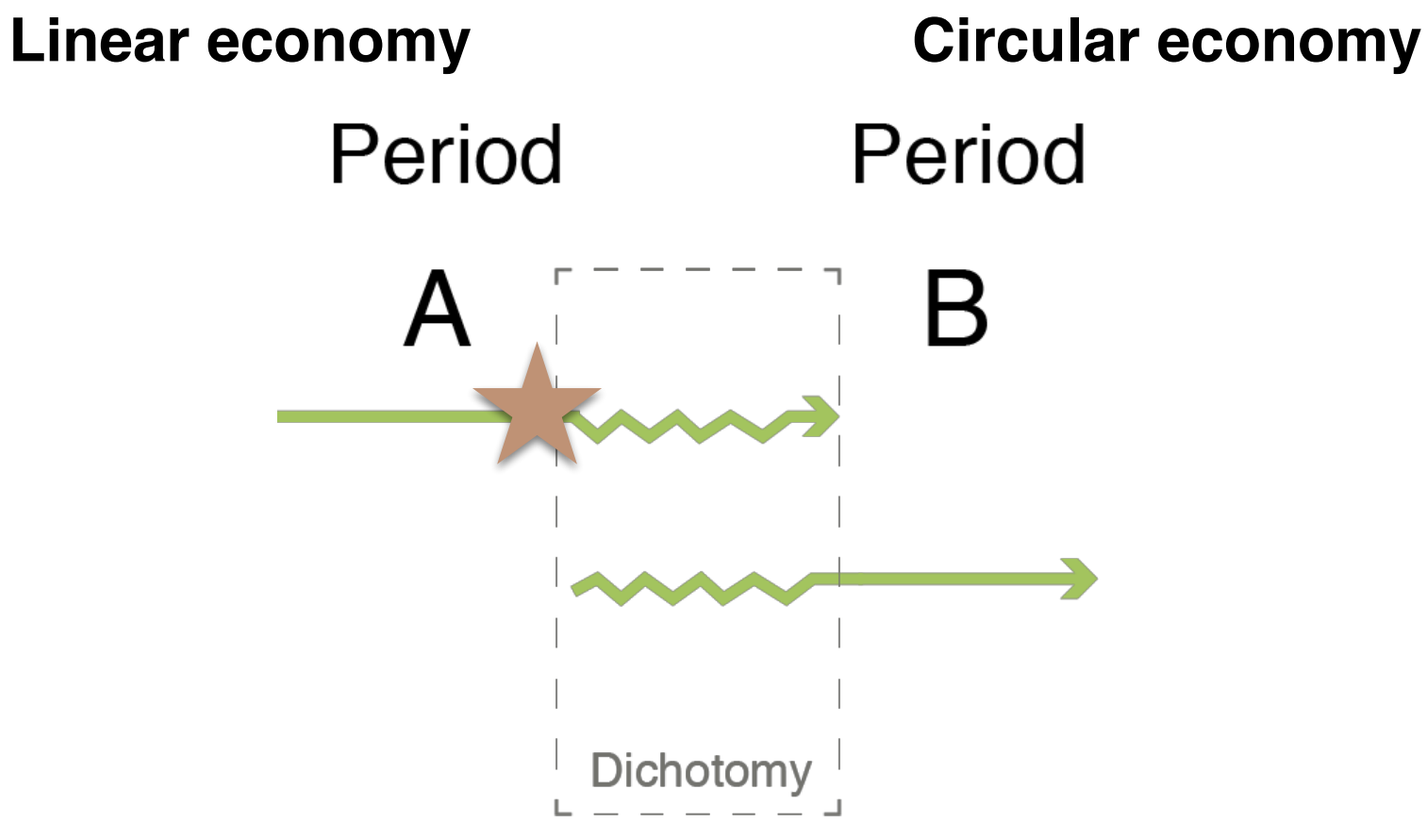
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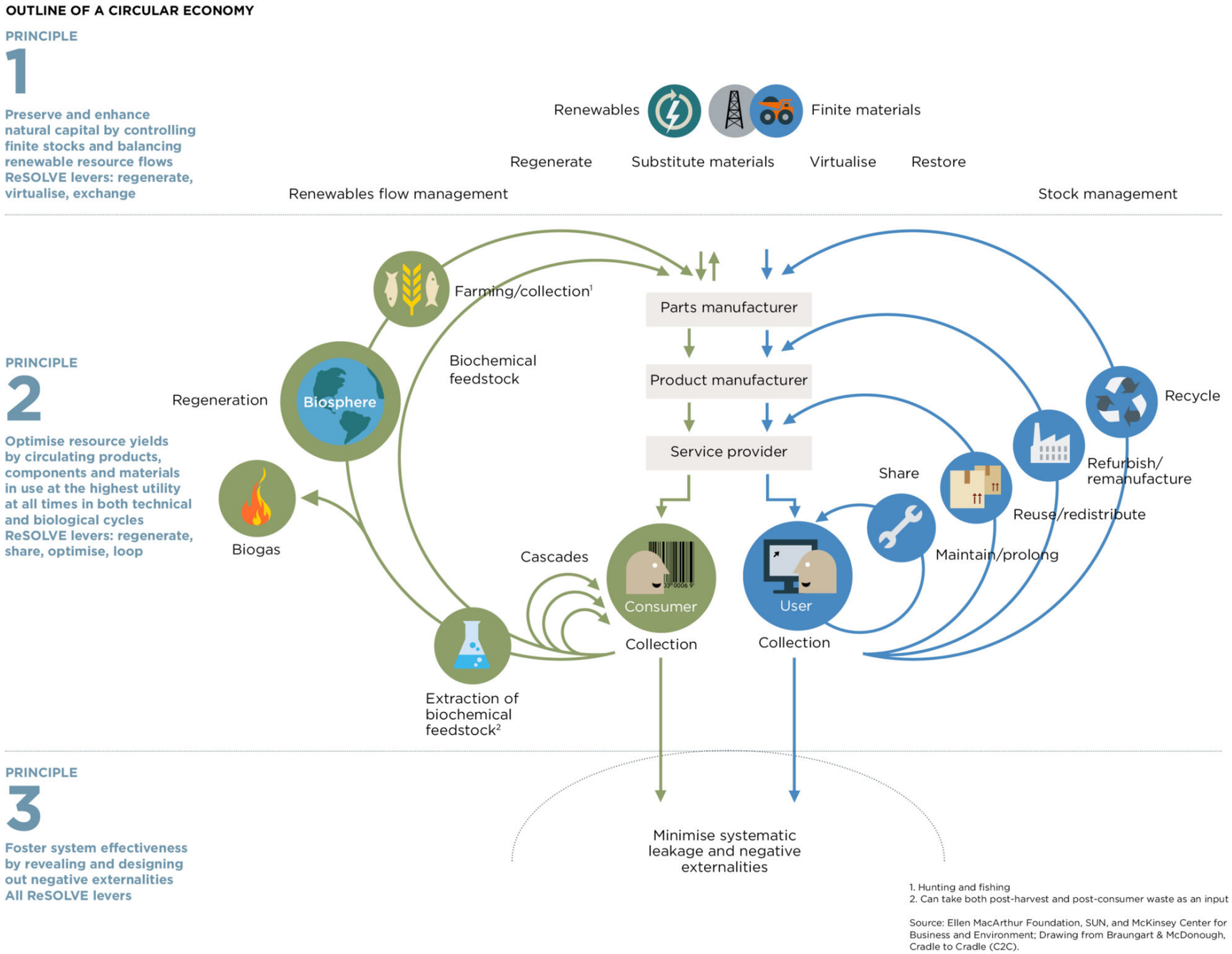
THANK YOU!

Extra slides



Extra slides

Smarter product use and manufactu-re	**R0 Refuse**	Make product redundant by abondining its function or by offering the same function with a radically different product
	R1 Rethink	Make product use more intensive (e.g. by sharing product)
	R2 Reduce	Increase efficiency in product manufacture or use by consuming fewer natural resources and materials
Extend lifespan of product and its parts	**R3 Reuse**	Reuse by another consumer of discarded product which is still in good condition and fulfils its original function
	R4 Repair	Repair and maintenance of defective product so it can be used with its original function
	R5 Refurbish	Restore an old product and bring it up to date
	R6 Remanufacture	Use parts of discarded product in a new product with the same function
	R7 Repurpose	Use discarded product or its parts in a new product with a different function
Useful application of materi-als	**R8 Recycle**	Process materials to obtain the same (high grade) or lower (low grade) quality
	R9 Recover	Incineration of mateiral with energy recovery