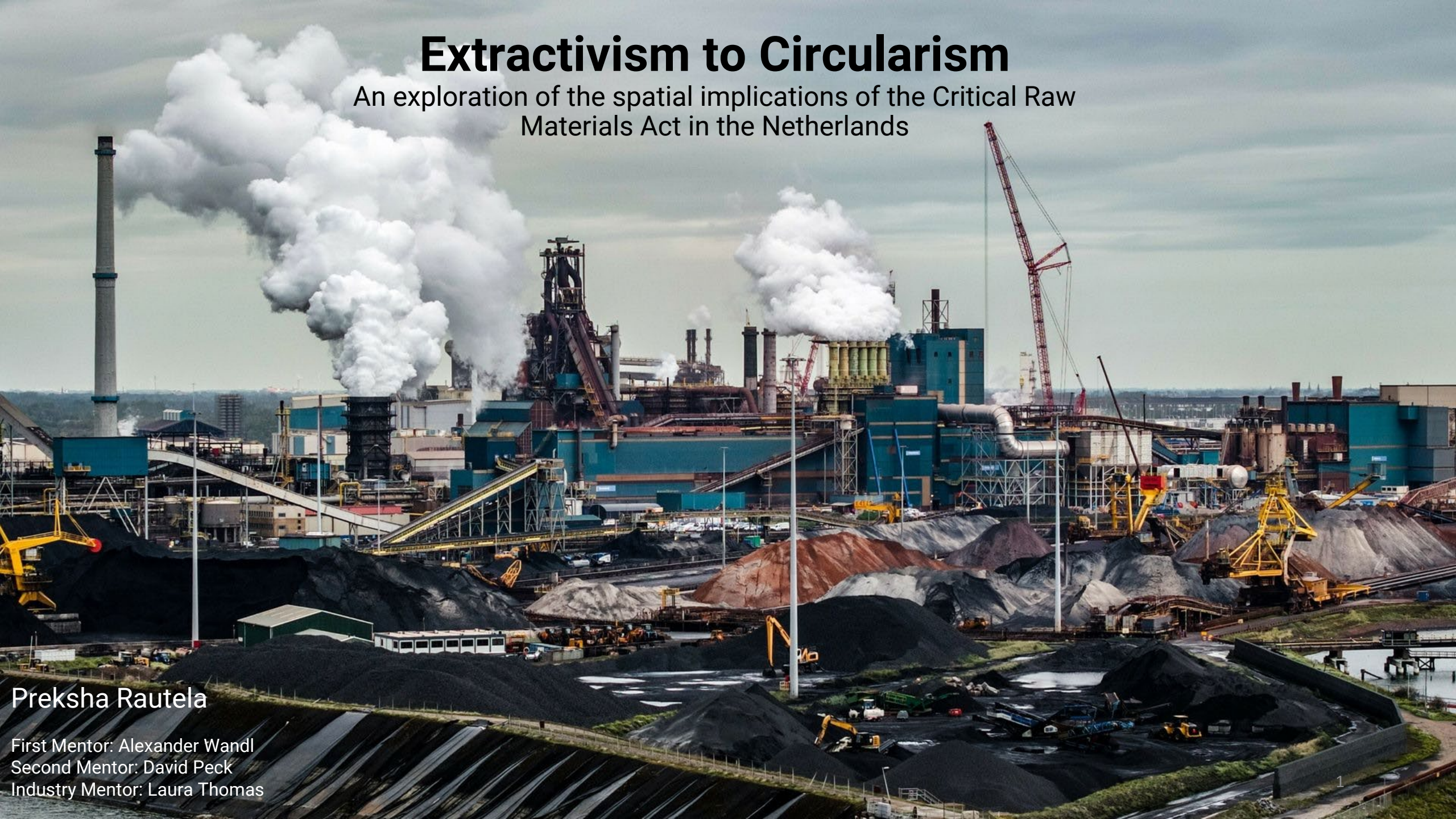
Extractivism to Circularism

An exploration of the spatial implications of the Critical Raw Materials Act in the Netherlands



Preksha Rautela

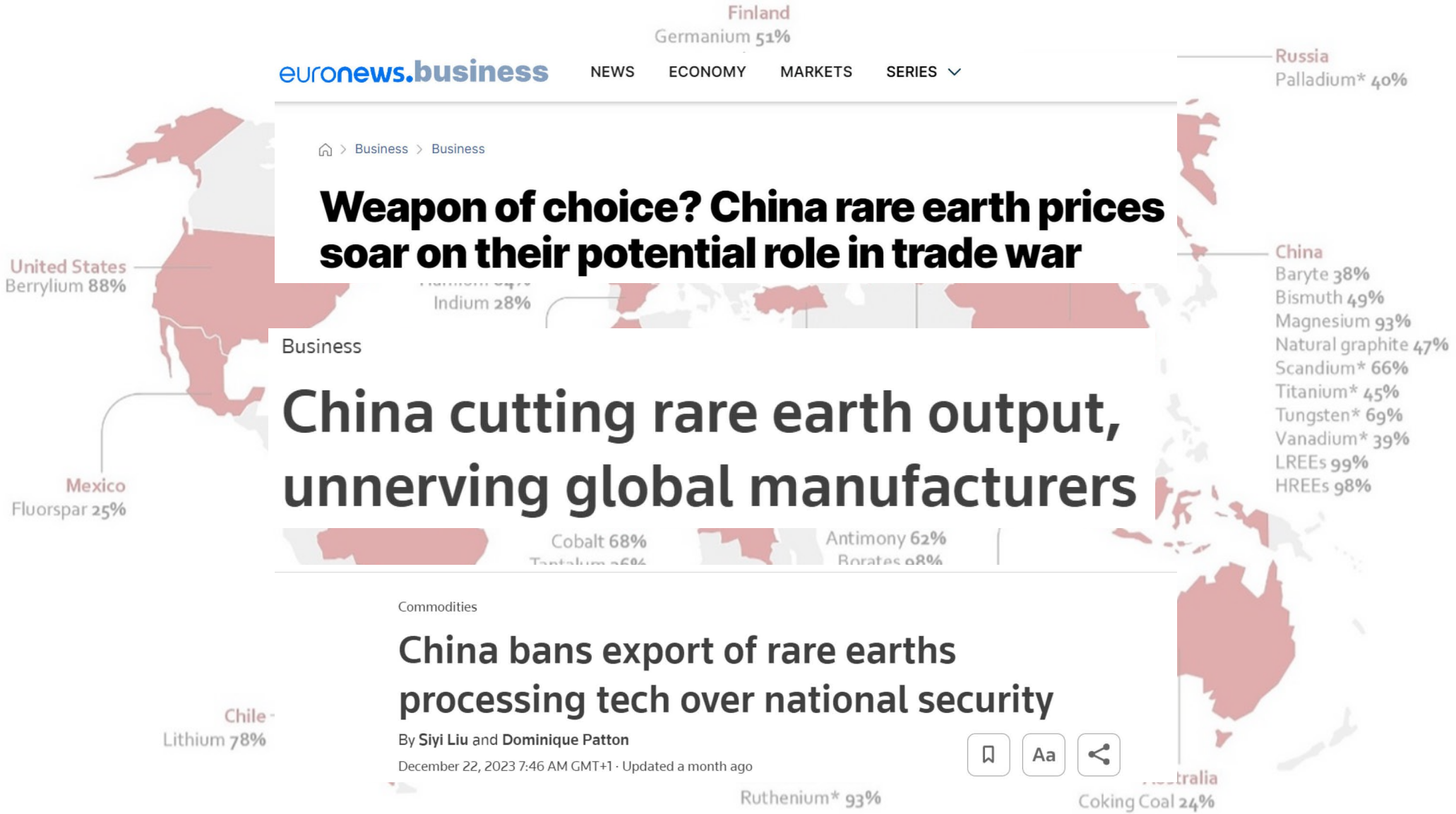
First Mentor: Alexander Wandl
Second Mentor: David Peck
Industry Mentor: Laura Thomas

What is the future you imagine by 2050 ?

Source: ChatGPT Prompt: create an image of what Europe would look like in 2050 if all its climate goals and deadlines are met

High demand of these technologies and materials.

European Union does not produce its own materials

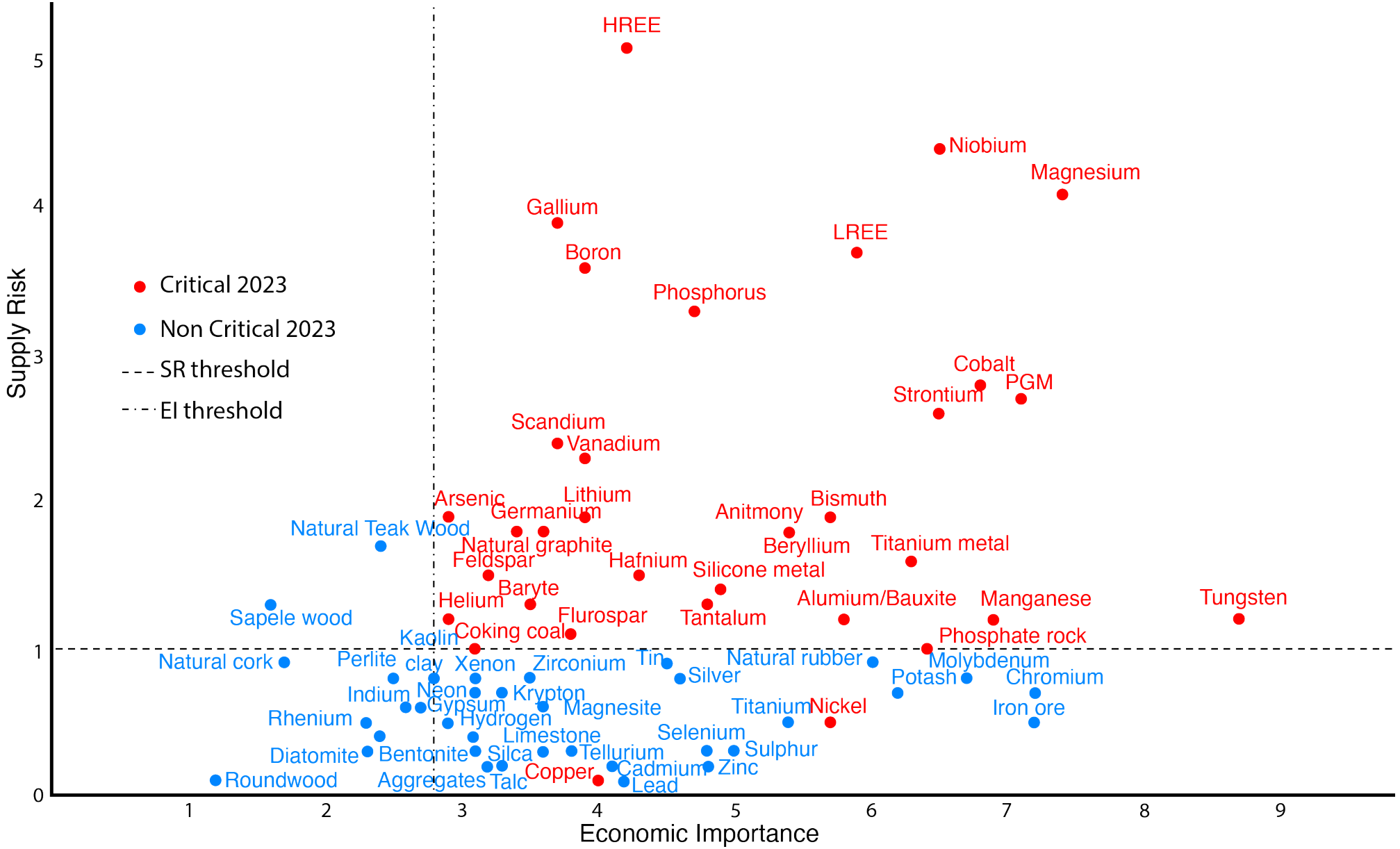


Source: European Commission (2020) Action Plan on Critical Raw Materials

Supply risk due to geopolitical uncertainties

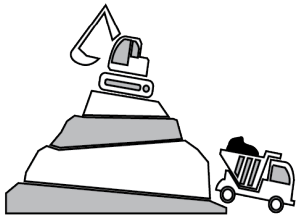
*share of global production

Critical Raw Materials

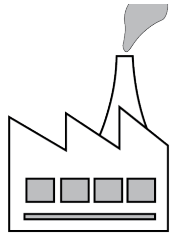


Source: JRC report

Critical Raw Materials Act (CRMA)



At least **10%** of the EU annual consumption for extraction.



At least **40%** of EU annual consumption for processing.

At least **25%** of the EU annual consumption for recycling

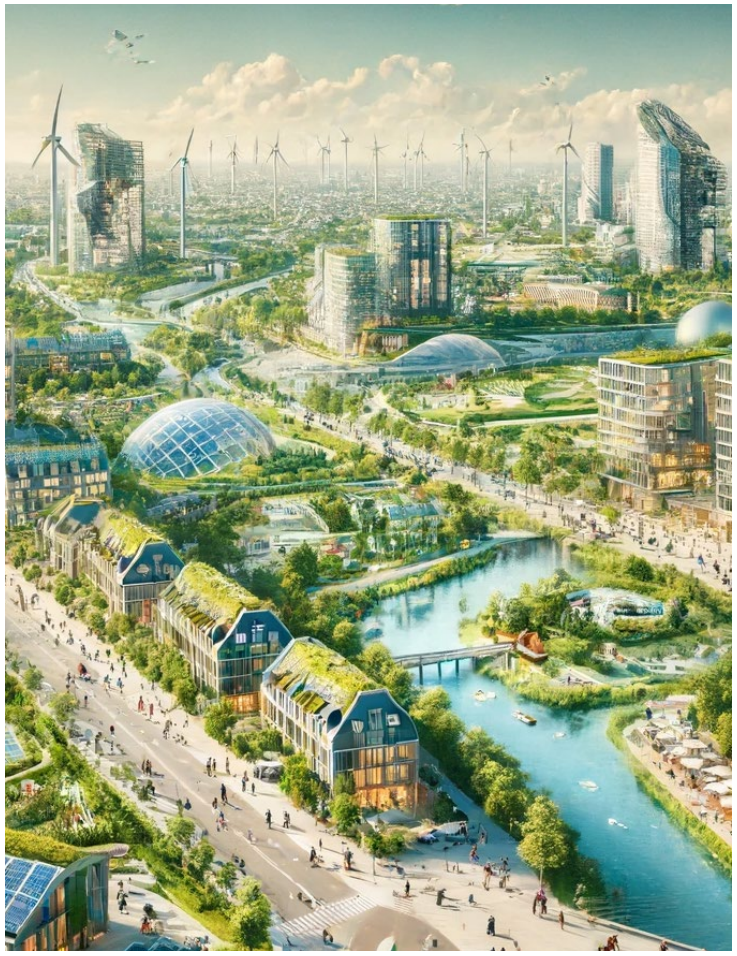
Benchmarks for 2030

Source: European Commission

Challenges with these materials

Need space and have environmental implications

Produce waste

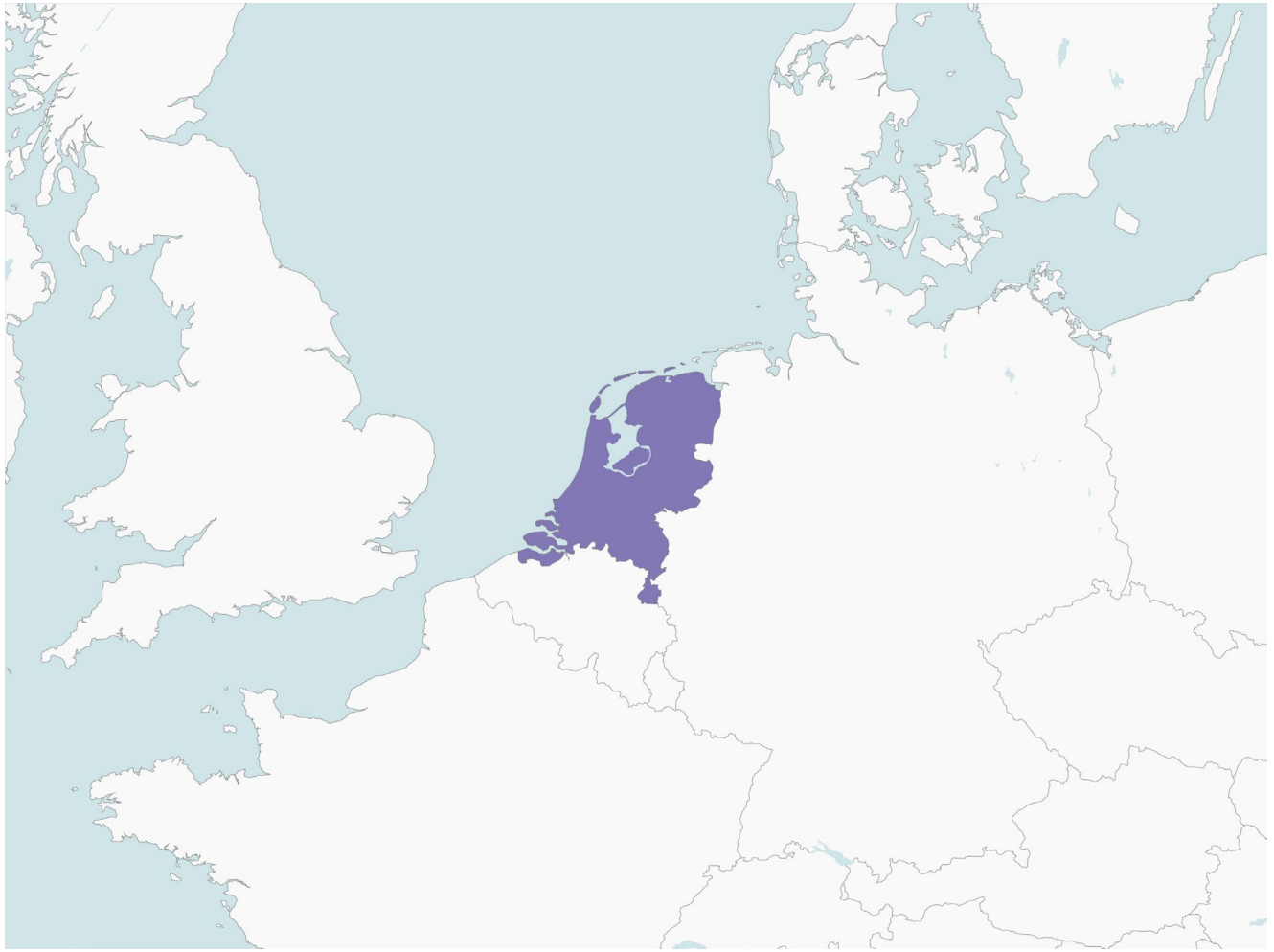


Increasing consumption

Research Question

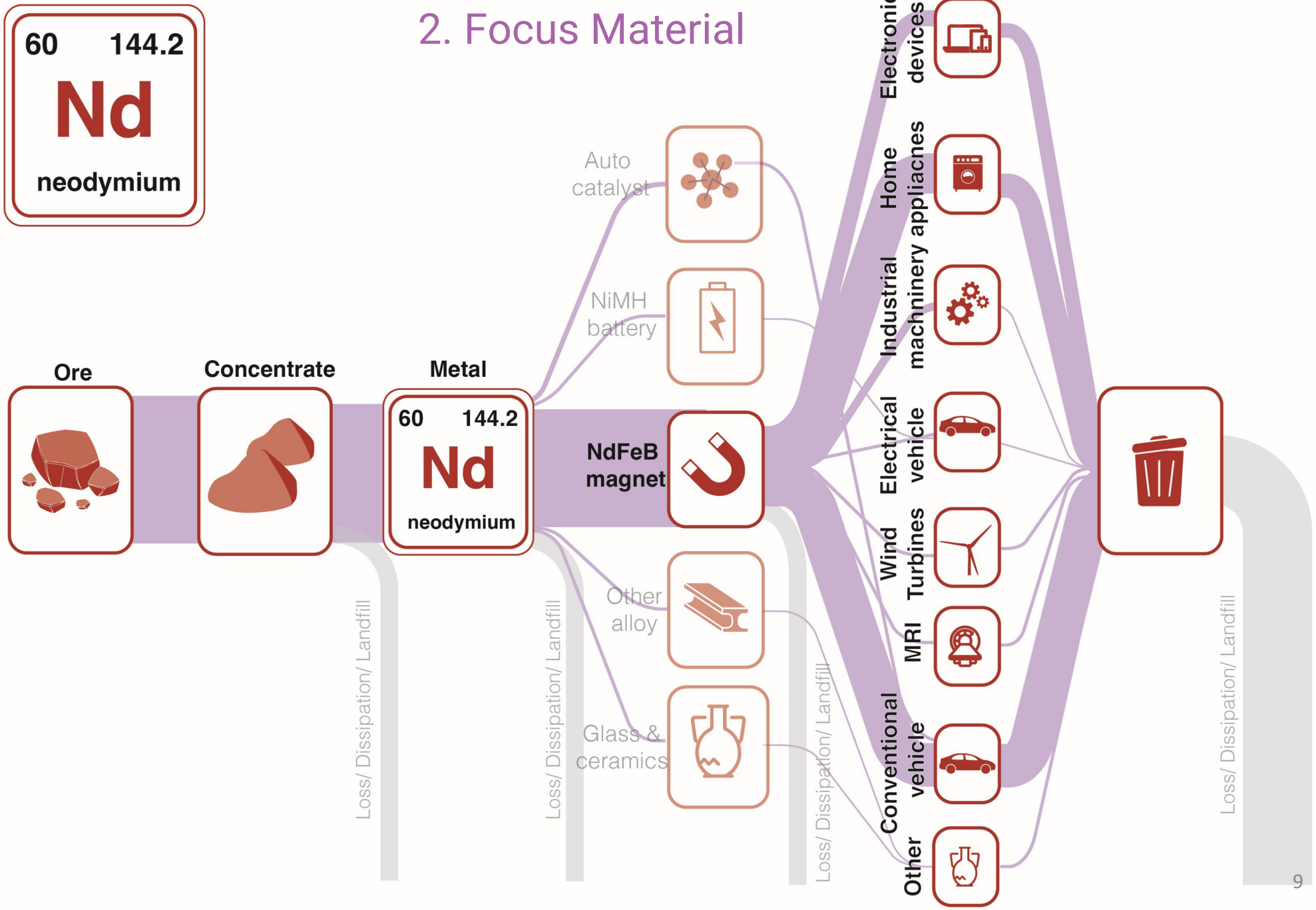
What could be the potential spatial and environmental impacts of the European CRMA on the Netherlands based on different economic paradigms ?

1. Focus Locations



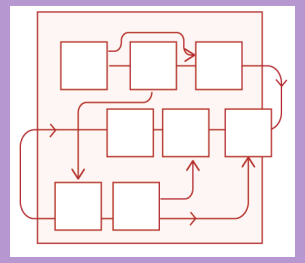
The Netherlands

2. Focus Material



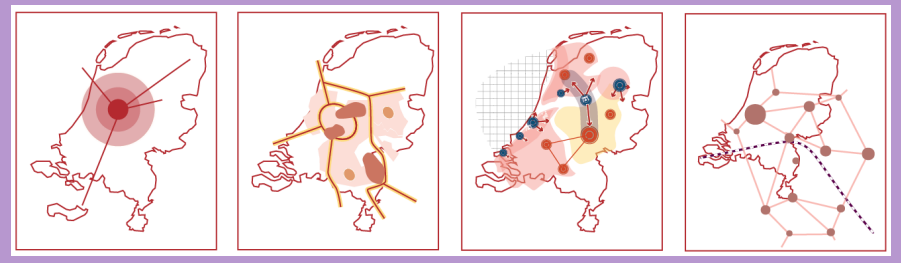
1

Understanding the supply chain



2

Scenario building



3

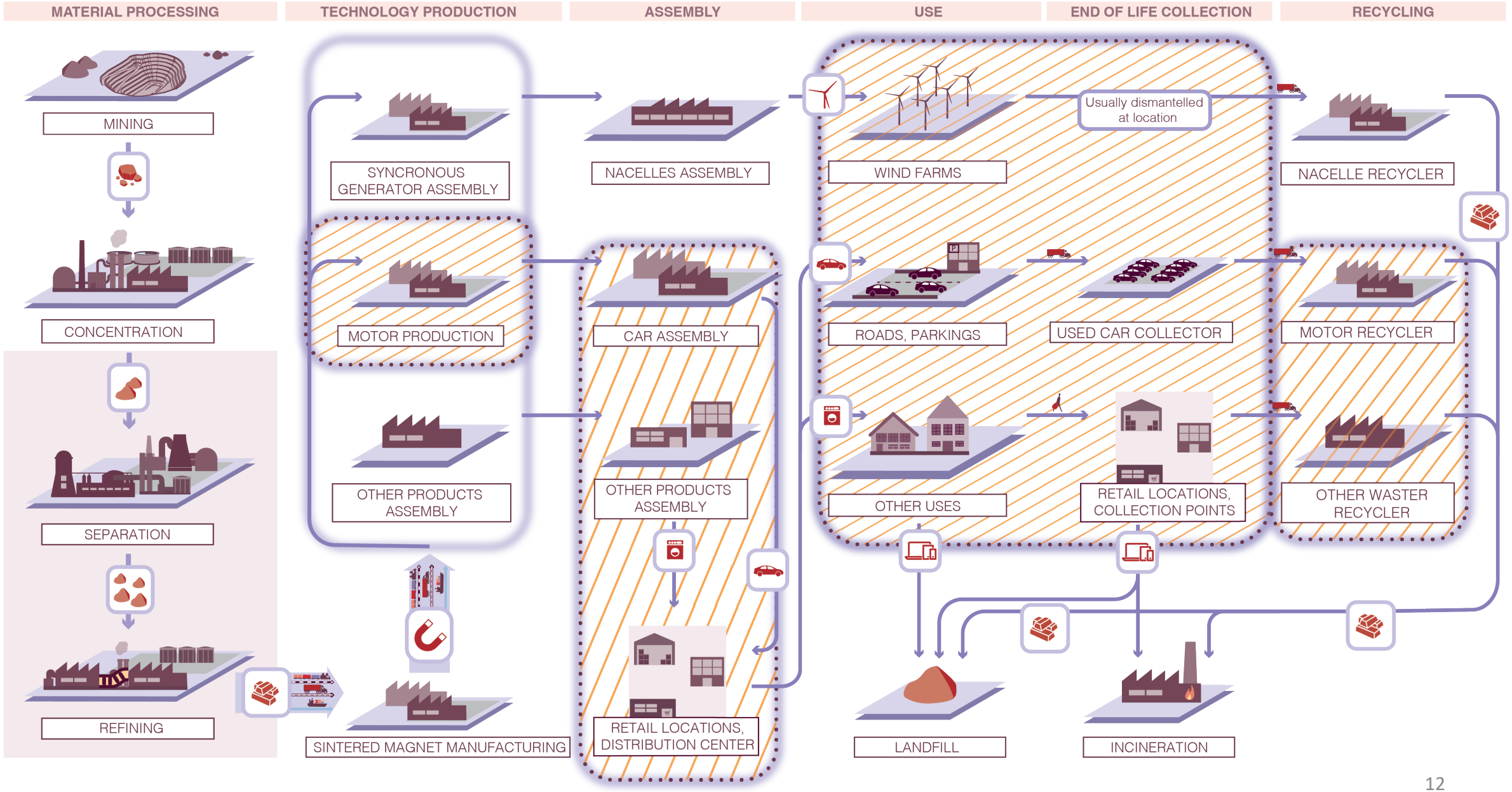
Evaluation

	1.	2.	3.	4.
	++	-	++	-
	++	-	?	-
€	?	++	-	++
	-	++	?	?

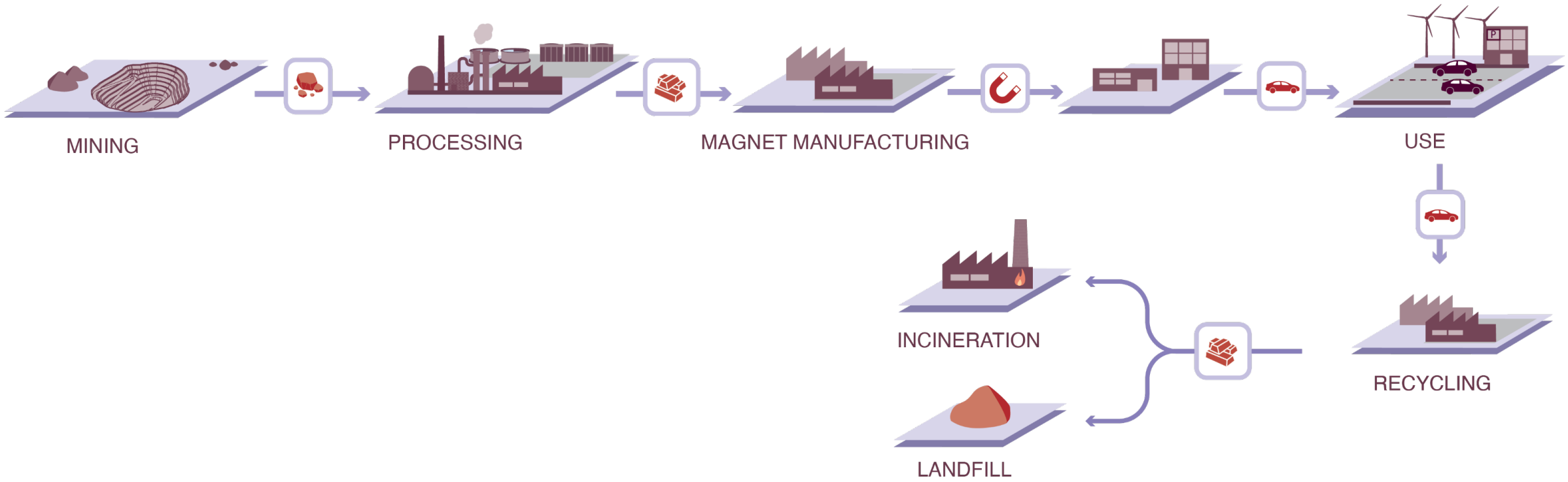
1

Understanding the supply chain

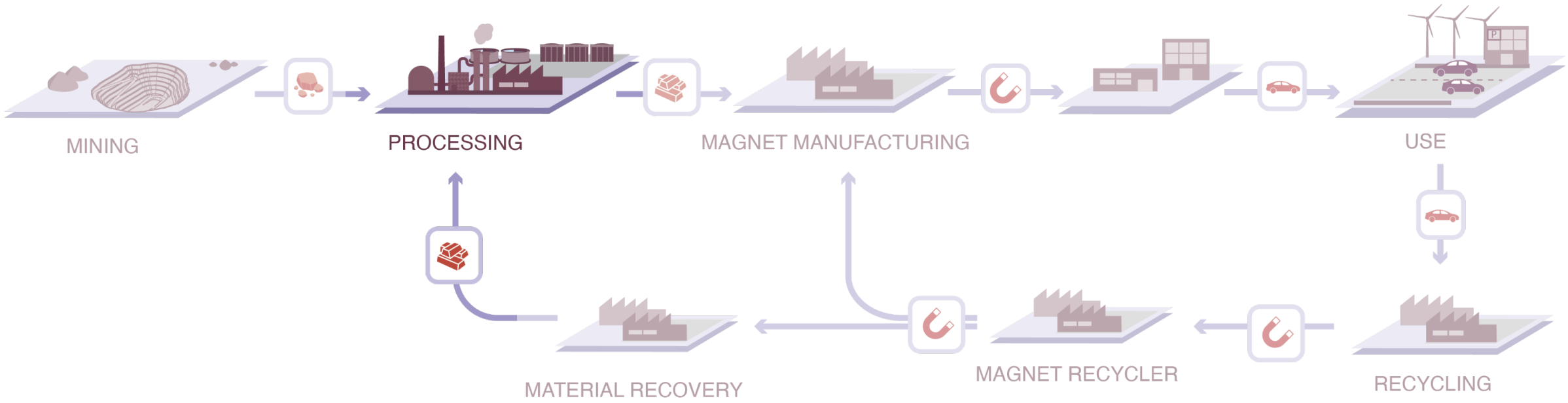
Current supply chain



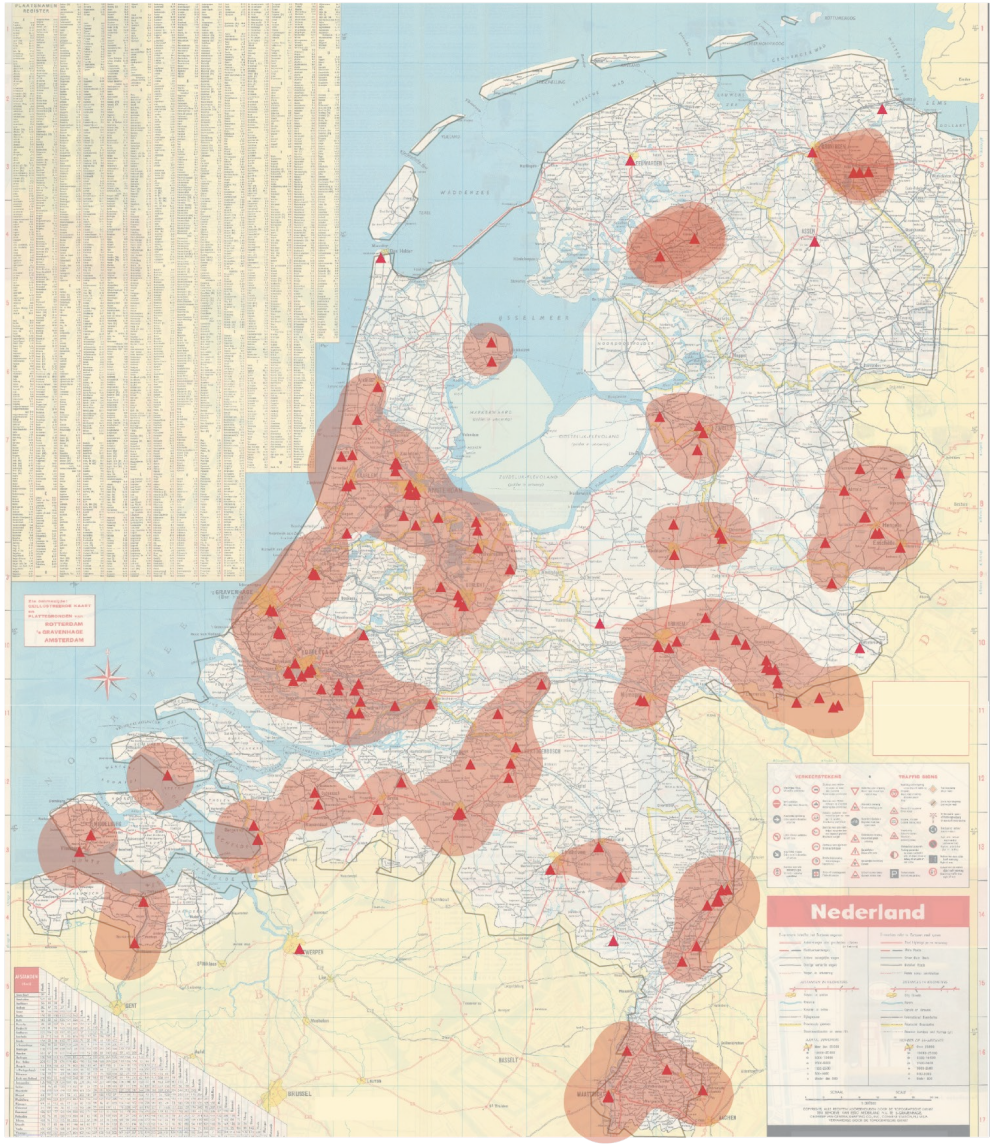
Current supply chain - Simplified



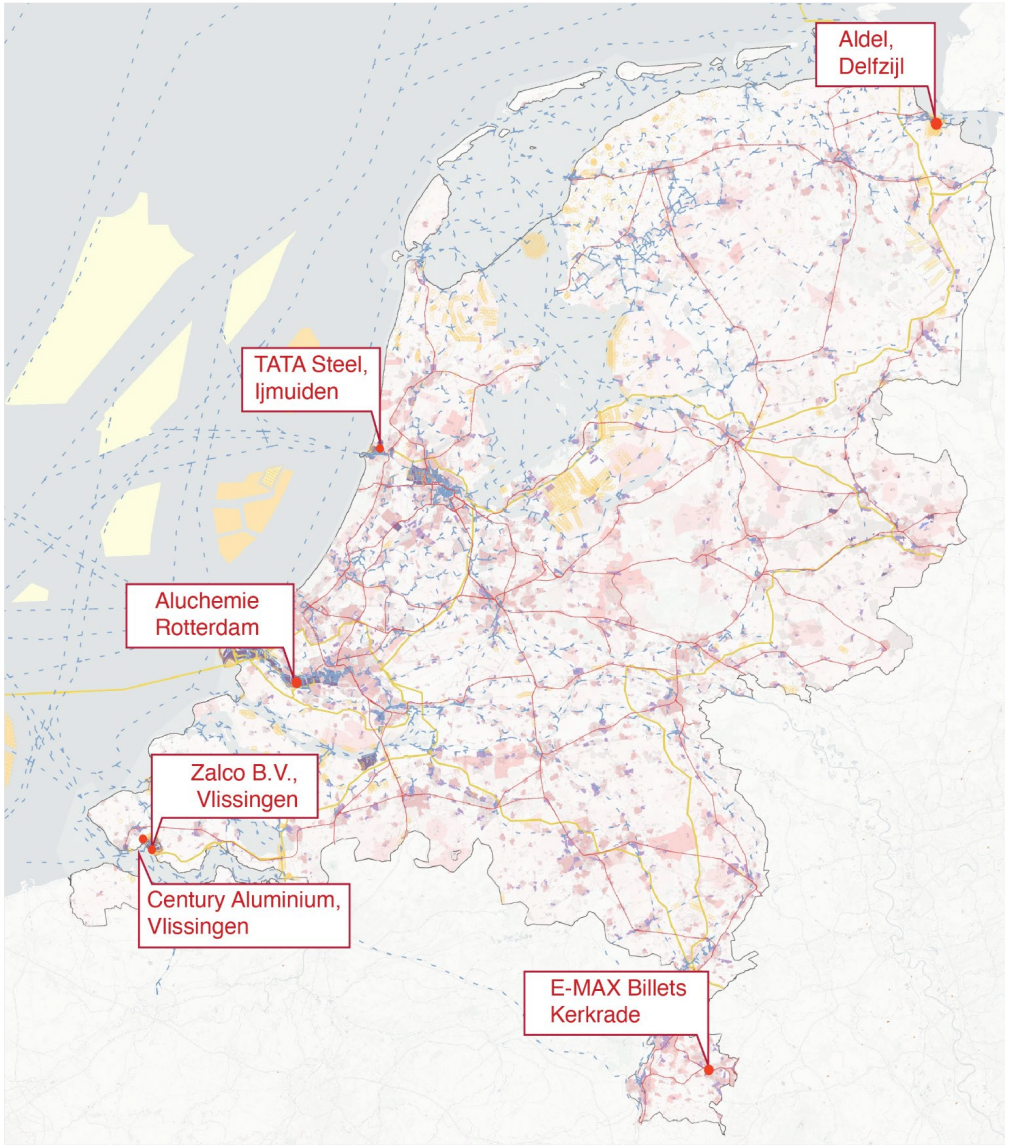
Future supply chain - Simplified



Historical analysis



Overview of iron foundries in the Netherlands (1689-2012)
Data Source: Nederlands IJzermuseum (2020)

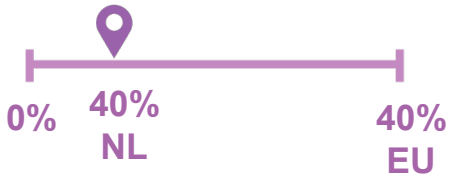


Overview of Steel and Aluminium Processing in the Netherlands (Current)
Data Source: PBL

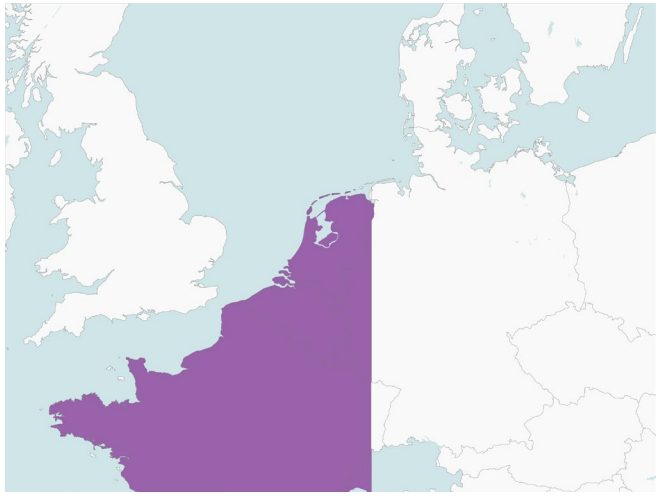
2

Scenario building

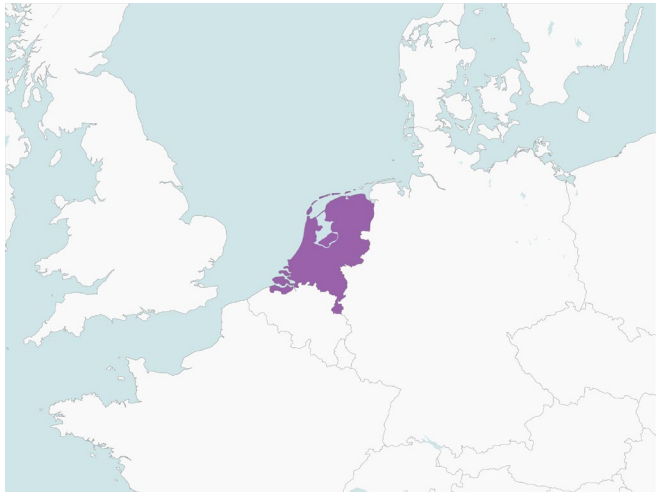
Scenario building



Knowledge Economy



Industry Leaders

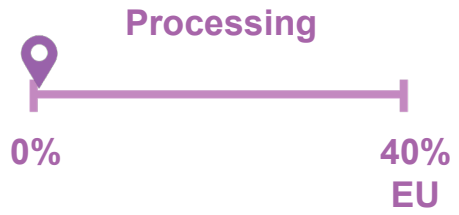


Self-Sufficient

Regenerative

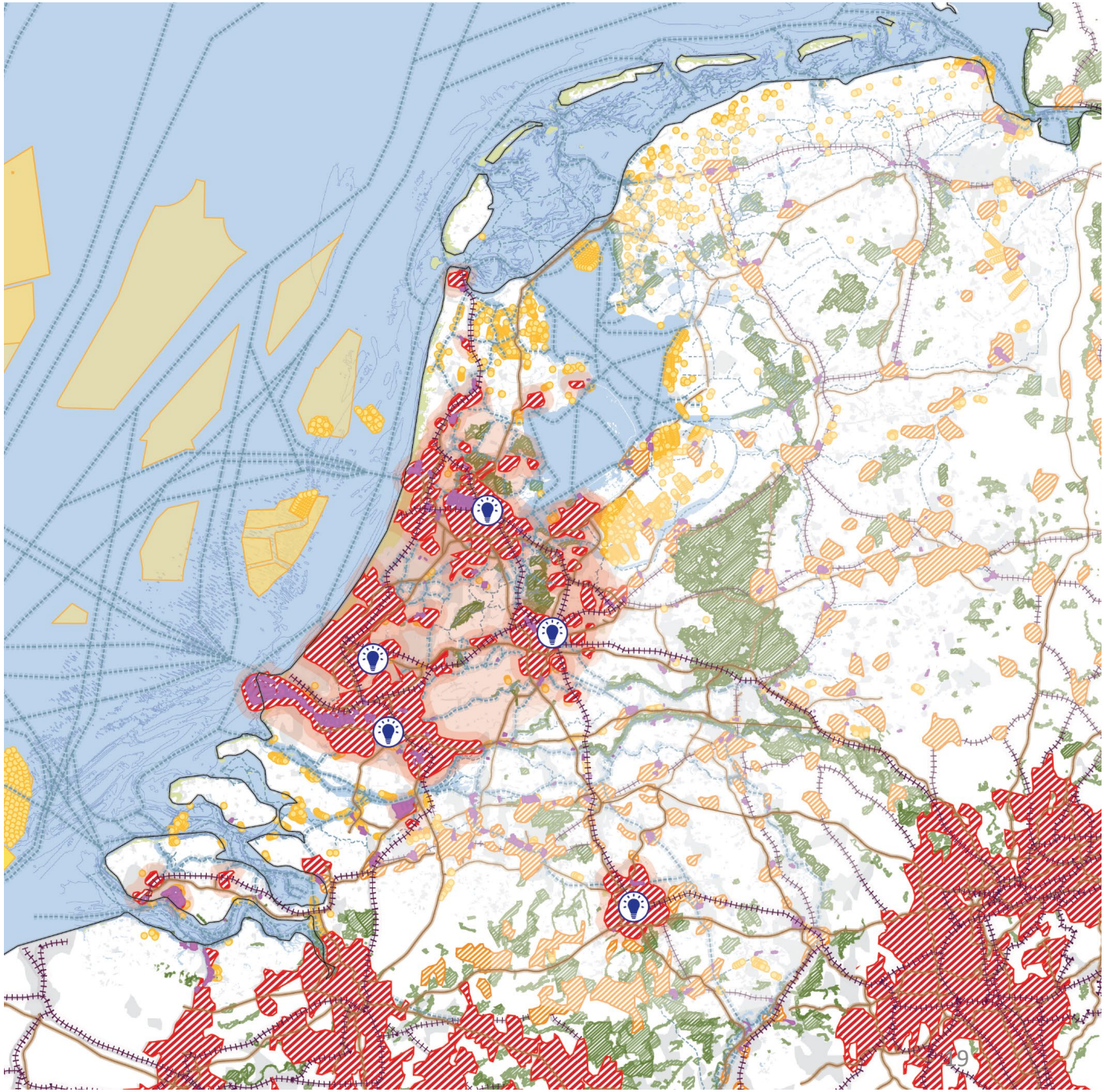
Knowledge Economy

- Access to technology by building knowledge hotspots.
- Increase in consumption.
- Global supply chain.
- Increase in container ports and storage areas.



Knowledge Economy

- **Growth is concentrated in the Randstad.**

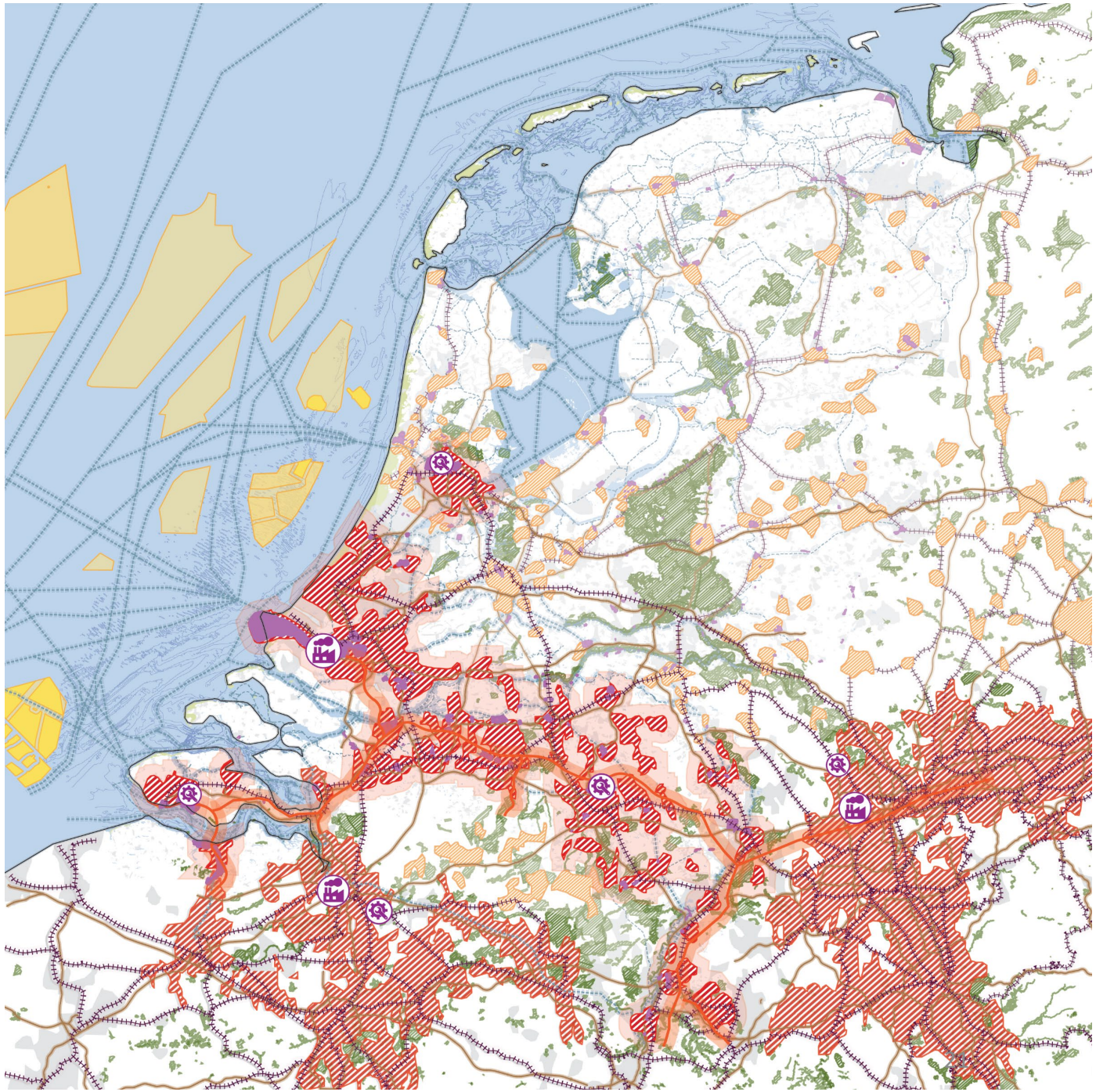


Industry Leaders

- Large processing facility.
- Processing away from living locations.
- Increase in consumption.
- European supply chain.

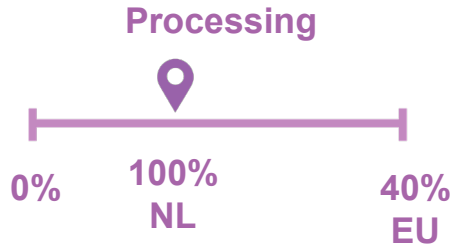
Industry Leaders

- **Growth concentrated around the Delta corridor.**
- **Processing in Rotterdam.**
- **Manufacturing in Eindhoven.**



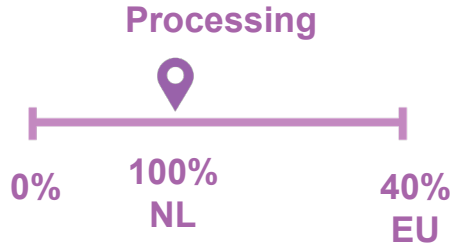
Self Sufficient

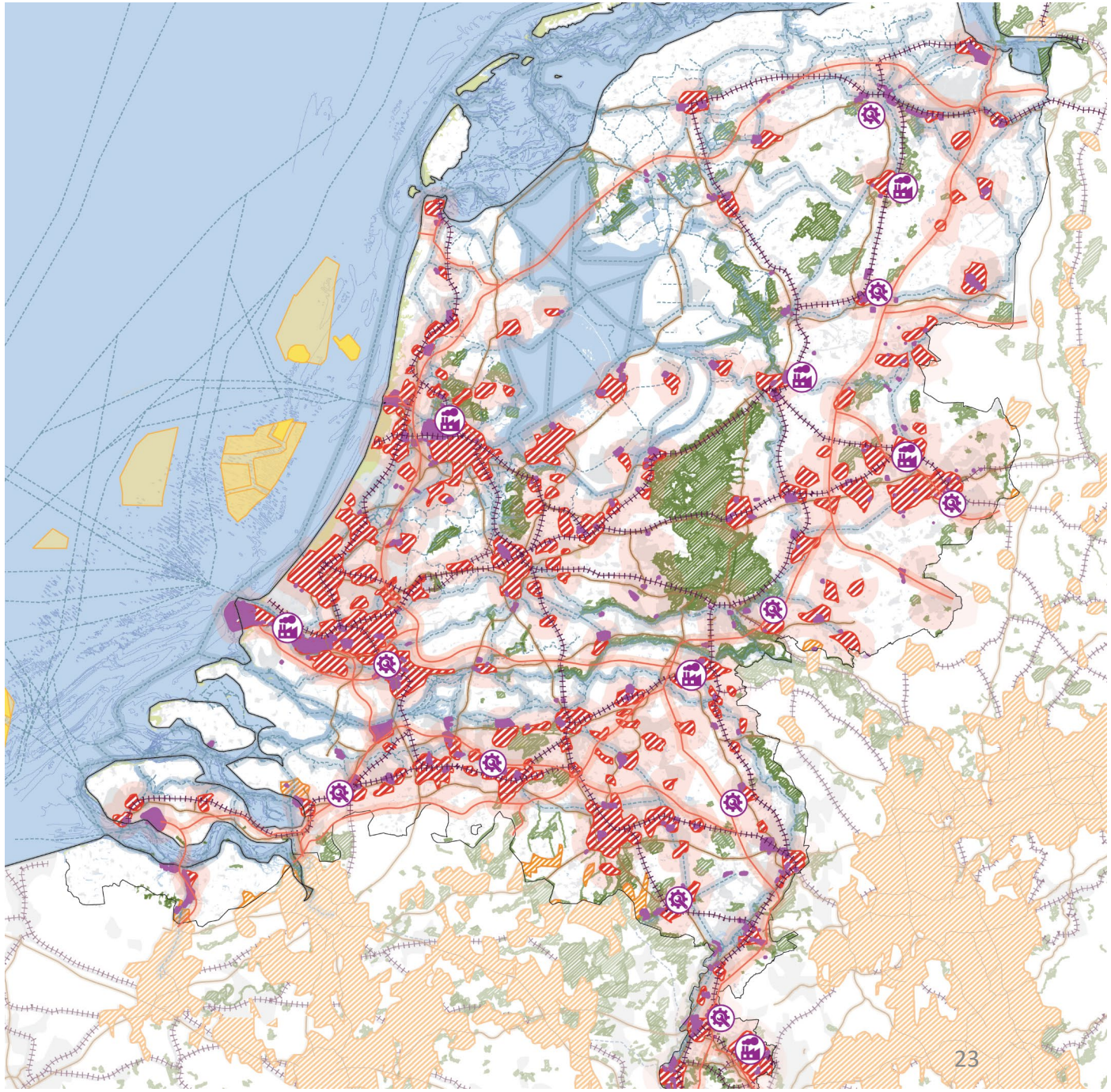
- Priority is social well being, equity and just distribution of resources.
- Decrease in material consumption.
- Processing happens in proximity to cities.
- Public plinths, mixed use areas, active public spaces.



Self Sufficient

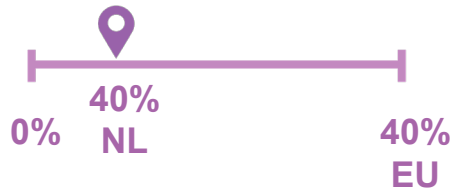
- No region dominates.
- Processing happens along the inland rivers.





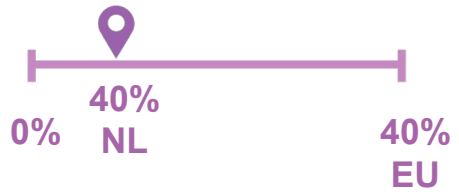
Regenerative

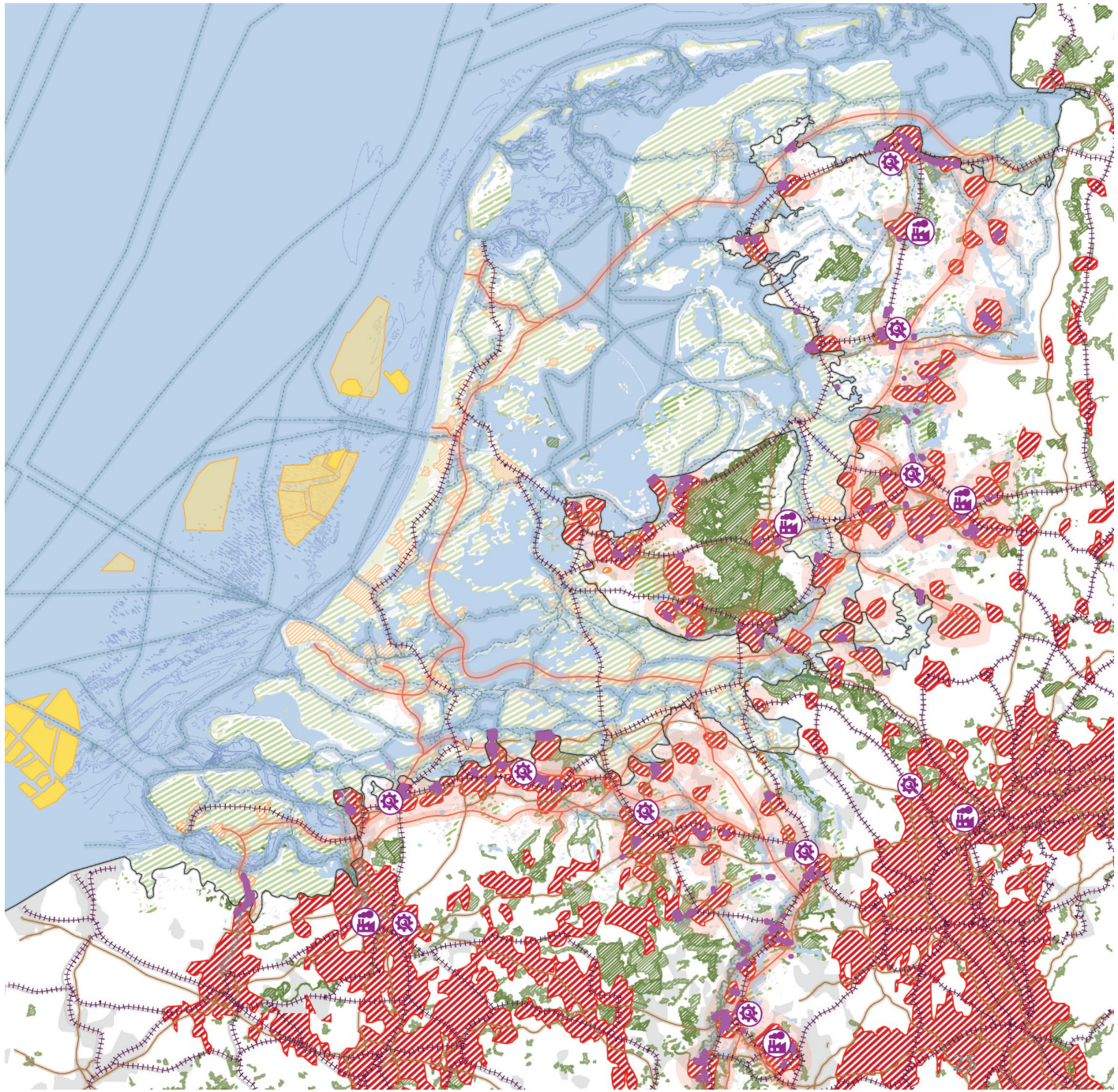
- **Priority is environmental sustainability.**
- **Decrease in material consumption.**
- **No mechanization of the landscape.**



Regenerative

- **Growth is concentrated at safe - higher and dryer locations.**
- **Seasonal agriculture is practiced in vulnerable locations.**

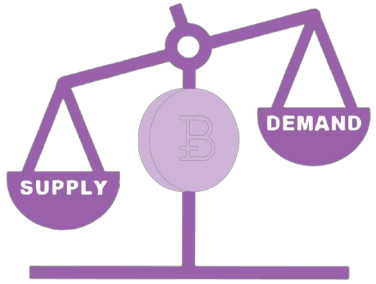




3

Evaluation

Evaluation Criteria

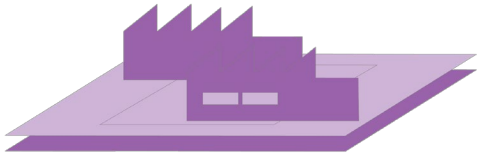


Supply meets demand

Time taken

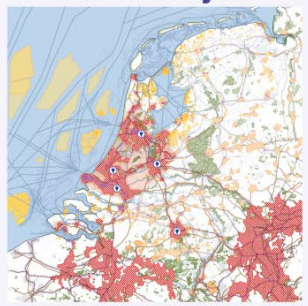
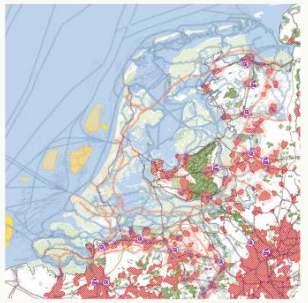
Social implications

Environmental implications



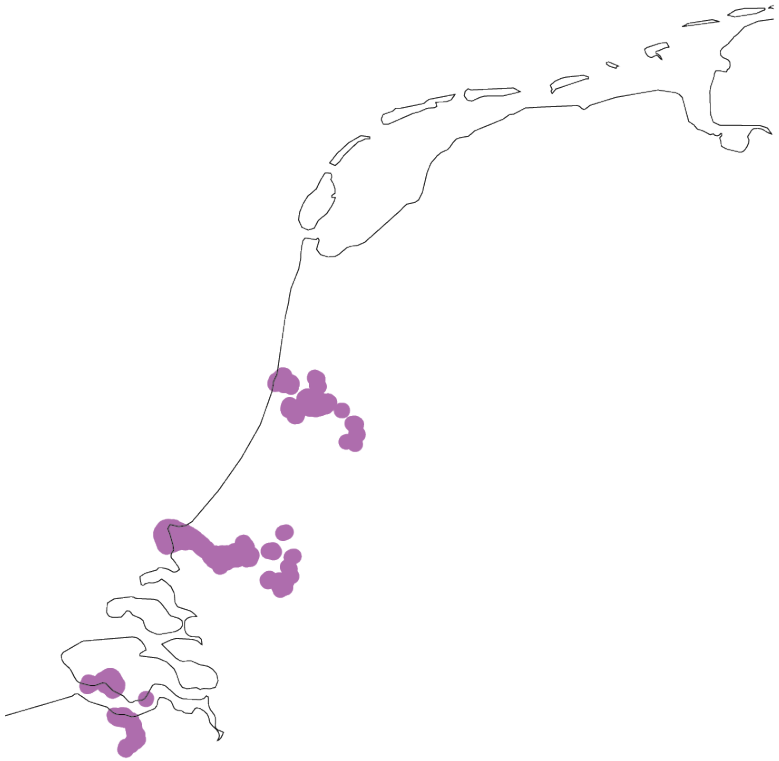
Space claims

Scenario Evaluation

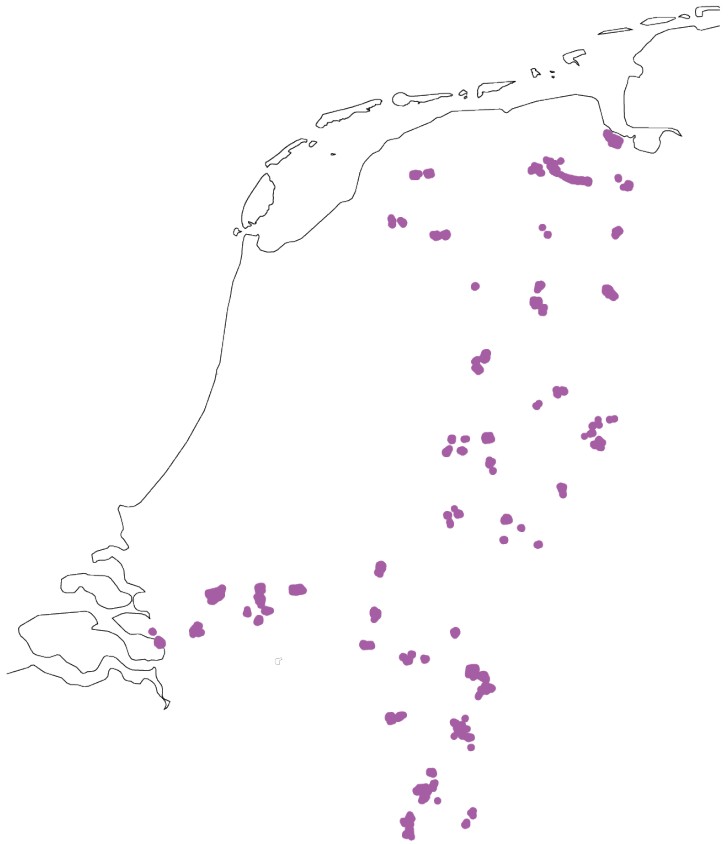
	Knowledge Economy	Industrial Leaders	Self Sufficient	Regenerative
				
Supply meets demand	−−	++	++	+
Time taken	−−	++	−	−
Social implication	−	−	++	−−
Environmental implication	−	−−	−	++
Space claim	50 ha	75 ha	55 ha	40 ha

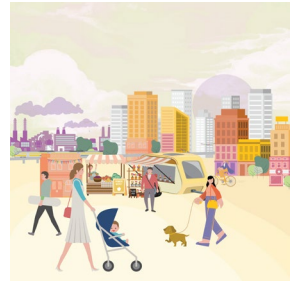
++ Positive 0 Neutral −− Negative

Scenario Conclusion - The Paradox



- **Meeting the 2030 deadline.**
- **Quickly building capacity.**
- **Lock-ins in unsuitable locations**

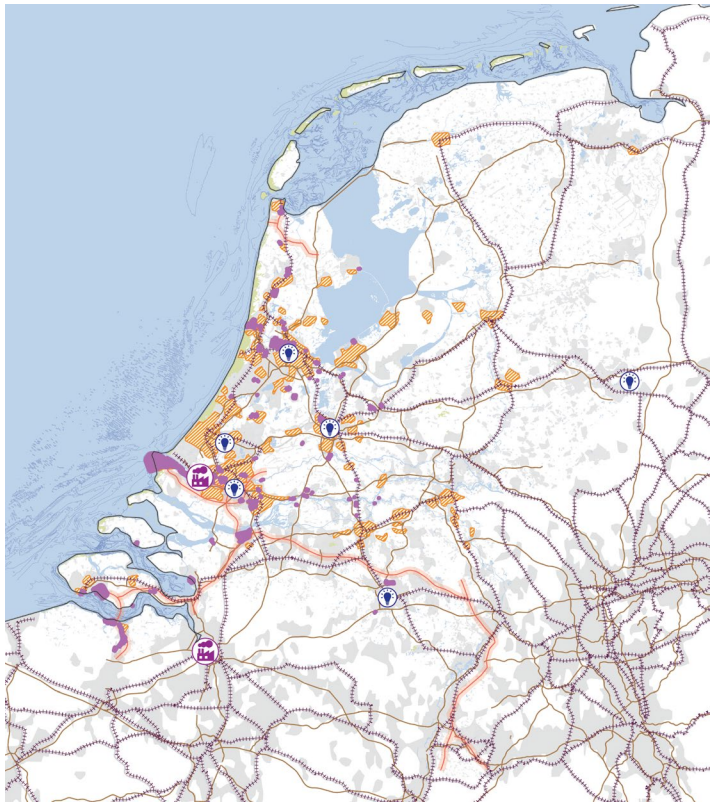




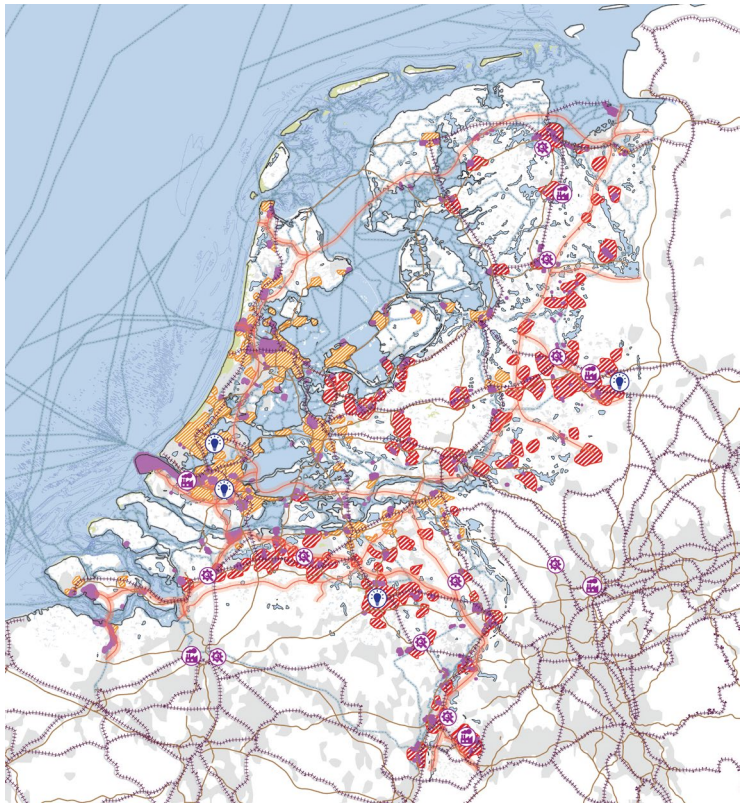
- **Delay meeting the deadlines.**
- **Planning with a long-term vision.**
- **Risking economic instability and prolonged dependance on fossils fuels.**

Envisioning the Netherlands in 2050

Phasing



Until 2030



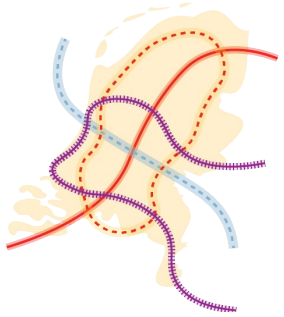
After 2030

Key strategies

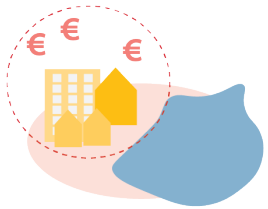
Knowledge Economy

1. Facilitating research and development hotspots

Industry Leaders

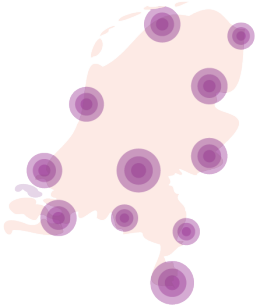


2. Adapting existing infrastructure for urgent action



3. Protecting areas with existing investments

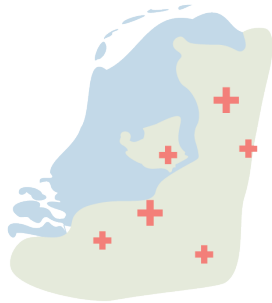
Self Sufficient



4. Building decentralized processing clusters

5. Using the transition for local revitalization

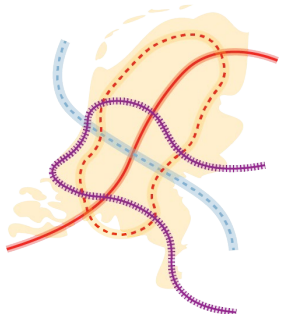
Regenerative



6. Soil and water form the basis for urbanization

Key strategies

1. Facilitating research and development hotspots



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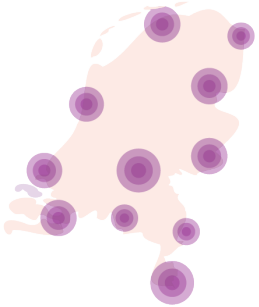

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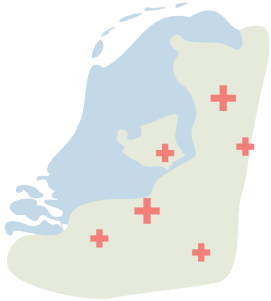
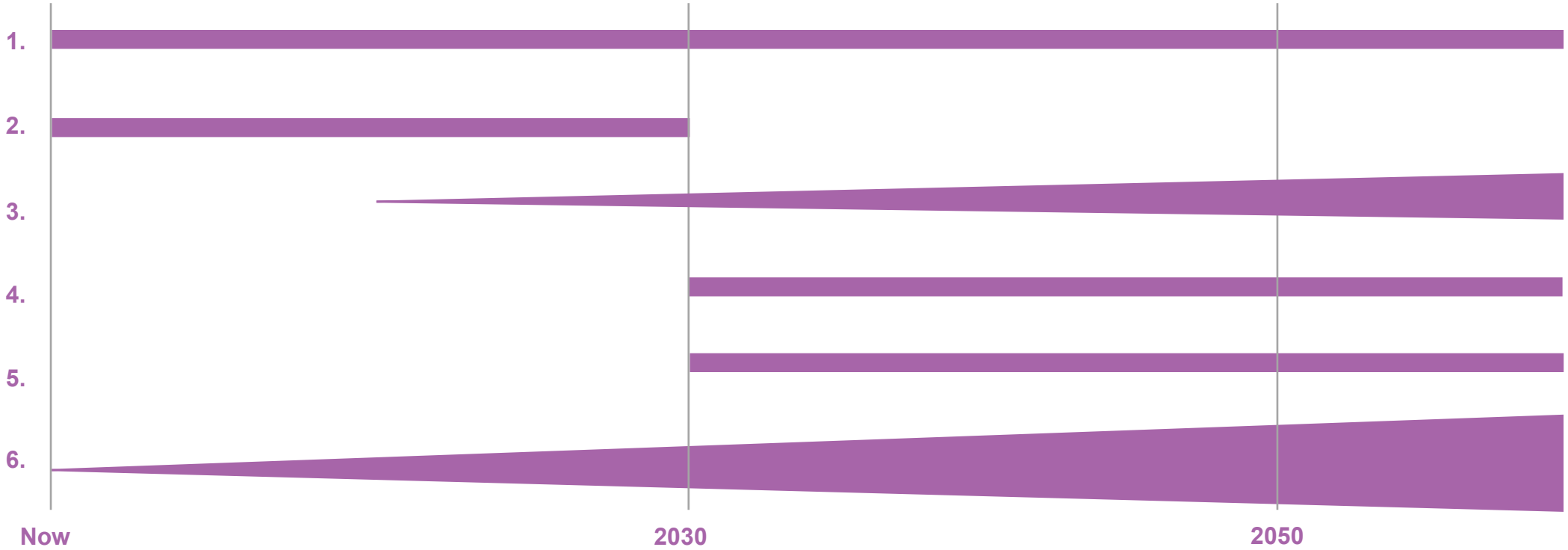


6. Soil and water form the basis for urbanization



Key strategies

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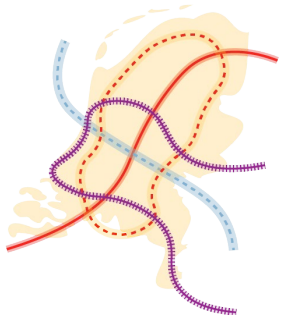

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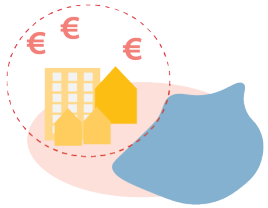

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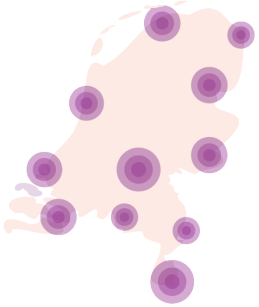

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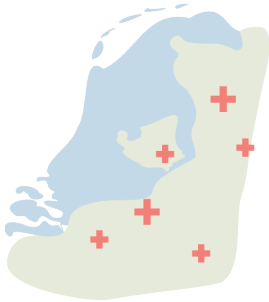

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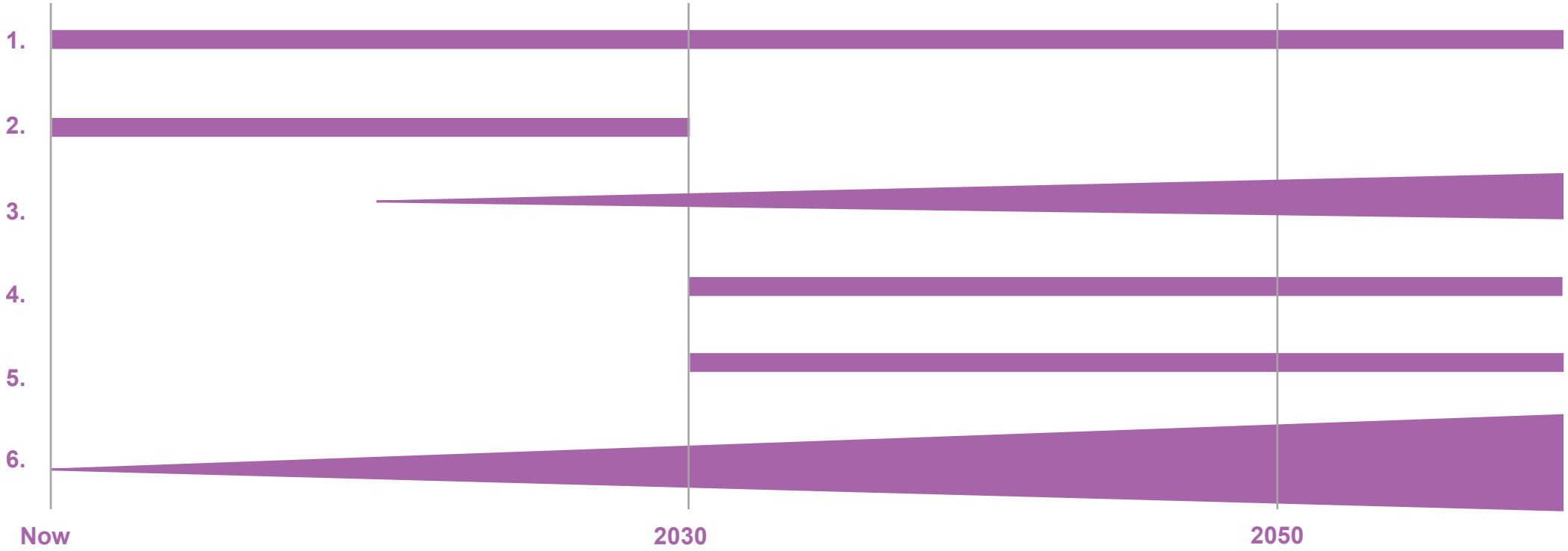
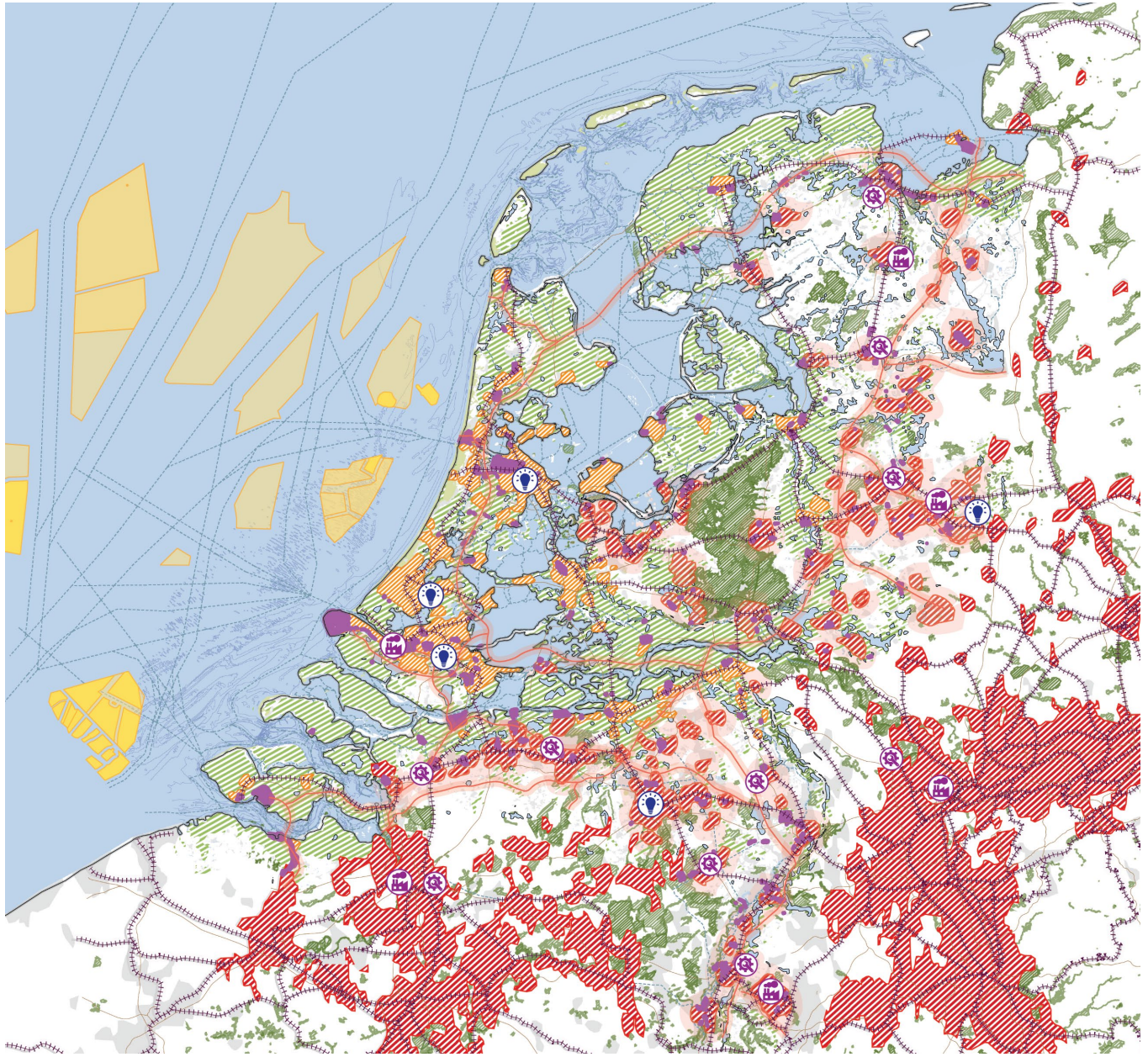


National Vision for 2050



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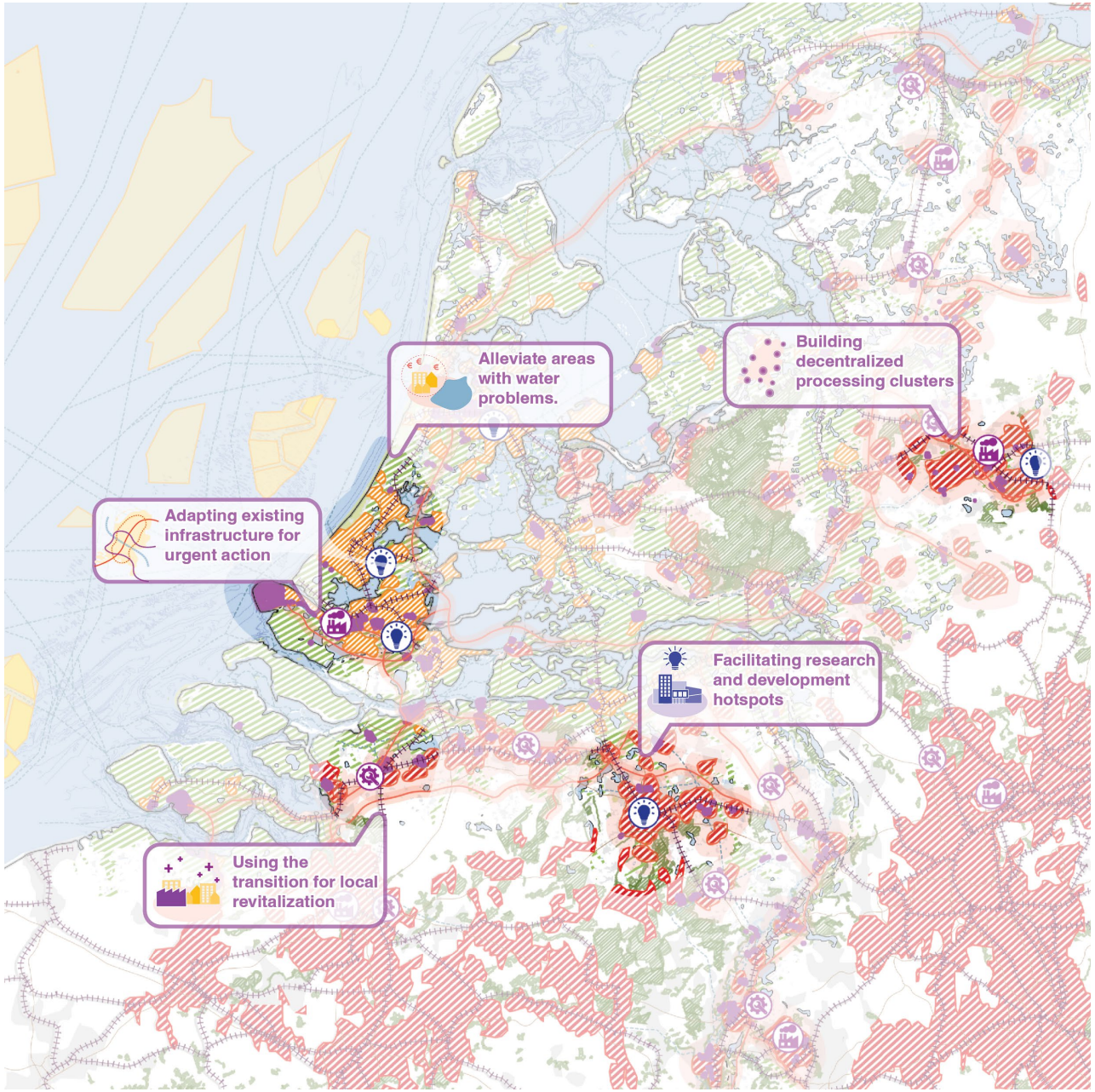
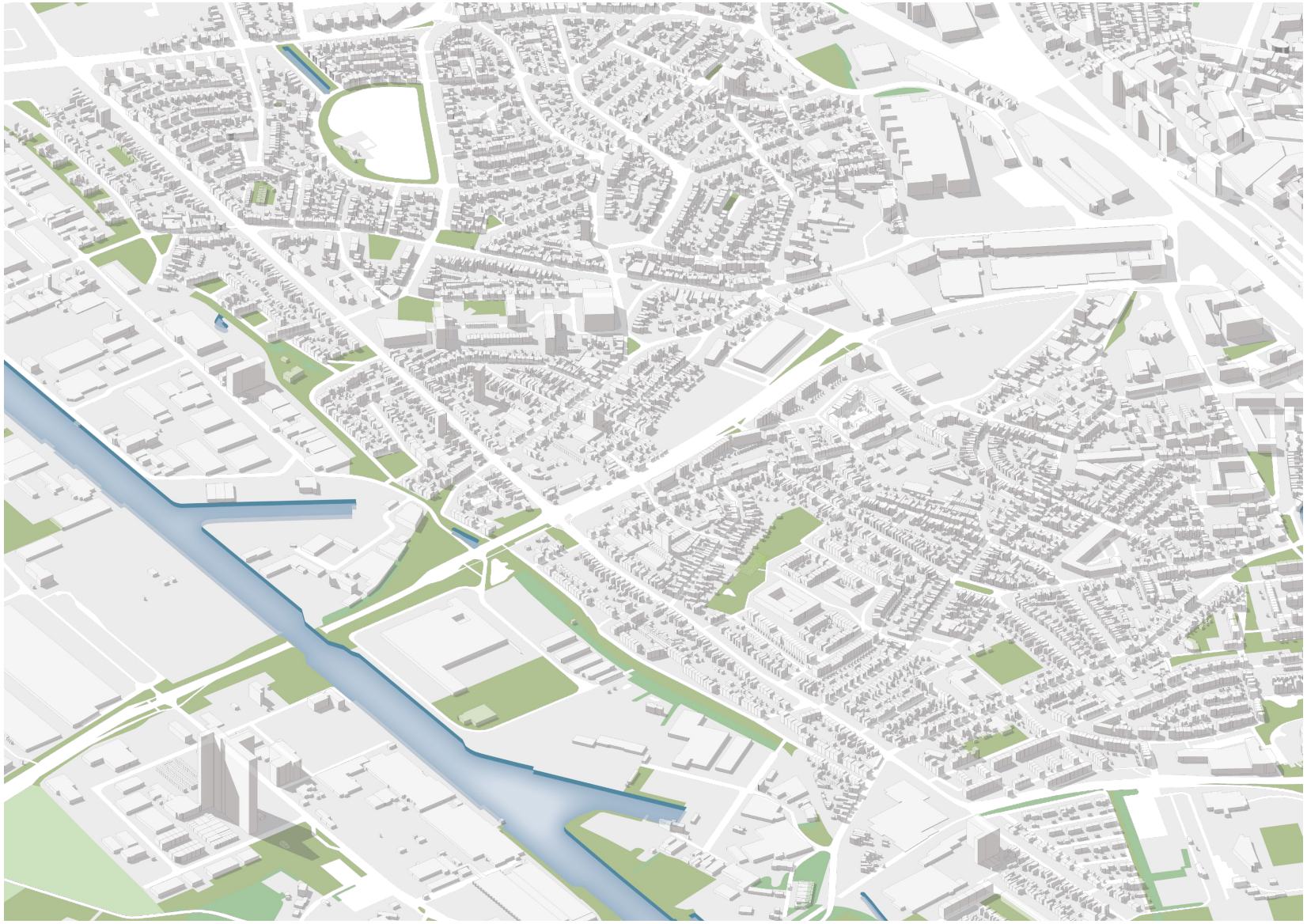
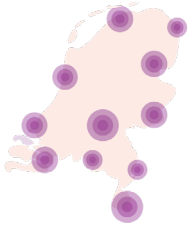


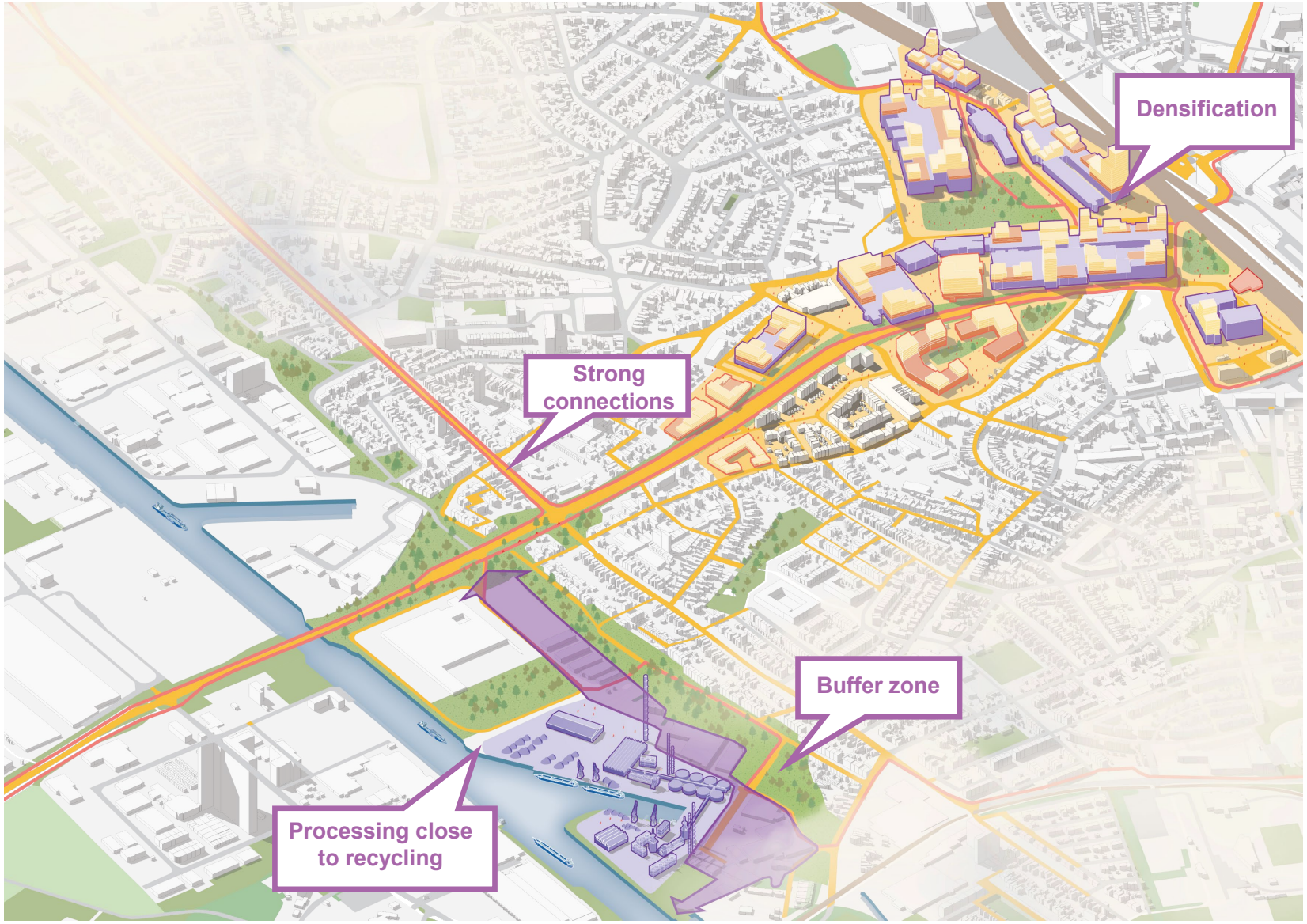
Hengelo

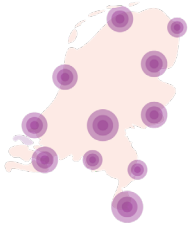




Building decentralized processing clusters

Hengelo

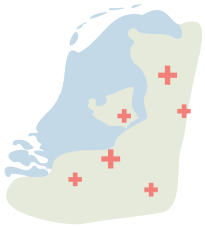




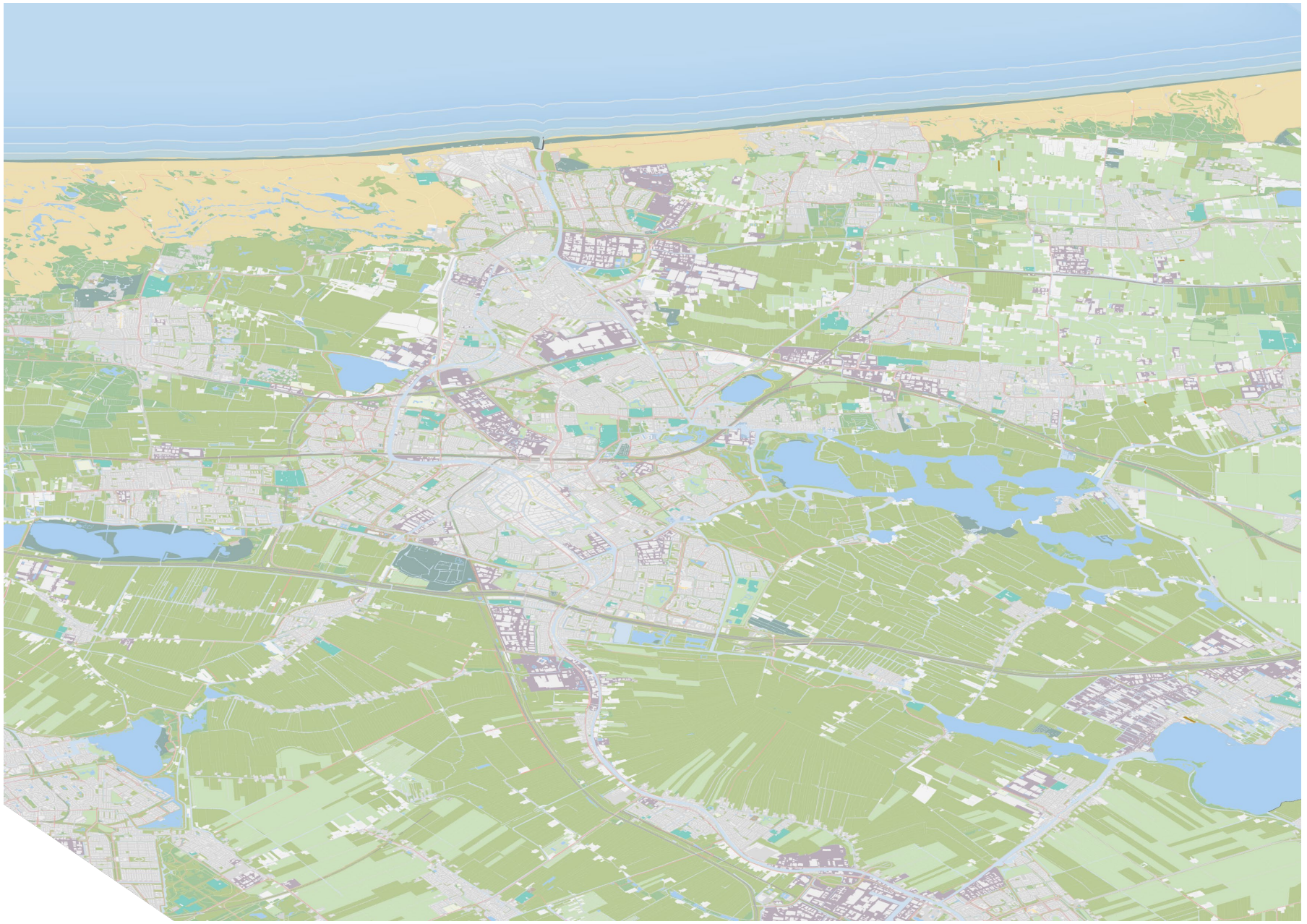
Building decentralized processing clusters

Leiden

Protecting areas with existing investments



Soil and water form the basis for urbanization



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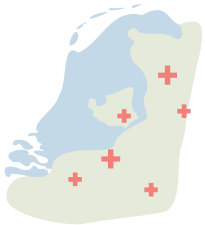
Protecting areas with existing investments

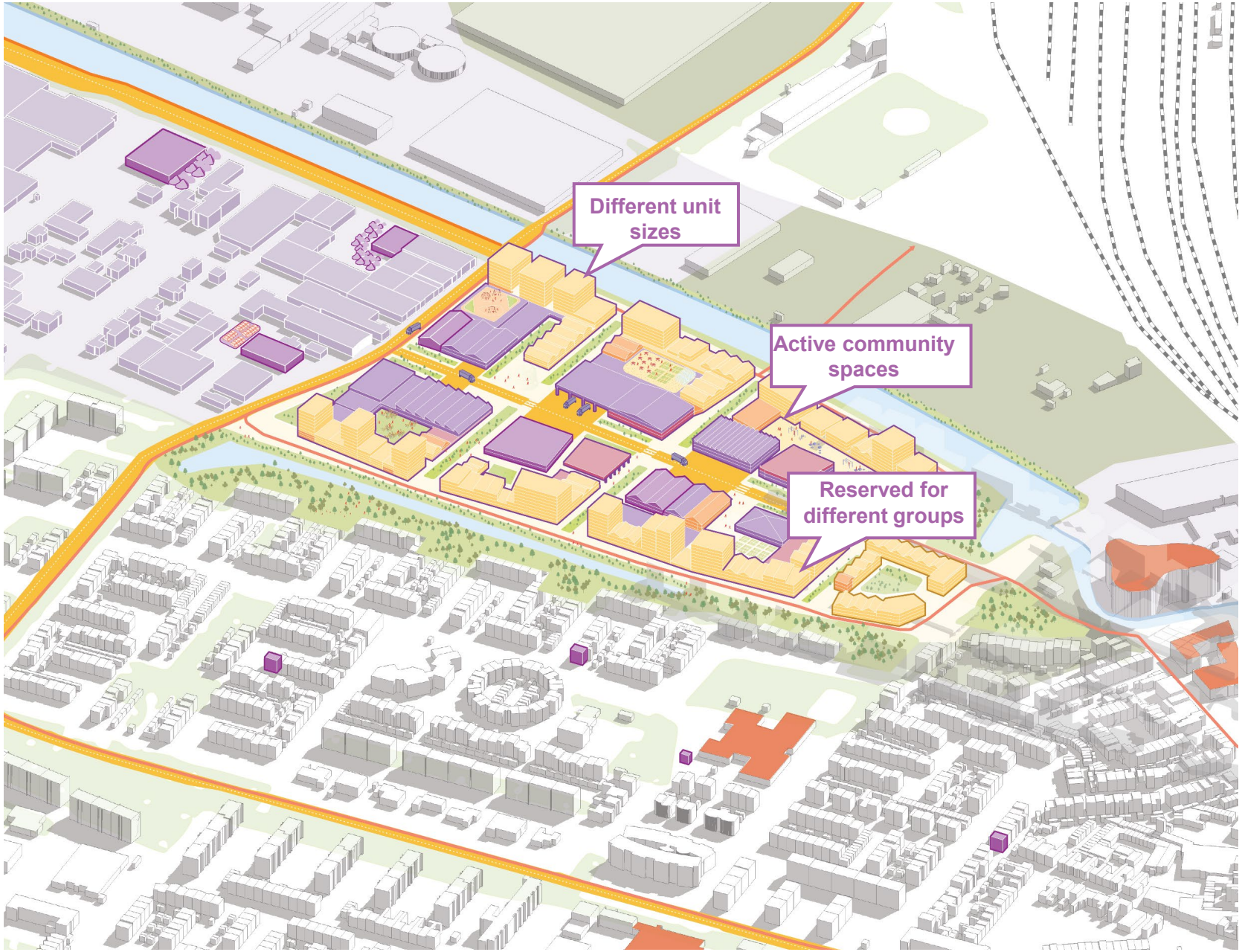


Soil and water form the basis for urbanization

Roosendaal

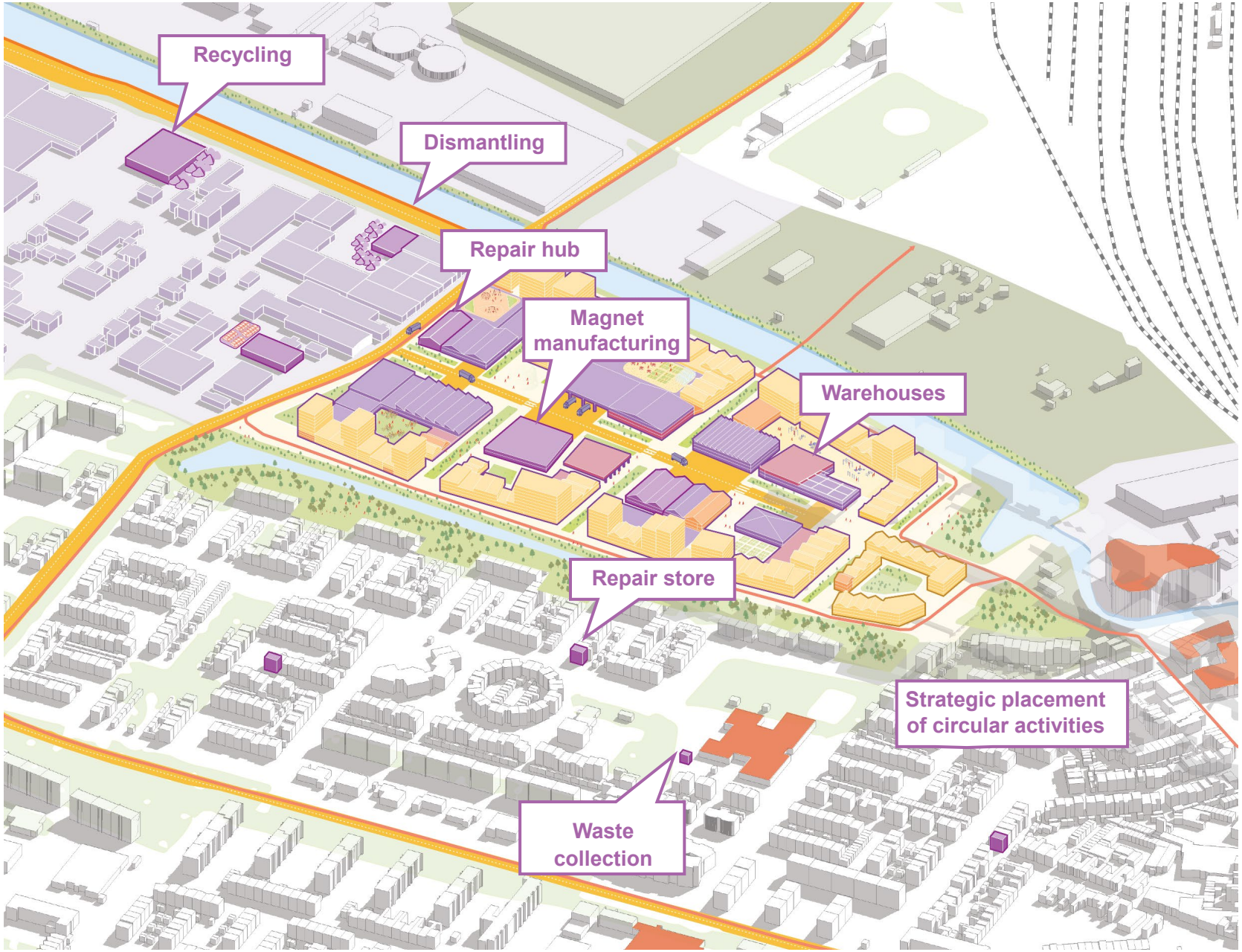
Using the transition for local revitalization

Roosendaal



Using the transition for local revitalization

Roosendaal



Using the transition for local revitalization

Conclusions

Conclusions

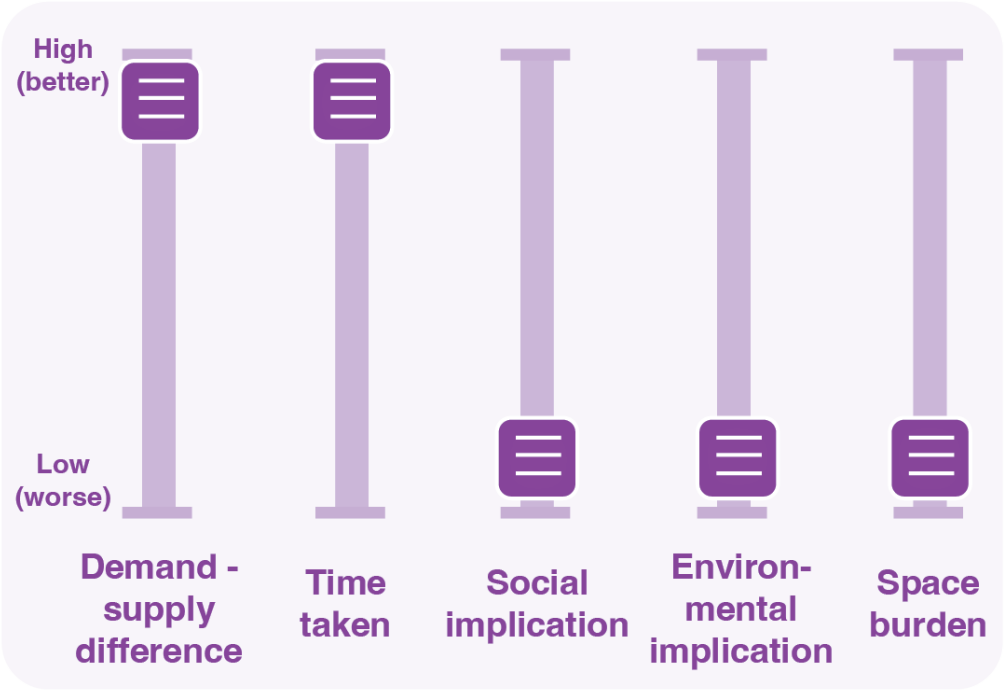
	Knowledge Economy	Industrial Leaders	Self Sufficient	Regenerative
				
Supply meets demand	– –	++	++	+
Time taken	– –	++	–	–
Social implication	–	–	++	– –
Environmental implication	–	– –	–	++
Space claim	50 ha	75 ha	55 ha	40 ha

++ Positive 0 Neutral – – Negative

1. No action in response to the Critical Raw Materials Act might have serious risks for the Netherlands

2. Space needed by circular activities is also substantial.

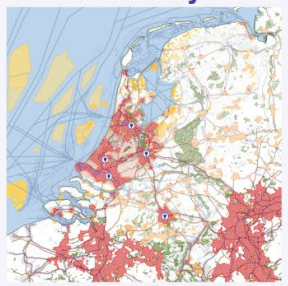
Conclusions



Industrial Leaders

3. Ambitions layed out by deadlines like the Critical Raw Materials Act can be environmentally unsustainable in the longer run because they could lead to lock-ins in unsuitable locations.

Conclusions

	Knowledge Economy	Industrial Leaders	Self Sufficient	Regenerative
				
Supply meets demand	−−	++	++	+
Time taken	−−	++	−	−
Social implication	−	−	++	−−
Environmental implication	−	−−	−	++
Space claim	50 ha	75 ha	55 ha	40 ha

++ Positive 0 Neutral −− Negative

4. Given conditions as in the scenarios a national or regional supply chain (euro delta) might better than global in terms of social and ecological sustainability.

5. Reduction of material consumption can have a significant impact on both the environmental and spatial implications.

Conclusions

6. Building capacity is often viewed as environmentally taxing but this transition can be used to revitalize existing locations by addressing their current issues.

Thank you for listening!