

# **(EM)POWERING**

# **AMA**

**THE GREEN ENERGY TRANSITION BEYOND DUALISM**

**DESIGN PROJECT**

**Wang Yi (4640349)**

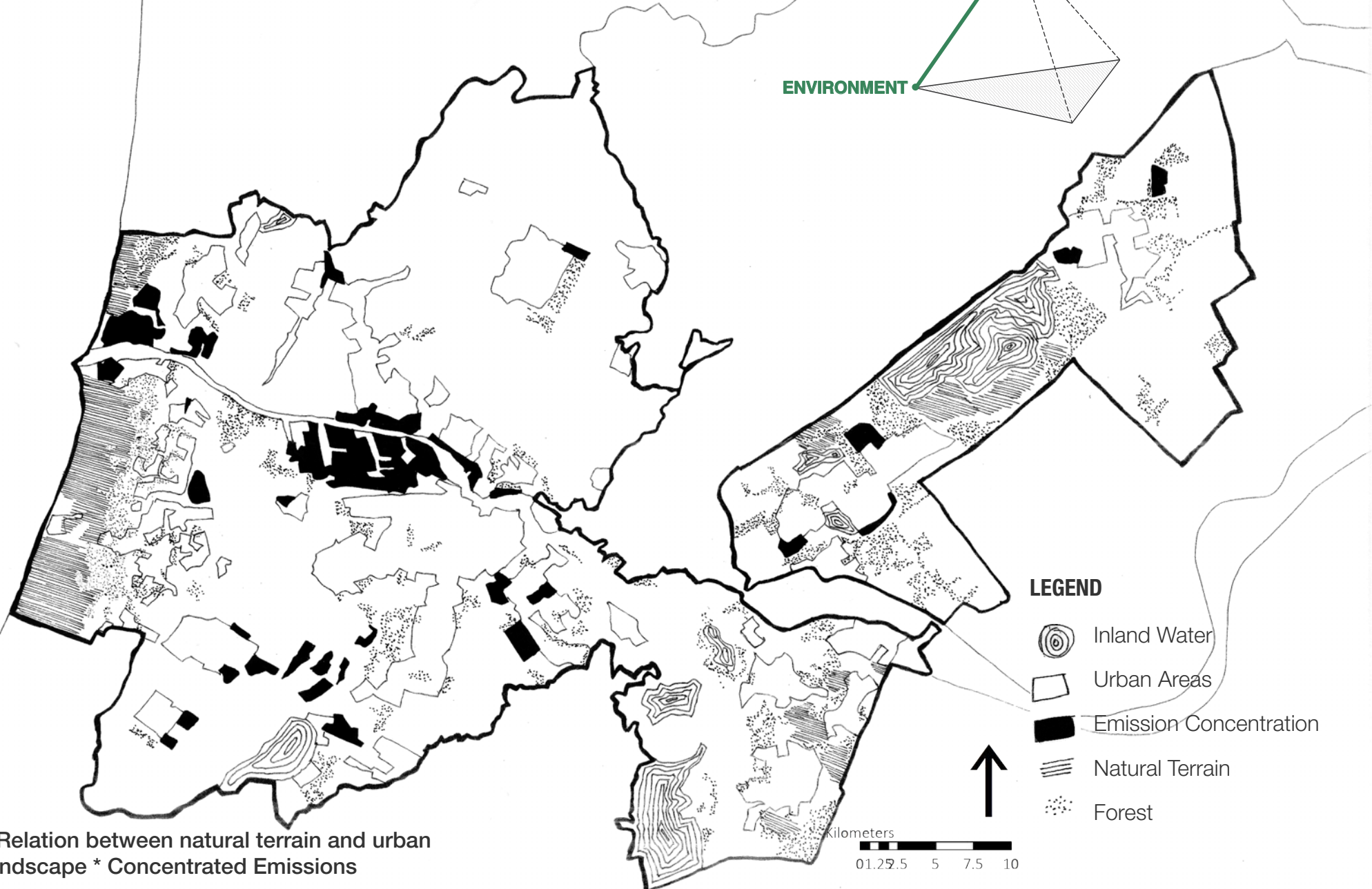
**Hu Ye (4588428)**

**Oujke van Merle (4135342)**

**Karishma Asarpota (4619625)**

# ENVIRONMENTAL FRAMEWORK

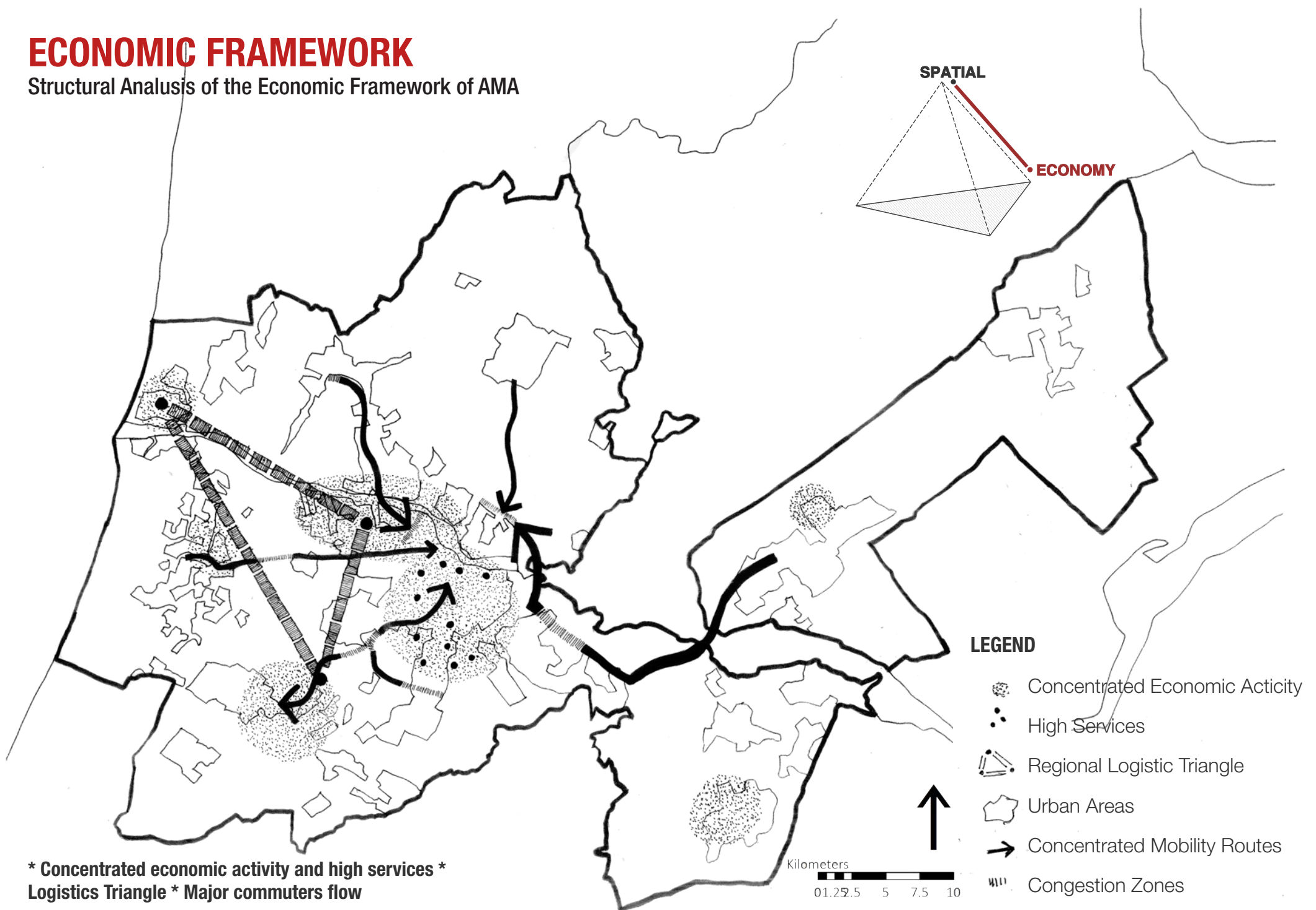
Structural Analysis of the Environmental Framework of AMA



\* Relation between natural terrain and urban landscape \* Concentrated Emissions

# ECONOMIC FRAMEWORK

Structural Analysis of the Economic Framework of AMA



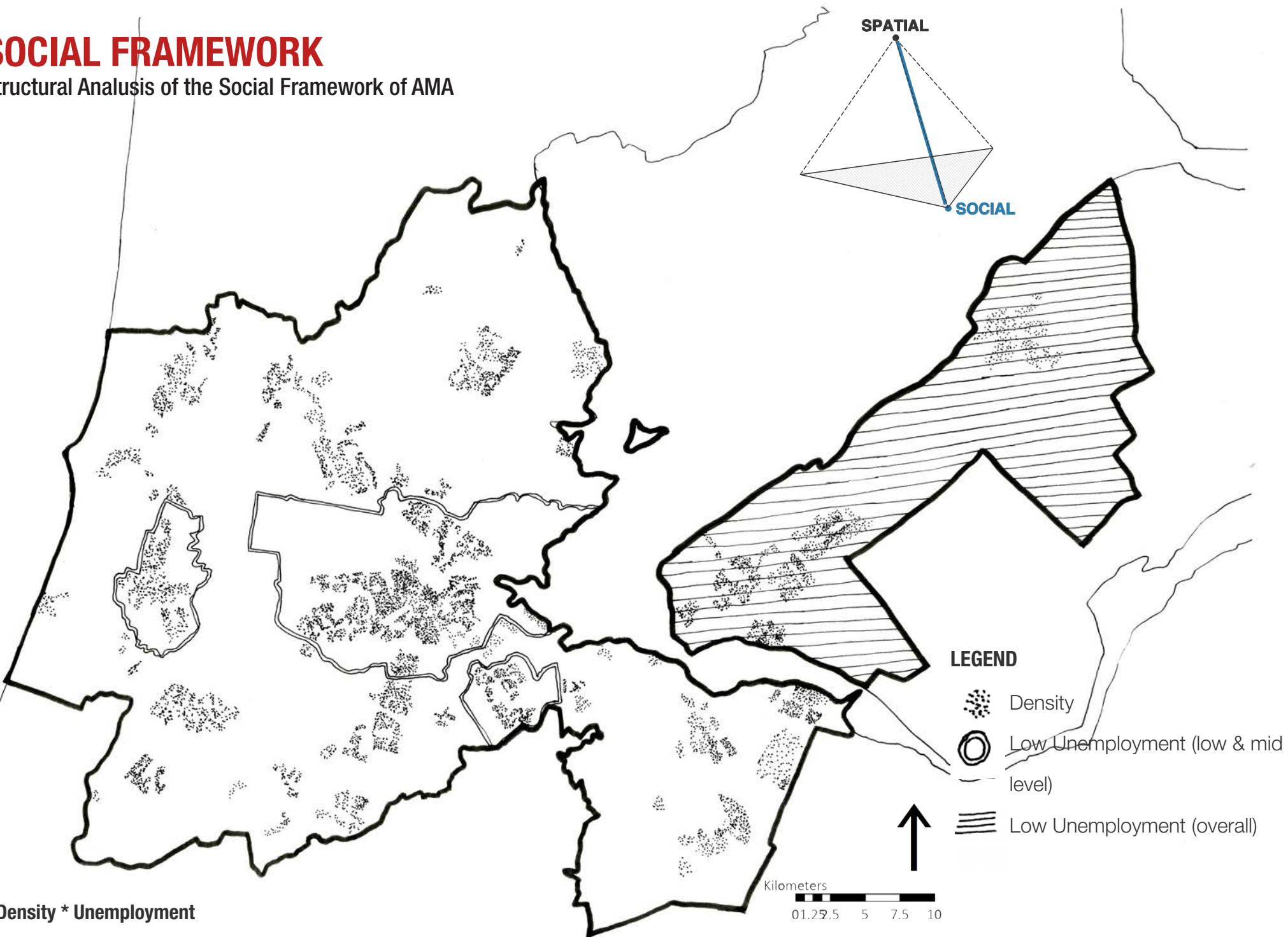
\* Concentrated economic activity and high services \*  
Logistics Triangle \* Major commuters flow

Kilometers  
0 1.25 2.5 5 7.5 10

- LEGEND**
- Concentrated Economic Activity
  - High Services
  - Regional Logistic Triangle
  - Urban Areas
  - Concentrated Mobility Routes
  - Congestion Zones

# SOCIAL FRAMEWORK

Structural Analysis of the Social Framework of AMA

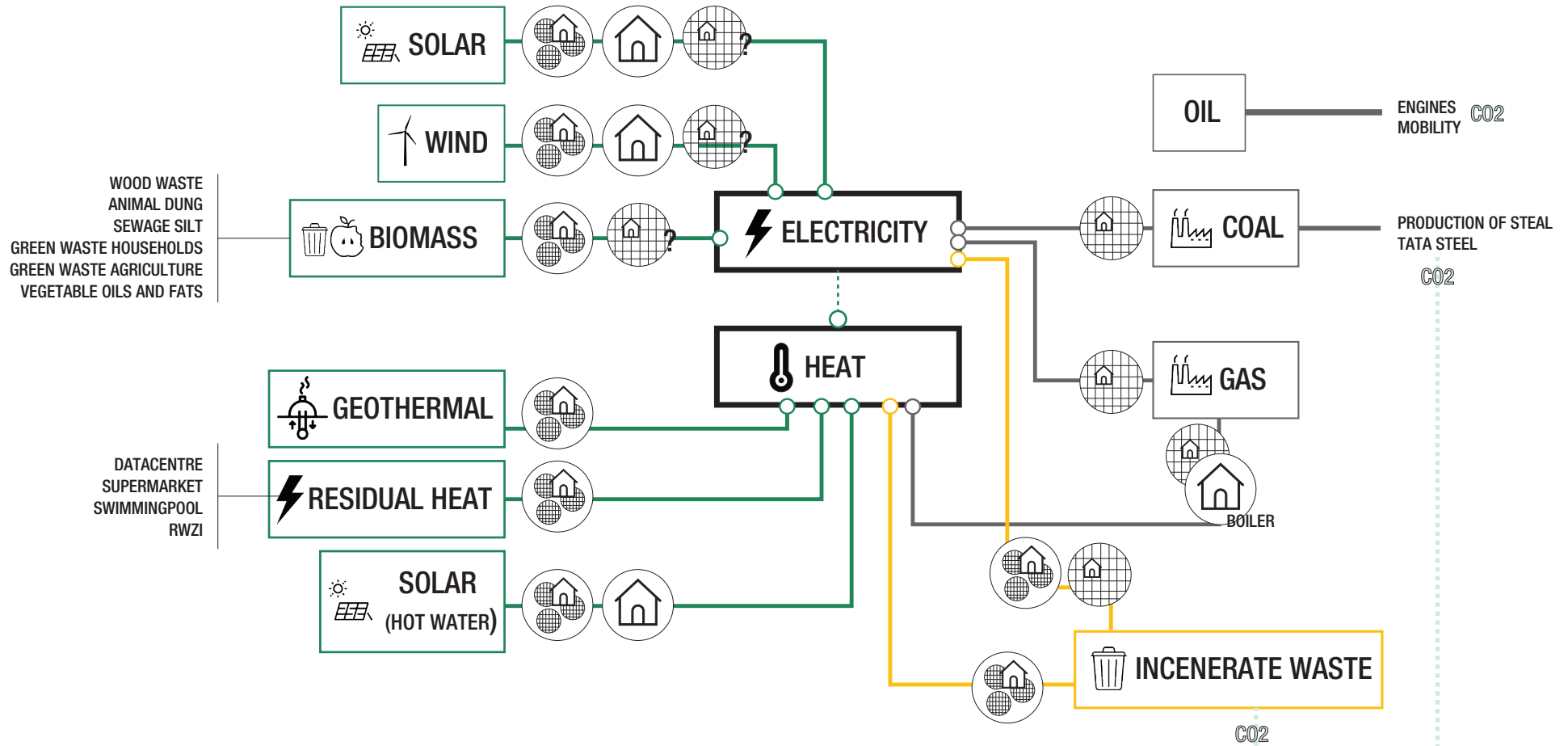


\* Density \* Unemployment

Kilometers  
0 1.25 2.5 5 7.5 10

# OVERVIEW

The relationship between energy flows in the built environment



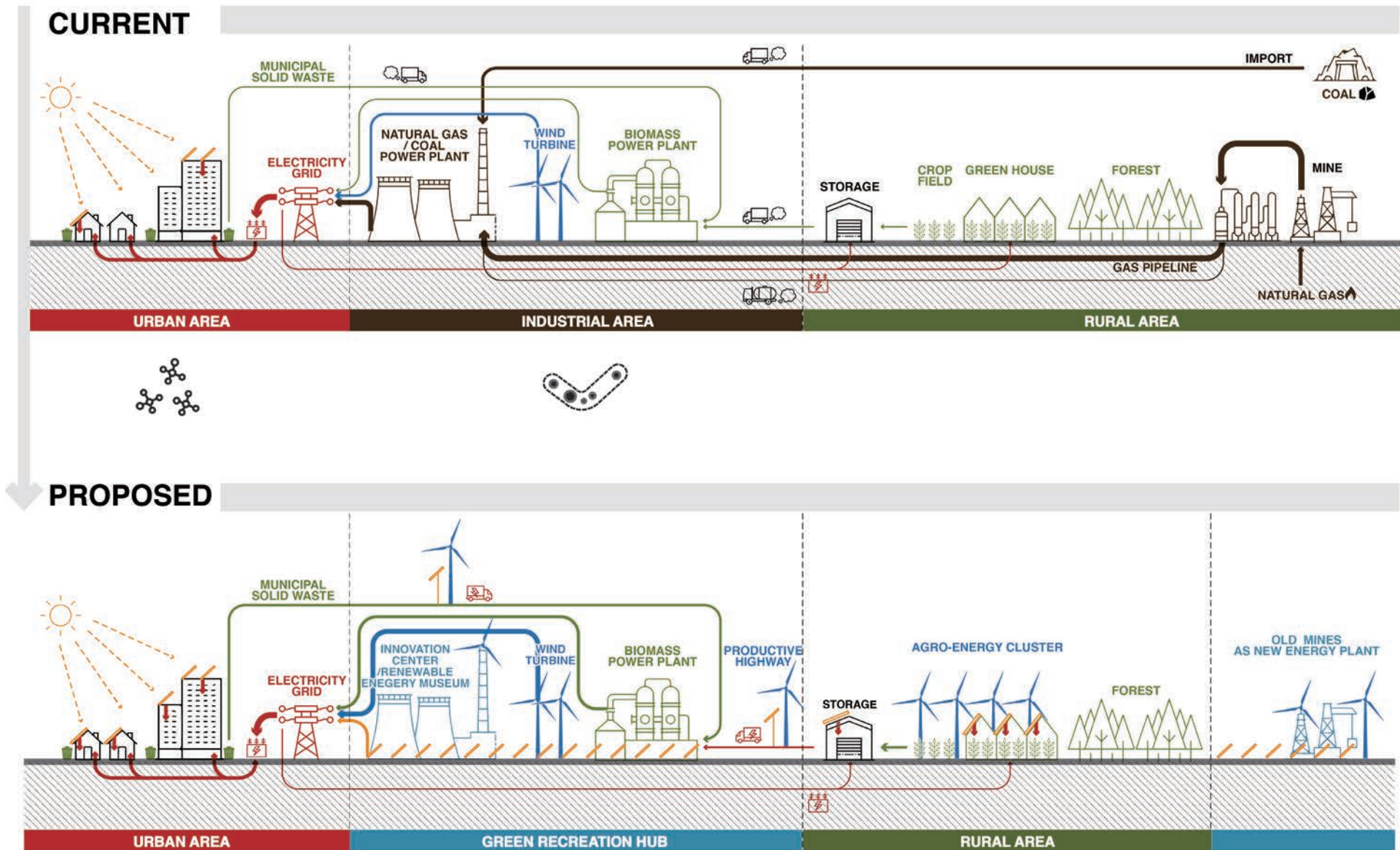
**LEGENDA:**  
DISTRIBUTION SYSTEMS


HOUSE LEVEL      DISTRICT      LARGE INFRASTRUCTURE

For energy flows, the non-renewables for electricity and heat production are mainly in large infrastructure scale and district scale. The renewables for electricity and heat production mainly in a district scale. So for the future energy distribution system, it will mainly be district energy system.

# ELECTRICITY

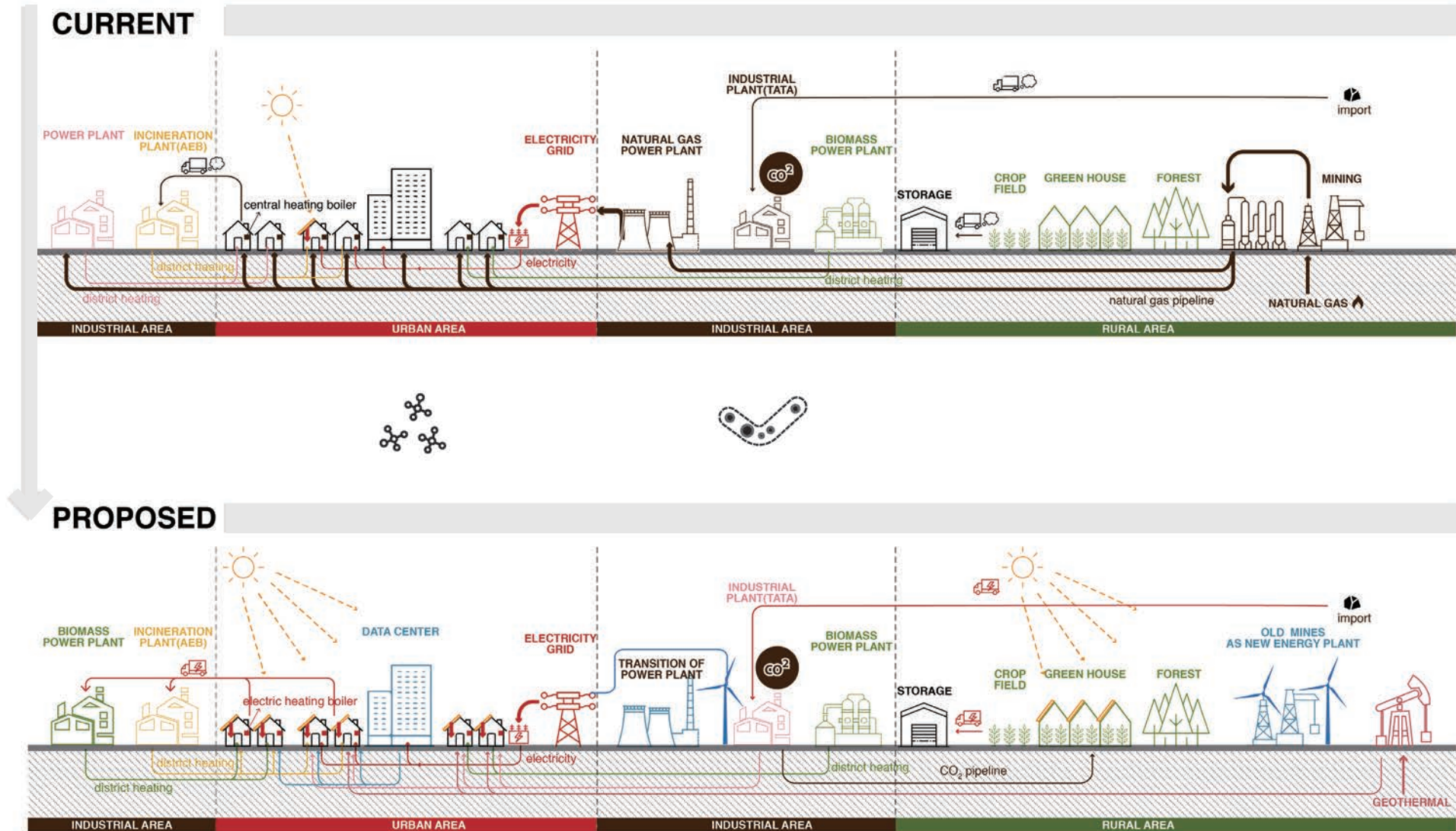
The transition of electricity flow fossil fuel based to green energy



\* energy transition from fossil fuel to green energy \* district energy system

# HEAT

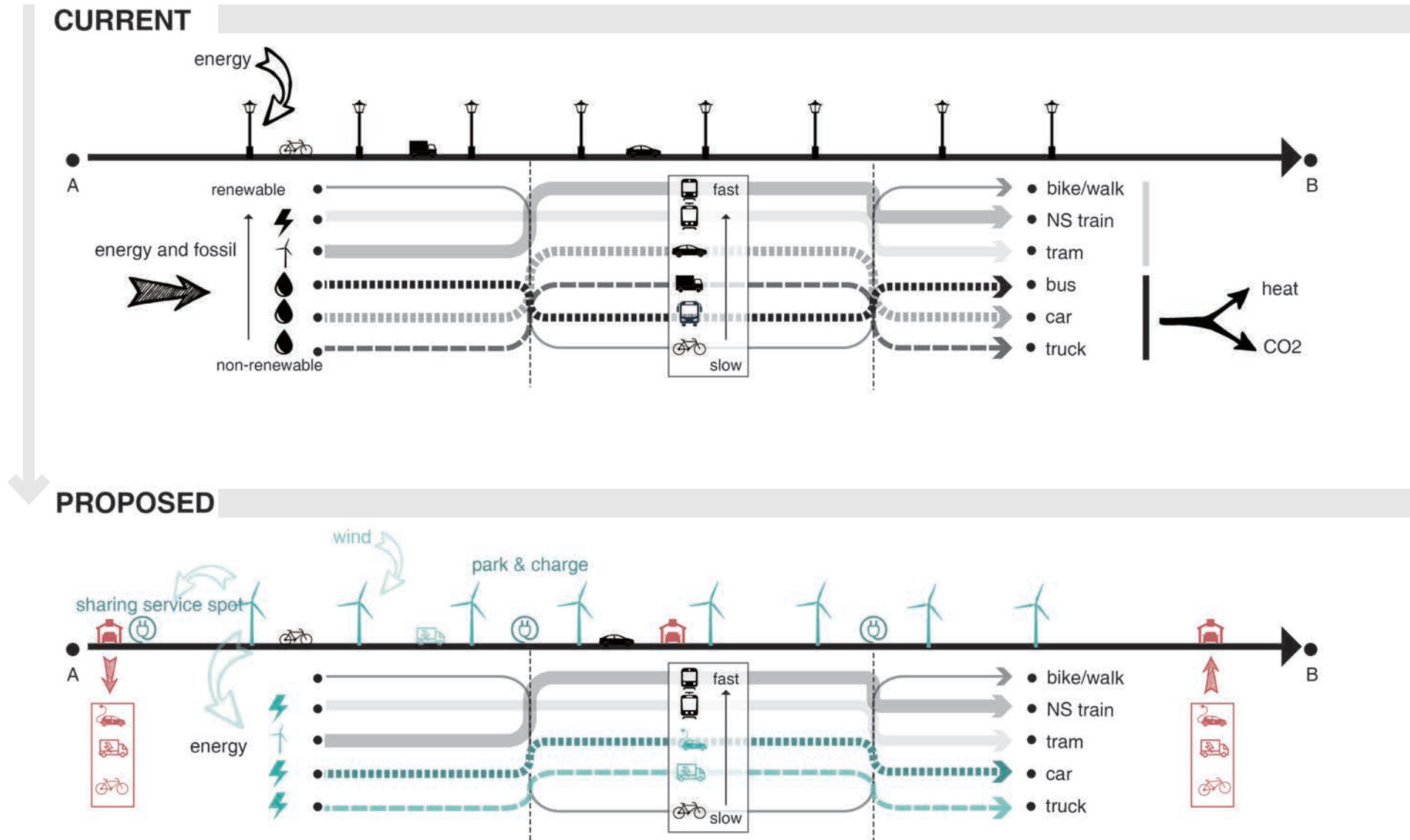
The transition of heating flow from fossil fuel based to green energy



\* energy transition from fossil fuel to green energy \* residual heat \* district heating network

# MOBILITY

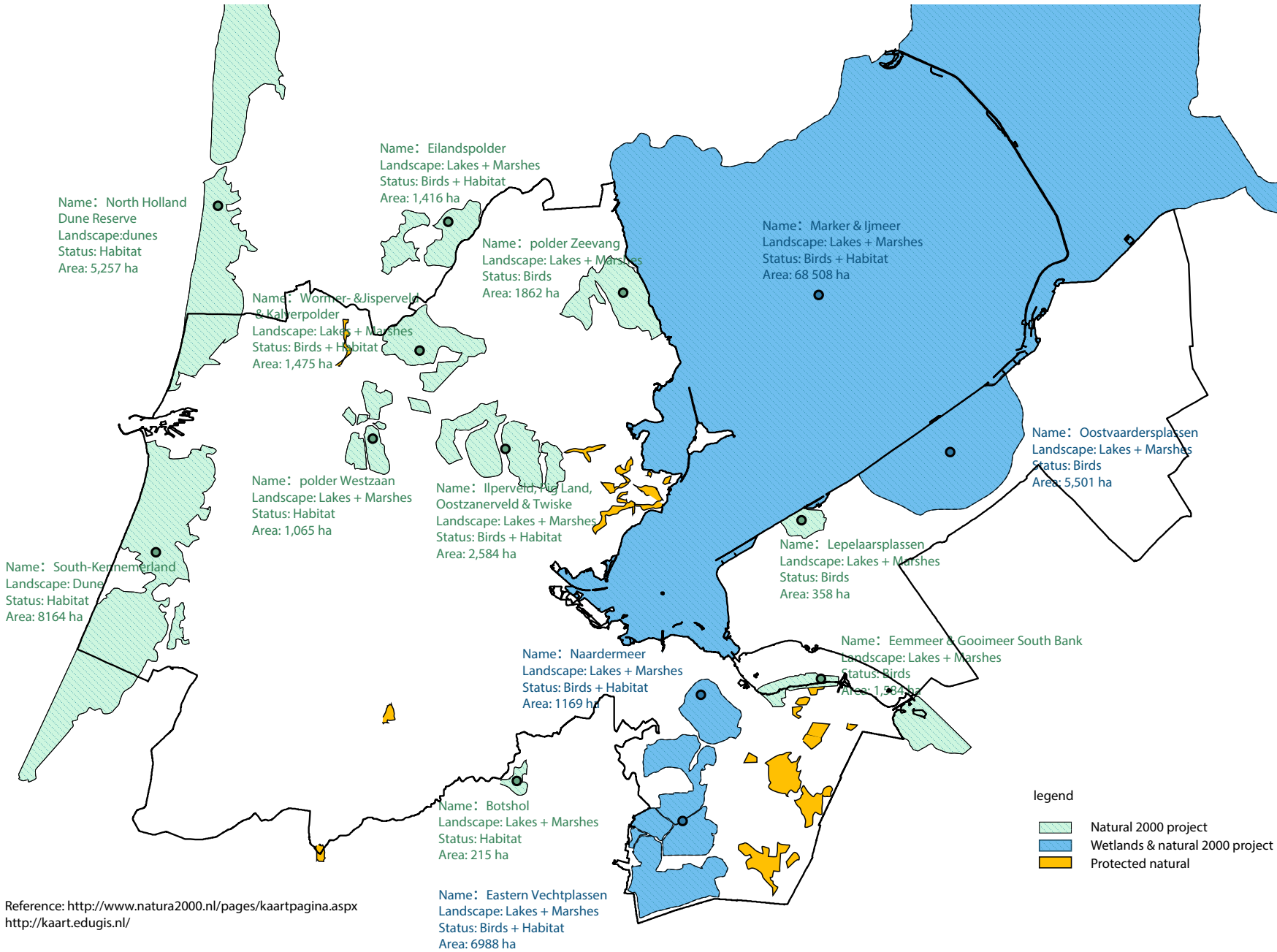
The transition of mobility system from fossil fuel based to green energy



\* sharing system \* green energy \* transition of energy consumption to energy production



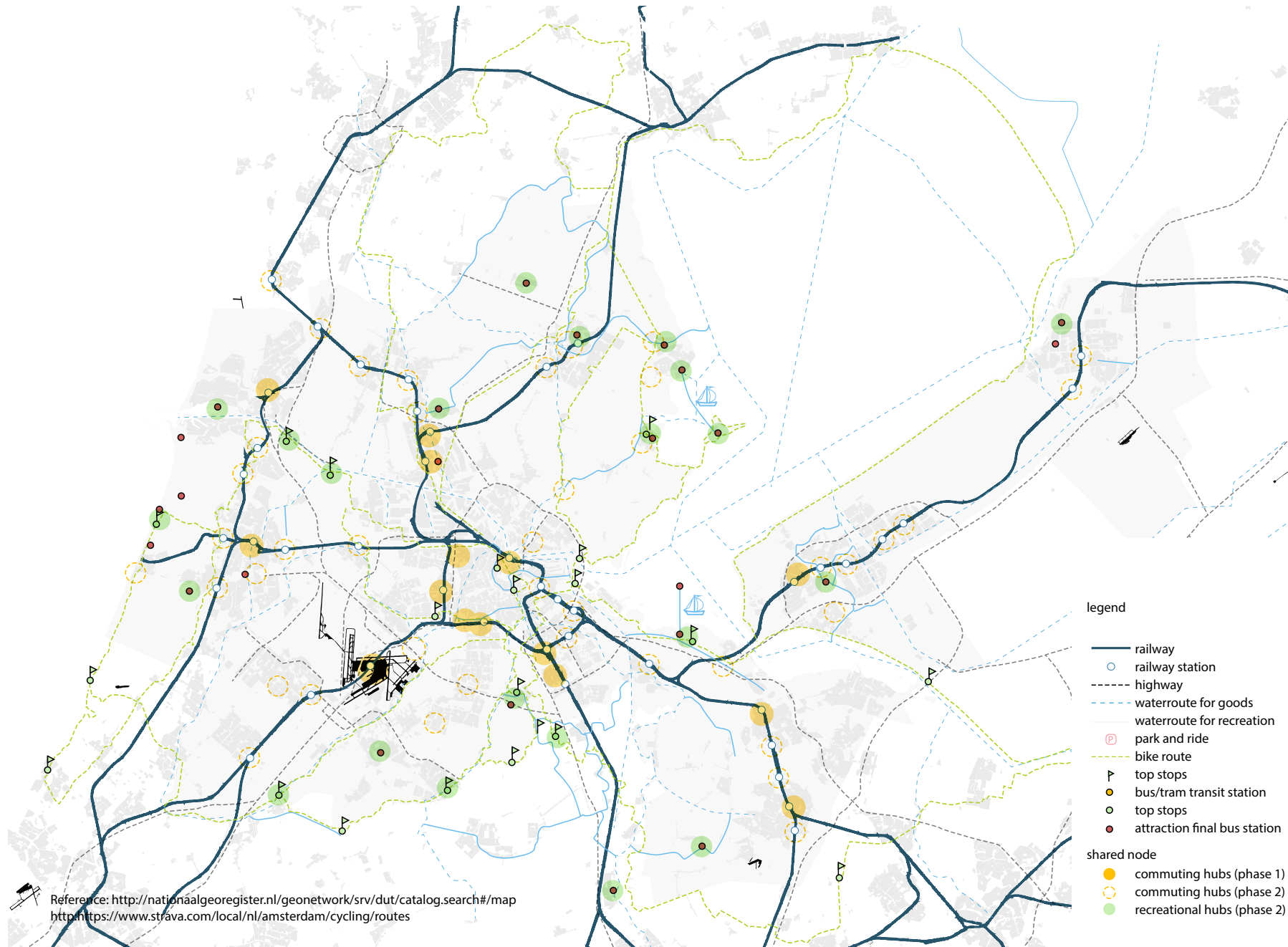
# LANDSCAPE



Landscape layer shows the different kinds of natural landscapes, which could be a potential for energy production through exploring the synergies between the landscape and energy. While the nature 2000 projects and protected nature site set a restriction on the use of those landscapes where are defined as protection. Based on that, we got the potentials and restrictions of energy landscape.

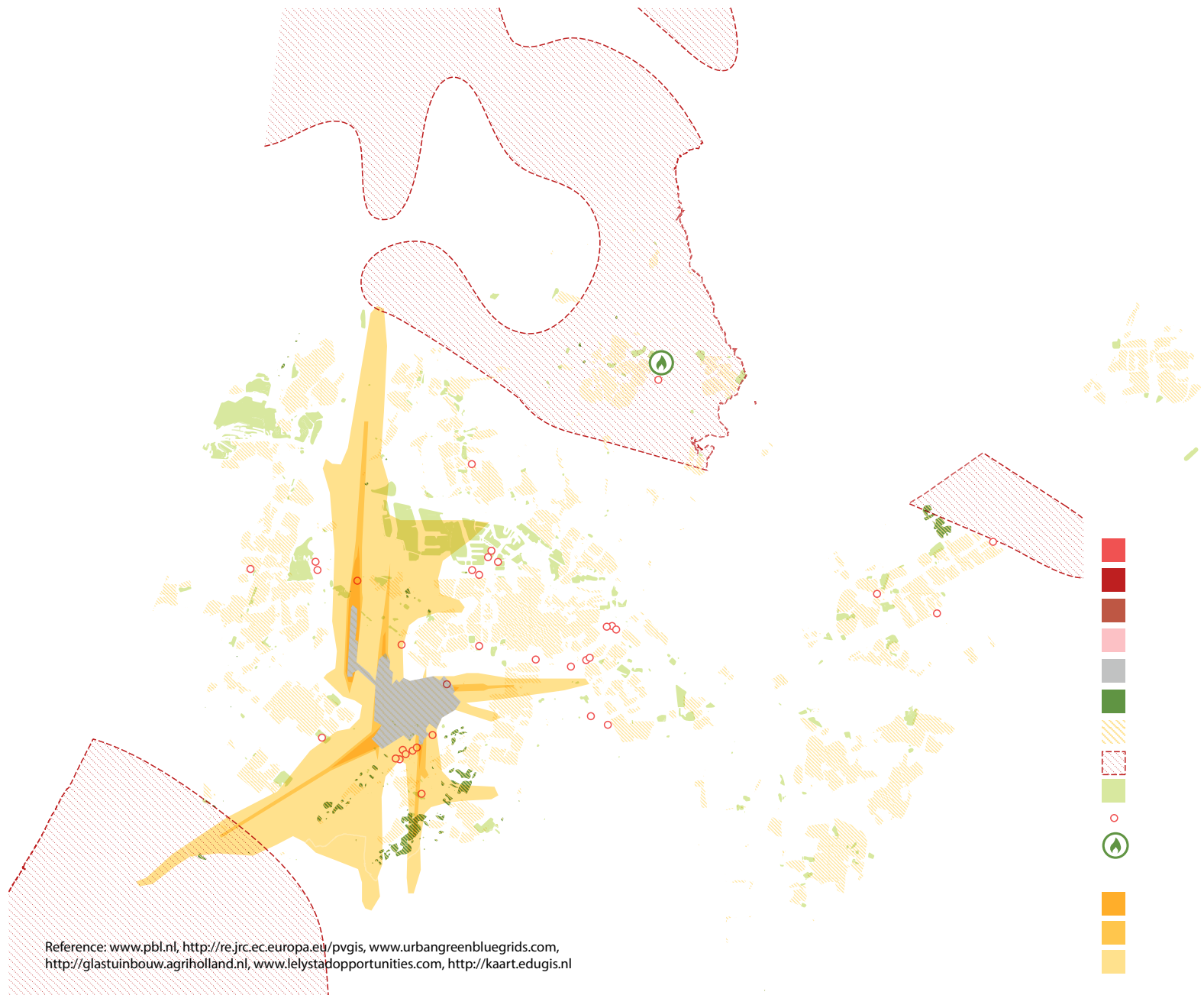
Reference: <http://www.natura2000.nl/pages/kaartpagina.aspx>  
<http://kaart.edugis.nl/>

# MOBILITY



Based on the former analysis of mobility flow, We don't want to add more road or change the current network, a sharing system will be built in the future. The sharing spots will be categorized into 2 types, one is for daily commuting use, another one is for recreation. Thus, based on the current condition, the potential site for commuting hubs and recreational hubs are highlighted. They are marked as different phases. Since there are park-and-ride spots near some train stations, the commuting hubs could start with these train stations.

# ENERGY CONSUMPTION



The category of cities related to energy consumption. For large high-dense city with historical towns, future solutions will be more on a household level, make the energy more efficient and reduce the consumption of energy by strengthen the insulation of buildings. For mid-dense city with quality landscape, we try to find the potential energy , like geothermal, greenhouses ,datacenter, and to build district energy network. There are some restrictions in the energy consumption area, near the airport, there are regulations.

# ENERGY PRODUCTION



## VISION

In 2040, AMA is empowered by the **green energy transition through three spatial systems** that have shaped the future energy transition landscapes. Together the layers form a seamless landscape: a landscape where energy production is integrated within the built and natural environment. Our vision goes beyond the spatial implementation of green energy transition as it shapes opportunities to **strengthen AMA from an economic, social and environmental perspective.**

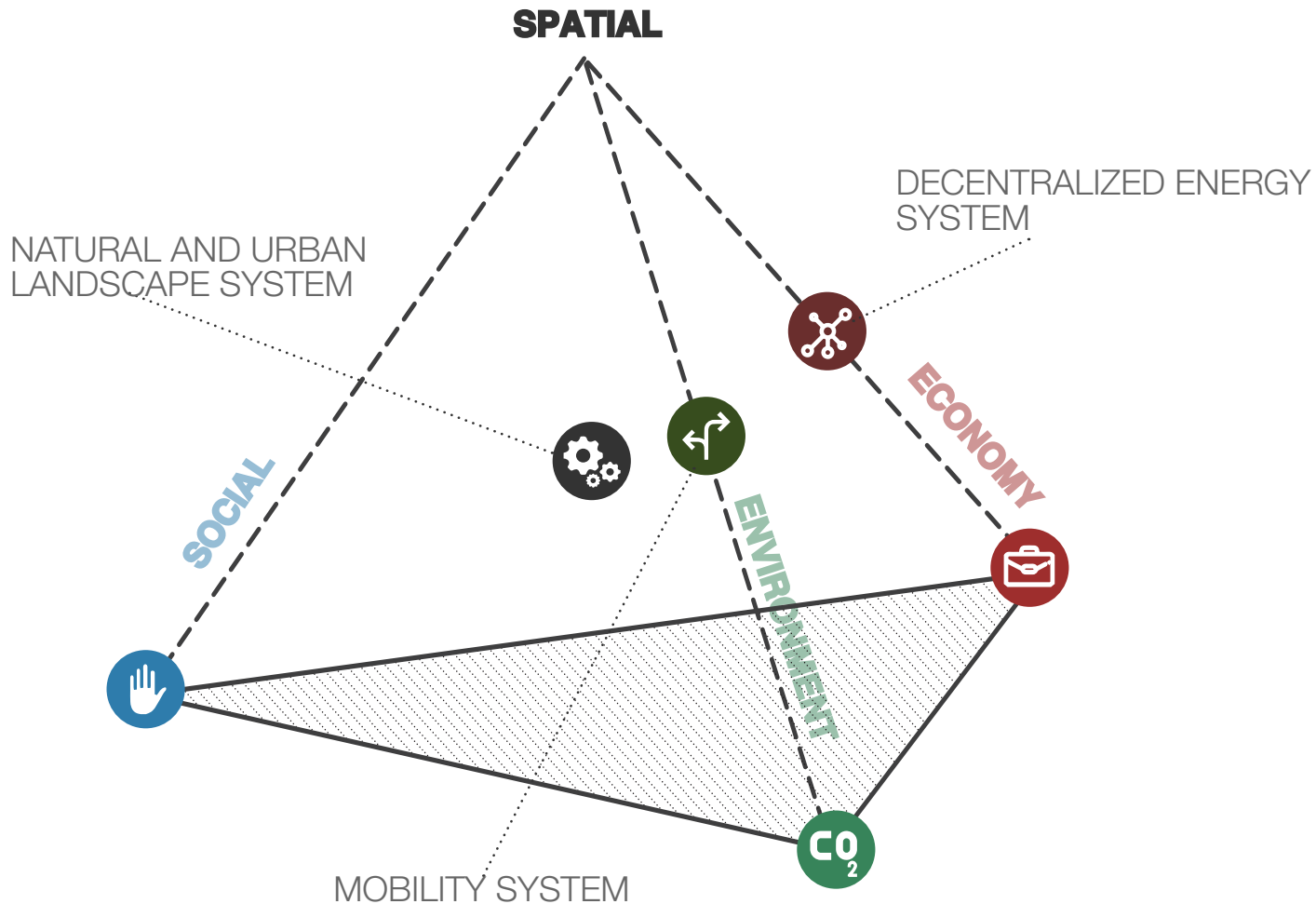
**(01) Decentralized Energy System:** It empowers and incentivizes municipalities through a decentralized system through the implementation of renewable energy. Decreasing consumption and adapting the current built environment to reuse energy flows can strengthen local economy and provide more jobs. This can strengthen the local economy and provide jobs. The decentralized system tackles dualism that lies within attitude of citizens by involving them within the design process of the energy transition.

**(02) Mobility System:** This system thrives to make consumption less , by implementing a flexible sharing system for e-bikes and e-cars and stimulate the increased use of public transport. The integrated system allows users to pick and drop off a ‘shared’ electric car or electric bike at any hub in the region. the system also emphasizes

on the optimization use of space by adding energy production within the mobility system. Both aspects of the mobility system will be applied on a larger scale to not only strengthen AMA, but also AMA within the Randstad system.

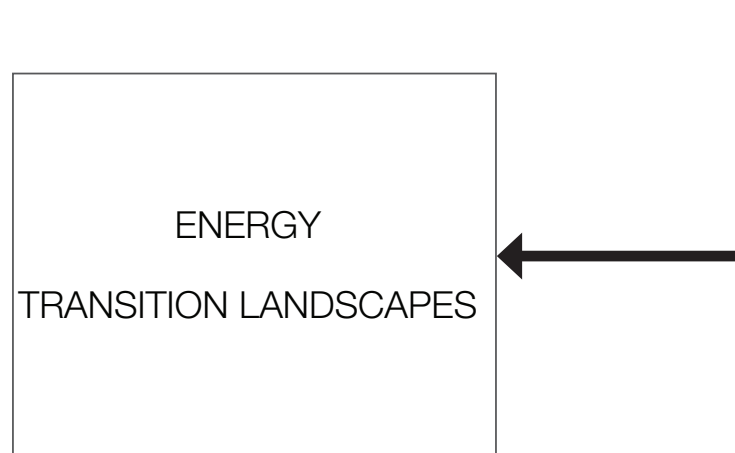
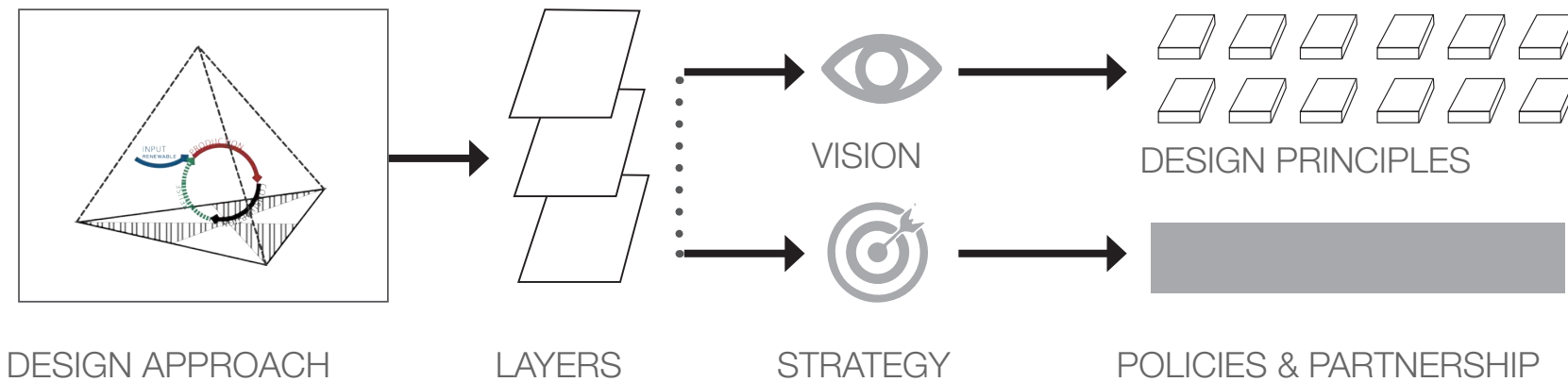
**(03) Natural and Urban Landscape System:** The switch from energy resources will create new values for the current energy producing landscapes and future energy landscapes. Post fossil areas will be transformed to areas with new public space reconnecting urban and natural landscape areas. Implementing wind energy in the current natural landscapes can provide new recreational uses within the landscape and collaboration with farmers.

# RELATIONSHIP BETWEEN THE GOALS AND SPATIAL LAYERS OF THE VISION



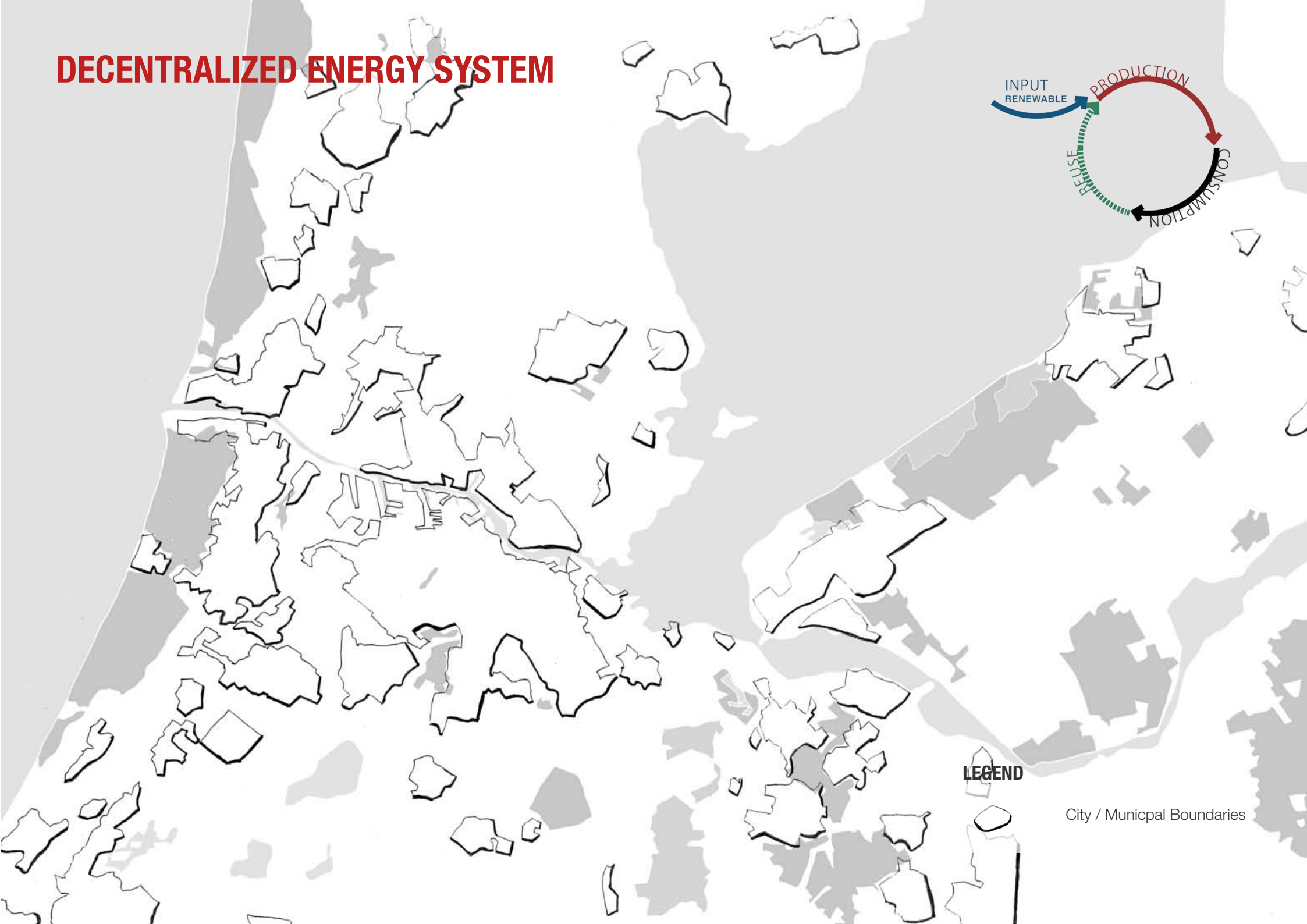
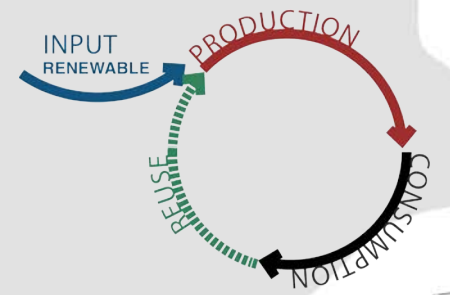
The three spatial layers relate to every landscape and the formulated goals. Protecting and strengthening spatial quality can be achieved in exploring synergies in the urban and natural landscape system. The decentralized energy system promotes renewable energy production within each municipality. The mobility system is the underlying infrastructure system that integrates the landscape, green energy and recreation.

# DESIGN APPROACH



The design approach is strongly embedded within the theoretical framework. Exploring the environment, economic and social perspective in the green energy economic model to overcome dualism has been applied to each layer. This has resulted in a vision per spatial layer and implementation strategy for each. The vision provides design guidelines on achieving the goals per layer along with highlighting key projects in the strategy. These layers have then combined to form the final vision and the energy transition landscape.

# DECENTRALIZED ENERGY SYSTEM



**LEGEND**

City / Municipal Boundaries



# DECENTRALISED ENERGY SYSTEM -- DESIGN APPROACH

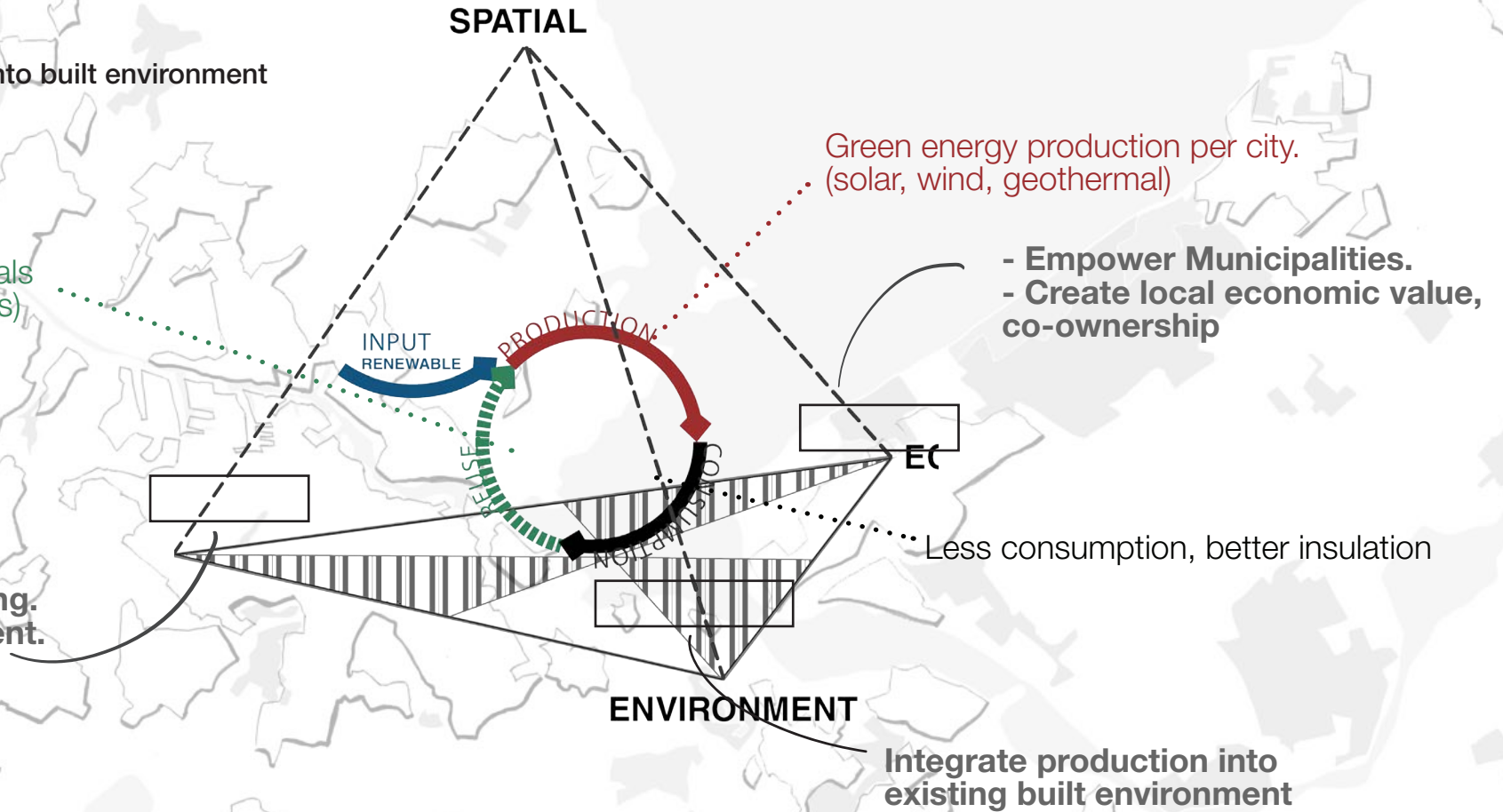
**GOAL 2040:** Residential areas are running on 100% renewables

## ELEMENTS

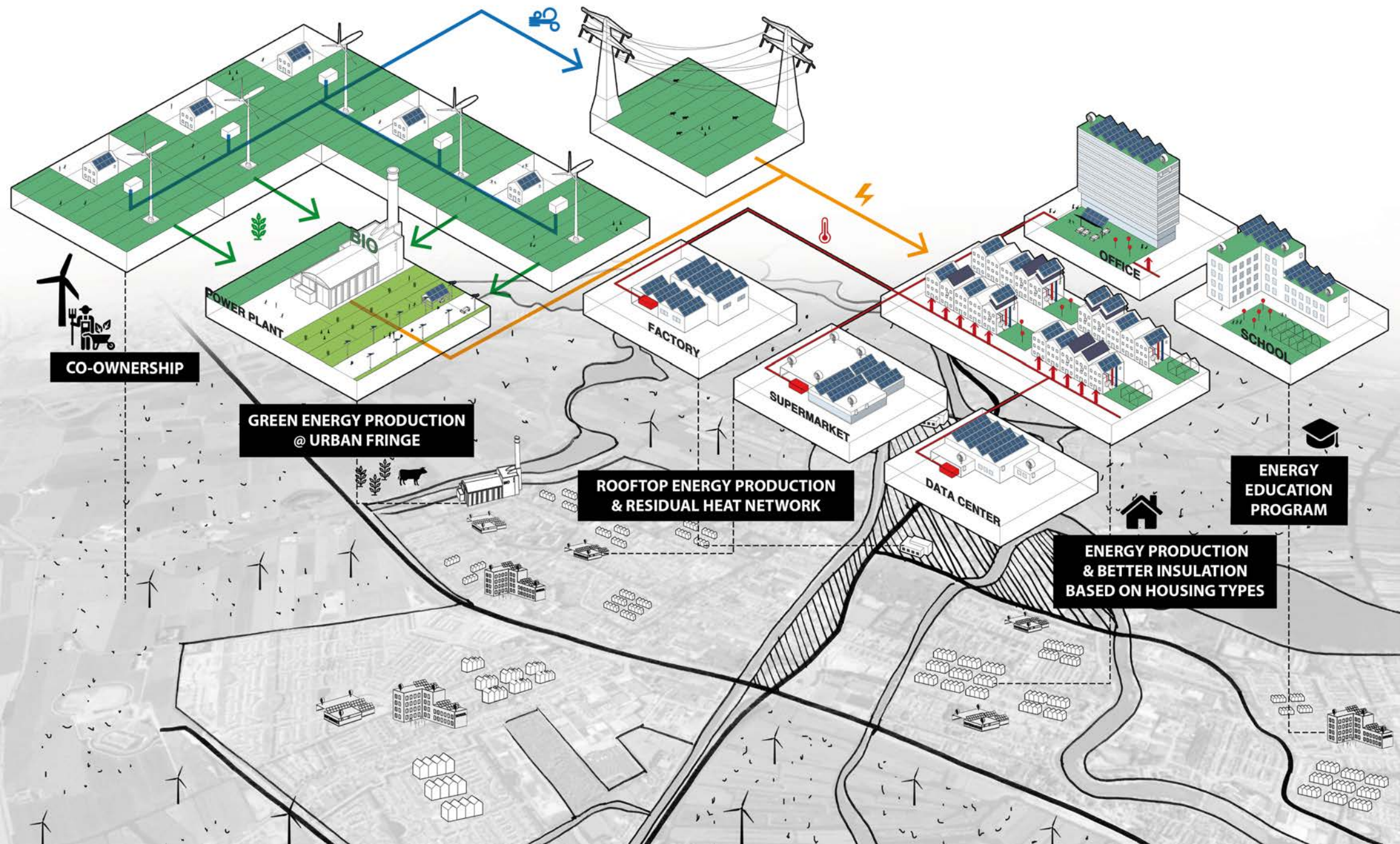
- Empower Municipalities
- Less consumption
- Reuse flows
- Integrate production into built environment
- Local economy
- Local jobs
- Citizens involvement

Reuse of local potentials  
(residual heat, biomass)

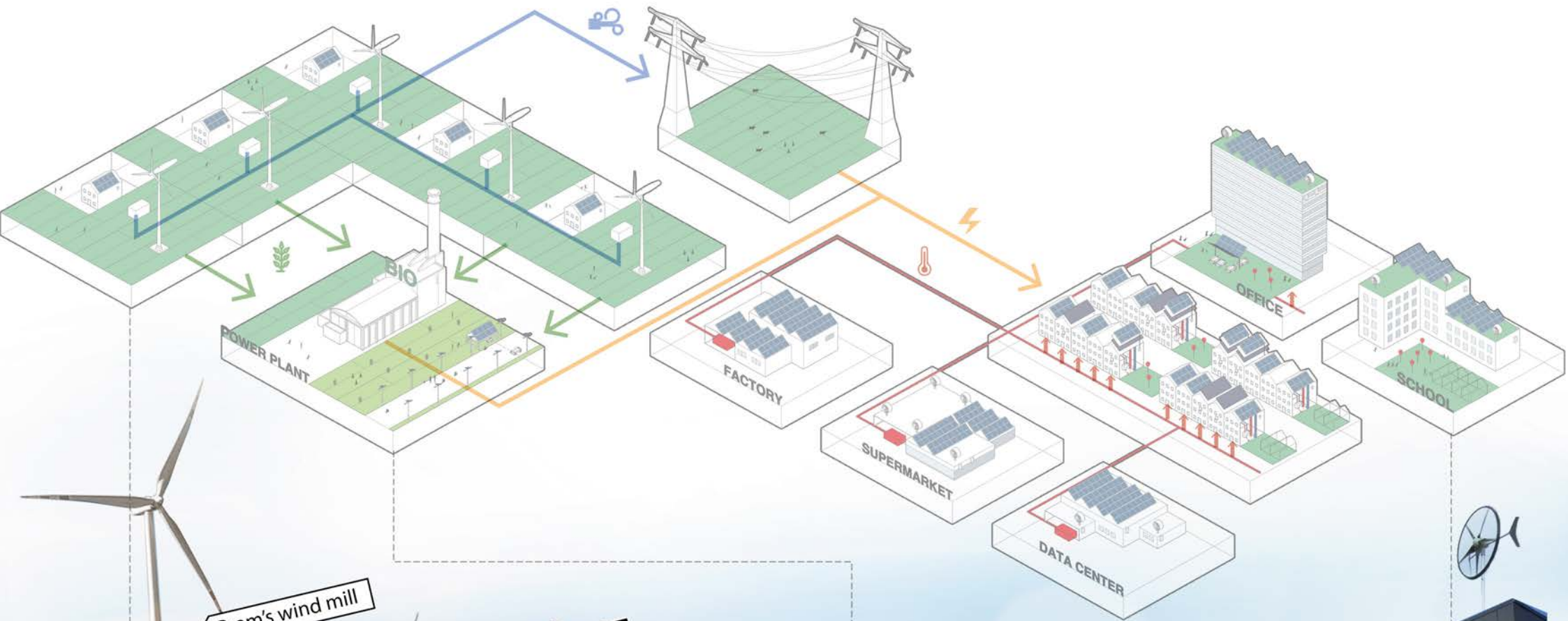
- Local jobs providing.
- Citizens involvement.



# ECENTRALISED ENERGY SYSTEM -- DESIGN PRINCIPLES



# ECENTRALISED ENERGY SYSTEM -- IMPRESSION



Bram's wind mill

Your wind mill looks cool!

We love green energy!



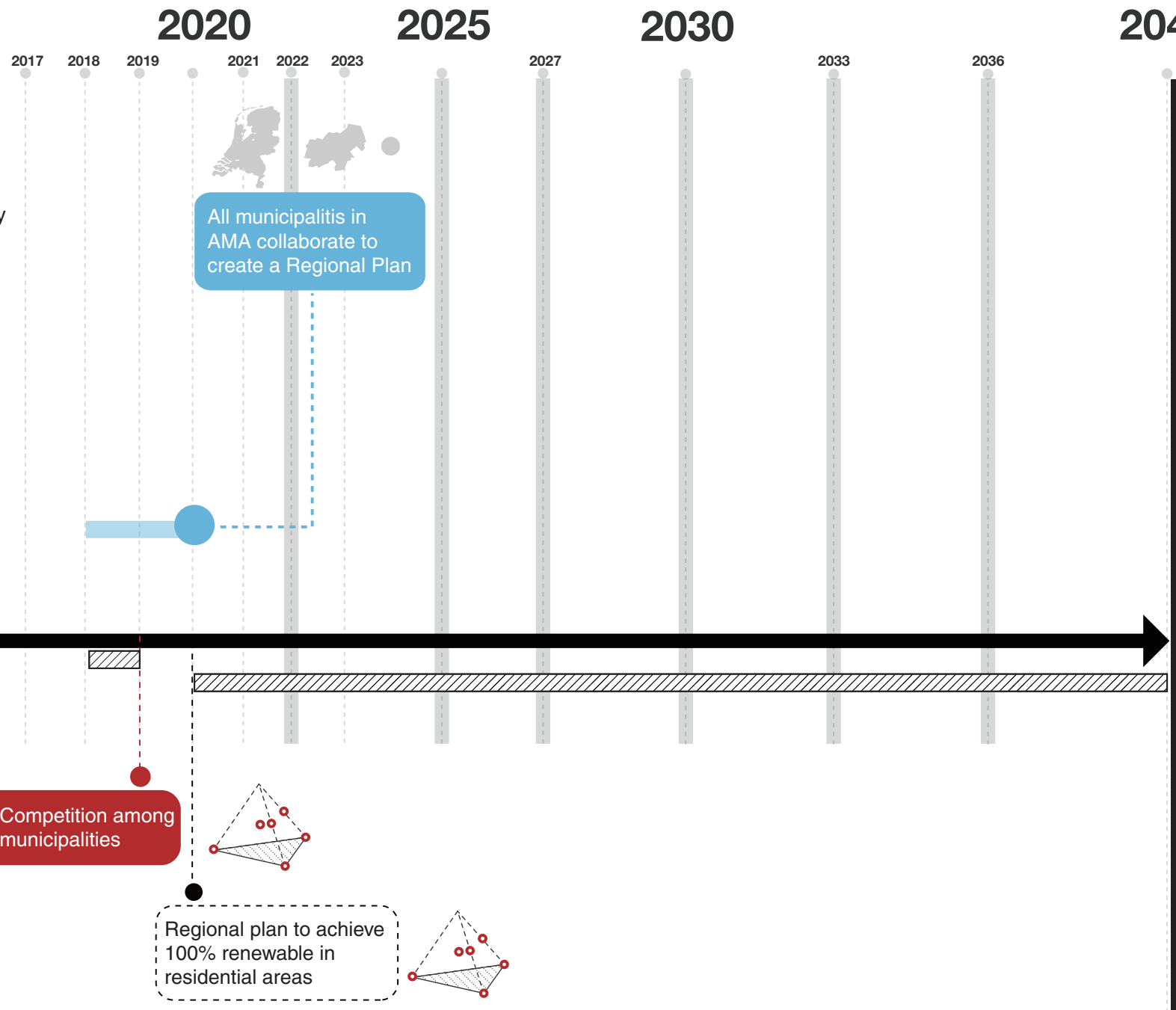
# IMPLEMENTATION STRATEGY

Operability in time

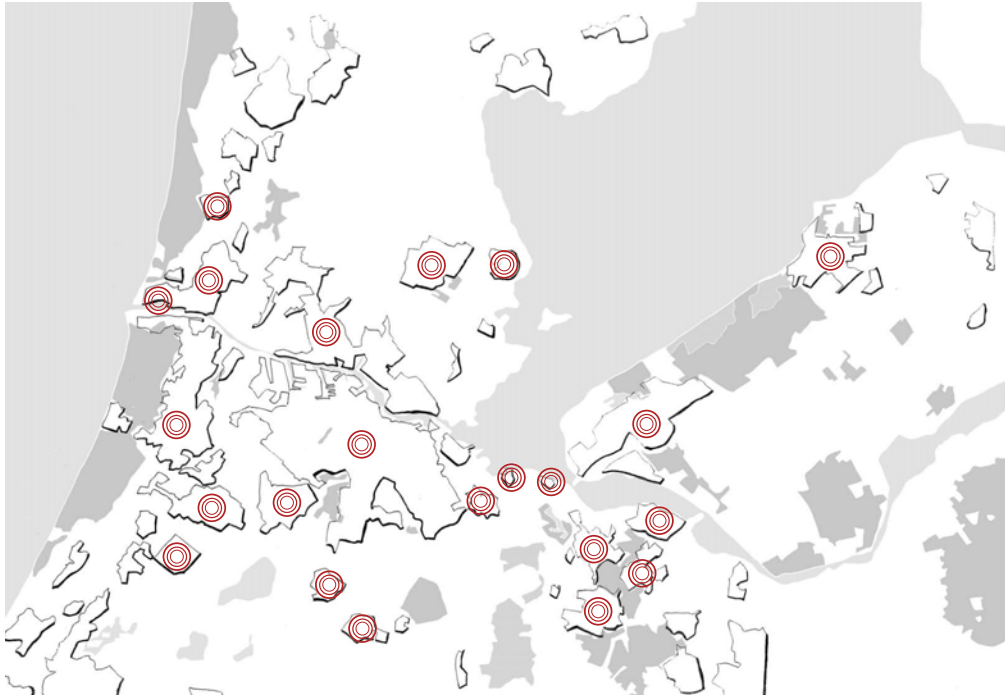
Key Projects

- Fiscal Measures
- Partnership
- Development Priority
- Existing Policy
- Long-term Development Policy

- Triggers
- Milestones
- Goals
- Review



Residents areas are running on 100% percent energy



This strategy aims at empowering municipalities to come up with innovative solutions to tackle the transition to renewable energy. Through partnerships a new regional plan can be created that is a combination of key projects in every municipality as well as promotes collaboration between neighbouring municipalities. This will be triggered through a competition between municipalities that promises a funding to implement the most innovative solutions.



January 2018, Amsterdam

Dear Municipality,

In December all Municipalities within the **Amsterdam Metropolitan Area** have come to the agreement to collaborate on the *decentralized energy goal for 2040*. We, the board of the **Metropolitan Region Amsterdam**, would like to congratulate you on this achievement! We see a future where residential areas have shaped a system to be fully self reliable when it comes to energy production.

We are pleased to announce that the next phase will include a competition between the municipalities! This competition is formed to gather innovative ideas on how to implement a new decentralized energy system. We have received a fund from the national government to make the transition possible and collaborate on a new regional plan for AMA

After a year we will gather all ideas and formulate an overarching regional plan. The regional plan will have projects that will strengthen every municipality within the AMA. Besides the implementation of the regional plan, there will be allocated fund for projects. that aptly respond to the requirement of the design brief

Requirements:

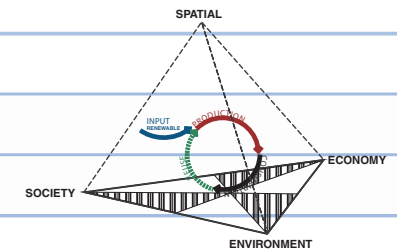
Projects should be embedded within the green energy transition model.

- \* Projects should integrate renewable energy into the current built environment and be able to Quantify the amount of added energy, by these sources
- \* Projects should take into account the reuse of flows (co2, residual heat, biomass) and quantify the amount of energy savings by implementing the reuse of flows.
- \* Projects should reduce energy consumption and quantify the overall reduction in energy consumption
- \* Projects should stimulate the local economy and provide jobs. estimate the amount of jobs and local turnover.
- \* Show projects/actions to involve citizens within the process.
- \* The projects should demonstrate the inclusion of all the stakeholders involved through innovative business models.
- \* Collaborative Projects that propose solutions across municipality boundaries are also welcome.

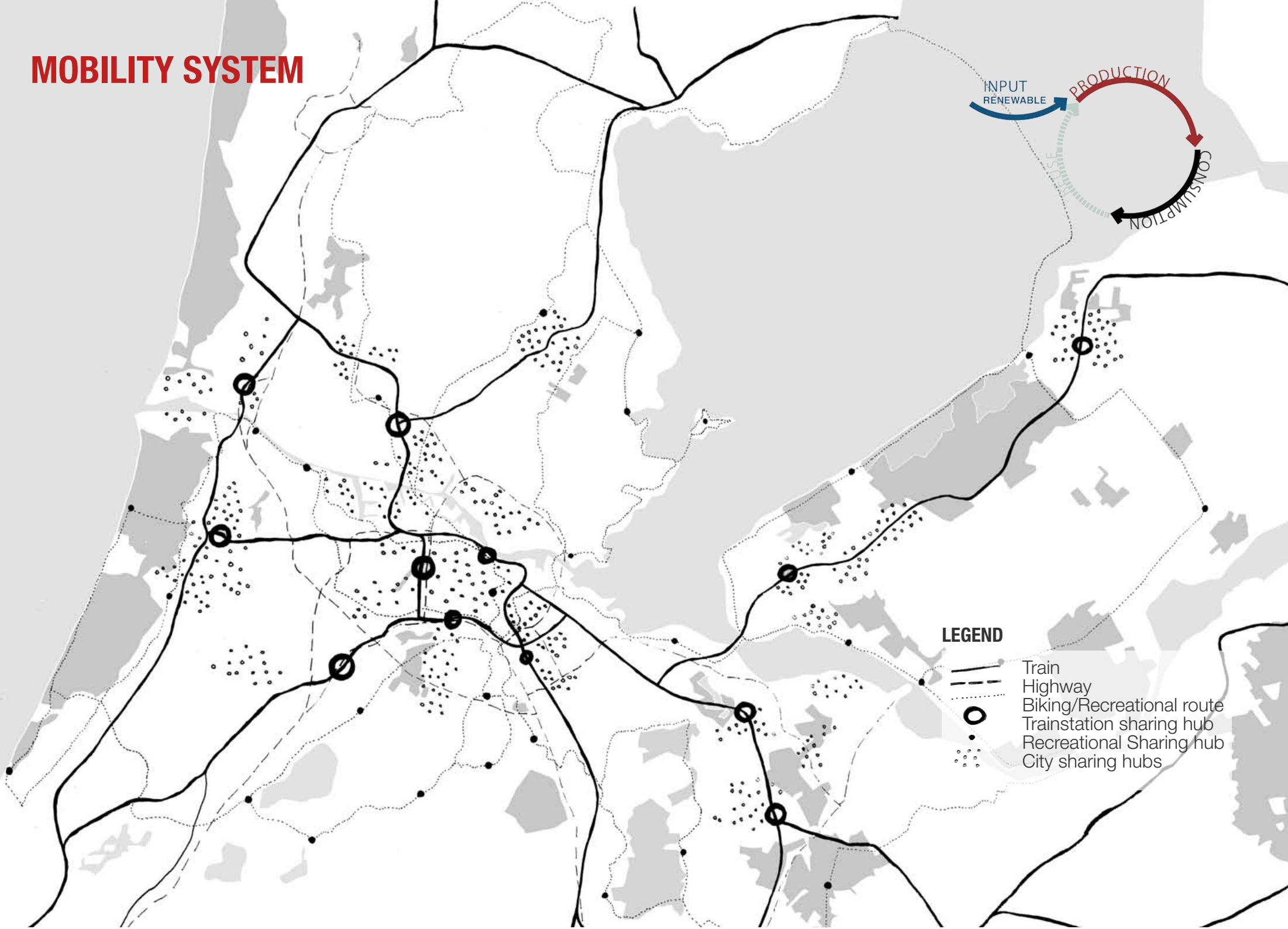
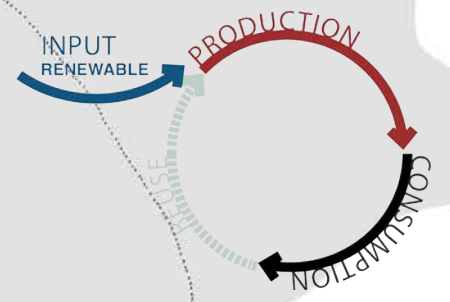
With the design brief we send you design principles and inspirational ideas that show examples of how the decentralized system can work. We ask you to formulate a set of projects that fit the requirements of the design brief. So let the completion get started! We are looking forward to your contribution.

Kind Regards,

The Board  
Metropolitan Region Amsterdam



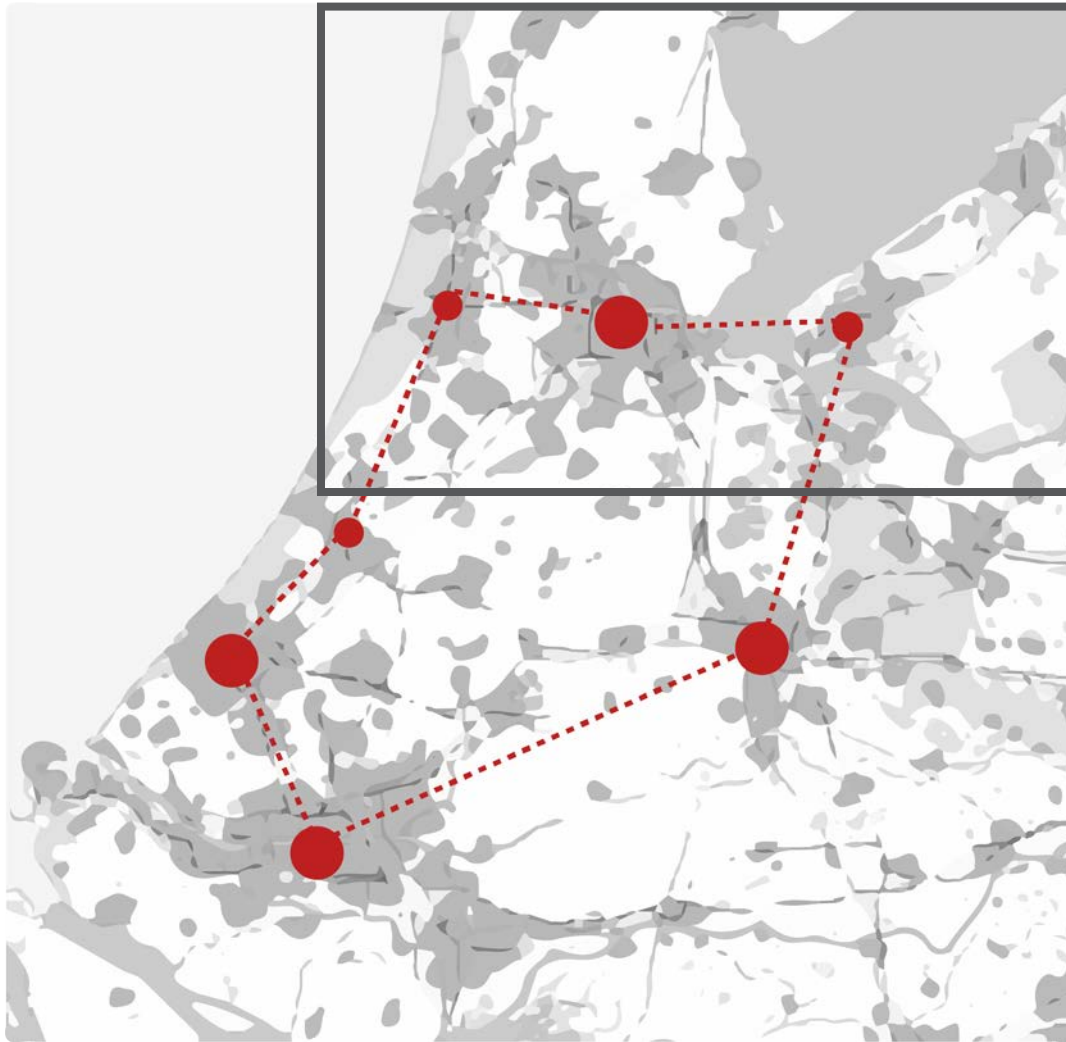
# MOBILITY SYSTEM



## LEGEND

- Train
- - - Highway
- ⋯ Biking/Recreational route
- Train station sharing hub
- Recreational Sharing hub
- City sharing hubs

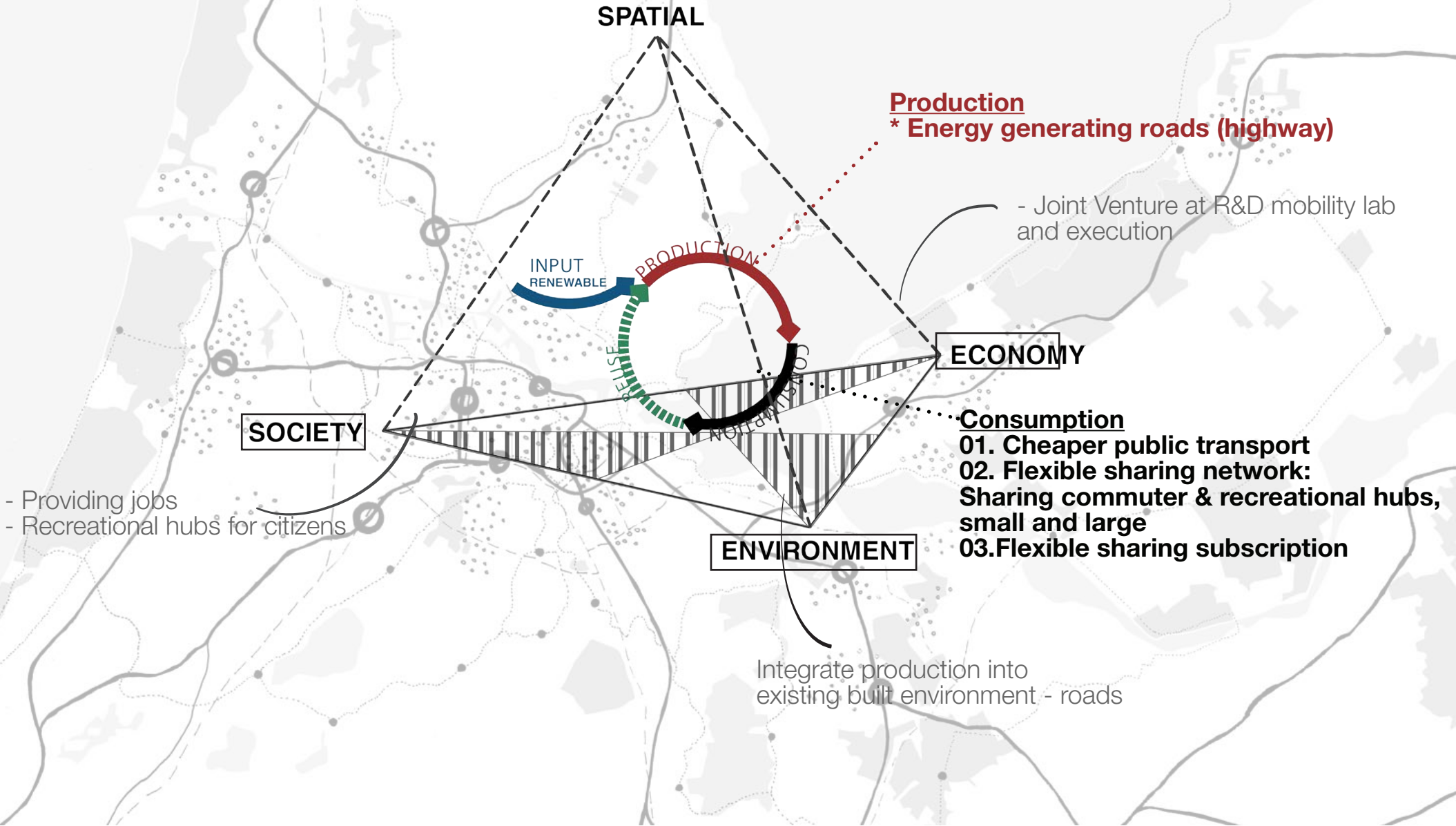
## MOBILITY NETWORK OF THE AMA IN CONTEXT TO THE RANDSTAD



The flexible sharing system for electric cars, electric bikes and bicycles is implemented through the AMA using a single subscription system. This system attempts to change the behavior of users by promoting sharing of vehicles while reducing emissions through the use of electric vehicles. This can only become widespread if it is convenient for the end users. Eventually this can be spread to the rest of the Randstad to make a truly comprehensive system within the Netherlands.

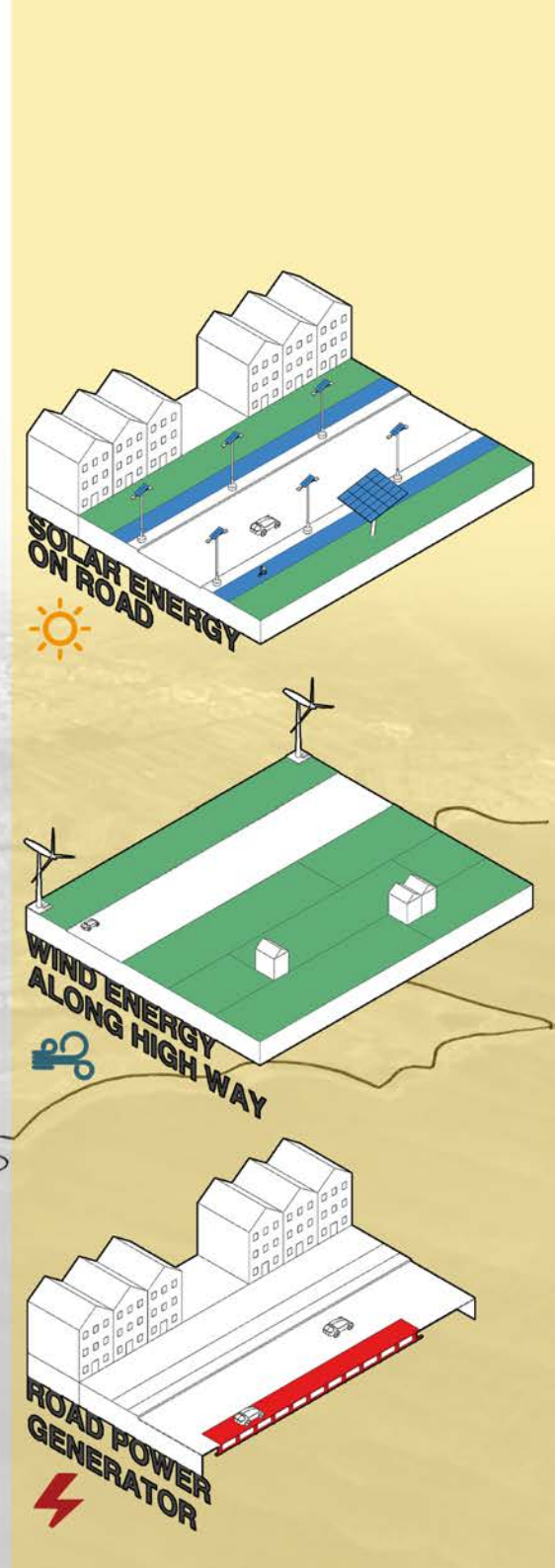
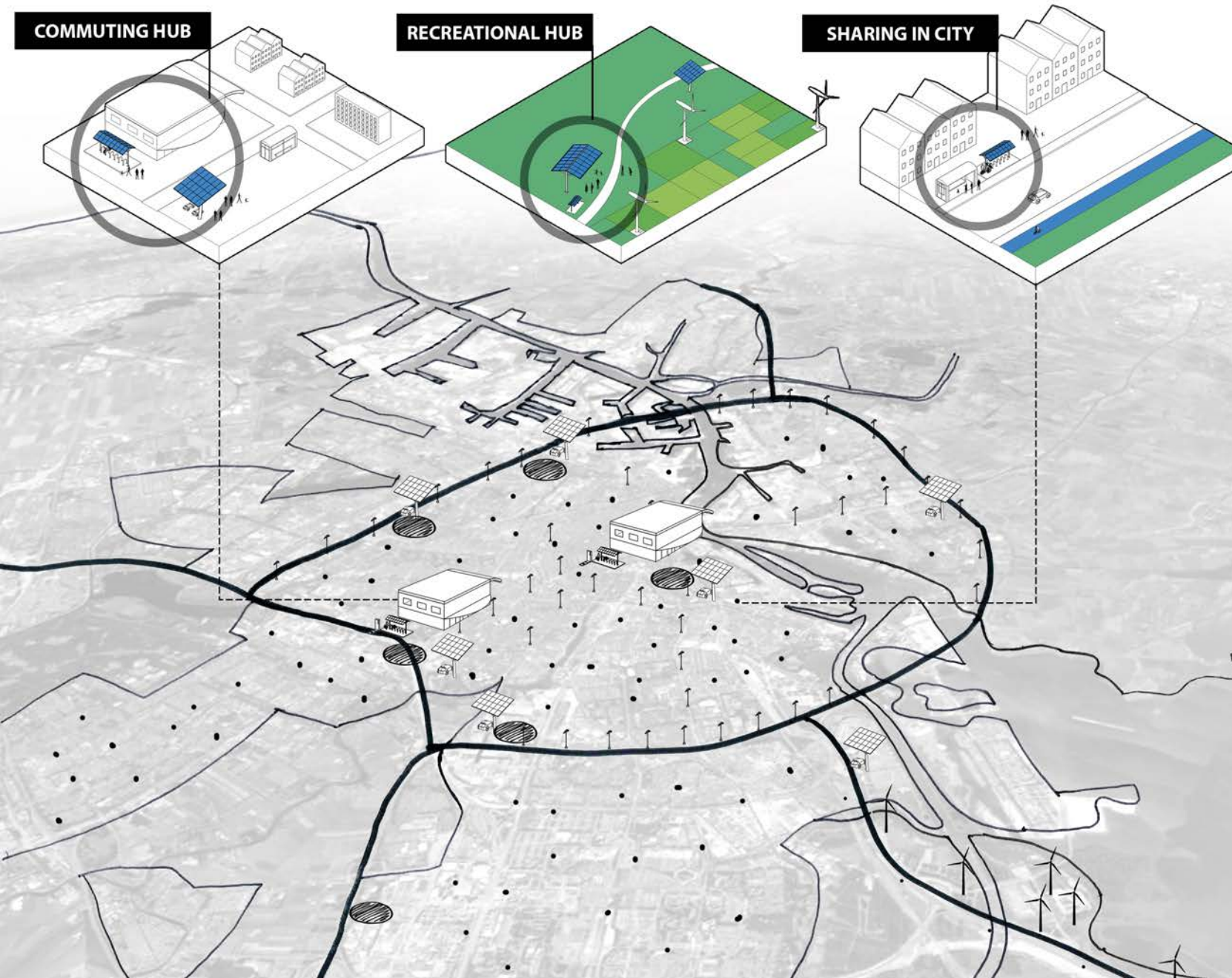
# MOBILITY SYSTEM -- DESIGN APPROACH

**GOAL 2040:** Extend the flexible sharing network & Adapts roads to generate electricity





# MOBILITY SYSTEM -- DESIGN PRINCIPLES



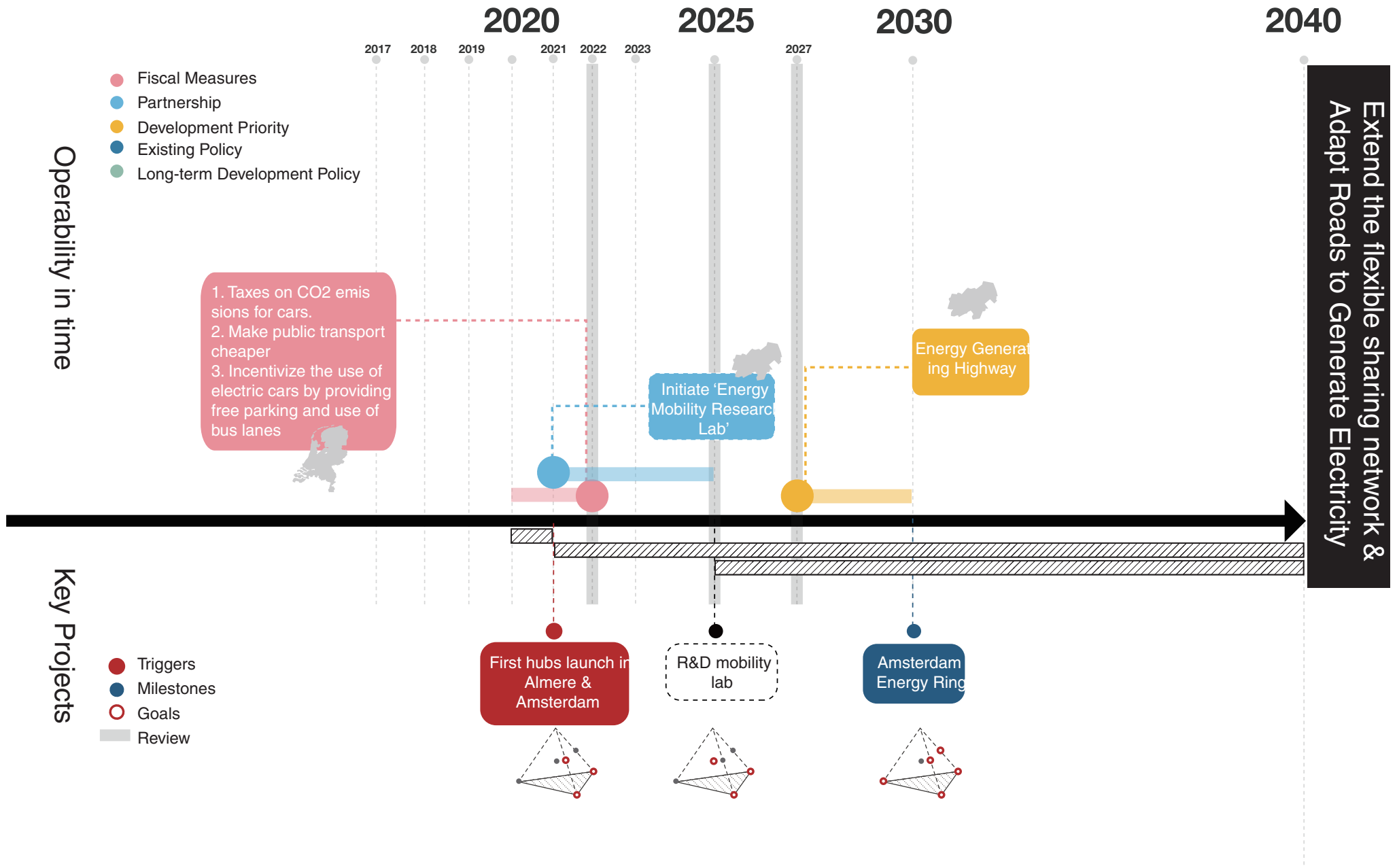
# MOBILITY SYSTEM -- IMPRESSION



E-car sharing point throughout cities

Energy generating road  
Forming new identity

# MOBILITY SYSTEM -- STRATEGY



# MOBILITY SYSTEM -- STRATEGY

2030

2040

Timeline in time

Key Projects

- Triggers
- Milestones
- Goals
- Review

To promote the use of the sharing system, fiscal measures can be adopted in combination with proving incentives to use electric cars. Taxes on CO2 emissions for cars should be introduced, public transport should be made cheaper to encourage a more frequent use and electric cars can be incentivized by providing free parking and the use of bus lanes. The first hubs should be opened in areas with maximum users, in Amsterdam Centraal and Almere. Technology to generate electricity is well on its way and can be initiated within the AMA. To be able to achieve this the government should invest in the research of this technology through a 'Mobility Research Lab'.

Initiate 'Energy Mobility Research Lab'

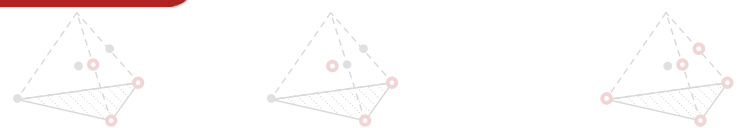
Energy Generating Highway

First hubs launch in Almere & Amsterdam

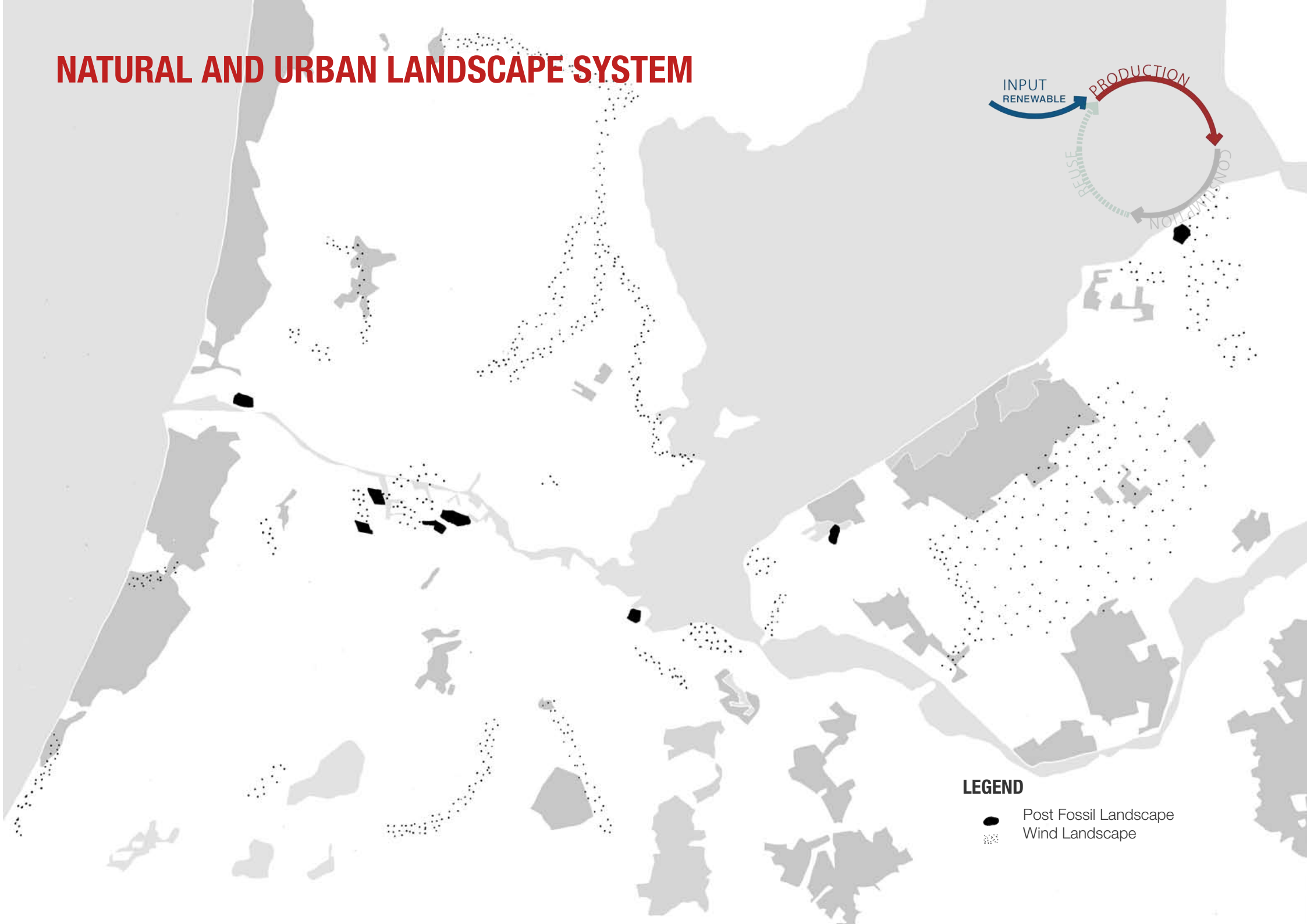
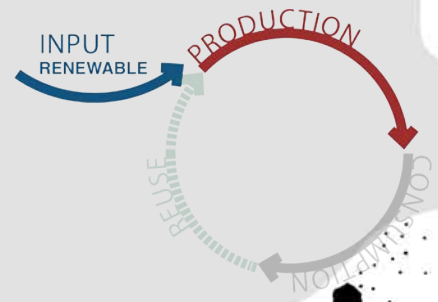
R&D mobility lab

Amsterdam Energy Ring

Extend the flexible sharing network & Adapt Roads to Generate Electricity



# NATURAL AND URBAN LANDSCAPE SYSTEM

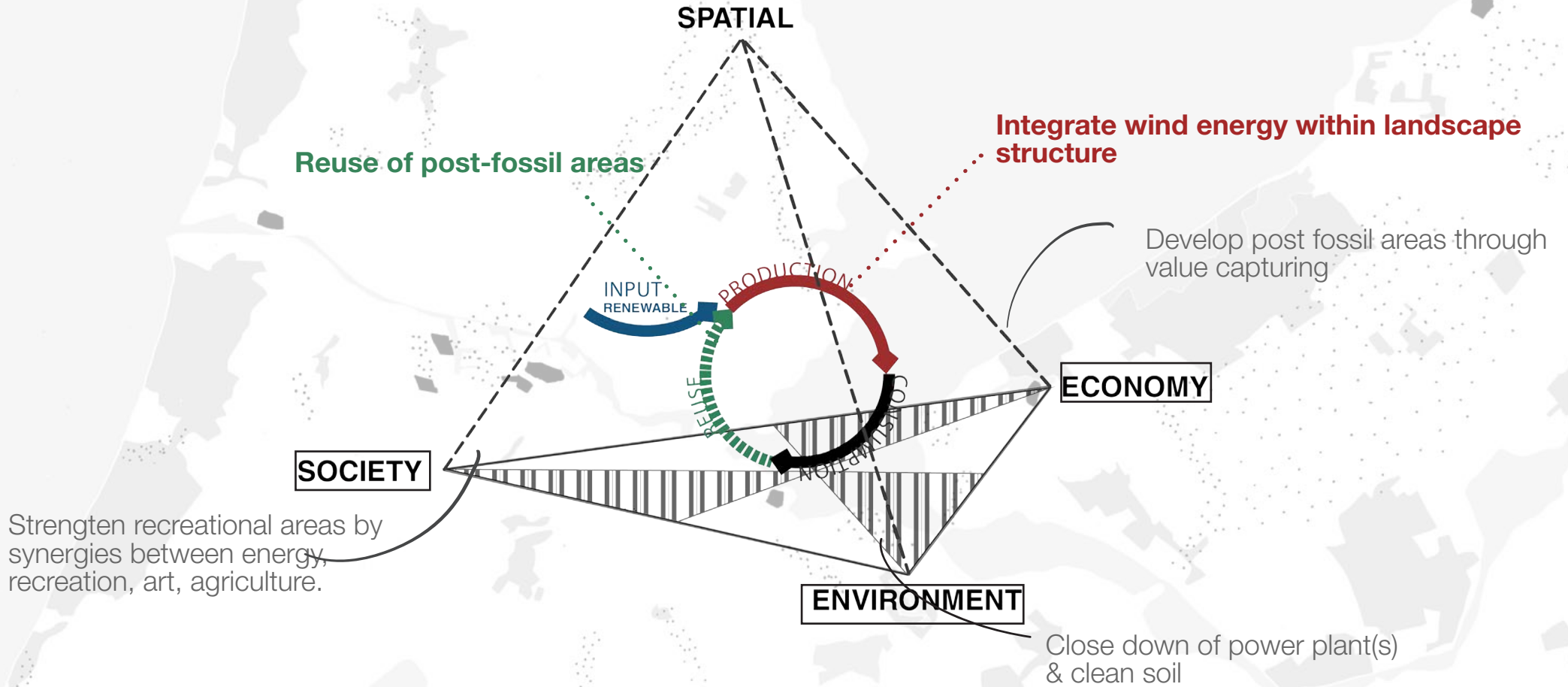


## LEGEND

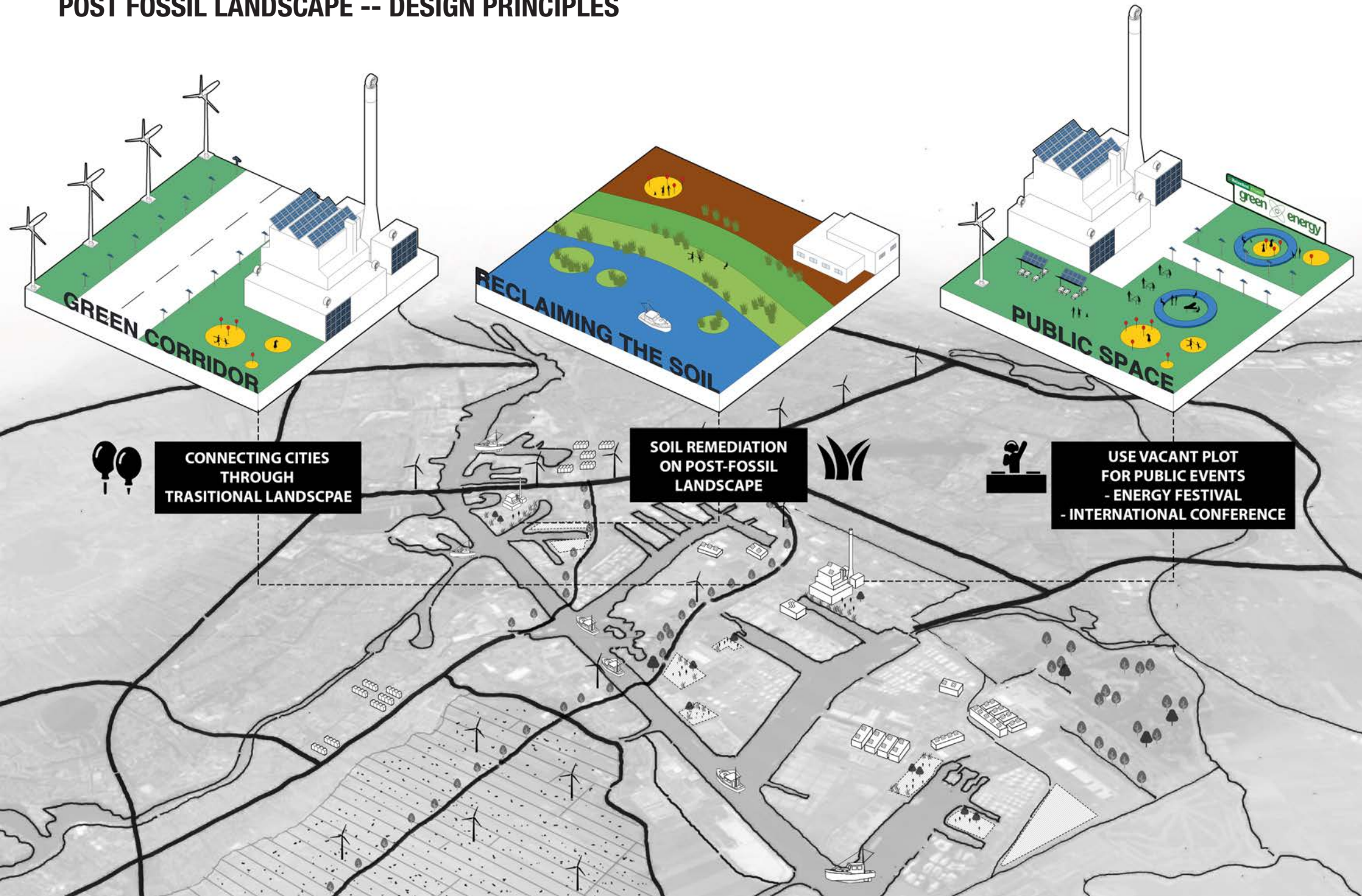
- Post Fossil Landscape
- Wind Landscape

# NATURE AND URBAN LANDSCAPE SYSTEM -- DESIGN APPROACH

**GOAL 2040:** Enhance spatial quality through energy transition landscape



# POST FOSSIL LANDSCAPE -- DESIGN PRINCIPLES



# POST FOSSIL LANDSCAPE -- IMPRESSION



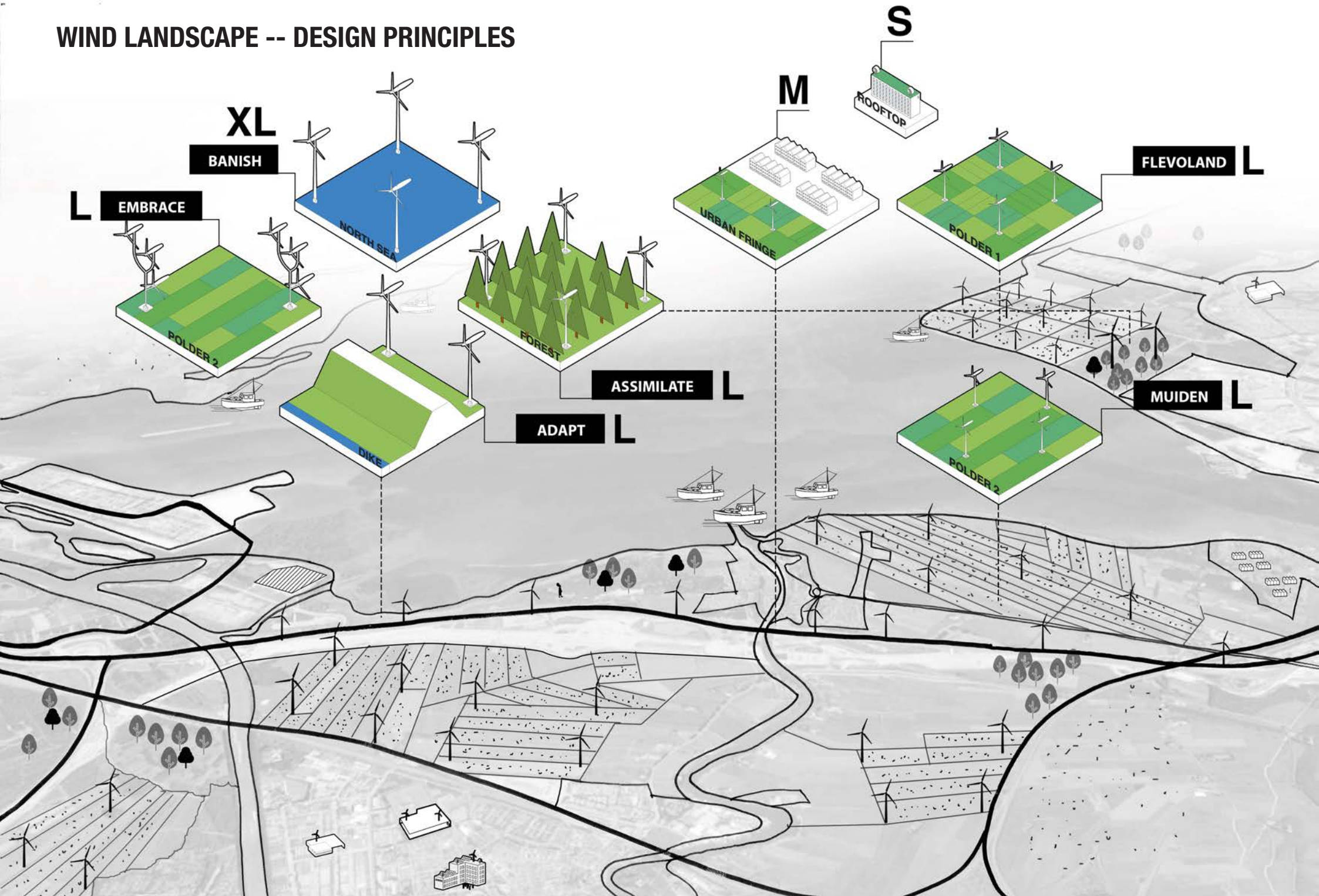


# POST FOSSIL LANDSCAPE -- IMPRESSION

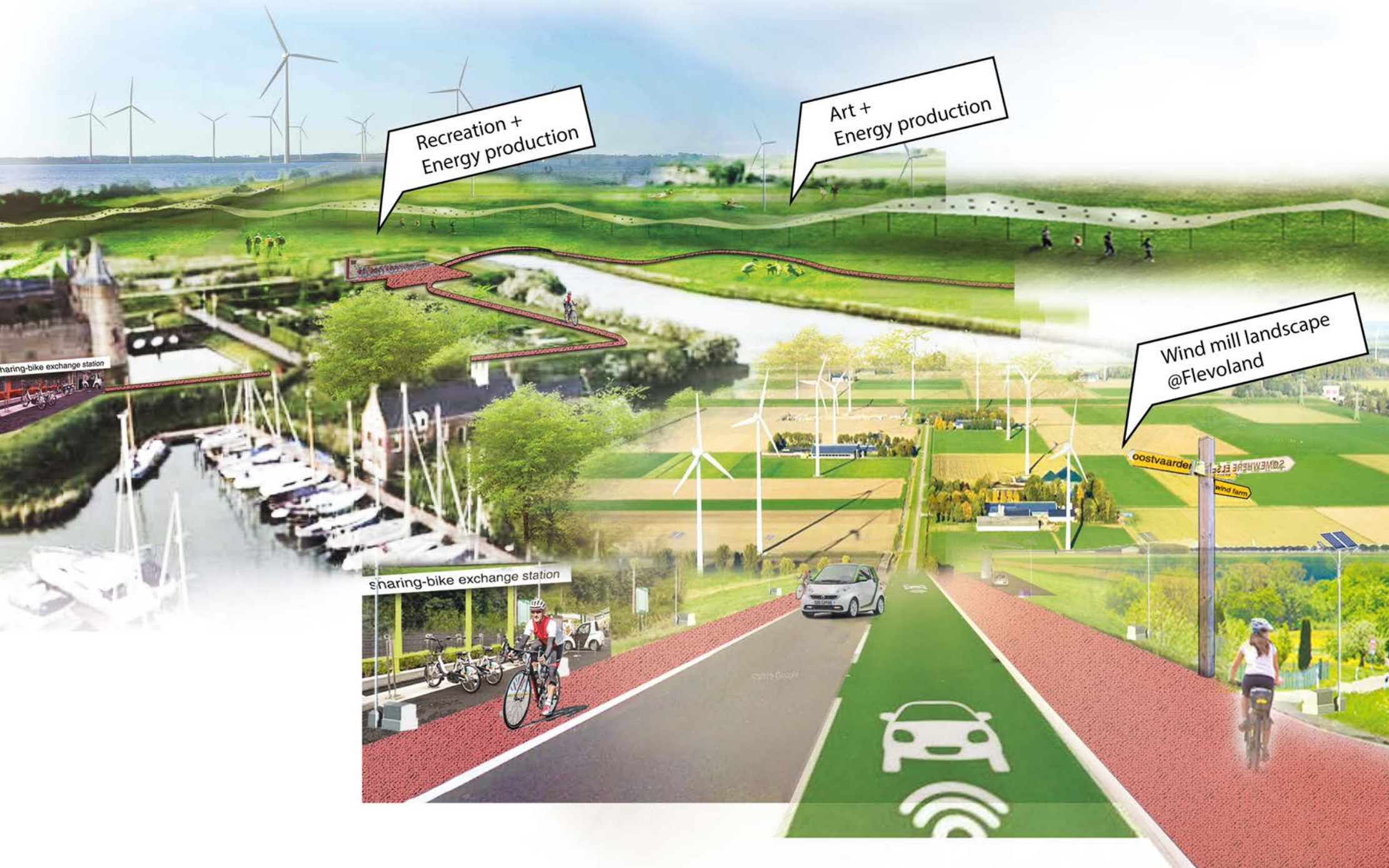
© 2013 Google



# WIND LANDSCAPE -- DESIGN PRINCIPLES



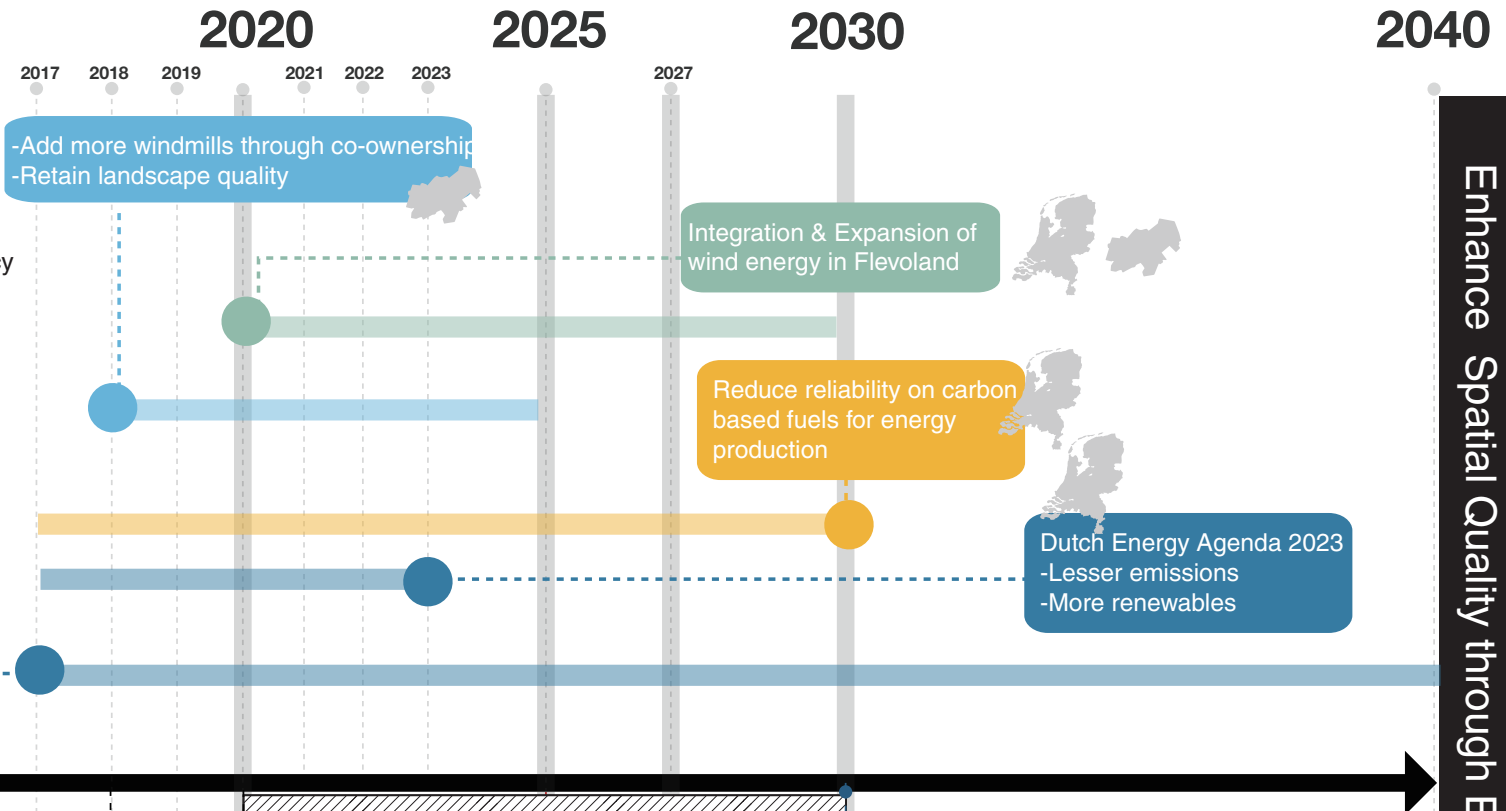
# WIND LANDSCAPE -- IMPRESSION



# NATURE AND URBAN LANDSCAPE SYSTEM -- STRATEGY

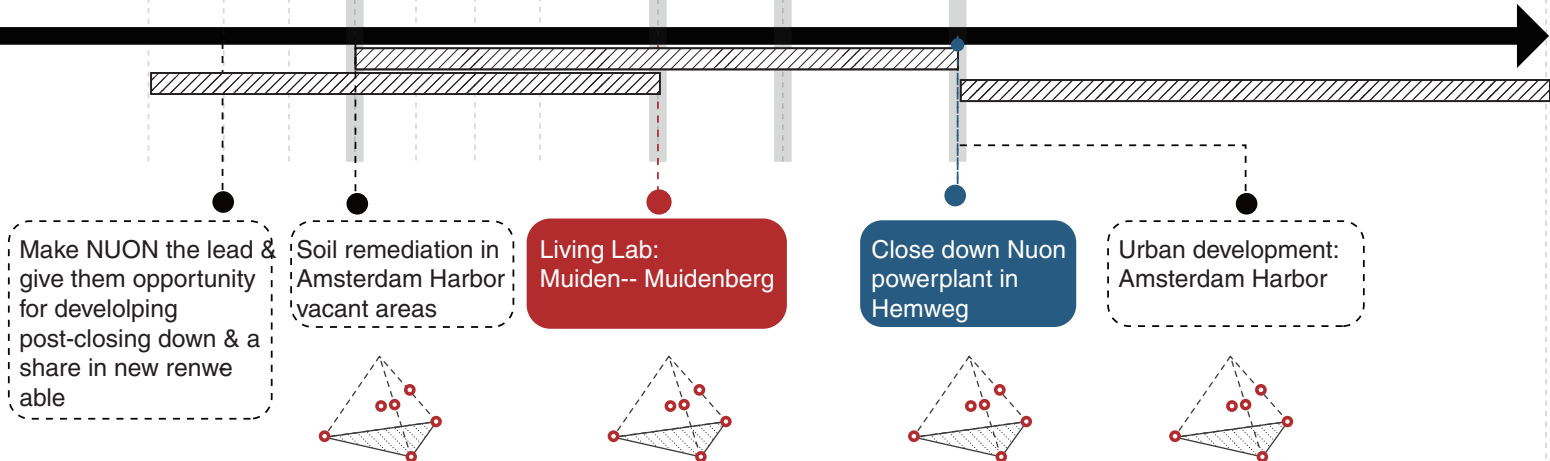
Operability in time

- Fiscal Measures
- Partnership
- Development Priority
- Existing Policy
- Long-term Development Policy



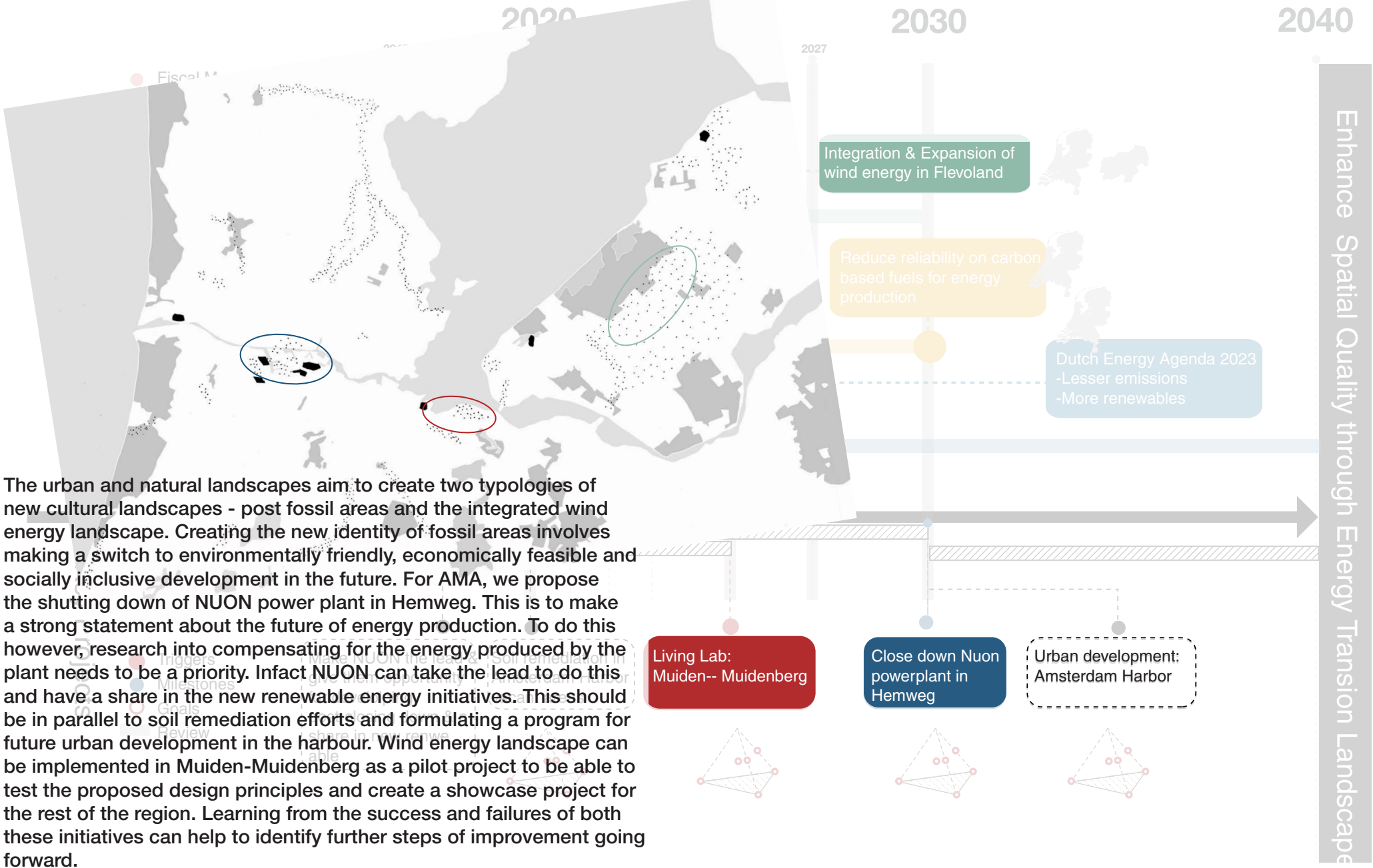
Key Projects

- Triggers
- Milestones
- Goals
- Review



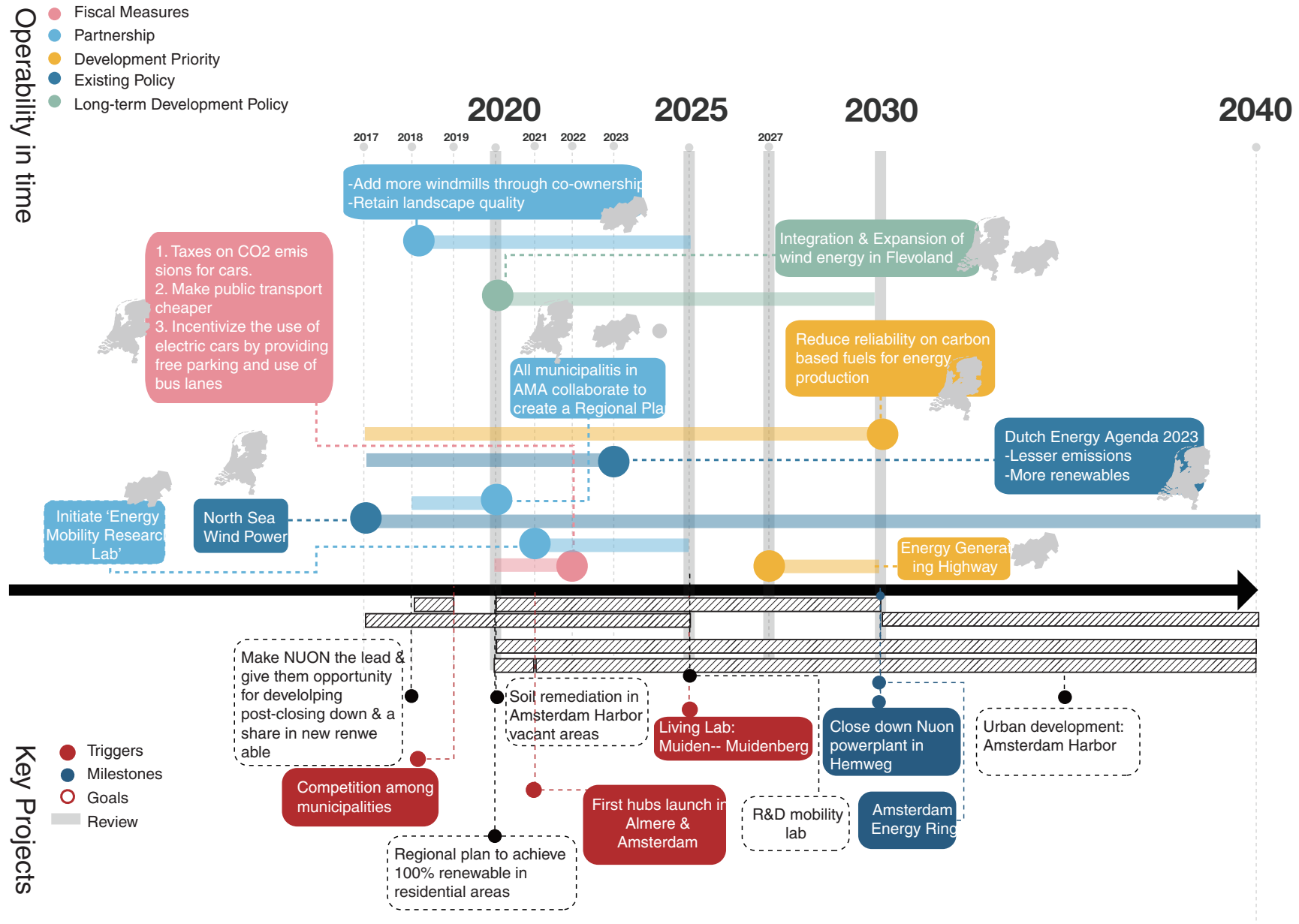
Enhance Spatial Quality through Energy Transition Landscape

# NATURE AND URBAN LANDSCAPE SYSTEM -- STRATEGY



The urban and natural landscapes aim to create two typologies of new cultural landscapes - post fossil areas and the integrated wind energy landscape. Creating the new identity of fossil areas involves making a switch to environmentally friendly, economically feasible and socially inclusive development in the future. For AMA, we propose the shutting down of NUON power plant in Hemweg. This is to make a strong statement about the future of energy production. To do this however, research into compensating for the energy produced by the plant needs to be a priority. Infact NUON can take the lead to do this and have a share in the new renewable energy initiatives. This should be in parallel to soil remediation efforts and formulating a program for future urban development in the harbour. Wind energy landscape can be implemented in Muiden-Muidenberg as a pilot project to be able to test the proposed design principles and create a showcase project for the rest of the region. Learning from the success and failures of both these initiatives can help to identify further steps of improvement going forward.

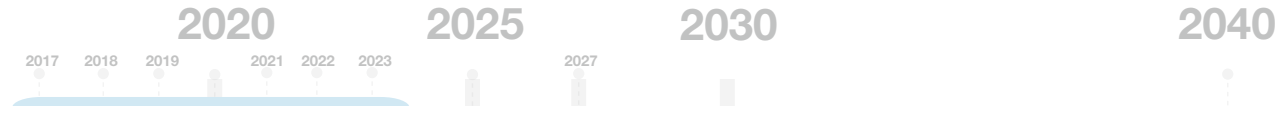
# OVERALL STRATEGY



# OVERALL STRATEGY

Operability in time

- Fiscal Measures
- Partnership
- Development Priority
- Existing Policy
- Long-term Development Policy

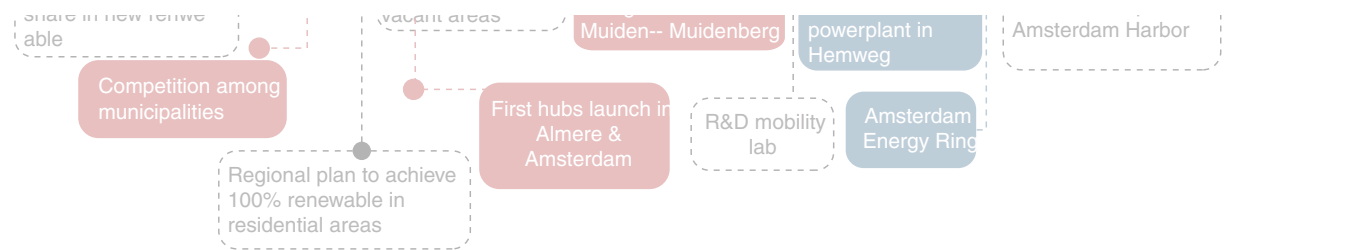


- \* **NEW CONSTRUCTION** should be 100% carbon neutral
- \* **NEW URBAN EXPANSION** should be located around local energy potentials, transit hubs and vacant plots
- \* **GAS INFRASTRUCTURE** should not be renewed. Instead, a framework to end the reliance on the gas roundabout should be formulated in parallel to investing in sustainable energy
- \* Formulate policies on **LIMITING EMISSIONS** (co2, heat) from large industries, reuse become profitable/.

In Mo

Key Projects

- Triggers
- Milestones
- Goals
- Review



# OUKJE van MERLE

4135342

## The roadmap of lesson learned

Looking back at the last 9 weeks I realize I have learned a lot. During my bachelor education the neighborhood scale has been the biggest scale of a project I have worked on. Thus the scale, and with that the work methods of a regional design & planning project, has brought me a lot of new knowledge. The next paragraphs show 'The roadmap of lesson learned'.

### Departure | Evidence and Design Based

01. Working with data related to topics about regional structures and flow system within the circular economy has revealed a different approach to me. As a trained intuitive designer, I have started to appreciate this approach a lot, because your project will be strongly embedded in reality. The other side of the coin is that there is always more data than you have at hand. Nico Tillie told us that as an urban designer you need to balance the amount of work you put into doing research. I interpret the spatial strategies as a process of going back and forward: a duet between data and design interpretation.

### First Destination | Vision

02. An example of a existing regional vision which I remember well is the map of the Randstad. It shows the structure as we still look at the region today: the cities connected and the green hart in between. A common vision today, but an eye opener at that time. It caused a huge change in perception: 'The world used to be flat and becomes round'. This is the power of a vision map. The storyline of a vision is therefore very important to be able to create this new perception. Building a strong storyline makes me tick and I think it has been a huge part of my contribution to the group work.

03. The other lesson learned about formulating a vision, is the ability to create a  $1 + 1 = 3$  formula. A vision and strategy can tackle several issues at once: for example working on spatial issues and social ones at the same time. This is good skill as an urban designer to train: go across fields and bringing them together.

### Means of transport | Process

04. The SDS lectures and the workshops at the methodology class

have been very helpful. As a group we were unfamiliar with many topics and the workshops 'forced' us to go out just get started: Layer approach by REPAiR, Storyboard workshop by Roberto Rocco and Strategy Development by Vincent Nadin. The lesson to learn is to try out different methods and tools as a group, even when you do not know the way to go forward yet.

05. Within the SDS lectures speakers have spoken about the communication and collaboration skills you need as an urban designer to be able to work in a diverse team. But it is an element I missed within the offering of tools and workshops. I have a lot of experience in collaboration within a diverse team and I tried to contribute this experience to our group. An example is the group and individual evaluation we did as a group after the mid-term.

### Second part of the journey | Strategy

05. The greatest lesson I learned is related to formulating a strategy. Within the last weeks I started designing certain elements of our vision and strategy, but it is not about the exact outcome. The workshops, lectures and tutoring has taught me to develop triggers, key projects and spatial agendas, that will shape conditions for design projects. You cannot control the exact outcome, but you can shape the context.

### Homecoming | Concluding

This project has been an interesting road for professional development. A road with many lessons, and traveled by a high speed train. Let's take some time to unpack my suitcase.



# HU YE

4588428

For this nine-week quarter, I learned a lot from the lecturers, teammates, tutors on how to organize the strategies in a regional scale. This high level of scale asks urbanist to have an eye on multiple perceptions of the built environment and the conflicting interests between them.

For our projects, "Empowering AMA -- the green energy beyond dualism", we state the problem from social, economic, environmental perspectives in a higher level, and found out there are dualisms in each aspects when it concerns to energy transition, and we aim to tackle these dualisms by energy transition landscapes.

The first thing I learned is the knowledge about energy from SDS course. The most important part in our project is about energy transition landscapes. The lecture shows the energy in planning and helps us to integrate energy with landscapes. Planning is needed for energy as renewables need space, which is also the dualism we find in the environmental perspective during our research, because there is only a certain amount of space available with the attempt of maintaining the quality of life. The methods learned from this course helps us from understanding the current situation of energy to find a solution for energy transition landscape. Through mapping energy savings potential and exchange of energy waste flows map, we understand the current situation. we have 4 layers of potentials and restrictions, Combining with our 6 sub-goals, we have our 3 strategies of mobility, transition landscape, decentralized energy system.

Another thing learned from SDS course is how to organize the storyline and the role of urbanists in conversation with stakeholders. We have the social, economic, environmental triangle and start the research from this model. Within this model, stakeholders, landscape, mobility infrastructure need to be considered. The energy shift can only be possible with a strategic plan defining the role of all involved stakeholders.

When things are all comes together and seems disorganized, the lecture from the SDS course help us to go through it. It teach us how to order interventions chronologically and where to put actors and organizations that are involved in spatial change through a time table. It helps to organize the storyline, so we know what is the key projects and the milestone for the goals, and what actions and stakeholders are involved in these strategies.

The third thing I learned is the way of thinking from my teammates and tutors. Integrating all elements on such a scale is not an easy task. For me, the most difficult task is the continuity and logic of the framework, it is easily to get deviated from the original start when the scale is so large and everyting is so abstract, and my teammates are very helpful on that. For such a large scale, the boundary and definition is hard to control, it is easily to get either too specific or too general, for this, tutors plays an important role in guidance and thanks to our tutors, we went smoothly in our project.

But for the whole project, I still have doubts about the uncertainties, what we proposed are based on our current knowledge and the world is changing so fast. And it also leaves a question for me, what urbanists could do in such a large scale, sometimes I feel we are powerless and how things could go as we expected , I also have doubts in expectation, if what we expect is not others expect?

# WANG YI

4640349

## Providing a flexible spatial scheme instead of making blue print

In the past 8 weeks, I gained not only in the understanding of how to carry out a comprehensive strategic plan for a specific theme (circular economy), but also how an efficient team should be like.

Since spatial strategic planning is a very broad subject, it is understandable that the course put focus on circular economy, which in a way helps us to narrow down the research topic. The lecture/workshop series SDS invites experts from related fields to present how they apply the circular economy model in their projects and researches, which also helps us to gain the knowledge of sustainable urban planning, and get to learn more about different analytical methods.

From my perspective, working on regional planning and design is not making blue print. It's providing a flexible spatial scheme for the region to grow in a healthy way both physically and non-physically. As a qualified urban planner, we should not only focus on spatial interventions (which most of the students from an architecture background tend to focus on), but also spend more time on related fields, especially get some knowledge about technical issues and social issues. So during this course, I read policy documents, academic reports and theoretical papers which related to circular economy, especially the one talked about energy issue. With the help of my Dutch group mate, I also gained understanding of the conflicting political and social situation of the country, and get further understanding of the dualism embedded in the social-economic development.

Urban planners are mediators among different stakeholders. I learned it from the beginning of this quarter and kept it in mind throughout the course. Always remembering it helps me to evaluating the ideas we came up critically. For every project we proposed, we need to take different stakeholders into account, especially those who have less power but more interest.

The other thing I learned is that urban planners are not utopians. When it comes to spatial planning strategies, the first thing we thought must be the motivation and the feasibility. Why the government has to implement

this project/policy first? Is the project strong enough to get investments from the private sectors? Will the policy be impeccable enough to get the expected output in the long run? We have to consider these issues, although in most of the times we cannot give answer to them.

Communications and collaborations are essential skills for urban planners. From this perspectives, I learned a lot from my groupmates. We had a lot of discussions every week, but they can be finished in a relatively short time, and we do not focus on minor details. Once we divided the works of each other, we do them separately and compile them before class. Sometimes we have conflicting ideas about the project, but we're willing to listen from each other and find a way to achieve consensus.

Everyone plays an irreplaceable role in the small group. Some are good for their critical and logical thinking, some can always come up with inspiring ideas for planning strategies and some are skilled at visualization. I'm not very good at logical thinking, but I tried my best to arrange information in a convincing way during the design progress, and at the same time looking things in a critical way (which I learned from my teammates). I also made great efforts on the visualization, devoting time to most of the strategic diagrams and the renderings.

# KARISHMA ASARPOTA

4619625

## Unfolding the layers of complexity

The regional scale is at the core of comprehending urban planning and is exactly where complexity within cities emerges to the surface. The 'layer' approach is an essential tool to understand the physical reality and invisible actors and forces within a region. Without this it is impossible to put forward key projects or strategies that are purposeful.

The concept of circularity within the built environment is a recent field of study that is gaining momentum. Exploring 'flows' within the built environment is key to improving the legibility of the region and proposing improved interventions. Through the workshop and lectures of the 'RE-PAIR' team we gained a different perspective on understanding the spatial implication of 'invisible' flows in the metropolitan region.

'The Planning Game' made me reflect upon my ethical views as a planner and the choices I have to make about the type of work I do in the future. It also made me realize that no plan or strategy is ever successful without collaborations and stakeholder agreement. It might be necessary to change roles from time to time, even when they differ from your personal stance, as a way to get people on board to ensure the best approach to problem solving.

A strategy is different from a plan. While a plan tries to provide a 'blueprint', a strategy gives directives within an overarching principle or plan. It provides the tools to arrive at spatial interventions and strategies. Nothing can materialize without partnerships. A strategy can be successful when there is an emphasis and clearly defined approach to get people on board. Designing with synergy between all the landscape types' results in a coherent built environment inclusive for everyone. Natural layers such as water, land and greenery are just as important as infrastructure and buildings. Addressing this layers individually and then together will highlight new perspectives that can help resolve problems.

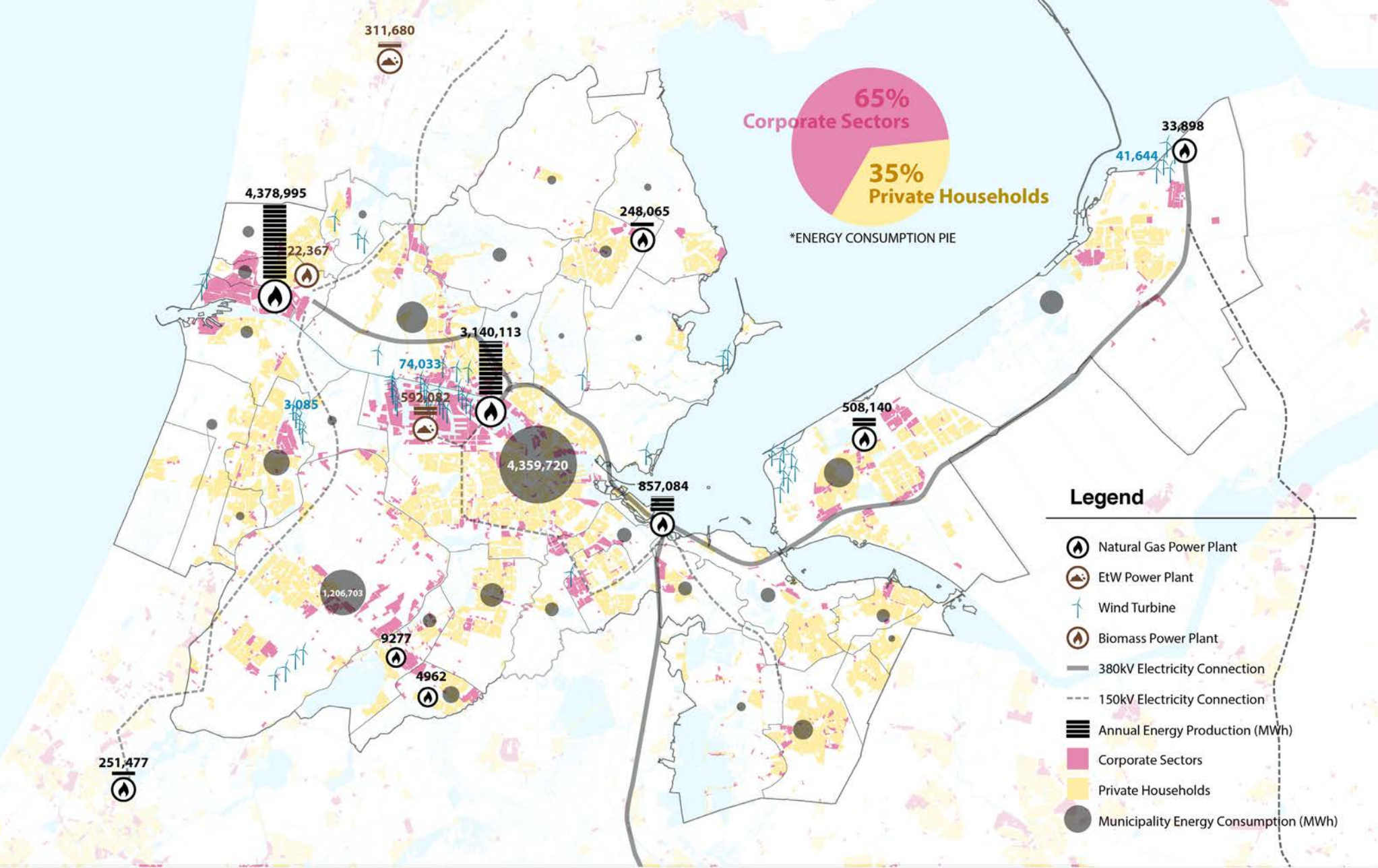
The dynamics of the course structure and tutoring approach was designed to make us realize the importance of clear communication. As urban planners, it is an essential part of our skillset. Technical knowledge and design

tools can only take you to a certain extent. Through being put into teams to work with for 9 weeks, I realized that the amount of learning is much more than doing an individual project. Interacting and integrating every individual's ideas and opinions is a reflection of how the profession works. This provided us a platform to experience that and think beyond technical and design solutions.

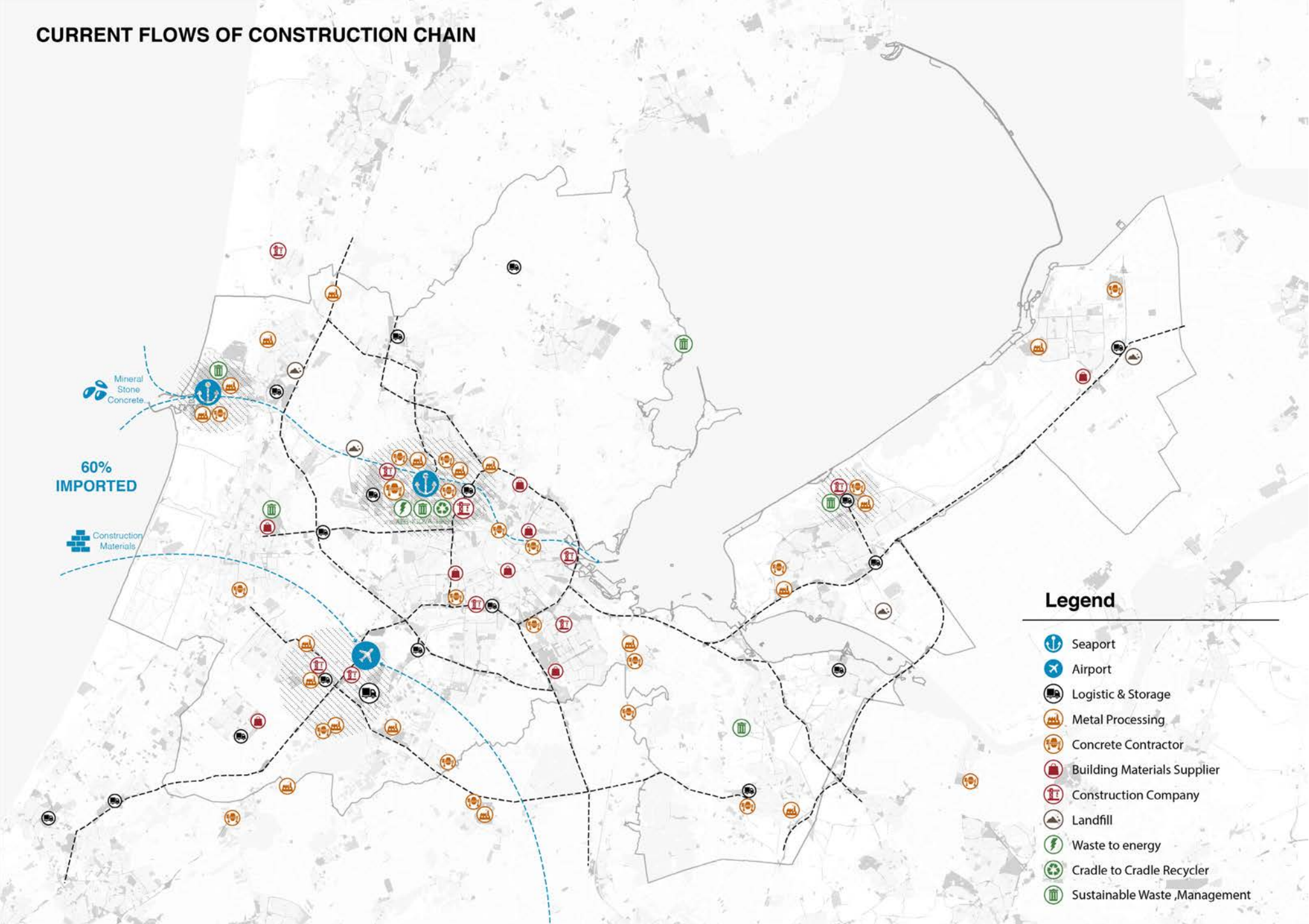
On the whole, the SDS sessions provided an essential understanding of concepts related to circularity and strategic planning within the regional scale. A lot of the topics covered were directly related to our project and provided us with references of feasible ideas to explore. It also provided an opportunity to interact with professionals in field and learn from their approach to tackle similar problems at the regional scale. On the whole, it provided an in depth perspective on relevant topics that were directly applicable to our studio work, thus making this dense course and vast amounts of information more comprehensive.

# ENERGY PRODUCTION AND CONSUMPTION IN AMA

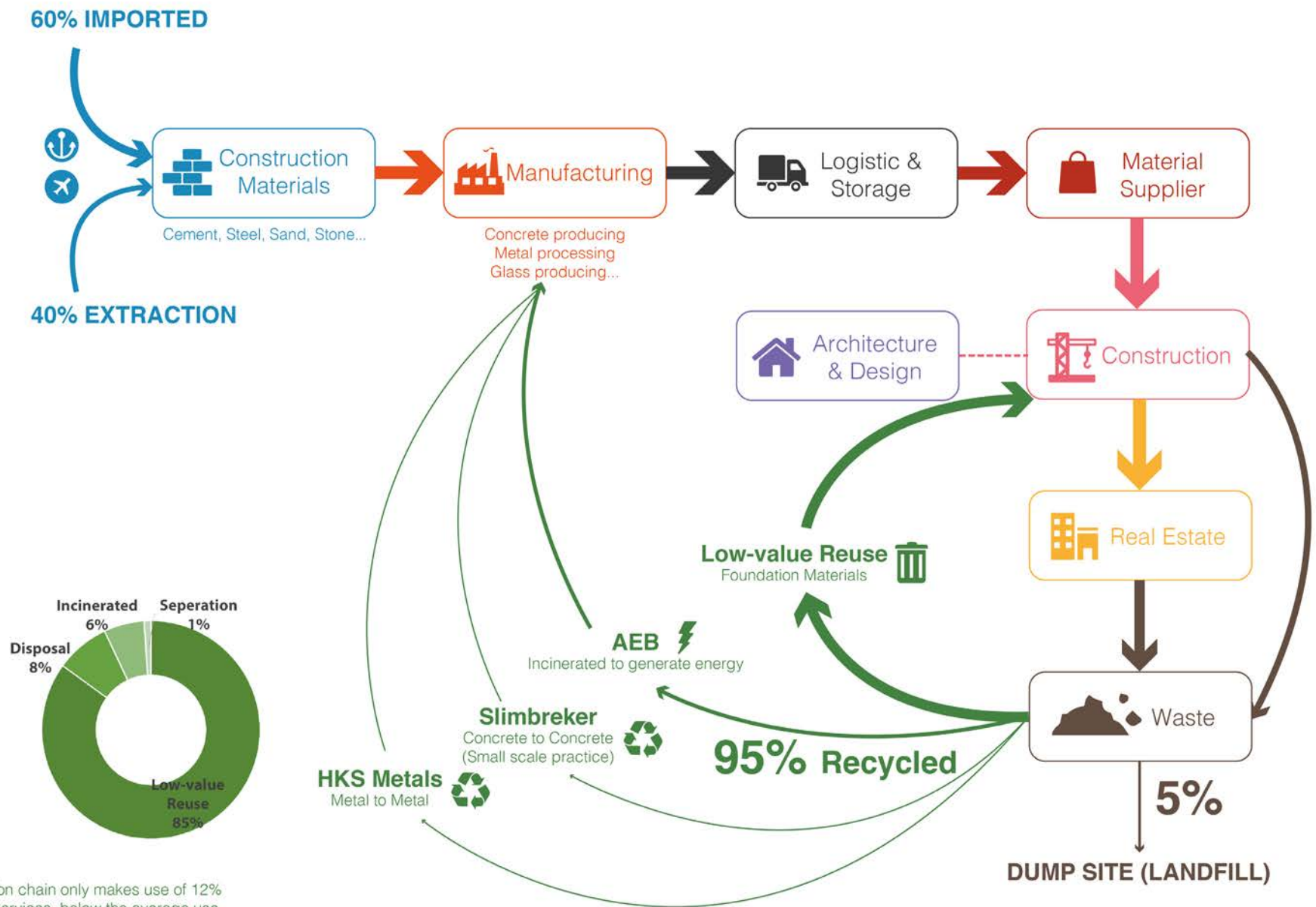
Source: www.cbs.nl, www.amsterdam.nl, enipedia.tudelft.nl/maps/PowerPlants.html



# CURRENT FLOWS OF CONSTRUCTION CHAIN



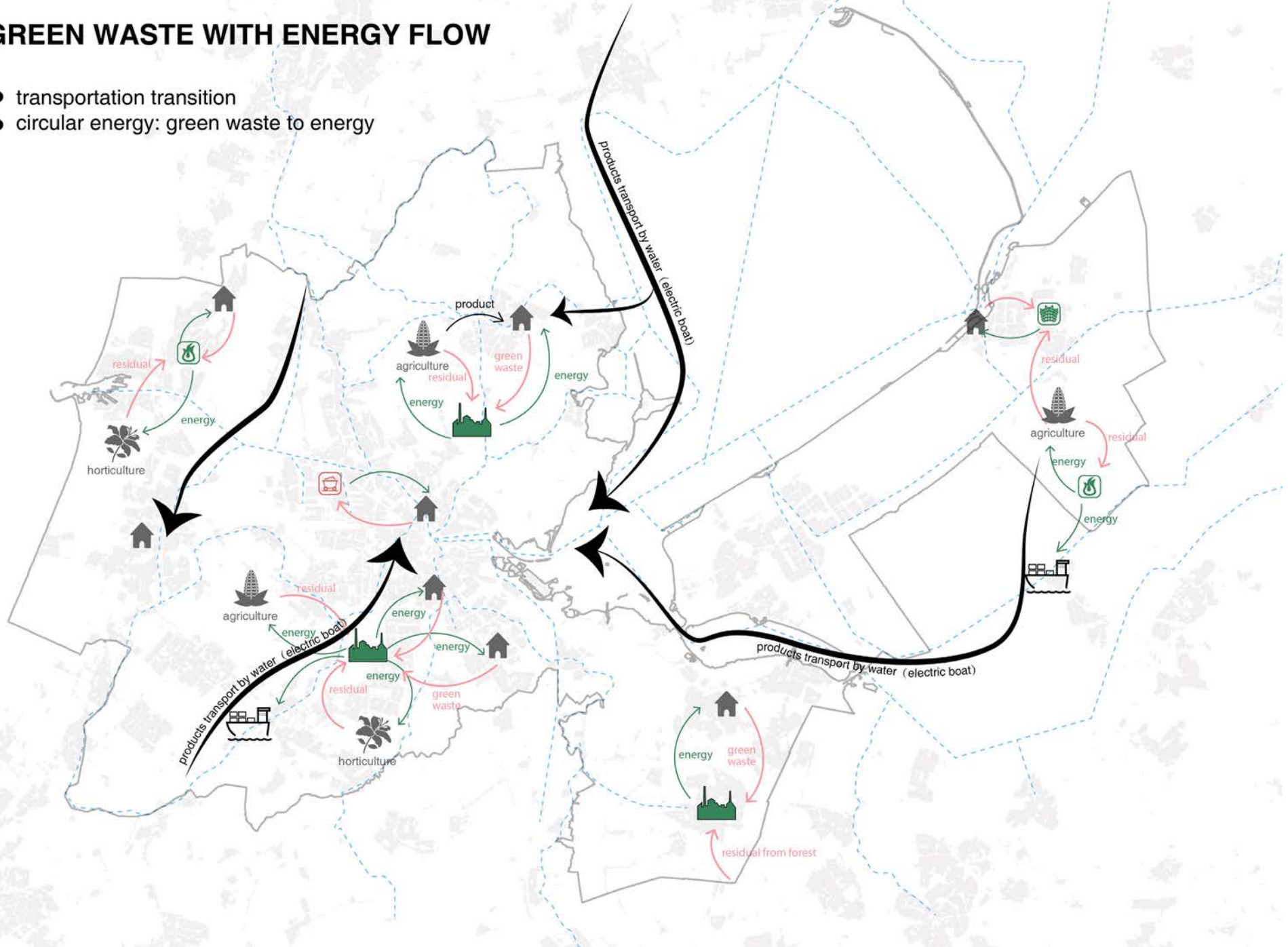
# CURRENT FLOWS OF CONSTRUCTION CHAIN



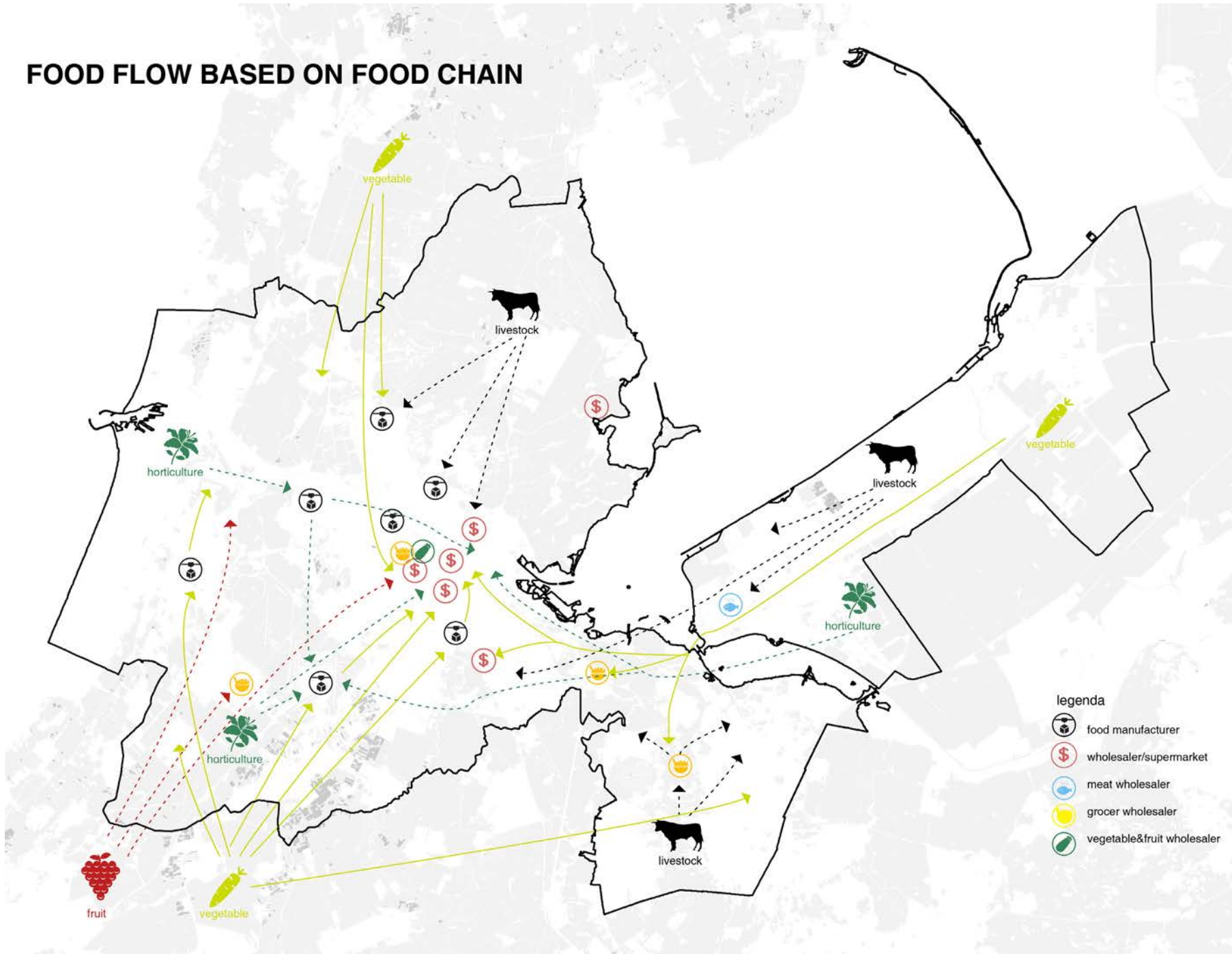
\*Construction chain only makes use of 12% of circular services, below the average use in AMA. (Circular Amsterdam, 2013)

# GREEN WASTE WITH ENERGY FLOW

- transportation transition
- circular energy: green waste to energy

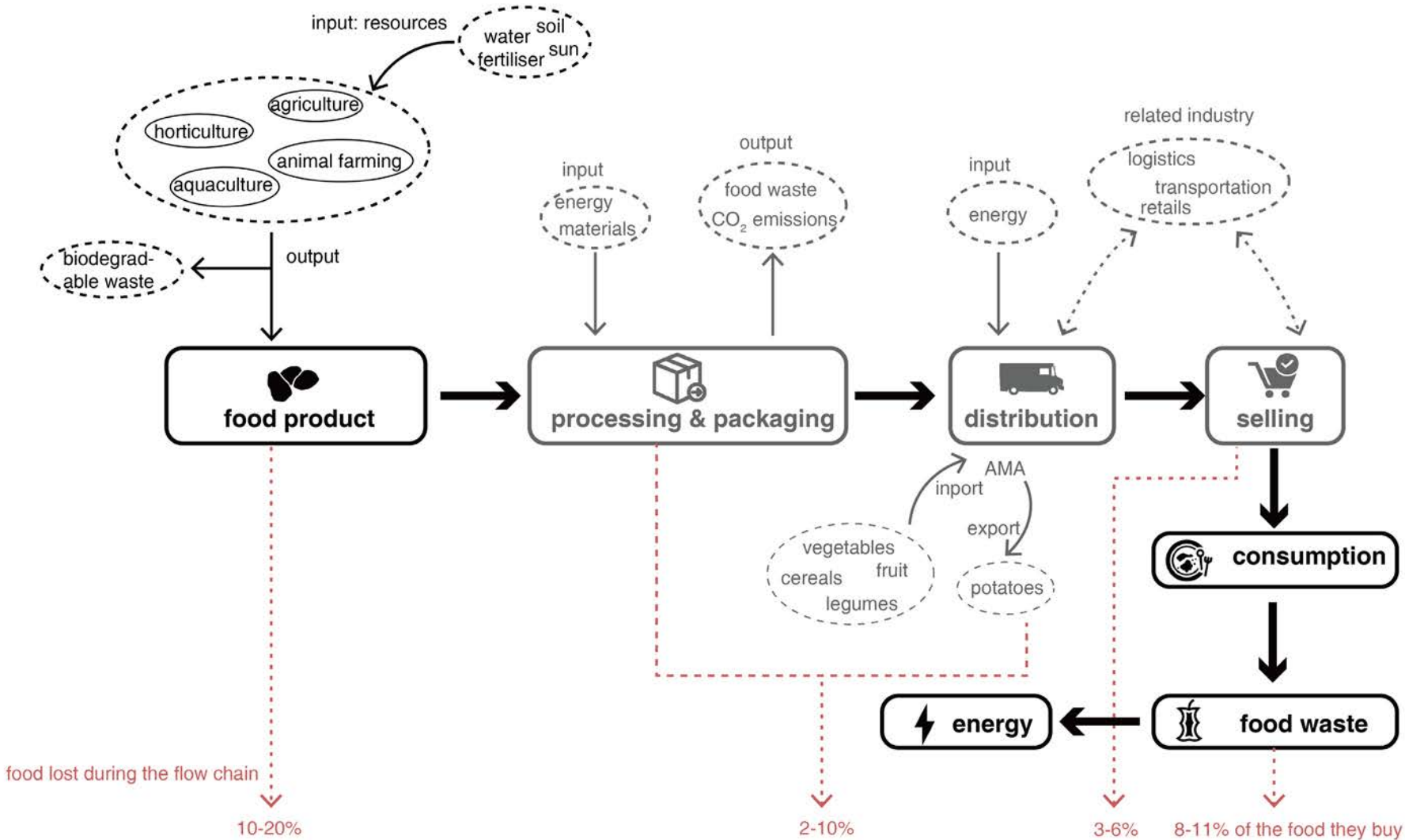


# FOOD FLOW BASED ON FOOD CHAIN



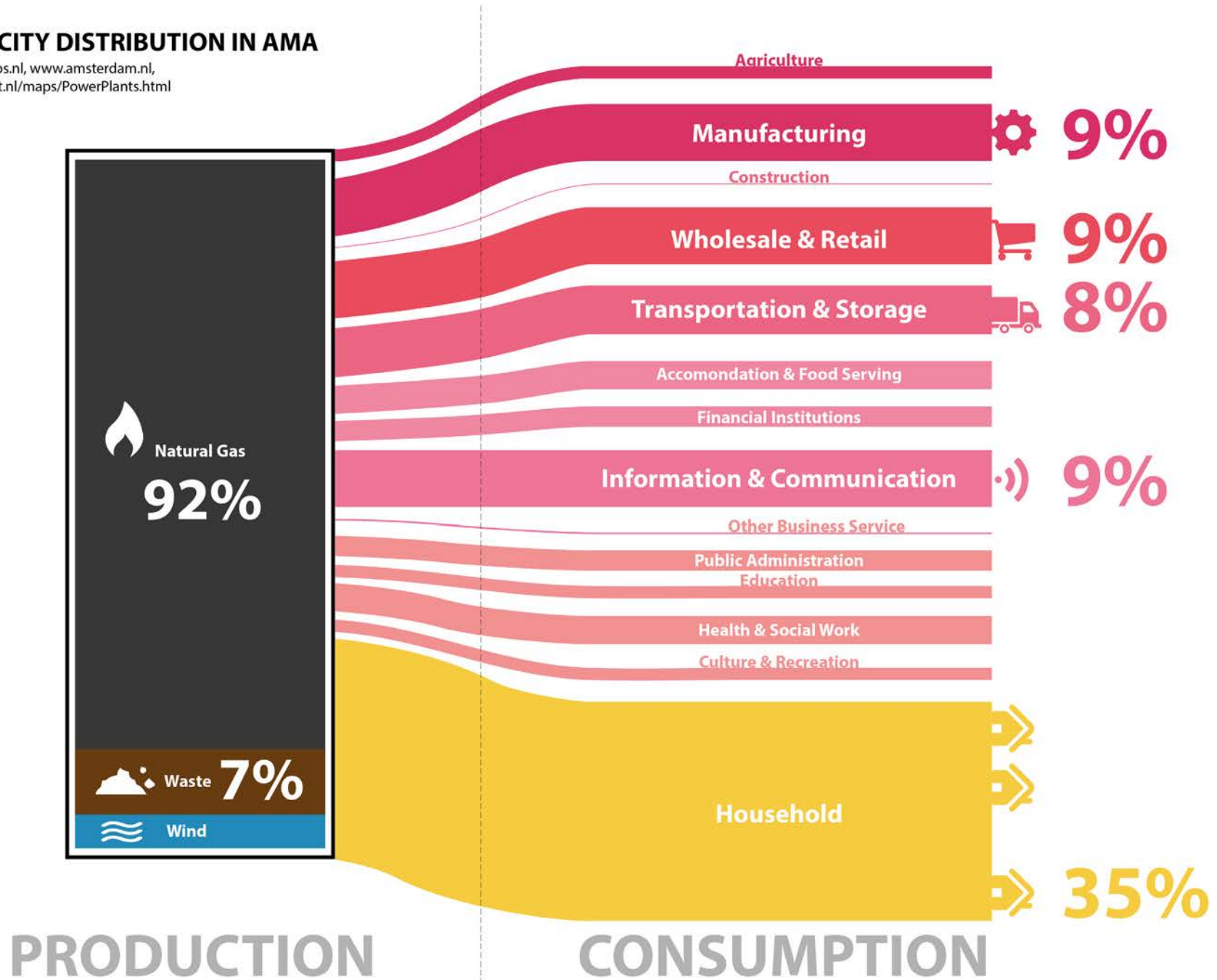


# LINEAR FOOD FLOW CHAINS



# ELECTRICITY DISTRIBUTION IN AMA

Source: [www.cbs.nl](http://www.cbs.nl), [www.amsterdam.nl](http://www.amsterdam.nl),  
[enipedia.tudelft.nl/maps/PowerPlants.html](http://enipedia.tudelft.nl/maps/PowerPlants.html)



# CONSUMPTION OF ENERGY

