

WAAL-RHINE VALLEY 2100

STUDY OF THE FUTURE STABILITY OF THE CITY REGION ARNHEM NIJMEGEN KLEVE

GRADUATION STUDIO ARNHEM-NIJMEGEN
FHK / MA+U 2013 / 2014

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INTRODUCTION

Author: Babak Jabery, Milou Wijsbeck

On the scale of the Netherlands the WaalRhineValley is quite unremarkable and usually gets little attention. The major centers of urban growth in the Netherlands are located in the Randstad and the Eindhoven region, in Germany this is the Ruhrgebiet. Yet the centrally located area is one of the largest urban areas in the Netherlands and worth an in-depth research.

On transnational scale, considering the cooperation with Germany, the Rhine-Waal Delta is greatly appreciated. Thanks to the excellent trade routes, Germany can regard the port of Rotterdam as their own. The welfare of the region itself is closely linked to the condition of the rivers. The region is characterized as economically strong and, according to the prognosis of the CBS, continuing to grow. This growth is partly caused by an increase in single households and the immigration from outside the region, both from the Netherlands and from Germany. This effects the request for housing and other facilities. In other parts of the region, the decline is of a serious kind and can lead to the disappearance of existing structures. It should be kept in mind that it could have huge financial consequences too. The decline of inhabitants, for example, leads to a lowering financial health and the number of needed facilities. Although, the region between the rivers has always been a makeable part of the Netherlands. Through advanced technology, we are increasingly able to live in conflict with the natural logic and the natural elevation. Therefore chances take place particularly where developments are not yet attuned to the nature of the landscape, the climate and shifts in living requirements.

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WATERSCAPE - TOWARDS AN EXCHANGING VALLEY

Author: Hein Oome

Surrounded by moraines the Waal-Rhine valley is a true plain river landscape in which rivers create a strong connection between east and west. Contrary they act as a physical barricade between north and south. Dutch struggle against high water resulted in a boundary line of uprising dikes and deep flooding streams. Contemporary project development is often old-school and driven by fear. A new way of thinking is emerging and inevitable: water should no longer be seen as a threat only, but as a great opportunity as well, at which borders and transitions will diffuse.

Climate change will lead to higher temperatures, increased rainfall, rising sealevel and more extreme situations. Themes like *trust, safety, landscape, nature, cultural history, energy, food production and drinking water supply* have to be considered. How do people live, dwell, work and recreate in twenty years in regard to this changed climate; which position has to be taken by architecture?

Historically, river systems in warmer periods (as nowadays) differ considerably from those in cold glacial periods. Due to the process of erosion and sedimentation untamed and interweaving river systems were created, in which lots of shallow streams swarmed around, moving constantly.¹

Three different foundations originated in the valley and are useful to different purposes. Sandy soils are being used for housing production and arable land and basin areas for meadows and cattle breeding. Water meadows serve as overflow areas which are not occupied permanently. Despite of the risk of flooding, basin areas are being occupied now, as aimed for in the vision for urbanization of the S-axis. Agricultural land will be spilled.

The main cities in the region will experience a continuing growth while surrounding villages will be dealing with shrinkage. This opposing demand for space demands a new approach. Occupation of the land is tuned to its intrinsic quality and value.

Shared-economy will be a new foundation for our society. Individualised supply and demand is of primary importance

¹ In the past two and a half million years glacial and interglacial periods alternated. During ice ages there were significant differences in rainfall during the year. The remains of the resulting interlacing river systems are found in coarse sandy and gravelly fluvial deposits that occur in the surface of large parts of the Netherlands. Caused by a lower sea level during glacial periods, rivers in the Netherlands could erode more and more. Twice glaciers from Scandinavia reached our country forcing river courses to bend to the West. Levees, and river basins originated. [www.geologievanederland.nl; Paul Haring, Frank Wesselingh & Hansjorg Ahrens, Naturalis]

in the digital daily life. The next 20 years the incentive to share and work together will have grown stronger. A corresponding evolution of physical space is evident. We have moved from static to dynamic, from owning to sharing and from dependence to initiative. There is a healthy climate for small, independent and local initiatives.

The amount of small households has experienced the largest increase by far.² Absolutely the number of single-person-households will have increased significantly.³ An aging population will account for this at first, but in the years following an increasing part of the younger population will choose to live individually.

Technological development brings us both low-and high-tech solutions. In twenty years we are going to use the water, utilize it for energy needs, foodproduction, drinking water supply, products and services. We have evolved from consumers into producers, from energy buyer into supplier, from contractor into entrepreneur. This heralds the end of sectarianism in the Netherlands. In many areas, one is longing for a new time. Information is available real-time, we are in constant communication with each other and our world.

However the region has an excellent location near Germany, its regional logistic potentials have not come true yet. Though the logistics system is functional at international level, the region does not benefit from the advantages. Once the Stadsregio had a position in the Dutch logistic hotspot-top-5; Question is whether and how it can re-acquire that position again?⁴

Climate change and a new way of thinking enforces a major transformation. River landscape will transform into waterscape. Water abundance will demand and get more space and will occupy a dominant position in the region.

In the year 2040 the new waterscape will boost Waal-Rhine valley towards a cyclical region. Qualities of the wet and dry deltas are optimally used. Soil types are used efficiently and to their suitability and features will be restructured. Food production goes in harmony with the subsurface: it got seasonal and regional, which incidentally got a new meaning. Known vegetations will grow in a new landscape: *Apple trees transform into vineyards, tulips into sunflowers.*

This waterscape will diffuse the physical barricade between

² In 2010, 33% of households in Gelderland will be single. In the period up to 2050, this share is expected to increase to 39%; [quick facts population forecast. Gelderland]

³ An expected increase from 285.000 up to 370.000; [quick facts population forecast. Gelderland]

⁴ [Logistieke kaart van Nederland, 2005 t/m 2013, vakblad voor logistiek Nederland]

north and south, leveling and connecting the cities of Arnhem and Nijmegen. In twenty years this region will offer its residents a new, safe and challenging place to live, dwell, work and recreate.

Technology

Technological advancement will provide low tech and high tech solutions. 20 years from now water will be used to provide in everybody's need food energie, food, drinking water, products and services.

VISION MAP

Author: Dennis Burger, Stefan Willebrand

Climate

Production of food harmonizes with subsurface: seasonal and regional, which will have a radically different appearance from the current. Known crop species in a new landscape: from fruit three to grape vine, from tulip to sunflower.

Waterscape

The physical demarcation between north and south will be eradicated by the water scape, this water scape will connect the cities of Arnhem and Nijmegen. Aproximatly 20 years from now the geography will offer it's inhabitants a new safe and challenging place to live work and recreate.

Subsurface

Soil types will be used efficient and according their capacities, occupation will be restructured

Social

Shared economy will be an new gauger in society. The customizing of supply and demand plays a crucial role in the daily and digital lifestyle.

Arnhem

Nijmegen

CONSTELLATION OF PROJECTS

To get a clear overview of all projects in our graduation studio we made a constellation of our projects. Relations are shown, but more importantly differences, to prove the projects cover a wide variety of subjects and solutions, aimed at making the region future-proof.

THE PROJECTS RELATED

Author: Thomas van Weert

Stefans project will aim at creating an urban tissue in Arnhem-Zuid with excellent livability standards. By restoring the harmony between occupation and underlying landscape a new balance between man and nature will flourish. Introducing an attractive water landscape in the urban tissue will prepare the society for 2040.

The relation to Milou's project is the harmony between occupation and landscape, but Milou's project will aim for an autarkic settlement, introducing sharing of property to reduce unnecessary spaceclaim. The harmonious relation between occupation and landscape will assure high yield.

Also concentrating on harmony between occupation and landscape is Dennis, he aims at relating the water system and the subsurface. Transformation of existing occupation (building as well as public space) is his main objective, preparing the region for future challenges.

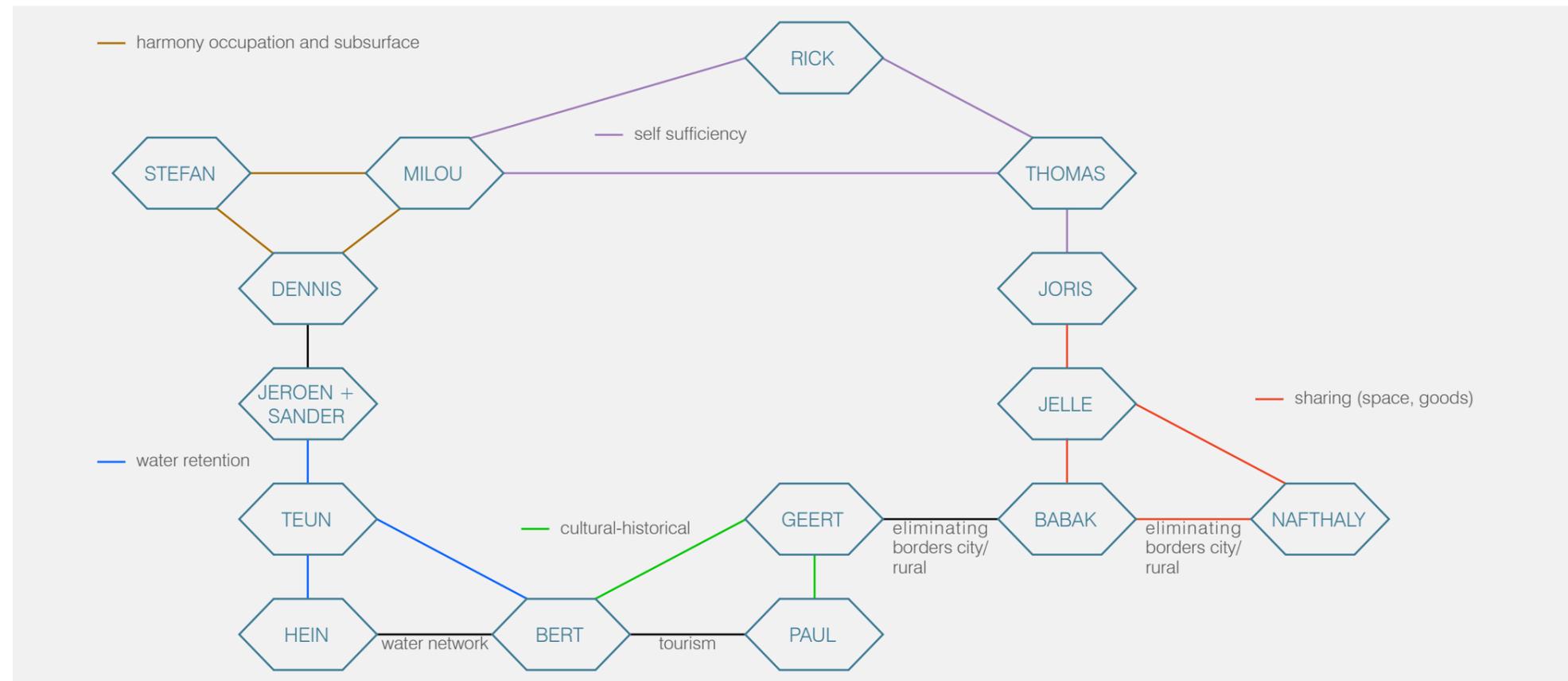
Transformation is also an important subject in Jeroen's and Sander's project. They aim to transform a natural area through adjustment of the flow of water by modifying an old pump station. This new natural area called Water of Life aims at boosting sustainable education and awareness is an important term.

Also engaged in adjusting the water system is Teun, who's project battles future challenges regarding periods of draught and extreme wetness by creating a water retention area, suitable for self-sufficient housing and recreation.

This future climatological challenge is also taken into account by Hein. His project will react to this by using areas for water-storage, and using the same areas as building space. By doing so he creates the possibility of a waterways network.

Also looking for a connection through waterways is Bert. His projects main goal is creating a water buffer for climatological changes, and connected to this is creating a water hub. This hub will connect land- and water routes. Bert wants to make the cultural-historical and natural features of the area visible in an experience that suits the tourists of the future.

Tourists are also the main target group for Paul. His project will ensure a great experience of the landscape between Nijmegen and Kleve by creating a bike- and hiking trail.



By giving the landscape a stronger identity and entity new economical opportunity for recreational- and corporate sector will emerge.

In the same geographical area Geert will repair and restore ecological cyclic structures, and create a shared, adaptive garden to connect the city with the rural surroundings and to combine the functions of living, working and recreating.

Also eliminating the borders between the city and the surrounding rural landscape is Babak. His social gateway to the countryside offers the youth a flexible lifestyle of working and residing in the city and at the countryside.

In relation to this, Jelle is also using people's experience in separate (geographical and knowledge-wise) areas. His project will upgrade the agricultural surroundings, creating down-scaled food producing communities meant as a retreat with more involvement and attention to the local.

Naftaly will create a lifespan-proof place for the people of Nijmegen in their third life-fase to live in a co-housing community. It will be built around the welfare and well-

being of its residents, with self sufficiency as common denominator. Following already emerging trends, sharing will be indispensably to be able to provide amenities whilst strengthening the social bond.

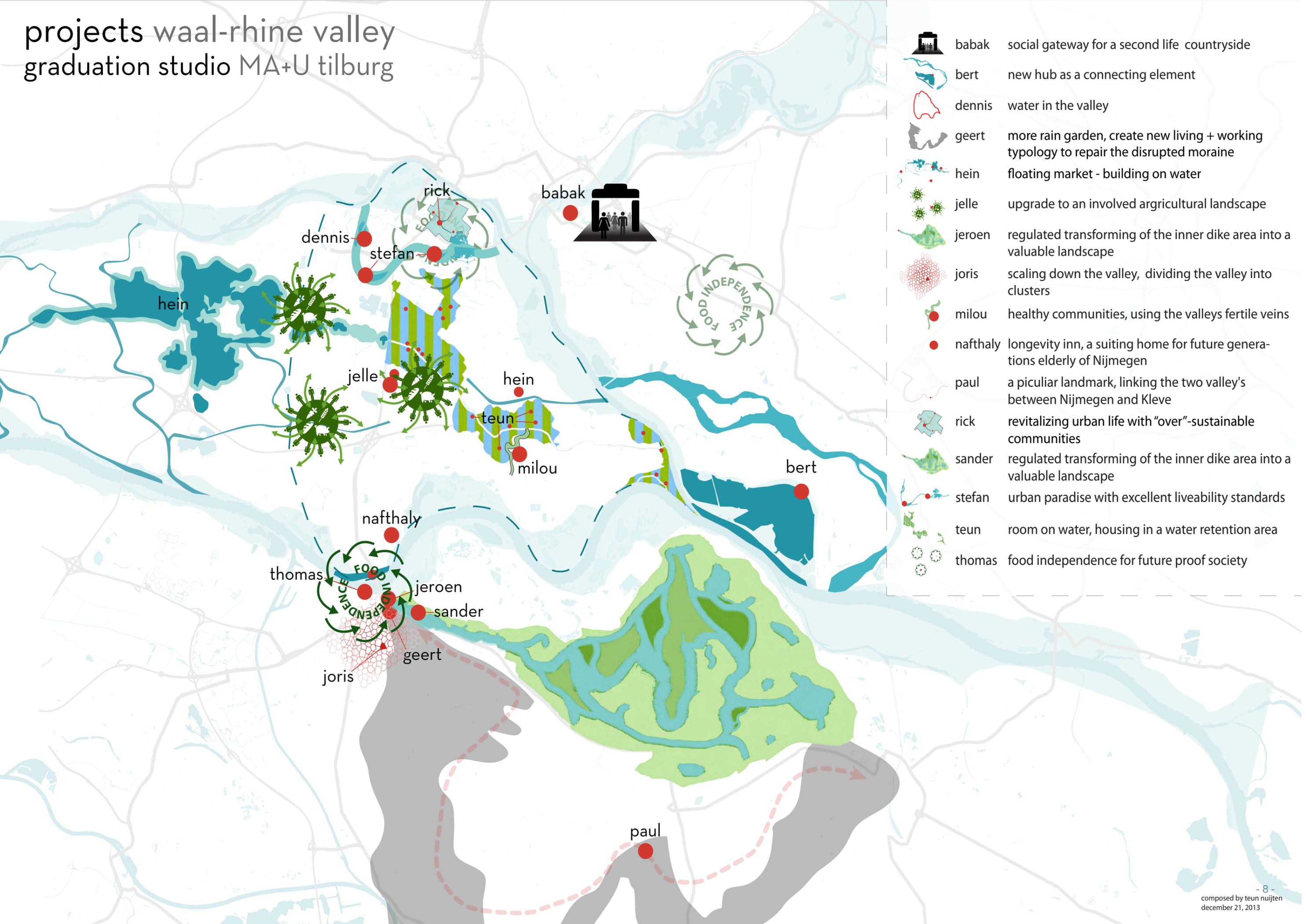
Joris' project goal is creating self sufficient clusters in the valley, by down-scaling processes of utilities for the basic needs. These measures are taken to ensure a future fail-safe society in the region.

The project of Thomas is aiming at ensuring food independency for a future-proof society. Moving all food production to the cities using high-tech solutions, lowering ecological footprint and raising awareness. Optimizing exchange of food, energy, water with surrounding city.

Also implementing his project in an urban environment is Rick. He will revitalize urban life with "over"-sustainable communities, using the strength of modern day open communities to spark initiative and ecological awareness in a pre-war decaying neighbourhood. "Over"-sustainability can create a self-sustainable infrastructure that can make existing energy, food and water supplies redundant

projects waal-rhine valley

graduation studio MA+U tilburg



-  babak social gateway for a second life countryside
-  bert new hub as a connecting element
-  dennis water in the valley
-  geert more rain garden, create new living + working typology to repair the disrupted moraine
-  hein floating market - building on water
-  jelle upgrade to an involved agricultural landscape
-  jeroen regulated transforming of the inner dike area into a valuable landscape
-  joris scaling down the valley, dividing the valley into clusters
-  milou healthy communities, using the valleys fertile veins
-  nafthaly longevity inn, a suiting home for future generations elderly of Nijmegen
-  paul a peculiar landmark, linking the two valley's between Nijmegen and Kleve
-  rick revitalizing urban life with "over"-sustainable communities
-  sander regulated transforming of the inner dike area into a valuable landscape
-  stefan urban paradise with excellent liveability standards
-  teun room on water, housing in a water retention area
-  thomas food independence for future proof society

VISION SUBSURFACE

To be able to envision the future of the valley understanding the valley is mandatory. The following will concentrate on the subsurface of the valley. The research conducted focuses on three subjects, subsurface, water system and elevation.

The interrelations between these subjects are the main ingredients to create a vision. Only through these interdependencies the valley can be understood.

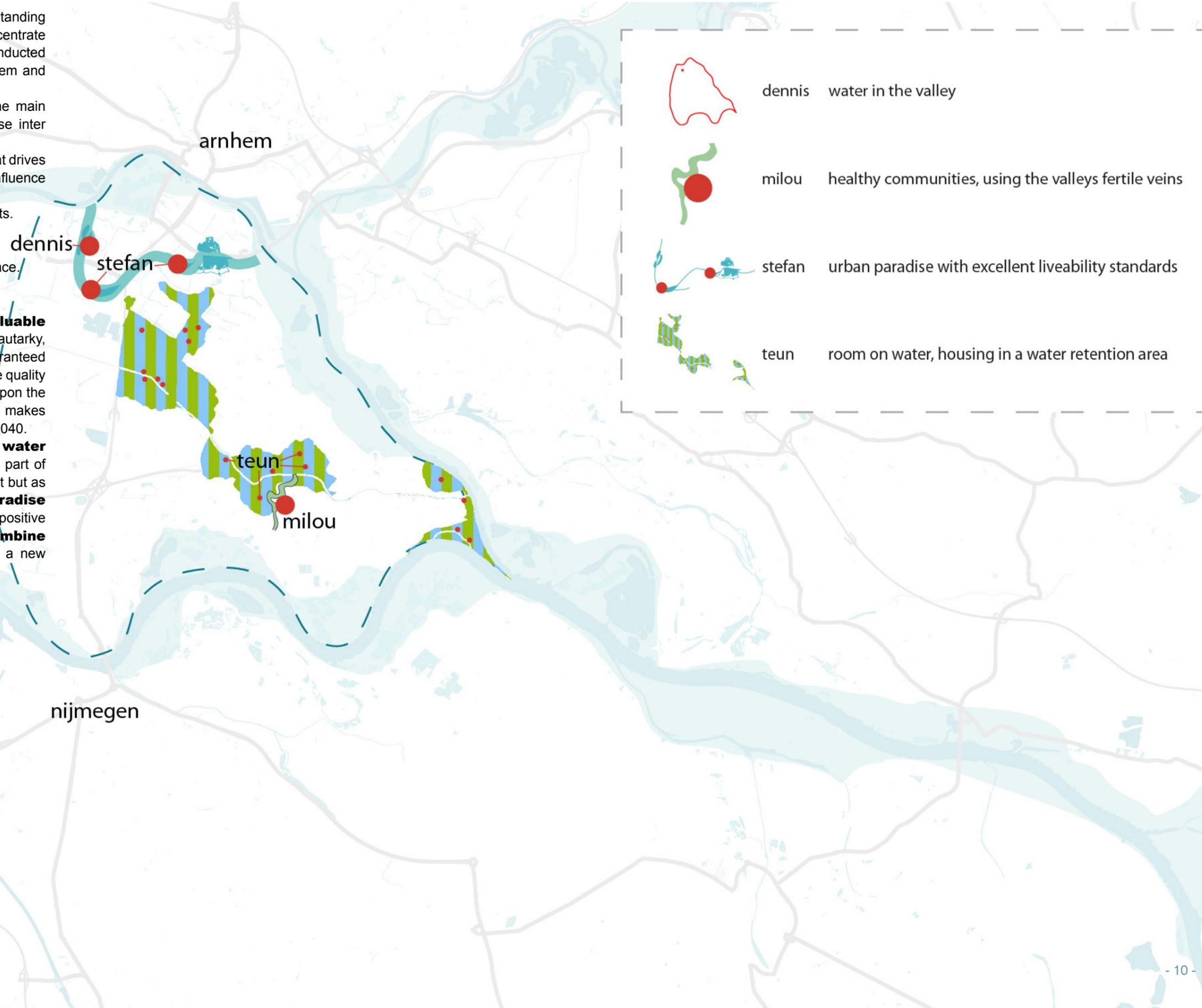
Combined with the hypothesis and the intention that drives the hypothesis interventions to anticipate and influence the future of the valley can be made.

Shortly this comes down to three statements.

1. A leading role for water.
2. Harmonization of occupation and subsurface.
3. Making smart use of the elevation.

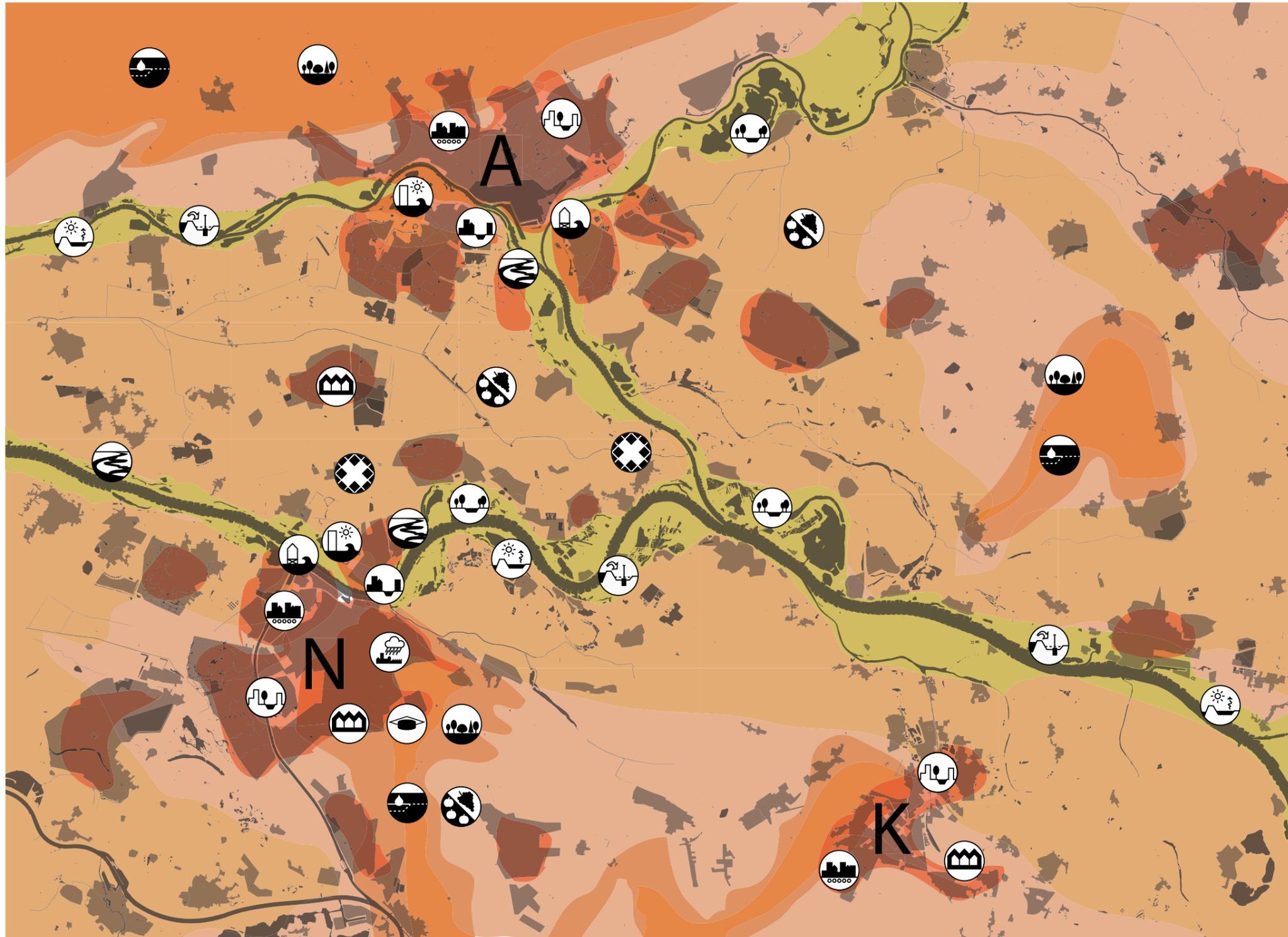
Following these statements will result in **valuable landscapes** where settlements will be based on autarky, and shared property. Where a high return is guaranteed due to the harmonization between land use and the quality of the subsurface. A careful (re)alignment based upon the specific characteristics of the "water landscape" makes Urban areas in the valley ready for the society in 2040.

With a less disruptive effect from occupation on **water in the Valley** as a result. Water will become a part of life in the valley and will not be treated like a threat but as a valuable asset. Thus **creating an urban paradise with excellent livability standards**. This positive view on water creates opportunities to **combine housing and room for water** and creates a new relation between housing and recreation.



VISION CLIMATE

fig 1.



RECOMMENDATIONS

urban area

- Adapt to the processing of extreme rainfall. Local water storage and infiltration into the soil relieves pressure on drainage systems.
- Incorporation of water in the environment with new challenges.
- Incorporation of water and green elements. They have a cooling effect on the ambient temperature.
- Construction of climate proof infrastructure and buildings
- Designing energy efficient buildings
- Overhauling sewer systems

rural area

- Integrated nature and water
- Afforestation with several species
- Changing agricultural practices
- Realization of storage and retention
- Levelling the groundwater level

general

- More space for water
- Spatial planning structured by risk
- Water storage areas to overcome droughts
- Creating public awareness through educational programs
- Build water resistant constructions

Hein Oome
Nafthaly de Graaf
Geert Verschuren
Jeroen Michielsen

VISION TECHNOLOGY

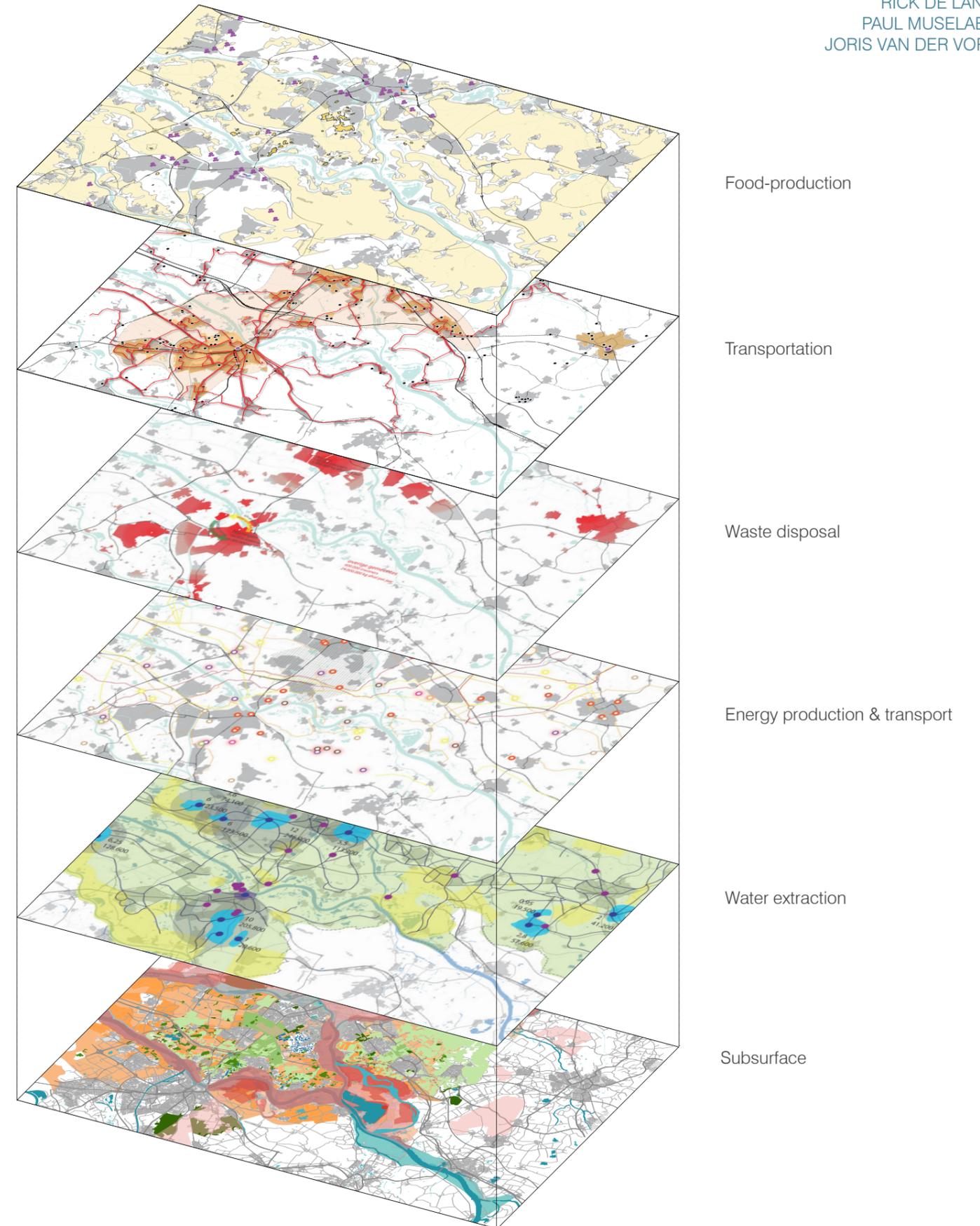
SANDER DE BRUIN
BERT VAN DER HEIJDEN
RICK DE LANGE
PAUL MUSELAERS
JORIS VAN DER VORST

ASSUMPTIONS

- Energy: only sustainable energy, produced local
- Waste: 100% recyclable
- Water: Only from local sources. Grey water
- Food: Focus on local products
- Transportation: 100% Electric modes of transportation

STATEMENTS (HOW TO ACCOMPLISH)

- 1 Downscaling stand-alone technological interventions within the region to become smaller fractions within a collective sustainable system
- 2 Efficient balance between local and global solutions for the primary needs of energy, food, transportation and water.
- 3 Technological interventions should be (inter)exchangeable.



ENERGY SOURCES AND TRANSPORT

- ENERGY BIO
- ENERGY WIND
- ENERGY SOIL
- ENERGY-LINES
- ZONE GETHERMAL ENERGY

WATER SOURCES

- DRINKABLE WATER SOURCE
- INDUSTRY WATER SOURCE
- GOED GRONDWATER AREA
- SUITABLE GRONDWATER AREA
- POOR GRONDWATER AREA

- GRONDWATER PROTECTION AREA'S
- MAIN PIPELINES
- SIZE SOURCE
- 6 WATER PUMPING MM2
- 123.500 DRINKING WATER FOR NR OFF HOUSES

INTENSITY OFF WASTE-DISPOSAL

- DISPOSAL PLANT

FOOD-PRODUCTION: ACTORS & GROUNDS

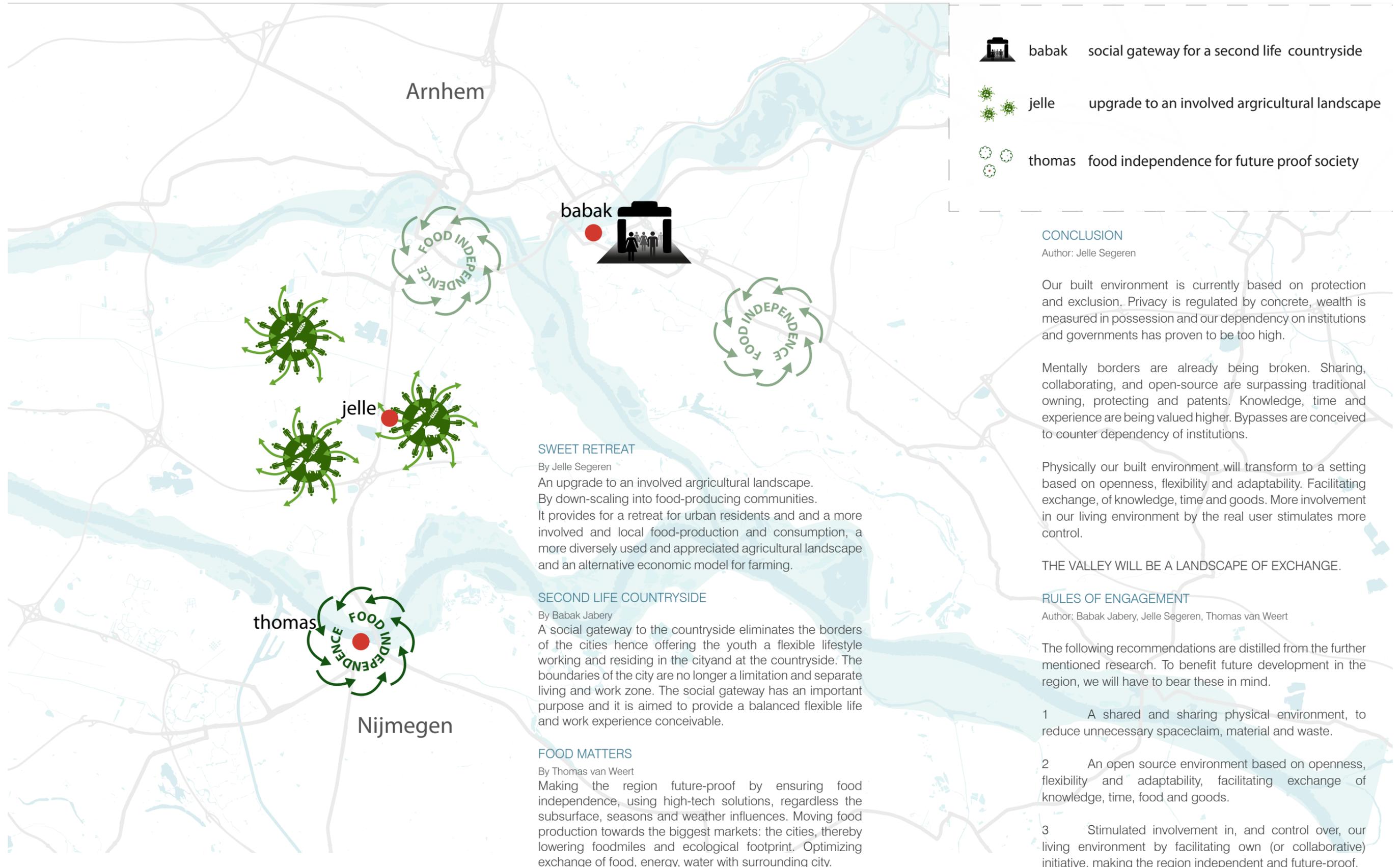
- PIG FARM
- POULTRY
- CATTLE
- DIFFERT FLOCK
- AGRO-FOOD BUSINESSES
- GREENHOUSES AREA
- FARMLANDS

TRANSPORTATION & LOGISTICS

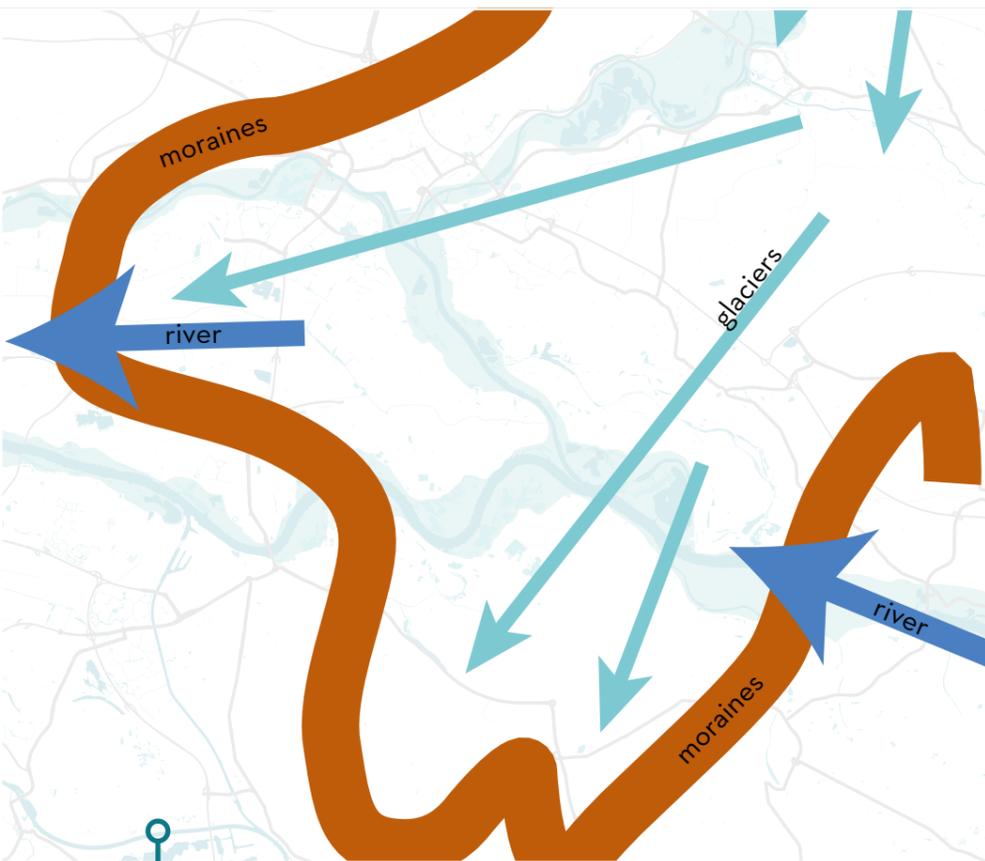
- Logistic companies
- Trainstations
- Busnetwork
- International economical focus points
- economical region

VISION EVOLVING LIFESTYLES

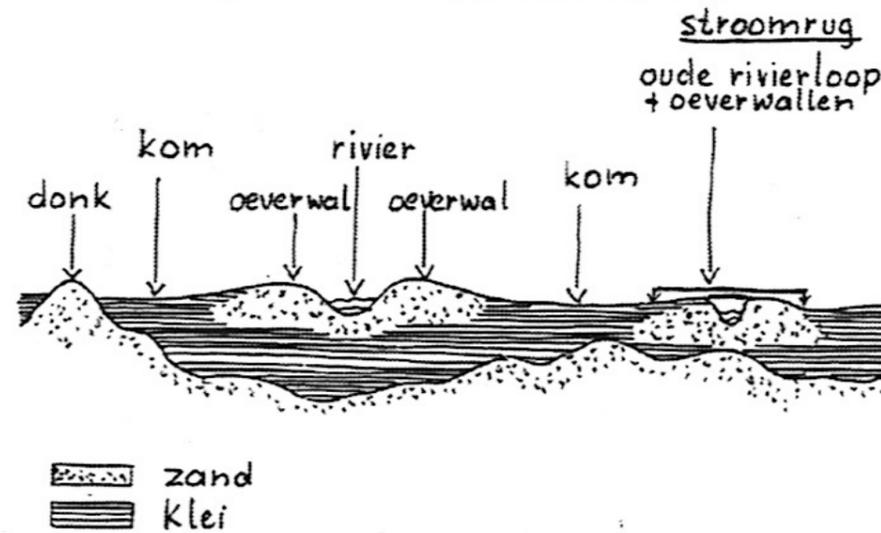
PHYSICAL CONSEQUENCES OF OUR CHANGING SOCIAL, ECOLOGICAL AND ECONOMICAL REALITY



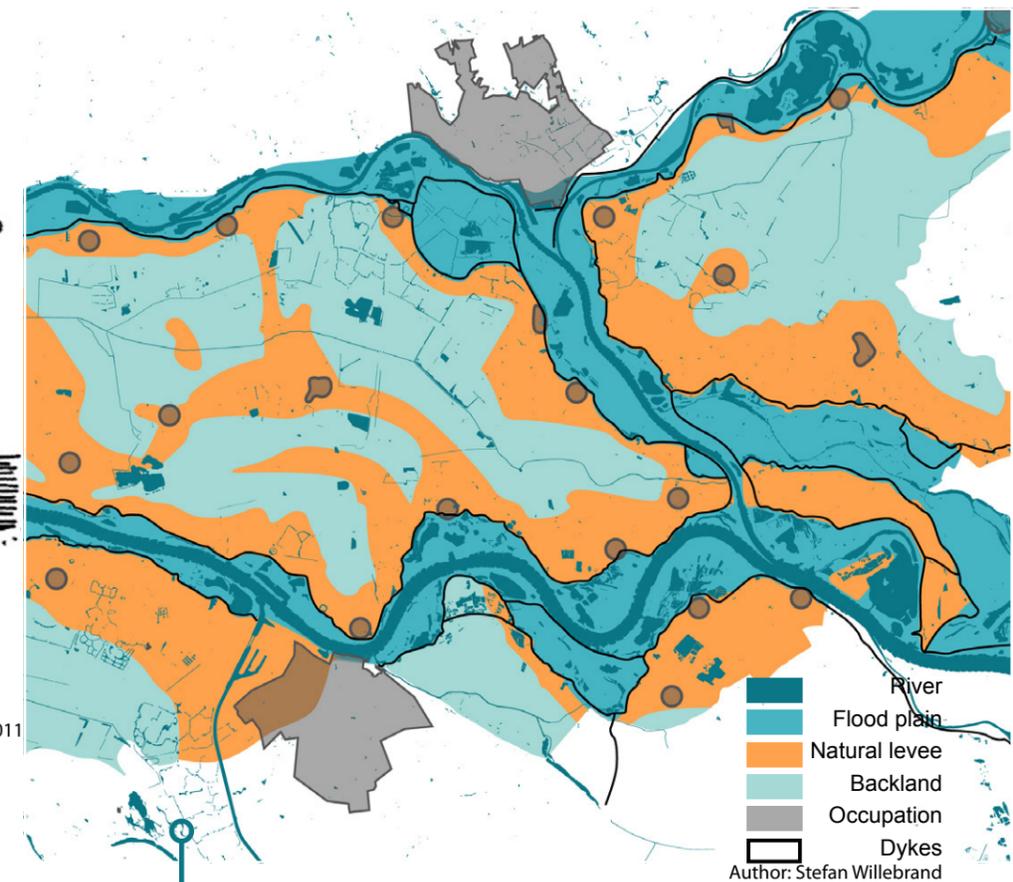
SUBSURFACE, HISTORY



Author: Teun Nuijten



Author: Woudstra, 2011



Author: Stefan Willebrand

THE NATURAL FORMATION OF THE LANDSCAPE

Author: Teun Nuijten

The area's basic structure of the landscape is formed in the ice age. In the Saale ice age, between 200.000 to 130.000 years ago, the glaciers from Scandinavia pushed sand layers up against- and forming the so-called moraines. The soil layers in the moraines are squeezed through the ice. The tongues of the glaciers penetrated the river valleys. The ice forced the Rhine to take a more southern course. When it was some warmer, in the same ice age, the river resumed its old course. Between Arnhem and Nijmegen the moraines were broken by the Rhine over a width of 15 to 20 kilometers. If the temperature at the end of the last ice age, 10,000 years ago, begins to rise the rivers flow because they have no dikes.¹⁺²⁺³⁺⁴⁺⁵

1. Eck, J. van, Historische atlas van Ooijpolder en Duffelt, een rivierengebied in woord en beeld (2005)

2. Gottschalk, M.K.E., Stormvloeden en rivieroverstromingen in Nederland, Delen I, II en III, Assen 1971-1

3. Verhoeven, D., De canon van Nijmegen (2009)

4. http://www.schooltv.nl/beeldbank/clip/20030331_stuwwal01 (2003)

5. <http://home.hccnet.nl/jan.arkesteijn/landschap/links.html#L1> (2007)

THE HISTORY OF THE LANDSCAPE'S DEVELOPMENT

Author: Stefan Willebrand

During the Holocene period, a massive valley was formed due to the sedimentation of the glacial river the Rijn, forming the Rijn-Waal river. During frequent floods and stream changes the river was covered with fine sedimentation, such as sand and clay. The combination of stream changes, sedimentation and compactness caused a high-lying sandy natural levee along the river and a low-lying clayey backland that partly changed into peat lands (Scharten & Dambrink, 2000). This all resulted in the typical "water landscape" composed out of rivers, flood plain, natural levees, backlands, deserted riverbed and banks (Woudstra, 2001).

HISTORY OF ITS OCCUPATION

Author: Stefan Willebrand

The sand natural levees of this "water landscape", belong to the sort of ground with most favourable conditions. These high located areas have been slowly occupied with homes, industry, commerce, orchards and forests. The underlying clayey backland have been much more vulnerable to floods and mainly consist out of meadows (Scharten & Dambrink, 2000).

THE NATURAL USE OF THE LANDSCAPE

Author: Teun Nuijten

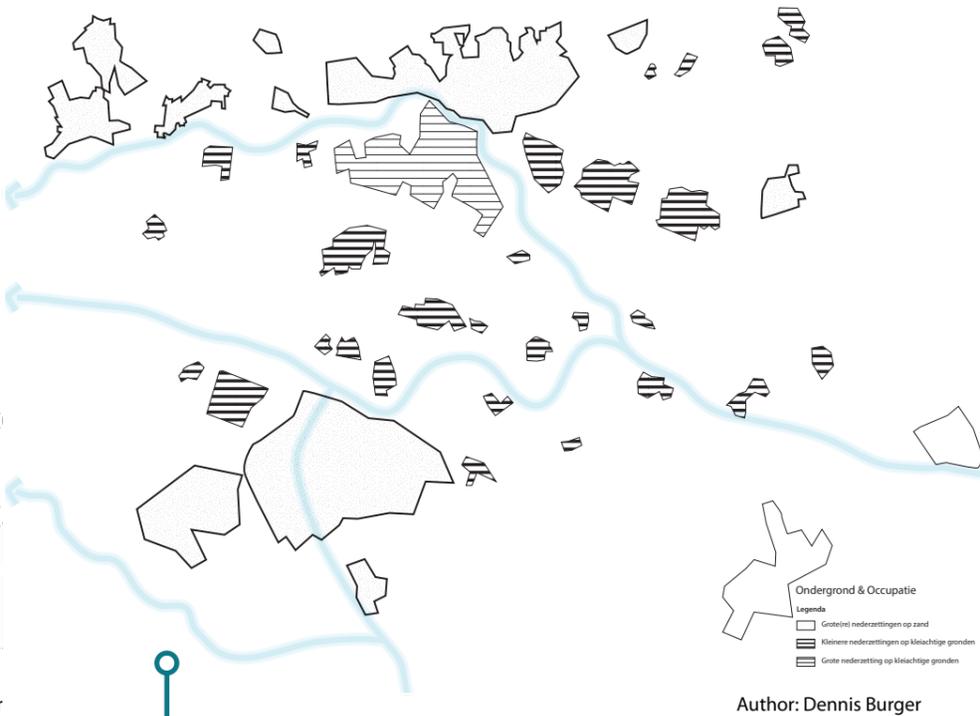
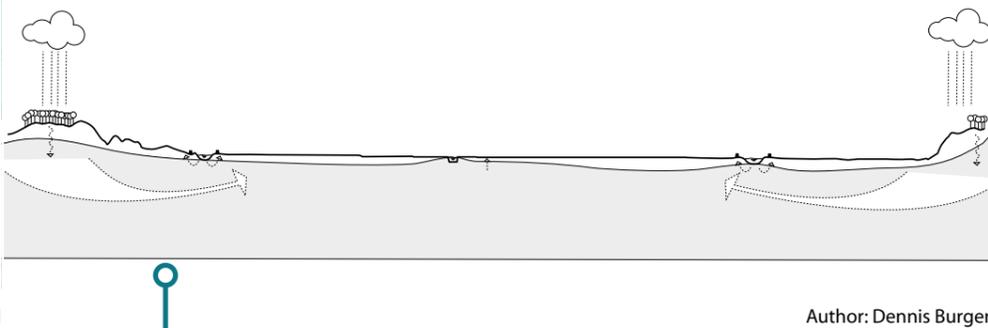
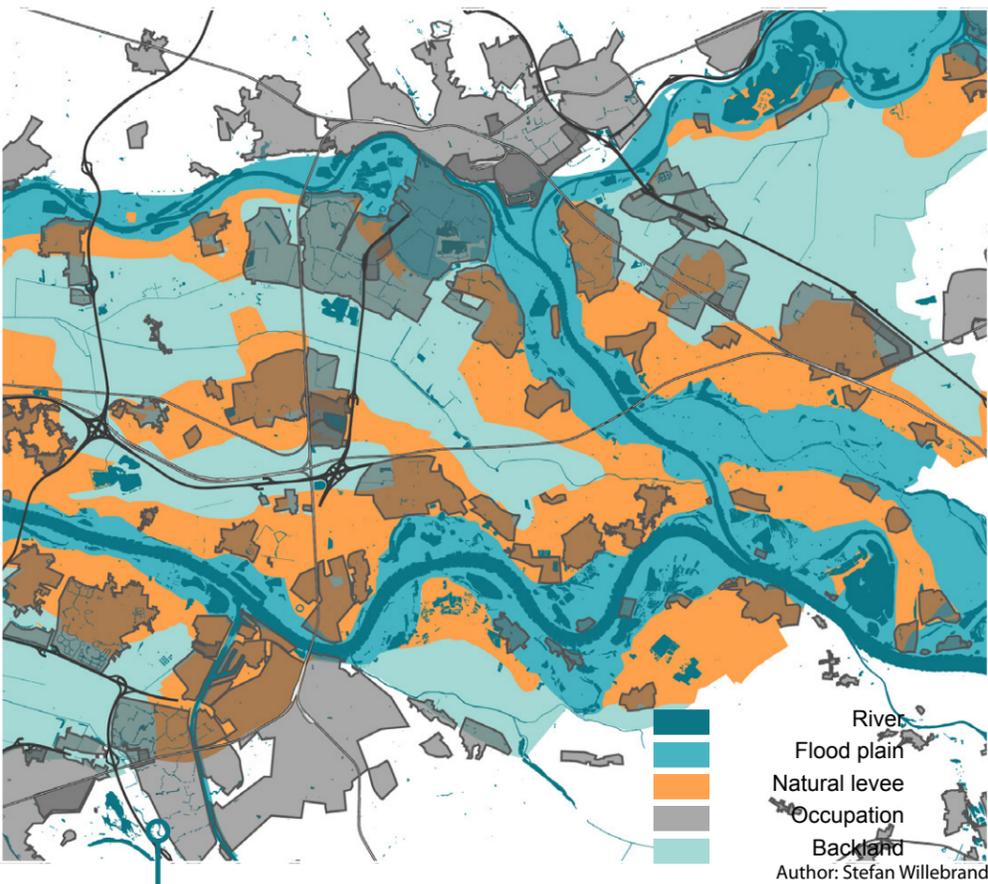
The relief always has been decisive for the occupation and the course of the rivers. There was built mainly on the higher sandy soils and the river banks.¹ Up to a few hundred years ago the transportation of people and goods went (almost) only by water.² In the lower valley, the river has allways chosen a different path.³

1. Verhoeven, D., De canon van Nijmegen (2009)

2. <http://home.hccnet.nl/jan.arkesteijn/landschap/links.html#L1> (2007)

3. Eck, J. van, Historische atlas van Ooijpolder en Duffelt, een rivierengebied in woord en beeld (2005)

SUBSURFACE, CURRENT



CURRENT SITUATION

Author: Stefan Willebrand

Damming of the lower areas has taken place by using dykes, faces and cribs since 800 after Christ. These “new” technologies have resulted in “odd landscape” usage of low-lying soil. As a consequence of the disharmony between the landscape foundations and the subsequent occupation we now see that natural processes have been disrupted (Scharten & Dambrink, 2000).

THE VALLEY'S GEOMORPHOLOGY SYSTEM

Author: Dennis Burger

The valley was created when the river carved it's way trough the moraine where nowadays the cities of Arnhem and Nijmegen are located. Before that the two hills formed one moraine that was created by the shifting ice during the ice age. Water and the valley are inextricably linked.

The valley functions as the main entrance for fresh water in the Netherlands. The surface and subsurface are logically connected to the river, the subsurface consists of varying types of clay that were formed during the many floods in the area. The deeper layers consist of different types of sand and the top layer consists out of. Clay.

The formation of the top layer is connected tot the movement of the river, the river periodically overflows leaving a layer of clay sediment when the water retreated. This created a relief in the subsurface which guided the early occupation of the valley. This relief is created by the river system, the river system is connected with the moraine system.

The moraine infiltrates precipitation in the subsurface, this capacity is important for keeping the valley on level and feeding the groundwater, streams and rivers in the area.

OCCUPATION IN THE VALLEY

Author: Dennis Burger

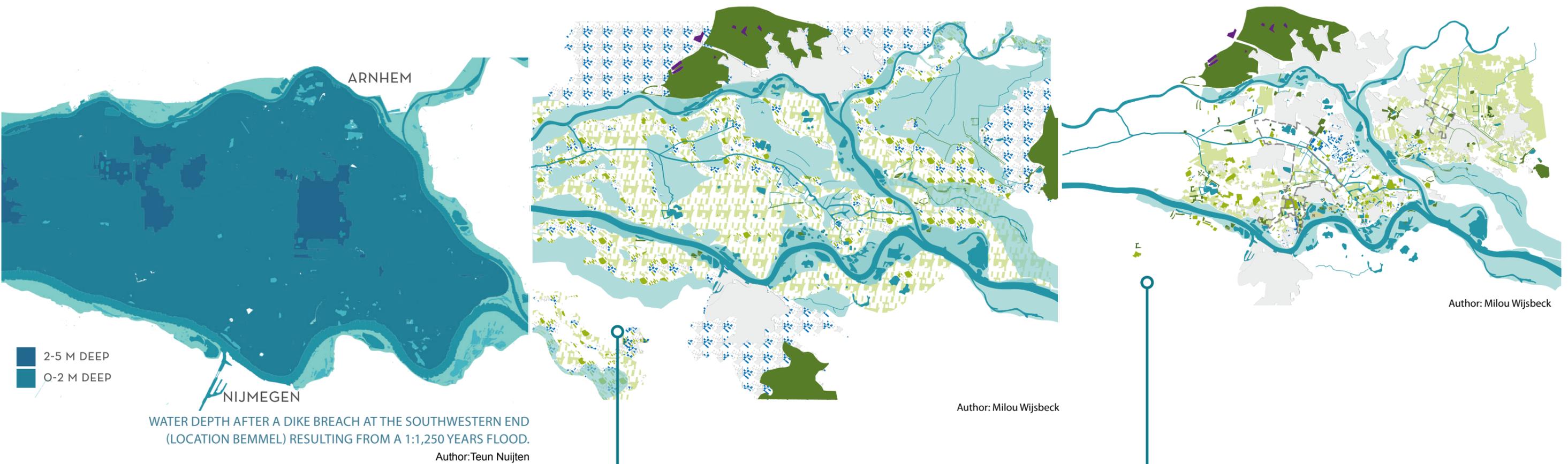
Occupation has long been connected to the geomorphological system.

Settlements arose on higher parts that where formed by sediment of the overflowing rivers. These settlements however where intended to stay small and had an agricultural function. Due to the fertile soil, a result of the water system, this area was seen as an agricultural hotspot.

Nowadays the main function of this area is agricultural, at least when comparing percentages in land use. When looking at influence on the system the main function of the valley is to facilitate residential industrial infrastructural areas.

When looking at the settlements in the valley a pattern can be recognized. On the higher parts the moraines the average settlement size is more extensive than in the valley. This relation can be explained trough the combination and relation between technological advancement and population growth. The decision made in the 'Koersnota' of the city region Arnhem-Nijmegen, opts for a further increase in occupation of the valley by planning 24K residential units in the valley until 2040.

SUBSURFACE, CURRENT



THE UNNATURAL USE OF THE LANDSCAPE

Author: Teun Nuijten

The last way of using the existing qualities of the relief in the present history is the civil defense project 'The Ijssellinie'. The whole area between Nijmegen en Zwolle could be flooded to stop the Russians if they would try to invade the country.¹ Instead of using the relief in a positive way, nowadays with flood risks, there's also built on the lowlands. The Regional Plan of The Cityregion Arnhem-Nijmegen 2005-2050 speaks about transforming the city region from a Two City Region into a Urban Network.² This means, making a connection, by realizing more occupation in the lowland valley, between Arnhem and Nijmegen. Building in a traditional way in the valley, draining and thrusting the dikes will keep the increasing amount of water out.³ But a dike breach, for example at Bemmel, will flood the entire valley.⁴ Where previously the river meandered on varying ways through the valley it is now necessary, due to draining, for farmers that The Linge provides water during dry periods.

1. Stichting de Ijssellinie, visited the website in November 2013
2. Stadsregio Arnhem-Nijmegen, Provincie Gelderland, Regionaal Plan 2005-2020 (2006)
3. Wit, M. de, Buiteveld, H., Deursen, W. van (Rijkswaterstaat RIZA WRR & Carthago Consultancy, Rotterdam Klimaatverandering en de afvoer van Rijn en Maas (juni 2007)
4. Journal Flood Risk Management, (2010)

Usable surface increases by 30 percent if taken advantage of soil

Author: Milou Wijsbeck and Dennis Burger

The rivers have formed three different soils in the delta, all having their own quality and therefore suitable for various destinations. Despite the extra effort it takes, the surface now is thoughtlessly forced used. If all functions would be sited on the most suitable subsurface, the fertile valley between the rivers would look very different comparing to the current situation. A scenario¹ is showing the layout of the subsurface. A striking finding is the gain in usable agricultural grounds of 30 percent comparing to the current situation. Because there is taken advantage of the existing soil all suitable grounds are most optimal in use.

The subsurface in the valley is characterized by clay-like grounds. Heavy clay, heavy loam, light clay and light sandy clay are the types that are most common.² The presence of these soils may be explained on the basis of the presence of rivers, and the sand in the bottom. However, the occupation pattern (morphological) can best be described as 'scattered'. The pattern is partly related

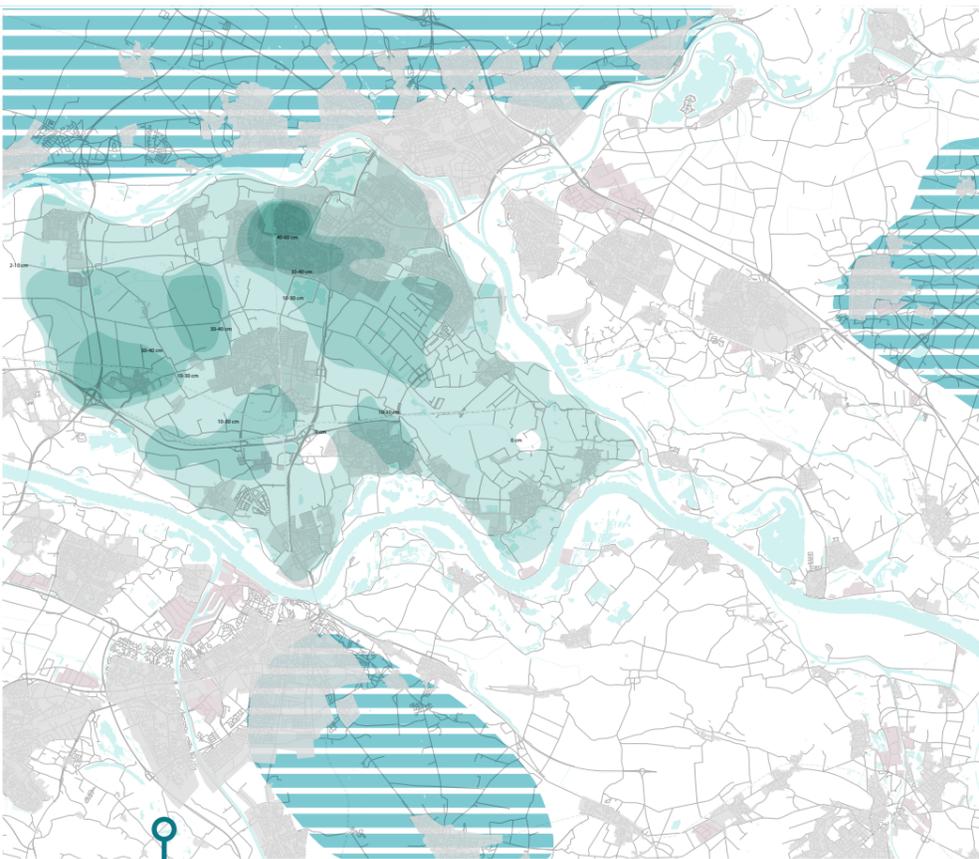
to the course of the Waal and the northern part of lateral moraines.³ The two largest settlements are located on the sandy soil in the northern and southern borders of geography.

The geography shows a dependence on technological developments

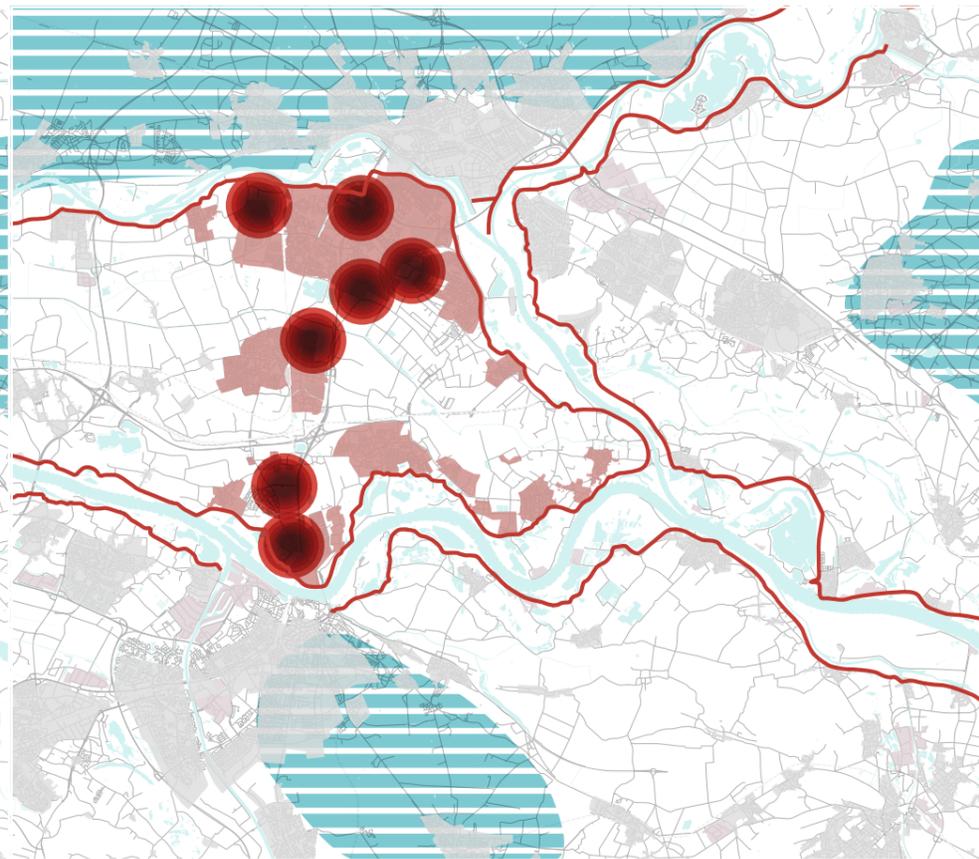
Author: Milou Wijsbeck and Dennis Burger

On the sandy soil is built more compact (less scattered) then on the clayey soils. The clayey soils are more often used for agriculture and livestock. The connection between subsurface and occupation can be named in a certain sense logically, because the clayey soils are fertile and the sandy soils form a solid base to build on (apart from settlement motives). However, the geography also shows a dependence on technological developments, eg Arnhem-South and Waalsprong. As a result of technological progress, the production landscape at these locations changes into urban areas with new occupation, but with a loss of fertile ground as the price to pay.

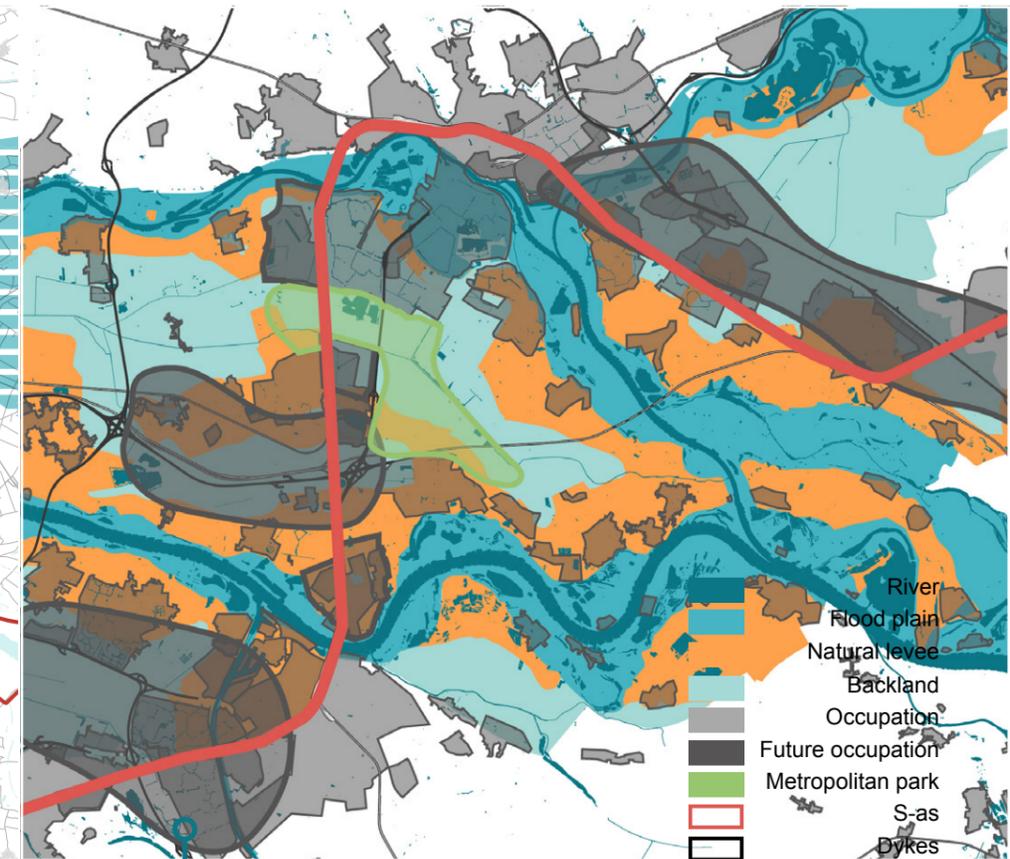
SUBSURFACE, CURRENT AND FUTURE



Author: Dennis Burger



Author: Dennis Burger



Author: Stefan Willebrand

OCCUPATION IN THE VALLEY

Author: Dennis Burger

Occupation has long been connected to the geomorphological system.

Settlements arose on higher parts that were formed by sediment of the overflowing rivers. These settlements however were intended to stay small and had an agricultural function. Due to the fertile soil, a result of the water system, this area was seen as an agricultural hotspot.

Nowadays the main function of this area is agricultural, at least when comparing percentages in land use. When looking at influence on the system the main function of the valley is to facilitate residential industrial infrastructural areas.

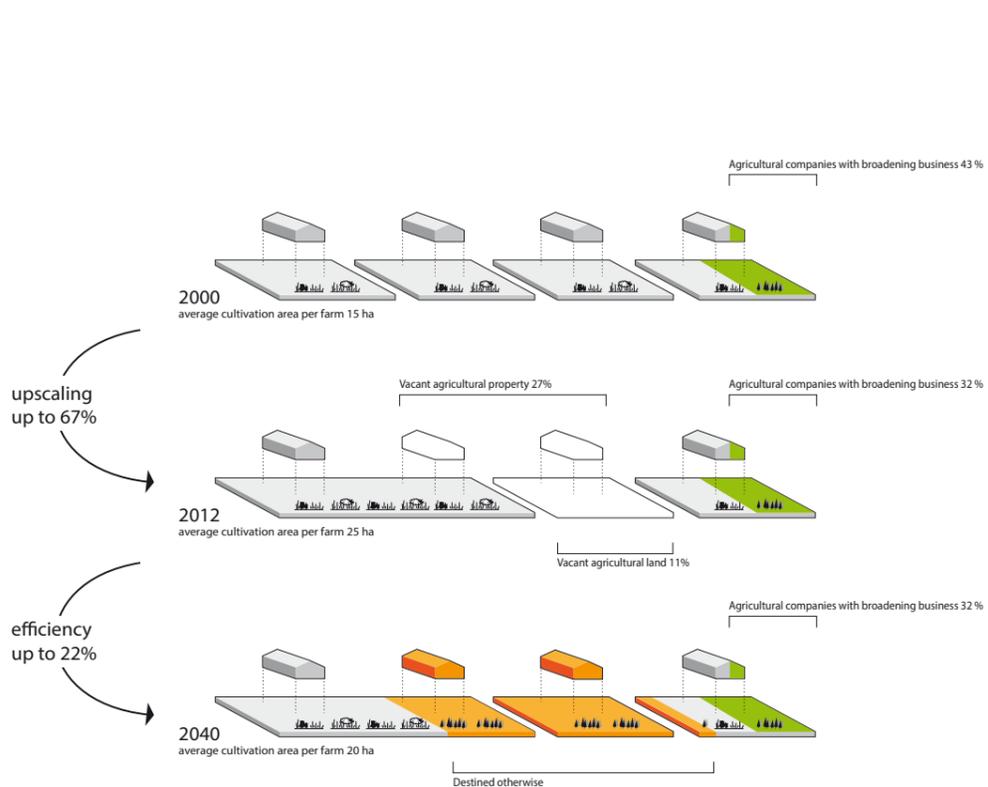
When looking at the settlements in the valley a pattern can be recognized. On the higher parts the moraines the average settlement size is more extensive than in the valley. This relation can be explained through the combination and relation between technological advancement and population growth. The decision made in the 'Koersnota' of the city region Arnhem-Nijmegen, opts for a further increase in occupation of the valley by planning 24K residential units in the valley until 2040.

VISION FROM POLITICS

Author: Stefan Willebrand

The current vision for the future being held for the Rijn-Waal Valley reinforces this disharmony. This vision supports the integral development of a spatial economic development axis, the so-called S-as. Existing cities and villages develop at a high pace (Stadsregio Arnhem Nijmegen, 2007). The aim of the S-as is to improve the area's competitive position as a strategic-economic fortification between urban agglomeration and the Ruhr Area. In the centre of the Valley, vast areas such as industrial plots (A12-area and A15-area), a metropolitan park (park Lingezege) and several VINEX-sites (Schuytgraaf, Waalsprong and Westeraam) (Stadsregio Arnhem Nijmegen, 2011) are being developed in a short period of time.

SUBSURFACE, FUTURE

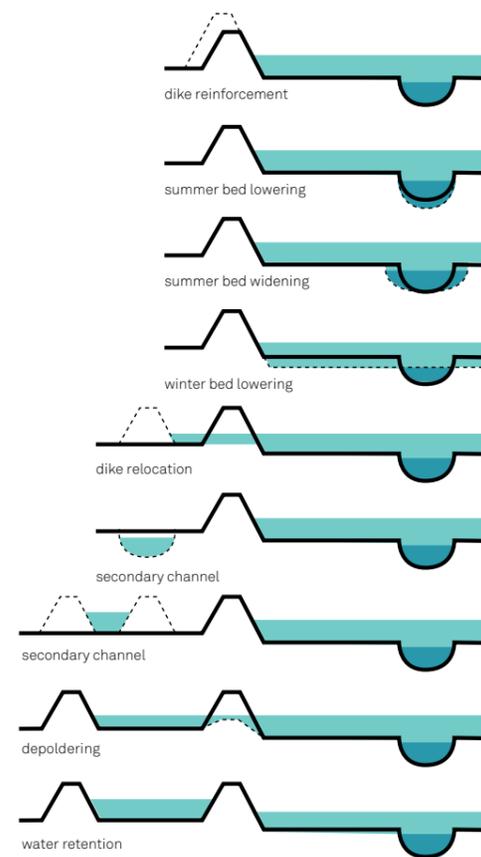


upscaling
up to 67%

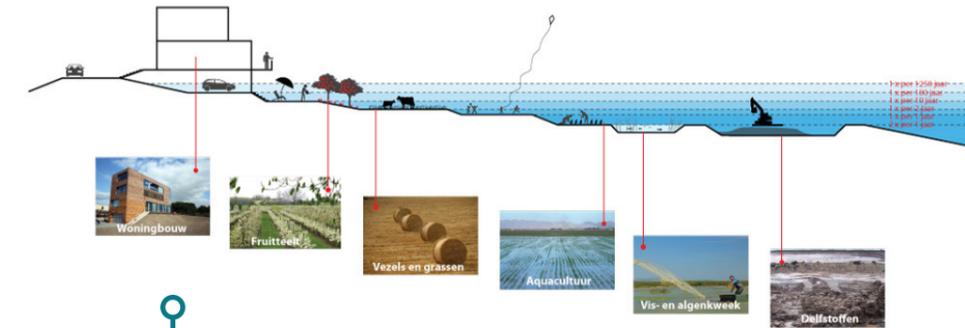
efficiency
up to 22%

new research question
which areas are suitable for large-scale agriculture and which for agricultural landscape management?

Author: Milou Wijsbeck



Author: Milou Wijsbeck



Author: Studio Marco Vermeulen

UNSEEN ABUNDANCES IN LAND OFFER NEW DEVELOPMENT OPTIONS

Author: Milou Wijsbeck

The S-axis has high priority at the Stadsregio Arnhem Nijmegen. Cities are supposed full and plans are made to expand inside the danger area between the two big rivers.¹ But there is no reason to presume the nearby expanding possibilities are exhausted. For example the cluttered edges around urban tissue can be redefined. Due to shifts in control in the past, the space between habited areas and rural areas has become an unclear line. Thereby, the rural area itself is facing decline² which results in a large amount of undefined agricultural property.³ In the project 'valuable landscapes', the aim is to create a settlement on shared property to reduce unnecessary spaceclaim. This will restore the border between urban and rural areas. To guarantee a high return and to minimize land spills, production land and dwellings will be attuned to the qualities of the subsurface.

¹ Stadsregio Arnhem Nijmegen, Regionaal plan 2005-2020 (may 2007)

² Image; The number of decline in agricultural activities (32%) vacant land(11%) and vacant real estate (27%) is serious. CBS (2012) Illustration by Milou Wijsbeck

³ The rights are often taken over by neighboring farms, who aim to upscale, but don't take over the property. Biemans, M., Blind spot vacancy discussion: vacant agricultural buildings (August 2013)

NEW WAY OF LIVING WITH HIGH WATER LEADS TO PERIODICALLY FLOODED AREAS

Author: Milou Wijsbeck

According to Rijkswaterstaat there exist different methods of storing water,¹ during high water and during the summer period. In the geography, the most common way has always been dike reinforcement. Concerning the new way of thinking and acting this is no longer the best solution. After structural analysis of the region² the new answer to the rising amount of water, is water retention, secondary channels or depoldering. The best way to adapt, is to let water in periodical and store it for a longer time. This technique can provide in water basins in dry periods and, when dried out, be used as meadow. Flexibility is required of interventions, because of the occurring weather and water conditions.

¹ Image; Ways of dealing with high water in the Netherlands. Illustration by Milou Wijsbeck

² Study by Dennis Burger, Teun Nuijten, Stefan Willebrand and Milou Wijsbeck

SCENARIO 1: VALUABLE LANDSCAPES

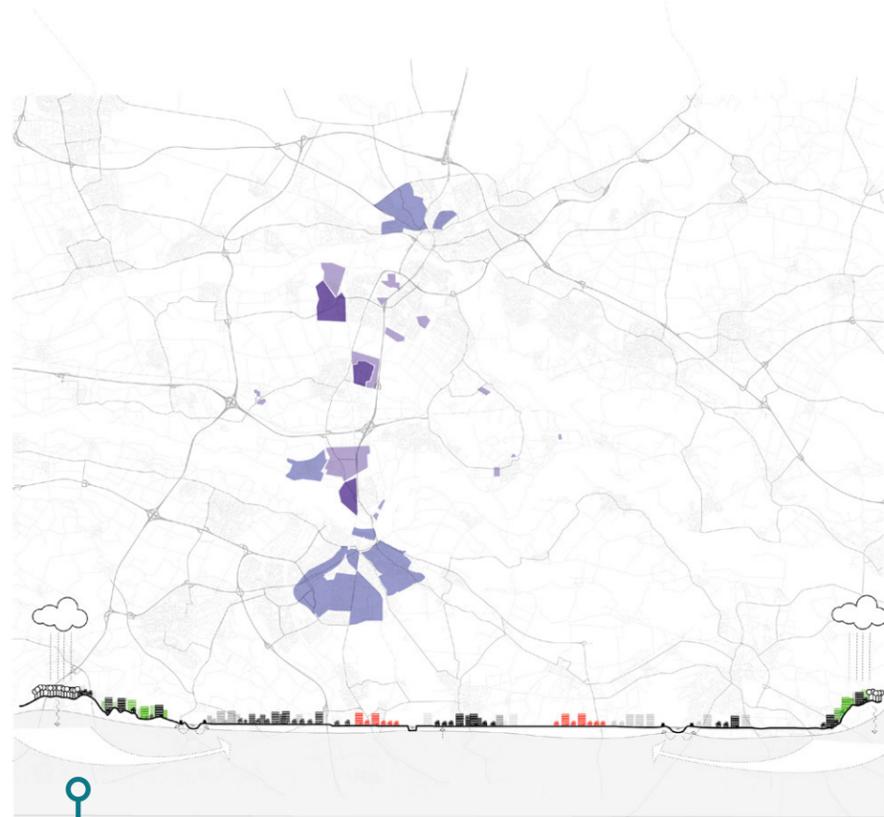
Author: Milou Wijsbeck

Changing lifestyles and spatial tension require matching types of housing. Cluttering boundaries between town and land ask for new forms of collaboration in which one can locally fulfill their needs in financials, food and services. The project aim is to create an autarkic settlement on shared property to reduce unnecessary spaceclaim. To guarantee a high return, production land and dwellings will be attuned to the qualities of the subsurface.

The new appreciation of the water brings back ancient cultures, professions and live forms.¹ Not only this brings exciting new forms of use, also the appearance of the landscape will change in a way it will represent the society of tomorrow. In this, flexibility is a necessity because of the occurring weather and water conditions.

¹ Case study; studio Marco Vermeulen, Waalweelde. The presence of the river and local potential are enhanced by a functional shared use. The agricultural activities take account of occasional flooding and are extended with river-related activities.

SUBSURFACE, FUTURE

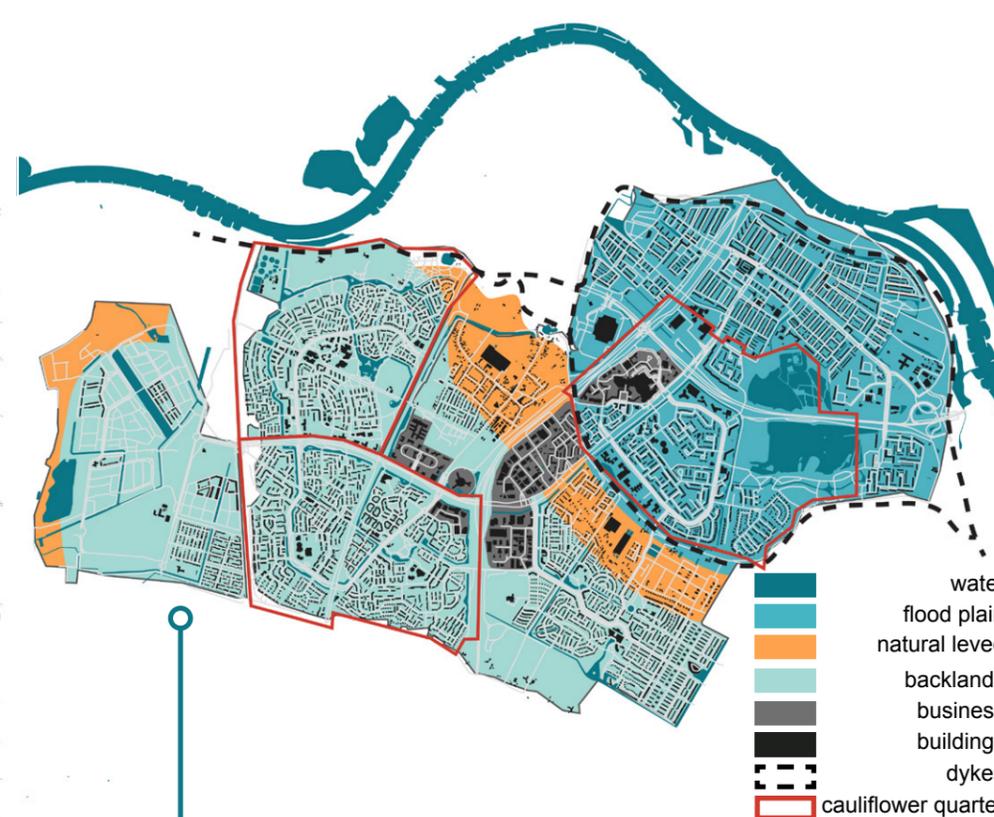


Author: Dennis Burger

SCENARIO 2: WATER IN THE VALLEY

Author: Dennis Burger

To enjoy the benefits of the new climate, occupation of the Rhine-delta should adapt to be able to cope with the extremes the climate shift will bring along. This calls for existing and new structures to be adapted and designed to synergize with the water system. To create such a system interventions have to take place on both the higher laying cities Arnhem and Nijmegen and the lower laying cities in the delta.



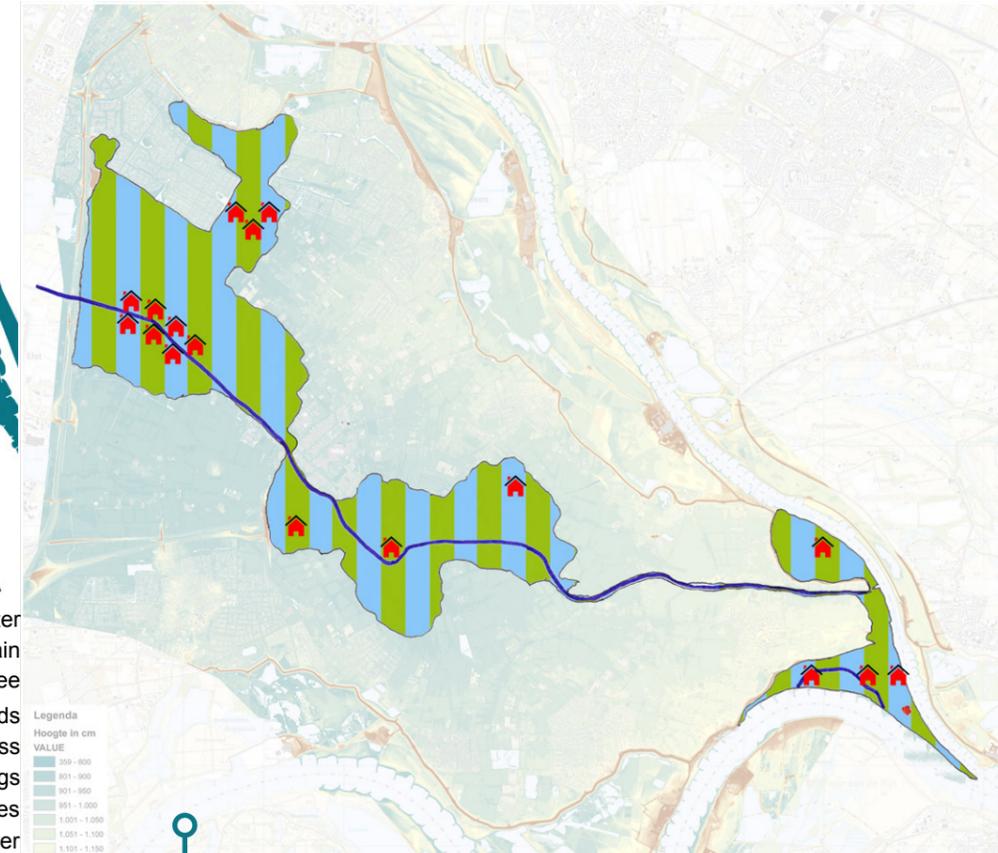
Author: Stefan Willebrand

SCENARIO 3: URBAN PARADISE

Author: Stefan Willebrand

The Rijn-Waal Valley is preparing itself for a new developmental phase: A harmonious future between sustainable economy, social well-being, landscape patterns and natural processes. By 2040, through a consequent occupation design of the so called "water landscape", the region will be transformed into an urban paradise offering excellent liveability standards.

An elaboration of a basic repair of the unbalance is Arnhem-South. This part has an urban fabric of various post-war urban development, spatial and social views and theories (Wentink, 2011). The Southern District will become an urban paradise with excellent quality of life, where life is central.



Author: Teun Nuijten

SCENARIO 4: ROOM ON WATER

Author: Teun Nuijten

The new vision on water is no more 'room for the river', but 'room for the water'. The new way of building is no more 'room between water', but 'room on water'.

Water retention on a large scale creates a safer Netherlands. By utilizing the existing topography a wetland landscape is created in the valley between Arnhem and Nijmegen.¹ This wetland will act as a water retention zone for the region. The Linge is the connecting river through the new landscape.

The lowland areas are no longer built in a manner which is intended for safe, dry, high soils. It is necessary to build in a different way in areas where there is room for water. Distinctive and landscape specific housing - and living environments will emerge.

1. Harbrecht, J., Verkregen hoogtekaart van Rijkswaterstaat, in 2 delen, oostelijk en westelijk deel van de vallei (november en december 2013)

RESEARCH CLIMATE CHANGE

Daily we are being faced with our climate: it is present everywhere and determines how we live and deal with and in our environment.

Research on climate and climate change is therefore important. We like to know our position in order to be prepared.

Climate is the average weather over a period of thirty years. The climate is changing and is set on a very large scale. When we want to indicate differences and changes in climate, concerning our region Waal-Rhine Valley, we note that the scale for that actually is too large and answers are meaningless.

Climate change is the gradual change of the climate. This change is manifested most clearly in an increase or decrease of the average temperature and the average amount of rainfall on Earth.

PROBLEM STATEMENT

The changing climate will cause higher temperatures, increased rainfall, rising sealevel and more extreme situations. This will not be distributed evenly throughout the year and will sign off on different seasons. Flattening rainfall in summer will be combined with a higher evaporation which will lead to dehydration of the soil, while during winter frequency and intensity of extreme rainfall will increase. [source: Klimaatschetsboek, KNMI, september 2009, Publ. nr. 223]. Seasons will shift. Present weather in Central France is comparable to our kind of weather in future. Spring will make its premature appearance.

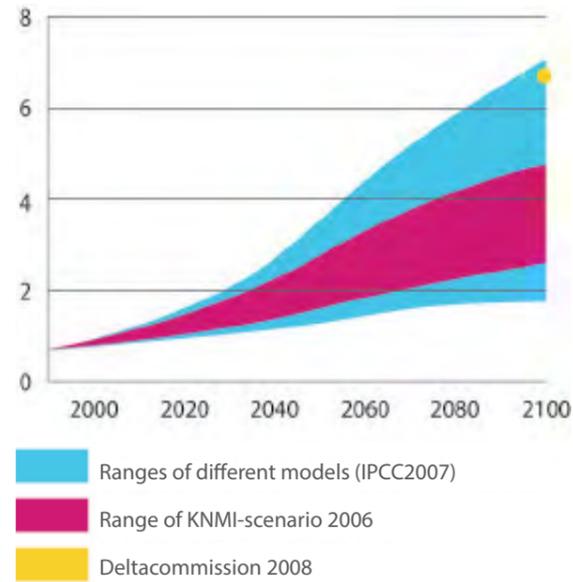
Climate change will lead to higher winter runoff and lower summer flows through the rivers which has a major impact on safety, agriculture, nature, culture (eg loss of historical dyke housing), drinking water supply and waterways. How do people live, dwell, work and recreate in twenty years?

QUESTION

How can we describe the consequences of (global) climate change within our region?

CHANGING CLIMATE

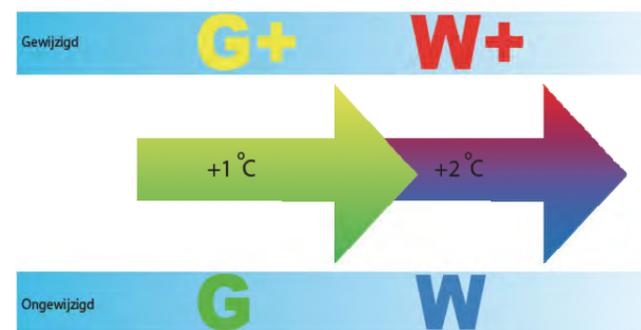
fig 2.



CHANGE OF TEMPERATURE SINCE 1850

The different models of the change of climate shows a large range of expectations.
(IPCC)

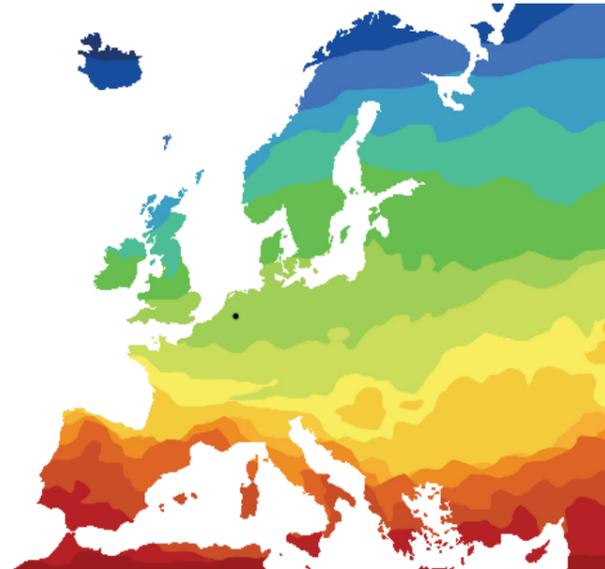
fig 3.



CLIMATE SCENARIOS

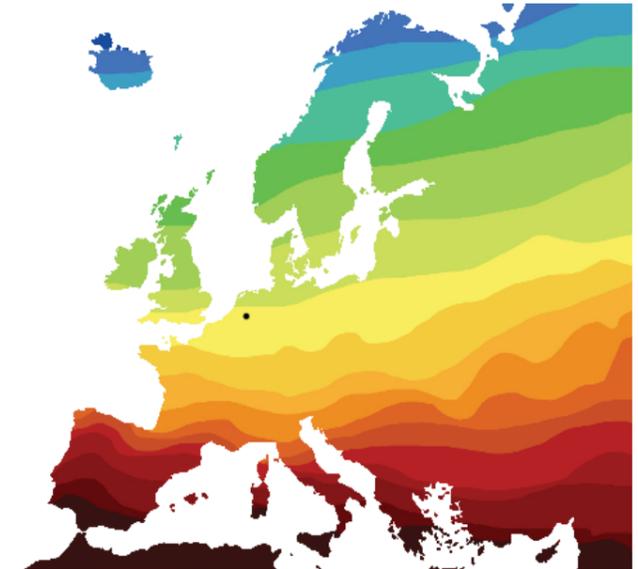
KNMI develops periodically updated climate scenarios for the Netherlands. Both new scientific knowledge about the climate system - periodically summarized by the IPCC
(KNMI)

fig 4.1.



CLIMATE EUROPE 2013

fig 4.2.



CLIMATE EUROPE 2050

fig 4.3.



CLIMATE IN GELDERLAND AT A GLOBAL SCALE

fig 4.4.

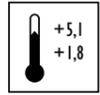


HEAT INTENSITY MAP

CHANGING CLIMATE

1

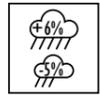
Climate has a direct influence on the primary effects of its changes. These are the rise of the sea level, temperature and rainfall. The number of the amount of tropical days during the year is one of the primary effects.



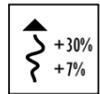
Annual average temperature +1,8 till 5,1°C



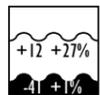
Increasing wet periods; 10-day rainfall exceeded once every ten years in winter +8 till +24%



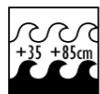
Annual rainfall -5 tot +6%



Potential evaporation +7 tot +30%



Rivers drain: winter +12 till +27%; summer -41 till +1%



Rising sealevel +35/+85 cm

URBAN AREA



Adapt to the processing of extreme rainfall. Local water storage and infiltration into the soil relieves pressure on drainage systems.



Incorporation of water in the environment with new challenges.



Incorporation of water and green elements. They have a cooling effect on the ambient temperature.



Construction of climate proof infrastructure and buildings.



Designing energy efficient buildings.



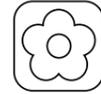
Overhauling sewer systems.

2

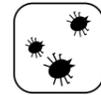
The consequences of the primary effects will arise impact of flood, waterlogging, runoff by extreme rainfall, salinity and city heating (TNO, urban heat islands). These are secondary effects.



Dutch migratory birds overwinter here



Spring starts earlier, winter starts later: prolonged flowering season



More gael wolfs ensure higher risks of Lyme infection



Warmer North Sea: habitat for other species



Summer smog caused by higher temperatures



Increase in number of recreational auspicious days



Urban heat islands

RURAL AREA



Integrated nature and water.



Afforestation with several species.



Changing agricultural practices.



Realization of storage and retention.



Levelling the groundwater level

GENERAL



More space for water.



Spatial planning structured by risk.



Water storage areas to overcome droughts.



Creating public awareness through educational programs.



Building water resistant constructions.

EFFECTS OF CLIMATE CHANGE

To obtain the effects of the change the climate, a distinction has been made into three categories, the so called primary, secondary and tertiary effects (WUR, klimaatlas).

The climate has a direct influence on the primary effects of the changes of the climate. These are the rise of the sea level, temperature and rainfall. The number of the amount of tropical days during the year is one of the primary effects

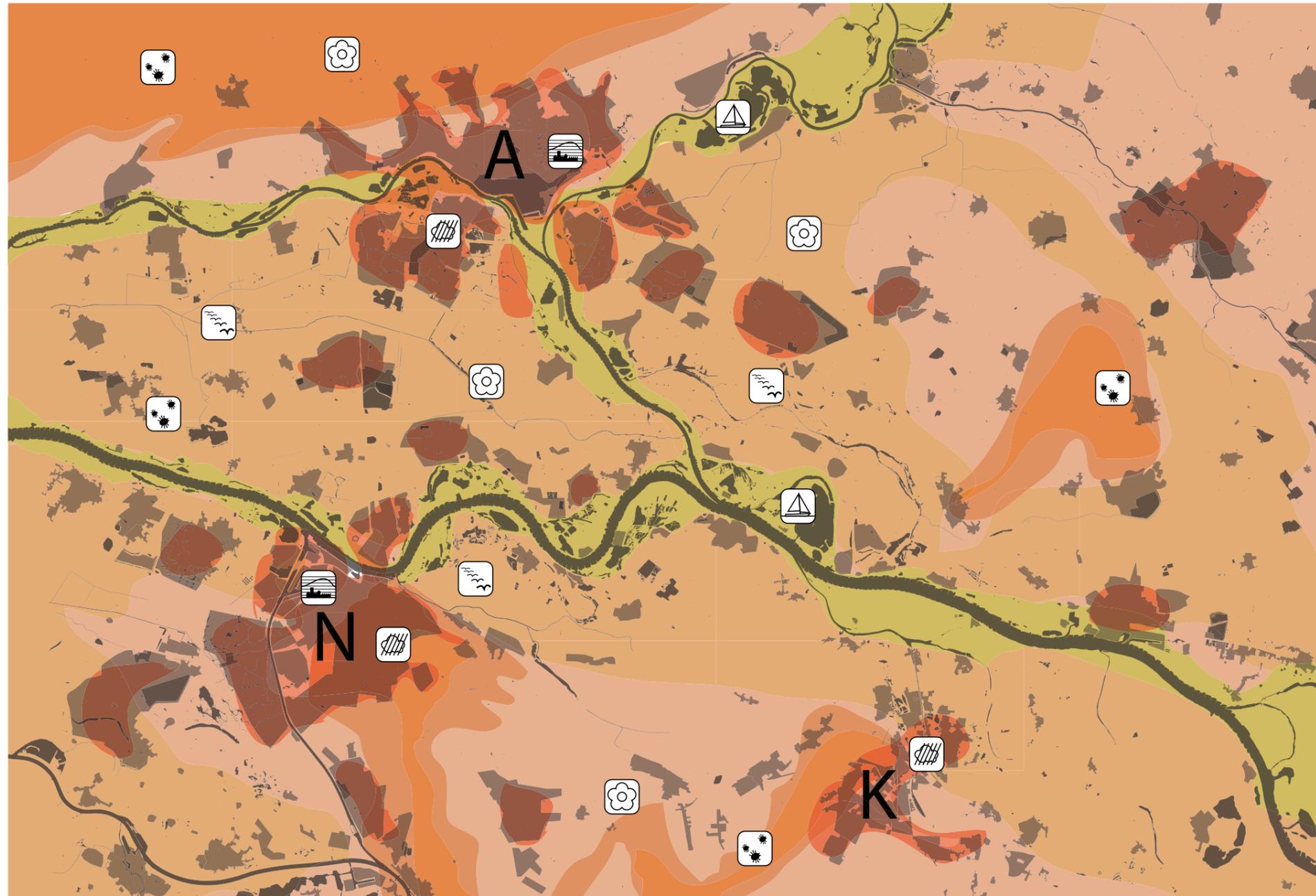
The consequence of these primary effects will arise impact of flood, waterlogging, runoff by extreme rainfall, salinity and city heating (TNO, urban heat islands). The so called secondary effects

Once the climatic effects that may occur has been identified, they will be examined whether they also creates problems for the use of land and safety. These tertiary effects show the implications of the changes for different sectors such as agriculture, tourism, nature and the urban area.

To get some insight in the consequences for the geography, we divide the region into different microclimates. It is distinguished into areas based on geography, vegetation, altitude and human intervention such as urban development. Within these areas, we are capable to identify the diversity of the different effects to provide the possibility of the measures to be adopted.

We filtered the decisive factors from the various effects. Based on these consequences a research has been done in the field of architecture and urban design, as well as the social aspects.

CHANGING CLIMATE



MICROCLIMATES

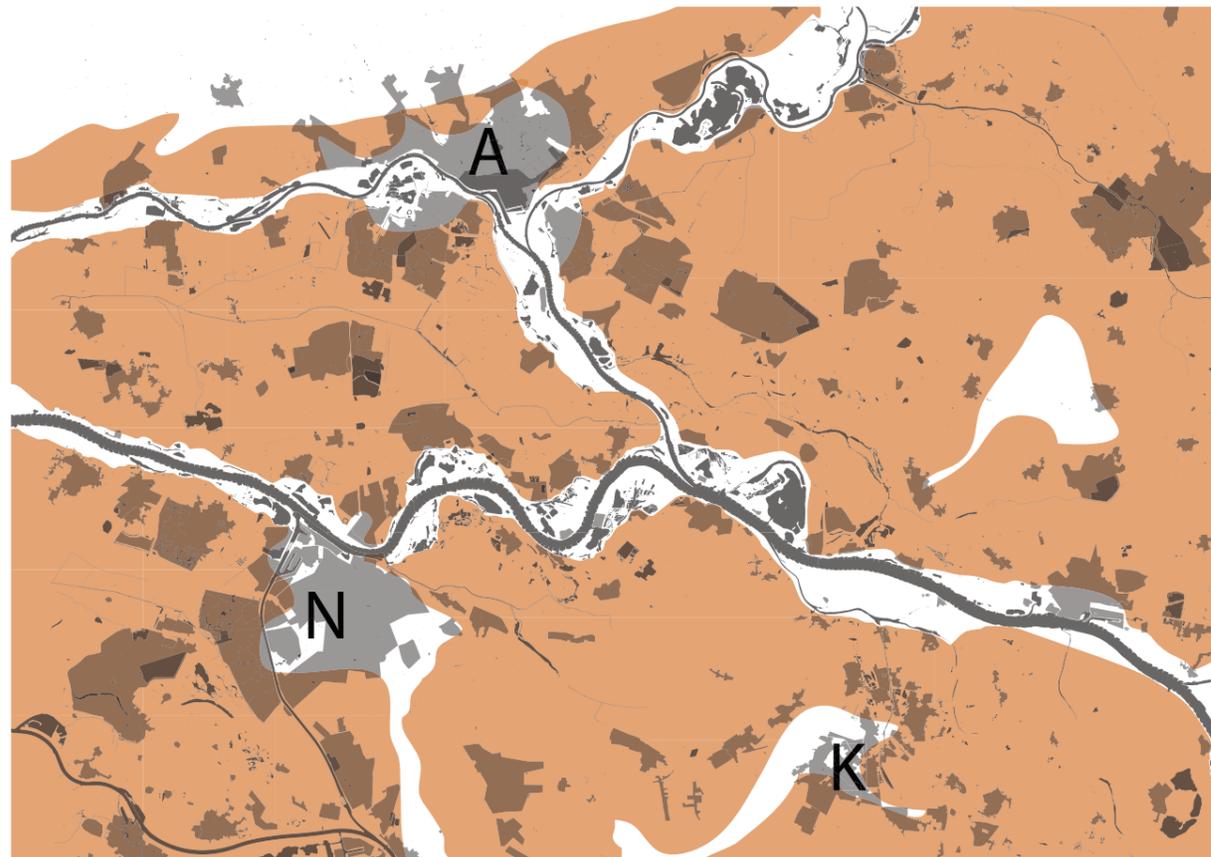
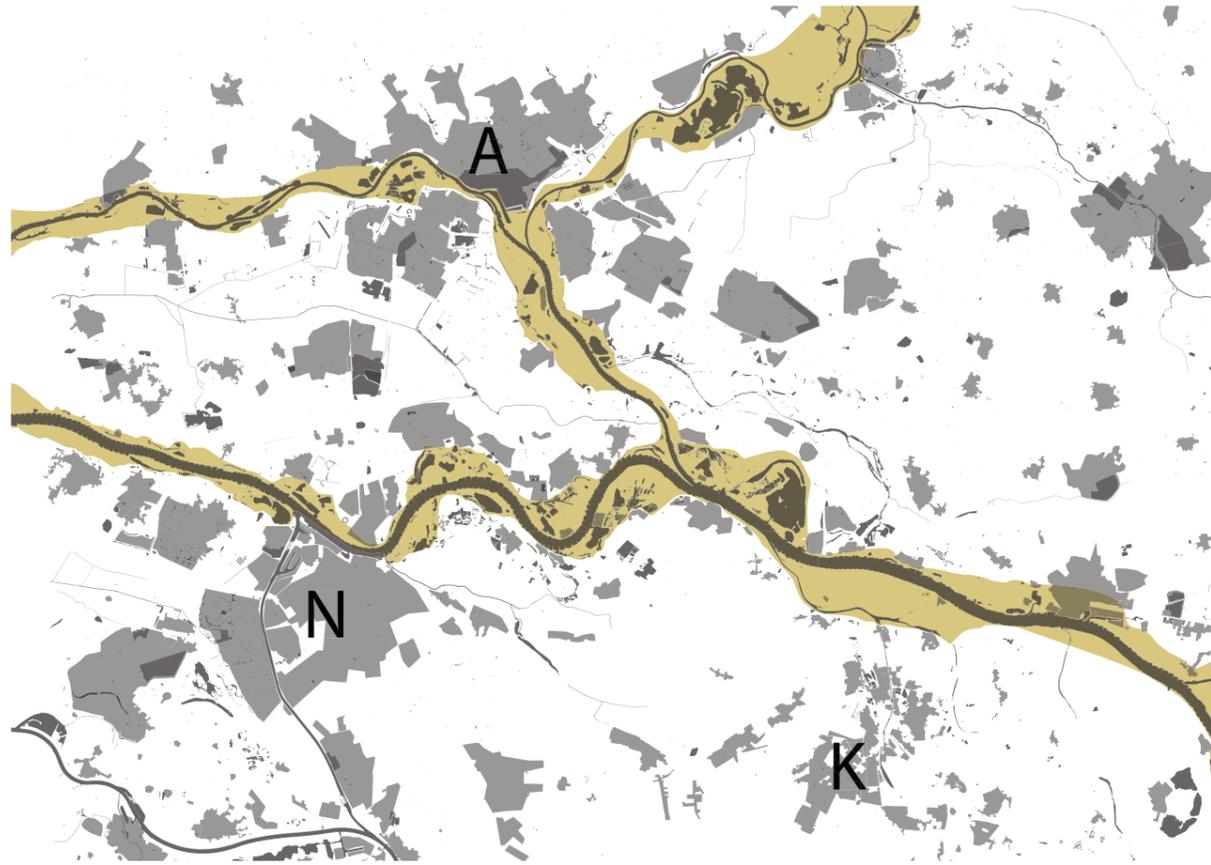
These proposed scenarios are a way to depict possible long term developments. However, be aware that the projections have a high degree of uncertainty (Klimaatonzekerheid in MKBA's, 2011). To accurately adapt to the changing climate therefore is very difficult, if not impossible. Because it is hard to say what effects eventually turn out to be decisive and how they will continue to influence the different subsurfaces.

Flexibility should be incorporated in the chosen measures. We also advise to seek for measures that will provide benefits for other themes. Like green in the city, it has a cooling effect whilst adding value to an area and increases liveability.

Within the geography we can tell apart a number of areas that will, because of their geographical features, show various consequences to climate change. Our study on future climate projections (Klimaatschetsboek, KNMI, 2009 and Klimaateffectatlas, IPO, 2009) and the subsurface of the geography shows the geography of this studio can be divided into four different microclimates. Because of their various characteristics each of these microclimates will show a unique set of consequences as a result of climate change.

The same precipitation will have different consequences for elevated areas than for lower situated areas. Also a rural area will collect and discard this precipitation in a different way

CHANGING CLIMATE



OUTSIDE THE DYKES

The dynamics of this area is completely determined by water. Located directly adjacent the riverbanks, the area is very vulnerable to fluctuating water levels. Some parts of the river forelands, like sections of the Ooypolder, may become completely submerged. This principle is utilized on different locations along the river in the national Room for the River programme. For example by relocating the dyke at Lent and the Hondsbroekse Pleij and by lowering the river forelands at Meinerswijk and Middelwaard. (ruimtevoorderivier.nl)

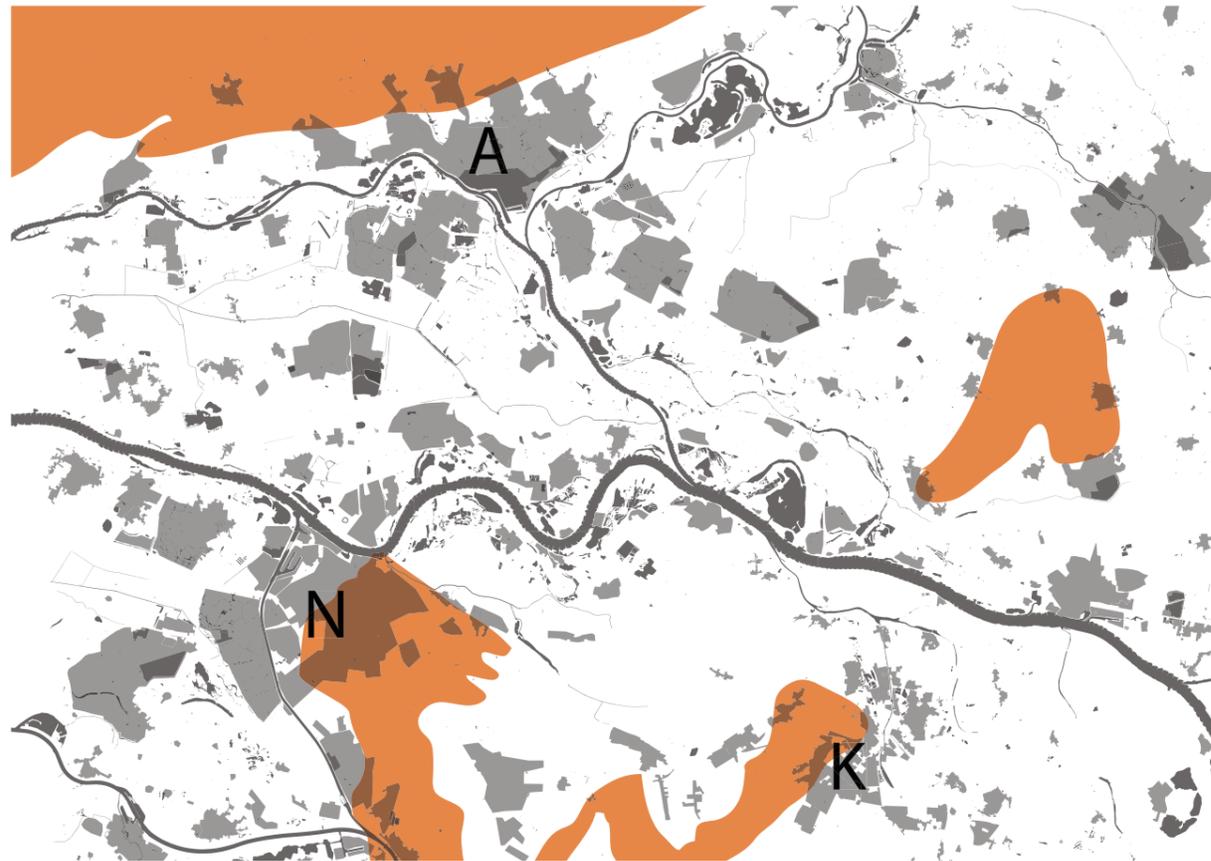
Groundwater levels are high but quite stable. High levels lead to a big risk of inundation because of heavy rain. On the other hand there is a small risk of groundwater shortage in summertimes because of these high levels. Soil dehydration does not occur in this type of area.

INSIDE THE DYKES

The consequences for this area show great similarities with the areas outside the dyke. Groundwater levels are high and quite stable because of the lowered position in the landscape that is still sinking slightly. During prolonged, heavy rainfall there is risk of inundation as result of insufficient drainage of water. Plots and fields may become submerged. Partial flooding can also occur as a result of high water levels in the rivers at many locations along the dykes of the Rhine, Waal and IJssel. Due to insufficient discharge capacity of the rivers the river forelands can become submerged. Water may be pushed under the dykes (piping) after an extended period and subsurface on the other side, also known as seepage. In the event of a dyke breach large parts of, if not the whole, area can become inundated.

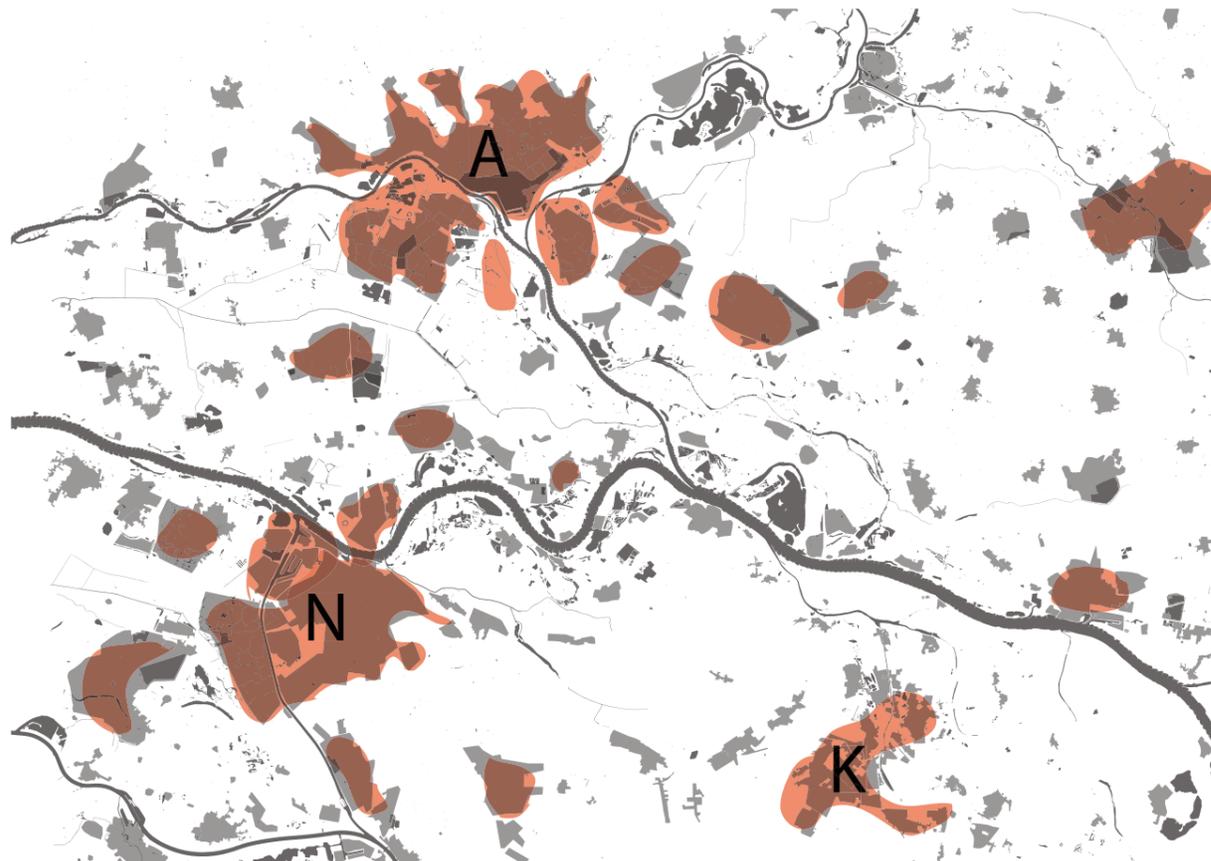
Even in summertime when the river levels are low, groundwater levels are generally quite high which greatly decreases the chance of soil dehydration. Wooded land has virtually no risk of dehydrating. Grasslands like meadows, locally have a slightly increased risk of dehydration.

CHANGING CLIMATE



MORAINES

High and dry has a double meaning when it comes to the moraine. Risk of flooding is nil, even during a dyke breach, due to its elevated position. It is not by chance the Romans built their settlement on a moraine, near present Nijmegen. Nuisance due to prolonged, heavy rainfall is minimal because the soil does not hold water very well. So groundwater levels can not rise to the point it may cause inundation. The flipside is an increased risk of dehydration of the soil due to low groundwater levels. Most noticeable in summertime on the Veluwe and in the woods of Groesbeek. Low groundwater levels lead to moisture deficit which has implications for the development of crops.

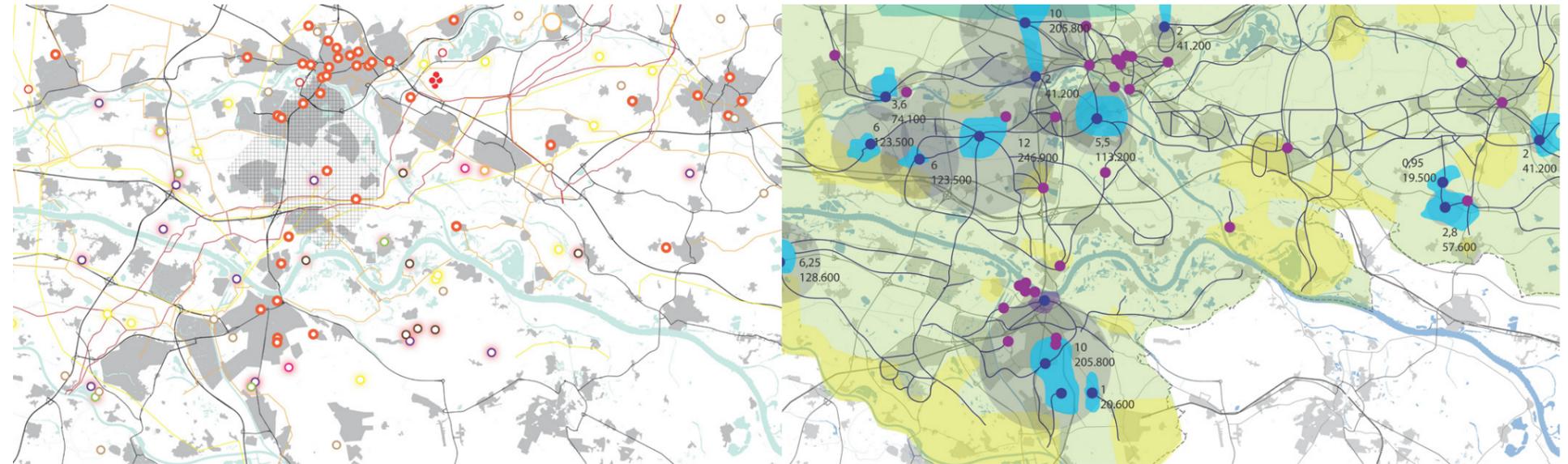


URBAN

Urban areas will see an increase in two consequences of climate change with the increase of density. Both primary effects of the changing climate (rising temperature and heavy rain) have direct impact on the area followed by unique consequences. Mainly the cities Arnhem and Nijmegen will face an increase of the so called urban heat island effect (Exploring the Urban Heat Island Intensity of Dutch Cities, Alterra, 2011) with increase of temperature. Urban areas tend to become significantly warmer than its surrounding rural area and it takes more time to cool down. The presence of vegetation and surface water can have a cooling effect on the surrounding area. The woods of Groesbeek, de Ooijpolder and the Waal may act as cooling elements voor the city of Nijmegen. For Arnhem it is the Nederrhine and the Veluwe which reaches into the inner city that may have a mitigating effect on the urban heat intensity.

RESEARCH TECHNOLOGY

SANDER DE BRUIN
BERT VAN DER HEIJDEN
RICK DE LANGE
PAUL MUSELAERS
JORIS VAN DER VORST



TECHNOLOGICAL DEVELOPEMENTS IN THE VALLEY

In the transition to a cyclic WaalRhineValley which is self-sufficient within a few decades, technology plays an essential role. The current situation in the WaalRhineValley shows that people are still dependent on facilities outside the area, although this region has the potential to be self-sufficient. Are we able to move in the direction of the self-sufficient region or are modifications necessary? To answer this question, existing technological facilities in this area are described in the following text. In addition, table 1 gives an overview of the different scales and technologies that are possible to create a self-sufficient WaalRhineValley. The research results show the basic facilities: energy, food, waste and water.

ENERGY PRODUCTION & TRANSPORT

Sander de Bruin

To provide solutions for the future use of energy in the WaalRijn Valley it is important to get a clear overview on the present energy sources. It is quite remarkable to see that most energy is generated outside the region. Natural gas is being imported from Russia, oil and diesel comes from the middle-east and electricity is often delivered by foreign companies. The total region consumes yearly a total energy of 75,2 PJ. Only 11 % is generated in a sustainable way. The region has the mission to generate all the energy in a sustainable way by 2050 [1].

Our future energy concept is based on the Trias Energetica principle [2]. The energy use is being restricted, we will be frugal with fossil fuels and sustainable sources are maximum used. By searching for combinations within sustainable energy sources and to apply this on local scale we can create a self-sufficient region [3].

WATER EXTRACTION

Bert van der Heijden

The WaalRhineValley contains a sufficient amount of groundwater to meet the needs of the next decades [1]. The groundwater is of constant good quality and has low vulnerability to disasters [1]. The groundwater is extracted from groundwater protection areas where water quality is protected by environmental regulations [2].

The groundwater protection areas contain smaller extraction sites [2] which are located close to cities [1]. The water is mostly purified through natural processes [1] [3]. In the next decades a shift is made from many local water treatment plants to larger regional plants [1]. Extraction sites can be connected with more flexibility to this large production plants [1]. Technological progress makes it possible to detect contamination earlier, purify the water better and maintain quality in longer transport processes [1]. Reducing energy and costs are leading factors in this decentralization [1].

ENERGY

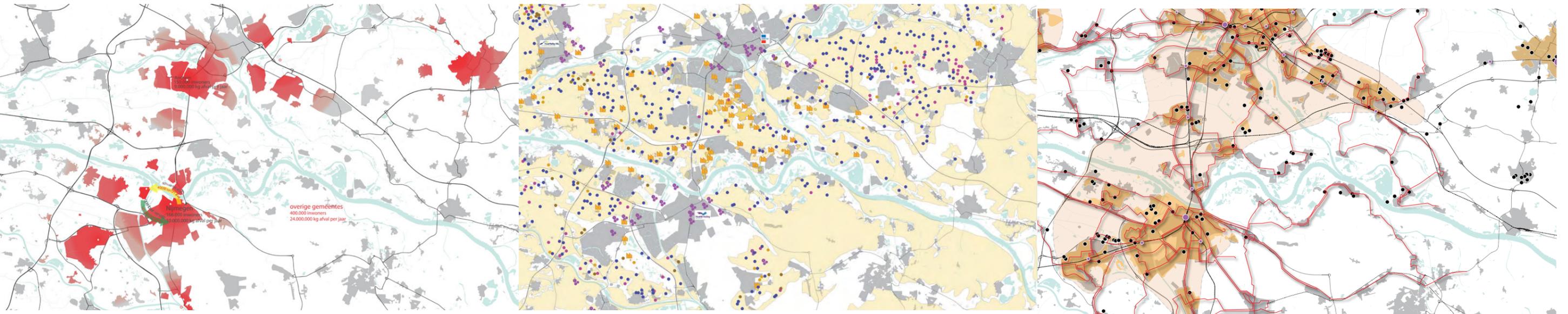
1. Stadsregio Arnhem Nijmegen, Routekaart de groene kracht (2013)
Publisher: MARN, Nijmegen
2. Lysen, E.H., The Trias Energetica (1996)
Publisher: Novem, Utrecht.
3. AgentschapNL, Energiezuinige gebiedsontwikkeling (2012)
Publisher: Servicepunt Duurzame Energie, Zaanstad

WATER

1. Vitens N.V., Zicht op water: Langetermijnvisie win-infrastructuur 2010-2040 (Hardinxveld-Giessendam 2011).
2. Provincie Gelderland, Drinkwaterkrant (Gelderland 2007).
3. CMO, Drinkwater (van <http://www.cmo.nl/> op 06-12-2013).
4. Kilian Water, Wat is grijswater? (van <http://www.kilianwater.nl/nl/grijswatersystemen/wat-is-grijs-water.html> op 07-12-2013).

RESEARCH TECHNOLOGY

SANDER DE BRUIN
BERT VAN DER HEIJDEN
RICK DE LANGE
PAUL MUSELAERS
JORIS VAN DER VORST



WASTE DISPOSAL

Joris van der Voort

Waste in the valley is being processed like the other basics needs in the area; central plants incinerate the waste. The scale of this process is too large. For the valley to benefit from the heat that the plants are generating, the current infrastructures have to be scaled down, so the process becomes more efficient.

However, there are benefits from the current waste-disposal processes. The city of Nijmegen has for example over a 100 busses driving on the energy, provided by burning biologic waste. This energy is also able to be scaled down, so houses can use their own biologic waste to create energy.

FOOD PRODUCTION

Paul Muselaers

To develop a self-sufficient region, a cyclic food-strategie must be formed. This will be determined by the required and available farm-lands. The valley is pressed between two nature reserves in the north and the south. The lands in between are farming- and dwelling-ground. The food-production grounds are mainly used for cattle, with a slight concentration in the east, and greenhouses in the center [1+2].

Food-production claims almost 45% off the surface area off the landscape. 60% for human consumption, and 40% for our cattle. Next to this, 30% off the food is being imported [3]. We need almost 2500m² productionground per person. If the region would become self-sufficient. Ten time the surface of the dwelling grounds must be used for intense food-production [3+4].

Innovations in food-production are mainly visible in two sectors: the agro-food [5] ('food-valley' focus) and the greenhouse sector [6].

TRANSPORTATION

Rick de Lange

The biggest energy consuming industry within our daily lives is the transportation industry. Over 20% of our total energy consumption is dedicated to keeping our lives running [1]. This large amount of energy consumption is partially caused by the industrial transport industry, but the personal transportation sector will be most likely to change within the next decades.

An average person travels about 28,3km a day [2]. Whether this is by car, train, bicycle, or car is evident. Within the personal transportation sector huge technological developments are upon us. Within the next two decades electric or hydrogen fuel cell modes of transport will become common use. Reducing the emission, but also lowering the amount of energy used to get from point A to B [3].

A scaled down valley will reduce the average km travelled by a person each day. The current transportation network of the WaalRhineValley could be optimized. Sustainable centralized public transportation in combination with shared individual transportation are the future of the Valley.

SOURCES:

WASTE

1. bron 1
2. bron 2

FOOD

1. CBS Statline, Landbouw; gewassen, dieren en grondgebruik regio's Gelderland
2. Provincie Gelderland: Geoweb Energie-atlas
3. Food City: www.youtube.com/watch?v=-CP5Z4-IPrg&feature=related

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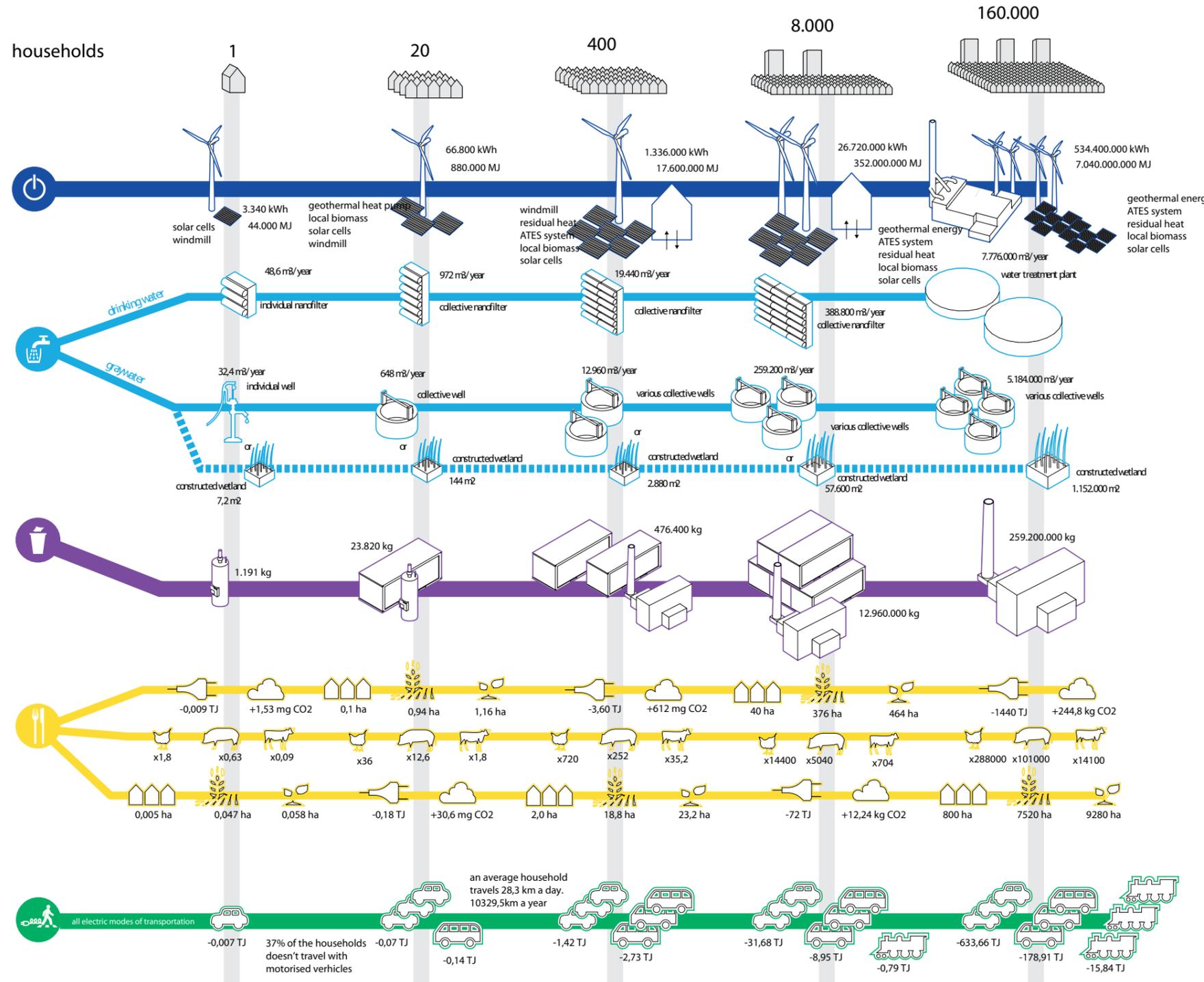
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RESEARCH TECHNOLOGY

SANDER DE BRUIN
BERT VAN DER HEIJDEN
RICK DE LANGE
PAUL MUSELAERS
JORIS VAN DER VORST



To get a complete insight into all of the elements involved to keep a sustainable society running a scheme was set up.

The scheme is based on the needs of 1 household to become self-sufficient. By multiplying the societies capacity by 20, several technological developments were tested on scalability. Different techniques apply to different scales of societies to become efficient. Some techniques become more efficient when the scale of a society becomes larger, and some decrease in efficiency when applied in larger scale.

ENERGY

Solar panels and windmills are the most efficient sustainable solutions on small scaled societies. On a larger scale, solar paneling solutions will still be efficient, but will take up a lot of square meters. Geothermal energy sources become more efficient.

WATER

Water purifying installations are pretty straightforward. They can be obtained for different scales, and can only be replaced on the largest scale by water treatment plants. Grey water can however always be obtained. Within larger societies it's more efficient to use centralized wetlands instead of decentralized structures.

WASTE

Only on a larger scale will it become efficient to collect waste that can be transformed to bio-gas based energy. Currently the smallest installations available have to process 100kg a day to become efficient.

FOOD

The amount of land needed to become self-sustainable in food largely exceeds the amount of land available in the WaalRhineValley. Efficiency is best on smaller scales. Larger societies will thrive best on centralized food production.

TRANSPORTATION

Transportation is adaptive. On larger scales transportation is most efficient when centralized. On smaller scale, door-to-door solutions far exceed centralized systems in efficiency.

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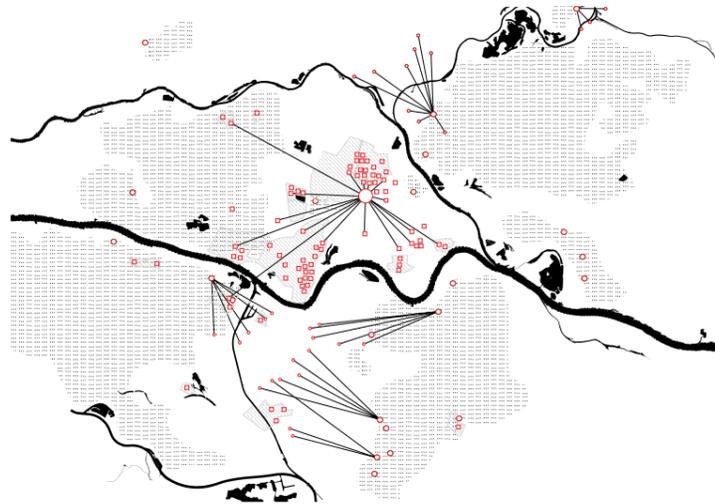
Wageningen Universiteit en Brabantse Milieufederatie

TRANSPORT

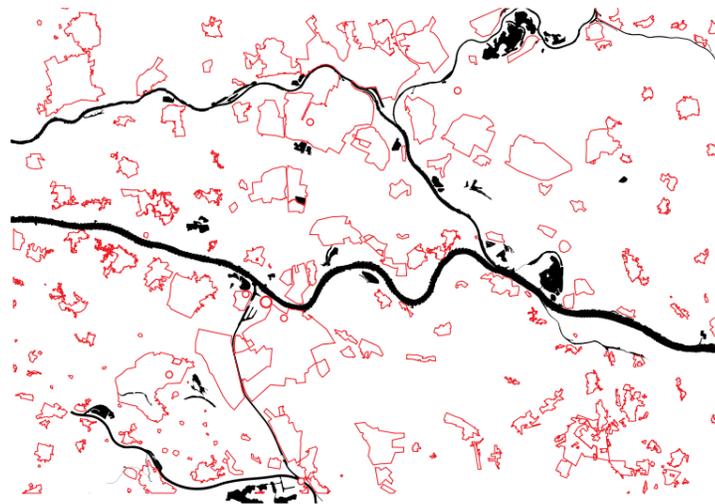
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RESEARCH TECHNOLOGY

SANDER DE BRUIN
BERT VAN DER HEIJDEN
RICK DE LANGE
PAUL MUSELAERS
JORIS VAN DER VORST



the food production in the valley happens on a large scale



energy production and waste centers are located in the middle of the valley, so most depend on these recourses



Joris van der Vorst

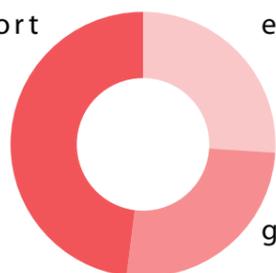
The valley has to be cut up into self-sufficient parts. We have to start thinking of what the user, the habitant of the valley, needs. The valley will practice a new kind of urbanism, that's built on the existing context, and will consist out of self-sufficient clusters. Social networks will connect the clusters together, so the valley becomes a grid of clusters.

The self-sufficient clusters of the valley have to be in balance; it has to provide in all of it's own basic needs, therefore it cannot afford to spill. It will be setting the example of how we should design with the large amount of water, the changing climate and new social structures.

To find a location for this project, the location has to provide in every basic need of the habitant. Energy, warmth, water, food and disposing of waste are the five basic needs that will form the basis of the design. The flowing rivers in the valley benefits this project, so the location has to take advantage of that and start the project near the water. The graph on the left shows the older (built before 1920) and newer area's of the valley to split up into self-sufficient clusters. The other area's are industrial area's.

The different types of buildings will define the clusters when they are built in existing context.

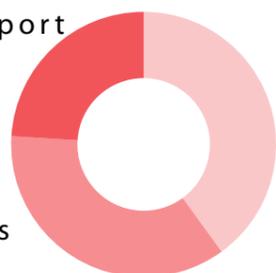
transport



electricity

gas

transport



gas

RESEARCH SOCIAL, HOW ABOUT LIFESTYLES NOW

LIFESTYLE : A DEFINITION

Author: Thomas van Weert

When discussing “evolving lifestyles” the meaning of these words needs to be defined. The literal translation of “to evolve” is “to develop or achieve gradually”. Time is an important factor in this word. Since our graduation studio is focussing on the future, time is a crucial ingredient.

The translation of “lifestyle” is more difficult. Literally it means “a way of life or style of living that reflects the attitudes and values of a person or group”. But what are the elements in “a way of life” or “style of living”?

One can define 4 elements in way of life. The traditional 3 are dwelling (where and how do we dwell/stay/reside), working (where and how do we work) and leisuring (how do we spend our leisure time). We add a social aspect of interaction between people.

A description of how we live now is only moderately interesting. Fascinating however is what is about to change in these domains. How will the lifestyles of the future be different from our lives today? We have researched indicators of change, happening now, considered to be permanent and structural.

RESEARCH SUBJECTS ON CHANGING LIFESTYLES:

DEMOGRAPHIC CHANGES

growth/shrinkage
aging population

CHANGES IN SPATIAL DEVELOPMENT

spaceclaim per capita
Private collaborative Initiatives

SOCIAL CHANGES:

Collaborative economy, sharing,
involvement, control and initiative

INCREASED AWARENESS

Ecology / sustainability
Food

ORDINARY LIFE, LIFE AS WE KNOW IT

Author: Babak Jabery

TRADITIONAL LIVING

Every resident has only its own living space. There is no space shared with other residents in the neighborhood. It is possible that certain rooms in the house are not often used.

COLLECTIEVE HOUSING

This lifestyle is mainly used in the Netherlands for student housing and senior housing.

It is a style of living where each of the residents have their own private residential space such as living room, bedroom, kitchen etc. There is also a common room available for all users. The communal space is shared by all residents. This way, there is interaction between the residents and the spaces are useful classified and used.



2 FUTURE LIFESTYLE SCENARIOS

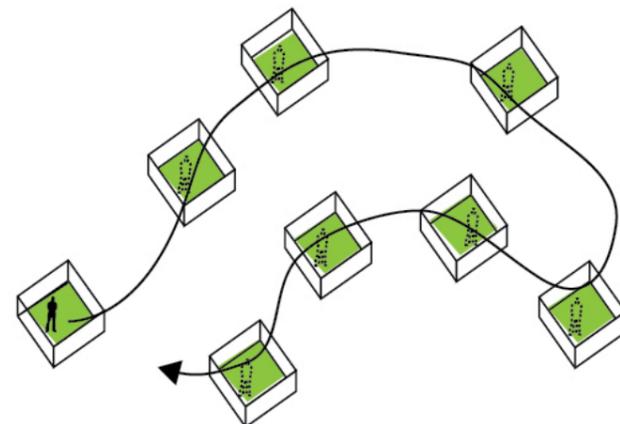
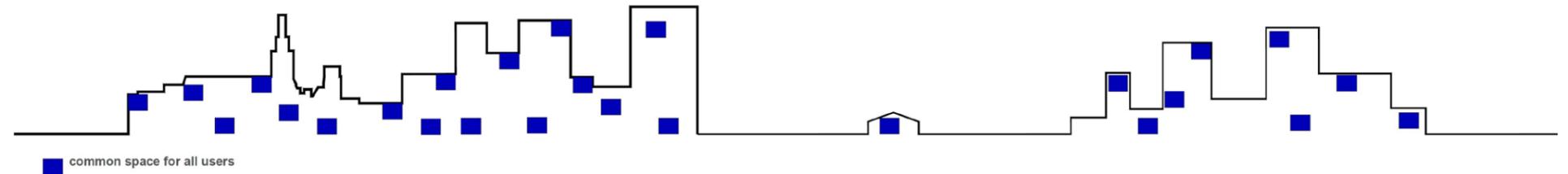
FUTURE NOMAD

Author: Jelle Segeren

AN EXTRAPOLATION OF OUR INDIVIDUALISED SOCIETY SHOWS AN EXTREME FORM OF SHARED SPACES IN 2040.

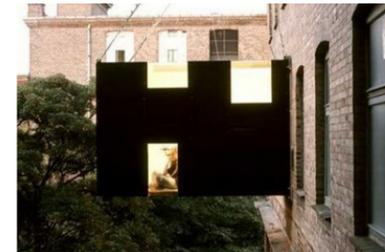
Freedom is recognized as our most valuable asset. Experience and enjoying are more important than owning. There is less need for physical storage, we are unleashed from our possession. `Het nieuwe werken` freed us from our desk, Living2,0 has become location independent. "Home" en "house" are no longer inextricably bound.

"The Urban Nomad" has adopted flexibility and agility in the choice for habitat. Owning property has been renounced, and limited to the bare essentials. Mobility is maximized thanks to technological advancement. Use of space is limited, by sharing different places to stay with lots of people. The living environment can be "chosen" to fit specific needs at specific times. It facilitates a more diverse living environment much more based on experience then on possession.



total space $8 \times 40 \text{m}^2 = 320 \text{m}^2$
 á $40 \text{m}^2 \text{p.p.}$

Future nomad cuts on the spaceclaim per person:



FUTURE NOMAD

Author: Babak Jabery

Compared to traditional living where every resident has only its own confined living space and where there is no space shared with other residents in the neighborhood. It is even possible that certain rooms in the house are not often used.

In the future nomad scenario there is no permanent residence and the members of the community share every available space with each other. The use of rooms is determined by the daily activities for the residents. your place to stay will be according to your specific needs at that time. This lifestyle is suitable for work at various locations in the city. Added benefit is that the travel distance to work may therefore be less, and in lower frequency.

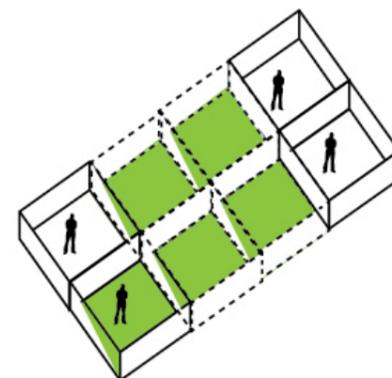
COMMUNITY THEMEPARK

Author: Jelle Segeren

THE SHARING-SOCIETY TAKES SHAPE AS PRODUCING COMMUNITIES IN 2040

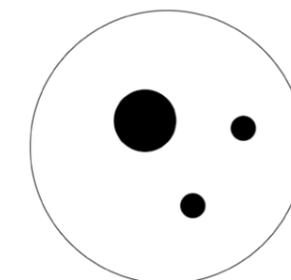
Further decentralization of our cities will be facilitated by entrepreneurial citizens. Many "theme" organized communities will be the "centers" in an extensive network. like organs in a body each its own specialty. Energy, Food, water etc.

After the first stages of city transition where small communities aimed for autarchy and self-sufficiency on all levels, common sense was that a decentralised city in wich specialised communities provided for specific needs was the better solution.

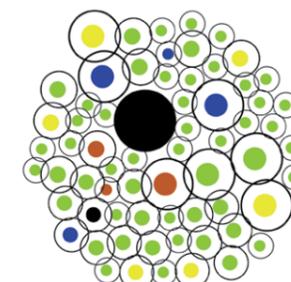


total space $8 \times 40 \text{m}^2 = 320 \text{m}^2$
 á $200 \text{m}^2 \text{p.p.}$

Sharing space in a community. Useable space per person is huge, while total spaceclaim per person is limited.



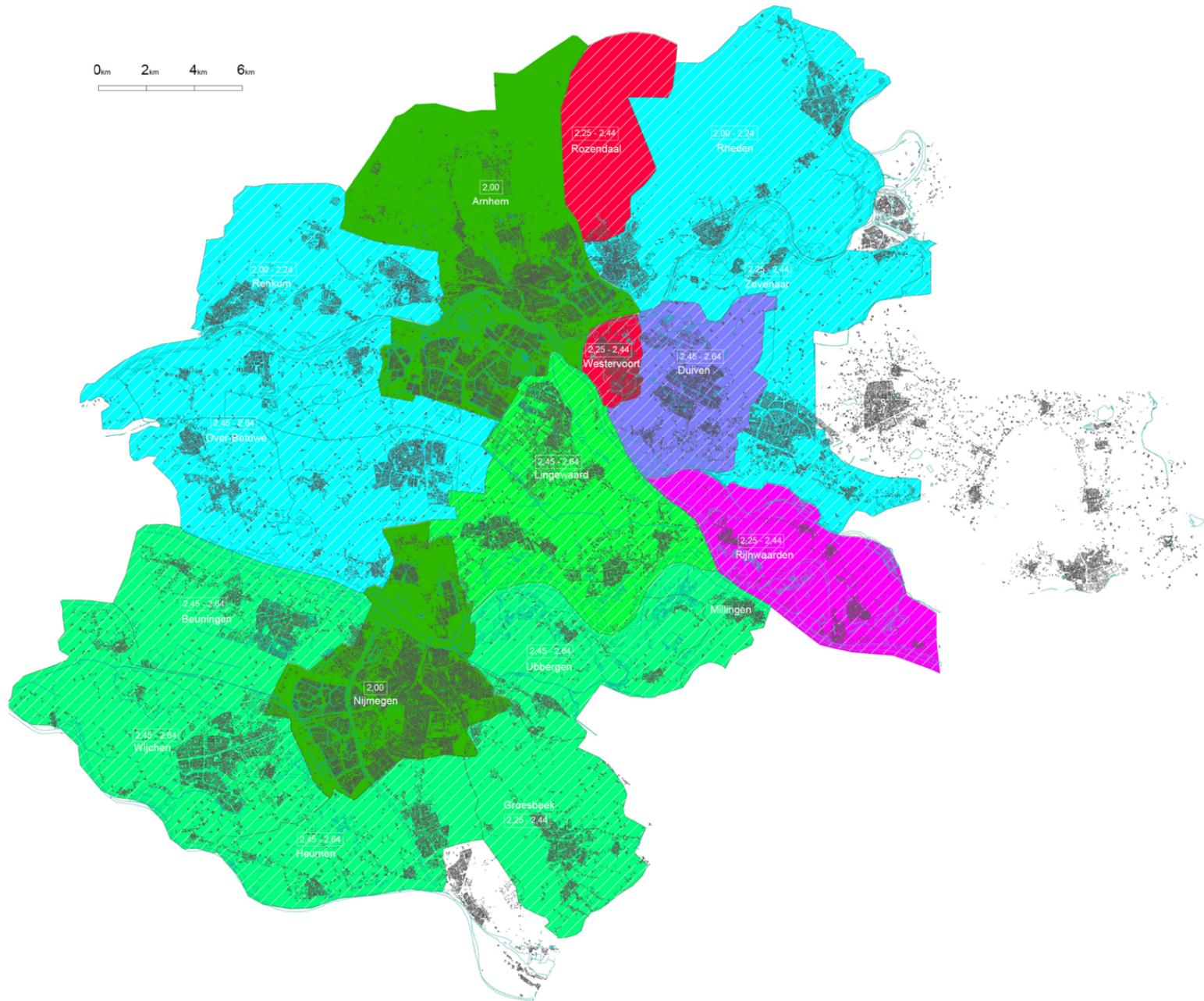
Traditional City with Central Amenities. High dependency and little control by residents, little redundancy and high mobility.



Decentralised City built of clusters of producing communities, each its own specialization. Energy, Food, Water, knowledge. It has high redundancy, high control and influence by residents. Limited mobility.

DEMOGRAPHIC CHANGES

0 km 2 km 4 km 6 km



GROWTH AND SHRINKAGE

Author: Babak Jabery

The city region Arnhem and Nijmegen is considered a strong economic region. It is predicted by CBS that the region will continue its growth and consequently its need for new housing development. In the period 2010 to 2024 the natural growth is the key growth component. According to the forecast model is the key growth component from approximately 2025 foreign migration. The growth is also encouraged by the increase in the number of single person households. This affects the demand for housing and facilities. It is predicted that in 2040, the cities of Arnhem and Nijmegen will be dealing with a population growth of 7.3%

which is higher growth in comparison to the whole of the Netherlands. However, in some regions of the countryside the population is in decline and the aging population will rises to 25%

Shrinkage in certain parts of the region can also lead to declining income and facilities resulting in the restructure or demolition of existing buildings. It should be kept in mind that the effects of such changes usually have huge financial and social consequences. In addition, the demographics in certain parts of the area are changing, for instance the number of young people is decreasing. As a result, the potential labour force will reduce.

- Shrinkage and growth population 2040 compared to 2010 : Growth > NL
Shrinkage and growth potential labor force 2040 compared to 2010: 0% - 15% Shrinkage
- Shrinkage and growth population 2040 compared to 2010: Growth < NL
Shrinkage and growth potential labor force 2040 compared to 2010: 15% - 20% Shrinkage
- Shrinkage and growth population 2040 compared to 2010: Growth > NL
Shrinkage and growth potential labor force 2040 compared to 2010: 0% - 5% growth
- Shrinkage and growth population 2040 compared to 2010: 10% - 15% Shrinkage
Shrinkage and growth potential labor force 2040 compared to 2010: 20% - 25% Shrinkage
- Shrinkage and growth population 2040 compared to 2010: 20% - 25% Shrinkage
Shrinkage and growth potential labor force 2040 compared to 2010: More than 25% Shrinkage
- Shrinkage and growth population 2040 compared to 2010: More than 25% Shrinkage
Shrinkage and growth potential labor force 2040 compared to 2010 More than 25% Shrinkage

65+ in 2040 25% or more

average householdsize

DECREASING HOUSEHOLD SIZE

In the last few years, the number of single person households in Gelderland has grown faster than the multi-person households and this has caused the need for new housing. In 2010, 33% of households in the region are single. It is predicted by CBS that this proportion will increase to 39% in 2050.

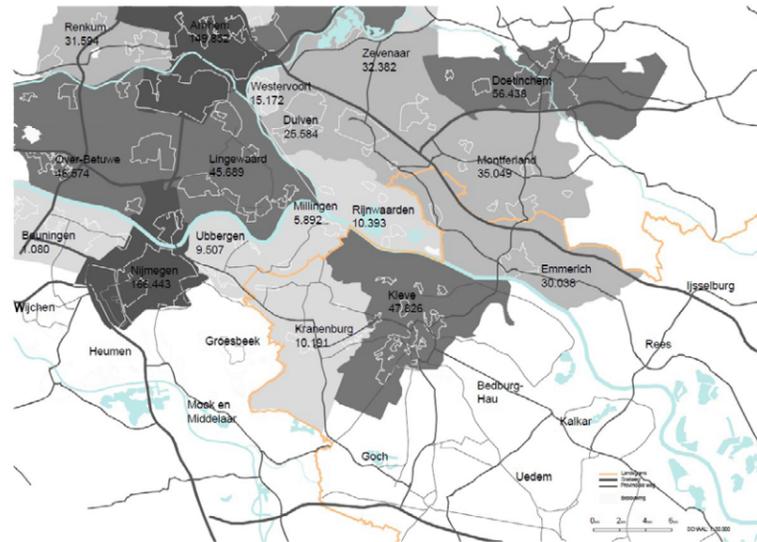
AGING POPULATION

Around 2019, 25% of the citizens are 65 years or older. In 2010 there are for every retired citizens over four potential labor forces. This number will drop to about two potential workers per persons over 65.

Statistics from CBS

DEMOGRAPHIC CHANGES

POPULATION



GROWTH OF POPULATION

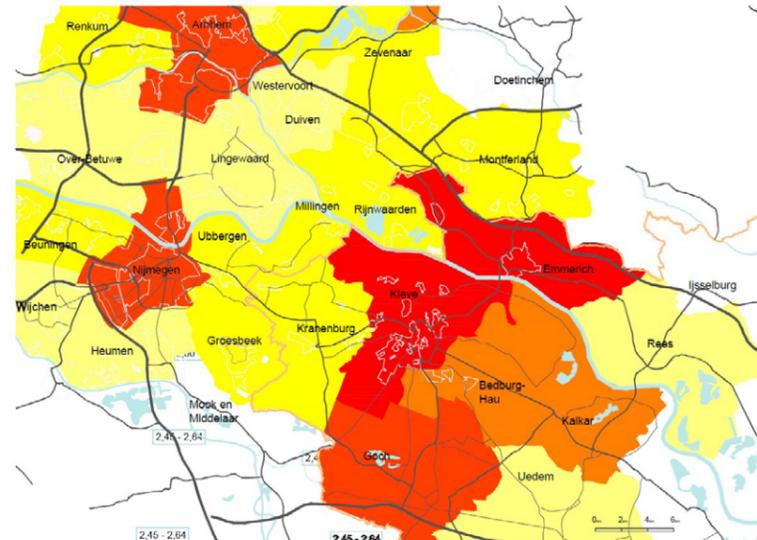
Author: Thomas van Weert

The next two decades the population in the region will grow. In all 22 municipalities in the region, including the German ones, the population will grow from the current 797.000 to a future 863.000¹. This is an 8,3% increase.

In the same period the global population will grow a staggering 20%, from a current 7,18 billion to 8,62 billion in July 2033².

1 Statistics from Gelderland and Kreis Kleve
2 www.worldometers.info/world-population

UNEMPLOYMENT RATE



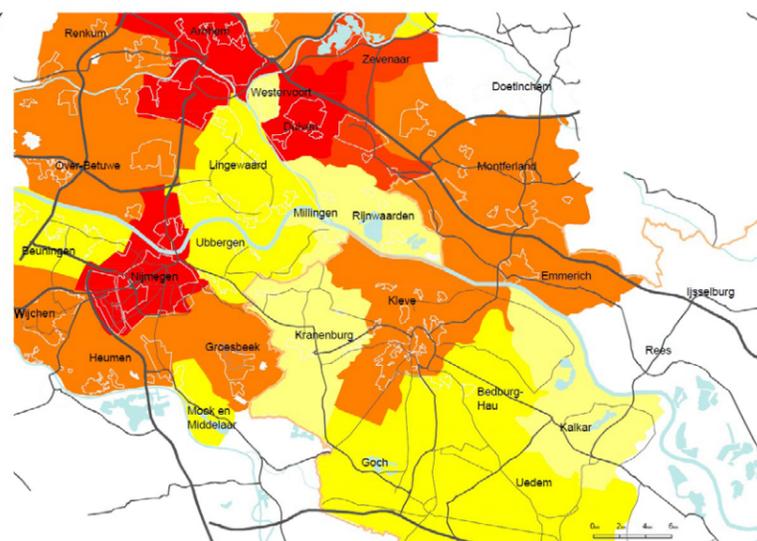
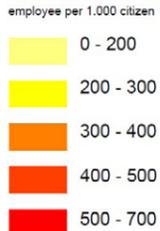
EMPLOYMENT

Author: Babak Jabery

In terms of the density of jobs, cities Arnhem and Nijmegen are the highest in the area. This is partly made possible because of presence of universities in Arnhem and Nijmegen, allowing young people move to the cities, and that has a positive effect on the job market.

Statistics from CBS

EMPLOYMENT DENSITY



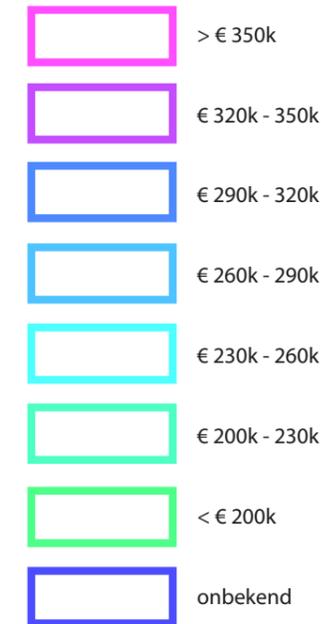
SUPPLY AND VALUE OF HOUSES IN REGION

Author: Thomas van Weert

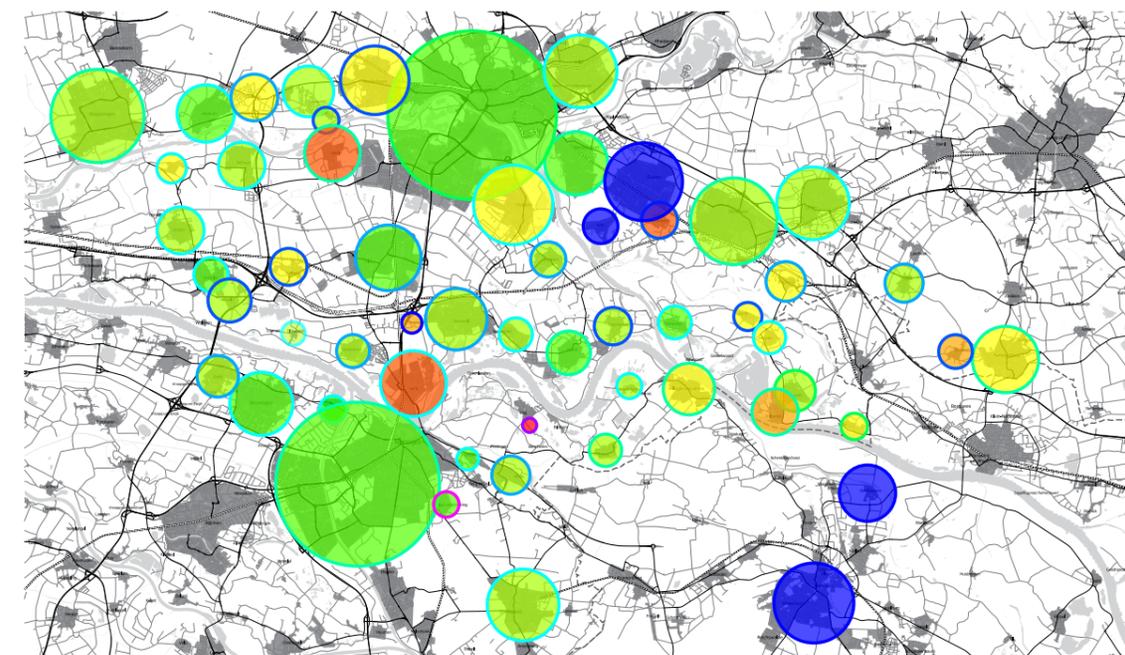
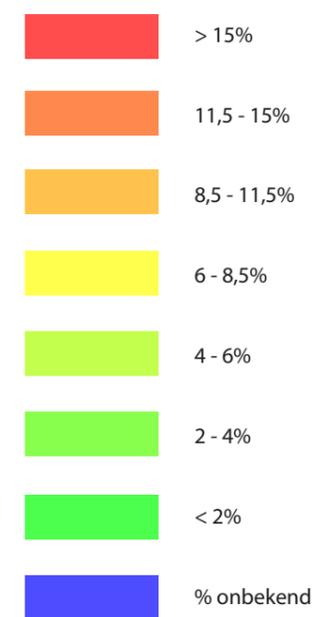
In order to find a connection between the location of a municipality and the supply and value of houses research was done using numbers from CBS and Funda.

The absolute supply of houses logically is greatest in the cities, but what strikes percentage-wise is that some municipalities close to Arnhem and Nijmegen (Lent and Driel) have a relatively large amount of houses for sale: people apparently want to leave. There are no areas in the region where prices vary greatly.

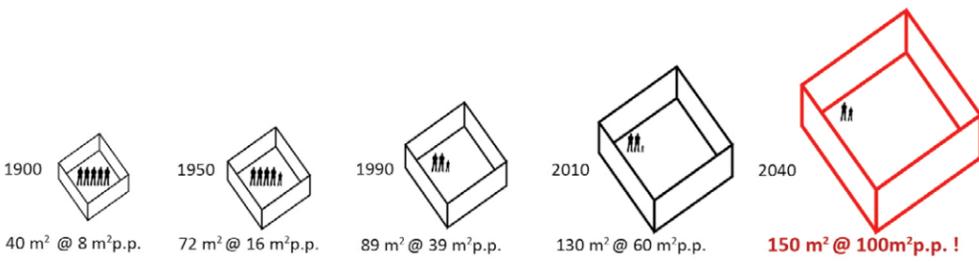
Average value of houses in this municipality



Percentage of houses for sale vs. total amount of houses

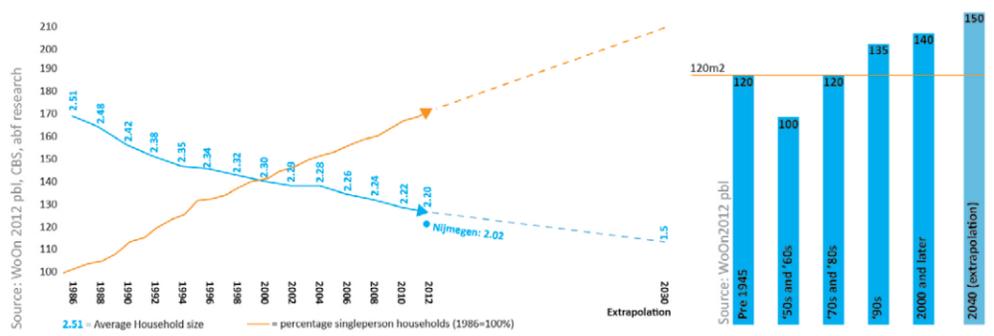


SPACECLAIM



Sources: Rudy Uytenga, Cities full of space 2008 & CBS, Statline 3-10-2013

History and future of spaceclaim for living per capita



Householdsize and % of singleperson-households
Size of dwelling (m²) and year of building

EVER INCREASING SPACECLAIM DEMANDS ALTERNATIVE

Author: Jelle Segeren

Past decades our dwellings have grown to become our huge personal palaces. Facilitated by economic prosperity and little awareness and consciousness of our footprint. We have locked ourselves up in concrete boxes, and apparently felt obstructed by that. So we started making our boxes bigger and bigger, little by little.

An average newbuilt house in the Netherlands now counts approximately 140m².¹ Almost 1,5 time that of pre war buildings. At the same time our demography is changing throughout the nation. Households are becoming smaller, we are breeding less offspring, and are more often choosing a lifestyle without a partner. The average household in The Netherlands is now close to 2 persons², in urban regions even lower. Still living in the same houses built some years ago, these small families account to an astonishing spaceclaim of almost 100m² a person, 6-fold of that of a century ago³.

We need an alternative on the use of livingspace. Especially because of the enormous waste of built space, and thus materials.

Lets start sharing!

1 cbs statline, may 2013
2 pbl, WoOn2012, abf research 2012
3 Rudy Uytenga, Cities full of space 2008



CHANGES IN OWNERSHIP ALTER SPATIAL ORGANISATION

Author: Thomas van Weert

Past decade the sharing economy has grown rapidly. There are numerous platforms to share goods and services¹. In our built environment this translation isn't as visible yet, but our workplace has already been influenced by "Het Nieuwe Werken" (from now on "HNW", generally defined as "working when and where you want to").

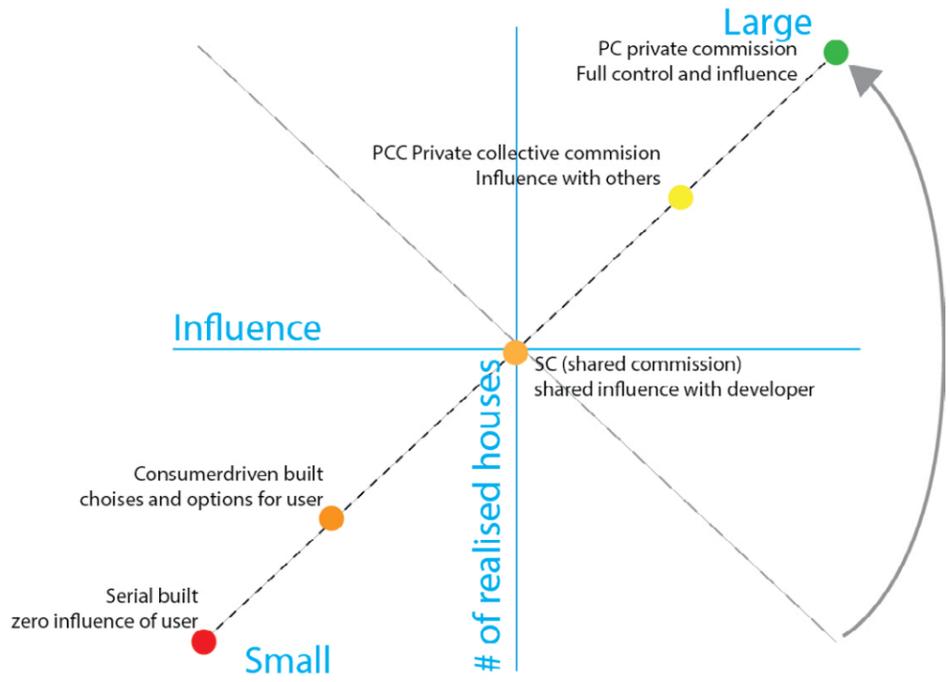
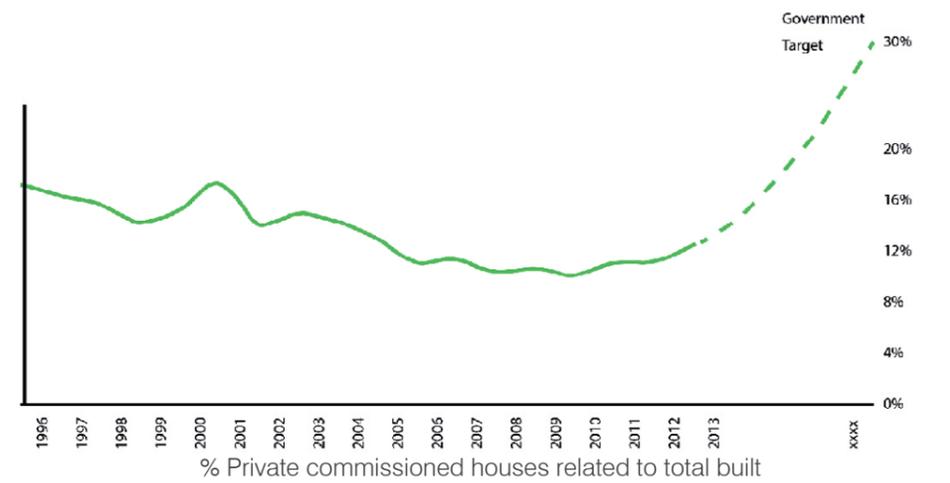
Because of efficiency the workplace shifted from everyone having their own space towards a more flexible workplace. An employee can easily work from home or on the road, and when at the office he or she can plug in a laptop anywhere.

This has great financial and social benefits for The Netherlands. Approximately 700.000 Dutch employees could work in a HNW setting. This would save 2 billion euro in the year 2015². Social benefits are happier employees, a better balance between work and personal/ family life and a better image as a company.

There also are some points of attention. The amount of contact between employees is lower while people still like to get in touch with colleagues. And the balance between work and personal/family life is not only a blessing, because it gets easier to continue working day and night. Also an open office area is not the best suited workplace for a more introvert employee, who benefits from seclusiveness and gets distracted easily. We shouldn't loose these points out of sight.

A future translation of the changes in the sharing economy in our dwellings can be expected. Why does everyone need a separate study room or a guest bedroom? Will people find new ways to live together the coming years? To share their space, to efficiently make use of the resources used to build our environment?

1 Also see article "Collaborative or "shared" economy to equal "regular" economy " in this report
2 Report PWC about HNW and numbers from CBS



Tipping the scale, shift of influence towards private commissioned houses

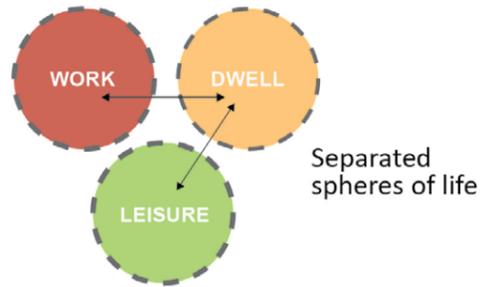
ARE FUTURE HOUSING DEMANDS TO BE FULFILLED BY PRIVATE COMMISSIONS?

Author: Jelle Segeren

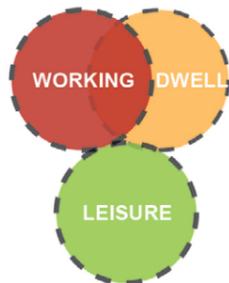
Government policy to stimulate private commissioned building did not yet have its result. There is an increase, and the number of private collective plans is increasing. However the number of serial or developer built homes has decreased significantly. Private commissions or building in groups favours "own" expression and non-economic motives and therefore has the future.

SHARED SPACES

life



Separated spheres of life



Homeworking



"3^d workplace" working on the road in a cafe etc.



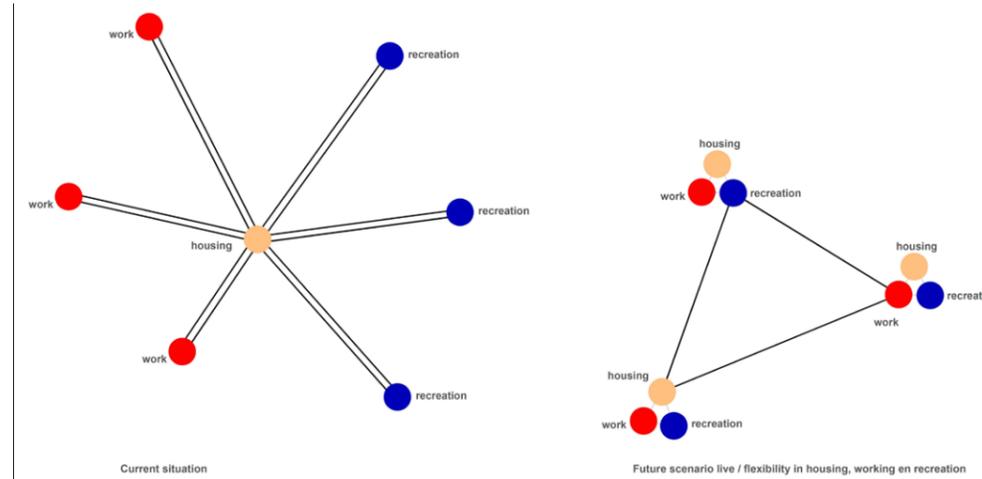
Merged life

A MERGE OF WORKING, DWELLING AND RECREATION

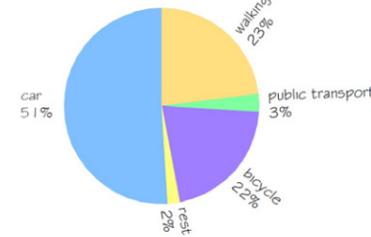
Author: Jelle Segeren

Working, dwelling, and leisure are merging¹. We are no longer limited to one location or environment to live or work or recreate in. Working at home has already become normal practice in many occupations, the rise of the 3^d workplace is an indicator of a further changing mindset on work vs private time. Working in the cafe, 20 years ago you would have been institutionalized just for suggesting it. Surely we do that for pleasure also. The difference between recreation and working could completely disappear. Not by giving up the escape from hectic stressful work, but by using our skills currently suppressed by our job-descriptions. A secondary "job" for diversity, a change of environment. Who needs spare time anymore?

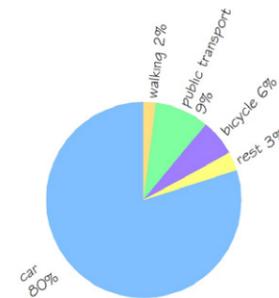
¹ Cbs Statline, May 2013, increase of "working at home"



Now

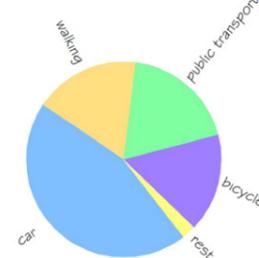
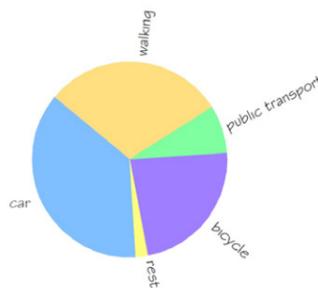


Used transport



Traveled distance

Alternative scenario



TRAVEL PATTERNS

Author: Babak Jabery

With business and leisure travel, we lay the greatest distances annually¹. In a scenario where people live alongside their workplace, place of recreation the travel distance could be smaller. The location of the residence is connected with the location with the work and recreation. The use of public transport and bicycles will increase. The residence can be shared with other users of this new style living. Thus, it is necessary to make use of a good work/ living planning.

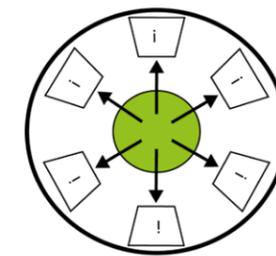
¹ www.vrijetijdtoerisme.nl and Cbs, 2013



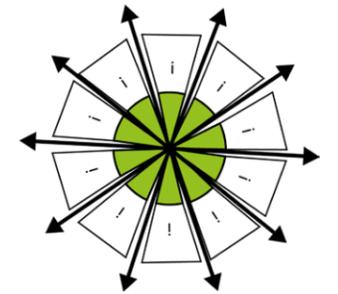
Kibbutz Eim Harod



Cohousing "centraal wonen hilversum"



Old school community:
Introvert, shares with intimate circle -
Common property, individuals "use" space -
Static -



Community 2.0:
- Extrovert, shares externally
- Individual property "shared to a collective"
- Dynamic

COMMUNAL LIVING, REFERENCES

Author: Jelle Segeren

Communal living isn't new, It has been around for ever. Starting with the first settlers that had to stick together for protection. In more recent history communities are mostly formed on religious basis, or strong ideologies.

The Kibbutz is a collective community in Israel that was traditionally based on agriculture, but nowadays are not scarcely replaced or expanded by other branches. Started as religious community they now have an enormous economic contribution¹.

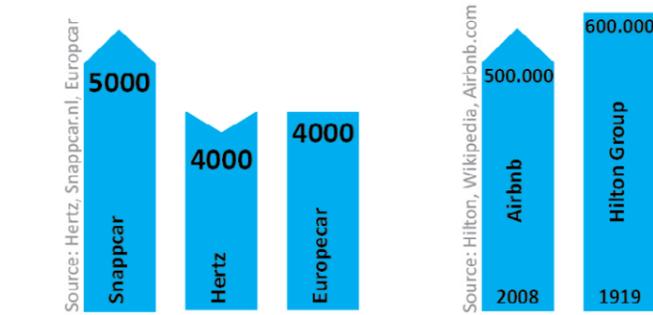
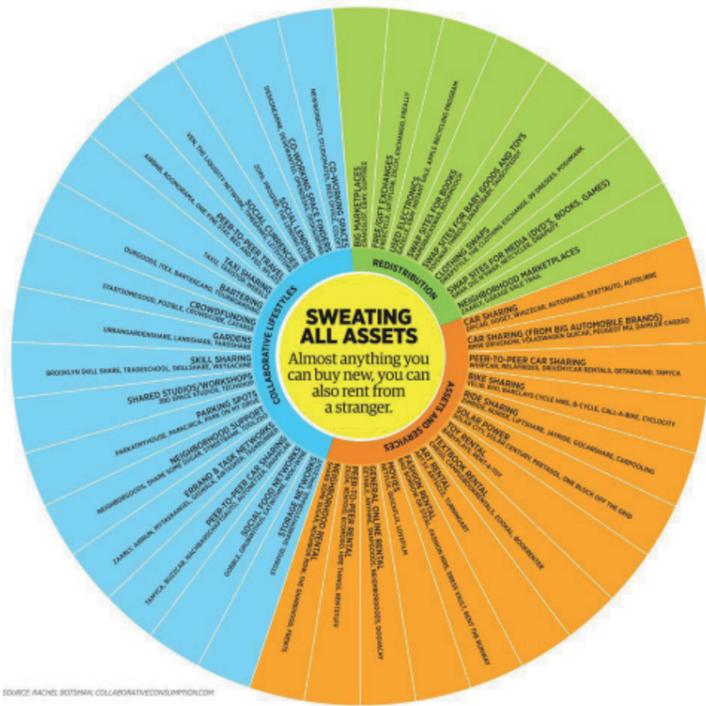
Cohousing (centraal wonen in Dutch) is a form of living where people consciously choose to live together and where households have a separate dwelling or housing unit available, and common areas and facilities for sharing².

Both are examples of "Old school communities" very introvert and sharing only within borders. The community of the future is extrovert and "members" will be part of multiple communities, facilitated by technology.

¹ Kibbutz reinvents itself after 100 years of history

² LVCW.nl, national association for cohousing in Netherlands

SHARING FOOD AND RESOURCES

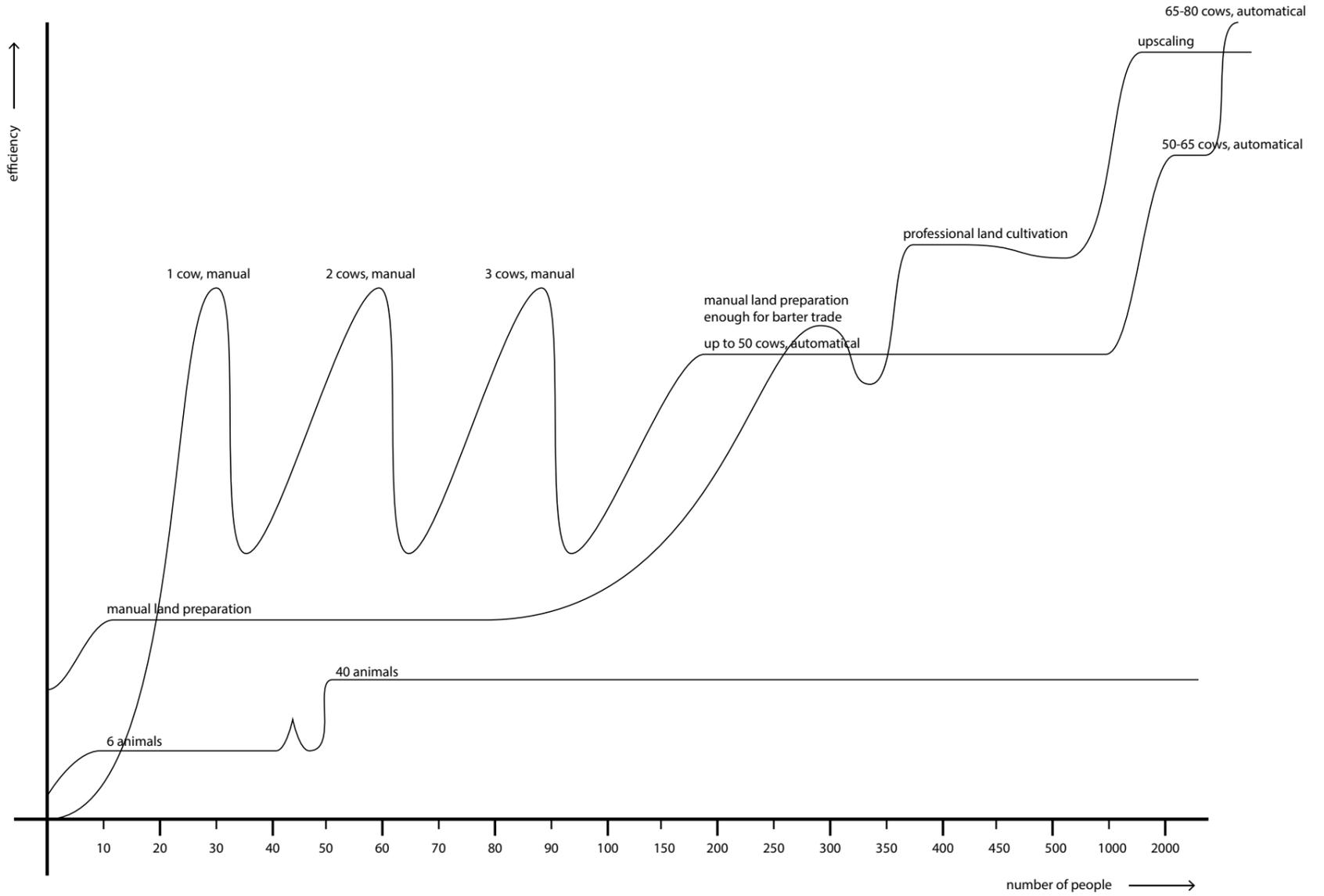


Snappcar fleet comparison
 Collaborative or "shared" economy to equal "regular" economy
 Author: Jelle Segeren

"Research shows that ... a new realism is emerging. People anticipate on own initiative and expect less of their government.¹ Illustrative to that is the uprising of all sorts of sharing and collaborative initiatives. Some of them now have now matured. They even have a coverage and magnitude comparable to traditional corporations² and are experiencing growth that is unknown to the traditional companies.

It appears that truly anything you can do alone, you can do better together. It requires a new businessmodel to gain traditional economic profit. But most initiatives focus on alternative values at first.

¹ Motivaction, "tegenstand eigen verantwoordelijkheid slinkt"
² collaborative consumption.com, Hertz.nl, Europcar.com, snappcar.nl airBnB.nl and Hilton.com



AUTARKIC FOOD SUPPLY ON 1/2 OF CURRENT AGRICULTURAL LAND
 Author: Milou Wijsbeck

To a new way of living and thinking, belongs a new way of eating and supplying in our basic needs. Food production will be downscaled because of the possibility of self-reliance. For example, a great part of the basic need in starches will be provided in grain instead of potatoes, because of the smaller amount of land that is needed to produce grain. Also the consumption of pork meat will be less regular. This meat costs a great extra amount of land in animal feed. A more efficient solution is the consumption of chicken or fish. In an autarkic society fishing will fulfil a great role.

In a situation where the basic needs are attuned to self sufficiency and we are no longer relying on import, an autarkic lifestyle can occur. According to the research of the LEI institute¹, in this way the whole population of the Netherlands can supply in their food on 20 to 50 percent less agricultural land than in the current situation. This is based on a number of changes in diet, but the profit is huge when we are no longer dependent on import. Starting from this conclusion we can state a number of ideal sized communities².

¹ Terluin, I., LEI-repot, Food supplies in the Netherlands under extraordinary crisis conditions (Den Haag: February 2013)
² AFBEELDING L Study by Joris van der Vorst, Nathaly de Graaf, Rick de Lange and Milou Wijsbeck, showing the most efficient sizes of communities based on food autarky.

ATTITUDE TOWARDS FOOD AND RESOURCES

HISTORY OF FOOD AND PRODUCTION

Author: Thomas van Weert

Food has been the most important factor in survival. There has been a clear development in the way we as humans obtain and eat our food. The early humans had a hunter-gatherer diet, before fire was discovered only eating raw food.

There was an early shift when people started living in cities. Crucial tasks were divided, farmers producing food not only for themselves, but also for others. The city overlooked the countryside, keeping the people safe from attacks. The countryside provided the city with the necessary food. There still was a clear connection between food and the people. The way food was transported into cities literally shaped the city in the past. You can still recognize this in the names of streets and markets in some cities¹.

It slowly evolved towards the dietary patterns we see nowadays. Production has been intensified as a response to the increasing demand for food. Pesticides have been developed to fight diseases and to get higher yield. Organisms have been genetically modified to grow faster, straighter and more colourful, to be less susceptible to diseases. Food is being transported all around the world. All these phenomena have gradually alienated people from their food.

GROWING AWARENESS OF ECOLOGICAL FOOTPRINT

Author: Thomas van Weert

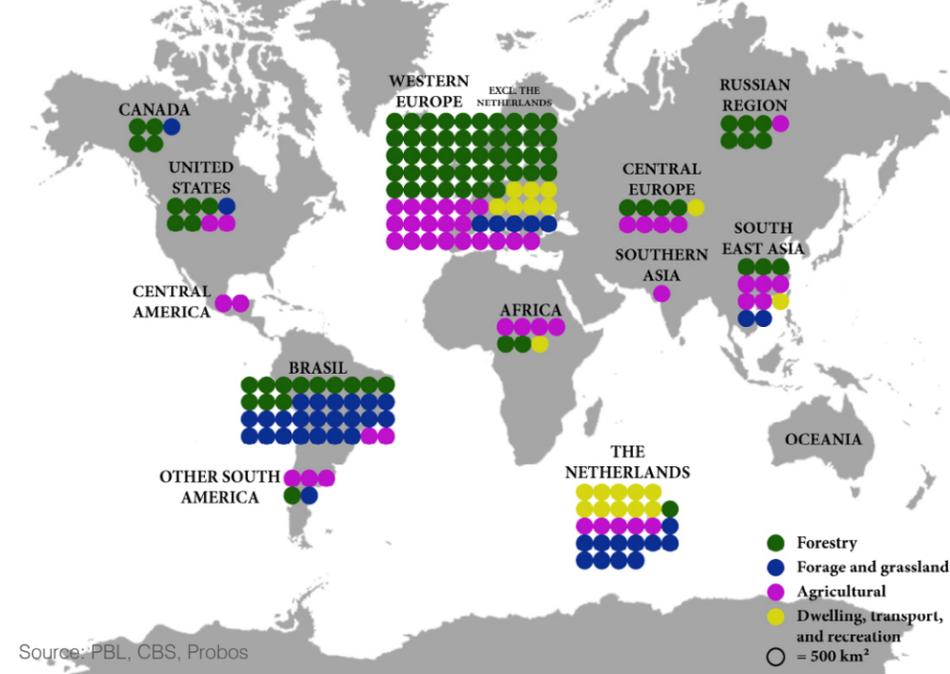
Ecological footprint is described as “the amount of productive land appropriated on average by each person (in the world, a country, etc.) for food, water, transport, housing, waste management, and other purposes”². The global footprint is normally given in global hectares (gha for short), the amount of hectare or productive land across the world a person needs.

The ecological footprint of people around the world varies greatly. Generally speaking people in the Western World have the largest ecological footprint, and people in the Third World have the lowest. The latest global research on the subject was done in 2007, and published in 2010³.

The world-average ecological footprint in 2007 was 2,7 gha per capita (18 billion in total). With a world-average biocapacity of 1,8 gha per capita, there is a 0,9 gha

1 Carolyn Steel; Hungry City, How food shaped our lives
2 www.thefreedictionary.com
3 www.globalfootprintnetwork.org

GLOBAL USE OF LAND FOR DUTCH CONSUMPTION, 2005



Source: PBL, CBS, Probos

Map of the world, showing where resources used for Dutch consumption are coming from

ecological deficit per capita. The Netherlands' biocapacity is 1,0 gha per capita, and the ecological footprint is 6,19 gha per capita, leaving a ecological deficit of 5,19 gha per capita⁴.

When calculating the ecological footprint several factors are taken into account, such as transportation, food and dwelling. A big part of the ecological footprint in the Western World is taken by food.

RENEWED APPRECIATION OF LOCAL FOOD

Author: Thomas van Weert

Last years the Dutch society gained more interest in local food. This renewed appreciation has several reasons, but mostly it's because people want to know the background of their food, assuring them it hasn't been treated with harmful chemicals or genetically modified, and there are no doubtful additions. This seems like a hint to the past. Locally produced food is often related to organic food, which is also strongly upcoming.

There are more positive effects of locally produced food. One of those effects is the number of foodmiles (the amount

4 chartsbin.com/view/1046

IMPORT AND EXPORT FROM NETHERLANDS TO OUTSIDE EU

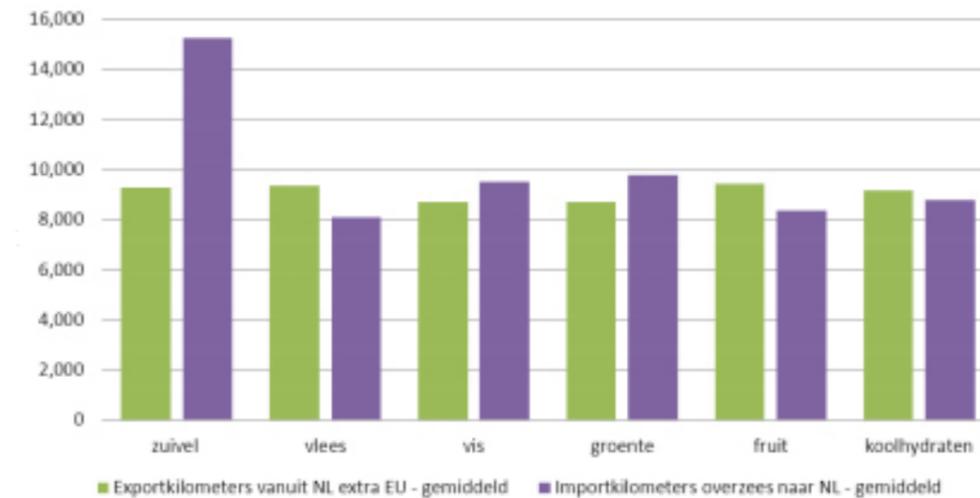


Table showing import and export of 6 groups of food produce to and from countries outside the European Union. In 5 of the 6 groups import and export is almost equal.

of kilometres food travelled before ending on our plate). An Elstar apple bought in The Netherlands usually doesn't travel much more than 100 km, as opposed to a Granny Smith apple that is transported over 20.000 km from New Zealand⁵.

The total number of transporting kilometres for the Dutch consumption is approximately 500 million a year (in 2009), with a spread of 100 million km for factors like load-percentage and loss of goods. About 35% of all food in The Netherlands is imported from abroad, for example only 8% of the dairy products but 82% of the fruit⁶. And what really strikes as absurd is that The Netherlands exports 30.000 tons of chicken to England, and imports 60.000 tons from England in the same year⁷.

Another positive effect is a social aspect. People are getting more in touch with their food when going to a local foodmarket, talking to the farmers and meeting each other. In our busy lives we are taking more time to feed ourselves and get back in touch with family life.

5 Article Trouw: "Hoeveel kilometers heb ik vandaag eigenlijk op mijn bord liggen?", July 6, 2006
6 "Verduurzaming voedselproductie, transportbewegingen van het Nederlands voedsel" by WageningenUR, August 26, 2011
7 "Hoeveel kilometers bevat uw bord", observe.be, March 3, 2009

LIFESTYLES OF URBAN AND RURAL ARE MERGING



PRODUCTION LAND UNDER PRESSURE NEEDS TO PROVE ADDED VALUE TO SURROUNDINGS.

Author: Jelle Segeren

Highly urbanised but in [sub]urban-islands surrounded by agricultural land still, it has a relatively high risk of further urbanisation¹.

Especially in the S-axis there are still islands of high production agricultural land, surrounded by ever growing villages. The fast moving city by Vinex has stopped, but steady growth continues.²

This productionland can protect itself by proving its value to residents of their surroundings. And not only resort to up-scaling to compete in global prices³. When residents are familiar with, and making use of, the qualities of their surrounding they are willing to invest.⁴

1 Milieu- en Natuurplanbureau, "landuse in 2030"
 2 structuurvisie Arnhem, Structuurvisie Nijmegen
 3 ING Food 2030, Samenwerking vanuit een nieuwe mindset
 4 Terre de liens, haalde in frankrijk 25 mln op van particulieren voor het behoudt van het boeren landschap rondom plattelandsdorpen.

VALLEY HAS HIGH CONTRAST CENTRAL AREA

Author: Jelle Segeren

The Waal Rhine valley is a [sub]urban area, for large parts of rural agricultural character. Especially the area in-between the Waal and Nederrijn is of alternating urban and agricultural character. Striking are the parts of high contrast. There are many places where the large scaled agricultural production-landscape abruptly turns to suburban housing, facing each other, without any interaction but visual.

The [Sub]Urban character is of high to medium density built, multifunctional in the citycentres and monotonous in the expansion areas and knows little local variation.

The agricultural character of the high production lands is mostly open field, large plots, few ditches, no trees. occupation of solitary farmsteads besides small streets.

The quality of the contrast and the proximity of the two opposing worlds and lifestyles should be exploited to its fullest.

CONTRARY URBAN AND RURAL/AGRICULTURAL LIFESTYLES ARE MERGING

Author: Jelle Segeren

Farmers no longer solely provide for food production, they engage in a multitude of enterprises to expand their businesses¹. Most striking example is the increase of the number of farmers engaged in fostering care for the psychologically ill, the elderly and for children. Almost half the farmers have income generated outside their agricultural company, through partners in other branches, to help generate income and stability².

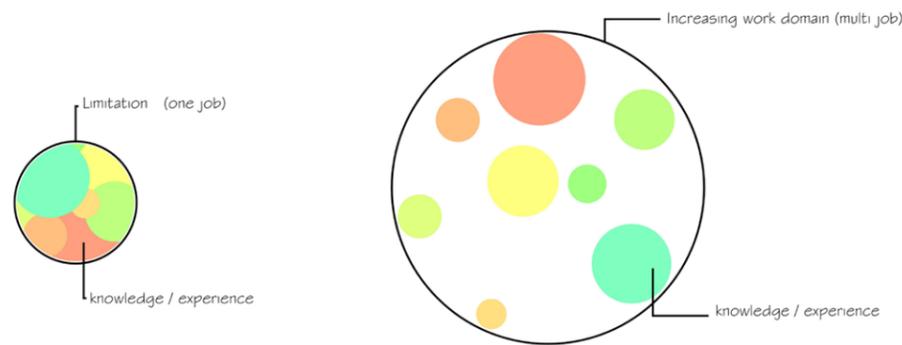
Urban residents on the other hand are more and more exploring ways of providing for food (mostly fruit and vegetables) in less- or un-used areas of the city. Sometimes leading to surprising or even troublesome "solutions" like roof farms. Urban farming is slowly maturing and projects are getting more publicly accessible, and larger in scale. An great example is "the incredible edible park"³.

1 "Verbreiding gevraagd", Ecorys 2009
 2 Cbs statline 2013
 3 <http://www.incredible-edible-todmorden.co.uk/>

SOCIAL CHANGES



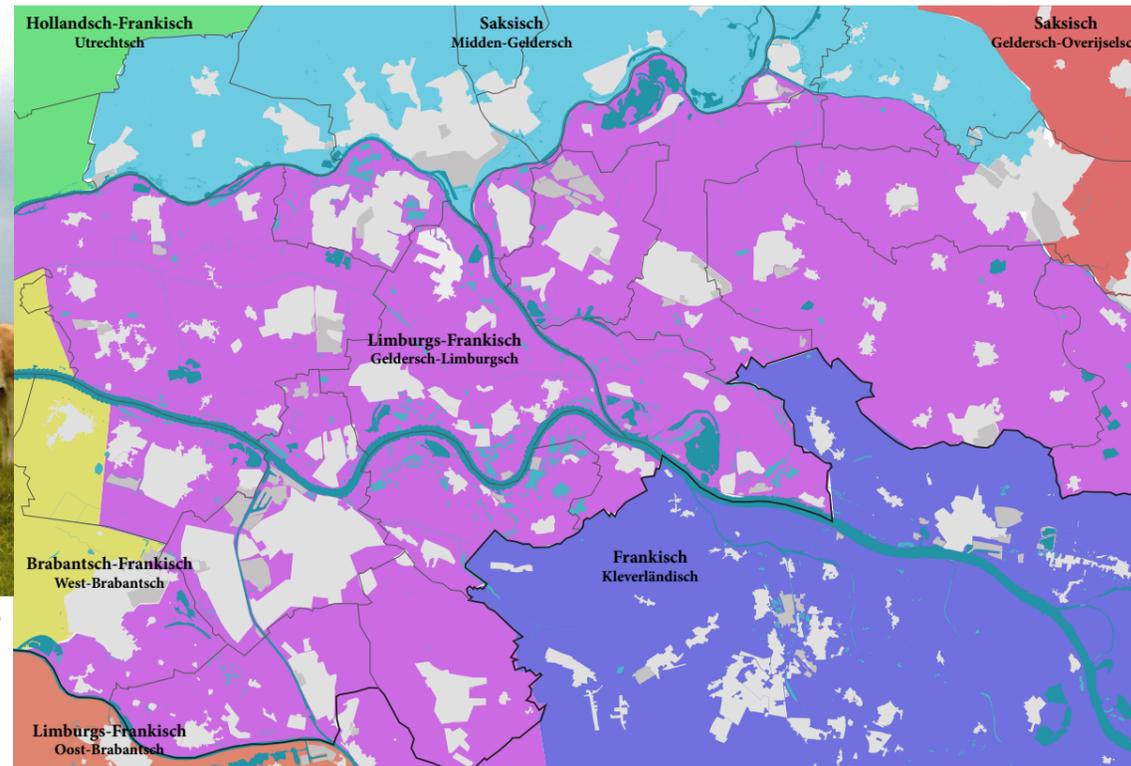
BE BOTH FARMER AND JAVA-DEVELOPER



UNLIMITED POTENTIAL BE BOTH FARMER AND JAVA-SPECIALIST

Author: Babak Jabery

In a society which aims for a flexible living and working environment, the knowledge of people would be much better utilized. People can use their different knowledge and disciplines in various fields. The living and working environment is no longer location dependent. Work and personal life can be combined much better than the traditional lifestyle. Another advantage of flexible working is the time savings that can be achieved. People can choose residence nearby their workplace, an environment most suitable for their current needs.



DIALECTS IN THE REGION

Author: Thomas van Weert

Natural barriers are traditionally borders of a certain dialect. Groups of people on both sides of the border had minimal contact, so their language developed differently¹.

In this map no less than 7 different dialects are defined. Dialects have always been a way to distinguish a group of people from another. Natural barriers became less important in the last decennia.

People have much more distant contact nowadays (via work, study, sports, social media), so use of dialects is decreasing. There especially is a clear decrease in the amount of children that are taught dialect from their parents².

People feel a strong relation to similar minded people nowadays, independent on distance. Technological and infrastructural developments have made this possible. The coming decades we will see this development continue, and eventually dialects will most likely die out.

¹ Research by Rijksuniversiteit Groningen
² Geert Driessen, Universiteit Nijmegen, "Ontwikkelingen in het gebruik van streektaalen en dialecten in de periode van 1995 tot 2003"

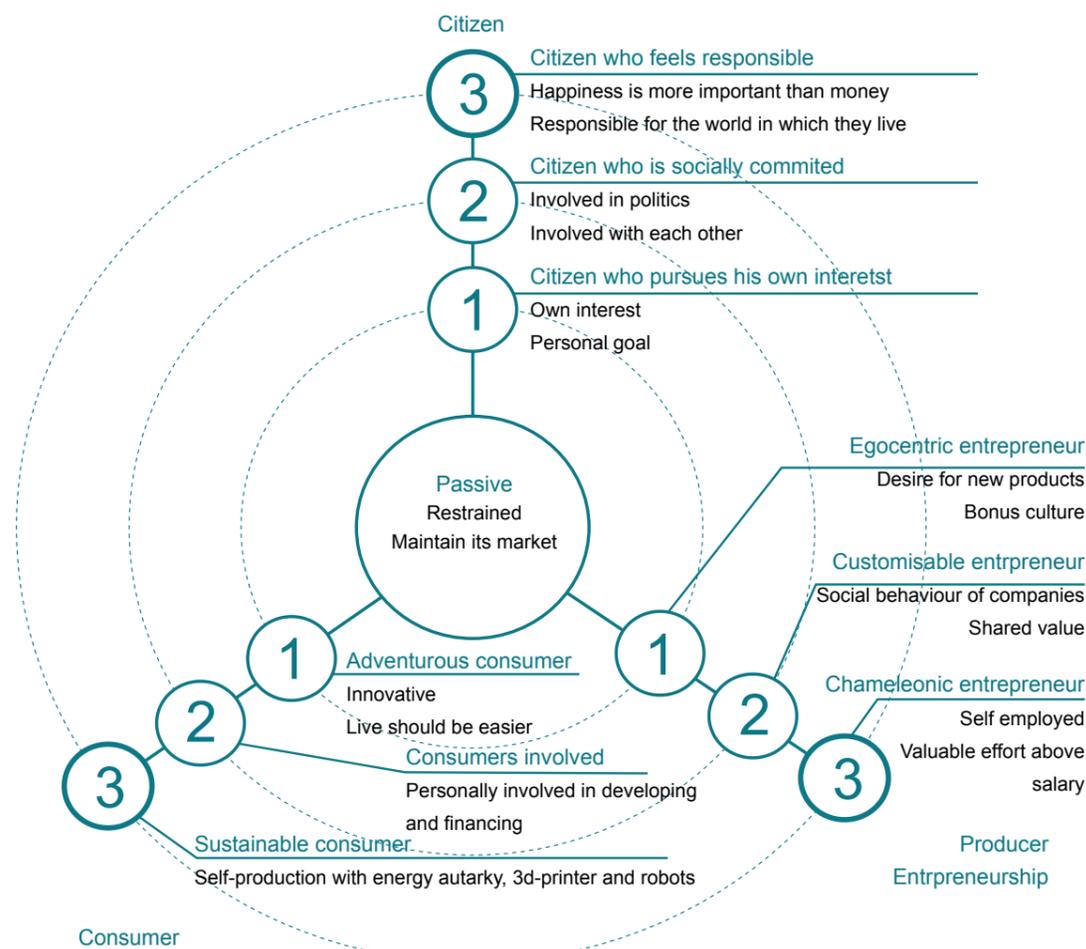
MAN BECOMES CITIZEN, ENTREPRENEUR, PRODUCER AND CONSUMER.

Author: Stefan Willebrand

Due to the reduction in the number of working hours, man spends more time innovative creation, self-production, social work and balancing society. Life will become one big game. Everyone remains citizen, but also entrepreneur, producer and consumer. On the basis of the development psychology, a number of stages can be defined in the trichotomy. The man will not be in the same status in all areas of development. (Ridder, 2013)

Below are the developmental stages mentioned:

- Baby-behaviour of people who are unable to take care of themselves. They are in need or behave as such. It is related to passive behaviour. (Ridder, 2013)
- Toddler behaviour of people who want to push boundaries without avoiding risks. Another characteristic is the focus on self-interest. The toddler-behaviour has many similarities with egocentric behaviour. (Ridder, 2013)
- Adolescence behaviour is characterized by intensive communication in the search for their own identity and to position yourself in the network of interest. Adolescence behaviour is also social behaviour. (Ridder, 2013)
- The adult behaviour is associated with people who take responsibility for themselves, take account of others, take care of each other and are committed to the society as a whole. (Ridder, 2013)



TOURISM NETWORKS

BERT VAN DER HEIJDEN, PAUL MUSELAERS

The WaalRhineValley has a great cultural and historical value. The river- and moraine landscape was of interest in any period of the past 2000 years. The water served as a natural barrier from which the area was protected. Water based defenses go back to Roman times. For example the Limes, the boundary along the Old Rhine, were used by the Romans as a defense line fortified with fortresses. In the Middle Ages, the defenses consisted of castles and lines in the form of militias along the borders of a duchy or county. In the Eighty Years' War, the struggle against the Spanish, the river also played an important strategic role. Especially in places where the rivers split sconces were built and dikes were used as embankment lines. In the seventeenth and eighteenth century so-called inundation lines were used, for example the Hollandic Water Line that stopped the French. From the nineteenth century until recent history of WOII and the Cold War, several other defense lines were used¹.

The water-landscape forms the natural connection in the upper and middle part off 'the valley', connection Arnhem and Nijmegen through rivers, floodplains, seams and river dune complexes. In the south, the historical (glacier-) moraine forms the connection between Nijmegen and Kleve. The higher grounds of the moraine have been occupied throughout history. It's always been a strategic point for establishments, because these sheltered landscape provides goed ventige-points over the surrounding river landscape. Much of the local culture is somehow related to the morain, giving this area it's identity.

In these two landscapes much of the cultural history is made invisible (by the water, as well as by WOII) in the course of time. The drowned villages, churches, castles and Roman works are not always visible these days. Nevertheless, these two area's are so saturated with heritage that it is hard to get an overview of the development of the WaalRhineValley over time. There is much reason to explore the valley and by the construction of many cycling and hiking trails this is increasingly possible. To enable easy accessibility for visitors it is necessary to create places from where the public can start exploring the area. These starting points are places that are easy to reach and make it possible to change to another form of transportation. They can make physical and psychological connections possible. Strengthening the identity of the two landscapes, and the Valley as an entity. These sites can also include recreational functions (e.g. restaurants), but most important are informational and educational functions (e.g. museum or knowledge centers) who clarify and tell the story of the area. This way, the identifiers that make the area so special play a role in the new development of the cultural and historical heritage¹.

DLA+ landscape architects BV, Geschiedkundig Bureau van Hemmen, MARC erfgoed adviseurs, Masterplan Dijk en Kolk (Groesbeek 2009).

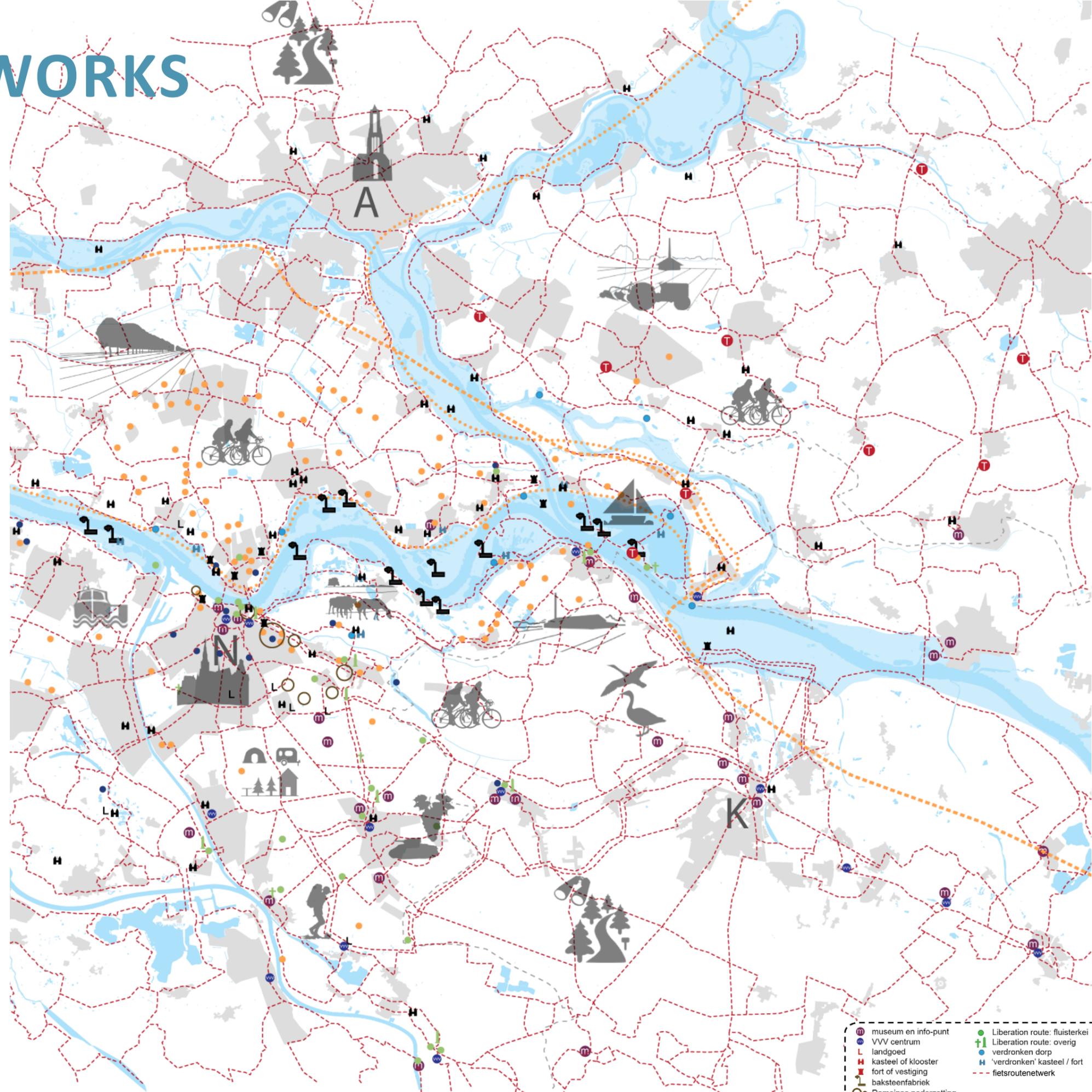


fig. 1 Tourist networks and cultural heritage in the WaalRhineValley

- museum en info-punt
- VVV centrum
- landgoed
- kasteel of klooster
- fort of vestiging
- baksteenfabriek
- Romeinse nederzetting
- Liberation route: fluisterkei
- Liberation route: overig
- verdrinken dorp
- 'verdrinken' kasteel / fort
- fietsroutenetwerk

THE FUTURE OF TOURISM

BERT VAN DER HEIJDEN

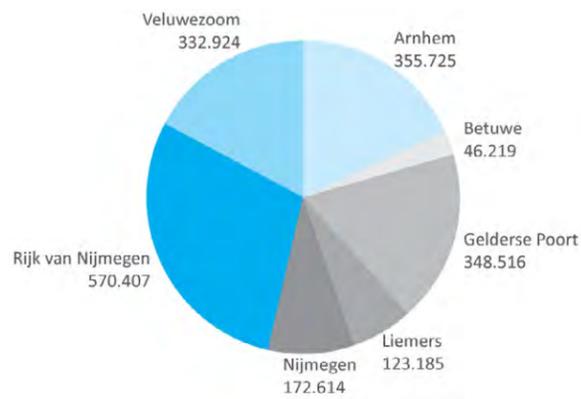


fig. 1 Number of stays in regions of WaalRhineValley 2011

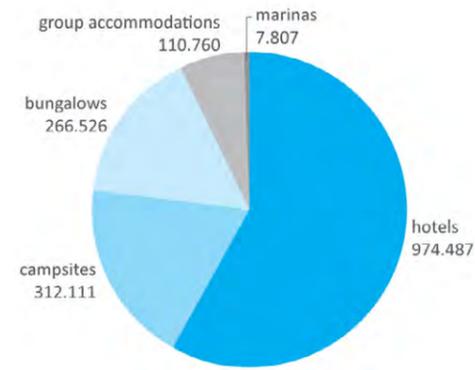


fig. 2 Types of stays WaalRhineValley 2011

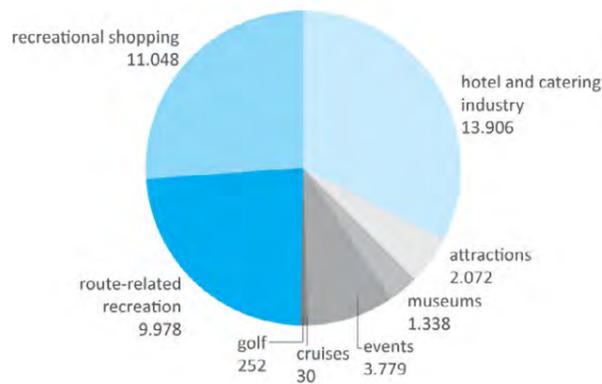


fig. 3 Type of daytime excursions WaalRhineValley 2011 (x)

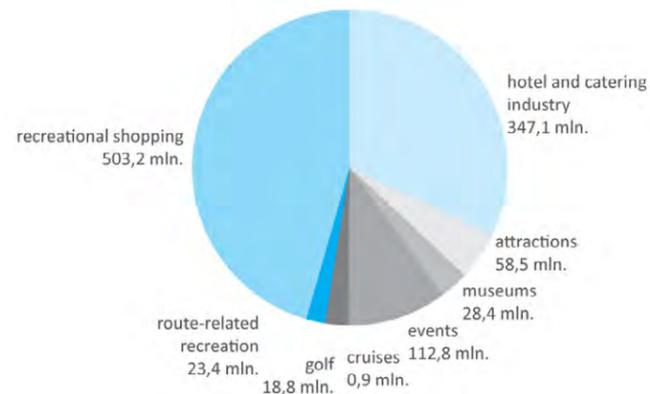


fig. 4 Economic value of daytime excursions WaalRhineValley 2011

In recent years, an increase in domestic holidays and vacations close to home is visible. For the WaalRhineValley this means an increase of Dutch tourists, but also close to five million German visitors. Spendings of the visitors decrease however, despite the increase in tourists, but in the WaalRhineValley a slight growth is seen. The WaalRhineValley is the most important domestic holiday destination but is economically growing too slow. In addition, the distribution of holidays throughout the year is altering, due to the growing number of vital and retired elderly people. Instead of peak times, a more equal distribution through the year develops. Also, holidays have a shorter duration and there is an increasing demand for large accommodations (for the whole family)¹.

The available leisure time of the population is decreasing. This is the reason that the tourists demand more these days. The leisure products in the WaalRhineValley are outdated and no longer meeting the demands of this new leisure consumer^{fig. 6}. The leisure industry is of great importance for the conservation of natural and cultural history. Research shows that natural green space and tranquility, combined with the rich cultural history of the area are the main reasons for the tourists to visit the WaalRhineValley. The visitor expects leisure of high quality, with their main focus on freedom, meaning and experience. By extension, an increasing demand for peace and nostalgia is seen^{1 2}.

Currently, six percent of the workforce in the WaalRhineValley is employed in the leisure sector. In recent decades, the basic infrastructure for tourists greatly improved. There are better constructed and marked cycling and hiking trails and more visible nodes. Yet the WaalRhineValley loses market share. Given the economic value, there is a demand to improve the tourist sector¹.

Because the route-related outdoor recreation is one of the main activities in the WaalRhineValley^{fig. 3} and is still growing, but is not economically viable^{fig. 4}, the networks should be improved by connecting them to other, more profitable, functions³. These functions must meet the personality of the new tourist^{fig. 6} but also the change in holidays, for example by strengthening the quality and experience of the routes¹.

Also sailing in the area is underexposed. There is an increase of sailing visitors of 1.5% per year who sail less and stay on the shore longer⁶, but there are not enough berths to meet the demand^{fig. 5}. Additionally, routes on the water are not sufficiently developed. The physical infrastructure for water recreation is limited. There are few water attractions and a growing shortage of berths². Now only one percent of overnight stays take are in marinas^{fig. 2, 4}. This while the temporary berths provide opportunities for walkers and cyclists to stay. Clearly, the rivers and waterways of the WaalRhineValley are part of cultural history. These wet roads are the routes by which cities, culture and commerce arose⁶.

CONCLUSION AND TASK:

To make cultural history and nature in the WaalRhineValley into a profitable shortbreakmarket, interesting product market combinations that meet the needs of the new tourist and holidays have to be established⁵.

When water is given more space to respond to climate change, the use of water can also include leisure activities. Creating the missing link between water and land by means of a hub that connects existing route networks of the land with new route networks of the water. In this hub, cultural-historical and natural features of the area can be made visible in an experience that suits the tourists of the future: the hub offers information, meaning and experience, from

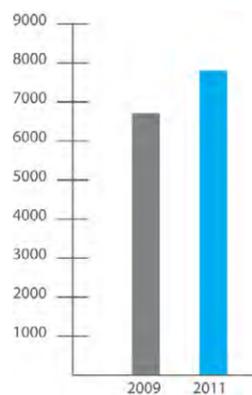


fig. 5 Growth of aquatic stays WaalRhineValley

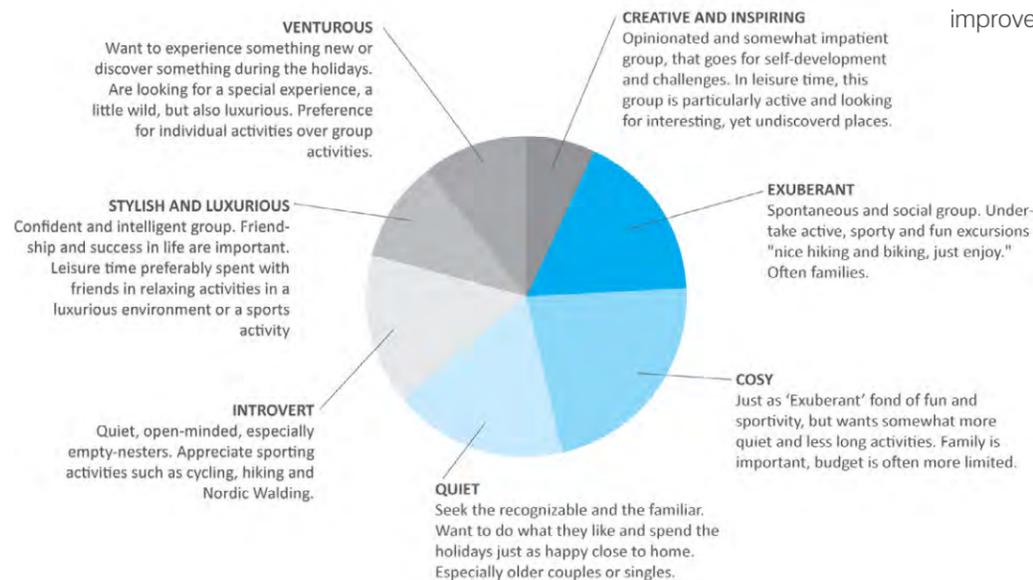


fig. 6 Types of tourists and their preferred activities

- 1 Provincie Gelderland, Actieplan Vrijtijdseconomie (Gelderland 2012)
- 2 Regio Rivierenland, Toeristisch recreatieve visie Regio Rivierenland 2012-2015 (Tiel 2011)
- 3 A. Bloemberg, A. Riefel & M. Wagenaar, Maak kennis met de vrijetijdseconomie in Gelderland (Arnhem 2011)
- 4 TNR Advies, Verkennend onderzoek WaalWeelde en Duurzaam Toerisme (Lochem 2011)
- 5 Regionaal Bureau voor Toerisme Arnhem Nijmegen, Strategische Marketingsvisie Toerisme 2013-2016 Regio Arnhem Nijmegen (Nijmegen 2012)
- 6 Stichting Recreatietoervaart Nederland, Beleidsvisie Recreatietoervaart Nederland (Bunnik 2008)

REGIONAL GOALS & OPPORTUNITIES

PAUL MUSELAERS

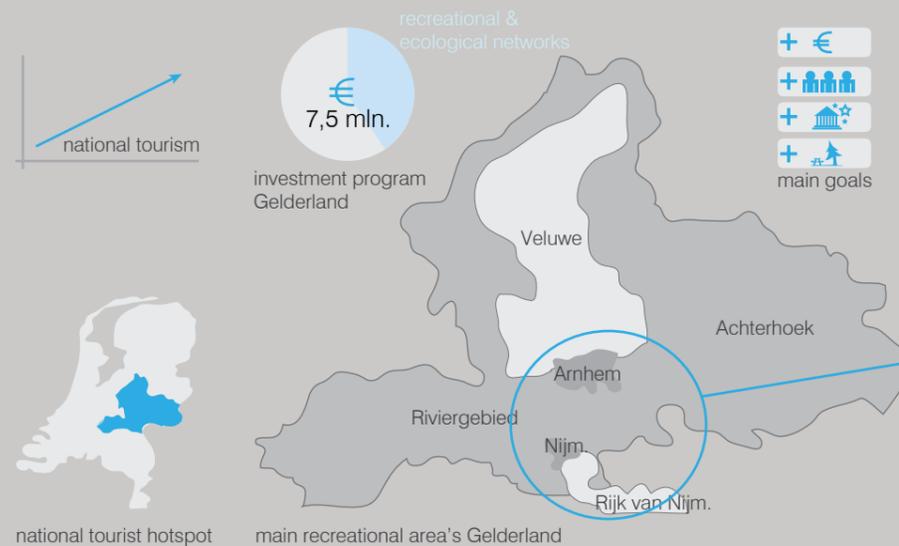


fig. 7 National tourism + goals and focus-area's of the province Gelderland

Gelderland contains a big part off the top off our national recreational area's. The leisure sector is very important for the province, because near 6% off it's habitants work in the recreation-economy. Because national tourism is largely increasing (and the area is glowingly attractive for foreign tourists), Gelderland has developed an investment program (2012-2015). It's goal is to boost the recreational- and social value of the area, maintain the cultural- and historical heritage, up-date existing facilities, and add new ones ¹⁺².

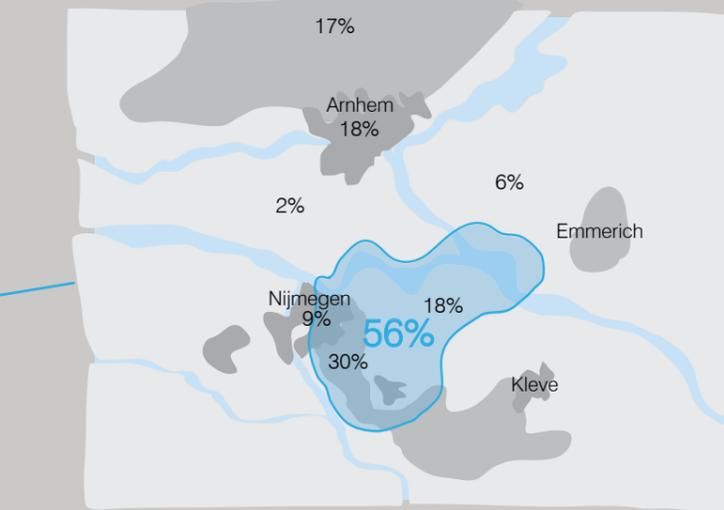


fig. 8 Tourism in the region Arnhem-Nijmegen 2011

The total recreational number off stays in the WaalRhineValley in 2011 were close to 2 million. Arnhem is two time more attractive than Nijmegen for overnight stays (mainly in hotels). But the area to the east/south off Nijmegen, 'De Gelderse Poort / Rijk van Nijmegen', shows a concentration for the valley's rural area's (18%+30%). This appeals to be the most attractive area for outdoor-stays, mainly in campsites and bungalows. The figures are even greater than those of the Veluwe. The central area (between the rivers) is shown to be unattractive ¹⁺².

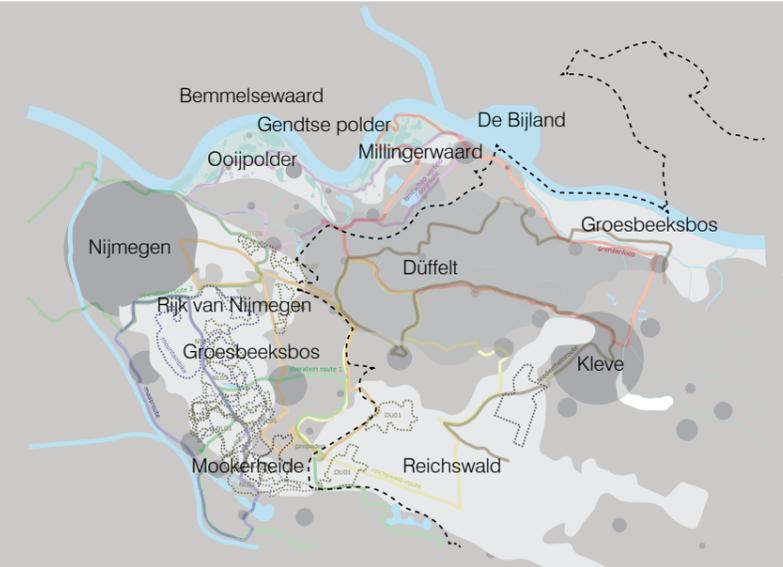


fig. 9 Recreational theme-routes & -area's in the WaalRhineValley-south

Many tourists who visit this part off the WaalRhineValley are attracted by the diversity off highlights, the unique ecological grounds, and the broad interwoven tourist network ^{(fig 01) 3+4+5}. The ecological grounds (natura 2000) are located alongside the rivers, and on the German side of the border (Die Düffelt) ³⁺⁵⁺⁶⁺⁹. The most valuable recreational grounds, are no part of the natura 2000 network. These are the forests area's located on the moraine ³⁺⁵.

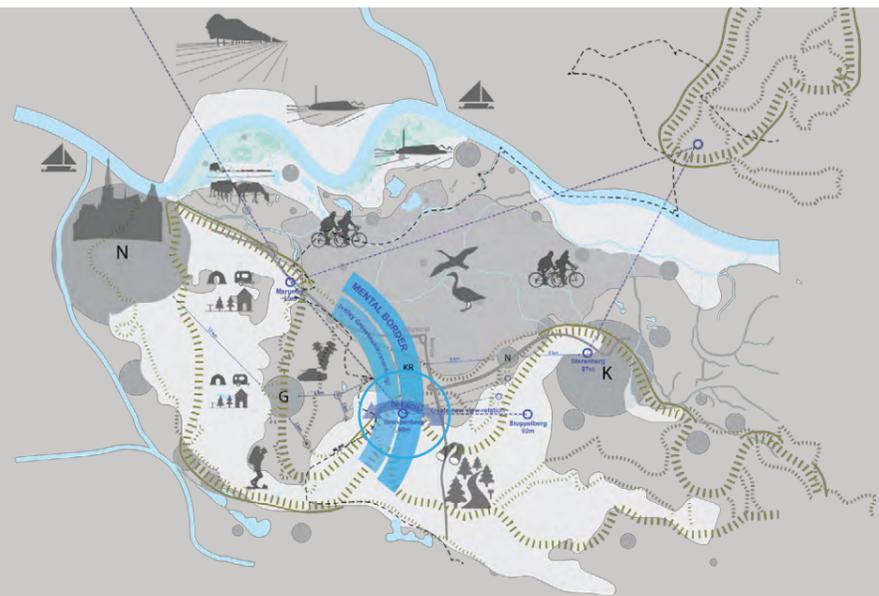


fig. 10 Mental mapping WaalRhineValley-south: entity's, relations and borders.

The moraine between Nijmegen and Kleve is not one continuous hillside, but consists off two curved ridges, creating the 'Groesbeek-Kranenburg valley' and the 'Kranenburg-Kleve valley' (it's created by two different glaciers). The centre ridge, is not only a psychological border, but also part of the border between NL - Ger and the two forests ⁵. Therefore many recreational routes, as well as infrastructure works, stop at this border ⁵⁺⁷. The edge the central ridge (Brandenberg hill), is an interesting orientation point because off it's central position between Nijm.-Kleve.

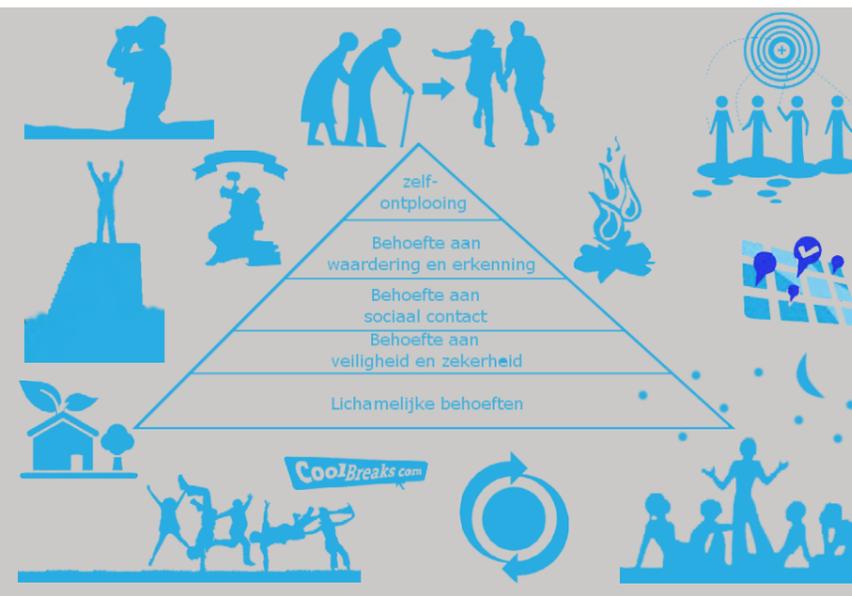


fig. 11 Trends and developments

The area between Nijmegen and Kleve is an ideal landscape for the new leisure consumer ^{fig 6}. Because on the one hand it's extremely large and desolated, and on the other hand it's an area with lots of (hidden) historical and cultural elements. Therefore high quality leisure, based on freedom, experience, venture, meaning and nostalgia, can be achieved. The only thing missing is a bit off luxury. Adding facility and new (profitable) functions can improve the connections of the existing network, and create new economical potential for the two cities ⁸.

1. Provincie Gelderland, Actieplan Vrijtijdseconomie (Gelderland 2012)
2. Provincie Gelderland, 'Groeten uit Gelderland', uitvoeringsprogramma vrijetijdseconomie (Gelderland 2009)
3. Tourist map region Nijmegen (tourist agency Nijmegen/Groesbeek + tourist map region Kleve (tourist agency Kreises Kleve).
4. DLA+ landscape architects BV, Geschiedkundig Bureau van Hemmen, MARC erfgoed adviseurs, Masterplan Dijk en Kolk (Groesbeek 2009).
5. Provincie Gelderland, RBT KAN, www.lekkerfietsen.nl, www.geopadenstuwwal.nl, www.wandeleningroesbeek.nl, Staatsbosbeheer, Gemeente Groesbeek, Gemeente Kranenburg, Gilde Nijmegen, VV Groesbeek, Rijk van Nijmegen, Nationaal landschap De Gelderse Poort, Gastvrij land van Maas & Waal, Tourist info center Kranenburg, www.liberationroute.com, Gelders Landschap, Stadsregio, GOBT, Gemeente Mook en Middelaar, www.oplaadpunten.nl, Interreg Deutschland nederland, NRW Nordrhein-Westfalen - tourist routes, bike-trials and tourist hotspots/highlights in the area.
6. Europa.eu, Natura 2000 network viewer.
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WATER OF LIFE

BY: JEROEN MICHELSEN & SANDER DE BRUIN

INTRODUCTION OF JEROEN MICHELSEN

By a different use of the capacity of the existing pumping station, the adjustable water ensures the transformation of a nature area. Based on cyclical processes and programs the design will anticipate on the need to boost sustainable education. Public access to the building will be provided by an addition and extension of the current program. This will create an inspiring environment in which true networks will be formed and maintained, in which the experience and knowledge that is gained in the Water Of Life area will be shared and distributed cyclically.

In order to strengthen the relation between this project and the geography, further specific research has been done to some of the themes of the recommendations.

PARTICIPATORY DEVELOPMENT

By doing and continuous learning in a network connection participatory development within the Netherlands can also be used to stimulate and develop¹. Educational sector in the field of sustainability education as a method within the geography.

A participatory approach can lead to great commitment. This leads to sustainable innovations and transitions at the societal level. Involved residents, businesses, farmers and policy makers consciously go with developing and transition. Thanks to the direct participation in activities themselves, they feel more involved and more responsible for innovations and developments within the region².

To make this approach successful there are some elements that should be considered for this development. These can be summarized as ownership, heterogeneity - connecting people, knowledge and will to share, values-driven experience³.

CONCLUSION

The geography has a great diversity of groups that distinguish themselves in position, age, knowledge and experience. In this process everyone can en need to contribute to a succesfull development.

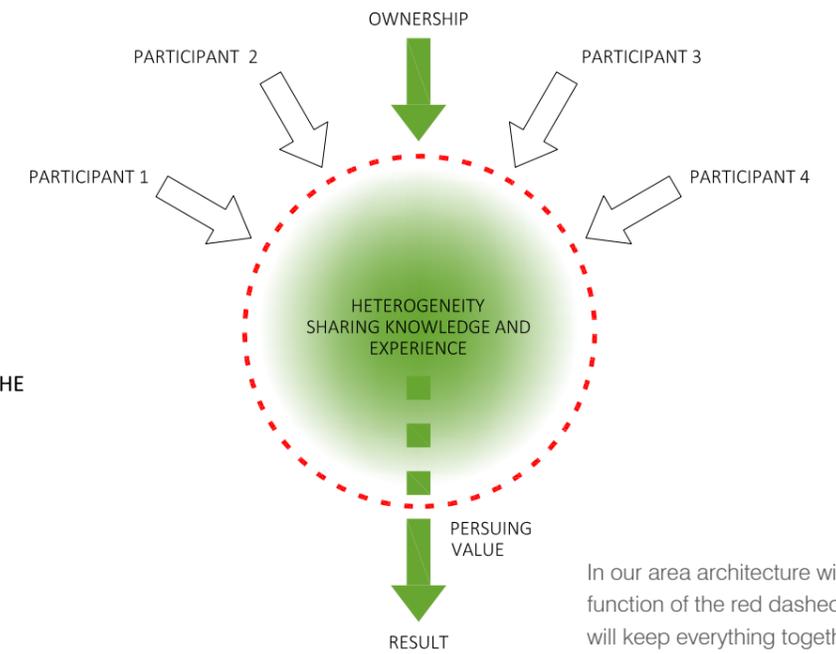
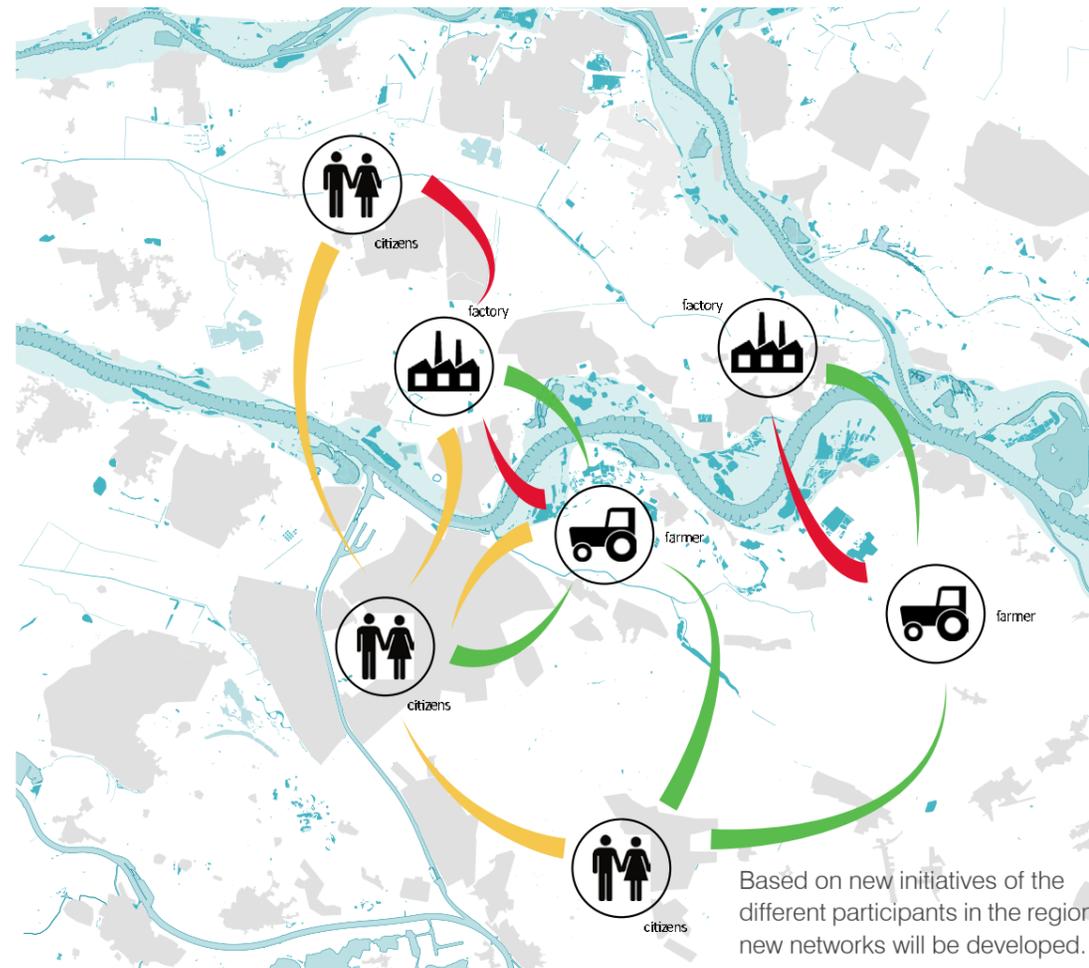
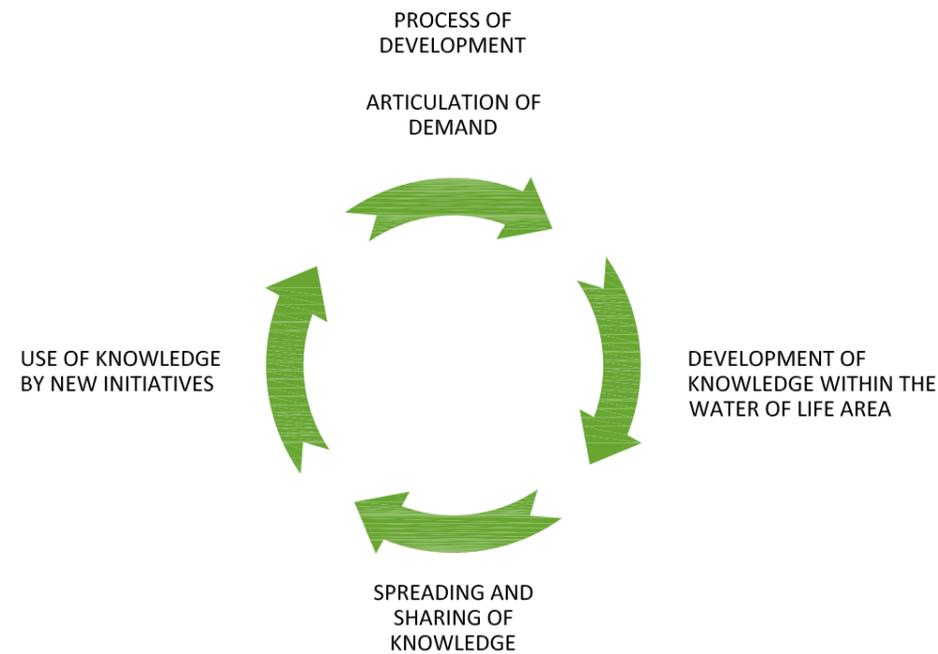
It is important that fascilities will be provided in which knowledge can be gained. This must be done for both theoretical and practical-oriented research. Besides the research it is also important to share information, knowledge and experience for further innovations. Architecture can fulfill an important role within the geography for this need of space.

1 Meeus, M., (2013) *innovatie in interorganisationele netwerken*

2 Sloep, P., Klink, M. van der, (2011) *leernetwerken: kennisdeling, kennisontwikkeling en de leerprocessen*

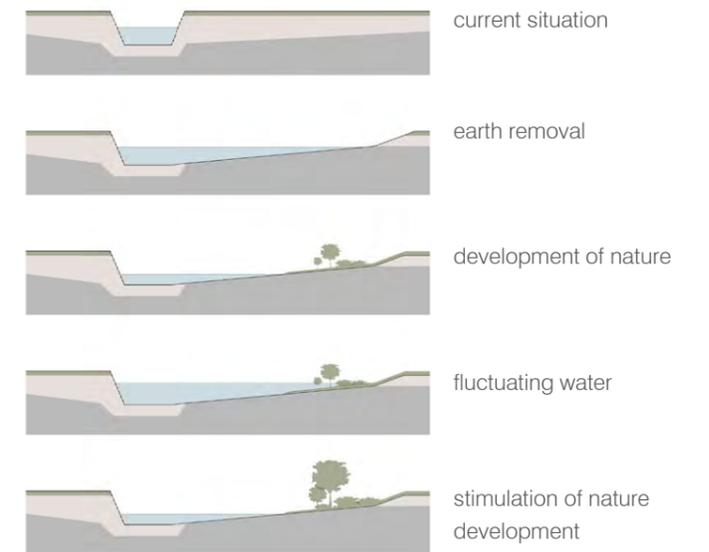
3 Koopmans, C., (2011) *Participatieve ontwikkeling*

SCHEME OF HOW PARTICIPATORY DEVELOPMENT WILL OPERATE



MORPHOLOGY

To encourage the development of nature an intervention of the current polder landscape is necessary. Because of its original function as a flood area of the river, the current polders are covered with a meters thick layer of clay. This suggested earth removal will reflect the geomorphology of the area. Under the thick layer of clay, we will find the interesting structures and original patterns of the landscape¹. When a fluctuating water level will be in contact with the new surface, an interesting natural landscape will be created².



1 Helmer, W., Litjens, G., (1999) *Levende rivieren*

2 Bogaert, D., (2011), *Getijdenatuur onschatbare waarde*

WATER OF LIFE

BY: SANDER DE BRUIN & JEROEN MICHELSEN

BY: SANDER DE BRUIN

By a different use of the capacity of the existing pumping station, the adjustable water level ensures the transformation of a nature area. Based on cyclical processes and programs the design will anticipate on the need to boost sustainable education. Experiencing the cyclical processes is the main purpose of the architecture within the water of life landscape. All senses of the visitors are stimulated which will realize an optimal experience. Awareness is the main goal.

For this reason it is important to create insight in which cyclical processes there are, how these processes work, what the current issues in the region are and in which way they can be turned in a positive manner.

This linear system is the cause of the depletion of the fossil fuels. This depletion has all kinds of negative consequences to the environment and the climate. With the extraction of raw materials the ecological areas are being damaged. Adjacent to this effect there are also great amounts of 'greenhouse-gas' released which can damage the ozone layer. All these effects are disturbing the biogeochemical cycles, also called as 'the cycles of life'.¹

The biogeochemical cycle can be divided into 4 important cycles; hydrology (water quality), carbon (raw materials), phosphor (soil quality) and nitrogen (air quality). The cycles include the key elements that living organisms possess and/or need. By cause of human activity these cycles are being disrupted and have a major impact on the climate.

It is a fact that the climate within the WaalRijnValley is changing.² Therefore it is important that action is taken simultaneously on two fronts, both the causes and the consequences of the change are requiring a different approach.

The aim should be to prevent the causes of the climate change. Within the region we will have to look for solutions to minimize the disruption of the cyclical processes and if possible contribute to the recovery of these cycles.³

The consequences of the climate changes ask for adaptive measures. Within the region we will have to look for solutions that respond to this changing climate. Besides these solutions we will also have to be looking for solutions that can take advantage of the new situation.²

1. De Vries, S. Artikel: Van een lineaire naar een circulaire economie: afval wordt weer grondstof Publisher: USI Urban, www.usi-urban.nl
 2. Van Dorp, D., Koolen, A., Timmermans, W. Ontwerpen aan een klimaatbestendige regio Publisher: University of Wageningen, Wageningen.
 3. Biology for Dummies Publisher: Wiley, Indianapolis
 4. <http://nl.wikipedia.org/wiki/Waterkringloop>
 5. <http://nl.wikipedia.org/wiki/Koolstofkringloop>
 6. <http://nl.wikipedia.org/wiki/Stikstofkringloop>
 7. <http://nl.wikipedia.org/wiki/Fosfaat>



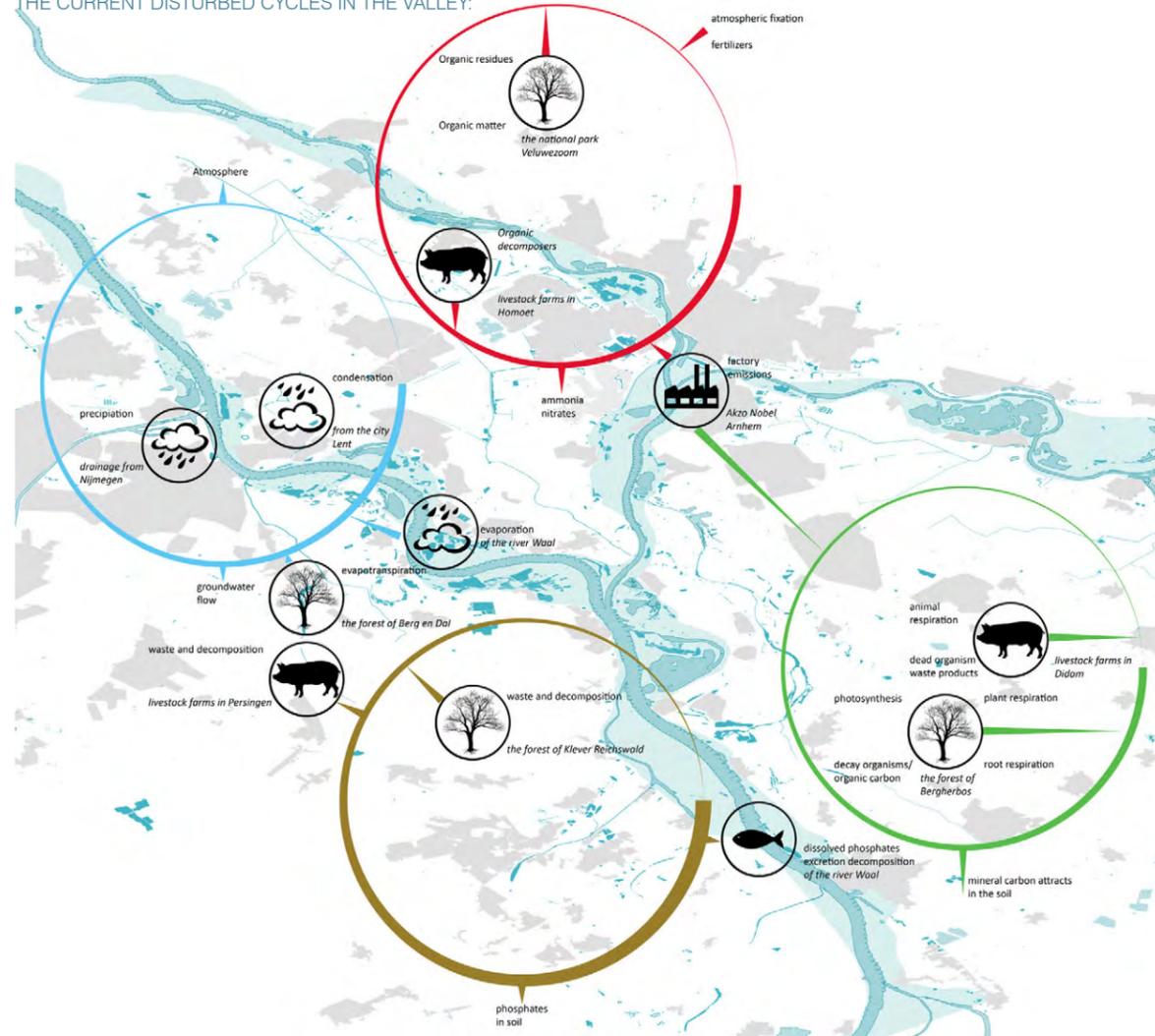
the hydrologic cycle (water)

The hydraulic cycle is a physical process in which surface water, such as sea water, evaporates. In the atmosphere these vapours are forming clouds, rainfall can occur. This rainfall comes back on earth in the waterways or is disappearing as groundwater. A large amount of this rainfall turns into surface water again.

Problem: The depletion of freshwater
Cause: The retraction of too much freshwater from the springs which are filled out with saltwater.
Consequence: This retraction creates disruption of the ecological system.

Problem: Less soil infiltration
Cause: The removal of vegetation, the consolidation of the landscape
Consequence: Soil-erosion which creates floods and landslides.

THE CURRENT DISTURBED CYCLES IN THE VALLEY:



The nitrogen cycle (oxygen)

The nitrogen cycle is the biochemical cycle and the geochemical conversion of nitrogen in the air, the plants, the soil and the biomass. Humans are disturbing the nitrogen cycle in a number of ways.

Problem: After incineration there is a release of nitric oxide. This reacts with oxygen and vapour which creates nitric acid.
Cause: A growing combustion of raw materials
Consequence: Damage to trees and marine ecosystems.

Problem: Greenhouse effect, demolition of the ozone layer.
Cause: A growth of the Bio- industry
Consequence: Global warming, the melting polar ice caps, changing eco systems.



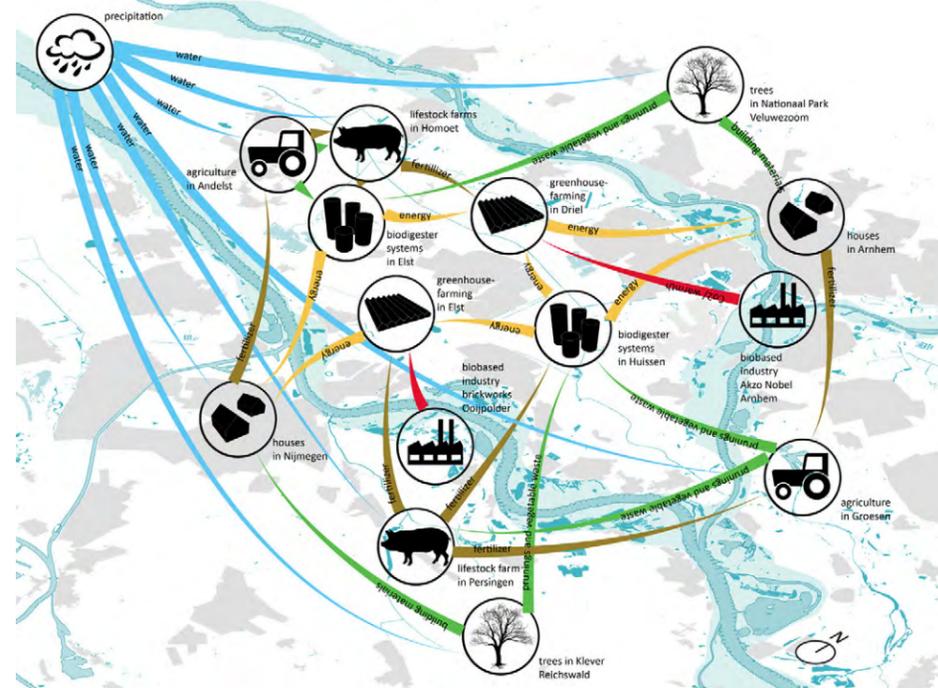
The phosphorus cycle (soil quality)

Phosphor is the essential nutrient for plants and animals. Phosphor creates the energy molecule ATP and ensures the formation of DNA and RNA.

Problem: A Shortage of phosphor in certain parts of the world (eg. Africa)
Cause: Retraction of phosphor from soil to make fertilizer.
Consequence: The ground has a lack of phosphor which makes it infertile for flora and fauna

Problem: A shortage of phosphor in certain parts of the world (eg. Africa)
Cause: Fertilizer creates an abundance of phosphorus in the soil
Consequence: The development of algae in water creates a lack of oxygen for animals

SEARCHING FOR RENEWED CYCLES IN THE VALLEY:



The carbon cycle (raw material)

The carbon cycle is the natural cycle of carbon between the earth's surface and the atmosphere which ensures that both always contain a more or less constant amount of carbon.*

Problem: deforestation
Cause: Too little absorption of carbon dioxide by plants
Consequence: There will be more carbon-dioxide in the air than what can be absorbed by the plants.

Problem: Lack of carbon/ too much use of carbon
Cause: Due to the industrial revolution, a shortage of carbon has occurred/By the combustion of this carbon an amount of carbon-dioxide is released which creates 'greenhousegas'
Consequence: Global warming/ the disruption of the carbon cycle.⁵

BUILDING ON WATER FLOATING MARKET

HEIN OOME

BUILDING ON WATER

In Waal-Rhine valley transformation will follow as water retention is necessary. A huge quantity of extra water in near future will demand more space and dominate the region. The river landscape turns into a new *waterscape*.

Not only in this region, but all over the world there will be a growing interest in building on water which is expandable, flexible and valuable to water retention. There is a new outline in architecture. In order to be successful in building on water, creating energy and taking care of public utilities will be important issues to explore.

REASONS

Reasons for building on water are: water safety, experience of the water, extra space, conversion, dual land use and water storage.

RISKS

Risks at building on water are shipping, surge and current.

KEEP IN MIND

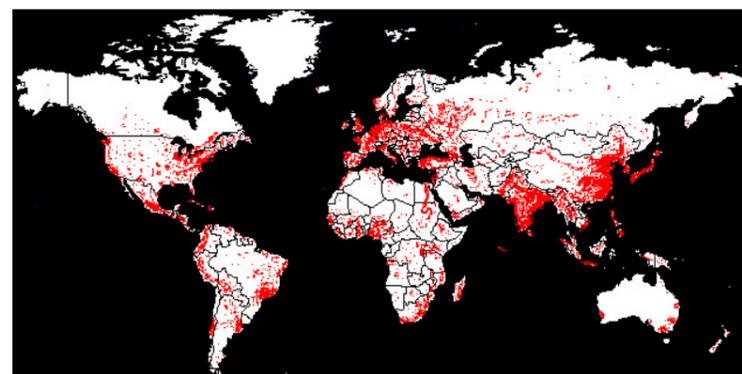
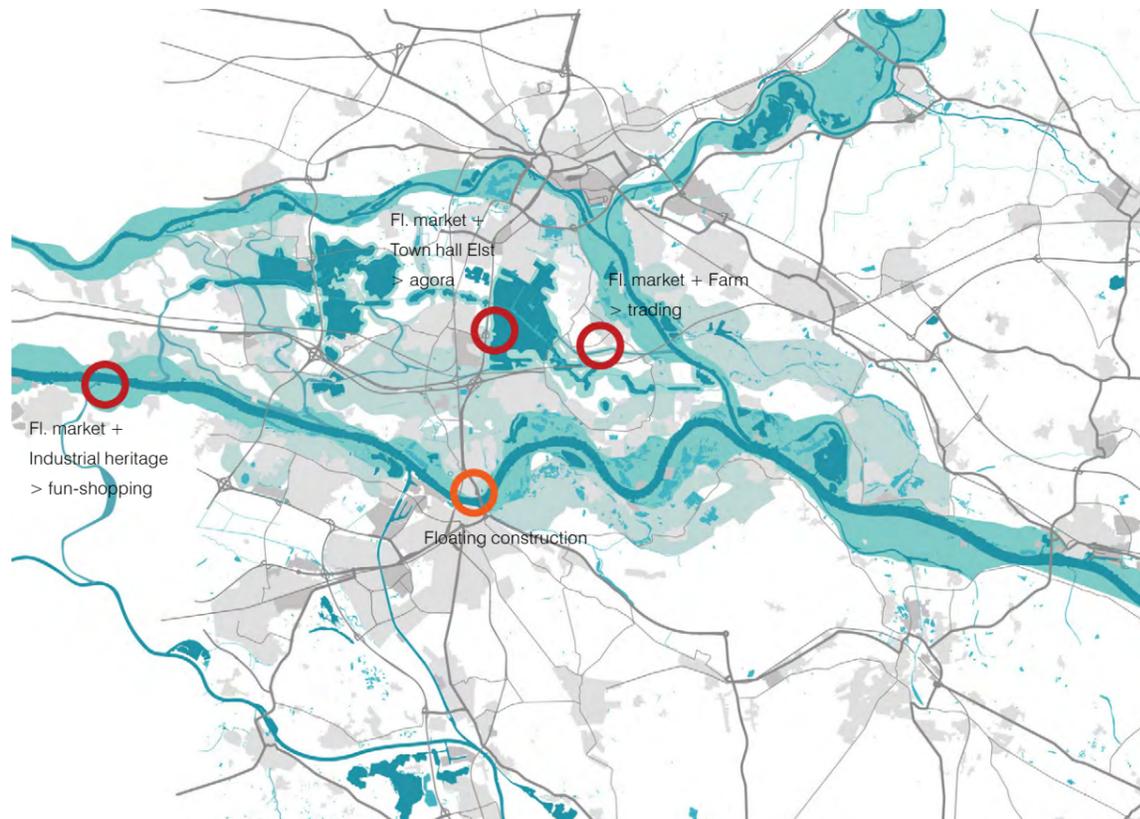
Extra possibilities are to be considered: recreation, mooring, harbour, waterways network and waterways network via lock.

RELEVANCE

Most of the bigger cities in the world are located along the coast. Every day around 150.000 people move to the city. This means that in 2100 4.5 billion people will live in cities. Combined with an ever-growing consumption this means an increase in farmland of 100% already in 2050. Land is lost due to the sea level rise and more land is needed to produce bio fuels. Eventually this means a future land scarcity of 22 million square kilometres, the size of North America.

The solution to this problem? Seventy percent of our planet is water. A lot of cities are located along the coast. New cities can be built on the water and use the waste products of the coastal cities to produce food and energy, for example in the form of floating algae farms.

[from: TEDx; DeltaSync; the Blue Revolution; 12-11-2013]



Where most people live

- Rivers drain: winter +12 till +27%; summer -41 till +1%
- Construction of climate proof infrastructure and buildings.
- Designing energy efficient buildings.
- Changing agricultural practices.
- Realization of storage and retention.
- More space for water.
- Water storage areas to overcome droughts.
- Building water resistant constructions.

FLOATING CONSTRUCTION - ENGINEERING

Sinking, the effect of waves, stability and trim are important aspects of design when building on water.

The probability of sinking depends on the construction. Compared to a hollow vessel, a solid base of flotation material cannot sink and a compartmentalized floating base has little chance of sinking.

Longitudinal embankments or breakwaters offer protection against waves; a floating swamp in front of the construction helps to decrease the risk of flooding.

Stability refers to the degree to which an object is inclined to capsize. The lower the center of gravity and the greater the mass, the more stable an object will be in the water. Direction of the wind and symmetry of the mass can influence the trim of a floating construction.

Flexible and extra long cables and pipes can be used to connect the floating construction to the fixed infrastructure. Sewerage systems are complicated. A grinder should be used to mill the waste water before it is flushed through the flexible sewage tube.

When a floating construction is prefabricated it needs to be towed to its destination by tugs. In that case it has to conform to the dimensions of locks and bridges. Individual units have to be stable enough.

Overflow can have major effects because the quality of the incoming water may be poor. Shallow waters can double in volume when subject to an overflow. Since the water's ecosystem has difficulties coping, overflow should only be used in emergencies.

Accessibility of a floating construction

A construction beside the quay is usually accessible from land. A bridge to a floating object makes the water around more prominent.

An object in or above the water can affect the water quality. A large shade underneath the built object can have an adverse effect on the water quality. Such objects require at least one meter free water depth, to guarantee the adequate flow of fresh water beneath the construction.

[from: Waterwonen in Nederland, A.L. Nillisen (d.efac.to), J. Singelen (sev); uitg. NAI, 2011)]

MORaine SYSTEM

BY: GEERT VERSCHUREN

VIBRANT MORaine: MORE RAIN GARDEN

The current moraine near the city centre of Nijmegen is severely disrupted by uncoordinated developments in the 20th century (roads, buildings, canals, dams, industrial areas), therefore the geomorphological connection of this complex became lost.¹

The diagram shows how to repair the moraine according to the four research themes. Due to the changing *climate* and *evolving lifestyles* a new typology is needed where outdoor space is taking a significant position. Therefore it is important to redevelop the *subsurface* of the moraine. Which forms a connection between city and urban on higher scale and living and working on lower scale. To create a vibrant moraine smart *technological advances* are needed.

Climate

The microclimates map shows the moraine located on the zone of all the microclimates in the valley: urban, moraine, outside- and inside the dike. The moraine has to deal with Urban heat islands and more draining rainwater. It is important to simply adapt the moraine due uncertainty of the climate.

Evolving lifestyles

Currently life-, work- and recreationstyles are separated from each other. To make the moraine future proof, a shared environment is needed to connect those styles.

Subsurface

Rainwater will flow on roads down the moraine where it has to deal with flooding. Temporarily roads will change in rivers. The subsurface of the moraine will withered. Down on the moraine, in the polder, natural seepage decreased a lot.²

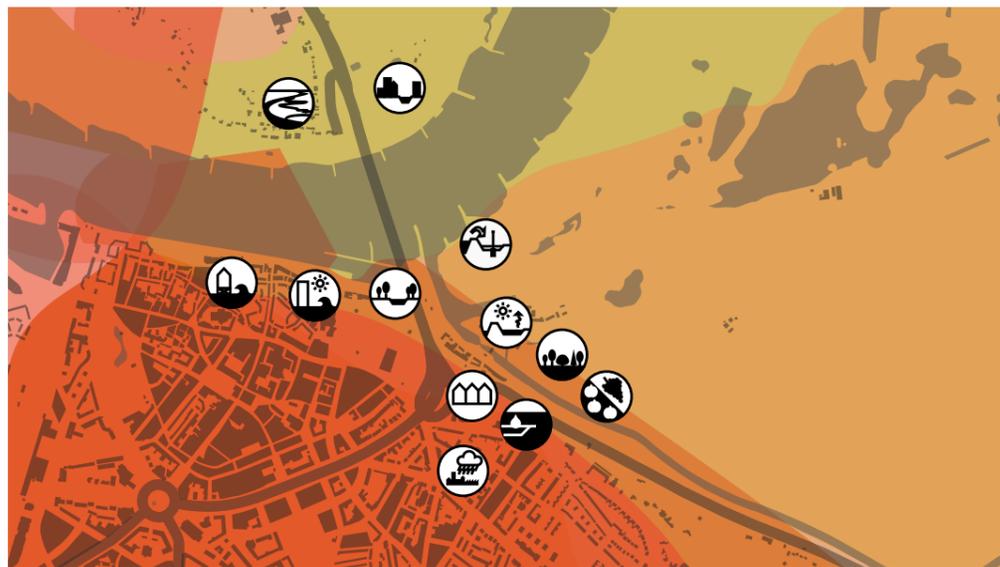
Technological advances

A smart technological system that reactivate cyclical processes is needed to make this interventions possible. When climate unexpectedly changes the moraine should be able to transform easily

Architecture

Current architecture has no consistency with the moraine, the subsurface, the climate, lifestyles and technique at this moment. The renewed architecture will form the base of the vibrant moraine.

1 verflechtungsstudie Rot8
2 www.waterwerkt.nl



MICROCLIMATES WITH RECOMMENDATIONS AROUND THE MORaine

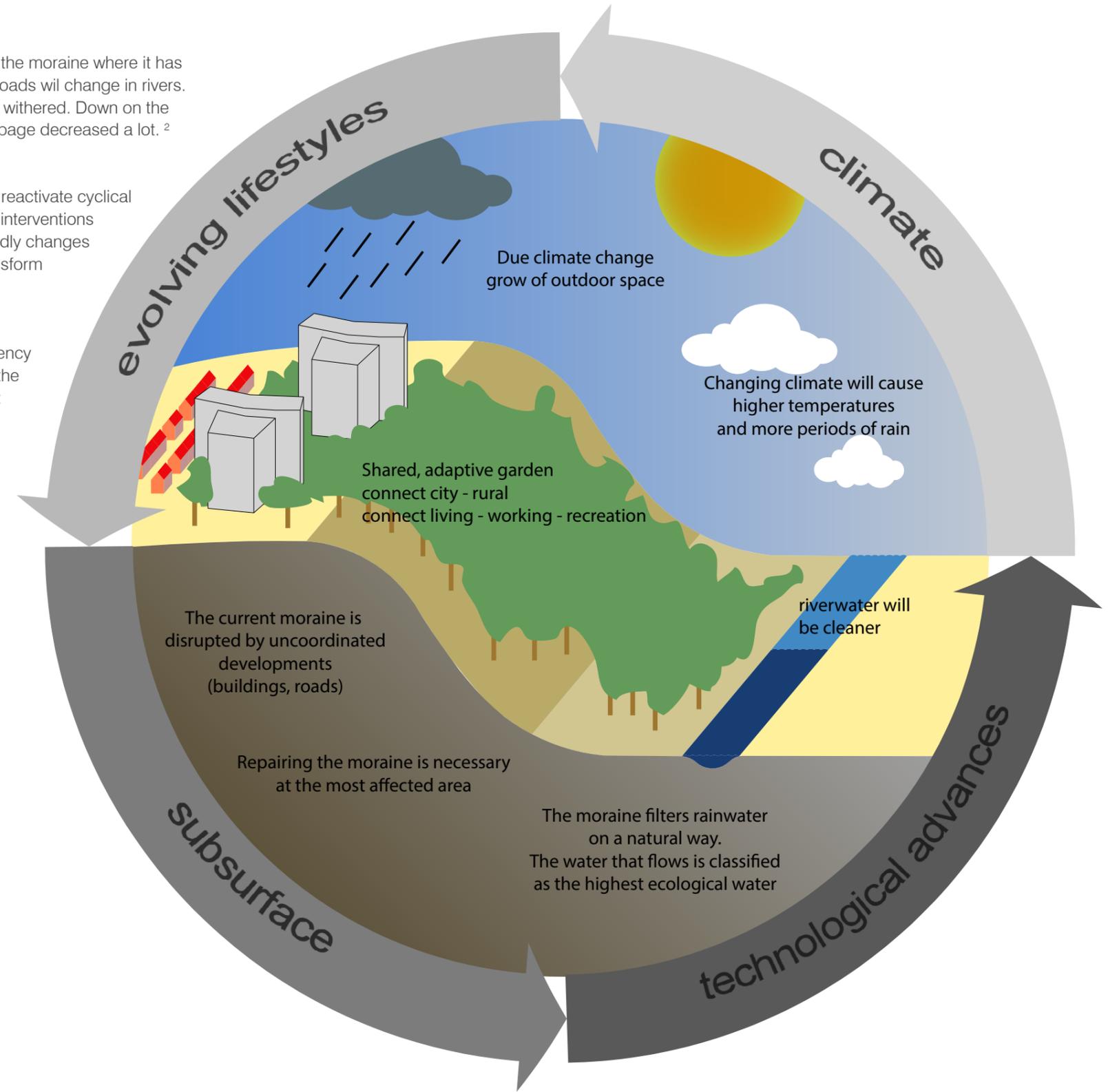


DIAGRAM SYSTEM OF THE MORaine

COLOFON

RESEARCH TEAM:

Sander de Bruin
debruin.sander@gmail.com
+ 31 (0) 6 28 27 61 42

Dennis Burger
dennis.burger@student.fontys.nl
+ 31 (0) 6 47 32 84 36

Nafthaly de Graaf
ng.degraaf@gmail.com
+ 31 (0) 6 43 99 73 29

Bert van der Heijden
bertvanderheijden@hotmail.com
+ 31 (0) 6 42 33 79 00

Babak Jabery
b.jabery@student.fontys.nl
+ 31 (0) 6 43 75 65 74

Rick de Lange
rick.delange@student.fontys.nl
+ 31 (0) 6 20 89 03 61

Jeroen Michielsen
jlcmmichielsen@tele2.nl
+ 31 (0) 6 38 53 09 62

Paul Muselaers
p_muselaers@hotmail.com
+ 31 (0) 6 53 27 12 34

Teun Nuijten
teun@new10.nl
+ 31 (0) 6 31 00 02 81

Hein Oome
hein.oome@gmail.com
+ 31 (0) 6 37 40 57 78

Jelle Segeren
Jelle@sgrn.nl
+ 31 (0) 6 15 07 10 24

Geert Verschuren
g.verschuren@student.fontys.nl
+ 31 (0) 6 46 21 76 36

Joris van der Vorst
jvdvorst@gmail.com
+ 31 (0) 6 81 99 94 33

Thomas van Weert
thomas@lionstreet.nl
+ 31 (0) 6 16 14 54 29

Milou Wijsbeck
m.wijsbeck@student.fontys.nl
+ 31 (0) 6 36 39 70 55

Stefan Willebrand
s.willebrand@student.fontys.nl
+ 31 (0) 6 51 37 28 81

MENTORS FHK MA+U

Pieter Feenstra
Pi.feenstra@planet.nl
+ 31 (0) 6 25 22 83 18

Jan Willem van Kuilenburg
mail@monolab.nl
+ 31 (0) 6 17 61 20 36

EDITORS

LAY-OUT

Rick de Lange
Thomas van weert
Jeroen Michielsen
Sander de Bruin

LETTERTYPE

Swis721 Lt BT



adressen:

Fontys Hogeschool voor de Kunsten (FHK)
Zwijsenplein 1, 5038 TZ Tilburg
www.fontys.nl/kunsten

FHK MA+U
Master of Architecture / Master of Urbanism
Postbus 90907, 5000 GJ Tilburg
FHKAAS@fontys.nl
www.fontys.nl/aas

PUBLICATIE

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RECHTEN

Deze uitgaven is beschikbaar als web en als print versie. Mocht er interesse zijn deze uitgave te bestellen neem dan contact op met de redactie. Niets uit deze publicatie mag worden gekopieerd, gedupliceerd of worden verspreid zonder schriftelijke toestemming van de auteurs.

VERSIE

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