

Online exhibition

R&D studio Spatial Strategies for the Global Metropolis (AR2U086 & AR2U088), part of MSc Urbanism, Delft University of Technology

This exhibition presents results of the Research & Design studio *Spatial Strategies for the Global Metropolis*, part of the MSc Architecture, Urbanism and Building Sciences/Track Urbanism programme at Delft University of Technology. The thematic focus of the 2020-2021 round of the studio was informed by an ambitious policy agenda that the Province of South Holland has set out: aligned with objectives of the Dutch national government, it intends to host a 100% circular economy by 2050. 19 groups of students have analysed spatial and institutional development in Southern Holland and have designed visions and development strategies that lead towards a circular construction- and demolition sector, a circular agri-food sector, and a circular bio-based chemical sector in the region. In conjunction the projects presented in this exhibition explore the spatiality of a circular economy and seek to inspire spatial planning in this way.

The responsible chair of *Spatial Strategies for the Global Metropolis* is Spatial Planning & Strategy. The 2020-2021 edition of the studio was prepared in collaboration with Province of South Holland (*Provincie Zuid-Holland*). It built up upon expertise acquired during the research project *Resource Management in Peri-urban Areas: Going Beyond Urban Metabolism (REPAIR)*, funded by the European Union under the Horizon 2020 framework, and by PortCityFutures, an initiative of the Leiden-Delft-Erasmus (LDE) collaboration.

Contributors

Students of the 2020-2021 courses AR2U086 & AR2U088

Quarter coordinators

dr. Lei Qu

dr. Verena Balz

Responsible course instructors

dr. Alexander Wandl

dr. Roberto Rocco

Studio tutors

dr. Alexander Wandl

dr. Caroline Newton

dr. Daniele Cannatella

dr. Diego Andres Sepulveda Carmona

dr. Lei Qu

dr. Luisa Calabrese

dr. Marcin Dabrowski

dr. Nikos Katsikis

dr. Remon Rooij

Lead societal partners

Helmut Thoele, Province of South Holland

Dr. Jeroen van Schaick, Province of South Holland

Guest lecturers & guest critics

Dr. Nina Alaily-Mattar, Department of Architecture, TU Delft & PortCitiesFutures

Dr. Libera Amenta, University of Naples Federico II (UNINA)

Marloes Arkesteijn, Province of South Holland

Els Boesveld, Province of South Holland

Dr. Rodrigo Cardoso, Department of Urbanism, TU Delft

Dr. Cecilia Furlan, Department of Urbanism, TU Delft

Birgit Hausleitner, Department of Urbanism, TU Delft

Prof.dr.ing. Carola Hein, Department of Architecture, TU Delft & PortCitiesFutures

Dr. Fred Hobma, Management of the Built Environment, TU Delft

Dr. Erik Meerburg, Department of Urbanism, TU Delft

Dr. Stephen Nijhuis, Department of Urbanism, TU Delft

Charlotte Ros, Province of South Holland

Eefke Schramade, Province of South Holland

Dr. Nico Tillie, Department of Urbanism, TU Delft

Pascal van Dam, Province of South Holland

Dr. Stefan van der Spek, Department of Urbanism, TU Delft

Gert-Willem van Mourik, Province of South Holland

Dr. Roel van Raak, Drift, Erasmus University Rotterdam

Student Assistant

Manon Speulman



Introduction



Urbanism is concerned with understanding the spatial organisation and dynamics of the built environment and with inventing new ways to maintain spatial quality and equality. The MSc Urbanism education at the TU Delft develops core knowledge and skills as a basis for innovative practical and theoretical applications. It provides students with typological knowledge and insights into urbanism tools and techniques. MSc Urbanism is a scientific design education, characterized by interaction between thinking (analysis and reflection) and doing (the speculative/intuitive imagination of spatial interventions).

Regional design is the core theme of the third quarter of the MSc Urbanism curriculum. This is urbanism at a high level of scale. The way global economic powers and planetary natural change influence social, cultural and environmental development is best sensible at this level. These influences result in the inability to fully control spatial development. Regional design is about steering development in the right direction. Regional design - as the exploration of plausible futures - promotes and debates solutions to problems in a given context. It is a reflection on prevailing spatial conditions, political agendas and planning regimes, meant to improve good (democratic) decision-making and to inform long-term strategic planning approaches to desirable spatial change.

Province of South Holland - The region at the focus of the 2020-2021 round of the *Spatial Strategies for the Global Metropolis* studio was the province of South Holland. The province is part of the Rhine, Meuse and Schelde delta, covers roughly 3,400 km² (including 600 km² of water), and has a population of about 3.7 million. It encompasses the large cities of The Hague and Rotterdam, several medium-sized cities, and a great number of small cities and villages. Students considered both, the highly urbanized and peri-urban parts of the region.

Circular economy - The thematic focus of the 2020-2021 round of the studio was informed by an ambitious policy agenda that the Province of South Holland has set out: aligned with objectives of the Dutch national government, it intends to host a 100% circular economy by 2050. A circular economy enables resources to flow through human-made and natural systems in renewable ways. Flows create or retain value through slowed,

closed or narrowed loops, rather than rapidly destructing value through the creation of waste. This value can manifest itself in monetary, social, ecological and economic principles. Important in this notion is the establishment of production-consumption-use systems built on restorative resources in optimal flows. Optimal flows imply that cycles are closed and connected at spatially and temporally favourable conditions, i.e. where and when most appropriate. Moreover, changes in one part of the system should not incite negative externalities in other parts. Of particular interest for this studio were impacts on spatial quality. In this perspective the notion of 'wastescapes' forms an important part of consideration.

A vision and strategy - Responding to their assignment, students formulated spatial visions and strategy proposals that support a transition towards circularity in Southern Holland. Their designs - presented in this exhibition - imagine the redesign of material flows that currently produce grave negative environmental externalities in the region and that have therefore been identified to be in particular need of reform. Designs concern a more circular construction- and demolition sector, a more circular agri-food sector, and a circular bio-based chemical sector. In order to properly position their proposals, students paid particular attention to a range of contextual spatial and institutional development trends, notably the development of the port of Rotterdam (including its socio-economic and cultural relations to surrounding cities and regions), the increasing importance of small and medium-sized makers industries, urbanisation that is in particular triggered by a large demand for new houses in the region, and the decay of delta landscapes. Building upon knowledge gained during the supportive course Research & Design Methodology for Urbanism students also paid particular attention to ethical issues involved in the activity of planning and designing, in particular socio-spatial justice.

Map: Indication of urbanized areas in Southern Holland in 2005. Source: Atelier Zuidvleugel.

Exhibition



This exhibition presents the projects that the 19 student groups of the 2020-2021 Research & Design studio *Spatial Strategies for the Global Metropolis* have designed over the course of 10 weeks. Each project is represented by an executive summary, which gives key information on the project and main recommendations on how to foster a circular economy in Southern Holland, and the title page of the group's project report. Visitors who want to gain a deeper insight into projects can access the actual report in the TU Delft education repository.

How to take a tour - Projects are grouped by their main thematic concern about material flows in (1) the construction- and demolition sector, (2) the bio-based chemical sector, and (3) the agri-food sector.

By clicking on the below tiles, visitors are led to a theme page that gives more information on the respective material flow in Southern Holland, and lists projects that investigated these. More information on projects can be accessed through clicking on one of the titles of listed projects. From one project page visitors can move to another theme or project page or return this main page. All routes are indicated by repetitive [LINKS](#).

Photography: Pedro Maia

**TOWARDS A
CIRCULAR
CONSTRUCTION- AND
DEMOLITION
SECTOR**

**TOWARDS A
BIO-BASED
CHEMICAL
SECTOR**

**TOWARDS A
CIRCULAR
AGRI-FOOD
SECTOR**

Towards a circular construction- and demolition sector

The South-Holland construction sector generates approximately € 13 billion per year, and entails around 33,000 businesses and 105,000 jobs in the building of homes, commercial buildings and roads (Drift and Metabolic, 2018). It is estimated that around 40% of all raw material flows within the provincial territory are generated by the sector and that it produces with around four million tons the largest waste stream in the region. Waste materials – in particular stony rubble – are reused but usually thereby undergo a process of down-cycling. Less than 3% of concrete granulate is turned back into concrete, for an instance. The negative balance is expected to worsen due to the ongoing energy transition. The rapid building of solar fields and wind farms – the latter for a large part on the North Sea – are expected to produce massive material return flows in the future.

Aligned with a series of other policy agendas (Transitieteam Circulaire Bouweconomie, 2018, Ministerie van I&M, 2016), the Province of South Holland therefore strives for a fully circular construction economy in 2050. In a dedicated strategy, it seeks for a wider, diversified and more value-sustaining re-use of construction waste, a circular design of the entire construction chain, a large-scale use of renewable bio-based raw materials (under consideration of 'fair share'-principles for biomass), as well as the application of a variety of supportive organisational and business models (such as leasing). During a transition period, the province wants to align efforts with in particular the energy transition. It also wants to focus on mitigating negative externalities of real estate development, through for instance supporting measures that extend the life of the built environment, avoid new construction, and enhance urban mining and circular demo-

lition through coordinated area development.

DRIFT & METABOLIC 2018. Zuid-Holland Circulair: Verkenning van Grondstofstromen en Handelingsopties voor de Provincie. The Hague: Provincie Zuid-Holland.

MINISTERIE VAN I&M 2016. Nederland Circulair in 2050. Rijksbreed programma Circulaire Economie. Den Haag: Ministerie van I&M.

TRANSITIETEAM CIRCULAIRE BOUWECONOMIE 2018. Transitieagenda Circulaire Bouweconomie. The Hague: Rijksdienst voor Ondernemend Nederland (RVO).

**THE SOFT
TRANSITION**

**VIRTUAL X
WATER**

**WASTE
SYSTEM
REJUVENATION**

FLUX

LANDBOUW

**TOWARDS A
CIRCULAR
DELTA
ENVIRONMENT**

**BUILDING A
FAIR
TRANSITION**

Towards a circular bio-based chemical sector

Besides the large-scale production of raw material by the Shell petrochemical industries, the province of South Holland hosts a number of businesses that are involved in the production of plastics. Approximately 30 companies manufacture plastics in primary form and there are major producers of plastic resins and PVC. Inhabitants and businesses in the region consume around 360,000 tons of plastic every year. Minor amounts of this waste are deposited or recycled; the vast majority (77%) is burned (Drift and Metabolic, 2018).

To reform plastic cycles is therefore an important aim of the province of South Holland; as a host to multiple production sites, it ambitions to become a leading region in the transition towards a circular plastics economy. One of its main objectives is to reduce the use of plastics through offering substitutes that are made of organic, preferably locally produced, raw material. Question on how and where such materials can be generated arise and how their production and processing can be linked in ways that, for an instance, benefit the port industrial complex. Another main objective is an improved system for the collection of plastic waste. Such a system should stimulate a diversified, more intense and more innovative re- and up-cycling of collected materials, should be aligned with other material flow systems - e.g. organic waste – and should not exceed provincial boundaries ('no leakage').

DRIFT & METABOLIC 2018. Zuid-Holland Circulair: Verkenning van Grondstofstromen en Handelingsopties voor de Provincie. The Hague: Provincie Zuid-Holland.

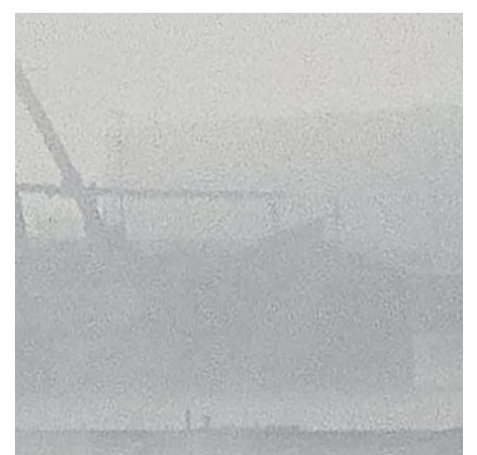
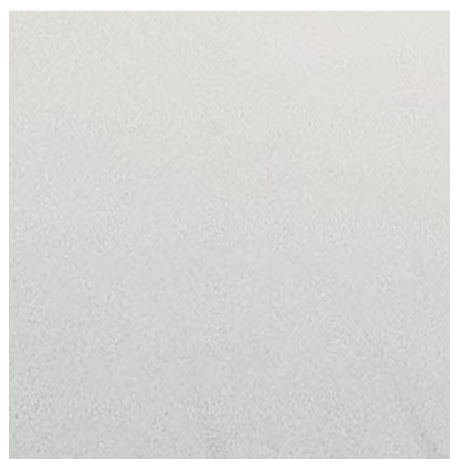
PROVINCIE ZUID-HOLLAND 2019a. Circulair Zuid-Holland - Samen Versnellen. The Hague: Provincie Zuid-Holland.

PROVINCIE ZUID-HOLLAND 2019b. Strategie Om Te Komen Tot Een Circulair Zuid-Holland. The Hague: Provincie Zuid-Holland.

**FANTASTIC
PLASTIC**

**PETRO-FREE
MOBILITY**

**SOUTH
HOLLAND'S
PETROLEUM
(E)SCAPE**



Towards a circular agri-food sector

The South Holland agri-food sector covers half of the province's surface, produces six million tons of products with a value of € 5.5 billion annually, and entailed around 16,500 businesses and 103,000 jobs in 2016 (Drift and Metabolic, 2018). The sector is an important driver of prosperity and innovation in the region but produces vast negative environmental externalities. Around one million animals consume 1.3 million tons of cattle feed yearly, and produce immense amounts of manure. Inputs such as soy, fertilizer, antibiotics, and pesticides generate a variety of serious ecological disturbance. Greenhouse horticulture, a key agri-food sector in Zuid-Holland, consumes large amounts of water and energy from fossil sources to produce food, flowers and greenery.

In alignment with a dedicated national agenda (Ministerie van I&M, 2016), the province of South Holland therefore seeks for the agri-food sector's transition towards more circularity. Focus is on a reduced use of natural resources, the closure of nutrient cycles, and the recycling of residual flows. The transition is also strongly associated with more deliberate, wider and higher-quality applications of biomass. Because biomass plays an important role in many plausible production and consumption circles, its use implies great potential for an integrated circular economy. Preconditions in this context are the integration of main and green port economies, the diversification of agricultural production across the region, and new respective urban-rural relations. However, while an increased reliance of economic sectors on biomass is desirable, it also requires scrutiny. Simultaneous use of bio-based materials for e.g. construction, energy production, and packaging may, for instance, threaten food security or lead to the depletion of natural habitats. Any

strategy for a circular bio-based economy – one that rests on return flows of biomass residues, often classified as organic waste – therefore needs to incorporate principles that organize the multiple claims on the materials efficiently and fairly.

DRIFT & METABOLIC 2018. Zuid-Holland Circulair: Verkenning van Grondstofstromen en Handelingsopties voor de Provincie. The Hague: Provincie Zuid-Holland.

MINISTERIE VAN I&M 2016. Nederland Circulair in 2050. Rijksbreed programma Circulaire Economie. Den Haag: Ministerie van I&M.

PROVINCIE ZUID-HOLLAND 2019a. Circulair Zuid-Holland - Samen Versnellen. The Hague: Provincie Zuid-Holland.

PROVINCIE ZUID-HOLLAND 2019b. Strategie Om Te Komen Tot Een Circulair Zuid-Holland. The Hague: Provincie Zuid-Holland.

**LIV/FE
TRANSITION**

**NATURE
INCLUSIVE
AGRI-FOOD
SECTOR**

**RECIPE FOR
RESILIENCE**

**DOWNSCALE-
UP!**

**HEALTH-
SCAPES –
MEATING IN
THE MIDDLE**

**LOCAL FOOD,
LOWER
FOOTPRINT**

**PLANTING
A CIRCULAR
FOODSCAPE**

**A FLOATING
CIRCULAR FU-
TURE**

**LANDSCAPE
BASED
AGRICULTURE**



Isabel van Ommen
Luiz do Nascimento
Matthew Roberts
Priscilla Namwanje
Robert van Overveld

Tutors: Diego Sepulveda, Luisa Calabrese and Marcin Dąbrowski

Key words: circular construction & demolition sector, housing, socio-spatial justice, soft planning, circular jobs

Currently the Construction & Demolition (C&D) sector in South Holland produces 2.581.840 tons of waste every year, and is also responsible for 50% of raw material usage and 35% of CO2 emissions. This issue is aggravated when considering the 200.000 houses that still need to be built in the region in the upcoming decade, increasing the amount of waste and pollution produced, not only by the construction of new houses, but also by new infrastructure. The provincial government has multiple obligations to reduce its greenhouse gas emissions and so has committed to achieving an entirely circular economy by 2050.

This project focuses on the Construction and Demolition sector and its implications for the province's spatial structure, focusing on three key themes: housing, socio-spatial justice, and the C&D sector. By using methods and practices found in Soft Planning theories, such as soft spaces, horizontal structure of stakeholders and open-ended proposals and design policies, the outcome of this research provides new perspectives on how to tackle social and spatial inequalities in the province of South Holland, whilst shaping the C&D Sector towards more sustainable, circular practices.

The soft transition takes the existing initiatives within the construction sector into account and aims for utmost collaboration with all stakeholders. Particular attention is paid to low-income neighborhoods that bear the brunt of construction companies' externalities and do not directly benefit from their proximity to educational institutions and job opportunities.

Resultantly, a set of patterns is formulated in order to set the stage for co-creation and facilitate the collaboration of the different actors at the scale of province, city and neighborhood. The project further details how these patterns could be applied on a contextual basis, and explores these scenarios in two locations within the province, notably Binckhorst in The Hague, and Dordrecht.

Recommendations:

1. Take an active role as government by creating strong and active networks between stakeholders and ensure an equal conversation
2. Create a playground for stakeholders to act in by using the suggested patterns
3. Reflecting on strategies and outcomes is of crucial importance to stay on track
4. Make information about bio-based and circular materials as accessible as possible

Virtual X Water

A ROADWAY TO CIRCULAR CONSTRUCTION AND DEMOLITION SECTOR IN SOUTH HOLLAND



Daria Beliavskaia
Jorg Hogerheijde
Rosalie Moesker
Isabella Trabucco
Nando Versteeg

Tutors: Daniele Cannatella, Nikos Katsikis, Remon Rooij

Key words: circular economy, water infrastructure, building materials, circular hubs

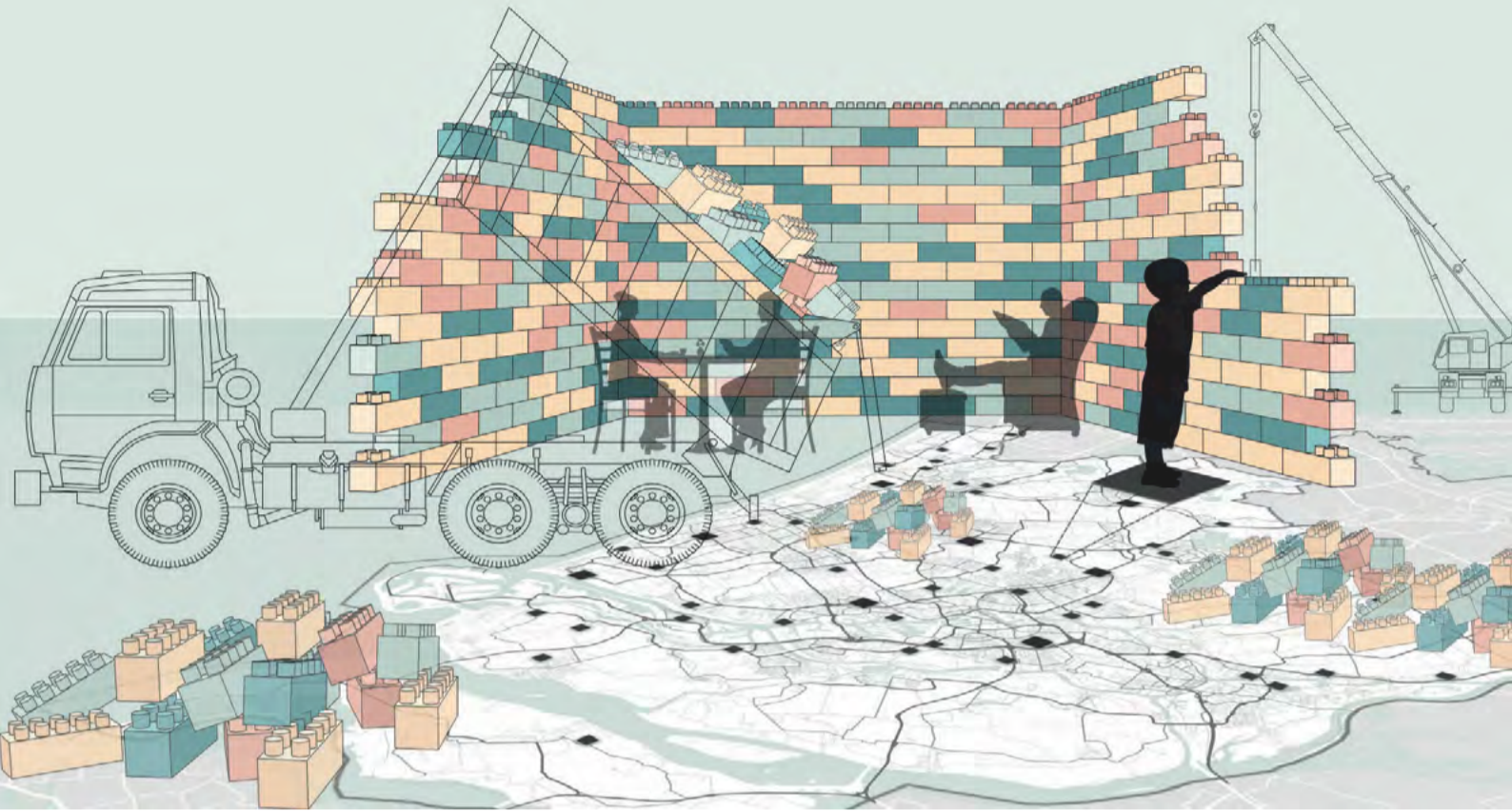
To achieve a circular economy in South Holland by 2050, the construction and demolition sector must use resources efficiently, close materials loops and work with fewer emissions. Currently the recycling of building materials is already an approach. Yet, since this costs a lot of energy and results mostly in downcycling, it is thus not an ideal long-term solution to achieve a durable circular economy. Adding to this is the space limitation to continuous growth. The usage of the existing space and infrastructure has to be optimized.

This research is answering the question: what is the best strategy to close material loops in South Holland while reusing the existing water infrastructure, amplifying it with integrated (data) networks and improving socio-spatial justice with circular hubs? The research was executed by analysing the most efficient waterways to use in the area, defining transformation locations according to a data-driven matrix and designing the most efficient circular hub network possible.

The waterways will connect circular hubs on three scales, a regional processing hub, a city storage & purchase hub and a flexible last mile hub. Transporting materials and goods in between the circular hubs helps in reducing CO2 emission and can substantiate traffic on the roads. This leads to less busy highways, safer city centres and efficient use of transport. All the logistic flows and used-material flows come together in the virtual realm, where all used-material data is accessible and a twin-region is ensuring spatial justice. In this way the concept of Virtual X Water defines the transition towards a circular economy in 2050.

WASTE SYSTEM REJUVENATION

Configuring the dialogue between waste collection stations and cities in the South Holland region



Jochem Vellinga
Minyue Jiang
Panagiota Patrisia Tziourrou
Ydze Rijff
Zahra Agbaria

Tutors: Daniele Cannatella, Nikos Katsikis, Remon Rooij

Key words: circular economy, South Holland, waste system, socio-spatial integration, construction-demolition sector

At the moment, 23,5% of total waste production in the Netherlands comes from the construction sector. Therefore in view of international agreements and the developing climate crisis, this construction- and demolition sector should be transformed into a circular system that limits CO2 severely by 2050. It is important to bear in mind that current waste collection and waste treatment in the Netherlands are often separated and that it is a system that does not integrate social and spatial aspects, such as education or embeddedness in the urban fabric. These processes lack optimal use of existing spatial systems in order to stimulate a sustainable circular flow of materials. In order to tackle this problem, we envision to integrate several systems of existing waste collection stations and treatment facilities and involve citizens in the waste system rejuvenation. In order to achieve this, we build upon the existing network of waste collection stations, by transforming these into a multi-functional system. Adding social values to the existing systems, via for instance educational facilities and makerspaces, improves their spatial quality and contributes to more public awareness about these systems. In order to achieve this, we propose to integrate systems into the urban fabric and improve the dialogue with the cities in the South Holland region.

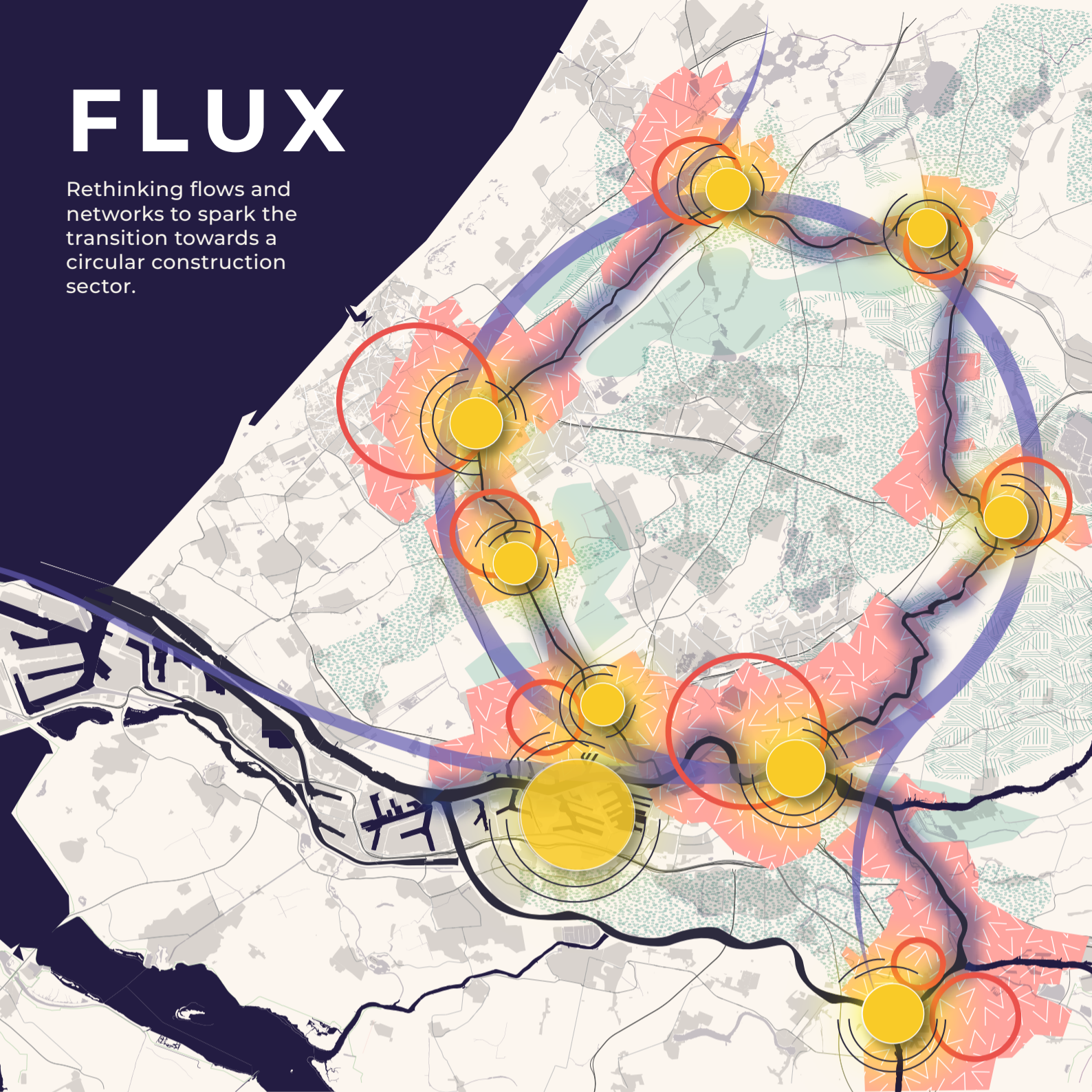
The unique identity of each location requires a multi-layered approach, consisting of central hubs and local and flexible spokes. The central hubs emphasize logistical optimization of circular material processes, while the local and flexible spokes focus more on the creation of public awareness. The local spokes do so through integration with the city and the flexible spokes through a

more adaptable character related to construction sites. To determine the functions and characteristics of each site, the regional strategy takes into account all individual spatial, environmental, social and technical characteristics, in order to achieve the best interaction between them. The multi-scalar integration and rejuvenation of the system improves the efficiency and the sustainability of waste collection, with an impact on the spatial qualities of the waste collection stations. In turn, this leads to added social values and crucial society-wide awareness for the transition and active engagement of citizens in the circular economy.

[Complete report](#)

FLUX

Rethinking flows and networks to spark the transition towards a circular construction sector.



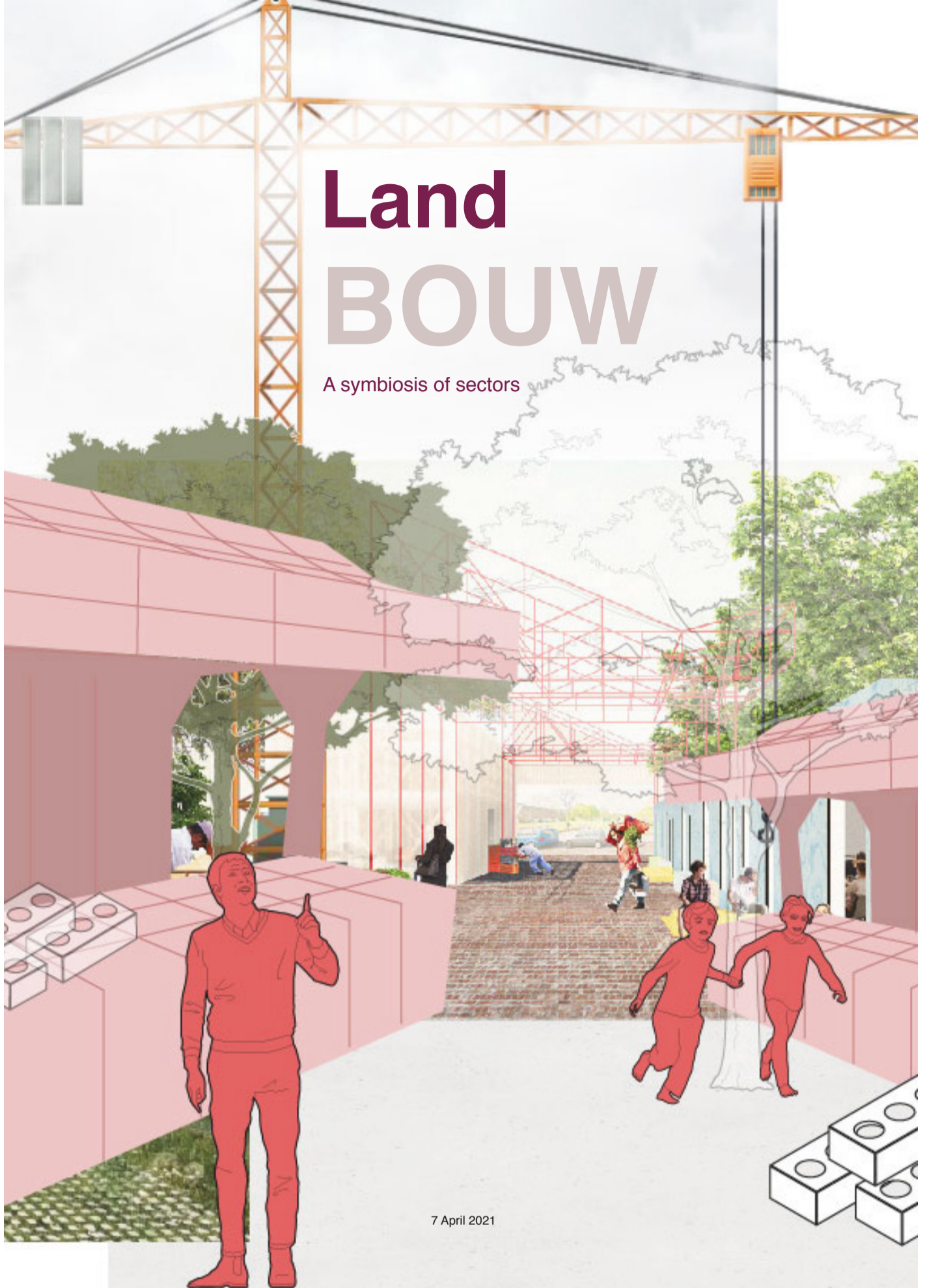
Montserrat Cortés Macías
Thomas van Daalhuizen
Paula Nooteboom
Siene Swinkels
Rosa de Wolf

Tutors: Caroline Newton, Lei Qu and Alexander Wandl

Key words: construction sector, circular neighbourhood, waterscape, bio-based materials, maker industries.

The large demand for homes in the province of South Holland, population growth and urbanisation result in a huge demand for raw materials to be used in the construction sector. The next 20 years many new buildings will have to be built to support current trends. Given the fact that 50 percent of all extracted non-renewable resources is accounted by the construction sector, a shift towards a bio-based circular system is necessary. In the province of South Holland, one of the fastest growing urban areas within the Netherlands, there is a missing link between circular initiatives, knowledge and data. The question that comes up is; how can a symbiosis of stakeholders and resources contribute to a circular construction sector? An analysis of the current situation of stakeholders and flows of resources has been made and potential spatial conflicts were understood. Whereafter the analysis of trends and requirements to transition into a circular construction sector has been made. This results in a new understanding of the spatial structure of the province, focussing on the use of waterways as a backbone to support the transition. This will lead to circular neighbourhoods connected by the water. With Flux we try to reform the current construction sector into a circular one by the year of 2050, while taking into account social and spatial justice. The shift to this new structure, supported by the waterways, can facilitate a change to a circular construction sector. Besides this it will also give the province a new identity and structural element for future improvements toward a circular economy, lifting the idea of circularity to a territorial level.

[Complete report](#)



Land BOUW

A symbiosis of sectors

7 April 2021

Donne Gerlich
Lotte van Oevelen
Eelkje Pries
Kefei Yan
Anne van den Berg

Tutors: Caroline Newton, Lei Qu and Alexander Wandl

Key words: circular economy, South Holland, agri-food, construction, symbiosis

The province of South Holland has many important stakeholders and drivers that impact the economy of the whole of the Netherlands. This, together with the increasing global need for circularity, is why the province has to take steps towards a circular economy in the near future. To address this task, this project has chosen to look into the agri-food sector, because of their high economic significance in South Holland, and the construction sector, because of the current and future high demand for housing. Both sectors also create large residual material flows. Minimizing the high amount of waste from both sectors is essential in order to reach a circular region. The existing approach to creating a circular economy is too often look at individual sectors and their material flows. This is logical, but adverse with the idea of circularity, where all chains are closed. We believe that problems should not be solved within 'their' sector.

Our vision to solve this problem is as follows: "In 2050, the material flow of the agri-food sector will be closed. All before-known waste is now used as a resource for

the construction sector. Because of this, the waste of the construction sector is reduced. Because of the collaborative sector chains, they could now be seen as one interlinked sector. The South Holland agriculture sector is now a leading example for a symbiotic and self-sufficient interlinked chain."

Our ambition is to create a new movement within the circular economy. Bottom-up initiatives show that it is possible to create interlinked sectors. This project suggests a pilot in upscaling this idea, and proves that this is possible and has great beneficial outcomes. The pilot focuses on using agri-food residual flows as a resource for the construction industry of South Holland, but can be an inspiration to interlinking other sectors.

To approach the interlinking of sectors, we envision a few strategies. We will be bringing the pieces of different policies together, use education and knowledge as glue between the sectors, and use transport and infrastructure to support the connection. Spatially, this results in four types of transition zones, a new living environment where the two sectors come together, also impacting the surrounding areas. This also impacts citizens from a socio-economic perspective, because more cross-sector jobs will be created and competition between businesses will be stimulated, which drives them to become more circular.

[Complete report](#)



A STRATEGIC VISION TO IMPLEMENT CIRCULARITY IN THE CONTEXT OF THE SOUTH-HOLLAND DELTA REGION

Dieuwertje Den Hartog
Faidra Ntafou
Joell ten Hove
Sanne Francissen
Sofia Valentini

Tutors: Diego Sepulveda, Luisa Calabrese and Marcin Dąbrowski

Key words: reinforced delta, water circularity, climate adaptation, urban liveability, socio-environmental justice

The changing climate pressures the resilience of cities and nature all over the world, putting the position of historically valuable urban and natural environments at risk. The province of South Holland has economically evolved around the unique triple delta landscape. In order to keep its economically competitive position and take environmental responsibility, the province aims to be circular by 2050. However, the province is facing a number of environmental challenges that are further aggravated by the intensification of land use and climate change. At the same time the region faces an enormous housing demand. Therefore, this strategic vision was created with the aim to propose a way to answer the high demand for space in South Holland while preserving the delta environment.

Three themes were identified as key drivers: the use of an adaptive delta water management, the transformation to sponge cities and a shift towards water circularity. Implementing interventions along these themes will preserve and redefine both the natural and the urban environment. The strategic vision provides the roadmap towards a circular delta environment in 2050. The vision involves the transformation of export-oriented agricultural land into wetland area, the densification and expansion of urban areas and a shift towards a bio-based port.

[Complete report](#)



Building A Fair Transition

Creating a fair circular built environment in the Dutch province of South Holland

Spatial Strategies for the Global Metropolis
Delft University of Technology • MSc Urbanism

Hannah Bos
Leto Demetriadou
Marieke van Esch
Ioanna Karadimitriou
Bowen Yuan

Tutors: Caroline Newton, Lei Qu and Alexander Wandl

Key words: circular economy, social justice, inclusive energy transition, material flow, South Holland

'Building a Fair Transition' strives for a fair circular built environment in the Dutch province of South Holland. By 2040 South Holland aims to have built 210.000 new dwellings to meet the rapidly growing housing demand. This transition in the built environment should align with current climate agreements and be as energy neutral as possible. To meet these goals, a lot of material and renewable energy are needed. However, the current linear economy creates inequalities for today's and future generations. Therefore, radical changes towards circular construction and the demolition sector are needed. At the same time, energy poverty is an issue that calls for immediate actions in order to make the much-needed transition truly sustainable. However, the country lacks a comprehensive assessment framework that considers social aspects to address the phenomenon. The main research question is how to manage the transition in South Holland towards a circular built environment while ensuring that this transition is done in a fair way.

In order to make this possible, a tremendous change in organisational structures is required. An interscalar approach is needed to create a symbiosis between the regional scale and the actions needed at a local level. In this work, bottom-up initiatives are encouraged and embraced within a bigger top-down mainframe. Through an assessment analysis, the goals towards a sustainable built environment are classified into three categories: materials, energy and knowledge. These goals will strengthen the social foundation of our project and fit the ecological ceiling that all development must respect. In our work, phasing of interventions is based on the urgency needed. In that sense, actions are prioritised in the most vulnerable areas while pilot projects serve

as the research ground for testing feasibility and potential upscaling. The most urgent areas will be addressed first according to the criteria of low liveability, building energy performance, low income and ownership status. The overall goal of this strategy is to create a just sustainable built environment characterised by circular material flows and fair energy transition. More precisely, the aim is to strive for affordable and adequate housing for all, a regenerative and stable labour market and knowledge exchange. Concerning material flows, the target of closed material loops is achieved through renewable raw materials used, upcycling of waste flows and optimal use. Finally, democratisation of energy has become a key theme. Supply and demand for renewable energy sources are controlled to minimise energy losses. A decentralised energy system enables every citizen to become a prosumer of energy leading thus to democratisation of energy.

[Complete report](#)



FANTASTIC PLASTIC

transitioning towards an inclusive
and circular plastics economy

Francien Fons
Hugo Lopez
Joaquim Boendermaker
Marit Vuyk

Tutors: Caroline Newton, Lei Qu and Alexander Wandl

Key words: Plastic, circular economy, compostable plastics, human engagement

Plastic is a durable and versatile material that underpins our global economy. However the increasing leakage to the environment and greenhouse gas emissions is concerning. To address these concerns, this project provides a comprehensive plan to integrate the network and push forward this change using data, technology and spatial planning for the province of South Holland.

Our ambition is that by 2050, the way we use plastics within the province of South Holland has changed drastically. The plastics industry, which is primarily linear at the moment, will shift to a circular model. The province will no longer rely on the import of non-renewable resources as raw materials for this industry, or rely on the export of excess plastic waste as an end of pipe solution - to plastic waste issues. Consumption has been limited to a minimum through socioeconomically fair and viable alternatives. End-of-pipe solutions shift to recycling and, perhaps, composting - diminishing the environmental impacts and closing the loop of the plastic cycle. In thirty years, the circular model will entail fair and viable solutions throughout the plastic lifecycle.

The strategy is that the plastics cycle runs sharing the values of cooperation, responsibility and spatial justice in every stage of the material loop. To realise this future, we propose the spatial intervention seen in the Fantastic Plastic hubs, parks and port. They are like catalysers of the first examples for the goals below can thrive:

- People actively engage in the plastics cycle
- Space and resources are used in fair, inclusive and efficient ways
- All plastics in Zuid-Holland are produced and processed locally
- Plastic use is reduced to a minimum and the plastic that is still used is recycled or fully compostable
- Recycling is the norm for end-life plastics

[Complete report](#)



PETRO-FREE MOBILITY

A REGIONAL STRATEGY TO FACILITATE THE MOBILITY TRANSITION IN THE PROVINCE OF SOUTH-HOLLAND

Juliette Brouwer
Miriam van Eck
Joëlle Hermans
Tijmen Louwen
Cynthia Rensman

Tutors: Daniele Cannatella, Nikos Katsikis, Remon Rooij

Key words: circular mobility, petrochemical industry, fuel transition, wastescape transformation, South Holland

Human driven pollution is causing irreversible damage to the habitability of our planet. Due to these environmental concerns, it has become imperative to move away from petrochemical dependency, as these industries contribute significant greenhouse gases, and cause air, soil and water pollution. About 85% of the petrochemical industrial products that travels through the port of Rotterdam, the economic centre of South Holland, goes towards fuels for mobility.

In the project 'Petro Free Mobility' we aim to contribute to a movement away from those current contaminating, and non-sustainable conditions. Therefore, our research question is defined as follows: How can a regional design strategy facilitate the transition away from petrochemical dependency towards a circular province of South Holland? This question has been addressed by means of a vision and a strategy, followed by an advisory on a set of interventions.

By creating space for sustainable developments towards circular mobility, we accelerate a shift from dependency on the major output of the petrochemical industry, mobility fuels, towards clean alternatives. The aim is to have a province driving fully on electric mobility in 2060, and one that prioritizes accessibility and fair distribution over the region. The application of biofuels in mobility is taken into account as a temporary option, but is not designated as suitable for a vision for circularity and sustainability in the long term. To turn desires into reality, a pragmatic approach is needed. Three strategies are proposed:

1. sustainable connections, putting focus on connecting innovative small-medium size stakeholders in an early stage, combined with improving the physical network.
2. consumer patterns, emphasising stimulation on the local scale, so that consumers will get used to a completely new societal system.
3. waste to value, indicating priority to waste valorisation. In this project, also spaces are interpreted as potential waste.

By splitting the transition into three phases; the preparatory phase, the shifting phase and the circular phase, the road towards a complete circular mobility system has been concretised. By the use of a decision tree, a structure has been defined to strategically repurpose the released leftover sites of the petrochemical system. Herein, the need for new places that contribute to an all- electric, shared and automated mobility system are prioritised. In addition, environmental as well as social goals of the province are taken into account for assigning new functions. By implementing the systemic changes proposed in this project, a step towards 2060 is made. The province of South Holland will have a more integrated and fully electrical mobility network, transformed a significant amount of waste scapes from the petrochemical industry, and have a healthy living environment for the over four million residents now residing in the province .

Further research into reinventing the refineries in the port should be done (this project would be really extensive, so we tried to cover it schematically in this project). Further research could also provide a detailed design for these enormous waste scapes. The specific functions within the mobility hubs could be investigated in more detail likewise. New sources for biofuel could also be explored, making it viable for the long-term.

[Complete report](#)

spatial strategies for the global metropolis

R&D STUDIO
Province of South Holland

South Holland's petroleum (e)scape

Q3
2020-2021

Jessica Stolk
Kimberley Nguyen
Douwe Douma
Jasmijn Hofman
Bjarne van der Drift

Tutors: Daniele Cannatella, Nikos Katsikis, Remon Rooij

Key words: Energy transition, petroleum, port region, South Holland

In the past decades, the port of Rotterdam has been considered as one of the main engines of the Dutch national economy, since it is the largest hub for fossil fuels in Europe. The province of South Holland and the Port of Rotterdam hereby form the heart of the economic centre of the Netherlands, contributing to 21% of the national GDP. However, the economic growth and prosperity of the region is inevitably linked to CO₂ emissions and pollution. On the local level, the petroleumscape produces an invasive effect on the liveability of its direct environment, exposing the local population to the burdens of the financial gains of the petrochemical industries. Also, we urgently need to transition towards a more sustainable energy system due to growing risks as a result of climate change. This poses a challenge to the region, since the main driver of the current industry is based on a highly centralized energy system. Such systems are not fit to make use of locally perceived potential of renewable energy sources. In the transition towards a distributed energy system, ecologic, social and economic challenges with strong spatial components arise in the region of South Holland.

Therefore, this strategy aims for an approach that gives shape and meaning to the energy transition in the province of South Holland. Our team explores the way in which decentralization of certain building blocks in the mechanisms of energy production, conversion and storage could deliver a more democratic, self-sufficient and resilient system. Simultaneously, it should empower the local economy. By rearranging and reimagining the configuration of space in the port region, new spatial layers come to existence, which are oriented towards improving social and ecological structures.

Once the polluting industries transform into cleaner industries, new spaces and opportunities open up for sustainable redevelopment of the waterfront. Space for recreation, flora and fauna will bring about a more gradual transition from port to city to hinterland. The sum of all interventions will contribute to the global objective of mitigating climate change, while reintroducing spatial justice and creating meaningful connections between industrial, rural and urban landscapes in the region.

[Complete report](#)



LIVFE

transition

to a healthy agriculture sector with
livestock as an integral part of life

Jannine de Jong
Carmen Jansen op de Haar
Ohad Shapiro
Jiaqi Wang
Max Corbeek

Tutors: Diego Sepulveda, Luisa Calabrese and Marcin Dąbrowski

Key words: South Holland, circular agriculture, value change, transitions, diet, technical, attitude, stakeholders

By 2050, South Holland will transform into a transition based urbanity with value change at its core. Currently, consumers are disconnected from where their food is produced, leading to a high environmental impact, unhealthy choices and social injustice to the farmers' work.

The proposed strategy of change in the region would see South Holland shift away from hosting an export based business of livestock farming, lowering and limiting production to local needs, while changing the attitude of farmers, and reshaping it as a spatial part of everyday life, freely accessible to the region's citizens. In order to do that a strategy of transitions is chosen, recognizing three core spatial movements based on the three pillars of sustainability; diet transition, attitude transition and technical transition.

- Diet Transition - changes in food consumption would also affect the spatial landscape upon which food is produced.
- Attitude Transition - raising awareness toward how meat and dairy is produced would affect the cities where consumption takes place and how the different actors are treated.
- Technical Transition - would help change the Dutch industry from one exporting goods to one exporting knowledge while supplying it with clean energy, overall creating a better South Holland while benefiting other countries.

In the vision, it is recognized that these movements have spatial manifestations in the form of rings, with their points of overlap being ideal to the beginning of change, as they are where new sustainable relations would be most meaningful. These zones are where the transition of attitude, diet and technology will happen for the circular agriculture in South Holland. A toolkit of 21 typologies is created with a focus on these transitions while keeping a pleasant environment. The new vision will lead to a circular economy in the livestock sector of South Holland with sustainable relations between producers and consumers.

[Complete report](#)

Nature inclusive Agriculture

Re-activating the fringes in the province of South Holland



Lisanne Meijer
Daan Helmerhorst
Jonah van Delden

Tutors: Diego Sepulveda, Luisa Calabrese and Marcin Dąbrowski

Key words: Circular Economy, Nature Inclusive Agriculture, agri-food sector, fringes, socio-spatial justice

The province of South Holland is one of the biggest drivers of the Dutch economy with almost a quarter of the gross national product earned in this region. The agri-food sector is the largest contributor with an annual turnover of about € 5.5 billion. About half of the surface of the province is dedicated to this sector, entailing many jobs and steering innovation worldwide. In line with the ambitious target of the Dutch government the province aims to be fully circular in 2050. This means the agri-food sector is facing an enormous transition.

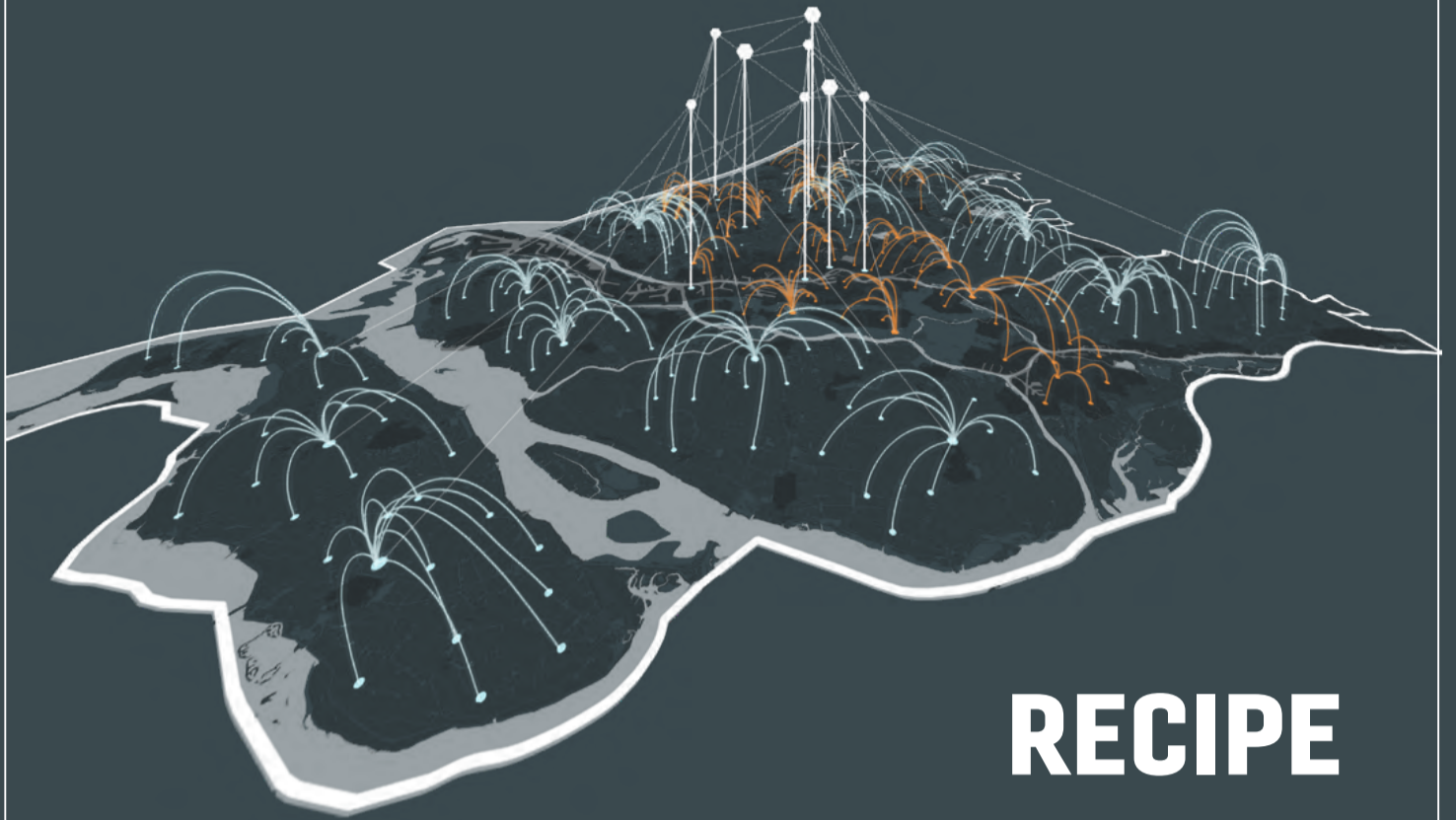
However, the sector faces several major socio-spatial and environmental challenges. The current monoculture food landscapes contribute to 20% of GHG emissions, consumes 67% of fresh water, and results in subsidence, salination and lack of biodiversity. Additionally, with the challenge to build 230.000 houses and the space needed for energy transition and nature, the pressure on space increases. The distribution of these negative externalities results in socio-spatial inequality, placing a burden on mainly lower income communities, including a lower socio-economic position for farmers. Nature-inclusive agriculture has the potential to tackle these issues as an overarching framework. How can the agri-food sector in the province of South Holland transition to a nature inclusive circular system?

This project aims to have a 100% nature-inclusive agri-food sector in 2050. To reach this goal, this project starts by further investigating the current linear system and its environmental social and spatial issues. It can be concluded that the socio-spatial challenges are most present in the fringes within the province. Hence, a regional vision and strategy are proposed that transform the linear-manufacture-waste model into a circular and

nature-inclusive agri-food sector, through re-activation of the fringes in the province. The fringes offer a high potential for implementation of a variety of nature-inclusive and circular functions, that can be established through stakeholder engagement, co-creation and participation of local residents. Part of the strategy are 3 fringe typologies, that can be expanded throughout the region. As a result, the agri-food landscapes become more nature-inclusive and resilient, with a shorter and more just food chain, whilst simultaneously providing equitable access to healthy and accessible food.

This project is interesting for governance parties or businesses in the agri-food sector that aim to transition to a circular economy. It could also be valuable for knowledge or educational institutions related to agriculture, food, nature-inclusive or transition methods, and regional spatial planning.

[Complete report](#)



RECIPE FOR RESILIENCE

for a sustainable agri-food sector in South Holland

Annam Irfan
Britt Hoornaert
Esmee Kuit
Oliwia Jackowska
Patrick Maurer

Tutors: Daniele Cannatella, Nikos Katsikis, Remon Rooij

Key words: resilience, knowledge, actor involvement, circular system, agri-food sector

Our modern food structure is unsustainable and fragile. Changes like climate crises, rising food demand, biodiversity loss, and the technological revolution will radicalize how and what we eat and produce. Whichever changes will happen, they will have an effect on the food system. In South Holland, this will happen with the transition to a circular economy. In order to deal with the unpredictability of these changes, this project proposes to create a resilient system. The main question that will be answered is 'How can resilient food systems contribute to a circular agri-food sector in South Holland?'. In this context, resilience is the ability to ensure the provision of system functions in the face of increasingly complex and accumulating shocks and stresses.

Through capacities of robustness, adaptability, and transformability a just transformation to the circular food economy can be ensured. The strategy 'Recipe for Resilience' derives from this definition. Based on a network of a mix of three types of hubs, the strategy calls for more widespread and integrated distribution of knowledge about food and the food system. These hubs are the Seeds, where knowledge and food produce germinates, the Melting Pot, common interacting ground for all actors, and the Mixers, the in-between spaces that are not transparent. Together, they supply a network facilitating producers, distributors, and consumers. Thanks to this high-functioning network of knowledge, the main goals of the strategy can be achieved.

During and after implementation, there will be high stakeholder engagement through all layers of society, local food cycles with feedback loops to distribution centers and farmers, and the knowledge about it will be

widespread throughout the South Holland population. The constant exchange of expertise will ensure feedback loops throughout all layers of the knowledge production. Through this constant adaptation and transformation, a resilient system can be achieved.

There are a few recommendations:

- There should be extensive research into potential locations before placing a hub. This strategy cannot function as a blueprint because of the varied landscape;
- It is important to look closely at relations between economies;
- This project focuses mostly on knowledge. It is key for the transition to also look at flows in the system;
- There should be a large focus on the value of both, theoretical and practical knowledge to include all actors.

[Complete report](#)



Down Scale-Up!

'Downscaling global agri-food flows with an upscaled regional system'



Rosa de Kruif
Henriette Hugenholtz
Yuru Chou
Amber Luesink

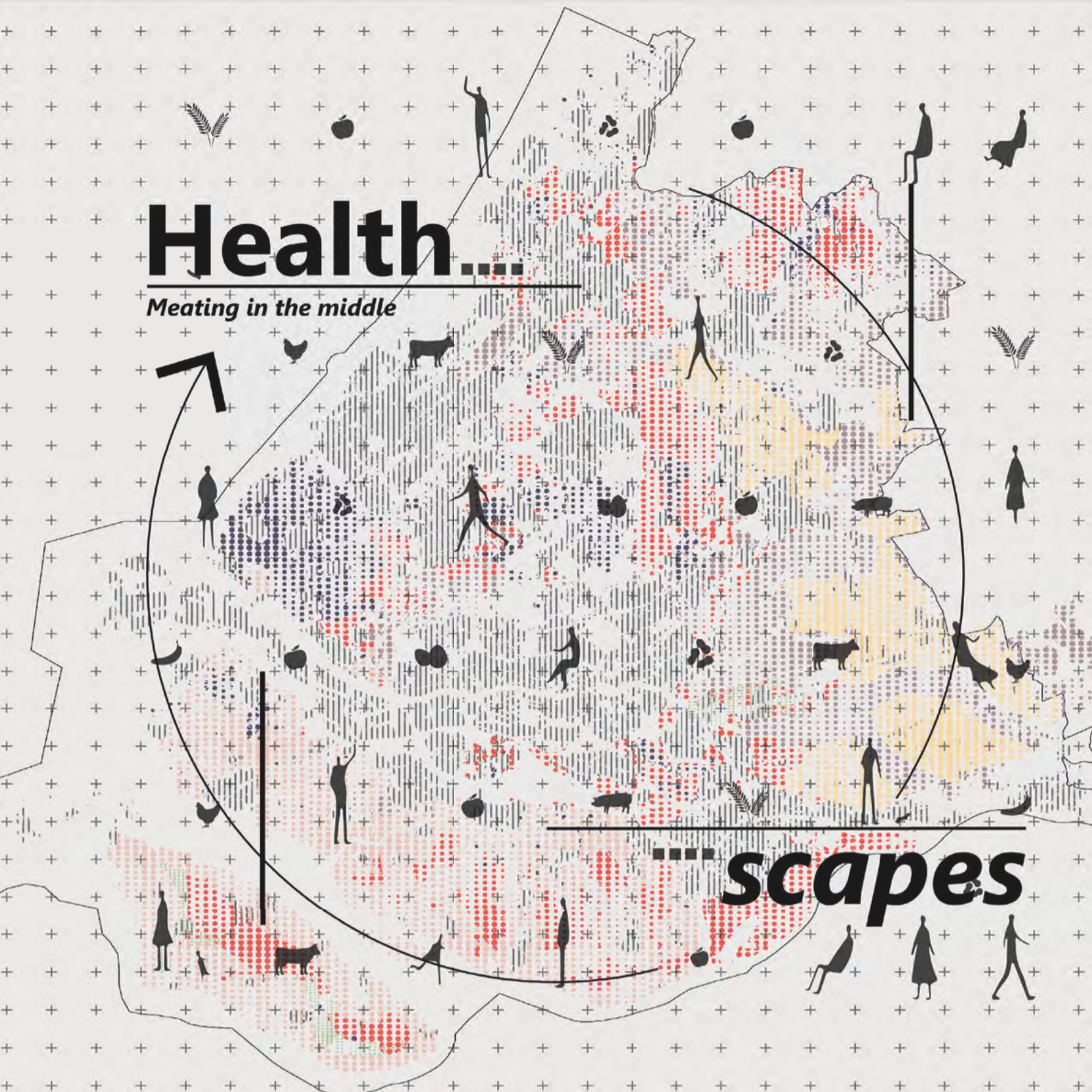
Tutors: Caroline Newton, Lei Qu and Alexander Wandl

Key words: agri-food, circular economy, global flows, regional food system, participation

Data on import and export in the Netherlands shows the big agri-food flows in which the country is involved. Sadly, these global flows have a big impact on economic, social and environmental sustainability worldwide. For example, transport causes many emissions, there is an unfair economic system that keeps farmers trapped and there is a lot of environmental damage. This is a situation that needs to change, but the Netherlands is also very dependent on the economy that the worldwide trade brings. This shows the problem that South Holland is dealing with: The Netherlands is too much economic dependent on its agri-food import and export flows and is thereby causing economic, social and environmental sustainability challenges.

This project proposes to DownScale international agri-food flows and Scale-Up a regional food system. The import and export flows are limited to only the European Union while food hubs and knowledge networks contribute to a system in which local food consumption and participation are important values. Waste, water and CO2 systems contribute to a circular approach of these DownScaled flows and the production of seaweed helps to change the diet which is necessary to make a DownScaled system possible. The project is supported by a sustainability triangle resulting from the nested sustainability model, the R-ladder of sustainability and the X-curve for a sustainable transition. A toolkit of interventions is designed as a strategy to achieve the vision goals. With DownScale-Up a new circular economy with DownScaled international flows and a Scaled-Up regional food system, is created by 2050.

[Complete report](#)



Health...

Meeting in the middle

scapes

Aikaterini Christina Inglezaki
Boris Bakker
Lilly Petter
Oviya Elango
Yoran Erami

Tutors: Daniele Cannatella, Nikos Katsikis, Remon Rooij

Key words: agri-food sector, self-sufficiency, diet change, land use, crop diversification, biodiversity, planetary boundaries, sustainable agriculture, Lancet diet

The future poses a major problem of feeding nine billion people by 2050, while the current system of agriculture in itself is unsustainable and demands resources which exceed the planetary boundaries. Further continuing this trend of exploitation and destruction of ecology will only worsen the planetary stresses the Anthropocene has established. Hence emerges the urgent necessity to reorganize and reinvent our current food system towards a sustainable and circular one to sustain life on our planet.

Accordingly, the primary goal of this project is to achieve sustainability in the food sector, thereby achieving circularity and food security. The Netherlands has an extraordinary position in the global market and is globally leading in agricultural research, technology and innovation. Therefore it could prove to be fruitful to develop a regional sustainable agricultural model that could become a role model for sustainable agriculture globally. The vision is to reduce the spatial impact of our food system while discontinuing the destruction of new habitats. To achieve this, a healthy diet must be embraced, which not only proves to significantly improve our health but also facilitate a transition towards a healthier planet.

By evaluating the spatial, environmental and health impacts of the current model, the negative externalities at each stage of the food sector are investigated. The diversification of the crops to be grown within South Holland is crucial in order to facilitate the transition from a food exporter to a self-sufficient region with respect to the food sector. To encourage more sustainable food production and enhance the relationship between people and their food production, it is invaluable to invest more power

in the producers. Finally, the various steps involved in the food systems and the gap between people and the source of their food are reduced by initiating big food retail corporations to focus on food production.

Thus, the transformation of the food industry through the integration of a sustainable agriculture model and re-shaping the public's perception of food consumption and dietary needs, will ultimately create a more healthy and balanced landscape, while aiming towards the collective goal of mitigating climate change.

[Complete report](#)

LOW CARBON FOODPRINT



AR2U086 Spatial Strategies for the Global Metropolis
MSc Urbanism Q3
TU Delft Faculty of Architecture and the Built Environment

Froukje Visser
Hidde van Beek
Lisanne den Held
Dennis Groen

Tutors: Caroline Newton, Lei Qu and Alexander Wandl

Key words: Agri-food sector, seaweed, aquaculture, dietary protein

In recent years the need for action against climate change has severely grown. Action is needed now and circularity can help to make sectors more sustainable. The agri-food sector plays a big role in this, as we need three times the surface area of our country to support the needs of the inhabitants. The agri-food sector is putting too much pressure on space and resources and this pressure will only increase as the population continues to grow. However, by creating spaces that are used more efficiently this pressure can be reduced while also providing for a growing population.

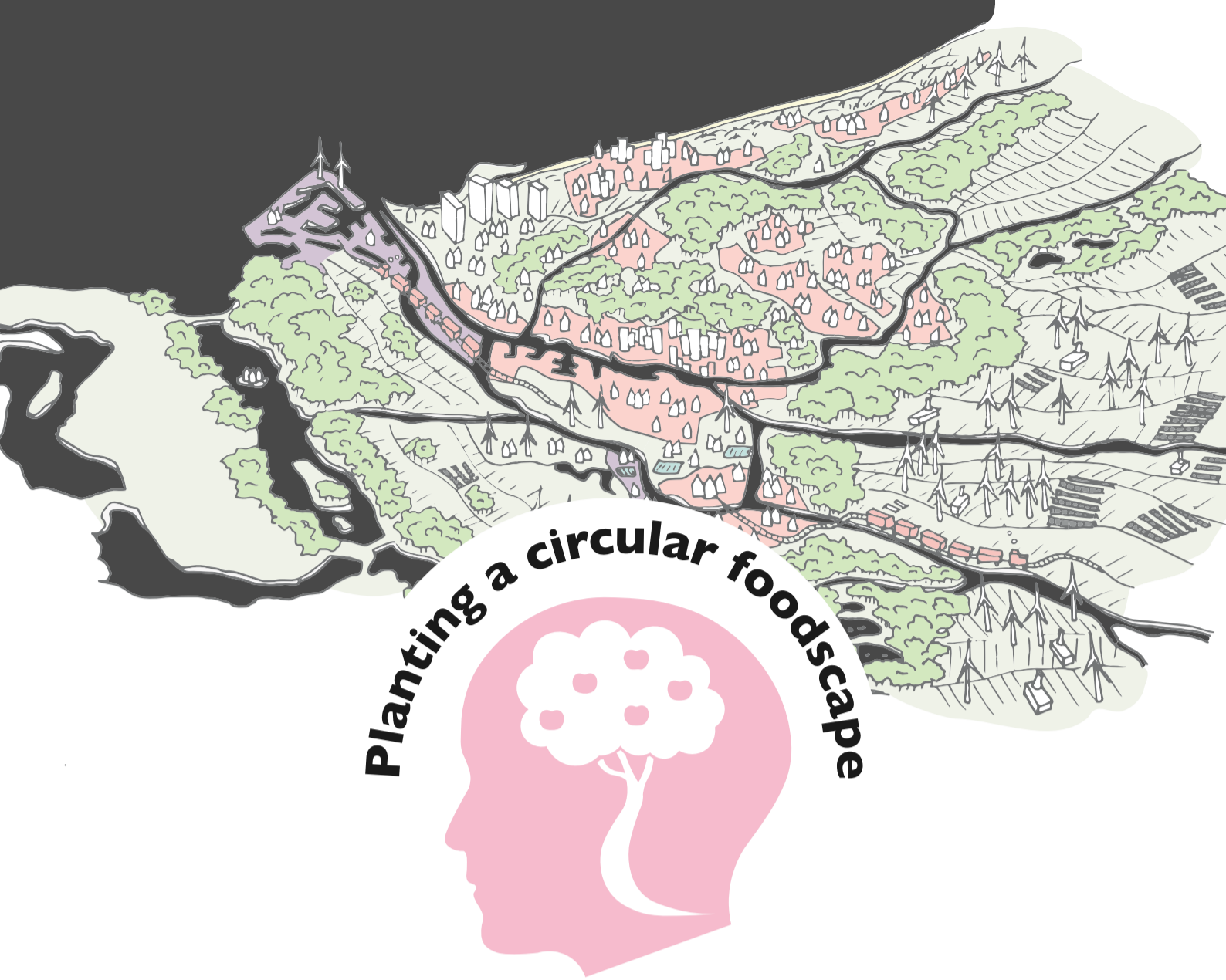
Decreasing the pressure of the agri-food sector on space and resources will lead to a drastically new South Holland in 2050. To achieve this new South Holland, research on several aspects of the sector was carried out. First the current situation was analysed. Furthermore, research on possible interventions and the future implications of these interventions was conducted. After extensive research, a vision for 2050 was formulated:

By 2050, both the land and the sea are used in a space-efficient way, reducing the (carbon-) footprint of the province and providing more food for its own population. Buying and eating local food have encouraged people to become more aware of the process and where the food comes from. This has resulted in a shift in diet and the inefficient space for cattle farms is reduced.

This conversion provides space for nature, housing and agriculture while also leaving room for the plans of the next generation. By reducing the meat and the dairy industry, space opens up for more nature and some small scale housing in the Green Heart. To replace the loss of dietary protein, the province makes a shift towards

seaweed and aquaculture. More circularity is achieved through the use of "waste" streams of the harbour, horticulture, arable farming and the meat and dairy industry.

[Complete report](#)



Solving spatial conflicts in South-Holland by changing to circular behavior in the food chain

Iris van der Rest
Samuel van Engelshoven
Xiaoling Ding

Tutors: Caroline Newton, Lei Qu and Alexander Wandl

Key words: circular economy, food chain, behaviour, conflict of space, foodscape.

Elsewhere, deserts emerge as we flood, yet we continue to consume at our leisure. Our food is shipped all over the world for our convenience. Our behaviour causes serious problems in the world but also on our own ground. Right now the province of South Holland copes with a conflict of space, as there is a need for more housing, renewable energy infrastructure, food, and nature. There is not enough land to keep up with the current trends and this creates many conflicts. The behaviour of the actors within the food chain leads to a linear food sector which is cost efficient but needs a lot of land for export of products. Furthermore it produces a lot of unnecessary waste and pollution.

These conflicts could be prevented by changing the way we consume and use our land. The agricultural sector needs to be more space efficient, by using new technological advances. We can make the sector more efficient by changing the behaviour of the actors in the food chain. In the future everyone should be able to live in a healthy and sustainable South Holland. By changing consuming behaviour and methods of farming we can create interesting new foodscapes while solving the conflicts.

The following steps are recommended for the development of circular economy. First, we will consume more consciously by eating more local and less meat. As a result, exports are no longer important and a lot of space is freed up in the port. Later, the farmer will use new technology and can produce, through vertical farms and with cultured meat, more on smaller pieces of land. This frees up a lot of space, leaving enough space for people and nature. This not only means that in the future it will be possible to buy a house in South Holland. It also shows that we relate differently to nature and the world around us, reducing climate change and boosting biodiversity.

[Complete report](#)



A FLOATING CIRCULAR FUTURE

*Utilizing the changing landscape as a
driving force to a circular economy*

AR2U086 R & D Studio
Spatial Strategies for
the Global Metropolis

AR2U088 Research and Design
Methodology for Urbanism

2021 Q3

Paul van Eeden
Xinqi Yao
Céleste Richard
Anouk Jansen

Tutors: Diego Sepulveda, Luisa Calabrese and Marcin Dąbrowski

Key words: circularity, flooding, climate change, resilience, delta

While attempting to find an answer to the question of how we could become sustainable and circular by 2050, we discovered that it was quite difficult to even imagine what South Holland, the Netherlands or the world, for that matter, would look like. The questions that arose quite quickly were, among others: how many people will live here then? How will we have dealt and continue to deal with the challenge of sustainability? How will the climate have changed? This resulted in the question that guided the rest of the research: will we still be able to live here? The design process started with the acknowledgment that climate change is a serious threat to us and the way we live. Then there was the realization that it does not make sense to imagine a future in which the economic structures have changed, but the landscape and the way we deal with this threat has not. From this, we continued to envision South Holland in 2100, to see what the landscape could look like and how the circular economy and its activities could exist within it.

While drawing up this image, the answers to the questions of flood risk and circularity are not found separately, but sought for in the creation of synergies between different sectors and layers. The idea is that the transforming landscape can be a generator of change within the agricultural sector and energy production as well. If the environment changes, the ways in which we use, inhabit or move through it will shift, too. The resulting strategy is about protecting what is crucial, using what is possible and letting go of what we can. This is all strived for in order to reach our goals of having South Holland protected from floods and sea level rise, a circular and sustainable agri-food sector, 100% clean and renewable energy and

increased environmental health, all while taking into account the (societal) challenges of the century.

[Complete report](#)



Landscape Based Agriculture



Towards a new circular agricultural system, a stronger ecosystem and improved liveability

Jasmine Cui
Mark Geers
Nadya Chabayuski
Rosemarijne Bouma

Tutors: Diego Sepulveda, Luisa Calabrese and Marcin Dąbrowski

Key words: circular agriculture, livestock farming reduction, ecological system, landscape based agriculture, water management

Currently, the agricultural system of South Holland causes many externalities including subsidence, increased flood risks by poor water management, a loss of biodiversity, air pollution and economic problems due to the nitrogen tax. Given these problems, the following research question is chosen: can improving ecological conditions and liveability in South Holland be accomplished by creating a circular agricultural system where livestock farming is severely limited?

The goal of this project is to respect and work with the underlying landscape system to construct a new circular agricultural system which is beneficial for the ecological system and liveability in South Holland. This will be achieved by reducing livestock farming by over 90%, which will still leave us with the right amount of animals needed for sufficient manure production. On the remaining land, new types of protein rich, eco-friendly agriculture will be introduced. Furthermore ground remediation will be done, in peat areas the ground water level is increased to battle subsidence and double dikes will be realised to limit the long-term flood risk in a natural way while producing seaweed at the same time. To create a stronger economy, knowledge on the new forms of farming and producing meat replacements will be created in the newly introduced meat replacement hub and then exported. Lastly an ecological network will be created to strengthen the ecosystem and increase biodiversity. By these interventions a stronger ecosystem is created that will be integrated into people's lives.

To make these interventions happen, scientists need to work together with policy makers and designers to dis-

cuss the details of the projects. They will initiate the processes, and then give nature time to heal and achieve the sought after ecological results. Overall, the following recommendations are given to the province of South Holland:

1. Initiate natural changes that will lead to a stronger ecology and underlying landscape
2. Give strong incentives for entrepreneurs to be circular: facilitate, stimulate but also regulate
3. Take externalities into account when making economic calculations, then a sustainable way is likely to also be the most profitable way

This project is interesting for policy makers and spatial planners at a national, regional and city scale level who are looking for spatial solutions to problems with a linear agricultural system as well as policy makers wanting to improve the subsoil conditions. The project is specifically interesting when one is interested in South Holland, but can also be applied broader to the Netherlands and countries with similar climates, soil types and ecosystems.

[Complete report](#)