

TURNING THE TIDE

Inverting Ecosystem Service Assessment as a Planning and Design Instrument for Decision-Makers to Develop Sustainable Eco-Based Solutions in an Uncertain Region

The manipulation of the delta landscape in the Rotterdam region, to meet the economic desire of society, resulted in a degradation of ecosystem services. Each eco-based design, such as 'the River as a Tidal Park', being the case-study for the research, is subjected to a wide range of environmental, societal and political risks. Considering the extremely uncertain projected risks for increasing sea levels and more extreme river discharges after 2050, the river does not provide the flexibility the future demands. After the implementation of relatively short term and local scale initiatives the projects are still subjected to these uncertainties. This makes the final values it can produce in the future uncertain and might conflict with long term and large scale projects. Therefore, it might result in a loss of capital for partners as the project appears to be unsustainable. Accordingly, the research aims for ensuring the project provides the desired ecosystem services for 2100. Costs and benefits are distributed more evenly among stakeholders through time and space without the loss of capital for collaborating partners.

To bridge the gap between time and space, the research considers the concept of seeing and working with "Nature as a New Economy" as a starting point. This concept focuses on the development, preservation and regeneration of nature to obtain most values from it. In order to make sure the 'River as a Tidal Park' provides the values society desires in the far future, the thesis approaches two scenarios for 2100. The Rest Scenario considers moderate climate change and socio-economic decline and the Steam Scenario investigates extreme climate change and socio-economic growth. The research follows in a search for value synergies among both scenarios to find 'no regret' measures for the short term. To guide decision-makers in the process between short term investments and long term needs, an adaptive framework is developed. This framework provides guidelines to take action when specific tipping points in time are reached. The research approaches eco-based projects from a different perspective as it provides a method to design and plan with ecosystem services in a deeply uncertain region. It makes short term projects more future-resilient and adaptable through time. The hypothesis which will be tested is to what extend the value of ecosystem services can be inverted in time to use it as a design instrument in relation to decision-making processes in order to obtain most values from it. The research question which leads this thesis is:

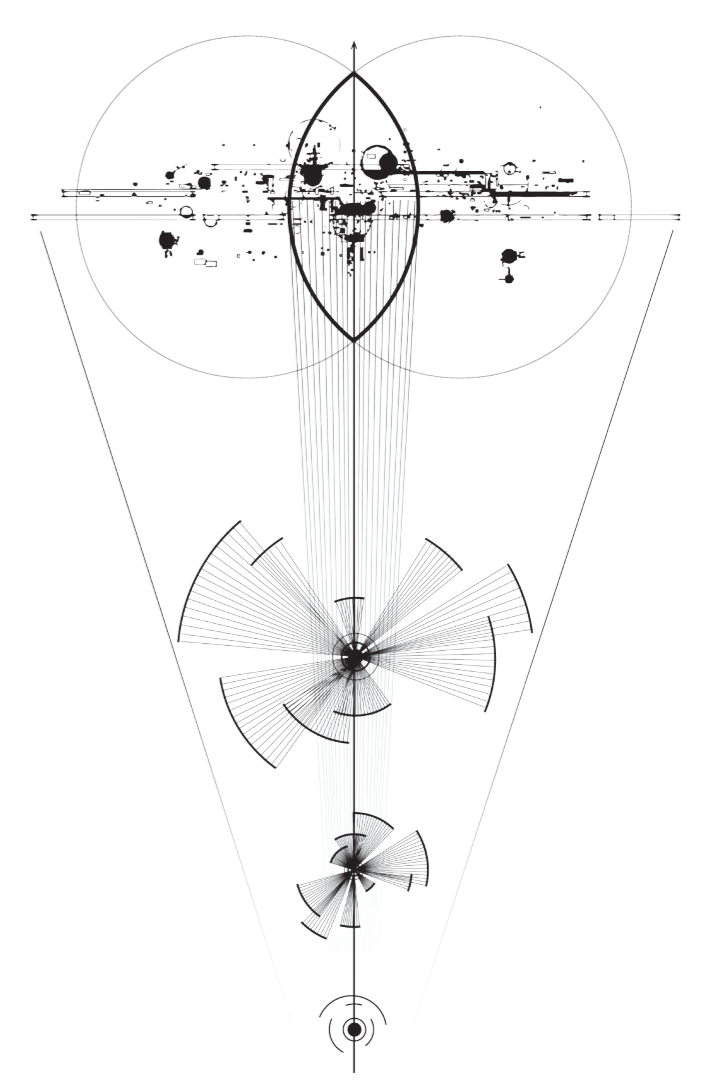
"How can the concept of 'Nature as a New Economy' be used for the development of an adaptive design for the spatial transformation of the fluvial zone of the Nieuwe Maas considering the uncertain future?"

The results show that, with the proposed adaptive design, most ecosystem services increase through time. This results in increasing interest and a model of revenue for stakeholders, which makes sure that the project can be extended until 2100. The concept of 'Nature as a New Economy' is providing decision-makers with a language to give insight in the benefits for them on the long term, is increasing the financial support for the project and will reduce the risks related to the uncertain future for society. It makes decision-makers aware of the value of nature and that it could go beyond economic growth. It can be seen as an inversion of the concept of nature: nature is no longer seen as something we have to fight against to strive for economic growth. Nature can now be seen as an economy itself which is the new value for producing economic growth.

Manipulation of the Delta Landscape

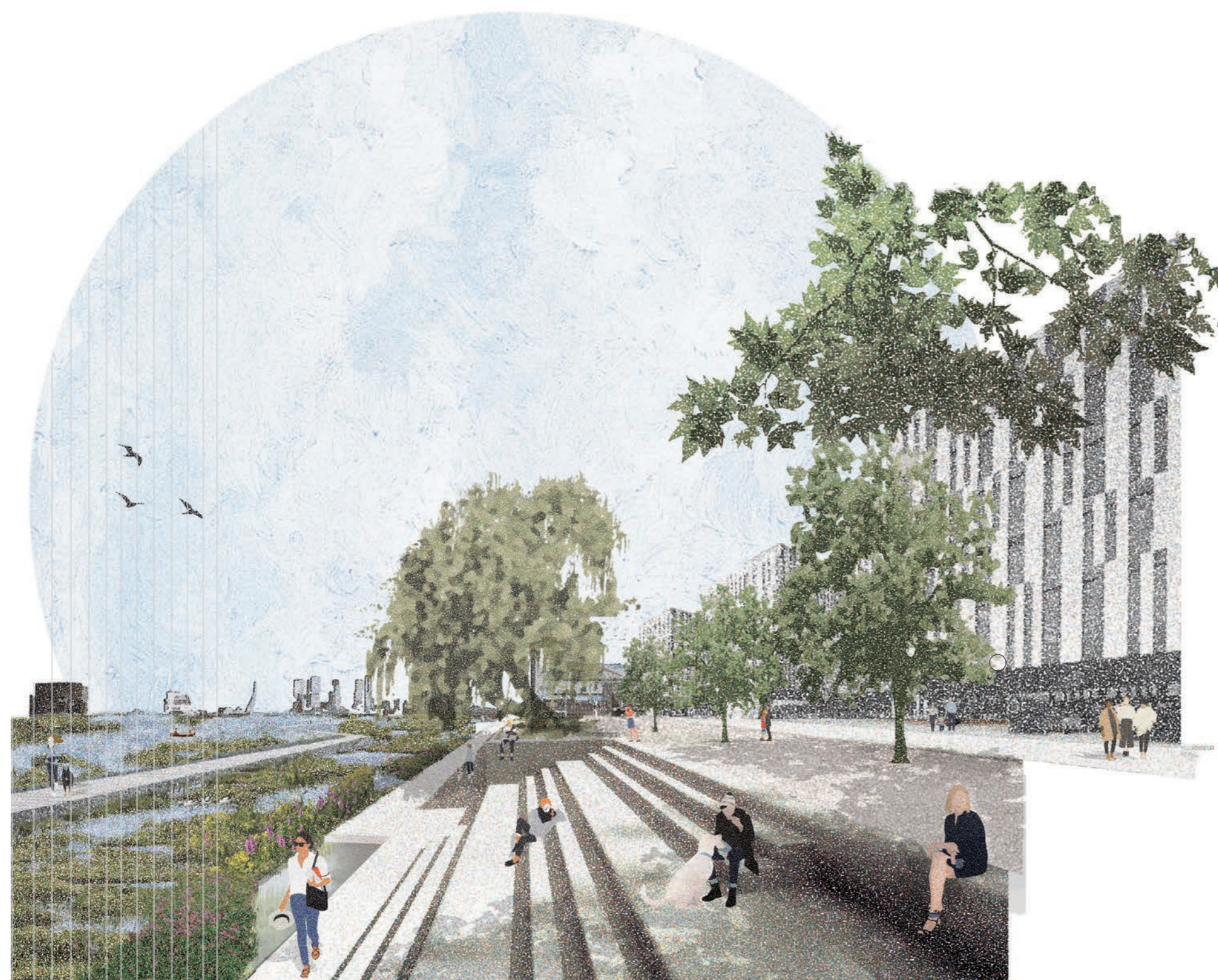


Transferable Method



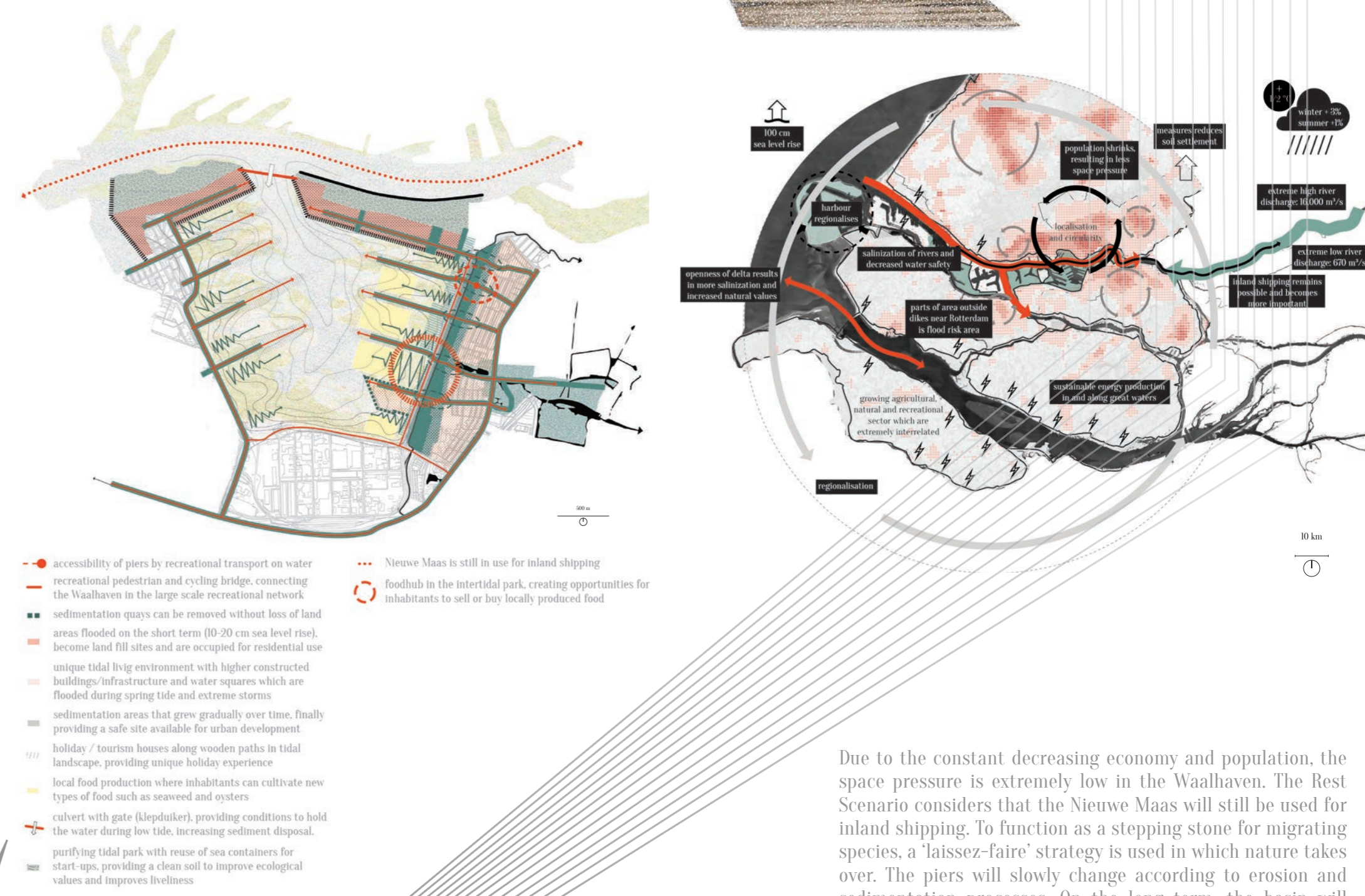
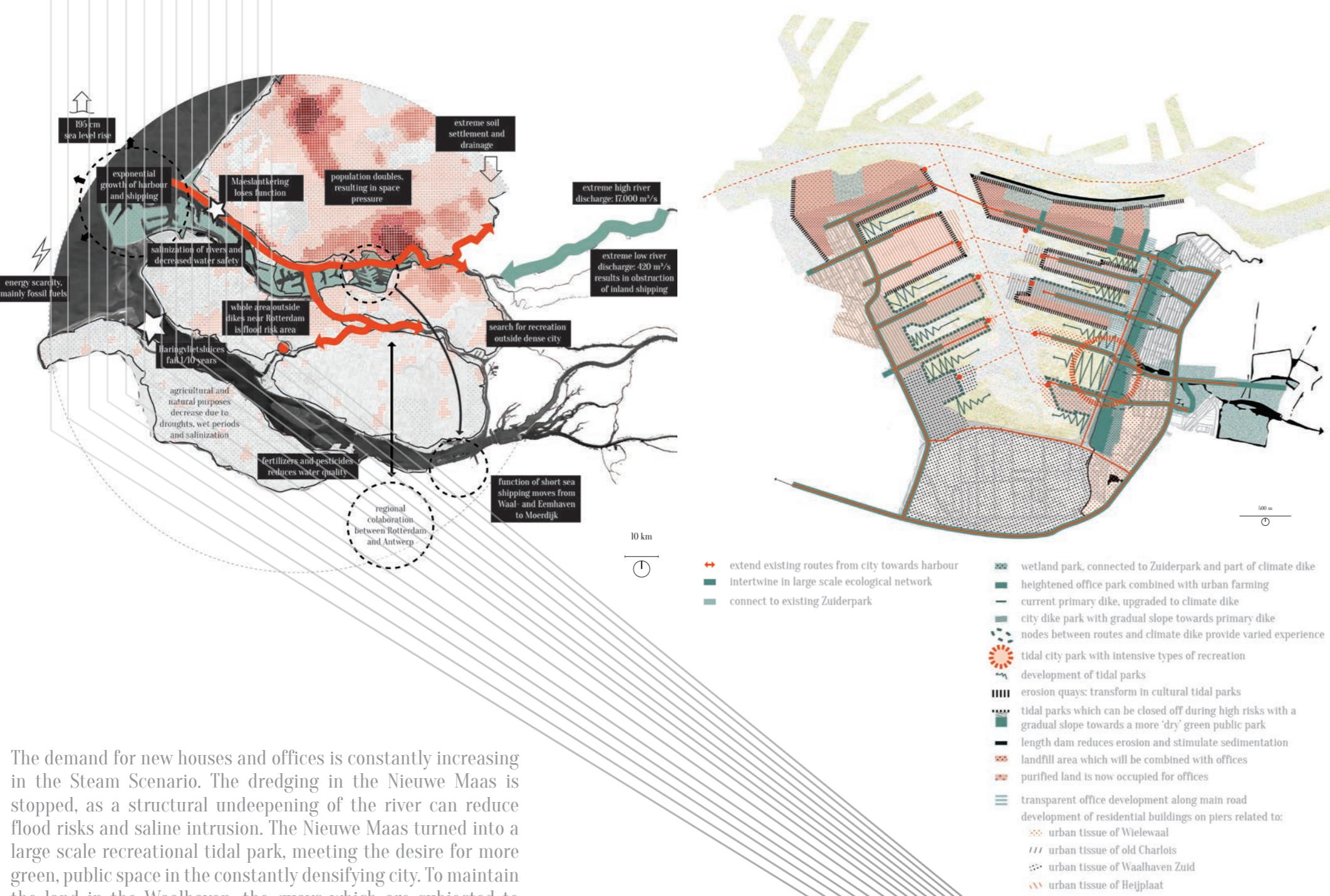
Steam Scenario

extreme climate change and socio-economic growth



Rest Scenario

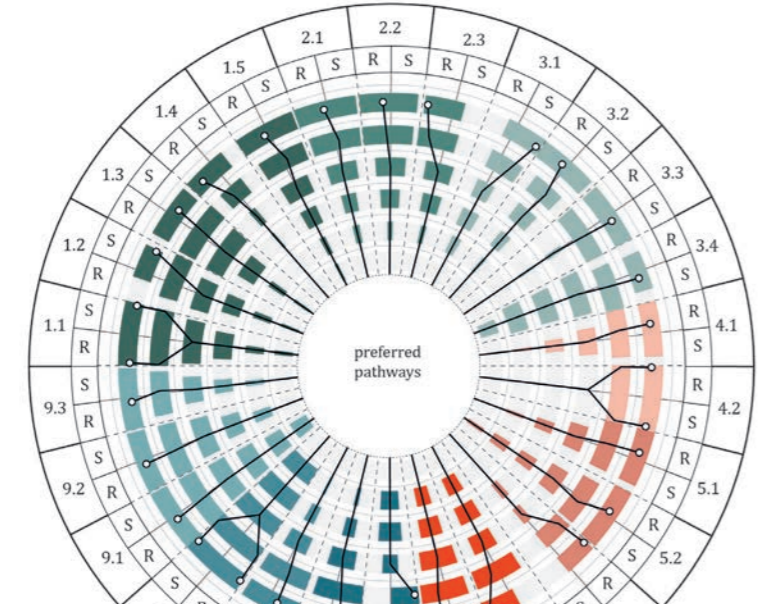
moderate climate change and socio-economic decline



The demand for new houses and offices is constantly increasing in the Steam Scenario. The dredging in the Nieuwe Maas is stopped, as a structural deepening of the river can reduce flood risks and saline intrusion. The Nieuwe Maas turned into a large scale recreational tidal park, meeting the desire for more green, public space in the constantly densifying city. To maintain the land in the Waalhaven, the quays which are subjected to erosion are developed into cultural tidal parks. In between the piers, urban tidal parks developed to meet the demand for green, public space for the new neighborhood. The broad climate dike, which extends from the primary dike towards the tidal nature, foresees in extreme water safety during heavy storms. At the same time, it provides a connecting landscape between the city and the Waalhaven.

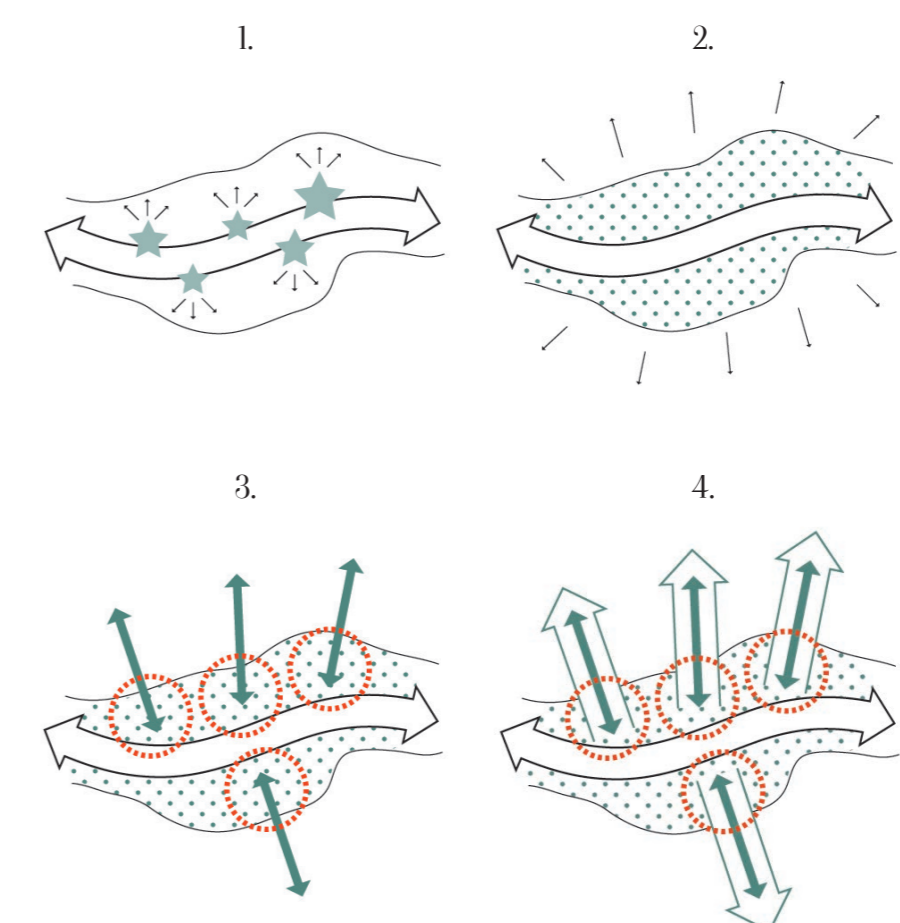
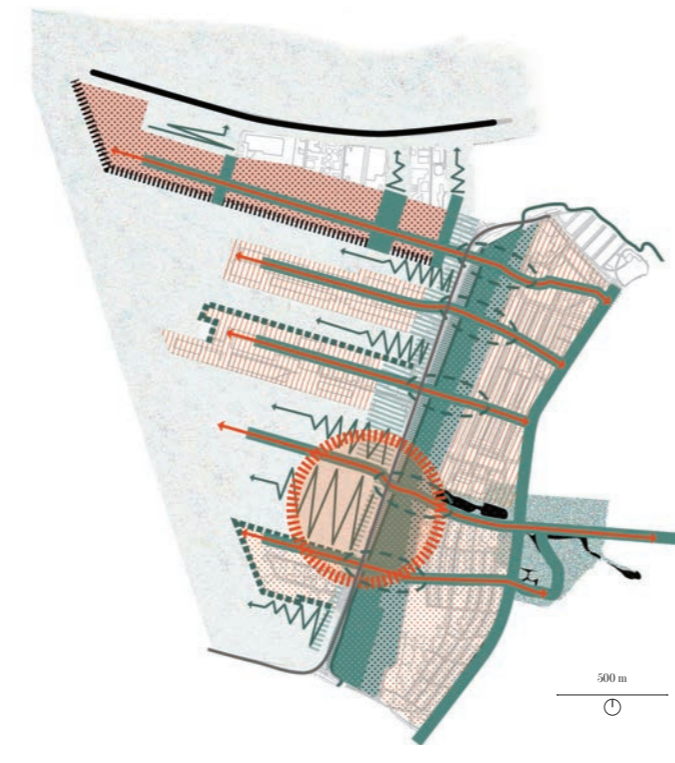
Due to the constant decreasing economy and population, the space pressure is extremely low in the Waalhaven. The Rest Scenario considers that the Nieuwe Maas will still be used for inland shipping. To function as a stepping stone for migrating species, a 'laissez-faire' strategy is used in which nature takes over. The piers will slowly change according to erosion and sedimentation processes. On the long term, the basin will be used as a large scale recreational landscape with optimal ecological values and opportunities for own food cultivation. Locals are also using the basin for extensive recreation, such as hiking and bird spotting. Holiday houses along the former piers will create a unique experience for tourists in the Dutch Delta Landscape.

Greater understanding of the institutional influences on ecosystem services are of a crucial importance to the conservation and regeneration of ecosystems and therefore to their services and human well-being. In order to bridge the gap between economy and ecology, the interest of the partners is related to the provided ecosystem services in each phase. The preferred pathways for partners in which this results are compared to find out what the similarities and conflicts are. As most partners finally prefer to direct towards the Rest Scenario, an acceptance of economic decline to improve the quality of life and reduce the risks of the uncertain future might be necessary.



Relate City, River and Harbor	Contribute to Regional Circularity
Increase Natural Value and Biodiversity	Provision of Fresh Water
Provide Educational Environment	Climate Regulation
Increase Water Safety	R Rest Scenario
Food Production	S Steam Scenario
Basis for Urban Development	Pathway with highest benefits obtained from ecosystem services

'No Regret' Measures



The 'Turning the Tide' method is transferable to other eco-based projects. By applying the method at the same time on a regional and even territorial scale, the ecosystem services would enforce each other. Multiple local tidal parks along the river, provide high values for the direct surroundings (1). These small scale interventions on the short-term provide high benefits locally. By connecting these projects to each other, ecosystem services such as increasing water safety and reduce saline intrusion can be seriously addressed on a regional scale (2). Inland connections, such as the green-blue and recreational network, can make the services available for a broader audience: the people, plants and animals (3). However, to really make a difference on the long-term in relation to climate mitigation, and therefore a good quality of life for future generations, we should give something back to nature (4) by applying the method along tidal rivers in the whole North Sea Estuary.