Summery of the IABR Atelier Delta Rijnmond-Drechtsteden 2100 digital publication

The current crisis caused by climate disruption can be seen as a head-on collision between our globalized economy and planetary boundaries. No region in the Netherlands will face this collision in its full administrative complexity more than the Rijnmond-Drechtsteden region, where the country's main rivers discharge into the sea adjacent to a major port complex.

The consequences extend beyond rising sea levels and the associated flood risks. They also include changing river discharge patterns, extreme high and low water levels, salinization, increasing drought, and threats to freshwater availability. In addition, intense rainfall events occur in the 'wrong' seasons. Environmental and flood risks are so deeply intertwined with the region's socio-spatial and economic systems that, although they can be distinguished analytically, they cannot be separated in practice. Over time, adaptation measures will require far-reaching spatial adjustments with major economic, social, and ecological impacts, particularly in urbanized areas outside the dikes and within the port complex. These adaptations must be developed in parallel with mitigation measures aimed at limiting global warming. This report examines how to address challenges that may currently seem distant and how the region should anticipate them at the administrative level.

Our assignment was to map long-term perspectives on flood risks in the Rijnmond-Drechtsteden region through research by design, taking socio-spatial and economic developments into account. Our work builds on long-term regional flood risk strategies developed by HKV and Waterstudio Ties Rijcken. We define the 'long term' as a scenario involving a sea-level rise of 2 meters (or more), which, according to current projections, will occur around 2100 (in an extreme scenario) or later. Three design firms – PosadMaxwan, De Urbanisten, and H+N+S Landschapsarchitecten – conducted the research by design, commissioned by the International Architecture Biennale Rotterdam on behalf of the involved partners and authorities. The results will inform policy preparation for the advice that the regional administrative steering group will submit to the Delta Commissioner as part of the revision of the current Preferred Strategy of the Delta Program Rijnmond-Drechtsteden (DPRD).

Exploration Space for Regional Adaptation

Mapping the range of long-term adaptation pathways to rising sea levels over time shows that the 'Protect-Closed' and 'Protect-Open' approaches address the region's first critical decision: whether to maintain an open or closed estuary. The 'Grow with the system' approach can be understood as a specific further development of 'Protect-Open.' Together, the regional elaborations of these approaches – referred to here as the 'Polder' and 'Estuarine' strategies –

clarify the exploration space for regional flood risk policy in the medium term, while keeping options open for the very long term.

The design teams explored spatial translations of both approaches, resulting in two integrated future strategies: the Polder Strategy by De Urbanisten and the Estuarine Strategy by H+N+S Landschapsarchitecten. PosadMaxwan developed an assessment framework based on future scenarios to evaluate the spatial, economic, and social implications of both strategies, and to identify opportunities and risks. They also produced a regional adaptation pathways map that elaborates interdependencies, identifies decision and tipping points, and incorporates social, economic, and port-related challenges and preconditions.

Two Future Strategies

The Polder Strategy addresses the inevitable rise in sea water levels by incorporating a range of civil engineering solutions into the water system to ensure safety through a closed defense. A continuous ring of dunes, dikes, and barriers manages flood risks in areas both inside and outside the dikes, placing cities such as Rotterdam and Dordrecht behind locks. Large seagoing vessels remain outside the locks, while inland barges and smaller seagoing vessels pass through them to the hinterland. This requires new storage and transshipment methods. The loss of an open connection to the hinterland implies a profound transformation of the ports, the associated maritime manufacturing industry, and logistics, with significant economic consequences. In the Polder Strategy, the port complex transitions toward a post-fossil port economy, including a third Maasvlakte. At the same time, the strategy creates opportunities for attractive (fresh)water-based urban development on former harbor and industrial sites.

The strategy requires an adjusted distribution of river discharge, reducing flow through the Lek and routing more water from the Waal through the Haringvliet to the sea. Drainage is managed through controlled discharge, dewatering, and pumping. Within the enclosed area, a regulated freshwater system emerges, supplied by the Lek, with the Nieuwe Maas and Oude Maas functioning as freshwater basins and as storage for extreme rainfall events. The water level in the Haringvliet rises along with sea-level rise. Consequently, the Haringvlietdam can remain open more frequently and for longer periods of time, strengthening tidal dynamics and the associated estuarine ecosystems in this area.

The Polder Strategy requires long-term administrative consistency, substantial investment in flood risk management, and strong integration of water management, spatial planning, port development, and ecology. Insufficient governance may lead to fragmentation or lock-in due to investments that are not future-proof. The success of the Polder Strategy therefore depends not only on technical feasibility, but also on timely decision-making, adaptive phasing, and sustained administrative and public support.

The Estuarine Strategy takes an open, estuarine approach to the future, relying on natural growth processes to maintain safety in the region. The strategy focuses on restoring natural estuarine dynamics, including reconnecting the Haringvliet to the sea. Flood risks are managed by shallowing river mouths (through the capture of sand and silt), constructing storm surge barriers, and creating adaptive, flood-resilient landscapes. These landscapes, located outside the dikes, grow with sea-level rise through sedimentation, while storm surge-resistant dikes are positioned further inland.

The system transition involves a lengthy preparation period and requires phased implementation. As new delta dikes and storm surge barriers – designed to be permeable to sediment and sand – are constructed, the Nieuwe Waterweg is gradually shallowed, and the gates of the Haringvlietdam are opened further to allow increased sediment inflow. Once flood risks have been sufficiently reduced, the Maeslantkering and the Haringvlietdam can be dismantled. In urban and industrial areas outside the dikes, ground levels must be raised and additional adaptation measures implemented. These interventions require tailored solutions, particularly in the low-lying inner-city areas of Rotterdam and Dordrecht, but they also create opportunities to develop attractive, safe, and diverse high-quality urban environments. Although the open port connection is maintained, the gradual shallowing of the river mouth necessitates a parallel reorganization of the port. Large seagoing vessels will primarily use the Caland Canal, while other shipping will rely on the Oude Maas to connect to the Drechtsteden and the hinterland. River discharge is redistributed so that less water flows through the Nieuwe Waterweg. Freshwater is supplied from eastern intake points and conveyed westward through restored creek systems.

The Estuarine Strategy represents a spatial policy that aligns economic development with the dynamics of the natural system. Taking an ultra-long-term perspective, it calls for innovation in hydraulic engineering and, over time, entails a form of strategic retreat, primarily affecting agricultural land. This approach creates time and space to achieve safety at lower cost. The long-term transition of the landscape, society, and economy depends heavily on consistent policy and public support. The system relies less on technical interventions and more on governance quality, coordination, and shared responsibility.

Findings and Next Steps

The research by design demonstrates that both perspectives are feasible and can ensure long-term safety, but they differ fundamentally in their underlying values and associated ‘price tags.’ Each approach requires a distinct spatial planning perspective and unfolds at a different pace and over a different time horizon. The Polder Strategy concentrates major infrastructural challenges within a relatively short timeframe. In contrast, the Estuarine Strategy develops

gradually, distributing challenges over a longer period and across society. While it is technically possible to shift from an Open Strategy to a Closed Strategy – albeit requiring a substantial double investment in flood risk infrastructure – the reverse transition is not considered realistic. As the Maeslantkering approaches the end of its functional lifespan, decision-making at that point will represent a critical moment for system transition. The research indicates that no irreversible decisions need to be made during the current DPRD policy period that would result in lock-in to either pathway. However, strategic choices in flood risk management, spatial planning, and port organization are clearly interconnected and carry long-term implications. We therefore recommend establishing a regionally focused, long-term research program in upcoming DPRD cycles. We also propose a set of research questions and topics for further research by design, along with suggestions for organizing such a program.

Perhaps the most important – and most complex – challenge is improving insight into regional adaptation pathways. If national adaptation pathways can be compared to a metro map that shows when specific turns in a chosen water strategy are required (or still possible), then the contribution of the DPRD can be understood as the underlying bus network. We also recommend linking follow-up research on flood risk to research on the socio-spatial future of the metropolitan region and the spatial organization of the port complex. In addition to technical, ecological, and spatial issues, the program should address social science questions, including those related to governance.

In our view, the regional administrative partnership can play a key role in establishing such a research program, drawing on the DPRD program team for its implementation. Embedding spatial planning as a permanent component of the program will strengthen its coherence. The program aligns with national research trajectories and other knowledge exchange initiatives, including international ones. It is directly linked to policy preparation and decision-making within DPRD cycles and is supported by a dedicated budget.

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or publication of (parts of) this material outside that context may lead to misinterpretation and is therefore discouraged.