



# SEMINARIO ESTRATEGIAS DE ADAPTACIÓN A LA CRISIS CLIMÁTICA

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**BLOQUE II:  
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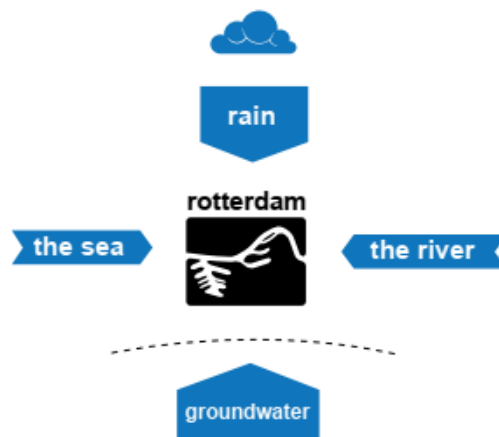
## "THE ROTTERDAM CLIMATE CHANGE ADAPTATION STRATEGY "

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More than half of the world's population now lives in cities. Urbanisation has been a strong trend almost everywhere in the world, also in countries that are already heavily urbanised. Urban areas are therefore key foci of climate change adaptation efforts.

The Dutch city of Rotterdam has been a front runner in developing climate change adaptation plans. In 2008, the City Council of Rotterdam ratified the Rotterdam Climate Proof programme, which consists of three main activities: development of knowledge, implementation of climate change adaptation measures and presenting Rotterdam internationally as an innovative delta city. The Rotterdam climate change adaptation strategy is a core component of this programme.

The climate change challenge for Rotterdam mainly centres on water. The port of Rotterdam is among the world's largest ports and it is Europe's busiest port by far. Making the port climate proof is therefore critical. In addition, a large part of the city of Rotterdam lies below sea level and is therefore at risk of flooding. Sea-level rise is not the only water-related challenge; in fact, Rotterdam faces water issues from four sides: from the sea, from the rivers, from the sky and from below (see Figure 1).



*Figure 1: Rotterdam faces water issues from four sides (City of Rotterdam, 2013)*

Rotterdam has an open connection to the sea, so sea-level rise affects the city's port infrastructure, but also some residential areas that are not protected by dikes. Climate change is also expected to result in increased winter discharge and decreased summer discharge in the Rhine and Meuse rivers. Higher discharge increases flood risk along the rivers, a risk that is considerably higher than the risk of flooding due to sea-level rise. Lower discharge affects the navigability of waterways connecting the port of Rotterdam with the hinterland, and it leads to more salt intrusion from the North Sea.

Furthermore, extreme rainfall is projected to become more frequent. Since Rotterdam is situated below sea-level and has many paved-over areas accelerating runoff, getting rid of the excess water is a major challenge. This challenge is exacerbated by soil subsidence. Soils in the western part of the Netherlands tend to be soft peat soils, which compact and sink as a result of water extraction in the context of water management. Droughts, which are becoming more frequent and intense, accelerate the subsidence process. They also affect the strength and stability of peat dikes, which are common along inland waterways.

Next to water-related challenges, the city of Rotterdam faces increased heat stress. As a result of climate change and the urban heat island effect, the number of nights with temperatures over 20 degrees Celcius is projected to increase very substantially. The elderly are particularly vulnerable.

The Rotterdam climate change adaptation strategy is multi-layered (see Figure 2). At its core is the robust system of waterways, infrastructures and governance arrangements that is already in place. The city already has a well-developed system of dikes, sluices, sewers and pumping stations to keep the city dry. That system forms the basis and starting point for adaptation.

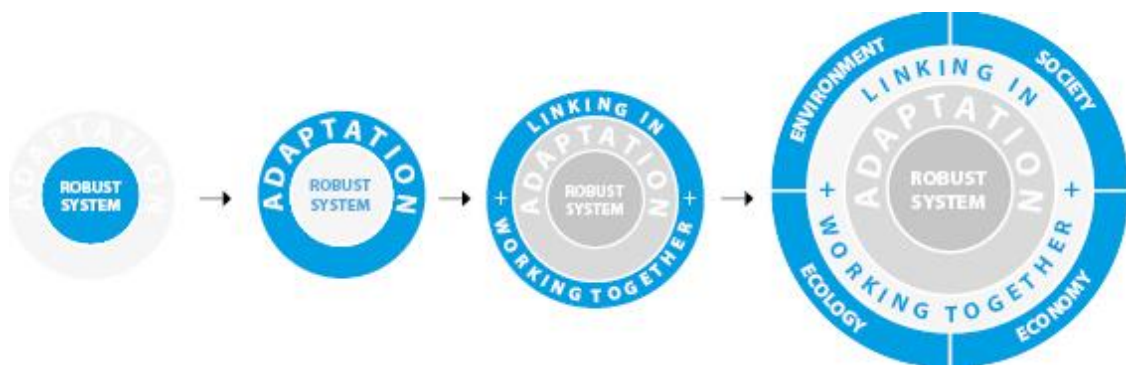


Figure 2: The Rotterdam adaptation strategy (City of Rotterdam, 2013)

The existing system is rather rigid, however, and a key challenge of adaptation is to make it more flexible to alleviate stress and make the city move in tune with the dynamics of the delta and its rising and falling water levels. That is the strategy's second layer. Of course, the climate is not the only thing that changes in cities. A wide range of other dynamics are at play as well, such as population growth, demographic changes, cultural change, in addition to for example the regular management and maintenance of the roads and public areas. The 'linking in' aspect of the strategy's third layer refers to the search for potential synergies between adaptation goals and developments in other fields, so that adaptation objectives can be met more easily and at reduced cost. This implies that adaptation is not a task for the local authorities alone, but a challenge for a wide range of stakeholders; indeed, for the community as a whole. The fourth and final layer relates to seeking co-benefits. For example, installing better pumps may be just as effective in dealing with excess water as creating attractive spaces for water storage, but these spaces for water storage may have the additional benefits of

providing options for recreation, improving human health by increasing the availability of greenery and cool places, strengthening biodiversity, or reducing the risk of droughts.

Rotterdam has been experimenting with projects in the spirit of its four-layered adaptation strategy, a few examples of which are briefly presented below. For the outer-dike areas, floating pavilions and even trees have been developed (see Figure 3) that can move up and down with the water level. In the city centre, a water square (see Figure 4) has been constructed that is designed as the neighbourhood's meeting place and as a venue for social and cultural activities, but also functions as a large water storage facility in extreme rainfall events.



*Figure 3 (left): Floating pavilions and trees in the outer-dike area (City of Rotterdam, 2018)*



*Figure 4 (right): The Benthemplein water square (credits: Ossip van Duivenbode)*

In an inner-dike area, at some distance from the city, the development of a water storage facility has been combined with a new rowing course (see Figure 5). Finally, in one of Rotterdam's parks, called Zuiderpark, more space was created for surface water, expanding water storage capacity, while simultaneously improving environmental quality and providing new opportunities for leisure and recreation (see Figure 6).



*Figure 5 (left): Water storage combined with a rowing course (City of Rotterdam, 2013)*



*Figure 6 (right): Water storage, nature and recreation in the Zuiderpark (City of Rotterdam, 2013)*

In the years following the publication of the climate change adaptation strategy in 2013, the climate change focus was successively expanded towards sustainability, liveability and, most recently, resilience (Gemeente Rotterdam, 2016). This trend towards increasing inclusiveness reflects the fact that climate change is only one of the challenges that the city of Rotterdam faces, and that the

transition towards a climate proof future is only one of several interlocked transitions the city is currently forging and experiencing.

According to Hölscher et al. (2019), Rotterdam is currently confronted with the challenge of moving beyond the initial momentum for experimental approaches and towards climate governance.

According to the authors, the city's planning processes have not yet sufficiently mainstreamed and prioritised climate-related concerns. In addition, regulations and incentive structures still favour short-term economic interests, so that longer-term risks, costs and benefits, which are key to climate change adaptation and sustainability, do not yet carry sufficient weight in decision-making processes. As the authors note, "this perpetuates counteracting investments (e.g. building developments in flood-prone areas) and undermines the contribution of innovative solutions into the policy mix" (Hölscher et al. 2019, p. 851). Furthermore, adaptation actions often do not go beyond the strategy's second layer, as they focus on technocratic solutions and disregard long-term uncertainties and the need for behavioural change. Behavioural change is typically sought through information campaigns and training, whereas social science research indicates that this is not enough to bring about change in behavioural patterns.

In conclusion, the long-term vision and strategies are in place, and local and small-scale experiments have been successful, but the internalisation of the vision and strategies into the city of Rotterdam's general decision-making processes is still a long way from being completed.

## Sources

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# CURRICULUM VITAE

Bas Amelung is an assistant professor at the Environmental Systems Analysis group at Wageningen University in the Netherlands. His research and teaching centres on tourism in relation to global environmental change. Bas has published quite extensively on climate change impacts and adaptation, and has recently broadened his scope to include water and ecosystem services. He currently coordinates a European research project called SIMTWIST, which focuses on water consumption in the tourism industry in the Mediterranean, with case studies in Benidorm and Rimini.