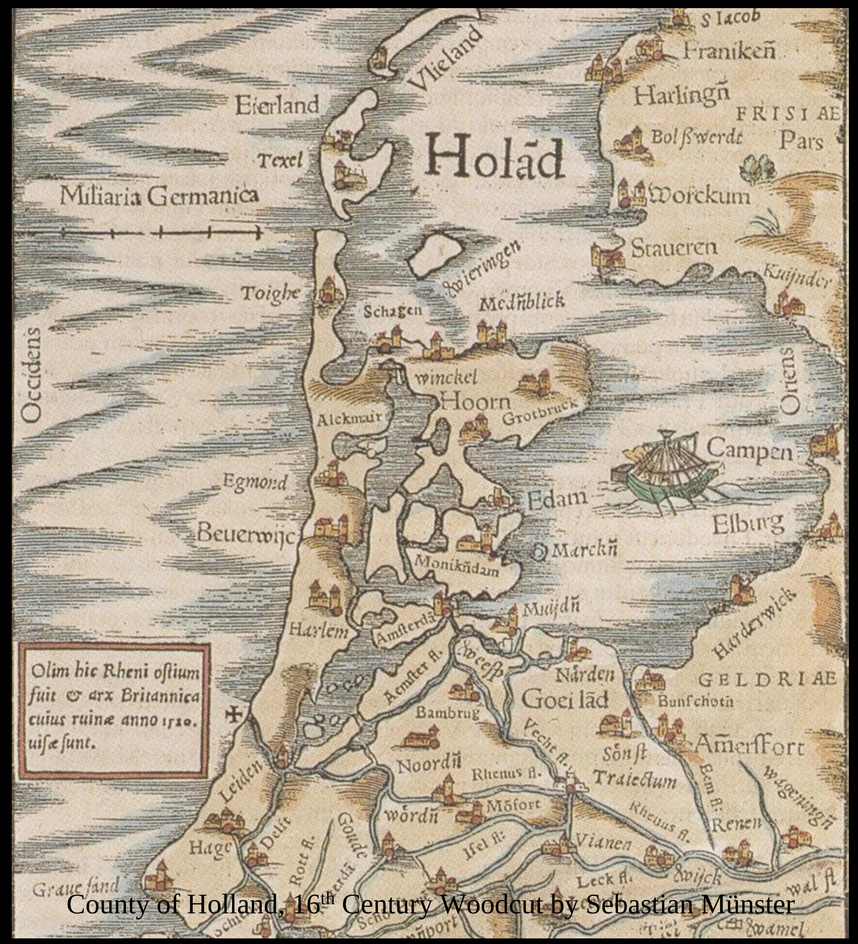
Daan Roosegaarde Inundates the Netherlands with a 'Virtual Flood'

The Netherlands - culture of living with water

Trade, negotiations and crafts, stubbornness, luck and faith.

Managing risks and uncertainties.

Born and raised below sealevel



County of Holland, 16th Century Woodcut by Sebastian Münster

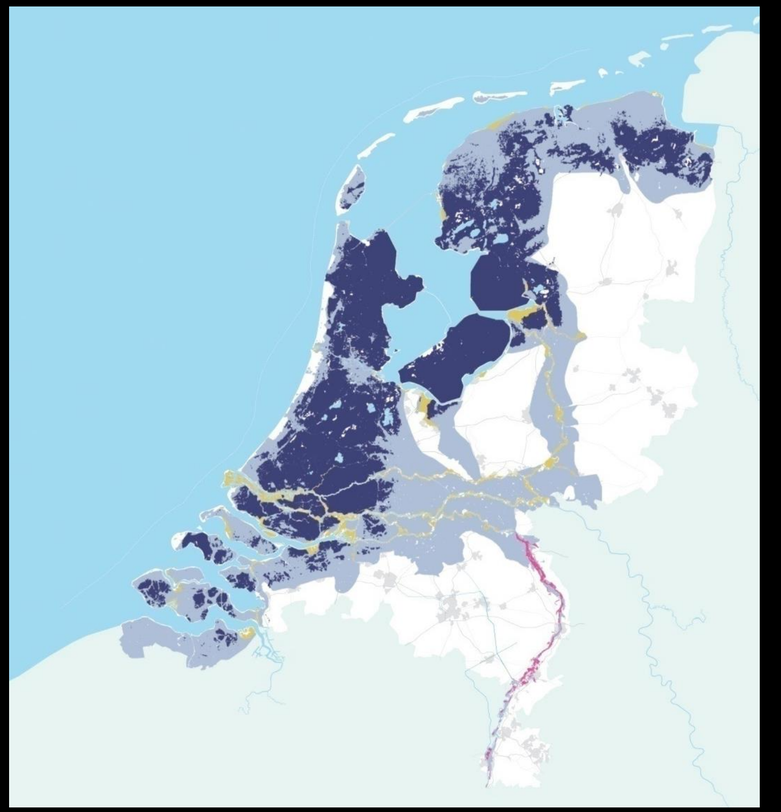
Below sea level: 26%

Above sea level: 29%

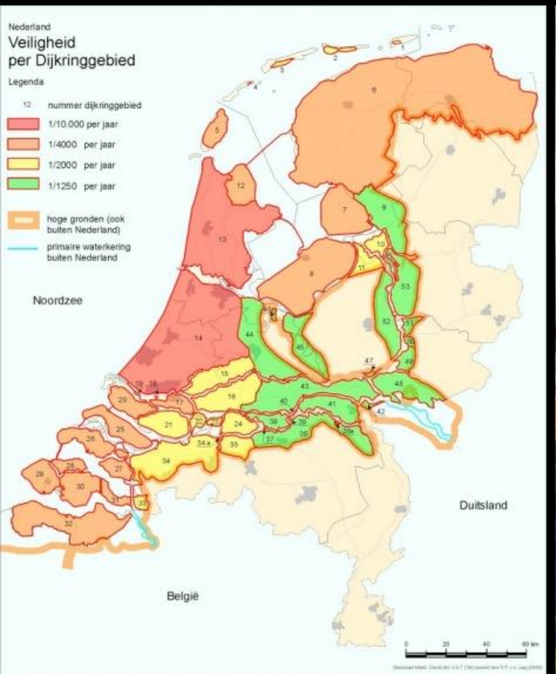
Outside the dykes: 3%

Meuse outside the dykes: 1%

Liable to flooding: 59%



SAFETY: DIKE SYSTEM - 22.000 kilometers of dikes, dunes and levees

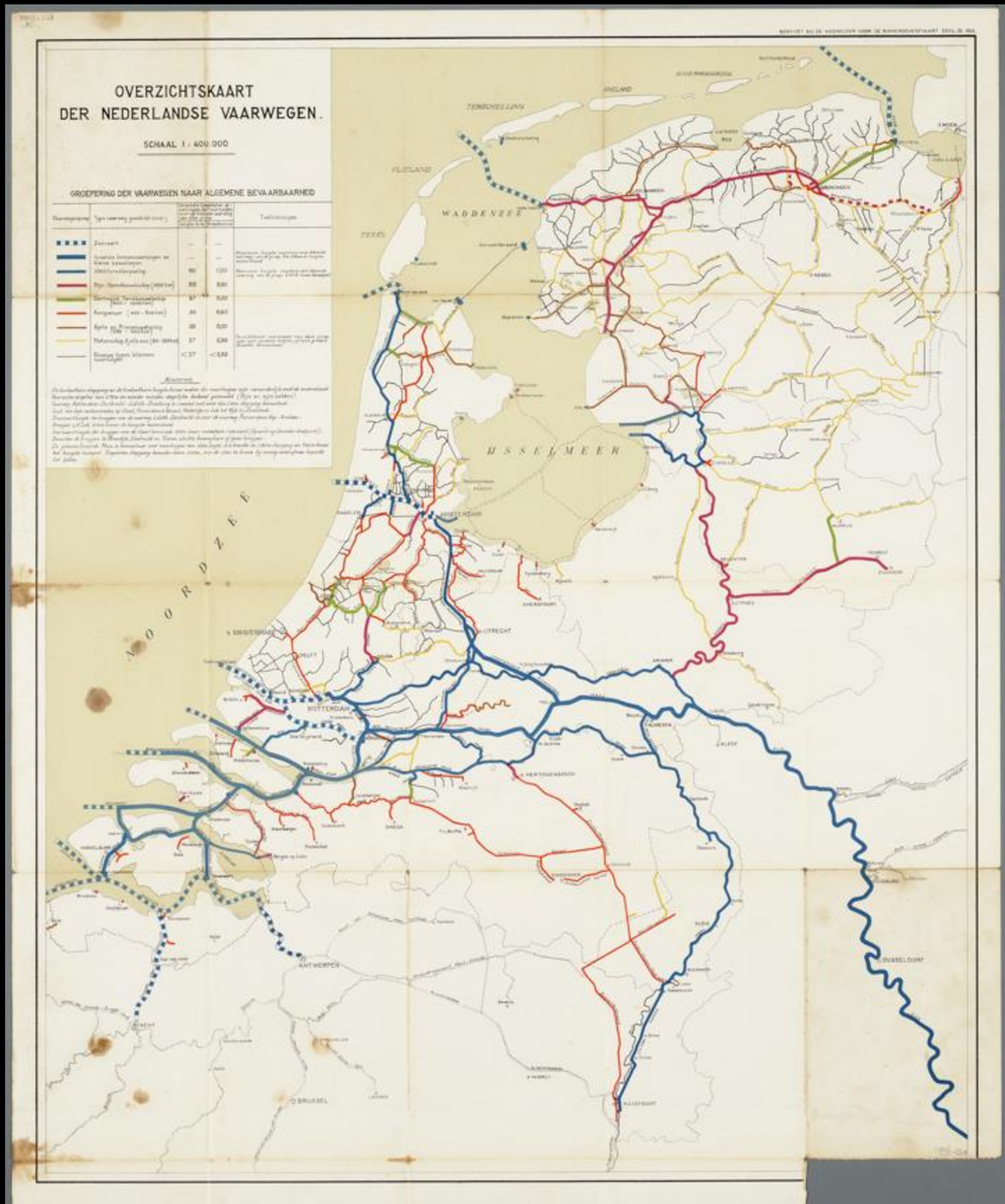



CLOSING ARGUMENTS
IT'S RISING DUE TO GLOBAL WARMING!
IT'S RISING DUE TO NATURAL CAUSES!

DUTCH WATER NETWORK (1953)

> BUILDING CANALS (1869: 'Apeldoorns kanaal')

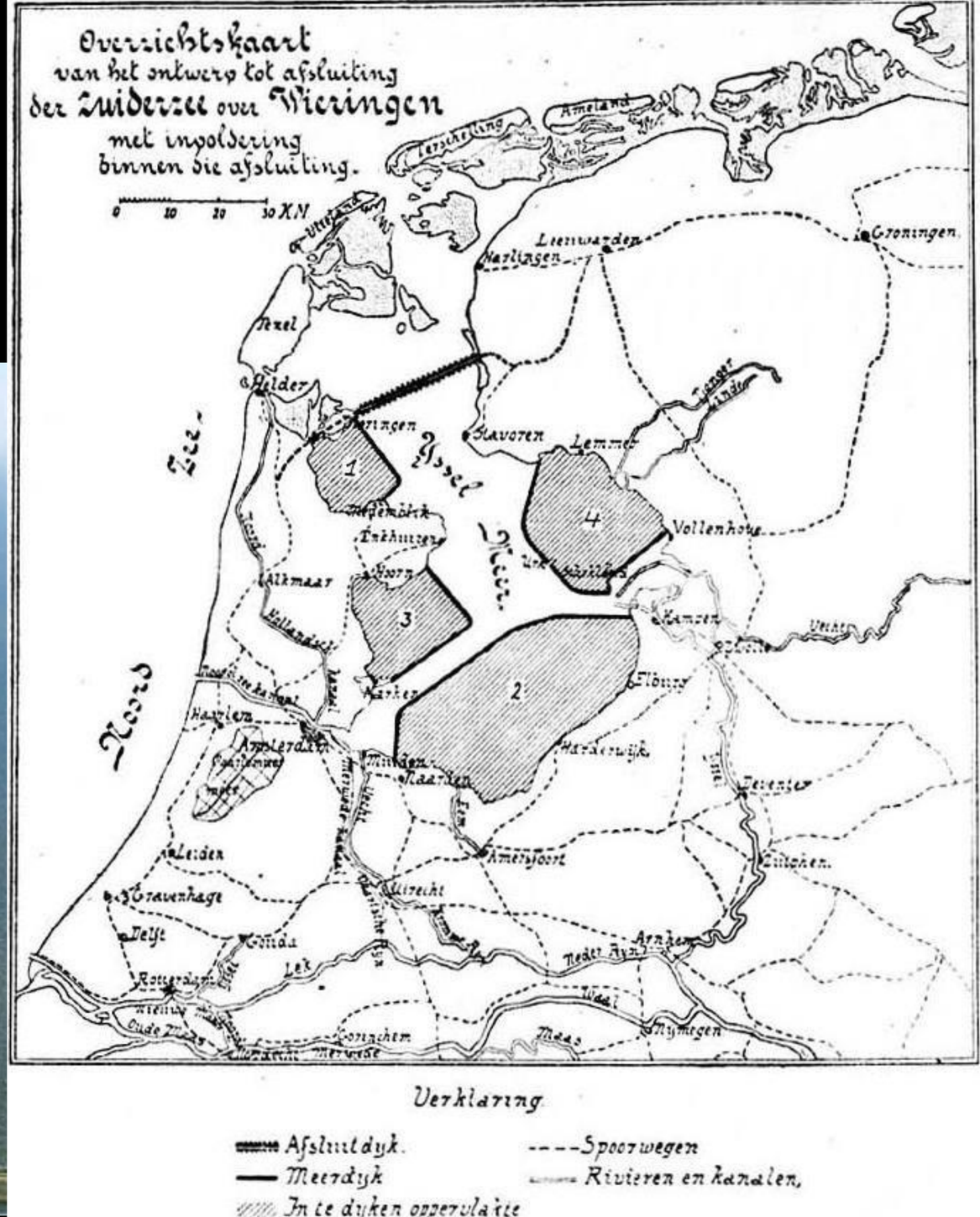
De voeding van het Apeldoorns Kanaal was een probleem waar vooral de bouwers van het traject Apeldoorn-Dieren mee worstelden. Deze afbeelding toont de aanleg van de Veldhuizersprenk in 1869. Duidelijk is dat het niet gaat om een 'natuurlijk beekje' maar om een met veel menskracht tot stand gekomen waterstaatkundig werk.



Zuiderzee works

1916 flood

- Response: Zuiderzee works
- Enclosure dam of Zuiderzee and 5 polders



1953

Post 1953: Delta works + new safety strategy

- Delta commission
- Delta works scheme
- Closing off estuaries
- Compartimention works
- Shorter coast line and fresh water reservoirs
- New closure techniques,
- New safety strategy
- National dike designs based on frequency of water levels

Maeslantkering (1997)

BUILDING WITH NATURE '*room for the river'*

Argument of ¥ € $

Make money with waterstructures

ECOLOGY AND AN ECONOMY ADDS UP TO MOBILITY
WATER INFRASTRUCTURE: ‘TREKVAARTEN’

WATER CONNECTS ECONOMY AND ECOLOGY I

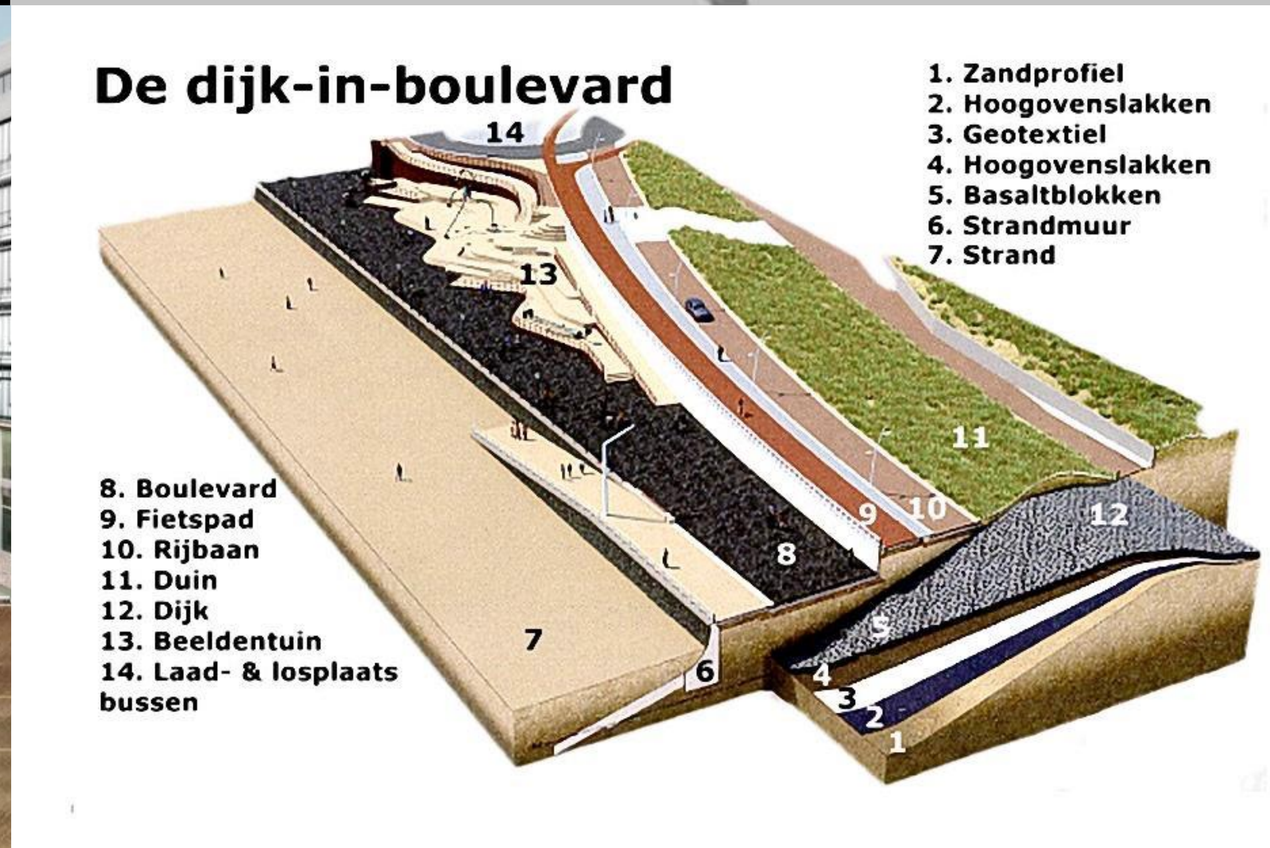
> maintaining and enhancing the Dutch country (polders)
> maintaining and enhancing watersafety (network of dykes, coast, deltawerken)
> waterquantity and waterquality next to and connected to safety

WATER CONNECTS ECONOMY AND ECOLOGY II

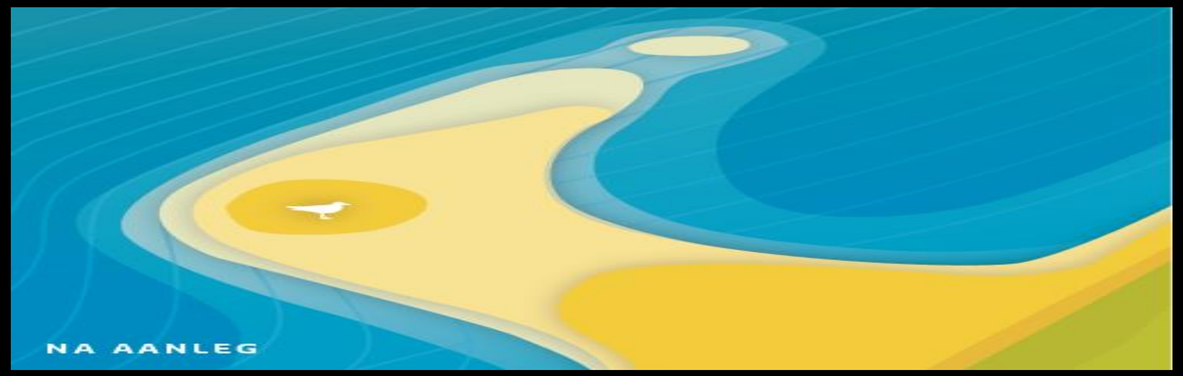
> investing now in a robust and resilient way will prevent costs with future disasters
> integrating investments builds a robust environment where quality, safety and economic assets merge and deliver
> a safe region is attractive for investors

Argument it looks ugly

Integration with urban development



Flexible measures? Building with Nature!



MAASVLAKTE ROTTERDAM: HARBOR EXPANSION

ROTTERDAM: HARBOR & CITY, CITY & HARBOR

Ministry of Foreign Affairs

Fact
The Netherlands is
26% below sea level,
29% at sea level and
60% flood prone

Kingdom of the Netherlands

your partner for water solutions

KINGDOM OF THE NETHERLANDS
UNITED NATIONS SECURITY COUNCIL
CANDIDATE 2017 - 2018

Disaster & Risk Reduction (DRR)

from response to preparedness –
reducing the risk of water related disasters

#KingdomNL takes its responsibility to share it's knowledge world wide. The DRR team helps governments to develop better preparedness and resilience strategies, and work on implementation and capacity building.

Dutch Surge Support (DSS)

immediate aid on the ground –
a rapid response to water related disasters

On call from international humanitarian organizations, DSS water responds to the needs during water related disasters around the globe by deploying the best experts from the Dutch Water sector.

Upcoming missions

Kenia & Uruguay

The DRR-Team and DSS water are initiated by the Dutch government together with the Dutch Water Sector, and the Netherlands Red Cross
www.dutchwatersector.com

Special Envoy Water: Henk Ovink

THE NETHERLANDS
ROOM FOR THE RIVER

Name: **Dutch River Region**
Population: **4 million**
Urban or rural: **Rural**
Above or below sealevel: **Just above**
Total investment: **EUR 2.3 billion**

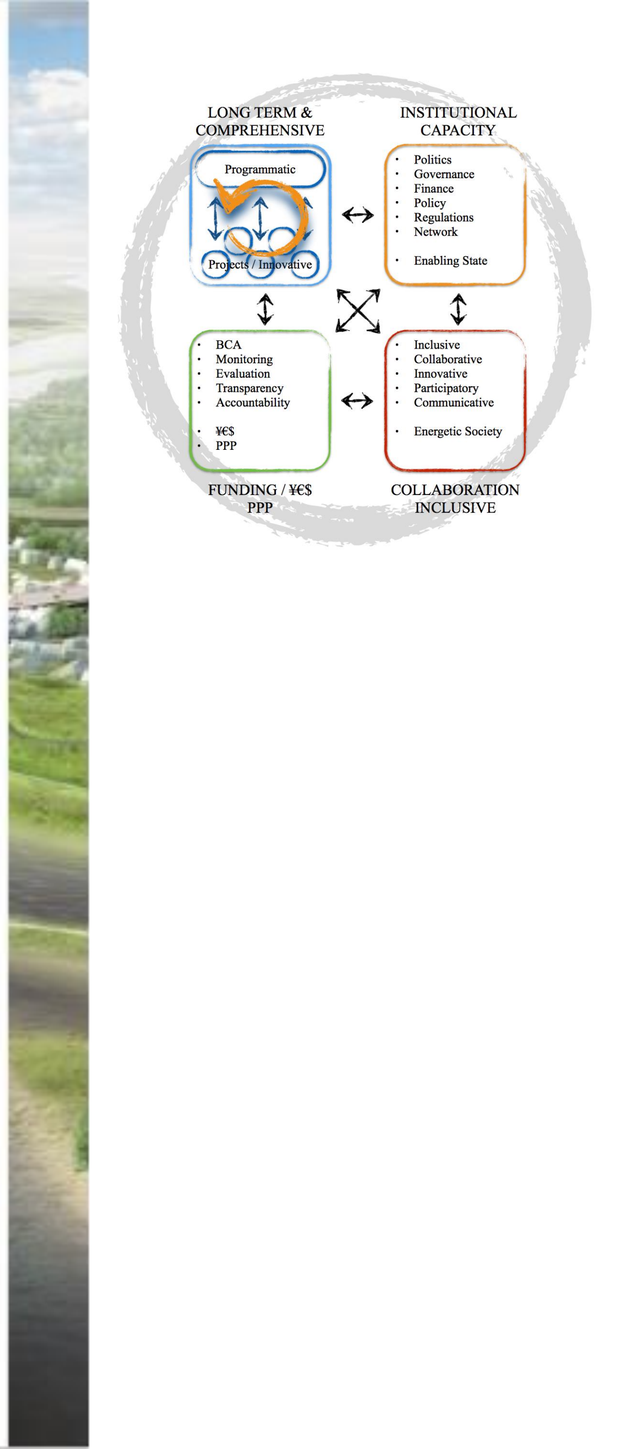
Extremely high water levels. That is the greatest challenge the river region in the Netherlands faces today. In 1993 and 1995, water levels in the Netherlands reached a critical level, weakening the dikes to the point of collapse. A quarter of a million inhabitants had to be evacuated, along with one million cattle. As heavy rainfall is becoming more common – and will become even more so in the future – the Dutch government is continually working on ensuring the safety of the river regions through programmes such as Room for the River.

Reinforcing dikes is not an adequate solution. In order to drain excess water into the sea, measures must also include widening and deepening rivers. At more than 30 locations, the Room for the River Programme allows rivers more space, for example by moving dikes, digging secondary channels and deepening flood plains.

The Room for the River Programme uses a globally innovative approach to protect areas against river flooding. Giving the river more room not only protects the river regions from floods but also improves the overall quality of the area, with new nature and recreational areas as an added bonus. In short, an integrated approach improves both safety and spatial quality. Multiple Dutch partners including central government, and local provinces, municipalities and water boards, companies and NGOs are implementing the Room for the River Programme. This close cooperation between national and regional governments ensures support and reduces the risk of delays.

Room for the River is a pilot programme for the Dutch Delta Programme, which is designed to prepare the Netherlands for extreme natural events. The main objective of this programme is to make water safety and freshwater supplies sustainable and predictable by 2050. The Dutch Delta approach is based on five Ds: Delta Act, Delta Fund, Delta Commissioner, Delta Decisions and Delta Programme. The so-called Delta Decisions, for example guide the concrete approach to the Rhine-Meuse delta with regard to water storage and drainage, and the need for new dams or dikes.

www.ruimtevoorderivier.nl/english



BANGLADESH
INTEGRATED DELTA PLANNING

Name: **Bangladesh Delta**
Population: **155 million**
Urban or rural: **Rural, with several rapidly urbanising cities**
Above or under sea level: **Just above**
Total investment: **EUR 7.65 million**

Bangladesh, encompassing the Ganges-Brahmaputra-Meghna river systems, can in many respects be considered one of the most dynamic deltas in the world. Huge amounts of water and sediment often exceed the carrying capacity of Bangladesh' rivers. Cyclones and coastal floods, intensified by climate change effects, and a range of socio-economic trends, pose additional challenges. The Bangladesh Delta Plan 2100 (BDP2100) attempts to address these issues by developing a long term, holistic delta vision and adaptive strategy.

Amongst socio-economic trends are a rapidly increasing population and a growing demand for food. The already high pressure on available land adds to the complexity of water-related problems in the Bangladesh Delta, which all need to be addressed in order to support sustainable living conditions and continued economic growth.

The Bangladesh Delta Plan aims to deliver an umbrella development vision, strategy and implementation plan that can act as a frame of reference for new governmental policy, thereby supporting the integration of existing sectoral development plans. At the same time it aims to provide anchorage for numerous on-going projects and no-regret measures to delta challenges in the short term.

A range of stakeholders is involved in an interactive manner, ensuring the necessary institutional support for the development and implementation of the programme. BDP2100 links with the Five Year investment plans, which are coordinated by the Government of Bangladesh. Importantly, the Bangladesh Delta Plan will build on insights from the Dutch Delta Programme and the Mekong Delta Plan.

www.bandudeltas.org

INDONESIA
TURNING THREATS INTO BENEFITS

Name: **Greater Jakarta metropolitan area**
Population: **< 4 million**
Urban or rural: **Urban**
Above or below sea level: **– 3 m to + 1 m**

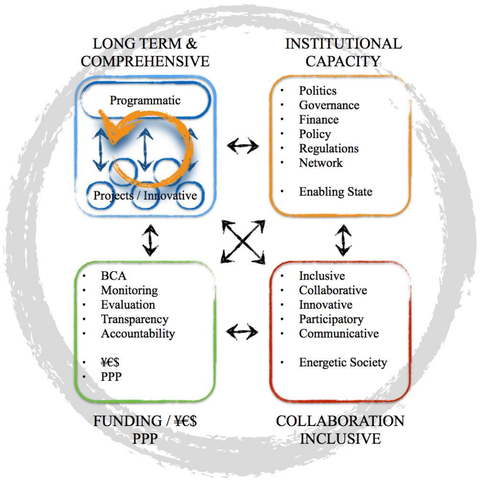
Indonesia is booming and its capital Jakarta is growing right along with it. The greater Jakarta metropolitan area is urbanising rapidly. While immigrants from other parts of Indonesia are sprawling the city and squatting uncontrollably, office buildings, shopping centres and housing for higher and middle-income households are being developed in a well-organised fashion. Jakarta's urbanisation is putting the infrastructure under enormous pressure and causing environmental problems such as pollution. Meanwhile, Jakarta is sinking into the sea due to subsidence and a rising sea level.

The overexploitation of groundwater resources is causing Jakarta to sink slowly below sea level at an alarming rate of 7.5 centimetres a year. As a result, the metropolis must constantly be protected against flooding from the sea and the 13 rivers that run through it.

The National Capital Integrated Coastal Development (NCICD) programme is designed to turn the tide and protect Jakarta from floods while revitalising its coastline, improving the water quality of channels and rivers and providing new socio-economic opportunities in the coastal area. The integrated approach draws on experience the Dutch have gained in polder creation and water management. An important first step is to slow down the subsidence process which is causing even greater problems with water drainage, demanding increasingly higher dikes of up to 7 metres. The water sanitation programme must be accelerated as large water retention reservoirs will have to be constructed to store the urban drainage water. Given the current water quality, these reservoirs are bound to change into open septic tanks. The existing coastal protection structures and river embankments will also need to be reinforced to limit the expected overtopping in one or two years.

The current strategy of onshore sea defence will only last 10 to 15 years. After this period, an offshore protection and water storage system is required. Revenues from land reclamations and toll roads can largely finance this flood protection system. The land reclamations are fully integrated with the Outer Sea Wall and the reclamations will be made in the shape of the so-called Great Garuda. This iconic design with a mix of housing, retail and offices and recreational areas will attract both investors and residents.

en.ncicd.com



FINANCE AND IMPLEMENTATION

INTEGRATED APPROACH

LEGISLATION AND DEPOLITISATION

GOVERNANCE AND COOPERATION WITH STAKEHOLDERS

EGYPT
NILE DELTA NEEDS A SHORELINE MASTER

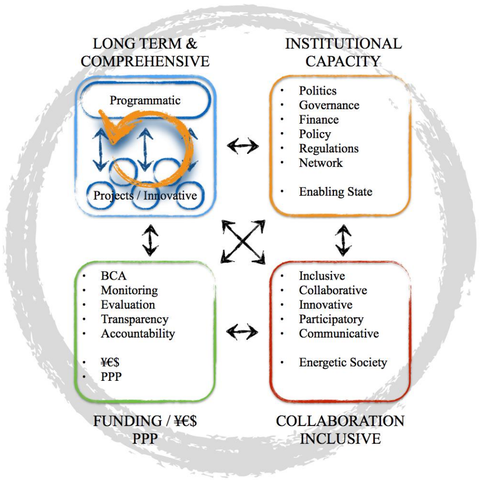
Name: **Nile Delta**
Population: **10 million**
Urban or rural: **Urban and rural**
Sea level: **Just above**
Total investment: **EUR 2.4 million**

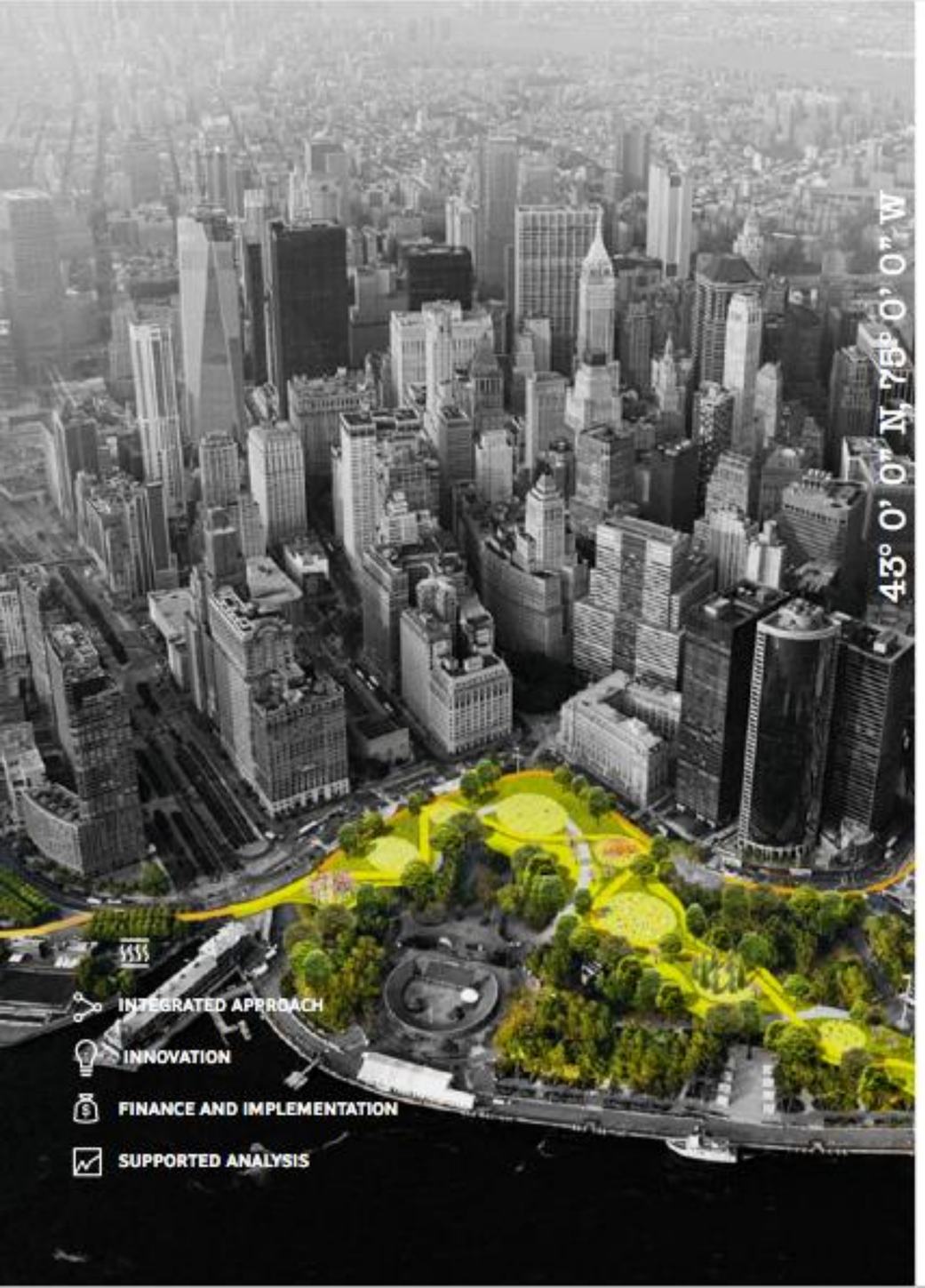
The Nile delta is heavily populated, with up to 1,600 inhabitants per square kilometre. The Nile delta coastal zone encompasses more than 40% of Egypt's industries and hosts vital centres for tourism, agriculture and fish farms. By the year 2075, a coastal area of about 500 km² will be vulnerable to flooding. The sandy barrier, separating the inland lakes from the sea, is very narrow and low lying, presently subject to strong erosion.

A UNDP report on climate change impacts estimates that hundreds of billions of Egyptian pounds, about 2 to 6% of future gross domestic product, could be lost from effects of climate change on water resources, agriculture, coastal resources and tourism. Thousands could die from air pollution and heat stress. Millions could lose jobs in agriculture as the result of climate change. In a middle scenario of sea-level rise, about 40 km² of agricultural land will be lost by the year 2060.

The Egyptian-Dutch High Level Water Panel, established 38 years ago, addresses these very urgent coastal zone challenges. Dialogues, knowledge exchange sessions and preparatory studies led to a public procurement for the development of an Integrated Coastal Zone Management strategy (ICZM) and a shoreline management plan for the Egyptian Mediterranean Coast from the Libyan border to the Gaza border. It should recognise, incorporate and address the concerns of all stakeholders through a well-defined and structured participatory approach.

Next to the tremendous natural challenges there are also a number of institutional and legal challenges. The institutional framework for addressing responsibilities in Egypt is complex and sometimes unclear. Cooperation among agencies is limited. The ICZM strategy must incorporate all required legislative and institutional changes that would facilitate the adoption, buy-in, and seamless development and implementation. The project, with a total budget of EUR 2.4 million, will be funded by Europeaid and should start by the end of 2014 and be finished within 30 months.





NEW YORK (USA)
REBUILD BY DESIGN AFTER HURRICANE SANDY

Name of delta: **North East region USA**
Population: **NYC 9.5 million, New Jersey 8.8 million**
Urban or rural: **Urban**
Above or under sea level: **+2.5 metres (lowest point NYC)**
Total investment: **USD 930 million**

Hurricane Sandy painfully clarified the implications of climate change for the north-eastern region of the United States, exposing the vulnerabilities of the area. Since then the affected region has not just been rebuilt, but solutions are being sought that are in line with the natural and socio-economic characteristics of the region. Not a plan, but a culture change.

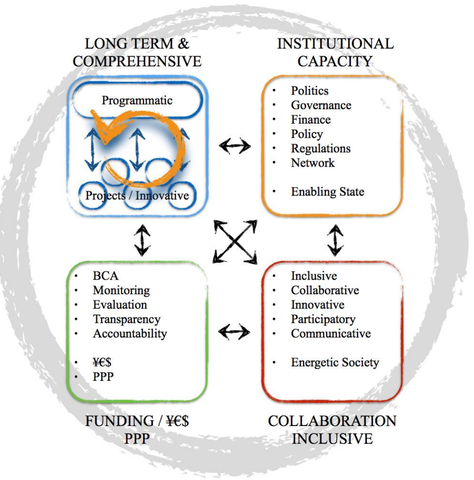
In the autumn of 2012, 650,000 homes and hundreds of thousands of companies in the largest metropolis of the nation were damaged or destroyed. In response, President Obama appointed the Hurricane Sandy Rebuilding Task Force in order to deliver aid, help and respond effectively and coordinate the rebuilding of the New York - New Jersey region. To become more resilient to climate change the Sandy Task Force, together with philanthropy, set up an ambitious project: Rebuild By Design (RBD).

After Hurricane Sandy revealed alarming infrastructural, environmental and social vulnerabilities, RBD assembled 10 teams (out of 148) of architects, engineers, planners and environmental scientists to undertake a regional research-intensive design process, identifying environmental concerns and developing strategies that will have a significant impact on the region and its communities. RBD is positioned not just to rebuild after the storm, but also to design a more sustainable and resilient region over the long term.

The designs combine innovation and regional strategy with location-specific, customised solutions. Each design team is made up of a coalition of local stakeholders including government officials, entrepreneurs, residents, researchers, NGOs and other organisations. This level of cooperation is unprecedented and has a strong Dutch flavour.

The same is true for the innovative designs - with members in six out of 10 teams, the Dutch are well represented here, too. The winning Rebuild by Design projects were announced in June 2014. The city of New York and the states of New York and New Jersey are responsible for implementation of the projects. An initial billion dollars of federal funding has been received for the realisation of the six projects.

www.rebuildbydesign.org



15° 60' 0" N, 95° 6' 0" E

INTEGRATED APPROACH

SUSTAINABILITY, FLEXIBILITY, SOLIDARITY

SUPPORTED ANALYSIS

MYANMAR
MAKING USE OF THE RESILIENCE OF THE DELTA

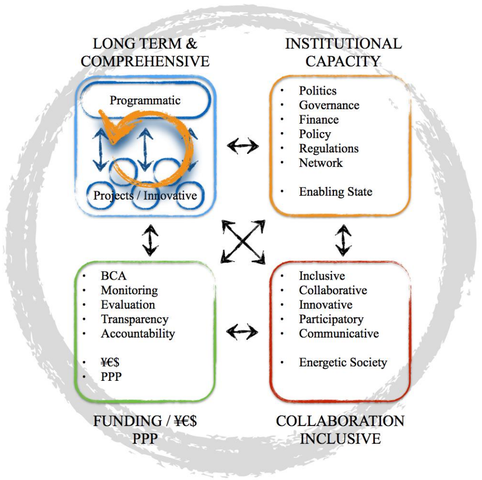
Name of delta: **Ayeyarwady Delta**
Population: **6.6 million**
Above or below sea level: **+3 m**
Urban or rural: **Rural**

The Ayeyarwady Delta in Myanmar is extremely fertile. The area, which is plagued by floods, salinity and erosion, can play an important role in the economic development of this Southeast Asian country. The first step is to assess the vulnerabilities and, in particular, the resilience of the delta.

At about three metres above sea level, the delta's sediment plays a dominant role in the large-scale cultivation of rice. The delta region is densely populated and is dotted with fishing communities in villages and market towns, mostly located along the rivers and streams. That is why the destruction caused by Cyclone Nargis in May 2008 was so catastrophic, causing nearly 140 thousand casualties and severe economic damage.

Myanmar has asked the Netherlands to take the lead in drawing up an adaptive, integrated water management plan for both the delta and the rest of the country to cope with Myanmar's expected huge economic growth and increasing pressure on water resources as a result of this. Delta Alliance Partners Deltares and Alterra are conducting a Vulnerability and Resilience Assessment Ayeyarwady Delta study, which is financed by the Global Water Partnership (GWP) and Bay of Bengal Large Marine Ecosystem (BOBLME).

The Ayeyarwady Delta is currently still, for the most part, underdeveloped. Uncoordinated exploitation of its resources in some areas may pose serious threats to the health of the delta. Effective, cross-sectoral management of the water system, in which local stakeholders are involved, will lead to sustainable solutions in the long term. The list of problems may seem long: Mangroves are cut down for fuel, there is overfishing, river bank erosion and deterioration of water quality as a result of salinisation. However, by applying Integrated Water Resources Management (IWRM), the delta can be used by the local people without compromising the integrity of these systems or overexploiting their natural resources.



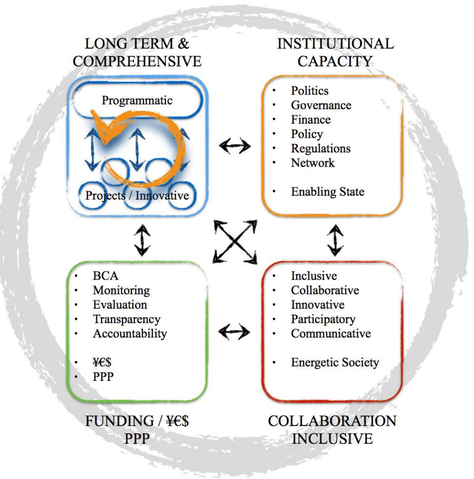
MOZAMBIQUE
A MASTER PLAN FOR BEIRA

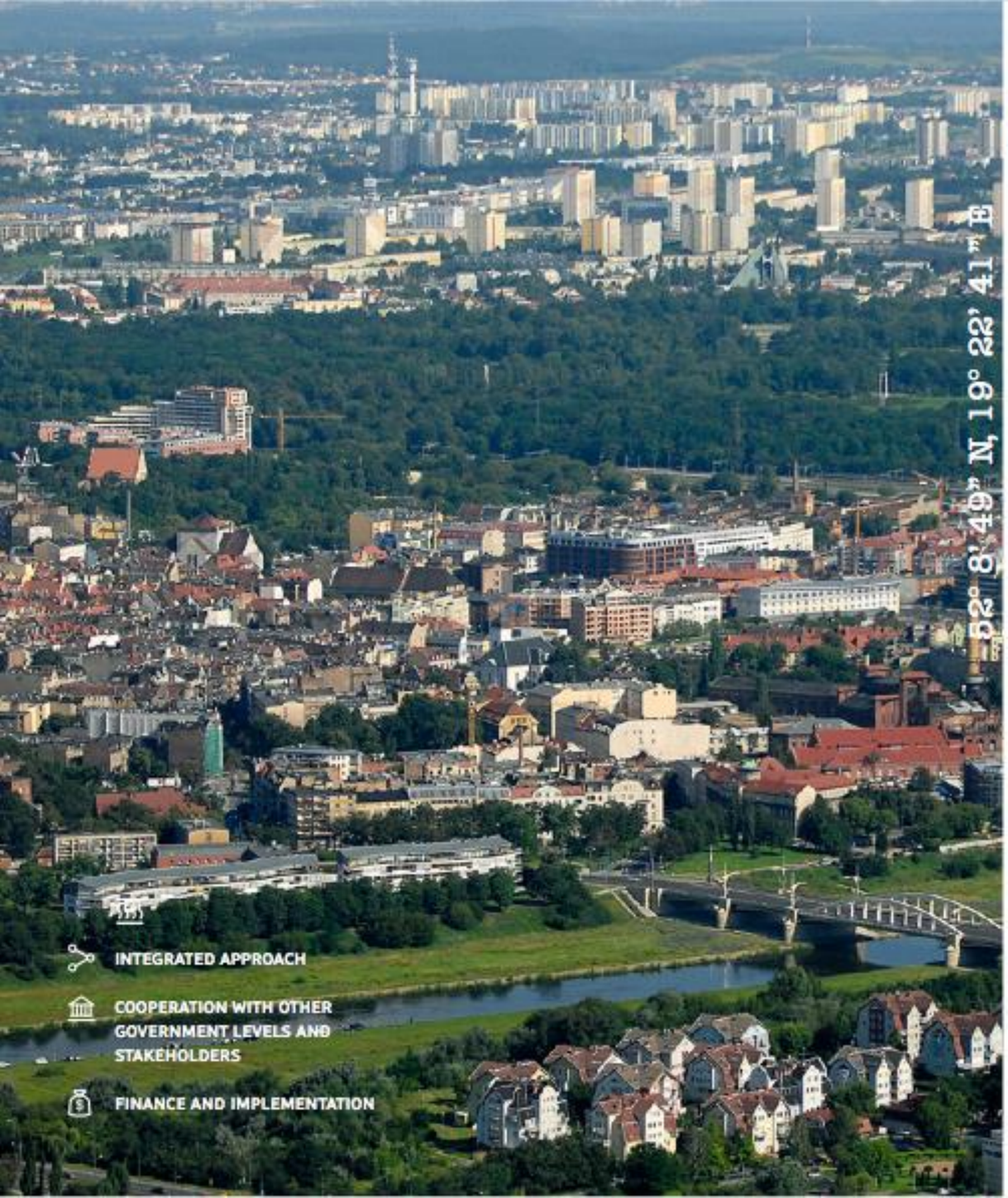
Name: **Beira**
Population: **0.6 million**
Urban or rural: **Urban**
Sea level: **Just above**
Total investment: **Approx. EUR 2 million**

Beira and Rotterdam: two low-lying cities in densely populated deltas with ports serving a massive hinterland. People keep flocking to Mozambique's seaport and settling in low-lying areas that are not fit for habitation. Waterborne diseases, especially malaria, are rampant and the city's infant mortality rate is dramatically high. What can Beira learn from its Dutch counterpart?

Focusing solely on water safety and water supply in these neighbourhoods means you are only addressing part of the problem. In addition to water safety, the integrated approach of the Beira Master Plan 2035, which has been commissioned by the Beira Municipality and drawn up in consultation with all stakeholders in the city, aims to stimulate both land development and economic growth. One important insight and result gained during the development process of the Beira Master Plan is the need for a public-private Land Development Company (LDC).
A company responsible for site preparation and for allocating suitable parcels of land for housing and business purposes. The Beira Municipality drew up the master plan in association with a Dutch consortium, aided by funding from the Dutch Global Water programme. The establishment of the LDC, again with help from the Netherlands, is currently underway.

The next step is preparing land development business cases aimed at generating concrete investment projects.
At the request of the Beira Municipality, Dutch experts will remain actively involved. Detailed financial engineering and the inclusion of crucial development partners will be the next step after that.





POLAND
WATER KNOWLEDGE HAS ECONOMIC POTENTIAL

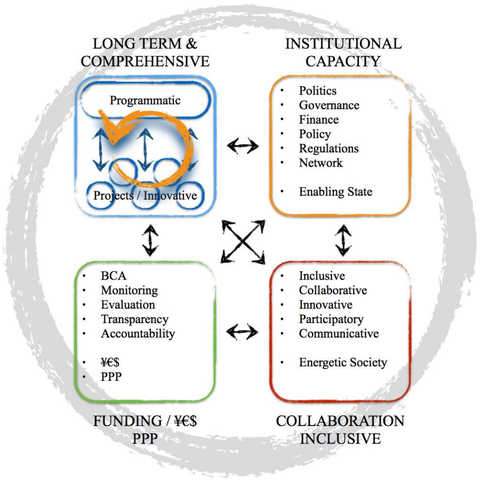
Name: **Vistula and Oder Delta**
Population: **2 million**
Urban or rural: **Urban and rural**
Above or below sea level: **-1.8 m to +2.5 m**

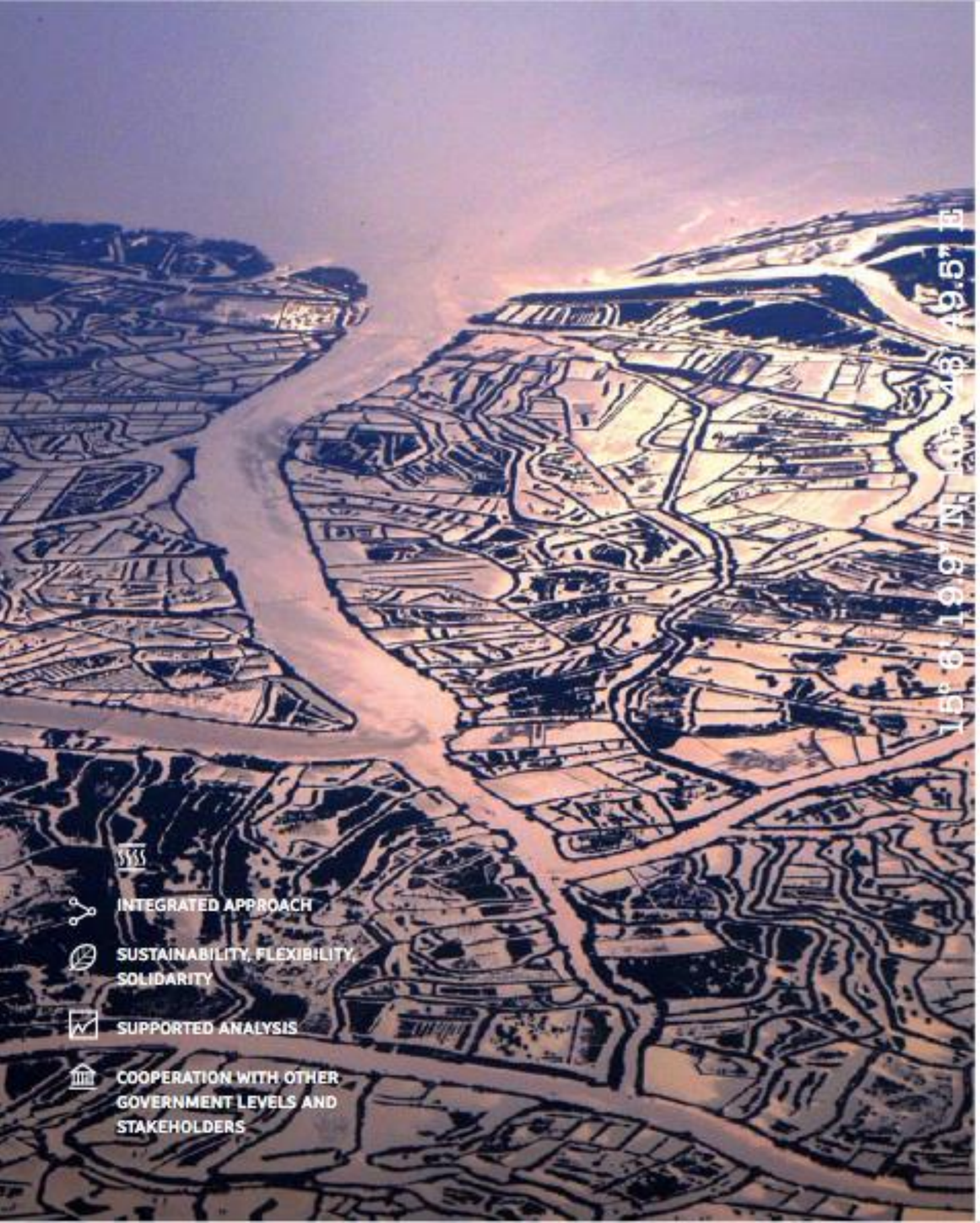
Poland is a country of water, although it does not have a reputation as such. Almost all major Polish cities are located by the sea or a river and are directly influenced by water. Sometimes, as is the case with the Vistula and Oder Rivers, which run from the mountains in the south to the Baltic Sea and the low-lying, flat deltas in the north, the influence of water is too great. The one-dimensional river system set up in the past is highly susceptible to flooding.

In the last century, various Polish rivers were canalised and subsequently poorly maintained. Water management was considered an architectural problem, with concrete as the solution. Little attention was paid to the natural behaviour of rivers, resulting today in flooding problems causing annual flood damages of up to EUR 3 billion in 2010 alone. In addition, cities such as Warsaw and Cracow are unable to exploit the social, economic and ecological potential of their rivers to the full.

Awareness that things can and must change is gaining ground in Poland, which is also being affected by climate change. Economically, the Central European country is doing well. Poland is reaping the fruits of EU membership, also in terms of knowledge exchange. There are valuable lessons to be learned from the Netherlands and the Dutch Delta Programme in terms of its holistic, integrated approach to spatial planning and water management.

In the coming years, aided by Dutch knowledge and innovation and European funding, efforts will focus on ensuring water safety in the form of infrastructure, retention and limiting building in areas susceptible to flooding. This alternative approach will make room for nature while creating opportunities for tourism, recreation and nature development, both in flood plains and on city shores.





VIETNAM
MEKONG DELTA PLAN: LONG-TERM VISION AND STRATEGY

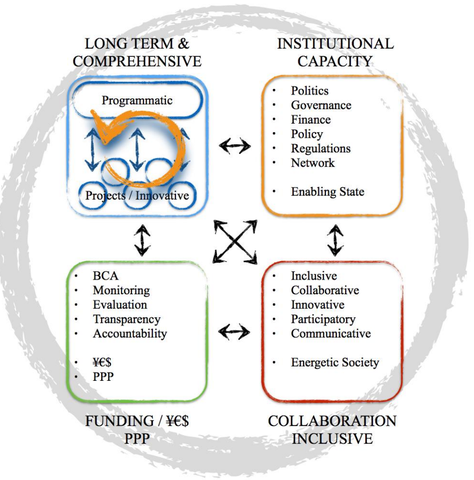
Name: **Mekong Delta**
Population: **17 million (expected shrink to 15 or growth to 30 million)**
Urban or rural: **Urbanisation 28%**
Above or under sea level: **Greater parts + 1.5 m**

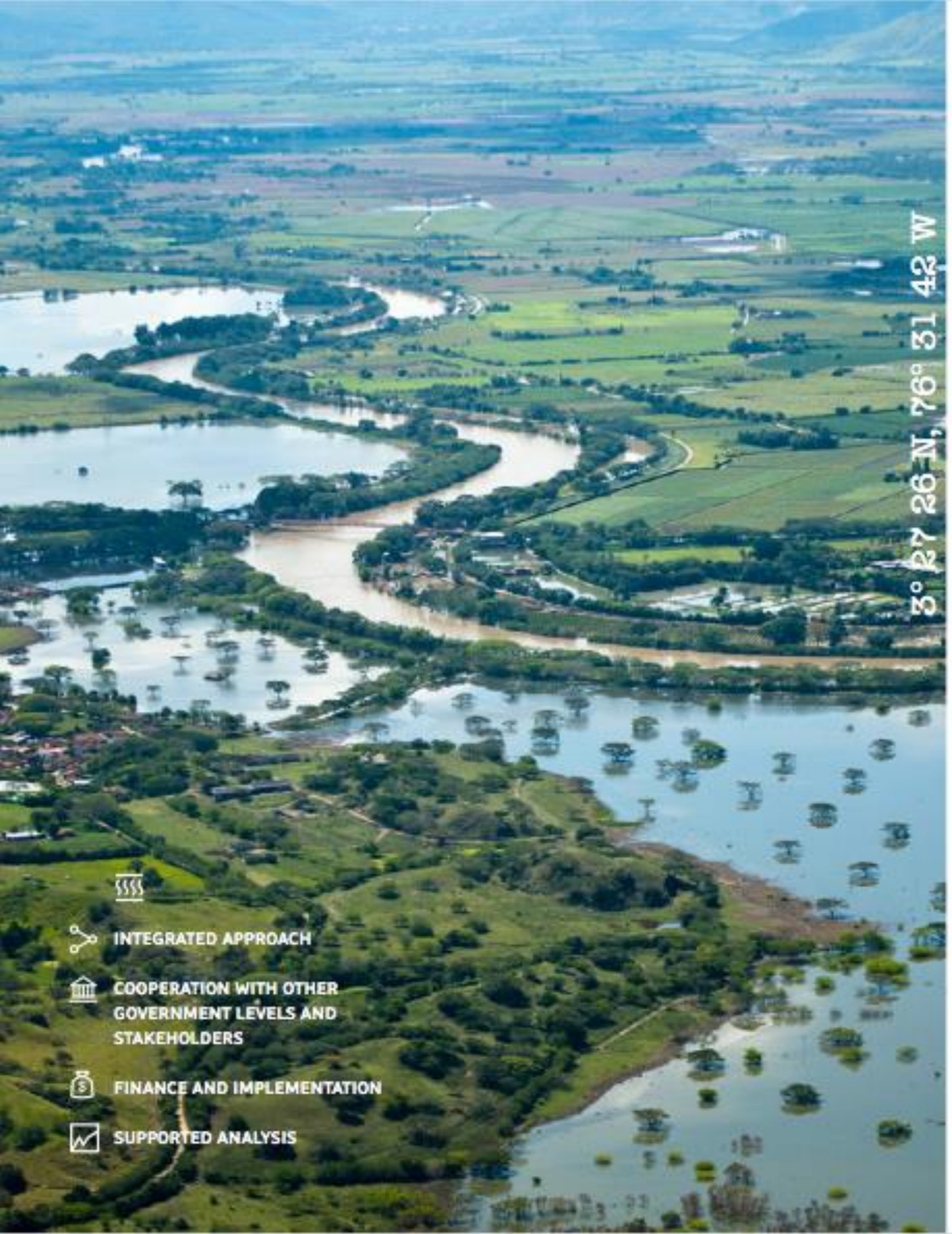
In the past decades, the Mekong Delta, with its rich land and water resources, successfully developed into the granary of the country and turned Vietnam into one of the leading rice exporters globally. On the other hand, the economic development of the delta lags behind other regions in the country. In its present state, the Mekong Delta is very vulnerable. Floods, droughts and salinity are dominant problems, hampering a prosperous and sustained economic development.

Inspired by the experiences in the Netherlands, the Government of Vietnam expressed the strong intention to work towards a Mekong Delta Plan for a safe, prosperous and both economically and environmentally sustainable development of the delta. It presents a vision to use the comparative advantages of the delta and focus on agro-business industrialisation. Organisation of the agricultural producers enables a better position to reduce transaction costs, platforms for more sustainable land and water resources management, improvement of product quality and competitiveness.

Diversification over the provinces is necessary to adapt as much as possible to available land and water resources. Important examples are a saline coastal zone with room for aquaculture integrated with mangrove restoration and in the upper delta controlled flooding with water retention and fish farming in the flood season instead of a third rice crop. Still, large-scale measures to guarantee flood protection and fresh water availability may be required when climate change causes persisting sea level rise and droughts.

The plan offers an assessment framework for government, donors and international financial institutions for moving from planning to implementation. The plan enjoys broad support - from the World Bank, the Asian Development Bank, the United Nations and countries such as Australia and Germany.





COLOMBIA
BALANCING INTERESTS AROUND THE CAUCA RIVER

Name: **Upper valley of the Cauca River**
Population: **4,5 million**
Urban or rural: **Rural and urban**
Sea level: **+1,000 to +1,200 m**
Total investment: **Approx. EUR 2.5 million**

Inundation in the Cauca Valley has caused major socio-economic damage. As the valley is an important agricultural region representing the heart of Colombia's sugarcane industry, flooding also affects Colombia's national economy. The challenge is to limit the risk of flooding from the river and tackle the problem of insufficient drainage while paying sufficient attention to river ecology recovery. This requires balancing the interests of a large number of stakeholders.

Due to the flat nature of the Cauca Valley, the area suffers from frequent flooding, the last of which occurred in 2011. The ministry, the local councils and the farmers owning land adjacent to the river are all responsible for flood safety, which makes the process of reaching agreements far from easy.
The economic interests of the sugarcane farmers are great. To strike the right balance between the desired level of safety and a healthy river ecosystem it is vital that all stakeholders participate in the development and implementation of a flood risk management plan.

The Regional Autonomous Corporation of the Cauca Valley (CVC) plays a central role in this initiative. With support from a Dutch consortium, CVC experts analyse present water safety levels and assess the effects of potential measures.
They draw up a master plan using the experience from the Dutch Room for the River Programme. This includes an active participation of stakeholders and an integrated approach.

Dutch experience has shown that stakeholders need to be involved in an active and timely manner. It is important to provide the right level of detail during the development process, moving from general concepts to concrete actions. Ultimately, the individual landowners and local councils are responsible for the implementation of structural or physical measures. The CVC can assist in the implementation of non-structural measures such as subsidy programmes, training programmes, regulation and enforcement. The project also includes searching for funding from external sources, such as the World Bank or the Inter-American Development Bank.