



Working Group 6:

## URBAN DELTAS: WATER RELATED CLIMATE IMPACTS

Extract from:

### Planetary Security:

Peace and Cooperation in  
Times of Climate Change and  
Global Environmental Challenges



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## WORKING GROUP 6

# URBAN DELTAS: WATER-RELATED CLIMATE IMPACTS

*Urban deltas are on the front line of the climate change impacts. Challenges due to rapid urbanisation enhanced by water-related climate impacts pose serious threats to the viability and the stability of delta countries. The interdependencies between vulnerabilities and water-related climate impacts show a clear opportunity for integrated approaches and innovative solutions. In this session we explored these opportunities and how to catalyse integration into policy and practice. This was the second Working Group where sea level rise was one of the central themes.*

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| 103 |

## 1. CHALLENGES

Deltas and coastal areas are amongst the most urbanised and urbanising places worldwide. Deltas, flood plains and coastal zones offer high economic activity through a confluence of agriculturally rich fluvial flood plains, connectivity assets and labour, economic and port shipping opportunities. Water is key for agricultural, food and energy production, thus essential for the economy, and our social and cultural wellbeing. In deltas, these assets come to bear. It is in these deltas that some of the world's largest metropolises are built and recent projections show that while by 2050, 75 percent of the world's population will live in cities, it is more than 70 percent of the urban population who will live in urbanised deltas.<sup>14</sup>

These great opportunities are however also the root of the challenges that delta cities face. Rapid land-use change, changes to the water system and rapid (uncontrolled) city growth put a lot of pressure on cities, societies and citizens, on the economy and ecology. This, in combination with climate change, makes urban deltas very vulnerable. They are especially vulnerable due to their low-lying location, rivers and coastal areas, as it is through water that we will feel the impacts of climate change most. Sea level rise is already threatening the economic and physical viability of low-lying areas and, according to the Intergovernmental Panel on Climate Change (IPCC), sea level rise will continue to rise this century. Additionally, they expect that the frequency and intensity of extreme weather events will increase, resulting in more floods and droughts in delta areas. The 2015 World Economic Forum (WEF) Risks Report (presented in Davos in January 2015) put the impact of Water Crises as the number one global risk. And these risks threaten the viability of delta countries even before the deltas begin to become submerged.

<sup>14</sup> Beroepsorganisatie Nederlandse Ontwerpers, Holland: A Sustainable Urban Delta <http://www.bno.nl/upload/nieuws/open-oproep-sustainable-urban-delta/Sustainable%20Urban%20Delta%20-%20Holland%20Branding.pdf>

Global urbanisation gives us growth, prosperity, emancipation, cultural activity and development opportunities, but these positive effects might be reversed if we do not make cities more resilient. Adapting to and mitigating the risks urbanised deltas face is extremely urgent because they must safeguard large numbers of people, and key infrastructure and assets. If we continue with business as usual, 2 billion people are expected to be severely affected by 2050, and 4 billion in 2080. Taking into account sea level rise and floods, the 10 most vulnerable urban deltas in 2050, measured as a percentage of GDP, are: Guangzhou, Mumbai, Kolkata, Guayaquil, Shenzhen, Miami, Tianjin, New York-Newark, Ho Chi Minh City and New Orleans.<sup>15</sup> Miami then leads with 278 billion dollars of assets at risk, followed by Guangzhou, New York-Newark, New Orleans, Hong Kong, Mumbai, Osaka-Kobe, Shanghai, Amsterdam and Ho Chi Minh City.

If lives and assets are not safeguarded this will have large consequences at the national and even international level. Decreasing viability in urbanised areas will lead to social disruption, displacement and migration, increasing the risk of tension and conflict in the affected areas. Some researchers even fear a simultaneous flood-tide of climate change refugees that may lead to civil unrest and possibly armed conflict nationally and/or internationally (especially in areas with a history of political instability). Another trigger for international conflict may be disputes over maritime boundaries, territorial seas and sea-lanes when coastlines change and border demarcations alter due to sea level rise.

To make cities more resilient, it is not enough to focus only on the effects of climate change and adaptation measures including improvement of flood defence systems. Human interventions in river and delta systems, such as damming and channelisation, also have large impacts on the way these water systems function. This was illustrated by the transformation of some natural delta systems into man-made, engineered systems in the nineteenth and twentieth century. This led to serious erosion and decay due to a substantial decrease in the transport of sediments by the rivers to the deltas and drainage resulted in land subsidence in many delta regions. Therefore urban water must be seen in the context of the rural hinterland and the systems of these (ecological) riverine basins that ensure quality of nature, ecology and the safety, scarcity (the quantity) and quality of water. Water quality defines economic and societal prosperity, and risks – caused by either too much or too little water – define our societies' vulnerability. This is not about "fixing" climate change; this is about moving towards a systems approach where long-term comprehensive strategies are connected to short-term (preferably innovative) interventions.

Urban water is at the heart of how cities develop. Therefore spatial planning and design have become increasingly more important. The WEF 2015 Risks Report concludes that both the failure of urban planning and the failure of climate change adapting are increasing the vulnerabilities of our communities across the world in the next decade. Again, this is a plea for a comprehensive integrated approach where the defence and development of cities are combined, adding value for all based on the principles safety and quality (of life, the environment, the economy). Vulnerable communities are located in the most vulnerable places, all over the world, as much in the developing as in the developed world. To improve community resiliency, adaptation plans must be connected to the local needs and the process should be inclusive, including all stakeholders. This also implies moving or sharing responsibilities from central governments to local authorities, private institutions and citizens.

The need for investment in climate adaption provides unique opportunities to combine and integrate spatial, economic and social needs and demands. An increasing number of deltas are already sharing knowledge and lessons learned to increase resiliency and improve adaptation strategies. Working on resiliency has become a global connecting task!

<sup>15</sup> Hallegatte S et al, 'Future flood losses in major coastal cities' (2013) in *Nature Climate Change*

## 2. RESPONSES

The 100 Resilient Cities initiative, pioneered by the Rockefeller Foundation (100RC), is dedicated to helping cities around the world become more resilient to the physical, social and economic challenges that are a growing part of the 21<sup>st</sup> century. 100RC supports the adoption and incorporation of a view of resilience that includes not just the shocks – earthquakes, fires, floods, etc. – but also the stresses that weaken the fabric of a city on a day to day or cyclical basis.

Cities in the 100RC network are provided with the resources necessary to develop a roadmap to resilience along four main pathways:

- financial and logistical guidance for establishing an innovative new position in city government, a Chief Resilience Officer, who will lead the city's resilience efforts;
- expert support for development of a robust resilience strategy;
- access to solutions, service providers, and partners from the private, public and NGO sectors who can help develop and implement resilience strategies; and
- membership of a global network of member cities who can learn from and help each other.

Through these actions, 100RC aims not only to help individual cities become more resilient, but will facilitate the building of a global practice of resilience among governments, NGOs, the private sector, and individual citizens.

| 105 |

The C40 Cities Climate Leadership Group was founded in 2005. It brings together the world's megacities in meaningful exchanges to better prepare them for climate change (see Figure 1). It sets actionable and measurable goals at the individual city and organisational levels to ensure that actions and outputs are effective. The C40 networks facilitate dialogue amongst city officials across more than 50 countries. As more than two thirds of the world's largest cities are coastal cities, the C40 group has come up with a network called Connecting Delta Cities (CDC). Here, cities exchange knowledge and best practices in the field of climate change related spatial development, water management and adaptation. A CDC Secretariat has been installed in Rotterdam.



Figure 1: C40 membership

The World Water Forum (WWF) is another international initiative that addresses issues surrounding water. It is hosted by the World Water Council and forums are held in major cities every three years. The 7th World Water Forum 2015 was held in South Korea. The themes are managed by the Forum and various stakeholders gather to select and discuss the most pressing issues such as climate change, disasters and green growth. Other themes include the Political, Regional and Science and Technology developments and changes. During the 5<sup>th</sup> WWF held in Turkey, perspectives on “Deltas and coastal cities” were discussed, in which adaptation to climate change was addressed as a challenge to the sustainable development of deltas. Deltas vulnerability to flooding, shortages of freshwater resources, ageing infrastructure, erosion of coastal areas and sea level rise were identified as core issues. Figure 2 shows the vulnerability risks of eight deltas.

Delta	Issues					
	Pressure on space	Flood vulnerability	Freshwater shortage	Ageing or inadequate infrastructure	Coastal erosion	Loss of environmental quality and biodiversity
Yellow River Delta (China)	**	*	**	*	***	***
Mekong River Delta (Vietnam)	**	****	****	**	*	***
Ganges–Brahmaputra Delta (Bangladesh)	****	****	**	**	****	****
Ciliwung River Delta (Indonesia)	****	****	**	**	*	****
Nile River Delta (Egypt)	****	*	****	****	**	**
Rhine River Delta (The Netherlands)	***	**	**	***	**	*
Mississippi River Delta (USA)	*	****	*	****	****	****
California Bay (USA)	**	****	****	***	*	***

Legend:

- \* relatively minor problem, now and in the near future
- \*\* currently a minor problem, but is likely to increase in the near future
- \*\*\* currently already a big problem, future trend uncertain
- \*\*\*\* currently already a big problem, likely to increase in the near future

Figure 2: Nature of delta issues in eight selected deltas

The Sendai Framework for Disaster Risk Reduction 2015-2030 was adopted at the Third United Nations World Conference in Sendai, Japan, on March 18, 2015. It is the outcome of stakeholder consultations initiated in March 2012 and inter-governmental negotiations from July 2014 to March 2015, supported by the United Nations Office for Disaster Risk Reduction (UNISDR) at the request of the United Nations General Assembly.

Taking into account the experience gained through the implementation of the Hyogo Framework for Action 2005-2015, and in pursuance of the expected outcome and goal, the Sendai Framework identified that there is a need for focused action within and across sectors by states at local, national, regional and global levels in the following 4 priority areas:

- Priority 1: Understanding disaster risk;
- Priority 2: Strengthening disaster risk governance to manage disaster risk;
- Priority 3: Investing in disaster risk reduction for resilience; and
- Priority 4: Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction.

Chapter 13 of the Physical Science component of the 2013 Intergovernmental Panel on Climate Change (IPCC) Assessment Report suggests that regional sea level change projections may differ substantially from a global average because of a combination of various contributions emerging from the ocean, atmospheric pressure loading and geology. As such, regional changes in sea level could reach values of up to 30 percent above the global average in the Southern Hemisphere and around North America, between 10 and 20 percent in equatorial regions and up to 50 percent below the global average in the Arctic region and some regions near Antarctica. Worldwide responses should therefore take these estimates into account, especially where the projected rise would be a significant percentage above the global average. However, there are not enough existing regional transboundary responses that involve several countries working together to mitigate and adapt to climate-related impacts. Often times, it is restrained to country-led effort, as such measures are costly and takes a long time to construct (for example, the London Thames Estuary 2100 Plan will take 25 to 30 years to plan and implement).

In the United States, the National Oceanic and Atmospheric Administration (NOAA) carries out climate and coastal erosion monitoring, and runs a Coastal Zone Management Program. The programme is a voluntary federal-state partnership created by the Coastal Zone Management Act that addresses a range of issues, including climate change. Together with the National Ocean Service (NOS), the programme creates sea level rise inundation models and supports the development of climate change adaptation plans, regulations and policies at the state and local levels.

Tim Folger for National Geographic wrote an article in 2013 describing New York City as essentially defenceless in the face of hurricanes and floods because of its lack of levees and storm barriers. This was showcased by Hurricane Sandy, which left 157 dead, destroyed or damaged 300,000 homes, damaged or forced to close at least temporarily hundreds of thousands of businesses and brought about a total damage and economic loss of 65 billion dollars, making it the second costliest storm in the history of the USA. In Florida, sea level rise threatens the state's freshwater supply. If sea level rises above 60 centimetres, Florida's aquifers are very likely to be poisoned beyond recovery. The National Geographic article points to best practices from the Netherlands, where a single storm in 1953 changed not just a city but the nation's policy. The Dutch saw that climate-related mitigation and adaptation measures are a matter of national security, especially for a country where 26 percent of the land lies below sea level and 60 percent is flood prone. To date, the Netherlands is one of the best-protected deltas of the world with standards of risk prevention based upon events that occur only once every 10,000 years. Living with water as a cultural approach, is the Dutch way of dealing with living at risk, making the Deltaworks, the Building by Nature projects like the Sand Engine and the Room for the River Program global standards and inspirations for many other delta cities worldwide.

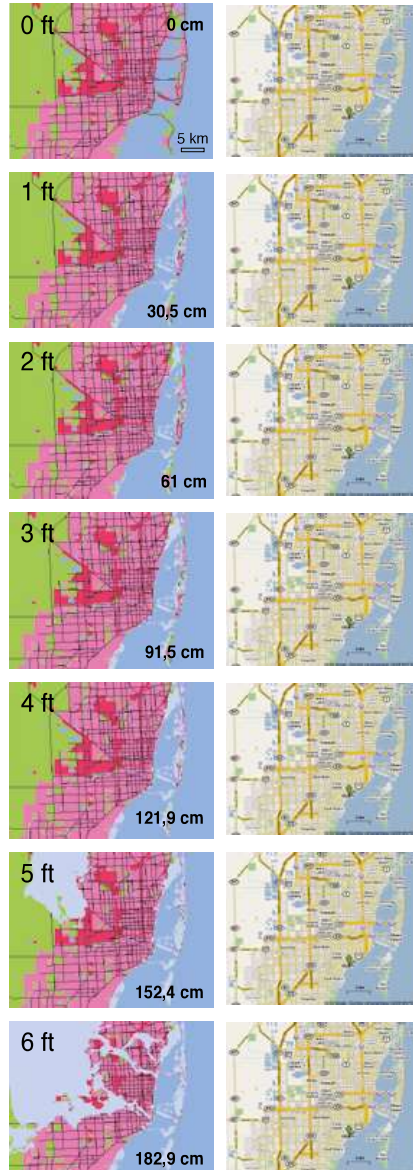
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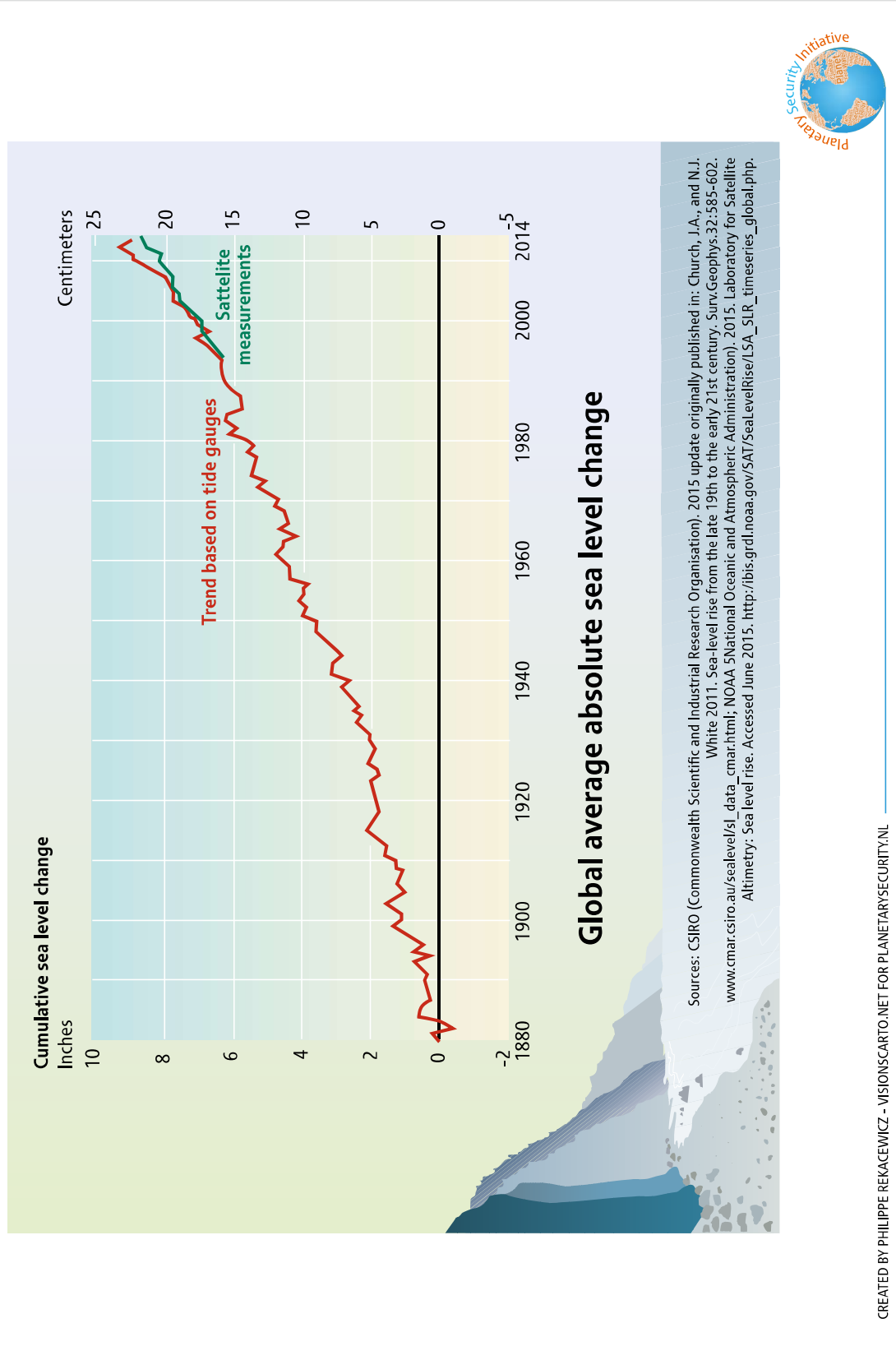
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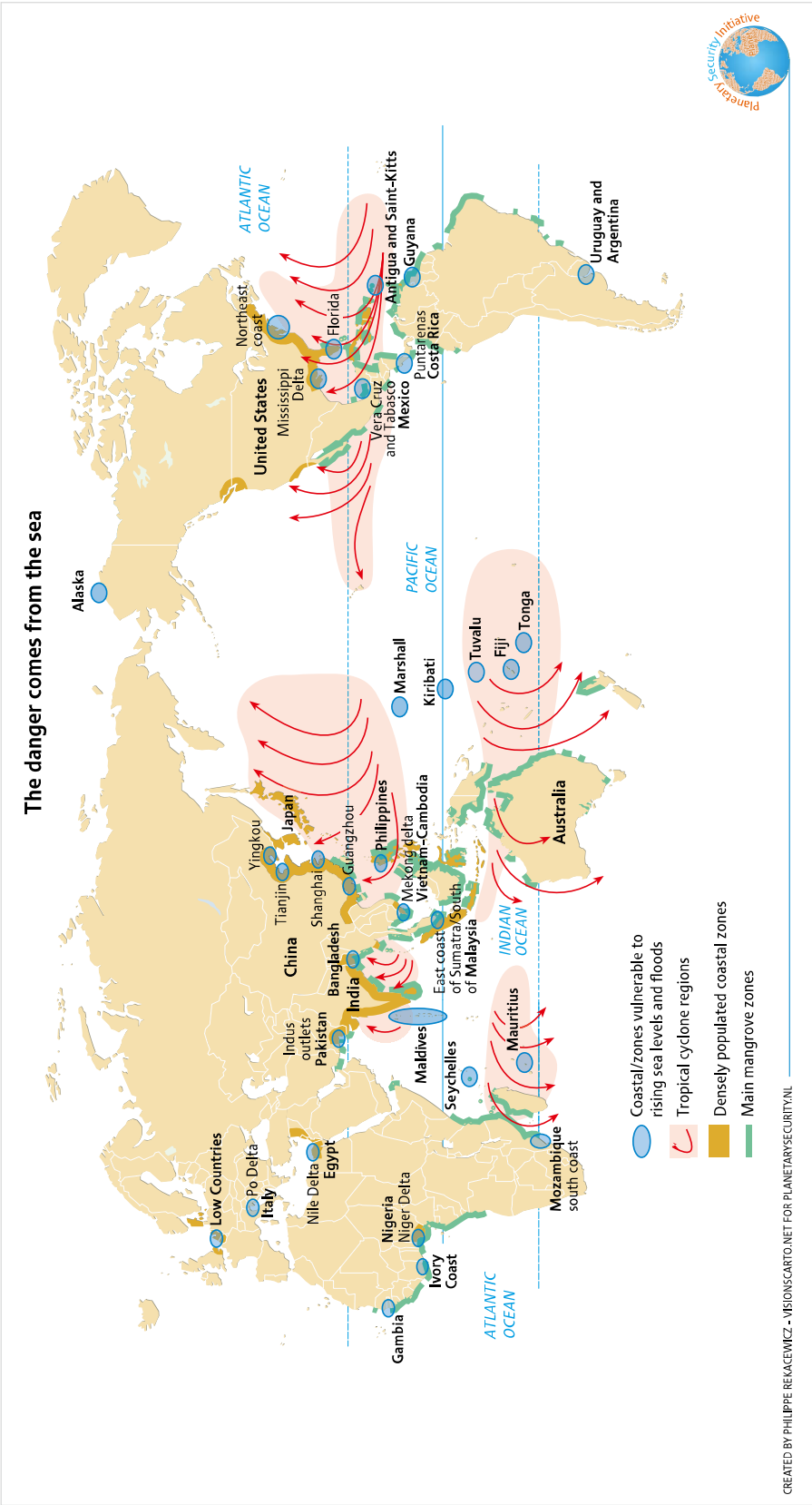
**Impact of Sea Level Rise in Miami**



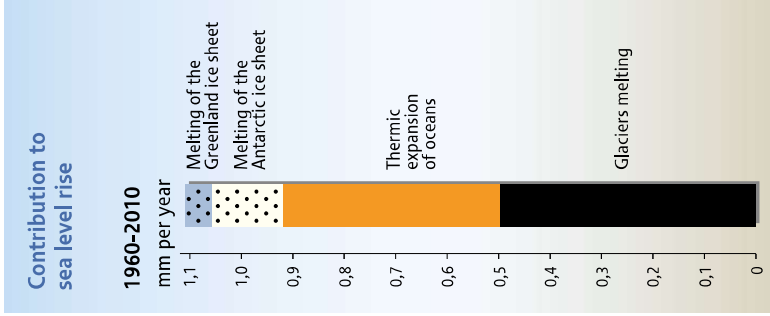
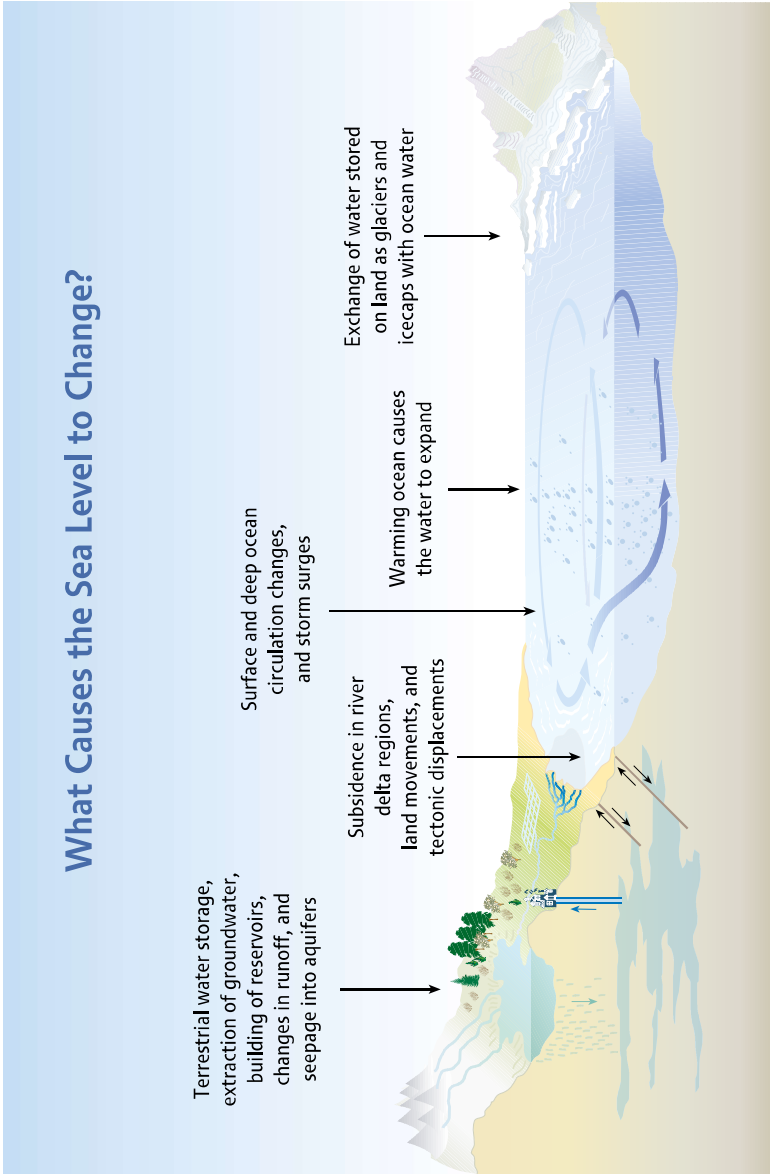




### The danger comes from the sea

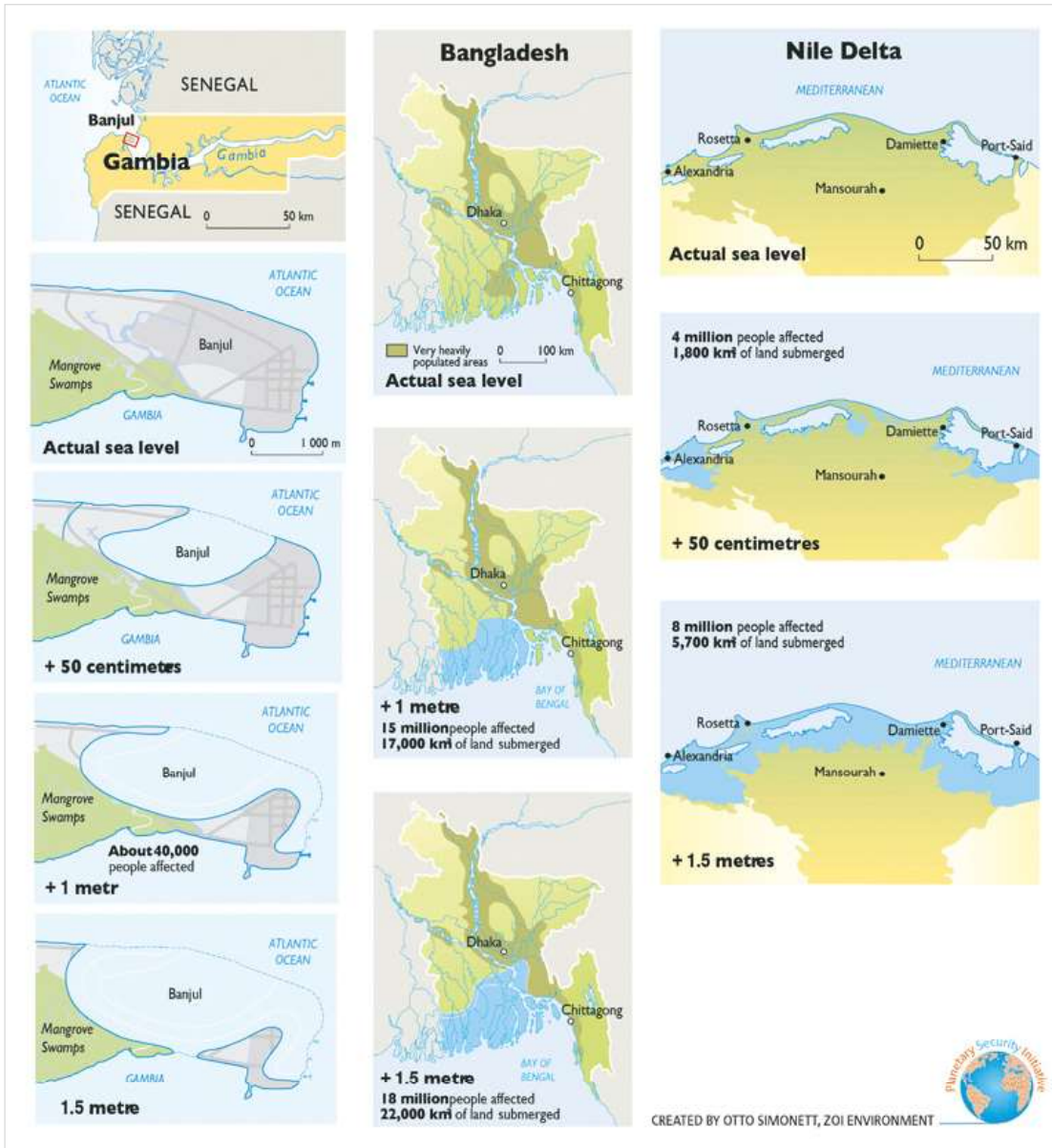


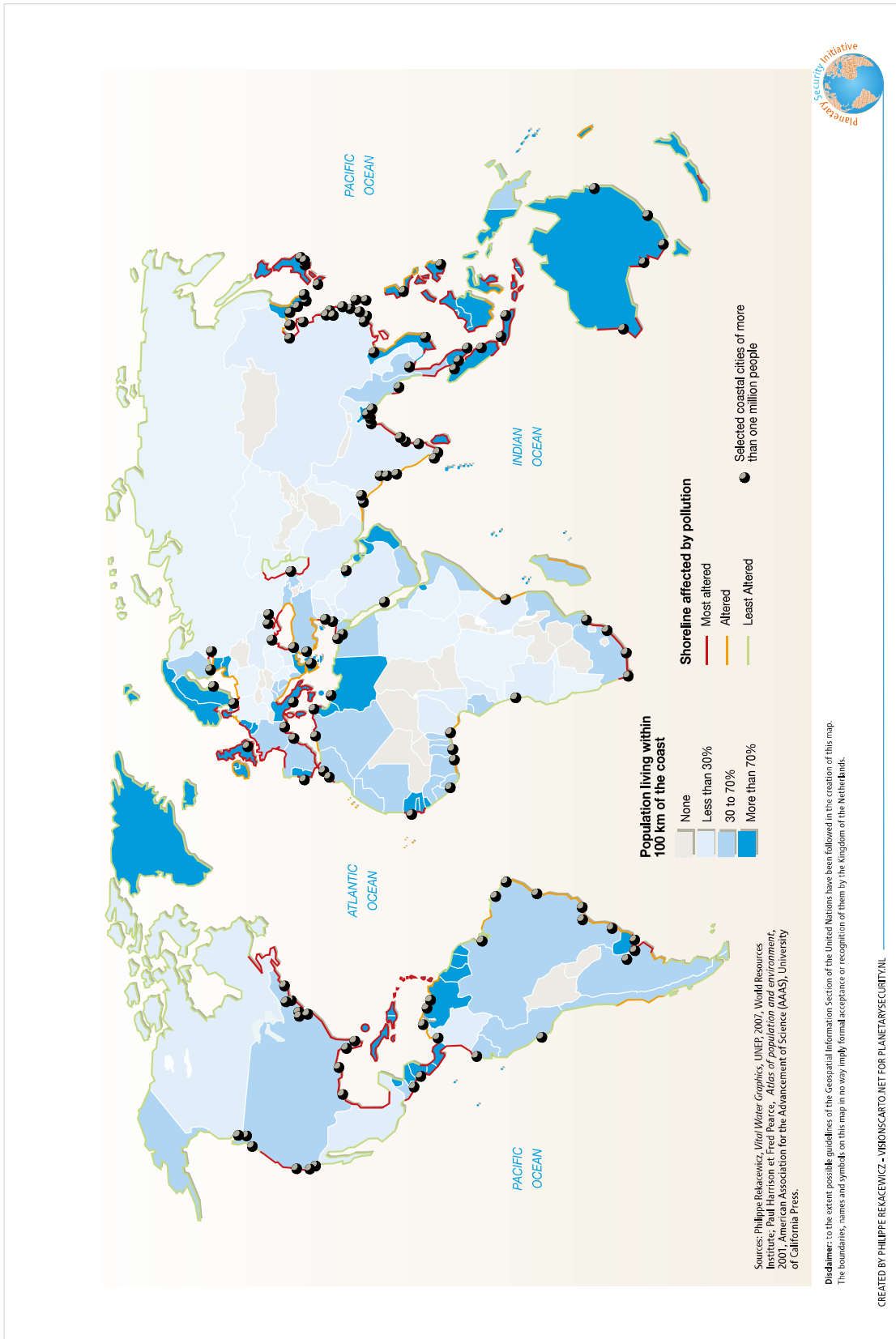
## What Causes the Sea Level to Change?



Source: David Griggs, in *Climate Change 2007*, Synthesis report, Contribution of working groups I, II and III to the Third Assessment Report of the Intergovernmental Panel Climate Change, Cambridge University Press, 2001; Quatrième rapport du Groupe intergouvernemental sur l'évolution du climat (GIEC), 2007 and 2014; NSIDC.







## 4. ANALYSIS

Climate change brings about a new era in geopolitics. Water-related impacts hit humanity, economy, culture and ecology. Tensions in national security are exacerbated by water, food and energy crises. With the increasing frequency and impact of natural disasters and extreme weather events more people than ever are vulnerable, at risk and on the move. Governments around the world fail to act because of misguided trust in technical solutions, uncertainty about societal, geographic and economic changes, lack of capacity, fragmentation and political gridlocks amongst others.

The magnitude of the figures on the risk we face are numbing, but we must rise up to the challenges. We must find ways to adapt to and to mitigate these risks, because we are talking about the lives of many billions. This should not be about dollars, or even national security. It is about planetary security and human dignity.

Finding the right solutions is complex, because the problems are inter-connected, especially in deltas. Deltas are vulnerable but also attractive places: people are drawn to the possibilities for agriculture, housing, and production. The system of a delta strongly depends on the availability of good quality fresh water filters and flood safety. In the case of a water crisis – be that scarcity or flooding or pollution – all sectors are in trouble and cities and deltas stop to function. The cascading effects multiply the losses and damages. Energy disruptions caused by flooding may cause telecom and transport services to break down, and without communication and transport emergency response actions are frustrated. Let alone the rebuilding.

Better understanding of the issues at stake in urban deltas and the interdependence between these risks requires more knowledge. We need proper data and assessments and we need to share more knowledge between governments, industries and society.

At the same time we cannot wait with action, given what we already know. This is a battle situation and people's lives are challenged every day. Transitions take a long time. The Netherlands due to its vulnerable condition has a resilience approach defined by "living with water" at the core of its political and societal culture. Cities like Rotterdam and Amsterdam are worldwide at the forefront when it comes to adaptation and resilience approaches. But most cities now are too vulnerable to wait for even ten years with investments, they have to start now. A comprehensive step-by-step approach is needed, based on a long-term climate-inclusive strategy.



Working Group 6. Urban Deltas

## 5. CONCLUSIONS AND RECOMMENDATIONS

To gain better understanding of the issues at stake and the interdependencies between them at the global and regional scale we need inclusive processes, data, facts and design for making connections. Satellite data is key and instrumental to this need. It can provide global information on the details of water stress, ground level water, runoff satellite data, projections for climate change and flood risk, coastal storm surge, water quality amongst others. Better understanding of the risks provides a better basis for action.

Although the interdependencies between the risks make it much more complex to understand the system, they can be a blessing as well. The interdependencies show mostly on the regional level and this is also the scale where humanity can adapt to and mitigate those risks. The need for investment in resilience provides unique opportunities to find integrated solutions for spatial, ecologic, economic and social demands.

For example, mangroves protect the coast against storm surges, but they cannot keep up with sea level rise when there is not sufficient sediment nourishment from upstream. When we understand the system, we see that in this dynamic system the sea is not the enemy but the sediment trapping upstream. When we design upstream measures in way to better manage water and sediment flows on a river basin scale, we also protect the mangrove ecosystem, which protects the shoreline during storm surges, provides wood, fish production and nursing, water quality improvement, biodiversity conservation and recreation.

Often complacency is harder to deal with than complexity. So to seize the opportunities complexity offers we need to build an enabling environment using a comprehensive systems approach that ensures a focus towards real transformative capacity of collaborations and their methods. In this system approach, 4 key aspects are:

**Long-term strategies matched with short-term interventions and comprehensive planning:** Planning and implementing adaption measures at the regional scale or system level in the existing governance structure proves difficult, and takes a long time. Therefore we need a long-term strategy that fits all the expensive pieces of the jigsaw into place.

**Institutional capacity:** Often there is a lot of fragmentation between decision-makers who need to give programmatic guidance to follow the long-term plan and to implement short-term measures. In that case we need to build institutional capacity. There is a Mekong Delta Plan, a delta plan for Bangladesh, a delta plan for Myanmar and some projects may get funding. To make sure that these projects do not become isolated interventions however, we need institutional capacity that ensures (local) ownership and follow up. As the case of Bangladesh poignantly shows, collaboration is needed across national borders, between many regional governments and a multitude of city authorities. What is needed is to work together in the regional context of the delta, across the board of agriculture, safety, biodiversity and ultimately defence.

**Transparency and (innovative) funding, linking public and private finance:** The problem is in part about getting the money. But most of all we need social understanding and full transparency of where the money goes, and how the investments add revenues. To publicly account for the measures taken and to attract private stakeholders to invest in resilience measures we need effective benefit costs analyses, monitoring and evaluation instruments that can take long-term comprehensive resilience strategies and measures into account. Interestingly, there is a good uptake from business (mining, agriculture, food processing and packaging, finance, insurance, energy, car manufacturers, consumer goods). There are good opportunities to get businesses more involved - they have been thinking about risk for decades. They see opportunities in materials, supply chains, risk assessment. Off course the

operate on their own terms and the 'bottom line', but they do not see themselves as isolated and are looking for proper, big investments. Also, PPP could provide very interesting opportunities for collaboration.

**Collaboration:** Cities in deltas are well positioned to take small action for mitigation and build adaptation plans, but the water system may extend city boundaries, out of the span of control. If authorities on different levels do not work together, if nations compete for the same water, the power to act is fragmented. Also, as mentioned before, water is connected to energy and food sector and urban development. Moreover, we need to include all stakeholders so that measures will be supported locally and integrate effectively into global and regional environmental and political dynamics.

We should be smart enough to not wait for crises and to take preventive measures. Yet, once there is a crisis, the willingness to act increases. Crises can catalyse the integration of solutions into policy and practice. We know that there will be crises, so why don't we package the information that we will need in case of a crisis in a clear and accessible way. At a time of urgency there is a great need for information. The packages can assist first steps in dealing with the crisis as well as first steps in transition to a safer delta.

Finally, there are lot of interesting cases, bright spots, are happening in the field where businesses and governments work together. For example in Miami, wastewater is rerouted into the aquifer to keep the water level up. In Los Angeles, water is treated as one jurisdiction without separating responsibility between wastewater of potable water. We can build on these good examples and add chapters to them.

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Rapporteur: **Florine Gongriep**, Government of The Kingdom of the Netherlands

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