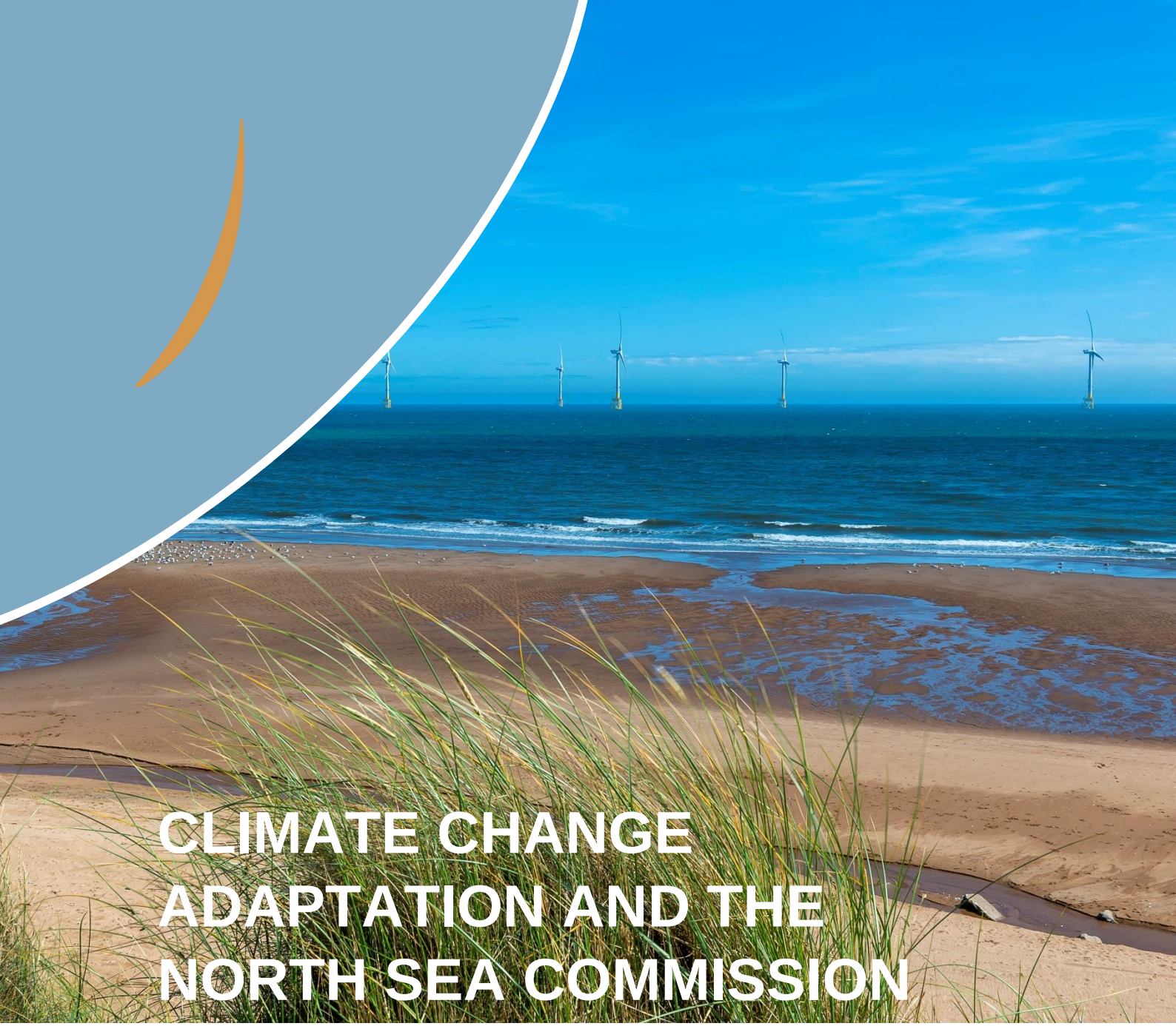

CLIMATE CHANGE ADAPTATION AND THE NORTH SEA COMMISSION

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CPMR NORTH SEA COMMISSION

INTRO

The North Sea Region is one of the safest, wealthiest and healthiest parts of the world. That didn't come naturally. Our ancestors before us had to learn from the harsh lessons that nature taught them, and these lessons are not over yet. There is an increasing awareness of the ever more rapidly coming changes of our natural conditions. Considerable effort is invested in mitigating the rise of global temperature yet decreasing the speed of change doesn't prevent change from coming. Therefore, a region that is affected as much as ours by changes such as sea level rise, intensified heavy rain showers, more extreme varieties in discharges, and long hot and dry summers should anticipate these events to stay and increase in frequency. We must keep up with these changes and begin to understand how we can adapt so that we do not become overwhelmed by them. Managing our situation by picking up the challenges ahead and staying in the same place, or even improving it, is what this position paper is about. The future is uncertain however uncertainty is not a reason to do nothing.

In this paper, we provide information and opportunities for taking steps into our complex and uncertain future. The Conference of Peripheral Maritime Regions (CPMR) acknowledge this issue and have drafted the "CPMR Regions Act on Climate Change". This paper is meant to give a more detailed description on how to reach a state of climate resilience in the North Sea Region. The North Sea Commission also sees action on climate change adaptation as important as action on climate change mitigation and is working towards a region which is climate ready, adaptable and resilient to climate change.

1. Challenges ahead

Wanting to deal with the effects of climate change is complex as it leads us into a situation where many developments are taking place autonomously. Climate change effects are connected to subjects, for example, investment value behind levees, population growth, land use, urban planning, land subsidence, and infrastructural networks. Therefore, making choices is the first challenge. We will focus on predicted climate change impacts and the effects they have on societal values. Certain side aspects, especially those aggravating the effect of climate change, will be mentioned as well. Per issue a selection of current topics under investigation in the Interreg North Sea Region projects are mentioned as well.

1.1. Sea level rise

For the lower lying countries sea level rise is a serious threat. Coastal erosion forms a risk for individual premises but may also flood large parts of the country. A huge number of studies is devoted to this issue and though studies vary amongst themselves, the fact that sea level is rising is well acknowledged throughout the scientific world. The problem of sea level rise is further aggravated by the post glacial sinking of the continent in parts of the region and by land subsidence through pumping, oxidation and erosion. Traditionally, hard infrastructure such as levee improvements have been an important way of dealing with these risks. Larger existing works such as the Dutch Delta Works and the Thames barrier prove to be difficult to adapt to the changing conditions. Green infrastructure, for example dune formation is another approach, and relatively new are the shoreface and beach nourishments with North Sea sand (NB. The availability of North Sea sand is a serious matter that should be linked to the Marine Spatial Panning developments as well).

1.2. Increased rainfall

The frequency and intensity of heavy precipitation is increasing in our region in most areas. Our systems are often not built for such peaks leading to the following issues.

1.2.1 Rainwater flooding

The capacity of stone to take up water is limited. In our concrete and stony cities water must find its way into the soil or the sewer and often fails to do so, for example due to a lack of sewer capacity. Too much water leads to accumulation and floods. Increasing drainage capacity, cleaning gutters, introducing parks and green areas, de-stoning gardens and driveways, making green roofs, and creating rainwater storage areas may all support the management of increased rainfall.

1.2.2 Ground water flooding

The water that is taken up by the earth will elevate ground water levels. Especially in more hilly or uneven areas and very deep polders this leads to an increase of flooding from the ground water seeping out of the soil.

1.2.3 Higher discharges

Rivers collect the water from the increased precipitation and the riverbed must deal with enormous peaks in discharge. This increases the risk of riverine flooding. In the recent years there have been various incidents like these, for example the UK flooding events. This effect is aggravated by intensified land use, neglected soil conditions (compactness), canalising of rivers and streams. The system has to be upgraded to be able to either hold back the water more efficiently therefore slowing it down (improve soil conditions, change land use, re-meander, restore ecosystems such as peat bogs), store it (puddles, side gullies, overflow areas) or more effectively release it into the sea (widening river beds).

1.3. Less precipitation in summers

The summer of 2018 proved the unpredictability of the future. A very dry hot period that led to extremely low discharges and exhausted water reserves on higher grounds. It led to water shortage, ecological harm, interrupted shipping on our rivers, salinisation, failed crops, subsidence of buildings and many more challenges. Being able to store water in surface and ground water systems and use the available water more efficiently is of great importance. Droughts harden the soil and prevent it from taking up water, therewith aggravating the situation further as we saw in the 2018 flooding events.

1.4. Less snow in winter

Less snow in winter is an issue for some of the regions, sometimes directly, sometimes indirectly. Less snow means less melting water which forms a problem for, ironically the climate neutral, hydropower dams in Scandinavia. Less melting water also aggravates the effects of already less precipitation in some of the rivers, for example the river Rhine, endangering fresh water supply and navigation. Solutions for this situation must be sought.

1.5. Increase in temperature

The increase in temperature happens everywhere but is felt most in the “heat islands” we call cities, infrastructural networks, agriculture, and mountain areas. It leads to failed crops, ecological migration and extinction, reduced road availability and increased mortality in cities. This is another issue on the rise. The increase in temperature of our seas and oceans is also having a detrimental effect on our underwater ecosystems.

1.6. Systems affected

Many systems are affected. The following illustrates the accumulation of effects mentioned before but on the systems we live and work in/next to. It illustrates the complexity of the earlier identified challenges.

1.6.1 Coasts

Coastal erosion and flooding provide shocking scenarios for low lying countries. Coasts and especially Deltas are usually quite densely populated, being the connection between maritime transport and the riverine hinterland. Investments are high, populations are big and often concentrated in cities. Coastal protection is costly and requires devoted well-trained specialists. Apart from the safety issues, the sea also poses a water quality issue through salinisation. Increased sea levels increase salinisation of fresh water inland.

1.6.2 Rivers

River systems must deal with the extremes that we are heading for. Designing river systems alone to cope with them is not enough. The entire watershed should be considered here, including the soils that could be prepared to take up water more easily and retain more and longer, reducing flash floods and countering the effects of dry periods. There is great use in storage areas and re-meandering for damping high discharges and retaining water. Designing the riverbed for improved discharges can also be an advisable thing to do. The Dutch Room for the River project tried to combine these measures and still provides valuable research for future investments. River systems never work alone: all the river-neighbours should do their share in reducing downstream disaster and allowing the river to be the economic highway it is. Also, water quality and thus drinking water availability is one of the important issues that should be kept in mind in taking riverine measures.

1.6.3 Cities

Cities are difficult places in the light of climate change: heat accumulates there, soil is hardened and covered by stone making it hard for rain to penetrate the ground. Accumulation of rain or groundwater is therefore an issue many cities struggle with, especially in the light of the increase of heavy rain showers. Mitigation measures such as greening the cities and improving sewage alleviate the effects. At the same time, the vulnerability of large accumulations of people for riverine and coastal flooding are evident. The same goes for the investments cities represent. Prevention, preparedness and good crisis management are of the utmost importance here since risks on harm and loss are highest.

1.6.4 Infrastructural networks

Connectivity is the basis for our economies. However, flooded tunnels, roads or railways hamper our flow. Evacuation situations can make road access vital. Vulnerability of our infrastructure is one of the rising issues in our region, especially in the densely populated areas under threat of flooding. Increased drainage, elevation of roads and improved spatial planning may provide solutions. Coinciding with the riverine issues, the important infrastructure that rivers are is threatened by extremes in discharges being either high or low. Nowadays infrastructure is more than the conventional roads and waterways. We are heavily dependent on our energy networks. Irrespective of the energy origin, connectivity of energy networks and guaranteeing them is of great importance for our well-being and economy. In developing new grids for example offshore windfarms, solar panels or otherwise, the robustness and adaptability are essential.

2. Taking Steps towards solutions

2.1. Working together

Important here is the notion that this problem we are facing is too big to tackle independently. We need to bring together the local, regional and national efforts on climate change adaptation. Utilising each other's knowledge and take advantage of each other's innovations and solutions. There needs to be processes and support to allow sharing and opportunities for partnership working to continue.

2.2. Closing the knowledge gap

The future is uncertain, the situation complex. Developing strategies to unravel and deal with uncertainty and complexity by increasing our knowledge on our systems, technical abilities, social structures and governance is what is required. There is a need for improved climate models, impact studies and further development of approaches and technologies. Also, research tends to be academic and focus less on the practical application of the knowledge. Bridging this gap will increase the efficiency of research money and the speed of uptake of technology and action supporting reaching a resilient state. Government engagement is key here because they are the place where societal interest, long term ownership and tax money come together.

2.3. Develop standards and indicators

With producing new insights and technology comes the opportunity to better monitor how effective measures are. The continuous monitoring of the North Sea coast in order to optimize protective sand nourishments is a good example of that. The uptake of experience from other parts of the EU and world and the active connecting of these indicators to the UN Sustainable Development Goals puts the work in the global context.

2.4. Think global, act local

Each situation has its own condition and dynamics. Standardisation is important to get climate resilience into mainstream practice. However, it should not prevent one from looking into the specific circumstances of a situation and acknowledging the local key-elements or figures that offer the catalysis for a solution.

2.5. Preventing harm

Making sure nothing happens is the best way to stay safe however that is not always possible and so it is important to be prepared. Resilience is about the capability of bouncing back or transforming easily. A society that makes sure that new developments are implemented in a no-regret way and that makes sure that normality can be restored quickly after an incident, is attractive for investors and is a pleasant place to live. Using spatial designs to facilitate this and educate civilians in ways to deal with disaster will prove wise for the future. We need to consider preventing things from happening, designing our spatial infrastructure such that effects of disaster can be worked around or dealt with, and good crisis management through prepared institutions and informed citizens.

2.6. Solving the silo problem

Multi-stakeholder and multi-goal projects are difficult to arrange but prove worthwhile if they come to implementation. One of the larger barriers is the institutional inability to combine several funds to make an integrated spatial plan with multiple benefits. The pursuit towards a methodology to break

free of the silo problem is the true goal. Research after and suggestions for implementation of such a mechanism would give decision makers in the North Sea Region a head start in dealing with our complex future problems.

2.7. Increase adaptability

As mentioned in the part on sea level rise, larger, concrete structures are usually created for a long period of time and are usually relatively difficult to alter. Our region knows a large quantity of ageing infrastructure that has to be replaced in the coming decades. This is about serious amounts of money and about serious risks given the current scenarios for the longer term. Adaptability of our infrastructural works makes us able to respond to future changes. Taking the option to expand or alter your infrastructure along in the design phase will probably ask for investment on the short term but pay off on the long term. The implementation of adaptable pathways as used in the adaptive asset management approaches will be vital here. Further development and accessibility of these should be encouraged.

2.8. Embrace the change and innovate

We have fought against nature for centuries, against disease, against the sea, against the wild. With our climate changing we need to adapt or lose this battle. By developing an attitude of not working against natural processes but working with them as much we can, we start using the force that formerly threatened us, now to protect us. Nature based solutions in the North Sea Region are among the best understood of such interventions in the world. The change is coming, and we need to understand it better to continue to adapt. We need to be innovative and experimental and let curiosity be our guide to get us there.

3. Suggestions for the future

The work on becoming resilient through adaptability has started but is nowhere near finished. Being one of the richest and most densely populated regions in the world, thus facing big threats, we have the capacity and capability to learn to adapt. Through acknowledging and better understanding the changes in the systems mentioned in section 2, we better know what we are dealing with and what our technical challenges are. Through developing the state of mind and attitude listed in chapter 3 we will become ready to face the enormous challenges ahead together and deal with them in full awareness of coherence.

4. The North Sea Commission

The North Sea Commission can help with progression by advocating the need for improved climate models, impact studies and further development of approaches and technologies. If we know more of what to expect, projections and tailor-made solutions are more accurate, thus facilitating uptake and decision making. Research tends to be academic and focus less on the practical application of the knowledge. Bridging this gap can help increase the efficiency of research money and the speed of uptake of technology and action supporting reaching a resilient state. The North Sea Commission will also work towards Influencing action on climate change adaptation across local, regional and national levels. Active sharing of research and best practices in climate change adaptation as well as staying informed on new technological innovations being adopted by regions will continue to be vital. It is

important that those areas most vulnerable to climate change have the support and ability to adapt. Addressing the challenges of globalisation and how exporting and importing goods and services will be impacted and addressed in the future is also an important part of adaptation. The North Sea Commission will seek support for funding and project opportunities, that demonstrate best practice across industry, business, and Government including community engagement projects ensuring a transition that is socially fair and just.

5. Acknowledgements

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For more information on what NSC member regions are up to with regards to Adaptation please visit: https://cpmr-northsea.org/download/climate-change-adaptation-in-the-north-sea-region/