

Resilience in the Region

Grazing for a North Sea Region climate adaptation position



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1. Introduction

The North Sea Region is one of the safest, wealthiest and healthiest parts of the world. That didn't come naturally. Our ancestors had to work hard, shed sweat and tears and learn from the harsh lessons 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, and thus the subsequent effects, under the Paris Agreement. Yet, decreasing change's speed 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, long hot and dry summers, should anticipate these events to stay in the happy situation we're in. When Alice ran against the Red Queen on the chess board, she mentioned that though she was running twice as fast, she still was in the same place. It means that we have to keep up with the changes to at least not be overhauled and consumed by them. Managing our situation by picking up the challenges ahead and staying in the same place, or even improving it, is what this paper is about. The future is uncertain to a certain extent. Yet, uncertainty is not a reason to do nothing, as Søren Kierkegaard mentioned in *Enter/Ellen*: not making a decision is making a decision as well. In this paper, we mean to give a handle to hold on to and take steps into our complex and uncertain future. The CPMR regions acknowledge this issue and have drafted the "CPMR regions act on climate change" earlier. This memo is meant to give a more detailed description on how to reach a state of climate resilience in the North Sea Region.

2. Challenges ahead

"If I try to pick out anything by itself, I find it hitched to the rest of the universe" said American (but born Scottish) naturalist John Muir. Wanting to deal with the effects of climate change leads us into a situation where so many autonomous developments take place that we call it "complex". Climate change effects are connected to subjects as investment value behind levees, to population growth, land use, urban planning, land subsidence, infrastructural networks etcetera etcetera. Dealing with complexity is the art of dealing with aspects whilst being aware of the effects it has. Therefore, making choices is the first part of this memo. Here, we focus on the climate change events 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 here as well.

2.1 sea level rise

For the lower lying countries sea level rise is serious threat. Coastal erosion forms a risk for individual premises, such as is known on the eastern UK and western DK coasts for example, but may also flood large parts of the country, for which Pas de Calais in France, Belgium, The Netherlands, Niedersachsen, Schleswig-Holstein and eastern Jutland are striking examples. 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, levee improvement is 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. 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 Planning developments as well).

2.2 Increased rainfall

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

2.2.1 Rain water flooding

The capacity of stone to take up water is very, very small. In our concrete and stony cities water has to 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 puddles for our children to play in, however it can also accumulate and flood parts of the city. Increasing drainage capacity, cleaning gutters, introducing parks and green areas, de-stoning gardens, making green roofs, organizing storage areas just outside of the city may all help.

2.2.2 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.

2.2.3 Higher discharges

Rivers collect the water from the increased precipitation and the river bed has to 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 floodings. This effect is aggravated by intensified land use, neglected soil conditions (compactness), canalizing of rivers and streams. The system has to be upgraded to be able to either hold back the water more efficiently (improve soil conditions, change land use, remainder, allow

our spongy peat areas to grow again), store it (puddles, side gullies, overflow areas) or more effectively release it into the sea (widening river beds)

2.3 Less precipitation in summers

The summer of 2018 proved the capriciousness of the future. A very dry 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, salinization, failed crops and so forth and so on. 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 floodings.

2.4 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 Sweden and some parts of Norway. 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 have to be sought.

2.5 Increase in temperature

The increase in temperature happens everywhere but is felt most in 1. the "heat islands" we call our cities, 2. infrastructural networks, 3. agriculture and 4. mountain areas. It leads to failed crops, ecological migration and extinction, reduced road availability and increased mortality in cities. This is another issue in the rise.

2.6 Systems affected

This paragraph is meant to illustrate the accumulation of effects mentioned before on the systems we live and work in/next to. It illustrates the complex, sometimes even wicked, combination of the earlier identified challenges.

2.6.1 Coasts

Coastal erosion and flooding provide horrifying 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 salinization. Increased sea levels increase salinization of fresh water inland as well.

2.6.2 Rivers

Less snow, less rain and an increase in heavy showers. River systems have to 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, therewith reducing flash floods and countering the effects of dry periods. There is great use in storage areas and remeandering for damping high discharges and retaining water. And, if this isn't enough to prevent the flash flood from roaring through the villages downstream, designing the river bed for improved discharges is 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. In river systems one never works 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.

2.6.3 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.

2.6.4 Infrastructural networks

Connectivity is the basis for our economies. However, flooded tunnels, roads or railways hamper our flow. And, in case of an evacuation situation road access is literally 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. We already discussed the hydropower dam issue earlier, but 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, say, wind parks at sea, solar panels or otherwise, the robustness and adaptability are things to take into account.

2.7 Summarizing

The big challenges lie in staying safe and prosperous in the light of increased risk for flooding, drought and heating. Securing fresh water quantity and quality and appreciating the good our soils have to offer us. We do this by an interdisciplinary approach where technical and spatial development is seen in the light of change. Therein we facilitate governance by elucidating the dark path of uncertainty as much we can.

3. Steps towards solutions

3.1 Working together

Stating the obvious, but also the not always implemented. Important here is the notion that this problem we are facing is too big to tackle on our own. We need to bring together the local, regional and national efforts on climate change adaptation. Utilizing each others knowledge and take an advantage of each others solutions.

3.2 Closing the knowledge gap

The future is uncertain, the situation complex. The same goes for Columbus when he started his journey. Exploring is the only way to push forward. 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. The North Sea Commission can help in this progression by advocating the need for improved climate models, impact studies and further development of approaches and technologies as described in chapter 2. If we know more of what to expect, projections and tailor made solutions are more accurate, thus facilitating uptake and decision making. Also, research has a tendency to be academic and focus less on the practical application of the knowledge. Here we experience the "valley of death" between low and high technology readiness levels. Bridging this gap will increase the efficiency of our research money and the speed of uptake of technology and thoughts and thus of reaching the resilient state. Governments can be the ultimate brokers or boundary spanners here because they are the place where societal interest, long term ownership and tax money come together.

3.3 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, benefiting from the *lingua franca* generated there.

3.4 Keep a keen eye for the local

Each situation has its own condition and dynamics. Standardization 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 acknowledge the local key-elements or figures that offer the catalysis of your solution.

3.5 Preventing harm

Making sure nothing happens is the best way to stay safe. We know, however, that something will happen every now and then. It is important to be prepared for that situation as well. 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 asap after an incident, is attractive for investors and is pleasant to live in. Using spatial designs to facilitate this and educate your civilians in ways to deal with disaster will prove wise for the future. We discriminate between 3 layers, 1. preventing things from happening, 2. designing our spatial infrastructure such that effects of disaster can be worked around or dealt with and 3. Good crisis management through prepared institutions and informed citizens.

3.6 Solving the silo problem

The budget for water quantity measures is not meant for nature. The same goes for the budget of municipality X in relation to water authority Y. Multi-stakeholder 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 pot of gold. 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.

3.7 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.

3.8 Embrace the change

We fought against nature for ages. Against disease, against the sea, against the wild. With our climate changing we should 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'll tango with it.

3.9 Innovate, innovate, innovate

Who would have thought in 1994 that we would all have cell phones 25 years later? And that calling is only one of the options we have with it. Recall the first phones with the ability to send e-mail that we (and Barack Obama) used to wear proudly on our belts? Need I say more about innovation? Let curiosity be our guide and we can go a long way.

4. Suggestion 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. The North Sea Commission is asked to stimulate the pursuit of these insights and devote ample time to initiate, follow and steer its progress.

5. Colofon

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