Flexible and adaptive coastal planning and protection approach in Aurich, Lower Saxony [1]

The rural district of Aurich in Lower Saxony is the northernmost district of Germany, bordering the Netherlands and the North Sea. Its natural environment is characterised by the Wadden Sea, by three islands off the coast and by more than 70km of coastline. Dominant habitats include coastal wetlands and inland moors and swamps. Large areas of the Aurich District are protected, the Wadden Sea National Park of Lower Saxony being only one example. In addition, large areas lie below sea level, both on the islands as well as a strip 2 and 15 km wide behind the mainland coast. Consequently, coastal protection has always played an important role in the district. Tourism and agriculture are the main economic activities with the economic importance of renewable energy production increasing.

Climate change is expected to result in sea level rise and seasonal increase of storm events and precipitation including more extreme rainfall events in winter. These projections are posing serious challenges for coastal protection (drainage of low-lying areas, risks of flooding from rivers and sea), water services, agriculture, conservation and tourism. The Coast Climate Project undertook an approach to implementing Integrated Coastal Management (ICM) in the District of Aurich, with the goal to come to more integrative and flexible solutions for coastal protection. Furthermore, the purpose of the project was to adapt existing planning frameworks to the challenges of competition for space between use functions, which is expected to be aggravated by climate change. Stakeholder participation in group interviews and workshops was used to identify conflicts of interest among use functions and to identify potential measures supporting the implementation of ICM. The project was funded by the German Agency for Environment and conducted by two institutes, Ecologic Institute (Berlin) and Raum & Energie. The project, focusing on the case study in Aurich, was carried out between January 2013 and February 2014 and resulted in a political decision concerning the implementation of concrete adaptation measures. The development of several concepts has been decided, as described below. Moreover the implementation process was initiated through strengthening existing networks for ICM and creating new ones.

Case Study Description

Challenges:

Aurich is a rural district, which is characterized by coastal lowland and wetlands. The area is vulnerable to flooding as a consequence of storms and heavy rainfalls. Regional climate models and climate change effect projections were used to identify likely trends in the district with regards to temperature, precipitation, storm intensity, water balance and sea level rise. A seasonal increase in precipitation including more heavy rainfall events and storm intensity in the winter has been predicted. Similarly, the water balance is expected to shift towards the winter months. The forecasted sea level rise lies between 26cm and 82 cm to the end of the century. A rise in flooding magnitude and frequency is very likely an, according to predictions, the area of flooding will increase. Hence, the district of Aurich is threatened by flooding originating from both land and sea.

This poses serious challenges in the fields of coastal protection, conservation, agriculture and water services, and conflicts about the use of space are likely to develop between these different activities. The following list summarise the different challenges caused by climate change in the district of Aurich per sector, as identified during group-interviews with experts in this case study:

- *Coastal protection*: Increased occurrence of damage to dikes, harbour and transportation infrastructure, and coastal infrastructure; High costs associated with coastal protection measures; Decrease in mud flats.

- *Water services*: Drought stress in agriculture and conservation; Drainage in the face of rising sea levels and increased frequencies of events with high precipitation rates; Water supply on the islands while freshwater aquifers are shrinking and sea level is rising.
- *Agriculture*: Change in precipitation rates: droughts and events of high precipitation; Changes induced by shifting species composition; Increasing risks associated with crop yields due to extreme events; Increasing amount of conflicts on spatial use; Limited capacity of spatial planning to take influence.
- *Conservation*: Increased drought stress impacting on habitats adapted to high humidity; Conflicts with agricultural sector about the production of biomass for renewable energy; Conflicts with the water services sector and with drainage interests.
- *Tourism*: Use of the opportunities generated by climate change; Impacts from deterioration of water quality; Impacts from increased intensity of storms that will cause more ocean debris to accumulate on beaches; Increased drinking water demand during summer months.

In discussions, the problems of drainage of the low lying areas and the provision of clay and sand for coastal protection measures were identified as the most pressing challenges.

Objectives:
The main goal of the “Coast Climate” Project was to identify options to address conflicts of interest arising from climate change and to identify potential synergies jointly with local stakeholders. In a pre-assessment exercise in which the main issues arising from climate change effects in the area were identified, the thematic focus was placed on problems with drainage of low lying areas and conflicts regarding the spatial planning of clay and sand abstraction, as both problems were considered particularly important for the project and the needs of the stakeholders due to their high complexity and conflict potential with other use functions. Possible solutions were identified also in view of the parallel efforts of the District of Aurich to develop regional spatial planning programs which take into account climate change. Reciprocal effects between clay and sand abstraction, drainage and other use functions and stakeholder needs were also taken into account in the analysis.

Solutions:
Inland-drainage

In expert interviews, desk research and stakeholder workshops the following solutions were identified:

- Use of mobile pumps as a flexible response to events of high precipitation.
- Remote control of pumps.
- Increase capacities of pumps.
- Combine pumping stations with wind energy installations to improve energy supply.
- Transform closed (/blind) drainage systems (particularly abundant in settlements) into open drainage systems, which are more resilient to fluctuating amounts of drainage water.
- Incorporate and identify possibilities to retain water in order to mitigate peaks in drainage/flooding.
- Shift the focus from pumping water to storing it in diked areas. Possible options for this include widening up of ditches, increasing height of dikes bordering tidal outlets, usage of new tidal outlets.
- Create room for flooding by establishing reed areas bordering the drainage canals (also beneficial for nature conservation).
- Transform former clay and sand abstraction sites into water storage areas.
- Use retention areas/reservoirs/areas designated for flood protection also for production and saving of energy (synergies with conservation possible).
- Make use of tools such as ‘eco-accounts’ and ‘area pools’ for the reservation of areas and the up-front implementation of conservation measures, which can function as compensation of negative ecological effects of future measures. However, it is due to the initiative of communities to use these tools as they belong to soft law.
- Conduct research to enhance prediction of events of strong precipitation, so that adaptive measures can be targeted more accurately and conflicts avoided.

- Awareness raising on the scarcity and importance of space and associated use conflicts.

Relevant events and related milestones to progress in the inland-drainage topic include:

- Round tables (twice a year) with representatives of the following sectors: agriculture, nature conservation, water management association, planners, renewable energy. Related milestones are: (i) concept for the transformation of closed drainage systems into open systems by end of 2015; (ii) concept for the combination of pumping stations with wind energy installations to improve energy supply by 2017.
- Round table of regional and Länder administration to find ways of including needs for a better inland drainage into existing legal frameworks. The related milestone was identified in: providing a wording to support an open drainage system within the current spatial planning program of Lower Saxony (LROP, 2008) until 2015.

Sand and clay extraction

In expert interviews, desk research and stakeholder workshops the following solutions were identified:

- Follow an integrative approach in order to avoid/ mitigate competition for space between sand- and clay extraction, agriculture and conservation.
- Participation of all sectors in spatial planning for abstractions (e.g. informal working groups).
- Improve data sharing on demand, occurrence and availability of clay.
- Acquisition of prior purchasing rights of areas by the district of Aurich, implementation of a leasing scheme for dike- and water associations (weaker dike- and water-associations would need financial support by the state).
- Explore alternative sources of clay (e.g. from dredging activities).
- Construction of groynes as a means for promoting the sedimentation of clay and sand. The accumulating outland could function as dike support (conflicts with conservation sector).
- Thoroughly assess & make use of possible synergies between uses, e.g. the use of former clay- extraction areas as retention areas/reservoirs (consider trade-off between needs of flood-protection and conservation).
- A freely accessible cadastre collecting relevant information of possible re-use of areas.
- Implement a pilot project on the re-use of areas after the extraction of sand/clay.
- Integrate existing efforts of integrated coastal zone management by the state of Lower Saxony.

The relevant event to progress in the sand and clay extraction topic include was identified in a roundtable of regional and Länder administration on re-use concepts. Related milestones are: (i) concept for the re-use of extraction areas behind the dike taking into account the interests of nature conservation and agriculture, by 2016; (ii) in parallel development of a cadastre with all available information as basis for decisions on reuse of the areas.

Importance and relevance of the adaptation:
Case developed and implemented and partially funded as a CCA measure.

Additional Details
Stakeholder engagement:
In its search for integrative and flexible solutions for ICM and climate change adaptation, the project followed a participative set-up with a strong focus on stakeholder interviews and interaction during workshops. The method used was structured in 4 distinct phases:

1. Group interviews with experts in June 2012. In June 2012, the first group interviews with experts were held in Aurich District. The purpose of these interviews was to identify the relevant topics and actors. Invited experts were representatives of the district administration, the state of Lower Saxony and associations (for dikes, drainage and agriculture). As the need for action at the time was most pressing in these fields, drainage, clay-and sand abstraction were identified as the most important issues, and the following

workshops were thus directed to these issues.

2. Desk study: Establishing the information base. To enable focused dialogue processes and to produce a common contextual information basis, during a second phase an independent expert team of two consulting institutes, subcontracted by the Federal Environmental Agency (UBA), analysed the impact of climate change, the aims of and potentials for climate protection, existing planning instruments and concepts with regard to climate protection, adaptation, coastal protection and ICM, as well as specific problem constellations and conflict situations in the case study region.
3. Workshop on CoastalClimate: Future strategies for coastal development facing climate change in September 2012. During a workshop in September 2012 with an extended group of participants, possible courses of action were identified for dealing with the spatial conflicts and challenges which result from the need to expand drainage, clay-and sand abstraction in response to climate change.
4. In-depth expert interviews (starting in January 2013). The results of the workshop were further developed by means of in-depth interviews with both external experts and experts who had previously participated in project activities. Apart from the elaboration of the results from previous project activities, the purpose of these interviews was also to include the state-level perspective on project results, and to obtain comments from and draw parallels with other states in Germany.

Success and limiting factors:
Main success factors include:

- The engagement of a variety of stakeholders during all project phases and in the decision-making process, assuring a comprehensive approach and a commonly accepted solution.
- Consistency of stakeholder meetings, due to the relatively small numbers of stakeholders.
- Inclusion of climate change adaptation measures into existing development plans of local municipalities and on state level.
- Continuous stakeholder meetings support the motivation to keep on with activities even though a project ends and no funds are available in the near future.
- The interest of the stakeholders to participate in different projects provided the opportunity to develop ICM guidelines on state level.

Main limiting factors include:

- Lack of financial capacity: in district administrations like Aurich, costs are often the main argument for not implementing climate adaptation measures, as the benefits are not clearly visible in the short term. Cost-benefit analysis could provide a useful tool here, but is not often used at this administrative level.
- Lack of expertise regarding funding instruments.
- The resources for the project were relatively limited (approx. 40.000 EUR) and mainly went for the organisation of workshops and the preparation of reports and flyers. The participation of local stakeholders was not paid and was only possible for those who were sponsored by their institution or for individuals on voluntary basis. In general it is difficult especially for representatives of small administrations to participate in a series of workshops without getting funded.
- Local representatives often do not get back tailor-made solutions for their problems, which lowers their motivation to participate in other projects/workshops.
- Existing programs for financing climate protection and adaptation measures on national and European level require matching funds (see also 2.6 for an overview of existing funding mechanisms on EU level, national level and of the federal state of Lower Saxony), and this has limited their potential uptake.

Budget, funding and additional benefits:
The Aurich case study is an example of how, with very limited financial means, an improvement of coastal management towards a more integrated approach as well as the consideration of climate adaptation was achieved. This was due to the small, highly motivated circle of stakeholders as well as to the general strong network in the region working on a day by day basis on several non-ICM issues. Above all, the work on the

Aurich case study was supported and channeled by the ICM platform of Lower Saxony. Therefore, local stakeholders are continuously working on these topics and see projects as helpful support. New for the stakeholders were organized workshops. These workshops conducted during the project have resulted in the formation of a community of stakeholders and ICM practitioners from different administrative levels who have continued meeting also after the lifespan of the project has expired. Furthermore, light was shed on the integrated nature and spatial dimension of problems such as sand-and clay abstraction and drainage, and the need for integrative approaches and flexible measures has become clear during the exercise.

As for the measures identified in this case study, data on their costs and benefits are difficult to find for the specific scale and area of the project. However, an approach on how to conduct such a cost-benefit analysis and what could be the results is provided by a study conducted for the German Environmental agency UBA: A cost-benefit-analysis for 28 case studies on climate adaptation measures was conducted (see also Tröltzsch et al 2012). For the construction of dikes and beach nourishments with a time horizon of 2085, the study found the benefits to be higher than the costs by a factor of 2.5. Despite the usefulness of such data in political decisions, care needs to be taken in their interpretation, as an important factor in estimating costs and benefits of climate adaptation measures is the uncertainty of possible effects of climate change. The degree of security associated with the cost-benefit estimation for dike-enforcement and beach-nourishments in this study was estimated to be moderate.

Legal aspects:
The policies which were assessed during the project and were found to be important building blocks for ICM and guiding coastal development in the case of Aurich are:

- *Land-Use Planning Policy of the federal state of Lower Saxony* (German abbreviation: LROP). It contains binding land-use plan for the whole state of Lower Saxony. Updated from 2009-2012 with provisions on land-use for the implementation of climate protection and precautionary regulations for flood protection as part of climate change adaptation. A package of regulations for integrated coastal management is also part of this policy. Year of inception: 2012; Legal status: fully binding.
- *Regional Land-Use Policy* (German abbreviation: RROP). It concretizes the provisions of the LROP for the regional level and function as a link to municipal land development plans. Issued by districts as the lowest entity of regional planning (such as the district of Aurich) and revised every ten years, these policies also devise areas for clay-and sand- winning. As of 2006, a strategic Environmental Assessment is necessary for the RROPs. Status: The RROP of Aurich is awaiting a thorough update. Until then, the version from 2008 (including an update from 2012) stays valid; Legal status binding.
- *Land-Use Concept for the Coastal Sea of Lower Saxony* (German abbreviation: ROKK). It formulates statements on land-use based on the LROP, complying with and cross-cutting through the RROPs of all coastal districts within Lower Saxony. The ROKK functions as an important ICM building block, as it offers information on different use functions and conflicts in the coastal sea and provides measures to solve these conflicts and to promote sustainable development. Year of inception: 2005; Legal status: spatial planning provisions non-binding.

The following list includes an overview of the commissions and platforms in place which are important for ICM in the case area of Aurich:

- *Governmental Commission of Lower Saxony for Climate Protection*. The commission functions as think-tank for the proposition of components for the Climate Protection Strategy of the State of Lower Saxony. Year of foundation: 2008. Degree of formality: voices recommendations for a climate protection strategy for the state of Lower Saxony, not binding.
- *ICM Platform*. Platform for information exchange and networking concerning ICM, chaired by the government of the city of Oldenburg. The platform has produced a web-based interactive map displaying relevant ICM activities in the coastal zone of Lower Saxony. Local actors can enter projects and information into the map. Year of foundation: 2013. Degree of formality: offer from the government of

Lower Saxony, not binding.

- *German-Dutch Commission for Land-Use Planning*. The Commission has the task to facilitate the collaboration between Germany and the Netherlands on topics of land-use planning and to coordinate harmonize measures and plans in the border area. Year of foundation: 1967. Degree of formality: informal Commission, not binding.

Implementation time:
The Coast Climate project was conducted between January 2013 and February 2014 resulting in a political decision concerning implementation of concrete adaptation measures. Moreover the implementation process was initiated.

Reference Information
Contact:
Ingo deVries
Landkreis Aurich
E-mail: Ingo.deVries@landkreis-aurich.de [2]

Websites:
http://www.raumordnung.niedersachsen.de [3]

Sources:
EC DG ENV Study "Sharing of Best Practices on Integrated Coastal Management (ICM) in a Context of Adaptation to Climate Change in Coastal Areas"

Start here

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Links

[1] https://adaptecca.es/en/flexible-and-adaptive-coastal-planning-and-protection-approach-aurich-lower-saxony

[2] mailto:Ingo.deVries@landkreis-aurich.de

[3] http://www.raumordnung.niedersachsen.de