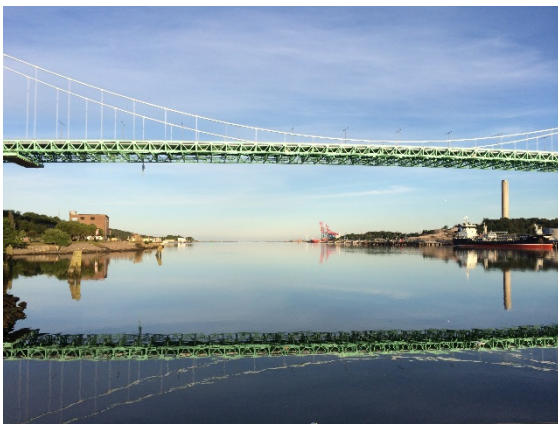

The Nordre Älv River Estuary: a case study

Place. The pilot area, the Nordre älv Estuary is located in the western part of Sweden, close to the second largest city Göteborg (Gothenburg). The Göta älv River starts from the Lake Värnen, which is the largest lake in Sweden. The length of the river system, from the lake to the sea Skagerrak is 93 km. For the purposes of the Swedish case study area for the ARCH project, we will focus on the Nordre älv River catchment area from where it separates from Göta älv river, near Kungälv, to the estuary. This part of the river has a length of approximately 16 km. The drainage area of this part of the system covers 174 km². The three municipalities connecting to the pilot area are Gothenburg, Kungälv and Öckerö.



Gothenburg, Sweden (photo: Amy Oen, NGI)

Gothenburg is the second largest municipality in Sweden with over 520,000 inhabitants. Kungälv has 41,000 inhabitants and Öckerö, located in the archipelago on the outskirts of the estuary, has 12,400 inhabitants and is one of the smallest municipalities in Sweden.

Natural system. As Nordre Älv and its estuary have been spared from major building, port facilities and industrial development, it is one of the most valuable natural areas in Västra Götaland County. The area is also protected

through the EU Habitat and Bird directives as well as through the RAMSAR convention. The area has been classed as a “general area of special importance for outdoor life” at a Swedish national level.

The Nordre Älv Estuary is the only one of its kind in Sweden with the typical characteristic of freshwater and marine species occurring together. The area is also of regional importance as a resting and wintering place for birds, and its beaches have large botanical value for both grazed meadows and wetlands.

The coastal shores are not exposed to tidal influence which makes them unique from a Western European perspective. Unmanaged wetlands are characterized by large stands of reeds and colonization by shrubs in the freshwater-influenced parts.

Three of the highest ranked ornithological sites (in terms of bird diversity) in the region are found in the region of the Nordre Älv Estuary. Bird species recorded here include a diversity of duck and wader species and also raptors, such as peregrine falcon and osprey. The coastal wetlands in the area are also habitats for a number of red listed insects and amphibious species.



The increased exploitation, such as house and road construction close to the shore line as well as more bridges across the rivers and increase in boating, has a negative impact on the quality status of the ecosystem. Thus, even if the estuary can be seen as a well-protected area, further development of management of human activities is needed especially with focus on future stressors as increased population and changing climate.



Sailing in the Nordre Älv River Estuary, Sweden (photo: Amy Oen, NGI)

Social communities. The coast and some of the islands within the area have a relatively large population of permanent residents. Many of the inhabitants are commuters to Gothenburg where they work. Ferries give good connections to Gothenburg. There is an increasing population with both permanent residents and a large population with leisure houses in the archipelago. Fishing and shipping is still of great importance.

As in many coastal regions, the recreation and tourism activities have increased, especially in the Nordre älv Estuary area where the whole region is designated as a national interest for recreation.

In the past, environmental concerns were mainly due to unsustainable fishing practices that have led to a decline of various marine wildlife in the area. Today, commercial fishing in the estuary is regulated; however, sport fishing is a growing activity.

Recreational activities include boating, as well as diving and fishing. The boating activities have particularly increased the accessibility to

islands in the archipelago. Subsequently, the Nordre Älv Estuary and archipelago has become a perfect region for recreational boating due to the closeness to the city of Gothenburg.

The largest marina in northern Europe, Björlanda Kile marina, is situated in the estuary with 2300 fixed seats. The marina has recently developed plans for further expansions in coming years.

Vulnerabilities. Due to its closeness to the Gothenburg region, which has 1.5 million inhabitants, the estuary is important for different types of recreation. Recreational activities, especially boating, can cause different types of pressure on the ecosystem. If boating activities increase in the future through, for example, extension of the marina in Björlanda Kile, more regulation may be needed.

Around the estuary, there is a competition for land for private residential developments and for creating an infrastructure for the growing population.

In the large region around the River Göta Älv valley there are vital transportation corridors, providing routes of transportation by watercraft and vehicles. However, a future expansion of the infrastructure could have negative impacts on the Nordre Älv River Estuary ecosystem.

The expected consequences of climate change on the Swedish west coast are an increase in total yearly precipitation and a higher intensity of precipitation.



Marina in the Nordre Älv River Estuary, Sweden

Evidence of this has already been witnessed, and it is predicted to become more pronounced in the future. This will lead to more surface runoff and higher river flows, resulting in a larger sediment transport, increased numbers of landslides and potentially the re-suspension of chemicals into the estuary. An increase in the frequency of stormy weather can also lead to a decrease in river flow in the lower parts of the River Nordre Älv, causing a risk of seawater intrusion higher up in the river. Consequently, the border between freshwater and saltwater could change, followed by an increase in marine species that would reduce the unique character of the estuary.

In summary, the five major issues of concern:

- Consequences of climate change for the estuary: increased surface runoff and changes in salinity in the estuary.
- Increased impact from different stressors to the estuary.
- Uncontrolled increase of recreational activities in the estuary, especially leisure fishing and recreational boating.
- Reduced shore accessibility along the estuary due to increase in private properties.
- An unsustainable expansion of the region's infrastructure.




ARCH project partners at the Consortium meeting held in Gothenburg, Sweden June 2014.

A Stakeholder's perspective

This section reproduces an interview with Ingela Isaksson, the Regional Coordinator MSP Skagerrak & Kattegatt for the County Administrative Board Västra Götaland.

What category of stakeholder do you represent and how would you characterize your role?

I am a manager at a governmental regional level, regional coordinator for the marine spatial planning process of Skagerrak & Kattegatt (one out of three MSPs in Sweden). I am also in charge of the process to support and coordinate collaboration between municipalities in Skagerrak & Kattegatt. I have also functioned as the Project leader of the Interreg-project "Sea meets Land," a collaboration between three administrative levels local-regional-national and three countries Sweden-Norway-Denmark.



A central feature of ARCH is to overcome the lack of integration between science and policy by actively using existing knowledge and policy, with the engagement of stakeholders, to form the basis for a management strategy.

In your opinion, what does not get enough focus when integrating and interpreting science and policy?

Three main points come to mind:

- *Visualizing outcome in maps to be communicated to relevant stakeholders.*
- *Clear guidelines and rules for development within limits of the ecosystem.*
- *Environmental cumulative consequences of exploitation of resources on the ecosystem processes.*



Ingela Isaksson in discussion with stakeholders during an excursion to the Nordre Älv River Estuary.

What do you believe is the main challenge for the Nordre Älv River Estuary?

The further work of the implementation of the outcome of the three workshops and how this can be integrated in the three municipalities' comprehensive planning process to secure the shared values of the Nordre Älv Estuary.



What do you perceive as the three most important contributions of the ARCH project to the case study site?

The "State of the lagoon" report is a cross-sectorial document and provides excellent updated material to continue work with the management plan of Nature 2000 area Nordre Älv, as well as each upcoming Comprehensive plan for the three municipalities.

The three workshops provided a good arena and platform for further communication between different stakeholders. The work of identifying a vision, threat ranking, analysis of the drivers behind the threats as well as suggested solutions will be important tools in that future process.

Since our Regional governmental organization was involved in the process at an earlier stage we had the possibility to discuss the content and the structure of each workshop in order to align the Nordre Älv process with the official ongoing policy processes: the Marine Spatial planning process as well as Integrated Sustainable Coastal Development process.



What would you like to learn from other ARCH case studies?

Challenges and how these have been dealt with in the other areas regarding to the different countries' legal framework.



Ferry traffic in Gothenburg, Sweden.

