

5. Conclusions and Recommendations

The coastline is constantly evolving. Analysis of the past enables us to assess progressive changes and alterations to the coast. Data from archaeology, heritage features, art, photographs, maps and charts provides both qualitative and quantitative information on coastal evolution. Research during the Arch-Manche project has highlighted that these data have been under-used as a resource to support understanding of long-term risks associated with a range of coastlines.

Coastal risk management and sustainable development in support of the planning process requires a thorough understanding of the rate, scale and pace of coastal change. Historically decision-making on the coast, in many areas, has not been able to take advantage of a sufficiently long-term perspective. This is because data and information on coastal erosion rates, for example, has not been available. There are very few locations around the European coastline where monitoring and recording of coastal change, in a systematic way, has been undertaken for more than 10 – 15 years. Monitoring provides an invaluable data source for those involved in coastal management. It also provides the basis for design and development of coastal defenses and will encourage a change in risk management philosophy from a reactive to a proactive approach.

The impacts of climate change and sea level rise, including an apparent trend for more unpredictable weather patterns, can only be measured and set in context if the long-term evolution for each coastal frontage is understood. Fortunately the need for a strategic approach to monitoring our coastlines is now being recognised and adopted more widely. However, trends can be understood better and predicted more effectively if the science is also supported by historical data and information.

By examining maritime heritage, seabed archaeology and depictions of the shoreline, beaches, the backshore and coastal hinterland, it is possible to offer a 'seamless' vision of the coastal zone extending back over time and to allow 'the wisdom of hindsight' to support integrated coastal zone management. By making such information available to all those involved in coastal management, particularly coastal engineers and their planning officer colleagues, wise decisions can be made in terms of planning for our coastal zones looking ahead for the next century. Armed with a more comprehensive understanding of long-term coastal change, planning decisions should result in the removal of risks by avoiding inappropriate development or by relocating development away from vulnerable frontages through effective land use planning.

In this region the diverse geological exposures and resulting coastal landforms including both hard and soft cliffs, coastal landslide systems, shingle and sandy beaches, saltmarsh and mudflats have allowed the approach developed through the project to be tested at suitable case study locations, and the applications of the heritage, art, photographic and cartographic resources to be tested and demonstrated very effectively.

5.1. Conclusions for the use of Archaeological and Palaeoenvironmental Data

- The historical evolution of the coast provides valuable information on past trends which can help develop future coastal climate change scenarios. Present coastal landforms have developed since the last Ice Age, studies of their evolution based on archaeology, palaeoenvironmental and coastal heritage features provides a seamless timescale from the Ice Age to the mid-20th century;
- Early archaeological evidence demonstrates how people were impacted by coastal change in the past and how populations reacted to some large-scale landscape and climate changes;

- More recent human activity along the coast can show us how humans have had a direct impact on coastal stability. Some has been positive but much has been counterproductive;
- In order to facilitate an understanding of the challenges we are likely to face with rising sea levels and a changing coast, it is possible to look back at the archaeological record for evidence of changes similar to those predicted for the future. This is particularly true of the Mesolithic period which experienced a rapid rise in sea level similar to those predicted in the future;
- The archaeological record from the Mesolithic period is now predominantly submerged in the Channel and Southern North Sea, such conditions allow for high levels of preservation including organic material which can be used to reconstruct the past environment. This data can help provide an insight into the effects of change on the coastlines of Europe and can provide lessons for the future;
- Archaeology and heritage assets can often be dated accurately to provide a calibrated time-frame, which can be used alongside geomorphological and coastal process studies to support coastal risk management; and
- The project has demonstrated an approach, which allows archaeological, palaeo-environmental and heritage assets to be prioritised in terms of their value in support of the understanding of coastal change, these results and the application of this data in the creation of 2,3 and 4D models demonstrating coastal change, is available through the portal www.archmanche-geoportal.eu.

5.2. Conclusions for the Use of Artistic Resources

- The coastlines of the Channel – Southern North Sea have been illustrated by artists, cartographers and photographers extending back to the seventeenth century and earlier. There is a rich resource of historical images available of the coastlines held in public collections that can be utilised to support understanding of long-term coastal change;
- In order to ensure that images being assessed to support understanding of coastal change can be confirmed as being true representations of the coastline concerned, ranking systems have been developed or refined for historical artworks, maps and photographs; this approach ensures accuracy and consistency of approach;
- Such historical images represent a currently under-used and under-valued resource. However, the increase in availability of museum and gallery on-line databases together with national databases such as *Jocande* in France and *BBC Your Paintings* in the United Kingdom offer greatly improved access for research and more general use by all those involved with coastal management;
- The cross-border dimension of the project has been addressed comprehensively by ensuring that the methodology has been tested and confirmed at case study sites which include the full range of coastal geomorphological landform types to be encountered across the Southern North Sea – Channel region;
- Sample testing of the ranking approach in other locations in the region (outside the case study sites) has demonstrated the wide transferability of the methodology across the European Union and Internationally;
- A portal www.archmanche-geoportal.eu has been established containing details of the artworks that were assessed as part of this project. For each case study location a short-list has been compiled of those artists who can be relied upon in terms of producing accurate depictions of the coastline at the time they were painted.
- The project clearly demonstrates the value of art, photography and cartography as additional resources to support understanding of coastal change. When these tools are used in combination, and through linking the disciplines of art and science, a much greater appreciation of long-term coastal evolution as well as the impacts of human intervention can be achieved and understood;

- A detailed description has been provided of the art history story of the Channel-Southern North Sea region, which aims to highlight the longstanding artistic links and influences that have developed around the coast of this part of north western Europe;
- The potential applications of historical resources such as topographical paintings, photographs and old maps and their ability to foster increased interest in local museums, art galleries and archives should be highlighted to curators.

5.3. Key Arch-Manche Conclusions

- Looking back to go forward – understanding past coastal change enables more accurate predictions of future changes and potential impacts in areas under stress;
- The long-term perspective provides a sound evidence base for future coastal planning and sustainable development;
- Areas of the Channel-Southern North Sea coastline are particularly prone to a range of natural hazards including coastal erosion, landslides and sea flooding. Project data has helped identify areas at particular risk;
- Some coastal areas have greater physical stability over the long-term as witnessed through Arch-Manche analysis, helping identify areas of lower risk;
- While detailed coastal monitoring data is often available for the last few decades, the approach taken by Arch-Manche can fill the large ‘data gap’ for earlier periods from the Palaeolithic to the 20th century;
- Archaeology, coastal heritage, art, charts, maps and photographs are sources of value to coastal scientists, engineers and coastal managers, making decisions on coastal management on a day-to-day basis.

5.4. Recommendations

- The transferability of the Arch-Manche approach has been demonstrated through the case study work. Those involved in coastal risk management should be encouraged to test the methodology on their particular coastal frontage;
- The creation of 2, 3 and 4 Dimensional models has proven to be a valuable tool in understanding change over time, these should be created for other case study areas and incorporated into the portal;
- The case study work has illustrated how the data can inform us of changing environmental conditions (vegetation patterns – tree, shrub and plant species) over time. This approach should be tested to demonstrate how the data may support the wider study of environmental and ecological change;
- The contribution that the Arch-Manche approach has been demonstrated to provide means other areas of the Channel – Southern North Sea coast, and more widely in any areas of the European coast impacted by change, should be encouraged to apply the methodology. This will aid future long term sustainable coastal management;
- The increasing availability of digital heritage resources, online art gallery and museum databases has proved particularly helpful in developing the project. This should be highlighted to curators and archivists of public collections bordering the Channel-Southern North Sea;

The wealth of coastal landscape art and photographic images, as well as cartography, archaeology and palaeoenvironmental data, can be used most effectively when considered alongside one another. With these additional resources those responsible for coastal management will be much better prepared to address the challenges to be faced in the future.

The data assessed, results of the project, technical report and 2, 3 and 4-D models are all accessible through the Arch-Manche portal, www.archmanche-geoportal.eu and website www.archmanche.hwtma.org.uk/downloads