

Interreg



2 Seas Mers Zeeën

European Regional Development Fund

SARCC

Blankenberge Pilot Study: Report in Support of the Maritime Atlas



Report in Support of the Maritime Atlas

PILOT STUDY: Blankenberge

Contents

| | |
|--|----|
| 1. Introduction | 2 |
| 1.1 Introduction to Pilot Study Area..... | 2 |
| 1.2 Geology, Geomorphology and Topography of the Pilot Area | 3 |
| 1.3 Storms and Flooding Patterns | 7 |
| 1.4 Current Environmental Impacts/ Threats & Management Approaches | 8 |
| 2. Archaeology & Palaeoenvironmental Resource Scoring | 9 |
| 2.1 Archaeology and History of the Pilot Study Area | 9 |
| 2.2 Results of Archaeology scoring..... | 15 |
| 2.3 Discussion of scoring results..... | 17 |
| 2.4 Photographic Survey of High Scoring Features | 18 |
| 3. Maps and Charts | 19 |
| 3.1 Maps and Charts Background..... | 19 |
| 3.2 Results of scoring..... | 28 |
| 3.3 Discussion of scoring results..... | 29 |
| 4. Pictorial Resources Scoring..... | 30 |
| 4.1 Artistic Images | 30 |
| 4.1.1 Summary of Art History of the Channel Coast | 31 |
| 4.1.2 Results of scoring Art | 33 |
| 4.1.3 Discussion of scoring results | 35 |
| 4.1.4 Field Survey of Art Locations..... | 37 |
| 4.2 Photographs | 38 |
| 4.2.1 Results of scoring | 38 |
| 4.2.2 Discussion of scoring results | 40 |
| 4.2.3 Field Survey of Photograph Locations..... | 41 |
| 5. Combined Application for Analysis of Coastal Change | 43 |
| 5.1 Pier | 43 |
| 5.2 Lighthouse | 45 |
| 5.3 Fisherman’s houses | 47 |
| 5.4 Dune Frontage..... | 49 |
| 6. Conclusions/ Recommendations | 51 |
| 7. References | 51 |

1. Introduction

The Blankenberge scheme to expand the dunes inland is one of seven pilot sites within the SARCC project that are developing Nature Based Solutions to coastal management in urban settings along the 2Seas coasts. Full details of the Blankenberge scheme are provided on the SARCC Website: <https://www.sarcc.eu/pilots/blankenberge>

This report concentrates on presenting details in support of the Maritime Atlas which considers how data from archaeology, paleoenvironmental material, historical sources, art, charts, maps and photographs can provide vital information on long term coastal change. This, in combination with datasets on storms, flooding patterns and sea-level changes, ensures schemes incorporating Nature Based Solutions for coastal management have the full benefit of hind-sight when planning for future changes.

Humans have interacted with the environment and landscape for thousands of years during which time the coastline has changed and evolved. The coast has been attractive for human use due to a wide range of social and economic reasons which include trade and defence, and in the last few centuries tourism and leisure activities. The resulting construction of settlements which have grown into urban centres and conurbations and their shoreside harbours, facilities and buildings have then required the establishment of coastal defences to prevent flooding and damage.

This report introduces the pilot area with Section 1 providing data on geomorphology, coastal processes and environmental impacts. The results of the results of the archaeological and palaeoenvironmental study and scoring are then presented (Section 2), followed by the maps and charts (Section 3) and then the pictorial resources – art and historic photographs (Section 4). The analysis of these results in combination as applied to a number of areas along the Blankenberge frontage then demonstrate the scale and rate of coastal change and are presented in Section 5.

1.1 Introduction to Pilot Study Area

Blankenberge is situated at the Belgian coast between Ostend and Knokke. The town has about 20,000 inhabitants year round and many more in the summer months. The site of the pilot consists of a part of the dunes between Blankenberge and Zeebrugge and also the road adjacent to these dunes (Figure 1).

In the “Masterplan for Coastal Safety” a number of measures to upgrade the safety level of the coast to a 1000 year storm surge have been proposed. The nourishing of the beaches in Blankenberge is one of those measures. In the pilot area the dunes will be expanded in an inland direction which will further upgrade the safety level. The pilot includes the removal of the road surface of a part of the road, closest to the dunes. This part contains a sidewalk, a bike lane, a parking lane, the actual road and another parking lane over a total width of 11 meters. After this part is broken up a new bike lane (4 meters wide) will be created. The rest of the area will be “given back to nature”. So that the already existing dunes will be able to expand over the broken up part of the road. This will create an additional nature based solution for coastal defence.

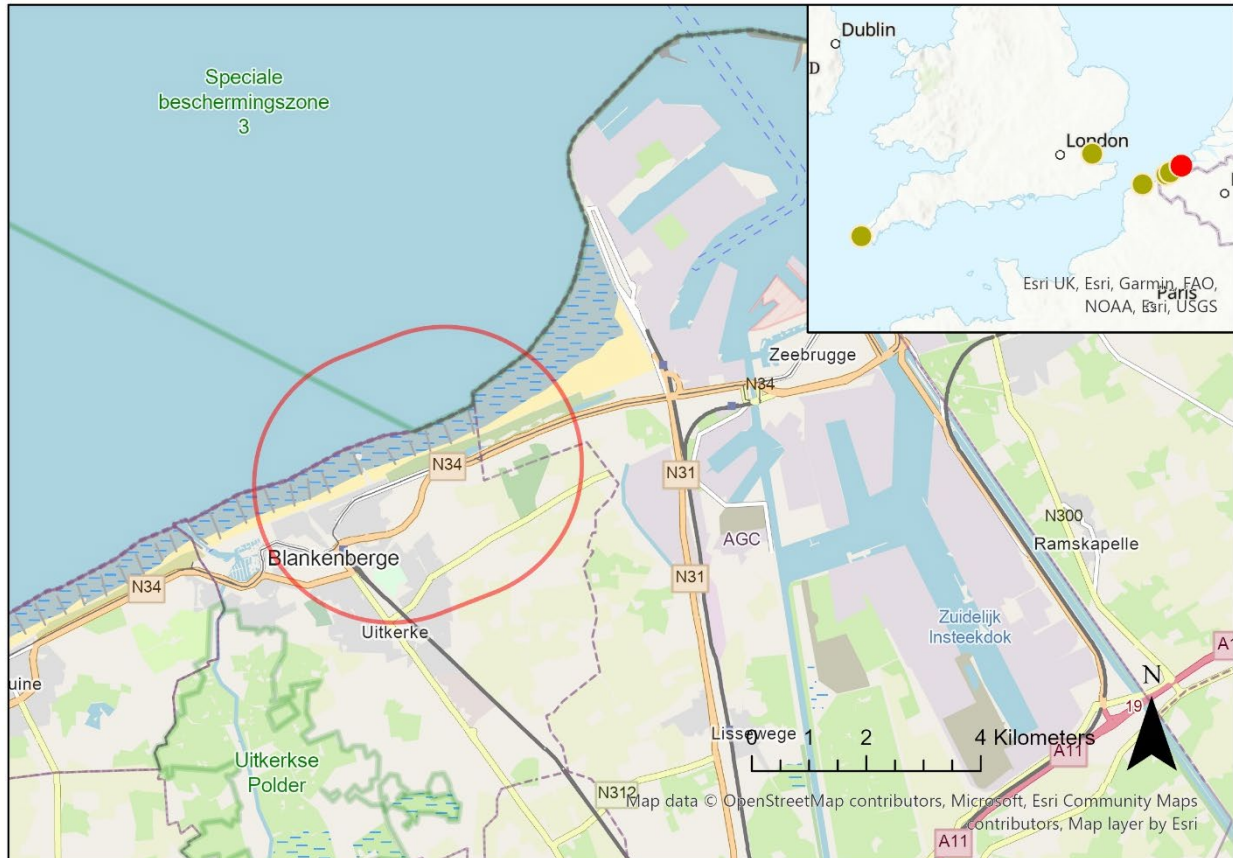


Figure 1: The location of the Blankenberge Pilot Study area, inset map shows Blankenberge (red) and the other SARCC Pilot Sites (green).

1.2 Geology, Geomorphology and Topography of the Pilot Area

Understanding the geology which underlies and influences the form of the coast and the geomorphological processes that have, and continue to, play a part in shaping the coast is important for providing context to the human use of the area and its long-durée. The summary presented below draws on previous work undertaken as part of the Arch-Manche project (<https://archmanche.maritimearchaeologytrust.org/>) with additional detail in relation to Blankenberge. Similar background information is also presented in the SARCC case study reports for Oostende and Middelkerke as they share comparative geology and geomorphology.

The pre-Holocene evolution of the Belgian coastal plain is highly intertwined with 4 major palaeovalleys: the IJzer, Ostend, Coastal and Flemish valleys. An overview map of these valley systems and the surrounding top-Pleistocene (i.e pre-Quaternary or top-Paleogene) surface of the Belgian continental shelf and coastal area is shown in Figure 2, with the position of the Blankenberge pilot area being indicated by the red circle on the right.

The shallow sediments of the area are made up of a highly variable (laterally and vertically) sequence of sand, peat, silt and clay layers that reflect the complex history of the Holocene during which marsh-like environments, sandy dunes, and intertidal mud- and sandflats alternated.

At that time the North Sea was dry land and large rivers incised the landscape. Gradually, river sediments were deposited in the valley. When temperatures started to rise at the end of the Saale ice age, the permafrost melted and the river started to incise even further. During the warmer Eem period (ca. 130,000 - 116,000 yrs BP) sea level rose again and the Ostend valley transformed into a tidally influenced estuarine area. It is then that it obtained its typical funnel shape.

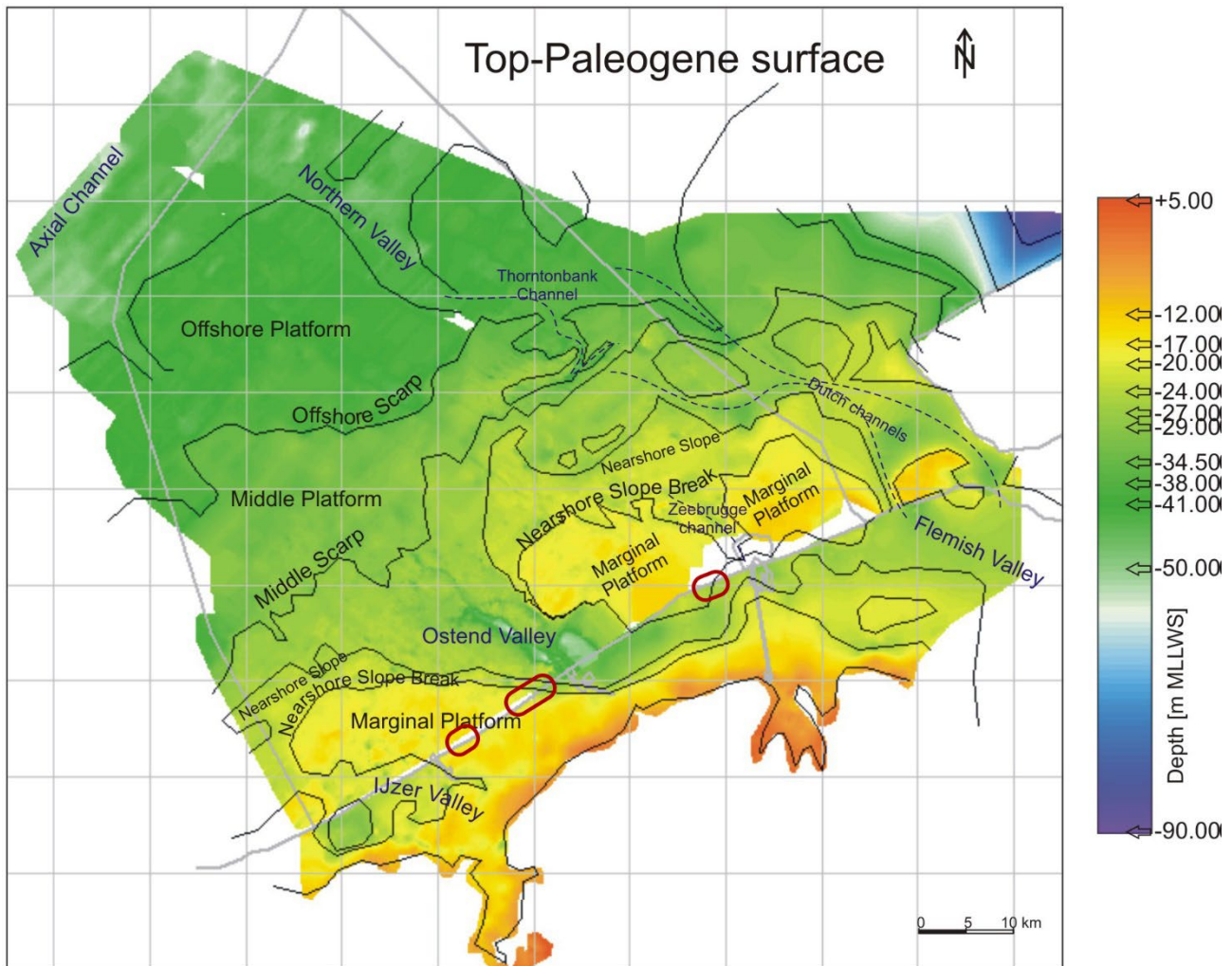


Figure 2: Belgian coast showing major palaeovalleys (the three Belgian SARCC case study sites are indicated in red).

During the Early Holocene sea level rose very fast and a large part of the Belgian continental shelf was already inundated. A large coastal plain came into existence, roughly 20-30 km offshore from the present coastline (See Figure 3). Because of the increasing wave action a large dune barrier system developed in front of the coastal plain. Behind the dune barrier, the coastal plain most likely consisted of a large (inter)tidal flat environment marked by constantly changing tidal channels, tidal flats and marshes. The landward part was most likely cut by numerous rivers that flowed towards the sea. Together with sea level rise also the groundwater level started to rise, and coastal peatland started to develop for the first time (so-called 'basal peat') (Baeteman, 2013) (see Figure 4 for a tentative reconstruction of changes to the coastal morphology over time).

Over the next 2000 years, sea level kept on rising fast and the coastline shifted further towards the land (green line in Figure 3). This caused considerable infilling of the tidal gullies with marine sand and clay. In the western part the sea intruded far inland. Around 7,000 yrs BP sea level rise started to slow down and the dune barrier system stabilised. This finally resulted in rising of the intertidal area to a level that prevented frequent flooding. For the second time, a fresh water marsh developed and peat growth was started (so-called 'surface peat') (Figure 4) (Baeteman, 2013).

Around 5500 BP sea level rise slowed down even further, causing a constant accumulation and growth of peat. An extensive coastal marsh, characterised by reed vegetation, started to cover almost the entire coastal plain (Figure 4:c). In the east, offshore of the Blankenberge pilot area, the coastline shifted further inland, whereas in the west the coastline shifted slightly back (orange line in Figure 3).

Over the next 2000 years peat growth expanded over a vast area. Towards the east, where the Blankenberge pilot area is now situated, a wide beach barrier system developed (Figure 4:d). Around 2,500 yrs BP peat growth started to slow down. Tidal channels cutting through the marsh were now becoming eroded by enlarged precipitation run off from the hinterland (due to climate change and deforestation). At the fringes of the tidal channels, the peat eroded completely, causing drainage of the peat layer and subsequent lowering of the surface (ca. 1 to 1.5 meters). Due to this compaction, the fresh water marsh was converted to an intertidal area again. By 1,500 BP the peat growth comes to a definitive halt (Baeteman, 2013).

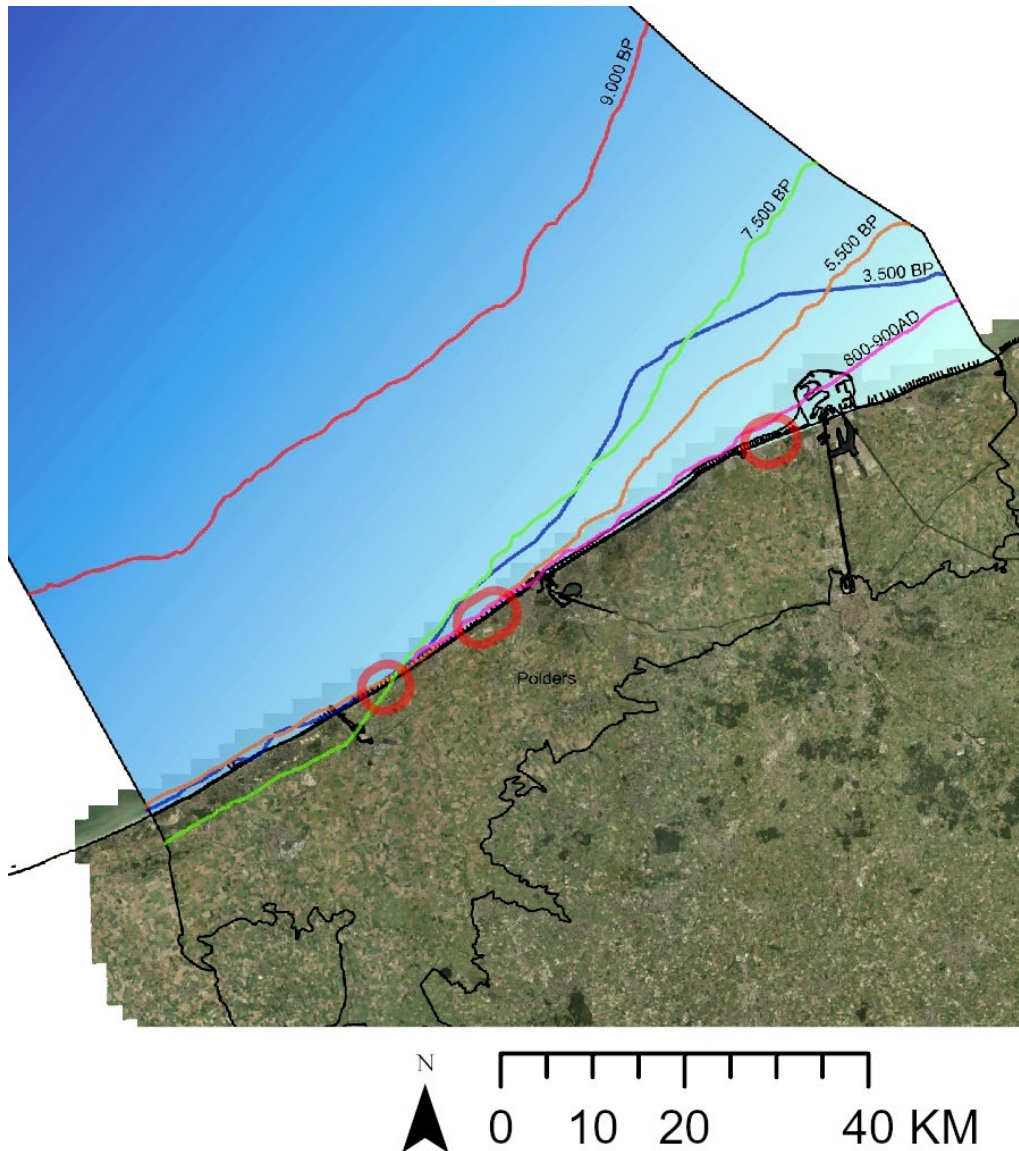


Figure 3: Schematic evolution of the Belgian coastline during the Holocene (De Clercq, 2013, after: Mathys, 2009). The red circles mark the position of the SARCC pilot areas.

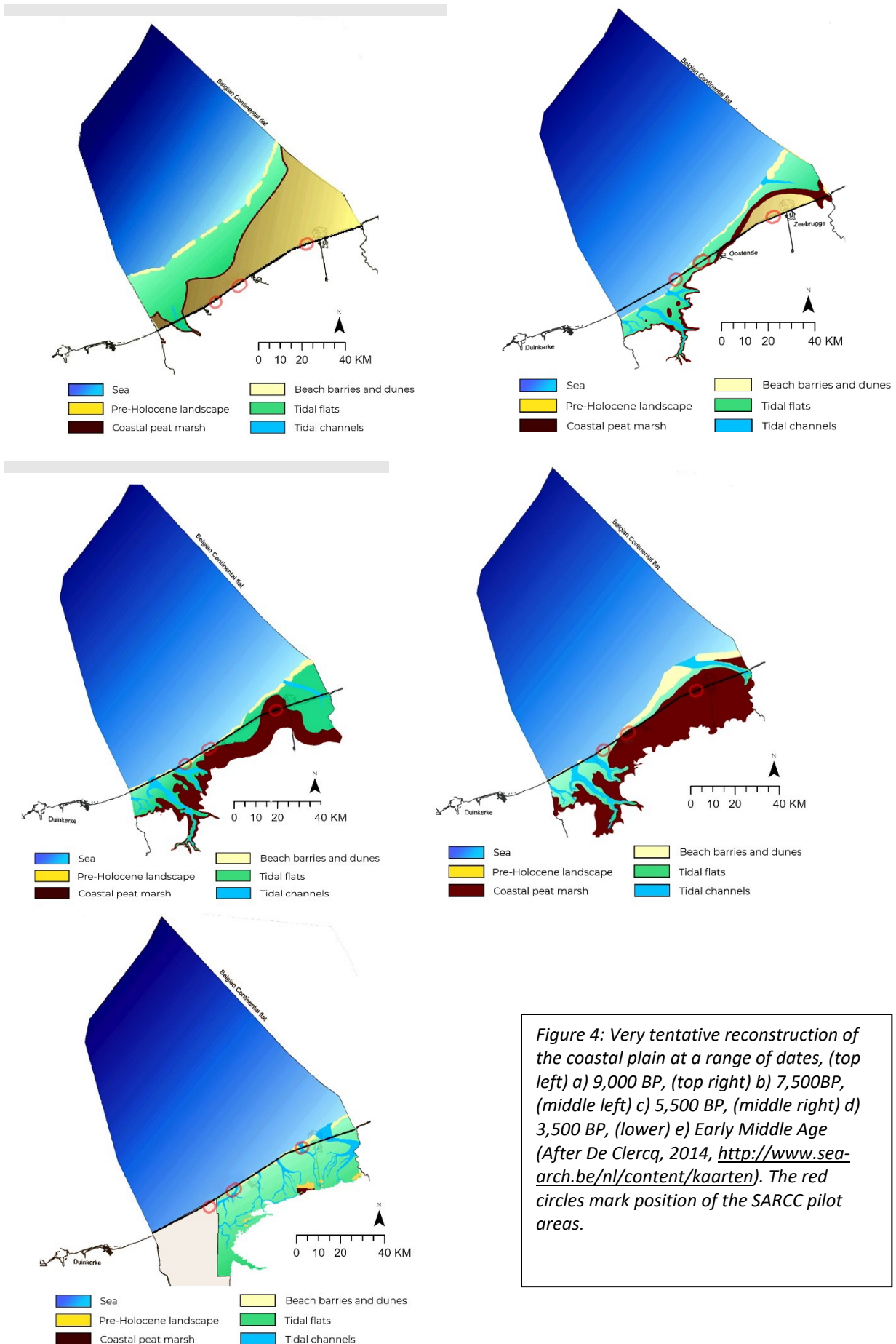


Figure 4: Very tentative reconstruction of the coastal plain at a range of dates, (top left) a) 9,000 BP, (top right) b) 7,500BP, (middle left) c) 5,500 BP, (middle right) d) 3,500 BP, (lower) e) Early Middle Age (After De Clercq, 2014, <http://www.sea-arch.be/nl/content/kaarten>). The red circles mark position of the SARCC pilot areas.

During the Iron Age and Roman era the sea was located a few miles offshore from today's coastline and an area of sandy dunes formed the border between sea and land. The area behind the dunes was marsh-like and crossed by numerous creeks and tidal gullies.

From the Roman period onwards the coastal plain noticed a growing human influence. Drainage and peat extraction further caused the surface to be lowered. After the Roman period the sea slowly progressed more inland, and a tidal flat was again installed in almost the entire coastal plain (Baeteman, 2013). It has been suggested that this increased tidal activity was possibly the result of increasing neglect of the water management systems during the late Roman period (Ervynck et al., 1999).

Although coastal changes have been more stable from the Early Middle Age, from Figure 4:e, it is clear to see that Blankenberge is situated on an areas of the coast that has continued to retreat to form its modern day position, this change is more marked here at Blankenberge than at the other two SARCC pilot areas further west at Oostende and Middlekerke, where the coast has been more stable. Evidence of human occupation and use of the coast helps understand these changes at a micro scale as it can reveal the specific topographic and environmental conditions at a particular time, which can scientifically dated.

1.3 Storms and Flooding Patterns

The relationship of humans to the coastline and their use of the area, whether as seasonal areas, or for more permanent occupation and building is influenced and impacted by storms and flooding patterns. A review of the patterns of these over time from known historical sources provides a useful background to understanding both the impacts on human populations and damage to associated structures, and on the morphology of the coastline.

Flooding along the Flanders coast is commonly caused by storm surges, the result of storm winds above the North Sea, or by the overwhelming of its dense network of rivers following periods of heavy and prolonged rain. Between 200-650 AD, three periods of marine transgression (see Figure 5) made large parts of the low countries uninhabitable. The worst, Dunkirk II 350-700 AD, submerged northern France, Belgium, the Netherlands and parts of Denmark. Evidence from soil surveys together with the lack of archaeological artefacts suggests that these areas were underwater between the mid-third-century and c.1050.

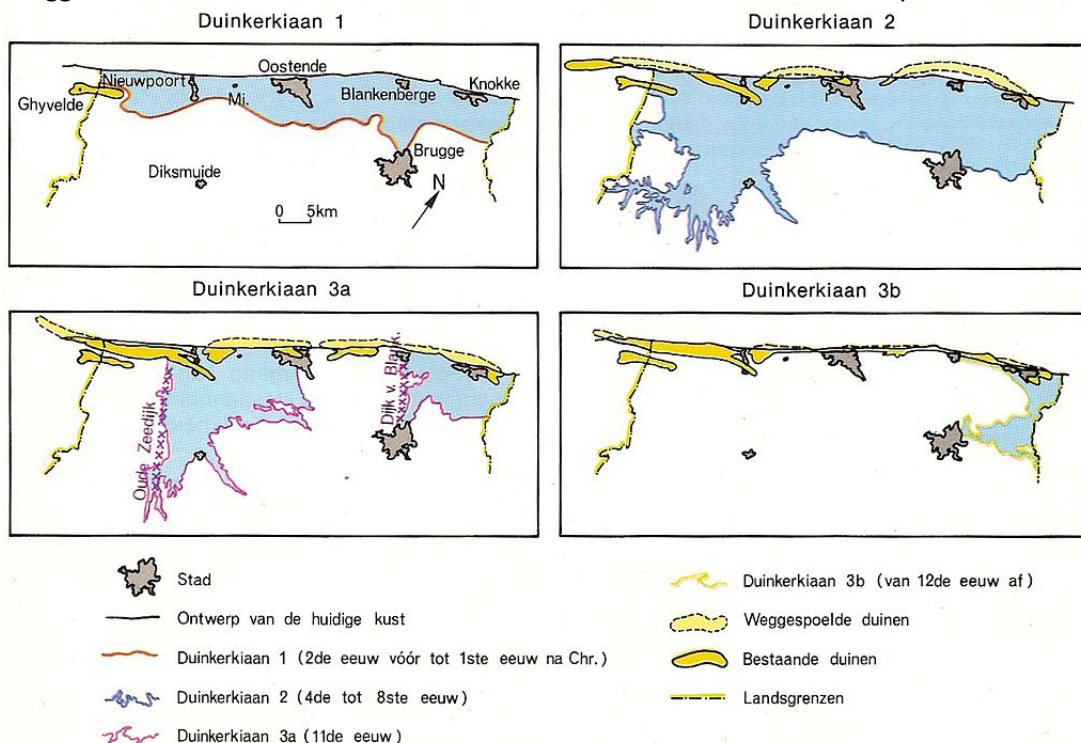


Figure 5: Maps illustrating three transgressions of the Belgian coast. (J. Amerijckx en F. Depuydt - *Fysische Bouwstenen voor de mens, Taken Aardrijkskunde 5*, CC BY 3.0 nl, <https://commons.wikimedia.org/w/index.php?curid=5078044>)

The following significant storms and flood events in Flanders have been recorded:

- 1334 The St Clemens flood on the 23rd November struck the coasts of Flanders, Netherlands, Zeeland, Holland and England.
- 1362 The Second St Marks Flood or First Great Mandränke (great drowning of people) took place from January 15 to 16, 1362, the day of St. Marcellus. (The first St. Mark's flood took place in 1219). All countries adjoining the North Sea were affected.
- A storm in 1374 and two in October and November 1375 again caused widespread flooding in Flanders and Zeeland.
- 1394 The St Vincentius storm surge destroyed many settlements along the Flanders coast, including Ostende, Middlekerke, and Walraversijde.
- Three catastrophic storm events were recorded in the early 15th century. All occurring on St Elisabeth's day, the 19th November 1404, 1421 and 1424. Each lasted around 36 hours and caused wide-spread flooding in large parts of Flanders, Zeeland and Holland. The 1421 floods are ranked 20th in the list of the worst floods in history. Many lives were lost as villages were washed away.
- The weather during the 16th century was particularly stormy. At least seven storm surges were recorded: 1509, 1511, 1530, 1532, 1552, 1570, 1594.
- 1570 All Saints Flood (1st November) - despite the first ever flood warning being issued, little could be done to prevent the national disaster caused by this flood. The collapse of numerous dikes resulted in flooding of the entire coast between Flanders and Groningen, up to the northwest of Germany. The Duke of Alba informed King Phillip II that 'no less than five sixths of Holland were underwater'. Thousands of people died, tens of thousands were left homeless and livestock and winter supplies were destroyed.
- 1682 The Storm Flood of 1682, the result of a spring tide and a north-westerly storm combined, resulted in flooding in Flanders and the South Western Netherlands.
- 1703 The Great Storm, the famous windstorm which began on the 26th November and was recorded by William Defoe, caused flooding and destruction throughout Belgium, Netherlands, Germany, Denmark and UK.
- In 1714, three storms in quick succession 26th February, and the 2nd and 7th March, caused damage and flooding along the coast of Flanders and Zeeland.
- 1715, 3rd March, a major storm surge hit the same area causing widespread flooding, one of the severest storm surges of the 18th century.
- 1808, 15th January, a storm surge combined with a severe gale hit the Flanders– Zeeland area, causing flooding in many areas.
- 1906 A large storm surge on the 12th March caused considerable damage in Flanders and Zeeland.
- 1953 The North Sea Flood. A storm on the 31st January combined with high spring tides, developed along the coasts of the UK, Belgium and the Netherlands.

In recent decades, the frequency of flooding in Belgium has increased. Major floods occurred in 1995, 1998, 2002, 2003, 2005, 2007, 2013, 2016 and 2020.

- 2007 - The North Sea flood of the 8th November 2007 was caused by the remnants of Hurricane Noel combining with a storm surge, affecting the coastlines of northern and western Europe.
- 2016 - In late May and early June 2016 flooding began after several days of heavy rain in Europe. In Belgium four days of torrential rain caused the rivers to flood.
- 2010 in November, Belgium experienced its worst flooding and mudslides in fifty years as extratropical Cyclone Carmen hit.
- 2013 A storm caused major damage to the beaches and flooding in the port, many houses were flooded as the drainage systems could not cope.

1.4 Current Environmental Impacts/ Threats & Management Approaches

The Belgian coast is one of the regions directly impacted by climate change. The sea defense is formed by only a small strip of land, which is in most areas strengthened by sea dikes and other "hard" structures,

leaving little space for natural responses to, for instance, storms or sea level rise. The Flemish government is aware of these threats and in the early 1970's breakwaters were constructed at regular intervals along the coast to protect the beach from erosion.

The Flemish Government approved the Master Plan for Coastal Safety in June 2011. That proposes a series of measures to protect the 67-kilometre-long coast against a 1000-year storm surge. In the Master Plan, all flood risks are established and the risk zones charted. For each risk zone, measures and possible alternatives are studied. The emphasis is primarily put on the realization of the chosen measure necessary to ensure the coastal safety until 2050. Thereby the expected rise in sea level is being taken into consideration.

2. Archaeology & Palaeoenvironmental Resource Scoring

This section provides initial background to the palaeoenvironmental, archaeological and historic development of the area surrounding the Pilot Project to put its development into longer term context. It then presents the results of the scoring of a range of sites, buildings and features within the pilot study area to identify those which provide the most potential for informing on the scale and pace of coastal change.

2.1 Archaeology and History of the Pilot Study Area

The origins of Blankenberge date back to a fishing community that was established in the ninth century. Unlike other SARCC pilot areas, notably Vlissingen and Ostende, settlement on the original site has been continuous throughout history, and the city has continued to grow from its original roots.

Prehistory

The only prehistoric archaeological evidence in Blankenberge is of a fragment of young auroch humerus bone discovered in the harbour channel. Prehistoric occupation has been revealed on the coast at Raversijde (22km south-west), where archaeological findings on the beach date back from the final-Palaeolithicum (14,000-12,000 yrs BP) to the Neolithicum/Early Bronze Age (around 4000 yrs BP).

Roman

As the first marine transgression began to displace people early in the first century AD, Germanic tribes invaded Flanders, where they settled as farmers and began to trade with the Mediterranean (Dunkirk Transgressions 2021). Julius Casear referred to the inhabitants of Belgium, North Western France and the German Rhineland as the Belgae and considered them part of Northern Gaul. There is relatively little evidence of Roman activity in Belgium, the Roman administrative capital was at Tongeren, 190km east of Blankenberge.

At nearby Oudenburg (15km east of Middelkerke), a roman vicus developed in the middle of the first century, but was submerged during the second Dunkirk marine transgression in the second half of the third century. The remains of wooden houses, pottery and other artefacts have been found during excavations. As the waters regressed, leaving the new coastline north of the old vicus, a castellum was built on top of the ruins, part of the Litus Saxonicum defence system (Stillwell et al 1976). The remains of three successive castella have been discovered. A roman road linked Oudenburg to Blicquy and Bavai, and other roads probably led to Cassel and to Bruges and Aardenburg. Soil analysis revealed that at the end of the third century, the castellum was located on a slightly raised sandy strip, surrounded by a lagoon. Other small fortifications and watch towers were likely to have been constructed all along the coast.

Middle Ages

The origins of Blankenberge date back to the ninth century when a small fishing community was established on the coast, between the current Hoogstraat and Weststraat, the east and west dikes built around 1100AD. This community, entirely based on fishing, grew and in 1272 was granted the title of city (Blankenberge, 2021). At that time the fishing fleet consisted of 60 Herring boats. Documents record that a storm in 1334/5 damaged the original church. The church of Sint-Antonius Abtkerk (St Anthony Abbot) was built further inland at Kerkstraat between 1335-1358. This church was to be the subject of constant attack by invaders but has

always been restored and renovated by the Blankenberge fishing industry and was designated a protected monument in 1937. To assist fishing, a lighthouse was built to the east of the city in 1337. With no harbour at Blankenberge, the fishermen used flat bottomed wooden boats to land on the beaches at high tide to unload their catch. In the fifteenth century, a jetty was built close to the lighthouse to allow larger herring ships to unload. The original lighthouse was replaced in stone in 1536. Boatyards along the beaches evolved barge design over time and in the seventeenth century, the Blankenberge barge emerged. The Scute Museum in the city tells the story of these boats and the history of its fishing fleet (De Scute, 2021).

The Blankenberge fishing fleets were regularly attacked and looted by the Watergeuzen (Sea Beggars) during the 80 years' war. In 1572, they launched an attack on the city itself and caused much destruction to the houses, the town hall and the church of St Anthony Abbot, but it wasn't until 1587 under Spanish occupation that a fortress was built. In 1591 the Sea Beggars stormed the fortress and set the city ablaze. Many residents fled the city and by 1600 less than 120 people remained. The jetty fell into disrepair as fishing declined.

In the engraving of Blankenberge by Antoon Sanders dated 1641 (Figure 6), the small linear city is shown in great detail; fishing boats approach the dune beach to unload their catch, the Spanish fortress and the church of Sint-Antonius are also shown, and crops can be seen in the back gardens of the fishermen's houses built on both sides Kerkestraat. Even forty years after the Sea Beggars attack, the population is still very small.



Figure 6: Page 306 of [Antoon Sanders Flandria Illustrata:Blankenberge](#) 1641 public domain (https://en.wikipedia.org/wiki/File:Sanderus_-_Blankenberge.jpg)

Slowly the city was rebuilt and by the end of the seventeenth century, the Blankenberge fishing fleet had been restored to 30 ships, though still only half its original size. One of the fishermen's houses of this period remains in Breydelstraat -The Huise vann Majutte (Figure 7). Its shallow foundations are built into dune sand. Until the early 1900's, Breydelstraat which opened onto the dunes, was made up of 66 houses and two cafes occupied exclusively by wealthy fishing families. The town hall (Figure 8) was rebuilt in Kerkstraat in 1680 incorporating materials from the demolished Spanish fort and remains today, the oldest preserved civil building in the city, a protected monument since 1937 (Flanders Inventory, 2021).



Figure 7: (left) *Huisje van Majutte*, nr. 10 in de *Breydelstraat* in *Blankenberge* Creative Commons CC0 1.0 Universal Public Domain Dedication Source: https://nl.m.wikipedia.org/wiki/Huisje_van_Majutte Accessed 07/07/2021

Figure 8: (right) Old Town Hall of Blankenberge Immovable Heritage Model license for free reuse Source: <https://beeldbank.onroenderfgoed.be/images/25763> Accessed 07/07/2021

The 1775 Ferrais map (Figure 9) records the expansion of the city. Dikes and groynes have been installed along the coastline and housing is now spread across a much larger area with a formal street system and a road leading out of the town. The Church still remains on the outskirts of the city. The Spanish fortress has gone, demolished prior to 1680.

Under French rule (1795-1814), a Napoleonic fort and a lighthouse (Figure 10) were built in the dunes. The fort was demolished in 1873.

The construction of a road to Bruges in 1723 not only facilitated fishing exports, but also brought the first tourists to Blankenberge. The first bathing cabins appeared on the beach in 1838 as the English influence spread into Europe (a similar style of bathing cabin can be seen below in Figure 11). A wooden sea wall was built, together with the first hotels and the Casino Kursaal in 1859 as Blankenberge began to develop as a spa town. The arrival of the railway in 1863 brought many more visitors to the seaside. The rise in tourism in the late nineteenth and early twentieth centuries created employment and prosperity leading to a major period of growth, known as the Belle Epoque, which reached its height between 1870-1914.



Figure 9: Ferraris 1775 Source: https://commons.wikimedia.org/wiki/File:Blankenberge,_Belgium,_Ferraris,_1775.jpg accessed 07/07/2021



Figure 10: Fort Napoleon. Source https://commons.wikimedia.org/wiki/File:Blankenberge_Fort_Napoleon_1810-1873.JPG Unknown author, Public domain, via Wikimedia Commons. Accessed 07/07/2021



Figure 11: Bathing at Blankenberge beach c.1890. Hotels and the Casino Kursaal can be seen in the background.
Source: https://www.flickr.com/photos/library_of_congress/3886402377/in/photostream/ Copyright not known.
Accessed 07/07/2021

A cast iron pier was built in 1894 (Figure 12), and a stone sea wall was built up. An additional church, St Rochus was built in 1889 to accommodate the large numbers of seasonal visitors. In 1908 the neo-gothic style Paravang (Figure 13) was built to provide shelter from the wind. This remains today, made a protected monument in 1987 and restored in 2002. This exclusive resort became popular with the Archduke Franz Ferdinand of Austria who holidayed here with his extended family.



Figure 12: Blankenberge Pier 1906 Source: https://commons.wikimedia.org/wiki/File:Blankenberge_pier_1906.jpg
Unknown author, Public domain, via Wikimedia Commons. Accessed 07/07/202



Figure 13: The Paravang Google Maps Street View accessed 07/07/2021

The fishermen of Blankenberge had been requesting a sheltered landing site since the end of the sixteenth century. The harbour channel was eventually created in 1871, and ships with keels replaced the flat-bottomed barges. However, despite the improvements made, the port still could not meet the requirements of the time and the fishing industry went into slow decline.

Blankenberge was occupied by German forces during both World Wars. The cast iron pier was destroyed by the Germans in 1914 to prevent Allied landings and barbed wire and trenches were installed along the waterfront (Figure 14) and bunkers built into the dunes. After the war, consideration was given to a new port, but the funding was not available and the fishing industry continued to decline. By 1925 the fleet at Blankenberge was reduced to 51 vessels and by 1939 there were only 19.



Figure 14 Barbed wire and trenches on the dike of Blankenberge during German occupation in WW1 Source: https://www.reddit.com/r/belgium/comments/gn804v/barbed_wire_and_trenches_on_the_dike_of/ copyright unknown. Accessed 07/07/2021

Money was found to replace the pier and casino both destroyed during the war. In 1933 the current 350m concrete pier opened together with the new art deco casino on the site of the original Casino Kursaal. During World War II, most of the hotels and villas along the waterfront, the lighthouse and the harbour infrastructure were destroyed, either by the German army during the fortification of the waterfront as part of the Atlantic Wall, or by Allied bombing. This was the final blow for the fishing industry. Once again, barbed wire and trenches were installed all along the waterfront and German artillery was set up on the end of the pier. As the Allies advanced and the Germans fled, orders came to blow up the pier, but the Blankenberge commander, Sergeant Karl-Heinz Keseberg disobeyed the orders and allowed it to remain. When the pier was renovated in 2003 83-year-old Mr Keseberg was invited to open it. The pier has been a protected monument since 2004. When the Allies arrived in Blankenberge, they established it as a rest centre and the casino was taken over by the NAAFI (the US Navy, Army and Airforce Institutes) (Figure 15).



Figure 15: Blankenberge, Belgium, 1945-6. NAAFI building at Blankenberge (155.4) (DONOR: R. CALVERT) Source: <https://www.awm.gov.au/collection/P00687.766> Public Domain. Accessed 07/07/2021

After the war, Blankenberge resumed its role as a seaside resort. The lighthouse was rebuilt in 1950 and a marina for pleasure craft opened in 1955, with further expansion in 1980 and 2004. Today it can accommodate 1000 berths and plays a significant role in making Blankenberge one of the most important seaside resorts on the Belgian coast.

2.2 Results of Archaeology scoring

This section outlines the results of the archaeological and palaeoenvironmental scoring from the Blankenberge study area, followed by a discussion of the results. The scoring methodology applied is detailed in *SARCC Maritime Atlas: Methodology Report* (MAT 2022). It should be noted that the scoring is not providing any measurement of historic or cultural significance of a site, only its potential to inform on coastal change.

Within the pilot area data was obtained from Belgian online heritage databases and available reports and publications. Where data indicated there were sites with potential to inform on past change then further research was required in order to understand the full nature and extent of the site. A total of 119 sites were assessed and scored.

The highest combined scoring sites are shown in Figure 16 and listed in the table below, the total score has been normalised to give each site a score out of 100. It is possible for a site to score highly in one of the three scoring categories and still be important for informing on coastal change over time. The combined approach identifies those scoring highly across the scoring categories.

Highest scoring sites based on total score

| ID | Site Name | Period | Score – sea level | Score – Environmental | Score – Temporal Continuity | Total Score | Coastal Context |
|------|--|-------------------|-------------------|-----------------------|-----------------------------|-------------|------------------|
| 5293 | Hoeve Raaswalle (Farm Raaswalle) | Early Middle Ages | Medium | High | High | 88 | Above high water |
| 4988 | Blankenberge dijk | Early Middle Ages | High | Medium | Medium | 77 | Above high water |
| 5294 | De Fonteintjes en omgeving (The Fountains and surroundings) | Early Middle Ages | High | Medium | Medium | 77 | Above high water |
| 5077 | Castle of Uitkerke | Early Middle Ages | Medium | Medium | Medium | 66 | Above high water |
| 4866 | Oudemaarspolder | Early Middle Ages | Medium | Medium | Low | 55 | Above high water |
| 5260 | Grand Hotel Pauwels-D'Hondt | Modern | Medium | Medium | Low | 55 | Above high water |
| 4839 | Drie pensions | Modern | Low | Low | Medium | 44 | Above high water |
| 4841 | Visserwoning (Fishermans cottage No. 27) | Early Modern | Medium | Low | Low | 44 | Above high water |
| 4855 | Pension in art deco | Modern | Medium | Low | Low | 44 | Above high water |
| 4873 | Parochiekerk Sint-Antonius (The Parish Church of St Anthony) | Middle Ages | Low | Medium | Low | 44 | Above high water |
| 4905 | King Beach | Modern | Medium | Low | Low | 44 | Above high water |
| 4927 | Palais du Comte Jean | Modern | Low | Medium | Low | 44 | Above high water |
| 4963 | Pier | Modern | Medium | Low | Low | 44 | Above high water |
| 5044 | Decanale Kerk Sint-Rochus | Modern | Low | Medium | Low | 44 | Above high water |
| 5166 | Old Town Hall | Middle Ages | Low | Medium | Low | 44 | Above high water |
| 5303 | Postgebouw (Post Office) | Modern | Low | Medium | Low | 44 | Above high water |

| | | | | | | | |
|------|--|--------------|-----|--------|-----|----|------------------|
| 5329 | Visserswoning Majutte (Fishermans House) | Early Modern | Low | Medium | Low | 44 | Above high water |
|------|--|--------------|-----|--------|-----|----|------------------|

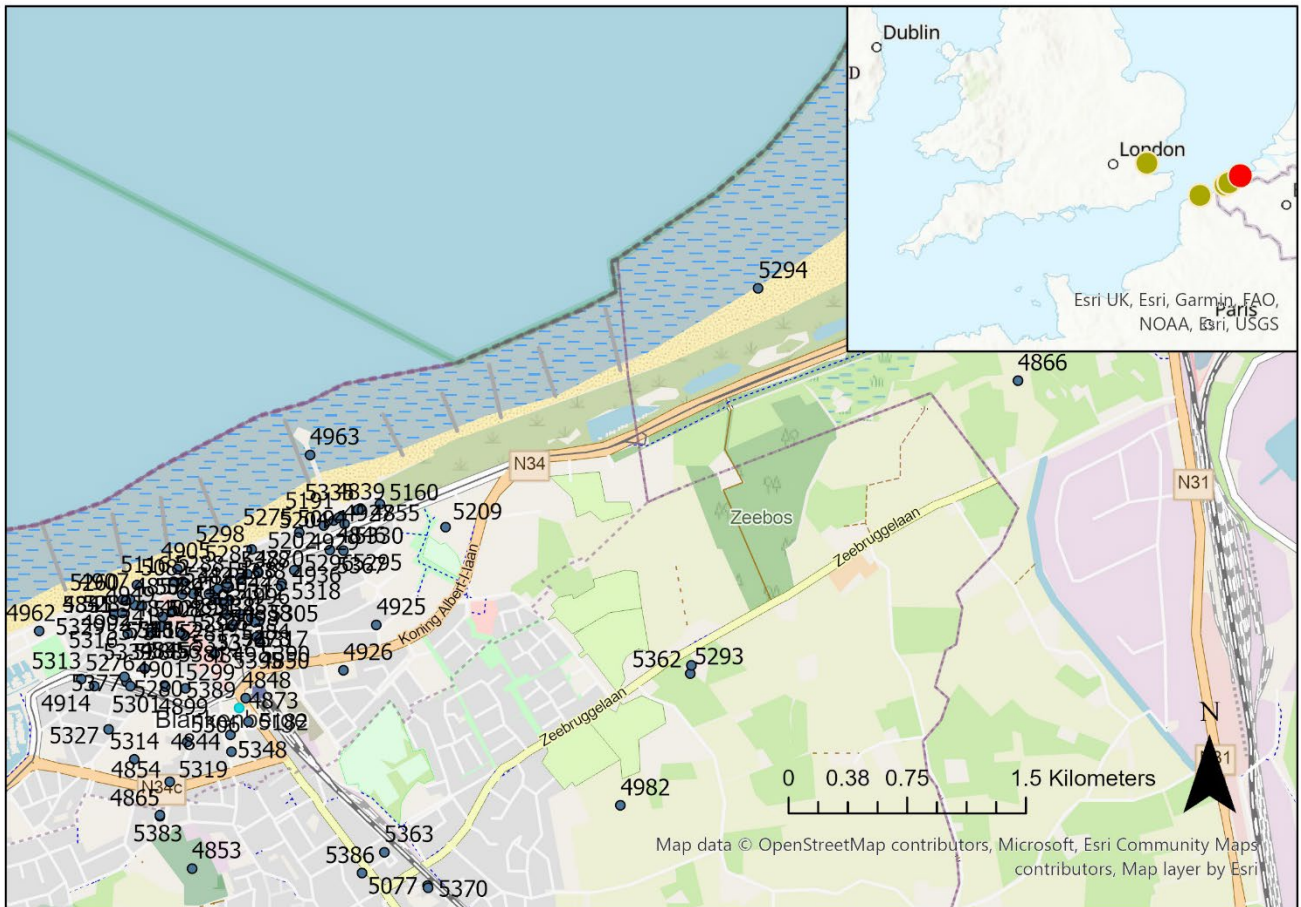


Figure 16: Distribution of the archaeological and historical sites in the Blankenberge Pilot Area.

2.3 Discussion of scoring results

The top scoring results can be grouped into three phases revealing the development of Blankenberge.

The first group date to the Middle Ages – the 10-13th centuries and early occupation in the salt marshes at the time of the Dunkirk III Marine Transgressions. The rising sea level and resulting flooding forced people to move inland to higher land. The top five scoring sites are all inland from the coast, marking the higher land where occupation continued: ID 5293 Hoeve Raaswalle, ID 4988 Blankenberge Dijk, ID 5294 De Fonteintjes, ID 5077 Kasteel van Uitkerke and ID 4866 Oudemaarspolder.

As the sea level dropped, occupation was able to spread onto the coastal plains and occupation of the early coastal town of Blankenberge began in the early 14th century. The original layout of the town, as seen in the Ferrais map of 1777 is still clear to see within the modern city. The early town was built behind the dunes and four early buildings still survive: Two fishermen’s houses built into the dune front in Breydelstraat (ID 4841 and ID 5329), the first church of St Antonius built in 1334 on the outskirts of the town (ID 4873), and the Town Hall first built 1451 and rebuilt 1620 (ID 5166). These buildings are visible on the 1777 map.

The last group chart the rise of Blankenberge as a seaside resort and the development of the coastline, which has resulted in the natural dune landscape being replaced by buildings. The first tourist facility was the Pavillon De Rycker, built in 1850 on the former dyke. This hotel was listed as the Grand Hotel Pauwels-D'Hondt (ID 5260) though it has recently been demolished and new buildings stand on its former site at 123

Zeedijk. The former Post Office (ID 5903) marks the development of the Zeedijk from 1885. A new church was needed to accommodate tourists, so in 1884 the building of St Rochus began (ID 5044). The pier was first built in 1894 (ID 4963). More hotel accommodation was required during the tourist boom of the interwar years, and buildings such as Palais du Comte Jean (ID 4927), Drie Pensions (ID 4839) and Art Deco pensions (such as ID 4855) and apartments were built. King beach (ID 4905) was built as a modern bathing facility in 1948.

2.4 Photographic Survey of High Scoring Features

Some of the sites and features that scored highly are in existence today and can be viewed/ visited. A site visit was undertaken to capture current day images of a number of the historic features, some examples are included below (Figures 17 – 21). These can now be used to directly compare with other available resources to demonstrate the extent to which there have been changes to the coastal frontage.



Figure 17: The Pier (MAT 2021).



Figure 18: The Fishermen's Houses Majutte on the left and No. 27 on the right.



Figure 19: (Left) St Antonius Church (source https://commons.wikimedia.org/wiki/File:Blankenberge_-_Sint-Antoniuskerk_1.jpg creative commons)

Figure 20: (Right) St Rochus (source <http://wikimapia.org/18127650/St-Antonius-and-St-Rochus-church>)



Figure 21: The old Town Hall (source https://commons.wikimedia.org/wiki/File:Blankenberge_Oud_Stadhuys_2012.JPG Zeisterre, CC BY-SA 3.0 <<https://creativecommons.org/licenses/by-sa/3.0/>>, via Wikimedia Commons)

3. Maps and Charts

This section provides a background to the development of maps and charts over time which have relevance for the area surrounding the Pilot Project. It then presents the results of the scoring of a range of maps and charts which cover the pilot study area with details that allow them to help demonstrate changes to the coastline over time.

3.1 Maps and Charts Background

Prior to the Middle Ages, early maps were little more than a sketch of a small area, accompanied by a more detailed written report. In the fifteenth and sixteenth centuries, more traditional maps began to appear, but were usually drawn by artists and were of a pictorial nature. Focusing on the location of towns, castles and fortifications, rivers, lakes and woods, these large works were commissioned to be displayed in palaces and castles. It wasn't until the mid-sixteenth century when systems of survey and measurement were introduced,

that the potential of maps as reliable tools for a variety of purposes was realised. Local surveying and map making developed in the Southern Provinces a century earlier than in the Northern Provinces. The oldest surviving property map of a piece of land in Flanders dates to 1307.

Blankenberge can be seen on this early pictorial map by Pieter van der Beke dated 1538 (Figure 22). Produced on four wooden sheets, this map reflects the defiant independence of the Flemish cities against Spanish rule, containing heraldic shields, a genealogical log and the four bears representing the oldest families.



Figure 22: Charte van Vlaendren Pieter van der Beke 1538 dated Source

https://commons.wikimedia.org/wiki/File:Charte_van_Vlaendren_1538_Pieter_van_der_Beke.jpg Public domain
Accessed 15/07/2021

In 1540, Gerard Mercator, a Flemish pioneer of cartography was commissioned by the Merchants of Ghent to produce a map of the county of Flanders (Figure 23). The merchants hoped a more respectful portrayal of the county would replace the 1538 map and appease the Spanish Emperor Charles, following their rebellion. Mercator signed the map “Dedicated to Charles V most Holy Roman Emperor by the most devoted Gerardus Mercator of Rupelmonde”. The accuracy of Mercator’s map is attributed to triangulation already carried out by Jacob van Deventer. The nine copper engravings together form a wall chart measuring 96 x 125cm. The map is on display in the Museum Plantin-Moretus. The museum in Antwerp is the original residence and workshop of the Plantin and Moretus publishers and is a UNESCO world heritage site. Mercator’s map was included in the *Theatrum Orbis Terrarum* by Abraham Ortelius. Printed in 1570, considered to be the first true modern atlas.

Jacob van Deventer, a leading Dutch Renaissance Cartographer, was commissioned first by the Emperor Charles V and then in 1559 by King Philip II to create manuscript topographical plans for all of the cities of the low countries. This was to be his life’s work. By the time of his death in 1575, he had created over 250 city maps. King Philip II required these maps to suppress the cities that revolted against him. Deventer pioneered triangulation to produce accurate scale maps. Drawn in plan, buildings were drawn side on for easy recognition by the soldiers. Important buildings, roads, rivers and fortifications were all mapped in water coloured detail. These plans were not published due to their secret military nature and were only rediscovered in the late nineteenth century.



Figure 23: Flanders By Gerardus Mercator 1540 - landkaart, Public Domain, Source <https://commons.wikimedia.org/w/index.php?curid=9557902> 1540 Gerard Mercator accessed 22/07/2021

Meanwhile, topographical maps were produced at provincial levels, rising from the desire for self-representation. Printed province maps were produced in almost all the countries of Europe between 1575-1700, many of these maps clearly show Blankenberge as a named town. The map of Flanders by CJ Visscher, 1621, shows the fort and dunes at Blankenberge (Figure 24).



Figure 24: CJ Visscher, Comitatus Flandria 1621. Source: <https://sanderusmaps.com/our-catalogue/antique-maps/europe/low-countries-belgium/antique-map-of-flanders-vlaanderen-by-c-j-visscher-22491> Copyright Unknown. Accessed 22/07/2021

In 1638, Henricus Hondius in Amsterdam and Alexander Serhanders in Ghent, published a multi-sheet map of Flanders that superseded Mercator's map. This was the basis Blaeu's six sheet wall map of Flanders published in 1638.

An incredibly detailed pictorial map of Blankenberge was engraved by Antoon Sanders in 1641 (See Figure 6 in Section 2.1). Blankenberge is seen as a small linear coastal city, with fishing boats approaching the dune beach to unload their catch. The Spanish fortress and the church of Saint-Antonius are shown in detail and crops can even be seen growing in the back gardens of the fishermen's houses that line both sides of Kerkestraat.

Other topographical maps of Flanders were produced by: Seutter (1678), Jalliot (1695), Mortier (1700), Masse (1729), Visscher (1730), Bodenehr (1740), Frickx (1744) and Ferraris (1775). From the 1700's maps start to be produced on a smaller scale and contain good detail. A good example is Ferraris map (1775) (Figure 25) which records the expansion of Blankenberge. Dykes and groynes have been installed along the coastline and housing is now spread across a much larger area with a formal street system and a road leading out of the town to Bruges. The Church is still on the outskirts of the city, and the Spanish fortress has been demolished. There is significant detail of the coastal area with the high and low tide marks shown.



Figure 25: Ferraris 1775 Source: https://commons.wikimedia.org/wiki/File:Blankenberge,_Belgium,_Ferraris,_1775.jpg accessed 07/07/2021

As a coastal city, Blankenberge has always required a degree of protection from the sea, with the first dykes installed in 1100 AD. This mid-nineteenth century map (Figures 26) records good detail of the groynes and dykes. A land registry map produced by Phillippe Christian Popp dated 1842-1879 (Figure 27) records every building and field in Blankenberge and the surrounding area.



Figure 26: Vandermaelen map, *Cartes topographiques de la Belgique*, 1846 - 1854 Source: <https://www.geopunt.be/search?facet=all&q=Vandermaelen%20map> No restrictions on public access. Accessed 07/07/2021



Figure 27: Popp, *Atlas cadastral parcellaire de la Belgique*, 1842 – 1879 Source: Information Flanders <https://www.geopunt.be/catalogus/datasetfolder/8f54a85f-4a89-4a58-8bdf-73972a91c30f> accessed 07/07/2021

The view from the sea over Blankenberge dated 1865 (Figure 28), shows development along the waterfront, in front of the original town. The lighthouse, two sets of stairs down to the beach, the hotel and the swimming baths(?) are visible additions. The 1890 map below (Figure 29), shows the new harbour for the first time.



Figure 28: Blankenberge 1865 (ID 461). Courtesy of Stadsarchief – De Benne, Blankenberge



Figure 29: (ID 366) An 1890 Map of Blankenberge shows development along the waterfront on both sides of the city. It also shows the new harbour. Courtesy of Stadsarchief – De Benne, Blankenberge.

On a 1:25,000 city map of Blankenberge by Wagner and Debes dated 1909, the railway line, pier, casino and hotels along the waterfront are visible, recording Blankenberge's growth as a tourism destination. This map can be seen online at https://www.discusmedia.com/maps/belgium_town_plans/4820/



Figure 30: (ID 372) Blankenberge Map 1937. Courtesy of Stadsarchief – De Benne, Blankenberge.

The 1937 map (Figure 30) shows the city starting to expand out of the original footprint, towards the harbour. It also shows development all along the waterfront and the addition of the pier. The 1951 map (Figure 31) shows a huge expansion of the city in all directions.



Figure 31: (ID 371) Blankenberge map 1951. Courtesy of Stadsarchief – De Benne, Blankenberge.

Military Mapping

Blankenberge was not surveyed for the British First World War Trench Maps, but was mapped during the Second World War in 1937-1942 and again in 1943-44. Accurate spatial positioning was essential for both defensive and offensive operations. The originals are held in the UK National Archives and the Imperial War Museum. Scanned copies can be viewed online at the Royal Library of Scotland.

Sea Charts

Charts have also been produced over the years to map the changing Flemish coastal geomorphology. In 2011 the chart below (Figure 32) was rediscovered, hanging on the wall at St-Pieterscollege in Blankenberge. This chart names the sandbanks and gullies off Blankenberge.

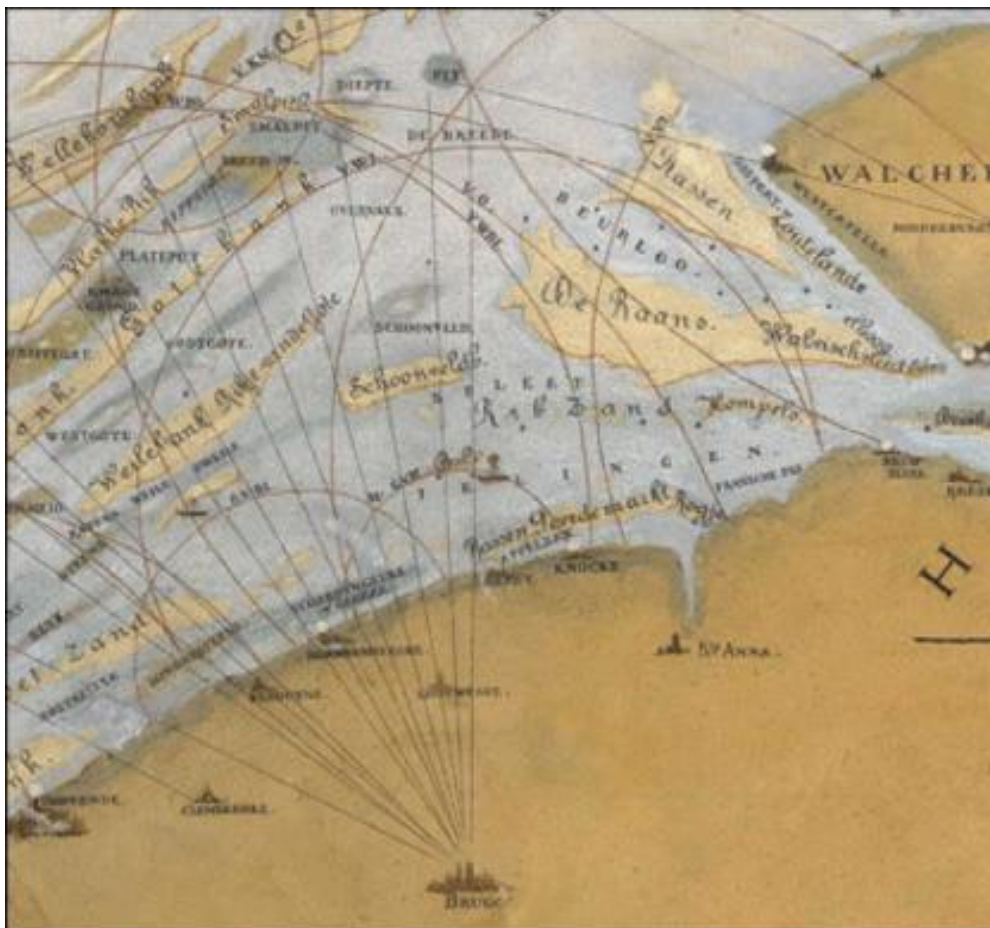


Figure 32: Source 1890 Maritime Chart of the Flemish Banks Source: <http://www.vliz.be/en/2011-11-16-maritime-chart-rediscovered-in-school-Blankenberge> Accessed 07/07/2021

The Historical Maps Coastal Zone website (<http://www.vliz.be/hisgiskust>) hosts charts for the years 1866, 1966, 1968, 1971, 1973, 1974, 1980, 1982, 1984, 1985, 1998, 1991 and 1996. The earliest, latest and a middle example are shown below (Figures 33 – 35).

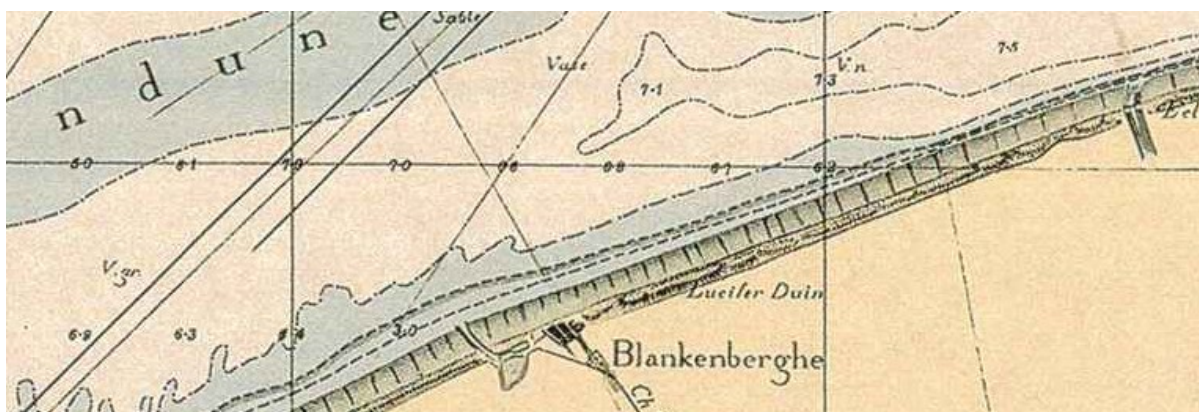


Figure 33: 1866 Map. Source <http://www.vliz.be/hisgiskust/en/image-library?p=search&term=oostende&search.x=3&search.y=1> non-commercial use permitted. accessed 07/07/2021

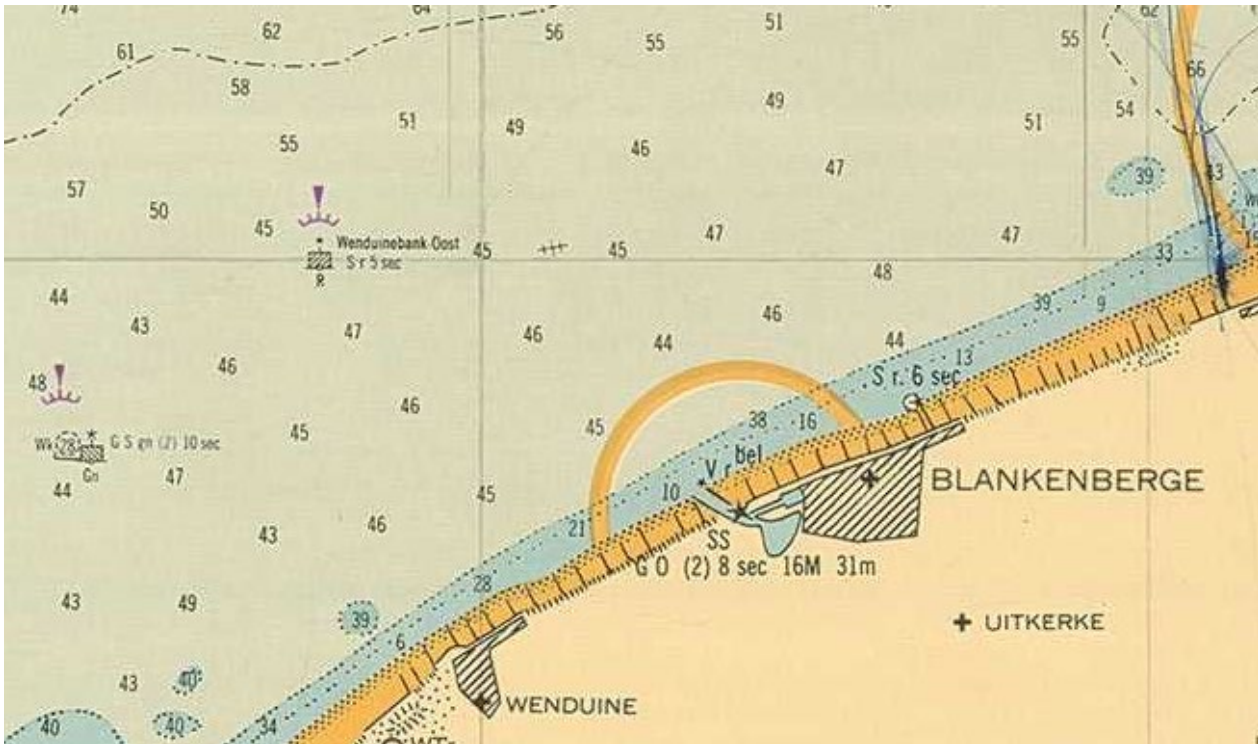


Figure 34: 1966 Map. Source <http://www.vliz.be/hisqiskust/en/image-library?p=search&term=oostende&search.x=3&search.y=1> non-commercial use permitted. accessed 07/07/2021

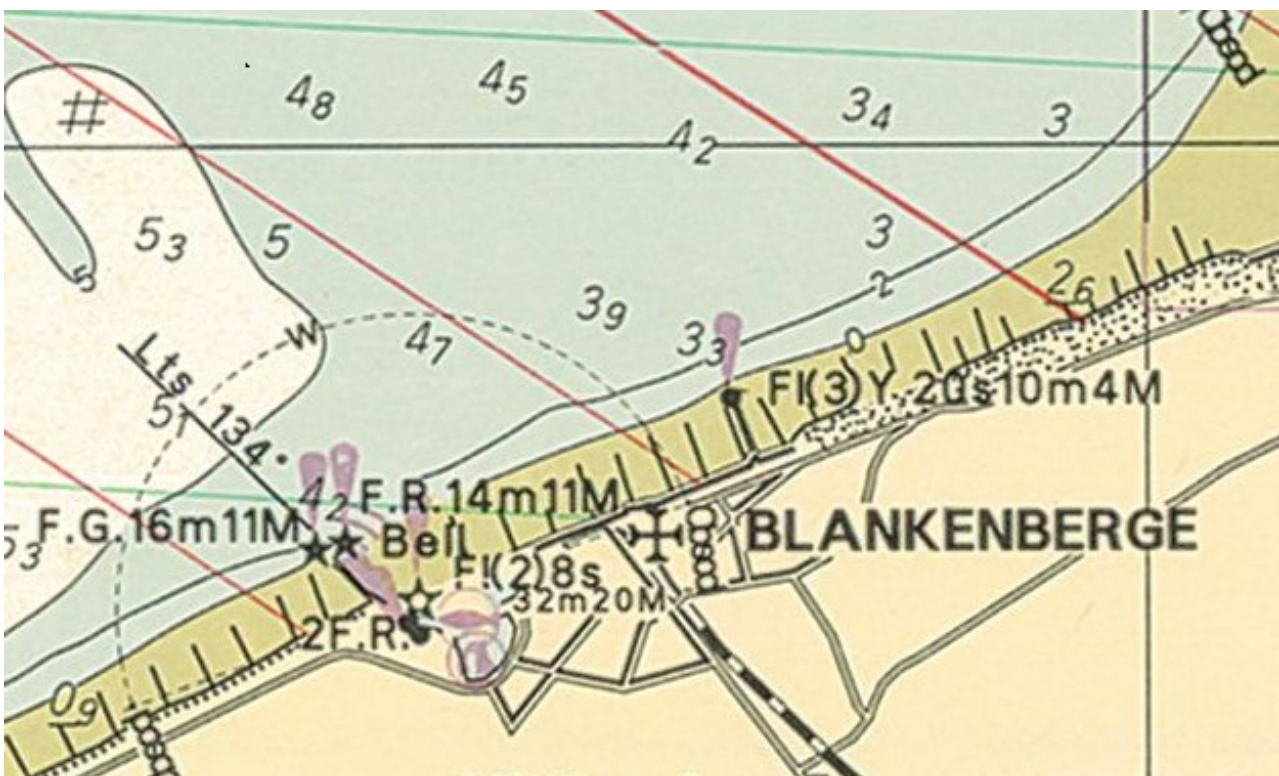


Figure 35: 1996 Map. Source <http://www.vliz.be/hisqiskust/en/image-library?p=search&term=oostende&search.x=3&search.y=1> non-commercial use permitted. accessed 07/07/2021

3.2 Results of scoring

The ranking system for maps and sea charts as set out in *SARCC Maritime Atlas: Methodology Report* (MAT forthcoming) and has been applied within the Blankenberge pilot area. A range of historical maps and charts of the area were assessed as part of the project, with some dating back over 500 years.

The study of maps and charts has utilised a range of online resources, it has been designed to show the potential of this type of resource for coastal change, but it is not an exhaustive study as other examples exist within archives, museums, libraries and galleries that is has not been possible to access due to Covid-19 restrictions. 40 maps and charts were analysed through the scoring system, the top scoring examples are detailed below and shown on Figure 36:

| MAP _uid | Title | Year | Score Chronometric Accuracy | Score Topographic Accuracy | Score Detail in non- coastal area | Score Geometrica l Accuracy | Total Map Score |
|-------------|--|---------------------------------|-----------------------------------|----------------------------------|---|-----------------------------------|-----------------------|
| 402 | Blankenberge and Vlissingen C17. | 1621? | 100.00 | 50.00 | 100.00 | 66.67 | 79.17 |
| 370 | Blankenberge map from above 1990. | 1990 | 100.00 | 38.89 | 100.00 | 66.67 | 76.39 |
| 374 | Zeebrugge/Heyst Map late C19. | 1899 | 100.00 | 61.11 | 100.00 | 33.33 | 73.61 |
| 401 | Blankenberge with fort. | 17 th Centur y | 100.00 | 50.00 | 66.67 | 66.67 | 70.83 |
| 371 | Blankenberge map 1951. | 1951 | 100.00 | 44.44 | 66.67 | 66.67 | 69.44 |
| 293 | Building between Oostende and Blankenberge | Multi period | 100.00 | 33.33 | 66.67 | 66.67 | 66.67 |
| 373 | Blankenberge map 1995. | 1995 | 100.00 | 33.33 | 66.67 | 66.67 | 66.67 |
| 291 | Knokke-Heist 1860, 1920, 1950 | | 100.00 | 25.00 | 66.67 | 66.67 | 64.58 |
| 406 | Wenduine 1952. | 1952 | 100.00 | 20.83 | 66.67 | 66.67 | 63.54 |
| 346 | Blaeu 1645 - Eastern part of German Flanders | 1645 | 100.00 | 52.78 | 66.67 | 33.33 | 63.19 |
| 202 | Blankenberge Belgium | 1775 | 100.00 | 50.00 | 33.33 | 66.67 | 62.50 |
| 408 | Zeebrugge chart 1980. | 1980 | 100.00 | 50.00 | 33.33 | 66.67 | 62.50 |
| 308 | Belgium 1584 | 1584 | 100.00 | 44.44 | 66.67 | 33.33 | 61.11 |
| 314 | Map of the Flemish coast 17th century | 17 Centur y | 100.00 | 41.67 | 33.33 | 66.67 | 60.42 |
| 338 | Vlaamse-banken-1966 | 1966 | 100.00 | 41.67 | 33.33 | 66.67 | 60.42 |

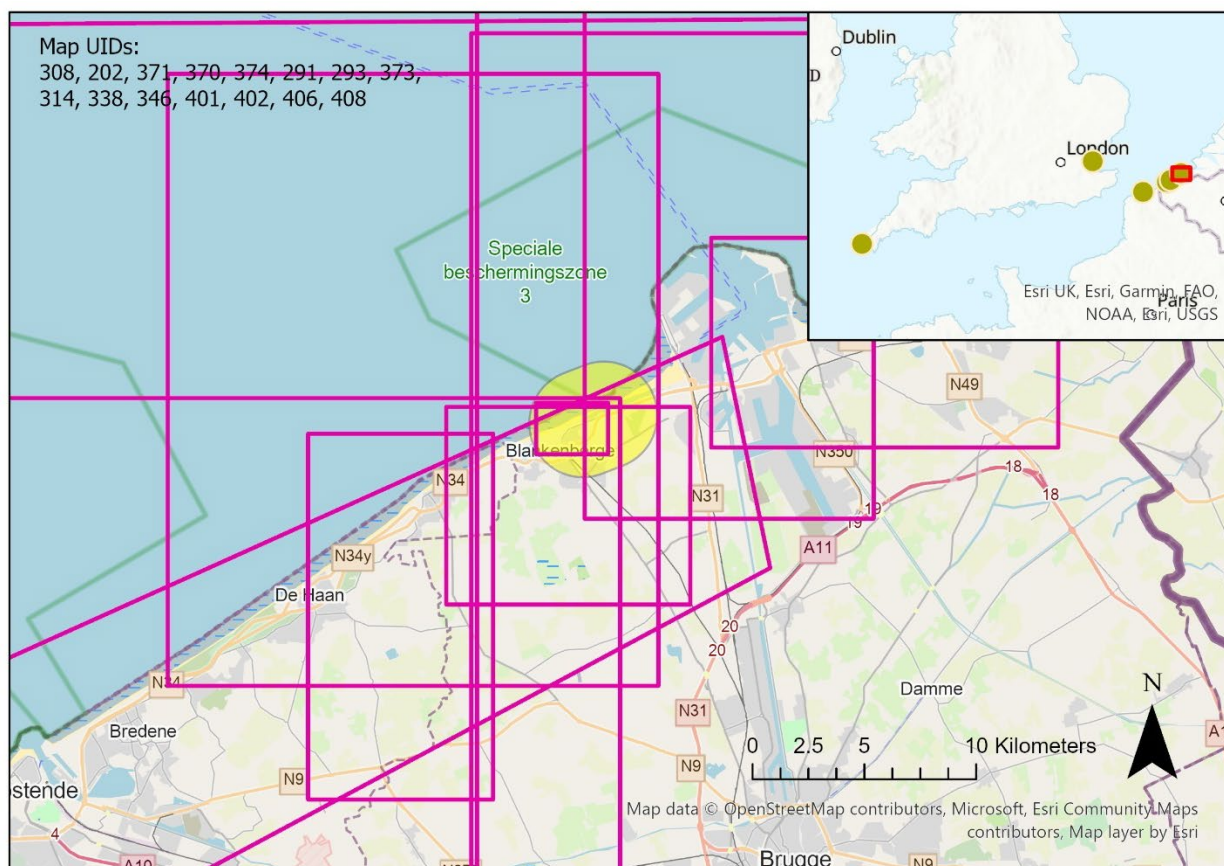


Figure 36: Extent of some of the highest scoring maps covering the Blankenberge pilot area.

3.3 Discussion of scoring results

As outlined within section 3.1 as a coastal town Blankenberge and its important relationship with the sea level and coastal frontage means that it is well represented within maps and charts. These resources allow the development of the town, sand dunes, groins, dykes and coastal form to be reviewed over time.

A succession of high scoring maps include the Blaeu map of 1645 (ID 346) (Figure 37) and the Ferris 1775 map (ID 202) which is shown in Figure 25 in Section 3.1), later examples show the town more developed and the dunes no longer present between the town and the sea.

There several more recent examples of marine charts which appear in the high scores 1980 (ID 408), 1966 (ID338) (included in Figure in Section 3.1), by these dates the practice of charting the coastline had developed significant accuracy and these can be relied upon for their depictions of the coastline and the near and offshore hydrography. They chart the form of offshore deposits, which show changes following the construction of Zeebrugge Harbour, which protrude into the marine zone and will have changed the sediment patterns of the adjacent coast line.



Figure 37: ID 803 Close up of the area of Blankenberge from the Blaeu map of 1645 (source, public domain, via Wikimedia Commons).

4. Pictorial Resources Scoring

This section presents the results of the research, scoring and analysis of artistic images and historic photographs. The scoring approach for these resources has been developed to take account of the various styles, approaches and potential subjectivity (particularly of art images), and the potential of the resources to provide information on coastal change.

Artistic resources provide a similar time-depth to maps and charts in terms of the periods over which they have been produced, with photography being available for periods from the mid – late 19th century. Whereas maps and charts were designed to be as accurate as possible in producing ‘plan views’ which include the coast, art and photography provide a range of landscape and oblique views which give a different type of evidence of coastal change.

4.1 Artistic Images

The use of artistic images to help understand coastal processes, measure coastal change and inform approaches to coastal management has been developed over the past 20 years. Initial reports focused on the use of art resources to demonstrate coastal change in relation to issues for life and for economic assets (McInnes & Stubbings 2010, 2011; McInnes & Benstead, 2013, 2013, 2015). They demonstrated the potential for the resource to provide more data on other aspects of coastal management. The use of art images alongside archaeology and heritage data was further developed through the Arch-Manche project (<https://archmanche.maritimearchaeologytrust.org/>) which focused on long-term coastal change and included the assessment of artwork, cartography and photograph for more recent periods.

This section briefly outlines the art history relevant for the Blankenberge Pilot Area before looking in detail at the high scoring art works, what these examples show us and how modern photos can be compared to the artistic views.

4.1.1 Summary of Art History of the Channel Coast

The development of coastal artistic representations across the area of the SARCC Pilots has a common history which reflects broader trends in social and economic development and their impacts on art and artists. This brief review of developing trends draws on the work of Professor Robin McInnes within the Arch-Manche Project and is a summary of the background to the art of the Channel-Southern North Sea Region from the Arch Manche Technical Report https://archmanche.maritimearchaeologytrust.org/uploads/images/Documents/Technical_Report_Section_One.pdf. It provides a review of the development of coastal art applicable across the Channel coast SARCC pilot areas, with additional detail on further research related to the specific pilot area.

The beginnings of coastal art

It wasn't until the early 17th century that the work 'landscape' started to be used in English to describe scenery, it came from the Dutch word 'landschap' (an area of cultivated land). But the origins of landscape painting date back to the 15th century when scenery was included in paintings of early artists such as Leonardo de Vinci. In the 16th century in the Netherlands Pieter Brueghel the Elder (1525/30-1569) painted scenes which included the countryside and coast. However, for much of the 16th and 17th centuries portrait painting was the most common work produced.

During the fifteenth to seventeenth centuries Flanders produced some of Europe's leading artists.

"Artists from the Netherlands, Flanders and Belgium played a significant role in the development of landscape art, particularly in relation to the coastal and marine environments", these included Pieter Bruegel the Elder, Rubens and Van Dyck. This encouraged other European artists to their centre of activity and Flemish Baroque painting flourished, particularly in the Antwerp School, but also in Brussels and Ghent. Following the Siege of Antwerp in 1584-85, Flanders became separated from the Dutch Republic and many artists fled to Holland, leading to the development of the 'Dutch Golden Age' of painting, which spanned the 17th century. A more naturalistic style of painting developed which included landscape depictions, with important artists being Esias Van De Velde (1587-1630), who painted landscape, genre and shipping subjects and Hendrick Avercamp (1585-1634) who painted some of the first Dutch landscape paintings. Seascapes became more popular with Hendrik Vroom (1566-1640) being one of the earliest seascape painters.

Strong European trading networks meant Dutch and Flemish painters and paintings were exported, including the famous Willem Van De Velde (c.1611-1693) and his son, also Willem (1633-1707), who moved to London in 1672. Their expertise in depicting ship and the sea dominated marine painting in England and inspired a generation of English marine painters. Dutch art was particularly influential on the 'Norwich School of artists' (1803-33).

"The influential role of Dutch, Flemish and Belgian artists on the development of land and seascape paintings cannot be underestimated. In particular, the prosperity of the Dutch Republic created an opportunity for strong trade links with the rest of Europe and this in turn enabled works of art, and, therefore, artistic styles, to permeate into Great Britain".

The fashion for monied young men to take the 'Grand Tour' in the late 17th and 18th centuries developed appreciation for classical remains and Renaissance art, particularly of Italy and Greece. Those returning often commissioned art work and were impressed by the landscape paintings. While 'on tour' they were able to purchase engravings and paintings of coastal scenes that had been painted for the 'tourist trade'. Some travellers were accompanied by their own artists and later photographers to capture sights while on tour.

Throughout the 18th century there was growing appreciation of landscape and subsequent interest in landscape painting including through watercolour drawings and through publication of richly illustrated aquatinted plates. Some of the dedicated topographical artists, such as Turner, Rowlandson, William Daniell and Richard Ayton, travelled extensively to inaccessible places to develop their works. This often included areas of coastline and their paintings have left a legacy which are an important record of the state of the British coastline.

19th Century Developments

In the 19th century artists continued to follow the Dutch tradition of creating very detailed depictions of the coast capturing developing coastal settlements which developed into resorts. "This era of coastal landscape painting relied not just on the skills of the original artists in the field, but also a number of remarkably fine craftsmen, engravers and colourists, who produced illustrations through a range of techniques such as aquatint and lithography".

In particular the mid-19th century Pre-Raphaelite Brotherhood became influential in landscape painting – they wished to capture nature in its precise detail and beauty and they painted the smallest of details in their quest for realism. Their works and those of their followers coincided with developing interest in the natural and earth sciences and the development of geology. Many important geological exposures have been painted by Pre-Raphaelite artists and their attention to detail means these works can be of particular importance for studying the chronology of physical, environmental and social change around the coast.

The influence of the Pre-Raphaelites was felt throughout the art world, and many artists were inspired by their methodical approach to depicting the natural world. Although there are many example of Pre-Raphaelite coastal paintings from Britain, many artists worked in a range of countries. For example Edward William Cooke RA (1811-1880) took a keen interest in depicting the geology of the coastline with great accuracy and precision and produced works of the English, French and Dutch coastlines.

Coastal Art Colonies

A number of 'artistic schools' developed around the coastline in the 19th century and thrived until the early 20th century. They often centred on particularly aesthetic locations where artists worked together developing particular styles. In the post Napoleonic War years and after the European-wide revolutions of the early 1800s there began a gradual movement of artists towards the coastal towns of Europe. This trend continued until the outbreak of the First World War.

Art colonies grew in size throughout the 1800s. There were over eighty art communities around the Channel-Southern North Sea coasts of different types including villages with transient and fluctuating artist populations, for example Honfleur on the French coast and Katwijk on the Dutch coast; villages with semi-permanent visiting and residing artists, for example, Concarneau in France, St Ives on the Cornish coast and Bonchurch, Isle of Wight; and villages with mainly stable groups of artists in residence, for example, Egmond on the Dutch coast and Newlyn in Cornwall and Walberswick in Suffolk, East Anglia.

Painting by the coast was seen as a means of reverting to a simpler way of life away from the industrialisation of many European cities. The artists of the colonies shared a common aspiration to paint en plein-air (i.e. out of doors), they embraced descriptive realism and were eager to paint out of doors in front of the subject and capture the subject in its natural setting.

Notable coastal artists are represented within the collection of works around the Blankenberge pilot area, these include the prominent 19th century landscape artist Herman Herzog, who was born in Germany and painted the European coast extensively before emigrating to America in the 1860s, and the Belgian painter Franz Courtens, who was a leading figure in the Dendermonde school and noted for his landscape painting.

Art and the Development of Tourism

From the mid 18th century visitors were drawn to the coast for health and leisure. In the 19th century with the expansion of the railway network and road building the numbers visiting developing seaside resorts from growing urban centres increased rapidly. The building of promenades, piers and hotels followed and fuelled this demand on both sides of the Channel coast.

Visitors wanted a record of the areas of the coast they had visited and before photography this was achieved through artworks, or copies of these. Even after the invention of photography works of art were still high in

demand as they provided colour views when photographs were still black and white. For this reason paintings of the coast continue to be important for records of coastal change into the 20th century.

Early guide book publications were highly illustrated with engravings, however, in the mid 19th century they could not be printed in large enough numbers to meet demand. However, the invention of chromolithography and colour plate reproduction allowed larger print runs to be developed. Artists were commissioned to write and illustrate books which covered all part of the European coast to meet the demands of travellers and tourists. From the 1890s onwards postcards became popular with tourists, many of them featured coastal scenes. Artists were commissioned to create paintings for use as postcards.

The popularity of Blankenberge as a tourist resort means there is a large archive of paintings and engravings from the 19th and early 20th century that help provide a detailed record of the coast.

4.1.2 Results of scoring Art

The development of the scoring system for works of art is described in SARCC Maritime Atlas: Methodology Report (MAT, 2022). Details of each artwork have been entered into the project database, including information on artwork type, medium, subject matter, time period and other parameters, the database was then able to calculate the scores for works of art from the pilot study site. 20 artworks were scored and analysed for the project, their scores are included in the table below with their positions shown in Figure 38:

| Art UID | Source Title | Artist | Date | Score medium | Score period | Score style | Score heritage | Score environ | Total Score |
|---------|---------------------------------------|----------------------|------|------------------------------------|--------------|--|-------------------------------------|--------------------------|-------------|
| 421 | Blankenberge Pier from the air | unknown | | Litho/ pencil/ watercolour drawing | Modern | Topographical /beach & coastal scenery | Suggests position of coast | General beach view | 81 |
| 461 | Blankenberge 1865. | | 1865 | Litho/ pencil/ watercolour drawing | 1840-1880 | Topographical /beach & coastal scenery | Supports understanding coast change | Detailed shoreline shown | 81 |
| 391 | Mole at Zeebrugge. | King | 1919 | Watercolour | Modern | Marine/ shipping subjects | Suggests position of coast | General coast view | 77 |
| 453 | Rough Sea Westende | Unknown | | Watercolour | Modern | Marine/ shipping subjects | Suggests position of coast | General coast view | 70 |
| 454 | Blankenberge early C17. | unknown | 1650 | Etching | Before 1770 | Caricaturist/ Genre subjects | Suggests position of coast | General coast view | 70 |
| 446 | Brandenburg beach and sailing boats. | unknown | 1890 | Watercolour | 1880-1920 | Caricaturist/ Genre subjects | Suggests position of coast | General beach view | 66 |
| 459 | Blankenberge Beach C19 changing huts. | | | Watercolour | 1880-1920 | Caricaturist/ Genre subjects | Suggests position of coast | General beach view | 66 |
| 451 | Boats in Blankenberge Harbour | Robert Ernest McEune | 1910 | Watercolour | 1880-1920 | Marine/ shipping subjects | Suggests position of coast | General coast view | 66 |
| 456 | Blankenberge Beach and Dyke 1873. | | 1873 | Litho/ pencil/ watercolour drawing | 1840-1880 | Caricaturist/ Genre subjects | Supports understanding coast change | General beach view | 62 |
| 460 | Blankenberge Dunes 1841. | | 1841 | Litho/ pencil/ watercolour drawing | 1840-1880 | Marine/ shipping subjects | Suggests position of coast | General beach view | 62 |

| Art UID | Source Title | Artist | Date | Score medium | Score period | Score style | Score heritage | Score environ | Total Score |
|---------|---|----------------|------|------------------------------------|--------------|--|----------------------------|--------------------|-------------|
| 421 | Blankenberge Pier from the air | unknown | | Litho/ pencil/ watercolour drawing | Modern | Topographical /beach & coastal scenery | Suggests position of coast | General beach view | 81 |
| 422 | Blankenberge from the sea | unknown | 1900 | Litho/ pencil/ watercolour drawing | 1880-1920 | Marine/ shipping subjects | Suggests position of coast | General coast view | 59 |
| 447 | Blankenberge Poster | unknown | 1890 | Litho/ pencil/ watercolour drawing | 1880-1920 | Caricaturist/ Genre subjects | Suggests position of coast | General beach view | 59 |
| 449 | Blankenberge Pier | unknown | 1890 | Litho/ pencil/ watercolour drawing | 1880-1920 | Caricaturist/ Genre subjects | Suggests position of coast | General beach view | 59 |
| 450 | Blankenberge Sea Cabin. | unknown | 1890 | Litho/ pencil/ watercolour drawing | 1880-1920 | Caricaturist/ Genre subjects | Suggests position of coast | General beach view | 59 |
| 448 | Blankenberge 1840 | LX | 1840 | Litho/ pencil/ watercolour drawing | 1840-1880 | Caricaturist/ Genre subjects | Suggests position of coast | General beach view | 55 |
| 455 | View of Blankenberge Castle. | unknown | | Litho/ pencil/ watercolour drawing | 1840-1880 | Marine/ shipping subjects | Suggests position of coast | General coast view | 55 |
| 420 | Sunset on the Belgian Coast of Blankenberge | Hermman Herzog | | Oil painting | 1840-1880 | Topographical /beach & coastal scenery | Suggests position of coast | General coast view | 48 |
| 452 | The Port of Blankenberge | Franz Courtens | | Oil painting | 1880-1920 | Marine/ shipping subjects | Suggests position of coast | General coast view | 48 |
| 462 | Blankenberge 1865 Hotel Kursaal. | unknown | | Litho/ pencil/ watercolour drawing | 1840-1880 | Caricaturist/ Genre subjects | Suggests position of coast | General coast view | 48 |

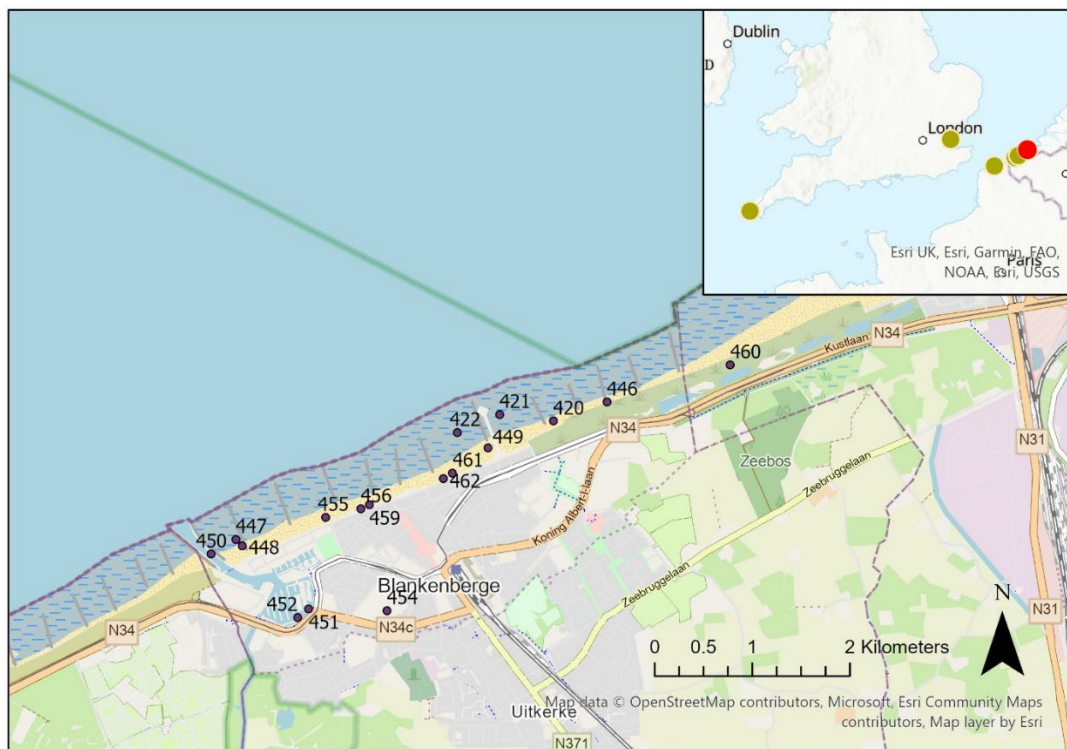


Figure 38: Distribution of high scoring art works in the Blankenberge Pilot Study Area.

4.1.3 Discussion of scoring results

Engravings and lithographs as well as coloured watercolour drawings feature very heavily in the high scoring art works table. These reflect the popularity and development of Blankenberge as a tourist destination and date mainly from the mid to late 19th century.

There is an early, 1650 art work (ID 454, score 70), which is similar to an early map that features in Section 3 – this shows how early depictions of settlements are often more ‘art work’ showing buildings and the coast in relief rather than directly from above. In this art work Blankenberge is still small, with relatively few houses considering there is also the Church and the Fort has been constructed. This art work can be compared to a view of 1865 (ID 46, score 81) which show a similar view but in reverse – looking from the coast back at the town. In the two hundred years between the art works there has been a growth in the street plan and buildings have been constructed along the sea front in the area once occupied by sand dunes.

A set of three high scoring art works (Figure 39 – 41) show the development and use of the coastal frontage for tourism. These 19th century depictions include a range of bathing huts in use and detail of the development of buildings on the adjacent shore. Figure 43 (ID 456) (in Section 4.1.4) in particular shows a range of human use of the area with ships beached on the foreshore, people using groynes and walkways to use the area and also a number of bathing huts in use. This image dates to 1873 and shows a period when maritime and fishing use is ongoing alongside developing tourism.

Image ID460, show a different artistic style – a sketch of an area of coastal dunes with a boat on the foreshore and a smaller tender (see Figure 43 in Section 4.1.4). It provides detail of the form of the dunes in this area which it thought to cover the specific area of the SARCC Pilot Project as the rooves of buildings of Blankenberge can be seen in the background. This sketch dates to 1841, so predates some of the expansion of building along the shore for tourism. A similar view which looks along this stretch of coast towards Blankenberge is depicted in an oil painting by Hernman Herzog dated to 1873 (ID 420) this shows fishing activity on the foreshore close to the dunes with boats on the shore and buildings of Blankenberge in the distance (image is subject to copyright, but can be viewed online here: <https://www.sothebys.com/en/buy/auction/2019/european-paintings-drawings-and-sculpture/hermann-herzog-sunset-on-the-belgian-coast-at>)



Figure 39: (ID 461) Blankenberge 1865 (Courtesy of Stadsarchief – De Benne, Blankenberge)



Figure 40: (ID 454) Blankenberge early 17th century (Courtesy of Stadsarchief – De Benne, Blankenberge)



Figure 41: ID 459 Beach and changing huts (Courtesy of Stadsarchief – De Benne, Blankenberge)

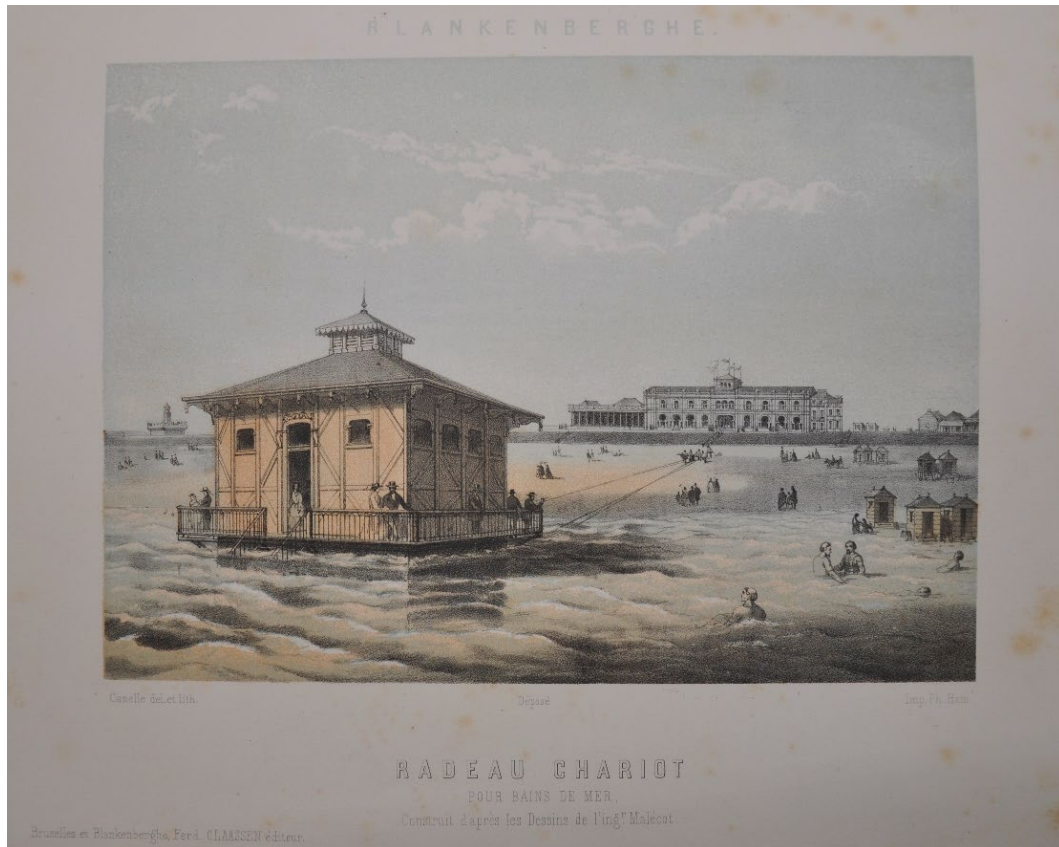


Figure 42: (ID 450) Sea Cabin at Blankenberge (Courtesy of Stadsarchief – De Benne, Blankenberge)

4.1.4 Field Survey of Art Locations

Following scoring of the artworks a number of examples have been the subject of more detailed analysis involving a site visit. Where it was practical to gain access and relevant to the study, present day photographs were taken in the field to try, as far as possible, to match the views painted by the nineteenth and early twentieth century artists. It also provided the opportunity to assess the conditions of the shore to note changes that may have taken place over time. This ensured that thorough comparison could be made between the situation depicted in the artwork and the present-day situation.



Figure 43: Although the modern photograph (right) isn't from exactly the same angle it shows the form and extent of the dunes which can be compared to the art work (left) (ID 460) Blankenberge Dunes (Courtesy of Stadsarchief – De Benne, Blankenberge)



Figure 44: ID 456 Beach and dyke (Courtesy of Stadsarchief – De Benne, Blankenberghe), and a modern image looking up the beach towards the frontage.

4.2 Photographs

Photographs are an invaluable resource to support coastal change studies because they represent true depictions of the landscape; there is not the need to rank them in the same way as artworks (where views may be susceptible to interpretation and variation). For photographs to be used to assess how they can support studies of coastal change the two key issues are the content (in terms of what the image tells us) and the quality of the image. Because of the dynamic nature of this coastline historic photographs can be a particularly valuable resource with many historic photos containing depictions of the shore and sea front with recognisable heritage features nearby, including buildings, quays and bridges. These can be compared to the modern situation and from this an accurate idea of the rate of erosion since the date of the photograph can be gained.

A total of 19 historic photos were assessed as part of the project, images include those from locations within the pilot area where historic paintings and archaeological sites were also known. The photographs were collected and then scored using the methodology outlined in SARCC Maritime Atlas: Methodology Report (MAT, 2022). The study and scoring of historic photographs highlights the potential for historic photos to provide information on coastal change. Sources and archives used included a range of national, regional and locally based resources that are available online.

4.2.1 Results of scoring

This pilot area has a range of available historic photographs and postcards many of which depict the aftermath of storms.

19 photographs were entered into the project database and their scoring results are included below. Figure 45 shows the distribution of the images and the table has the detail of their subjects and scores.

| Image ID | Title | Year | Purpose | Score Heritage View | Physical Image State | Total Score |
|----------|-------------------------------------|------|-----------|---------------------|----------------------|-------------|
| 1296 | Blankenberghe vue pris des dunes | 1926 | Touristic | Detailed View | Good | 100 |
| 1328 | Lighthouse and villas Blankenberghe | 1890 | Unknown | Detailed View | Good | 100 |
| 1447 | Blankenberghe New Lighthouse. | 1951 | Unknown | Detailed View | Good | 100 |
| 1297 | Blankenberghe port entry | 1919 | Touristic | Identifiable period | Good | 77 |
| 1298 | Stormy weather at Blankenberghe | 1919 | Touristic | Identifiable period | Good | 77 |
| 1326 | The beach and Kursaal Blankenberghe | 1890 | Touristic | Identifiable period | Good | 77 |

| | | | | | | |
|------|--|------|------------|-----------------------------|------|----|
| 1327 | Pier and shore Blankenberghe | 1890 | Touristic | Identifiable period | Good | 77 |
| 1329 | Blankenberghe Pier 2007 | 2007 | Unknown | Identifiable period | Good | 77 |
| 1360 | WW1 bunker in the dunes | 1914 | Propaganda | Identifiable period | Good | 77 |
| 1363 | Blankenberghe Pier 1919 | 1919 | Unknown | Identifiable period | Good | 77 |
| 1364 | Blankenberghe pier with fishing boat | | Unknown | Identifiable period | Good | 77 |
| 1410 | Villas in the dunes at Knokke at the end of the 19th century | 1890 | Unknown | Identifiable period | Good | 77 |
| 1448 | Blankenberghe Fort and lighthouse. | 1872 | Unknown | Identifiable period | Good | 77 |
| 1359 | Blankenberghe beach 1890-1905 | 1890 | Unknown | Identifiable period | Fair | 66 |
| 1361 | Blankenberghe building the casino | | Unknown | Identifiable period | Fair | 66 |
| 1295 | Waves on bridge at Blankenberghe | 2013 | Unknown | | Good | 55 |
| 1362 | Blankenberghe hotel with dunes in the foreground | | Unknown | No chronological indication | Good | 55 |
| 1365 | Blankenberghe Pier 1961 | 1961 | Touristic | No chronological indication | Fair | 44 |

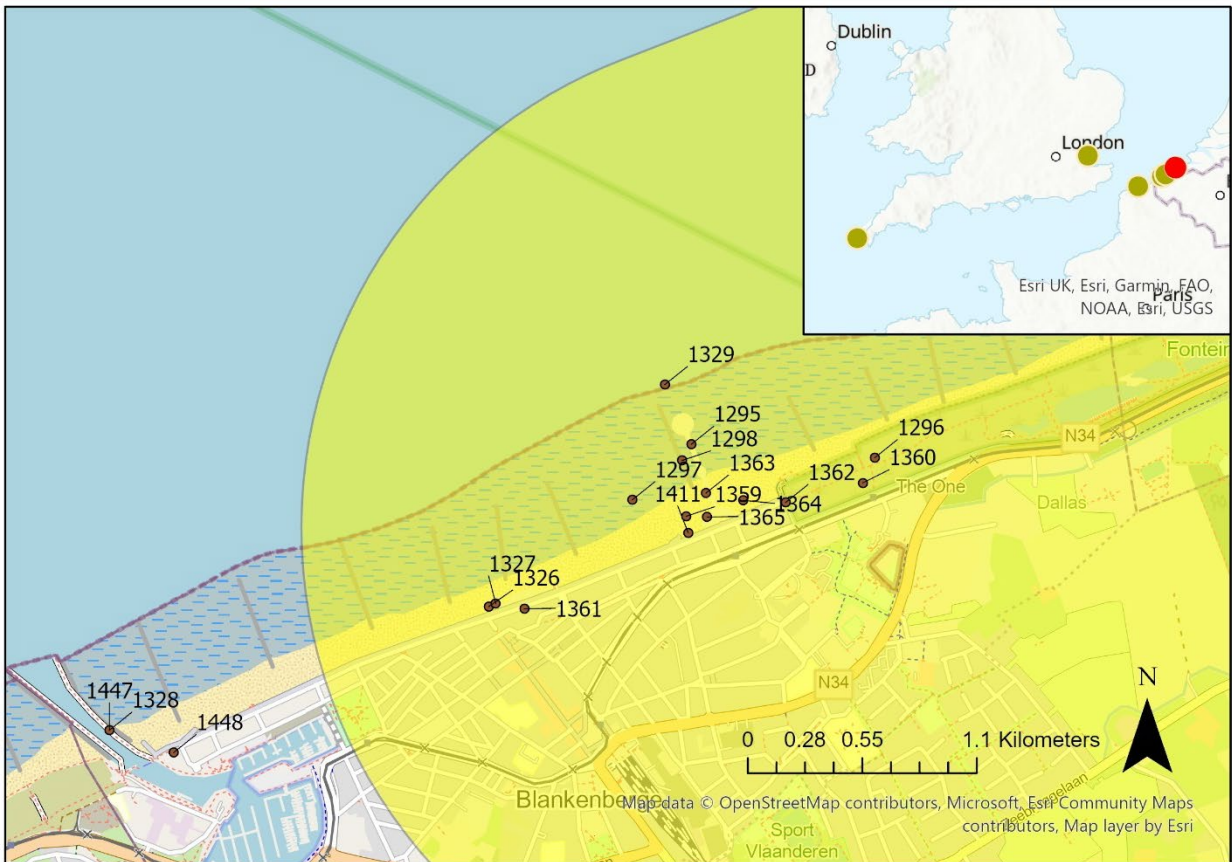


Figure 45: Distribution of high scoring historic photographs and postcards around the Blankenberghe Pilot Area.

4.2.2 Discussion of scoring results

All of the high scoring photographs from the Pilot Study area were within the category of 'heritage view'. Many contained features or buildings that can be identified today, or were images across or along the coast showing changes, examples of these are shown in Section 4.2.3 and within Section 5. The oldest photograph dates to 1872 (ID 1448), it features Blankenberge Fort and Lighthouse (Figure 46), it is an example where these features no longer exist, but they can be seen in a number of the art works and maps.

Figure 47 provides an interesting view of the Blankenberge Hotel [ID 1362] and shows the sand dunes directly adjacent to the hotel and appear to extend in front of the hotel as well. Although there isn't a specific date for this photograph it shows the form of the dunes and changes that have since occurred along the frontage.

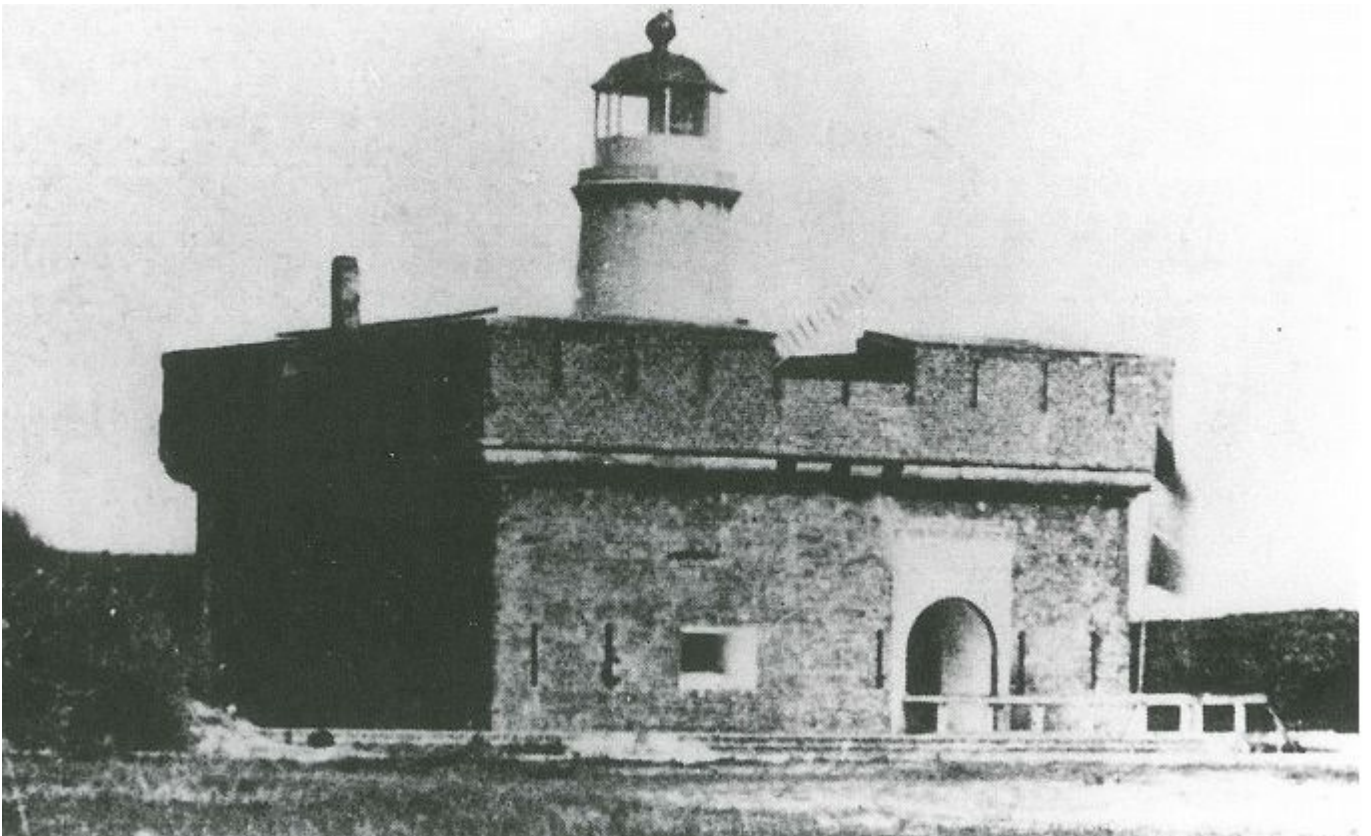


Figure 46: Blankenberge Fort and Lighthouse from 1872 [ID 1448]



Figure 47: Blankenberge Hotel with dunes in foreground [ID 1362]

4.2.3 Field Survey of Photograph Locations

Following scoring of the photographs a number were the subject of more detailed analysis involving a site visit. Where it was practical to gain access and relevant to the study, present day photographs were taken in the field to try, as far as possible, to match the views. It also provided the opportunity to assess the conditions of the shore and to note changes that may have taken place over time through comparison of the features shown in historic photographs and the present-day situation. Examples are included below (Figures 48 – 50), with further examples in Section 5.



Figure 48: (left) Historic photograph 'Dunes East of Blankenberge' [ID 1296], with the comparative modern day image (right).



Figure 49: (left) Blankenberge Pier 1919 [ID 1363], with the comparative modern day image (right).



Figure 50: (left) Blankenberge New Lighthouse in 1951 [ID 1447], with the comparative modern day image (right).

5. Combined Application for Analysis of Coastal Change

The above sections have demonstrated the potential of each type of resource – archaeological, palaeoenvironmental, artistic, maps and charts and photographs – to be assessed and analysed to inform on the scale and pace of coastal change. When these resources are utilised together to look at particular areas or features this provides an exceptionally powerful set of data to be able to understand the long-durée of the coastline. In addition to the frontage that is directly adjacent to the Pilot Area there are a number of other features in the nearby area which help show and understand how the local shoreline has changed. These are explored further here.

5.1 Pier

Why selected for detailed study: The first pier was built in Blankenberge in 1894 as an attraction to draw tourists to the developing seaside resort. This key maritime feature is close to the SARCC pilot site and has a particular relationship with the sea level and coastal frontage.

Detail from scoring of available resources: The Pier is a dominant building on the foreshore in Blankenberge. It appears across the range of scored resources. Figure 51 shows a combination of these showing the Pier over time.

- Archaeology – The pier is listed as a historic monument. It scored 44 in the Archaeology scoring (ID 4963)
- Maps/ Charts – the earliest map found that marks the position of the pier was 1913. There are relatively few charts from the more modern periods in the dataset, however, they can be used to show development around the pier close to the foreshore.
- Art – Two of the top scoring paintings feature the original pier (ID 421 and ID 449). ID 421 captures the frontage of the pilot area.
- Photographs – Both the original and current piers can be seen in many historic photographs and postcards. Figure 51 includes a photo of the original pier before and after its destruction and modern views of the current pier.

How the combined resources inform on coastal change: The first cast iron pier at Blankenberge was quite short-lived. Built in 1894 it was deliberately destroyed twenty years later at the outset of World War One. Postcards and art of the time show busy beach scenes, with people on the beach and boats sailing around the end of the pier. Rebuilt in the same position in 1933, the current Art Deco pier is 350m long and constructed of concrete.

The position of the pier can be used to show changes to the adjacent foreshore and buildings and its location has been used to compare views from art works and historic photographs. The change in material construction of the pier also helps date pictorial resources showing coastal changes. Figure 51 shows an aerial drawing of the original pier and an aerial photograph of the current pier. The change in buildings, and particularly their height and their density along the seafront is clear to see.

Blankenberge Pier

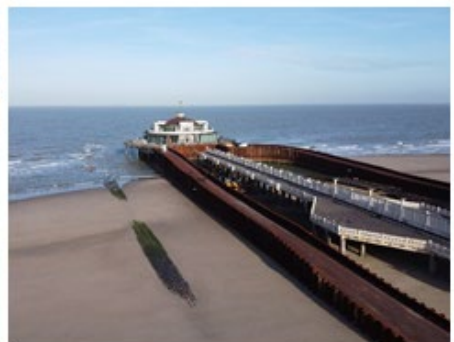


Photographs of the original pier dated between 1894-1914 (left) (ID 1364) and (ID 1327)

Pencil drawings of the original pier (ID 449 and ID 421) (right). Artists and dates unknown.



Photo (Above): Pier after its destruction in 1914 [ID1363], (right) map from 1937 showing position of current pier [ID372]



Historic photo of the pier from 1961 [ID1365] (left) and comparison with modern views (right)

Figure 51: Combined resources used to understand changes in relation to the Pier

5.2 Lighthouse

Why selected for detailed study: The current lighthouse was built at the harbour, to the west of Blankenberge in 1950, replacing a previous lighthouse built in the same location in 1872. This key maritime feature is close to the SARCC pilot site and has a particular relationship with the sea and the fishing industry. This was the third position for a lighthouse, the sources chart the history and position of two previous lighthouse locations. Two modern lighthouses have been added to the harbour arms in the 20th century.

Detail from scoring of available resources: Lighthouses are dominant buildings often featured on maps, in artwork and photography. The lighthouse in its current position in Blankenberge appears across the range of scored resources. Figure 52 shows a combination of these. These sources also reveal a former Napoleonic lighthouse and an even earlier position from the early 14th century.

- Archaeology – The 1950 lighthouse is a protected monument. There is no trace of the former lighthouses.
- Maps/ Charts – There are relatively few charts from the more modern periods in the dataset, however, they can be used to show development around the lighthouse close to the foreshore. Older maps record the position of the Napoleonic lighthouse. No evidence was found for the earlier positions.
- Art – Both the Napoleonic lighthouse and the two lighthouses in the current position feature in art works. The date of these art works reveal that in 1890, the Napoleonic and harbour lighthouse coexisted.
- Photographs – A high scoring photograph for Blankenberge (ID 1328) dated 1890, is the earliest photograph found of the first harbour lighthouse built in the current location. An undated photograph of the Napoleonic lighthouse was also found (ID 1448).

How the combined resources inform on coastal change: Records reveal that the first lighthouse dates from 1337 and was built to assist fishermen landing their flat-bottomed boats directly on the beach. Located to the east of Kerkstraat in the dunes, this lighthouse was a primitive wooden mast, anchored with chains and rocks, with a lantern placed on top. After this burnt down several times, it was replaced in 1526 with a stone tower. In 1771, there were concerns that the straw fuelled lighthouse was a danger to the city, so it was moved further east. This was damaged during the Napoleonic war and was out of use by 1795. The position of the first lighthouse in the dunes to the east is beyond the area covered by Blaeu's map of 1652 (ID 203).

The Napoleonic fortified watchtower was built in the dunes to the east of the city between the years 1795-1814. In 1817 a light beacon was added. This position is marked 'Phare' on Vandermaelen's map of 1854 (ID 267) and is shown in pictorial form on the 1865 map (ID 461). It is also captured in historic photograph (ID 1448) and art works (ID 446-448).

Once the building of the harbour (to the west of the city) was completed, a lighthouse was added in 1872. This marks a shift in the location of maritime activities. The patterned brick harbour lighthouse can be seen in artwork (ID 422) and historic photo (ID 1328). The 17m high octagonal tower dominated the landscape. This lighthouse provided accommodation for its keeper below.

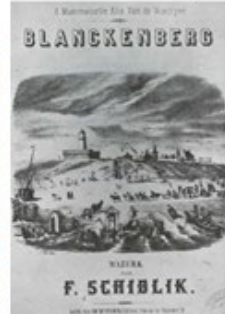
Two artworks dated 1890 (ID 446 and ID 447) capture the Napoleonic lighthouse. They are contemporary with the 1890 photograph (ID 1328) showing the new harbour lighthouse, suggesting that the two lighthouses stood at the same time. However, histories of the Napoleonic watchtower suggest it was demolished in 1873.

During World War Two (1944) the brick harbour lighthouse was destroyed by the German army to make way for trenches that were part of the Atlantikwal defences. A new round lighthouse in the 'nautical style' was built in the same location in 1950, this is the lighthouse that stands today. A nautical museum is housed below the tower. In 1955 a lighthouse was added on the east mole and another on the west mole in 1973.

Lighthouse



Top left: View from the sea c1880-1920 (ID 422), Top right photograph (ID 1328) dated 1890 both showing the lighthouse built in 1872, destroyed in 1944. Bottom left: The lighthouse built in 1950 (ID 1447 date unknown), Bottom right - a comparative modern view (MAT 2021).



Sources from 1890 showing the Napoleonic lighthouse that was east of the city: left artwork ID446, middle poster ID447 and right photograph ID1448.



Left: Vandermaelen's Map of 1854 (ID267), Right ID 461 showing the position of the Napoleonic lighthouse
Figure 52: Combined resources used to understand changes in relation to the lighthouses over time

5.3 Fisherman's houses

Why selected for detailed study: Two late 18th century fisherman's houses survive in Breydelstraat. 'Huisje van Majutte' is named after the last fishermen to live there, Jan Majutte (1874). Pe Majutte was the fisherman's nickname of the Debruyne family who lived here for several generations. The other known simply as '27'. These whitewashed brick houses were built at the end of the 18th century.

Detail from scoring of available resources:

- Archaeology – The two Fisherman's houses are protected monuments. They appear in the top scores as ID 5329 (Majutte) and ID 4841 (no.27), both scoring 44.
- Maps/Charts – Buildings can be seen built into the dunes on Vandermaelen's 1854 Map (ID 267) and the houses can be seen pictorially on the 1865 map (ID 461). There are relatively few charts from the more modern periods in the dataset, however, they can be used to show development around the house.
- Art – No artworks featuring the houses have been found.
- Photographs – No historic photographs of the houses have been found.

How the combined resources inform on coastal change: Built in the late 1700's the houses are too late for Blaeu's map of 1652 but can be seen on Ferrais' map of 1777, Vandermaelen's map of 1854 and the 1865 map. Breydelstraat, just behind the Zeedijk was the historic fishing quarter of Blankenberge. The fisherman's houses were built into the dunes, the closest to the seafront at that time. Around 1815, forty of these houses remained but they, like the dunes, have been lost over the years to modernisation and now only two remain. As the development of Blankenberge edged further towards the coast, this once main street has been reduced to a service road and the dune area has disappeared entirely and has been replaced by buildings (Figure 53).

Fisherman's Houses



Left: Huisje van Majutte a single storey two bay house, Right 'Number 27' one & a half storeys. Both have pitched plinth saddle tiled roofs (Source <https://inventaris.onroerendergoed.be/erfgoedobjecten>). House design is similar in style to those seen in Blaeu's map of Blankenberge 1652 (ID 203) (below left).



Top Right: Ferrais map of 1777 (ID202) with buildings built into the dunes in Breydelstraat, above left 1865 map (ID461) with houses built into dunes, above right map of the position of the buildings within the current city scape (coloured blue), modern building extend over what was the dune landscape.

Figure 53: Combined resources used to understand changes in relation to the fishermen's houses over time

5.4 Dune Frontage

Why selected for detailed study: The whole frontage at Blankenberge used to be a continuous grassland dune landscape. Over the years, the city has edged forward, and buildings have replaced the dunes. The SARCC Pilot project is situated adjacent to the dune frontage.

Detail from scoring of available resources: The dune frontage appears across the range of scored resources. Figure 54 shows a combination of these.

- Archaeology – five of the top scoring sites are informative for changes to the dune frontage (ID 5294, ID 4839, ID 4855, ID 5260 and ID 4905).
- Maps/Charts – The dune frontage can be seen intact on maps ranging from Blaeu’s Map of 1652 (ID 203) to the 1865 map (ID 461). There are relatively few charts from the more modern periods in the dataset, however, they can be used to show how development has spread over the former dune frontage.
- Art - Only one image of the dunes scored highly – ID 460 at 62.
- Photographs – A number of historic photographs captured the dune frontage (ID 872, ID 1296 and ID 1361).

How the combined resources inform on coastal change:

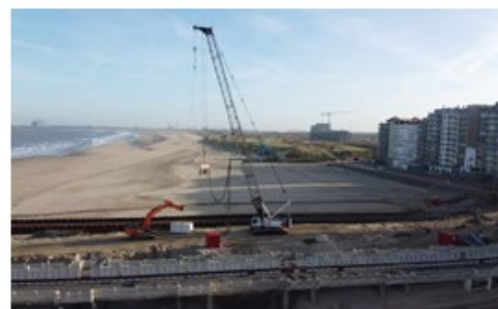
The Paleoenvironmental site ID 5294 (scored 77) identified as ‘The Fountains and Surroundings’ it is a surviving section of undisturbed dune grasslands representative of the landscape that once existed all along this stretch of coastline. This protected landscape extends east of Blankenberge to Zebrugge (the start of it can be seen in MAT 2021 photograph in Figure 54). The De Fonteintjes was created by 15th century land reclamation. Active sand migration still occurs on these dune grasslands, making them rich in flora and fauna. During the Second World War the dunes here were fortified. One bunker was dismantled, and the other has become buried. A photograph of the bunkers is held by the National Archives (ID 1360).

Site ID 5260 (scored 55) marks the site of the first building constructed on the Zeedijk in 1850 - ‘The Pavilion De Rycker’ This was converted into a four-storey hotel in 1873 (photo ID 872 above). In 1897, it was extended to seven-storeys and renamed the ‘Grand Hotel Pauwels-D’Hondt’ (photo ID 1296). Today, it is an apartment block. Ten years later, construction of the casino further along the Zeedijk began (Photo ID 1361) which was cut into the dunes. Several art-deco guest houses built on the Zeedijk are protected for their architectural value (ID 4839 and ID 4855). Their listing record reveals their construction dates to 1926. This marks the time when the dune frontage was rapidly being replaced with buildings associated with the rise in tourism.

Dune Frontage



Maps showing the dune frontage intact until 1865. Top left Blaeu's Map 1652 (ID 203). Top right: Ferrais Map 1777 (ID 202), middle left 1843 Map (ID 365), middle right Vandermaelen's 1854 Map (ID 267), bottom left 1865 map (ID 461). Bottom right. The current aerial view shows the dune frontage missing.



Above: First hotel built into the dunes c.1873 (ID872); above middle view c1897 (ID1296); above right modern view. Right construction of the Casino on the Zeedijk 1884-6 (ID1361); far right art work dated 1841 (ID460).



Figure 54: Combined resources used to understand changes in the dune frontage over time

6. Conclusions/ Recommendations

The variety of available sources for the Blankenberge Pilot Study has demonstrated the potential of the SARCC scoring approach that has been applied to identify those resources of particular importance for understanding the long-durée of the coast.

Evidence from archaeological and historical sites provide evidence from early historic periods through to the Second World War. Combining the archaeological and historic data with artistic resources, including historic maps, charts, photographs and artworks allows us to understand change from prehistory up to the present day. Through a better understanding of how the Blankenberge area developed, and in particular how the frontage and dune system became what it is today, coastal managers will be better placed in planning for the future.

The combination of the various available sources of data have provided detail on the form and scale of change over time – particularly with the building of structures further out into and eventually across the dune frontage. This information is of importance to the coastal scientist.

In many coastal locations detailed monitoring has taken place for less than twenty years. This pilot study helps explain the rate of change over past centuries as a result of sea level changes, human construction and the relationship of this with apparent periods of increased storm frequency. These data can supplement existing and future monitoring of trends and can support predictions for the future.

7. References

Adriaan, M. J. De Kraker, 2006, Flood events in the southwestern Netherlands and coastal Belgium, 1400–1953. *Hydrological Sciences–Journal–des Sciences Hydrologiques*, 51(5) October 2006 Special issue: Historical Hydrology.

All Saints Flood, [http://www.deltawerken.com/All-Saints-flood-\(1570\)/304.html](http://www.deltawerken.com/All-Saints-flood-(1570)/304.html), accessed November 2021.

Art-Deco Guest Houses <https://inventaris.onroenderfgoed.be/erfgoedobjecten/45060>, accessed November 2021.

Baeteman, C. (2013). History of research and state of the art of the Holocene depositional history of the Belgian coastal plain. In: Theon, E., Borger, J. G., De Kracker, A. M. J., Soens, T., Dries, T., Vervae, L. and Weerts, H. J. T. (Eds). *Landscapes or Seascapes? The history of the coastal environment in the North Sea area reconsidered*. Brepols, Belgium, pp 11–30.

Belle Epoque Centre, 2021, Wikipedia: <https://www.visit-blankenberge.be/en/belle-epoque-centre> Accessed November 2021.

Blankenberge, 2021, Wikipedia, <https://nl.m.wikipedia.org/wiki/Blankenberge>. Accessed November 2021

De Clercq, M., Vos, P., Missiaen, T. & Pieters, M. (2013). *Archeologische en Geoarcheologische indicatoren*. Internal report IWT SBO Project 120003 "SeArch".

De Scute, 2021, B1 Saint Peter's <https://descute.be/projecten/b1-sint-pieter/> Accessed November 2021.

Dunkirk Transgression (2021), Wikipedia. https://en.wikipedia.org/wiki/Dunkirk_transgression . Accessed November 2021

Ervynck, A., Baeteman, C., Demiddele, H., Hollevoet, Y., Pieters, M., Schelvis, J., Tys, D. and Van Strydonck, M. (1999). Human occupation because of a regression, or the cause of a transgression? A critical review of the interaction between geological events and human occupation in the Belgian coastal plain during the first millenium AD. *Probleme der Küstenforschung im südlichen Nordseegebiet*, 26, 97-121.

Fisherman's Cottage <https://inventaris.onroerendergoed.be/erfgoedobjecten/44837>, accessed November 2021.

Flanders Inventory, 2021, Old Town Hall of Blankenberge: <https://inventaris.onroerendergoed.be/erfgoedobjecten/44915>. Accessed November 2021.

Grand Hotel Pauwels-D'Hondt <https://inventaris.onroerendergoed.be/erfgoedobjecten/45048>, accessed November 2021.

Lighthouse <https://inventaris.onroerendergoed.be/erfgoedobjecten/45044>, accessed November 2021.

McInnes, R. 2014, The art of the Channel-Southern North Sea Region. Arch Manche Technical Report https://archmanche.maritimearchaeologytrust.org/uploads/images/Documents/Technical_Report_Section_One.pdf

McInnes, R. & Stubbings, H., 2010. *'Art as a Tool in Support of the Understanding of Coastal Change in East Anglia'*. The Crown Estate. 92 pps.

McInnes, R. & Stubbings, H., 2011. *'A Coastal Historical Resources Guide for England'*. The Crown Estate. 91 pps.

McInnes, R. & Benstead, S., 2013a. *'Art and Coastal Change in Wales'*. The Crown Estate. London.

McInnes, R. & Benstead, S., 2013b. *'Art and Coastal Change in Scotland'*. The Crown Estate. London.

McInnes, R. & Benstead, S., 2015. *'Art and Coastal Change in Northern Ireland'*. The Crown Estate. London.

Pieters M., Missiaen T., De Clercq M., Demerre I., Van Haelst S. (2020) Belgium: Prehistoric and Protohistoric Archaeology in the Intertidal and Subtidal Zones of the North Sea. In: Bailey G., Galanidou N., Peeters H., Jöns H., Mennenga M. (eds) *The Archaeology of Europe's Drowned Landscapes*. Coastal Research Library, vol 35. Springer, Cham. https://doi.org/10.1007/978-3-030-37367-2_9

Stillwell, R. et al, 1976, *The Princetown Encyclopaedia of Classical Sites*. Princetown University Press.

The Fountains and Surroundings <https://inventaris.onroerendergoed.be/erfgoedobjecten/135127>, accessed November 2021.