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2 Seas Mers Zeeën SARCC

European Regional Development Fund

Pilots — SARCC - Sustainable And Resilient Coastal Cities



SARCC EDUCATION RESOURCES

RESOURCE GUIDE FOR TEACHERS



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**SARCC
Pilot Areas**

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This series of education materials will assist learners with methods to identify features that can be used to indicate coastal change. Learners will explore the impact of climate change on urban coastlines and how the SARCC Project and Nature Based Solutions can have a role in reducing the impact of rising sea levels and tidal surges.

Scientists and archaeologists have researched the coastline to explain these discoveries. This research has extended to the seabed and revealed generations since prehistory lost land and property due to rising sea levels.

Visual representations in the materials provide insights into past natural and anthropogenic adaptations along the coastline. Many of the historic changes made by humans such as the lowering of the land by peat or water extraction, the building of dikes and the creation of hard sea walls have interfered with natural processes resulting in increased impacts on the coastline and the coastal plain.

The [SARCC Visualisation Tool](https://maritimearchaeologytrust.org) (maritimearchaeologytrust.org) that features in this series creates an interactive platform for students to become an active voice for the SARCC Project and Nature Based Solutions.



The Visualisation Tool



11,500 years ago the global oceans were about 40m lower than today. When the climate warmed, the ice sheets melted and sea level rose rapidly. Within 6,000 years there was a rise of around 40m. This had **three** significant consequences for the SARCC areas under study.

Lesson 6 Changing Coastlines

Materials:

- SARCC Work Book
- Pencil
- Medium sized container
- Sand
- Water
- Water bottle

LESSON GUIDE

Work Book Page 2:

- Case Study: Bouldnor Cliff which has been discovered because the shoreline is eroding away. Allow students to be part of a prehistory settlement and collect items outside. See Work Book. Emphasis about peat surfaces/marine silts that preserve burnt flints, charred hazelnuts and worked timbers. See Work Book images.

Work Book Page 3:

- Provide students with an introduction and overview of the three key points below.

Firstly, as the ice caps shrank the weight on the earth's crust was redistributed, initiating an adjustment which caused some of the land and associated coastline in the south to fall relative to the sea and some areas to the north to rise.

Secondly, fast flowing rivers carried the glacial melt water to the sea and with it vast quantities of eroded soils and terrestrial, windblown sands were introduced into the maritime system.

Thirdly, coastlines were and still are, being reshaped. Soft cliffs have been worn away, new marine waterways opened up and currents are continually evolving to transport all the eroded marine sediments around the shallow seas and coastlines. Complete the Coastline Erosion Experiment. Guidance notes are on page 3 of the SARCC Work Book.

RESOURCES

- Review past lessons on global warming and coastal flooding. View Southend On Sea Education Pack.
- [Maritime Archaeology Trust - SARCC - YouTube](#)

Students will be able to:

- Explore submerged landscapes and describe past changes along the coastline.
- Explain the impact of rising sea levels along the coastline.
- Complete the Coastline Erosion Experiment and apply key terminology.

KEY FACTS

When the climate warmed, the ice sheets melted and sea levels rose by 130m. Coastlines are being reshaped as sea levels rise.



The SARCC project looks at historic trends and long term patterns of change by researching case studies and pilot sites. This has been achieved with a variety of tools that can be used as coastal change indicators. Coastal flood plans and policies focus predominantly on deploying traditional grey infrastructure/heavy engineering and ignore the use of nature-based solutions (NBS), despite the overwhelming evidence of their potential to reduce flood risk and provide multiple benefits.

Materials:

- SARCC Work Book
- Pencil
- Access to the Visualisation Tool.

LESSON GUIDE

Work Book Page 4: How does the SARCC project look at historic trends and long term patterns of change along the coastline? What can these patterns tell us about the changing coast?

- Introduce students to the SARCC project and key terminology. Explore the meaning of sustainable and resilient and offer examples. Open class discussion. Guide students to create a newspaper article about changing coastlines and Nature Based Solutions. NBS introductory video (2mins) can also be shown. Link below.
- Introduce students to the concept of grey infrastructure working in opposition to the sea where it is constantly under attack from rising sea levels and expensive to sustain. Ask students what alternatives are there to grey infrastructure and how this may benefit the community. Think of the costs and managing coastline defences.
- Historic patterns of change have been analysed by way of studying archaeology, art, photography, maps and charts.
- View the Visualisation Tool for further images.

KEY FACTS

The SARCC project has assessed the historic trends and long term patterns of change within case studies and pilot sites from Cornwall to the Netherlands.



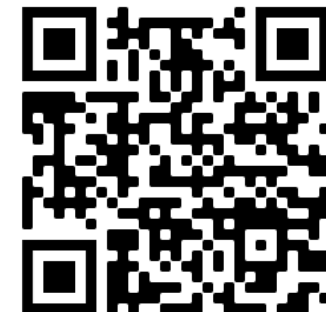
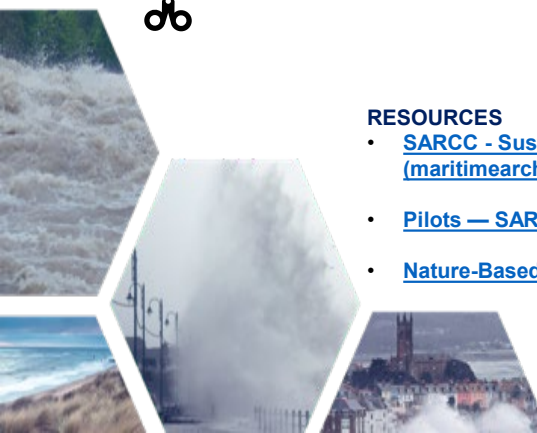
RESOURCES

- [SARCC - Sustainable and Resilient Coastal Cities Interactive Visualisation Tool \(maritimearchaeologytrust.org\)](https://maritimearchaeologytrust.org)
- [Pilots — SARCC - Sustainable And Resilient Coastal Cities](#)
- [Nature-Based Solutions in Coastal Cities - The SARCC Project - Bing video](#)

Lesson 6 - continued Changing Coastlines

Students will be able to:

- Apply SARCC terminology.
- Explore various pilot areas and evidence of coastal changes.
- Complete a Newspaper article or recording of class research.



Many of the recent changes made by humans have interfered with natural processes resulting in increased impacts on the coastline and the coastal plain.

Materials:

- SARCC Work Book
- Pencil
- Access to the Visualisation Tool.

KEY FACTS

When breaches along the shoreline did occur, as happened from the Middle Ages onwards the impact was magnified where humans had manipulated the coastline.



LESSON GUIDE

Work Book Page 5:

- Students can consider the people that lived in the area and built structures along the coastline.
- View the image and consider shipping through ports which people travelled and shaped global trade and movement. Use the art work to demonstrate key features along the coastline with key emphasis on erosion undercutting peat. Students can complete the Q&A from exploring the image for the answers.

Work Book Page 6:

- Pilot Area Case Study. Newlyn Harbour in England. Students can identify key changes in Newlyn Harbour via the images.
- Extension with images from Gravelines in France.

Key question answers:

1. It will become submerged and overwhelmed.
2. Increased costs for repair, restoration, relocation and loss of trade and commerce.

Work Book Page 7:

- Create a Story Board about Nature Based Solutions. Revisit the video to direct students.

RESOURCES

- [Nature-Based Solutions in Coastal Cities - The SARCC Project - Bing video](#)
- [Pilots — SARCC - Sustainable And Resilient Coastal Cities](#)

**Lesson 7
The Story Of Humans
Along The Coastline**

Students will be able to:

- Explore how people interact with the coastline.
- Complete compare and contrast exercise using images.
- Describe two pilot area case studies.



To demonstrate changes on the ocean floor we can look at shipwrecks and submerged landscapes. When shipwrecks rest on the sea floor, they are broken down over time by chemical action, changing ocean currents and tides. These artefacts can tell us about the people whose land was drowned and about changes to the landscape as sea level rose. Archaeological research can tell us about these changes.

Materials:

- SARCC Work Book
- Pencil
- Access to 3D Images

LESSON GUIDE

Work Book Page 8:

- Students can explore how shipwrecks become time capsules that reveal change on the seafloor. Evidenced by looking at changes to the seabed, collapsed wreckage, and how the site becomes an artificial reef for various underwater flora and fauna. Seagrass provides protection for shipwreck artefacts and can be used as a regional example. Emphasis on changes to shipwrecks/sea floor due to changing currents and tidal surges.

Work Book Page 9:

- Shipwreck case study. 3D imagery model of John Mitchell. Students can explore imagery and create a sketch of the shipwreck. Questions and answers.

Work Book Page 10:

- Create an ocean literacy log for key phrases and meaning. Follow the Life Below Water link on page 8 for printable handouts to assist with extension task.

Work Book Page 11: Cut out cards for students to add summaries.

Work Book Page 12: Work Book review and teacher feedback.

RESOURCES

- [Forgotten Wrecks of the First World War - Interactive Chart](#)
- [John Mitchell Interactive - Maritime Archaeology Trust](#)
- [8,100 yr old drowned landscape - BCV - Aug '21 - 3D model by Maritime Archaeology \(@maritimearchaeologytrust\) \[cc928ba\] \(sketchfab.com\)](#)

**Lesson 8
Past Changes
On The Sea floor**

Students will be able to:

- Explore changes to the sea floor applying the secrets of shipwrecks.
- Discuss links from shipwrecks to changing coastlines.
- Explain submerged landscapes through case study analysis.

**KEY FACTS
Shipwrecks
provide
information about:**

- changes on the sea floor
- global trade and migration
- insights into ancient civilisations and how they become submerged landscapes



KEY FOR TEACHER PLANNING

PA	Paired Activity
GA	Group activity
IA	Independent Activity
KC	Knowledge Check

PERSONAL LEARNING AND THINKING SKILLS

IE	Independent Enquiry
RL	Reflective Learning
TW	Team Working
SMS	Self-Management Skills

TEACHER GUIDANCE NOTES

Teachers may refer to previous lessons and learning on climate change and flooding as a starter activity. Refer to previous work completed and ask students to consider the effect this has had on people who live along the coastline. How has climate change and flooding along the coastline changed the way people live and work?

The Teacher Guidance Notes complement the Work Book included in this series of lessons which provides content that can be used to engage students according to their level. They can also be adapted to the curriculum subject or current mode of study.

The Work Book provides extended opportunities for students to explore and engage with this subject and teachers may set further research for students. In addition, the Work Book provides a glossary of terms log for students to add words or images to demonstrate application of phrases and their meaning.

SUGGESTED LINKS TO THE NATIONAL CURRICULUM – ENGLAND KS 3/4

English	Acquire a wide vocabulary, an understanding of grammar and knowledge of linguistic conventions for reading, writing and spoken language.
Mathematics	Use standard units of mass, length, time, money and other measures, including decimal quantities.
Science	Waves on water as undulations which travel through water with transverse motion; these waves can be reflected, and add or cancel – superposition. Difference between chemical and physical change making and recording observations and measurements using a range of apparatus and methods.
Citizenship	Different ways in which a citizen can contribute to the improvement of his or her community, to include the opportunity to participate actively in community volunteering, as well as other forms of responsible activity.
Computing	Create, re-use, revise and re-purpose digital artefacts for a given audience, with attention to trustworthiness, design and usability.
Design/Technology	Develop and communicate design ideas using annotated sketches, detailed plans, 3-D and mathematical modelling, oral and digital presentations and computer-based tools.
Geography	Human and physical processes interact to influence, and change landscapes, environments and the climate; and how human activity relies on effective functioning of natural systems.
History	Challenges for Britain, Europe and the wider world 1901 to the present day (First World War) Britain's changing landscape from the Iron Age to the present.

WEBSITE LINKS USED WITH THESE RESOURCES:

- [Nature Based Solutions - Introduction — SARCC - Sustainable And Resilient Coastal Cities](#)
- [SARCC - Sustainable And Resilient Coastal Cities](#)
- [Maritime Archaeology Trust - SARCC - YouTube](#)
- [SARCC - Sustainable and Resilient Coastal Cities Interactive Visualisation Tool \(maritimearchaeologytrust.org\)](#)
- [Pilots — SARCC - Sustainable And Resilient Coastal Cities](#)
- [Nature-Based Solutions in Coastal Cities - The SARCC Project - Bing video](#)
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THESE MATERIALS ALIGN WITH THE 7 PRINCIPLES OF OCEAN LITERACY. FOR MORE INFORMATION YOU CAN ACCESS THE OCEAN LITERACY TOOLKIT BY FOLLOWING THE LINK BELOW:

- [Ocean literacy for all: a toolkit - UNESCO Digital Library](#)
- [The Ocean Decade - The Science we need for the Ocean we want](#)
- [Oceans - United Nations Sustainable Development – Link to Life Below Water Handout - 14 Why-It-Matters-2020.pdf \(un.org\)](#)

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