

2 Seas Mers Zeeën SARCC

European Regional Development Fund

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<https://bit.ly/3VEfppW>

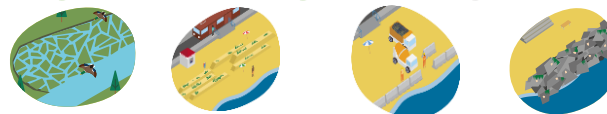
Visit the Visualisation Tool as you work
through this Work Book.



SARCC WORK BOOK

[SARCC - Sustainable And Resilient Coastal Cities](http://WWW.SARCC.EU)
WWW.SARCC.EU

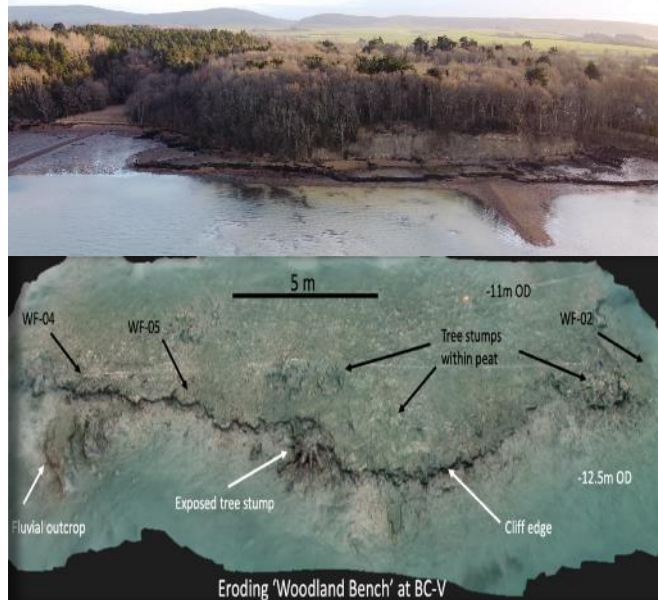
GREENING THE GREY



DID YOU KNOW THERE IS AN Underwater Settlement At Bouldnor Cliff off of the Isle of Wight?

Bouldnor cliff is a mesolithic **submerged landscape**.

Marine archeologists have found tools that have been identified and aged as far back as 8.000 years ago. This underwater settlement is now 11m underwater due to rising sea levels and changes along the coastline.



Below The Water

- [8,100 yr old drowned landscape - BCV - Aug '21 - 3D model by Maritime Archaeology \(@maritimearchaeologytrust\) \[cc928ba\] \(sketchfab.com\)](#)

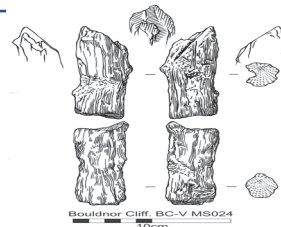
Case Study



Nuts and plants – plant and small animal remains have been found on the site, along with roasted hazel nuts and small quantities of burnt wood.



Worked wood – the oxygen free marine silts of the Solent have resulted in excellent preservation of wood at Bouldnor Cliff. It is even possible to identify tool marks on the wood which show how the wood was cut and formed.



ACTIVITY

Time to step outside. Collect some items such as rocks, wood, twigs and grass. When you have a selection, decide how you could use them. Decide which items could survive for 8.000 years and why. List your answers below.



- 1.
- 2.
- 3.
- 4.

But how did Bouldnor Cliff end up 11m underwater? Let's explore this further.

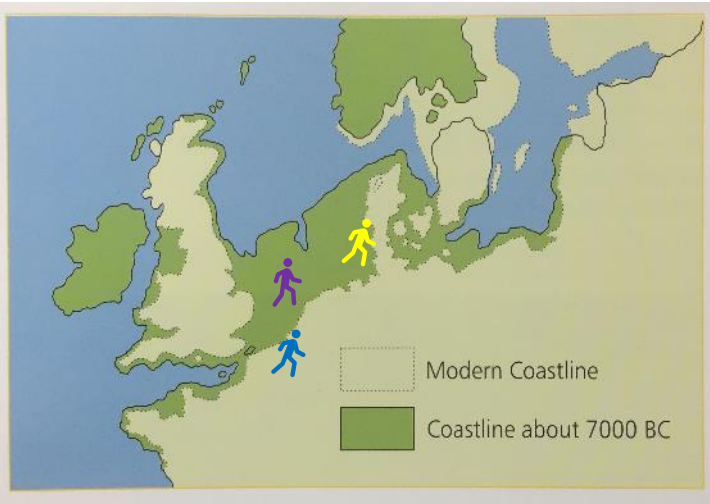
Knowledge Check

- Bouldnor Cliff is the only known underwater Middle Stone Age site in the United Kingdom. It has been discovered because the coastline is changing and the sea bed is eroding away.
- Describe the meaning of a submerged landscape.

Lesson 6 Changing Coastlines

KEY FACTS

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 pilot areas that are being studied.



Approximately
8,000 years ago,
the ice was
melting and sea
levels rose.

COASTLINE EROSION EXPERIMENT INSTRUCTIONS

Materials needed for this experiment.

- Medium sized container
- Sand
- Water
- Water bottle

1. Place sand on one side of the pan. Make it a steep slope. Place some items such as small stones half way up the slope.
2. Pour water into the other side until it's halfway up your sand slope.
3. Place your water bottle on the end with the water. Push the bottle down to create small waves. Do this consistently and evenly for 1 minute.
4. You may make your waves bigger, or keep them the same size. Make observations and note them below. What has happened to the sand and your items?
5. Repeat this experiment without any items on the slope and note the differences.

List below your observations of the Coastline Erosion Experiment.

Go to page 10
and start
building your
ocean literacy
vocabulary log.



Lesson 6 - continued Changing Coastlines

SARCC stands for;

S _ _ _ _ _

A _ _

R _ _ _ _ _

C _ _ _ _ _

C _ _ _ _ _

What does sustainable and resilient mean? Provide examples below.

Do you think using grey concrete blocks to stop coastal flooding is sustainable and resilient as sea levels rise?

For example, dune systems that built up over thousands of years provided natural protection. In recent times, they have been compromised with grey infrastructure that have had the unexpected consequences of lowering beach levels and reducing natural protection. See picture 1 and 2 below.

1. The sea wall between Ostend and Middelkerke. The shapes in the peat were a result of cutting during the Roman period.



2. A map of Oostende in 1706. Can you see where the cartographer has drawn the sand dunes. What did the dunes provide?



Create your headline and article about changing coastlines on a separate page. You may also create a recording about your research.



The SARCC Visualisation Tool has many images to see how the coastlines have changed. Your research task is to find more images from the pilot sites on the Visualisation Tool where coastal erosion can be seen. Add these to your newspaper article.
<https://bit.ly/3VEfppW>

Go to your Work Book Review on Page 12 and add some notes on Lesson 6.

NAME A COASTAL CITY or TOWN or ONE THAT YOU HAVE VISITED.

Lesson 7

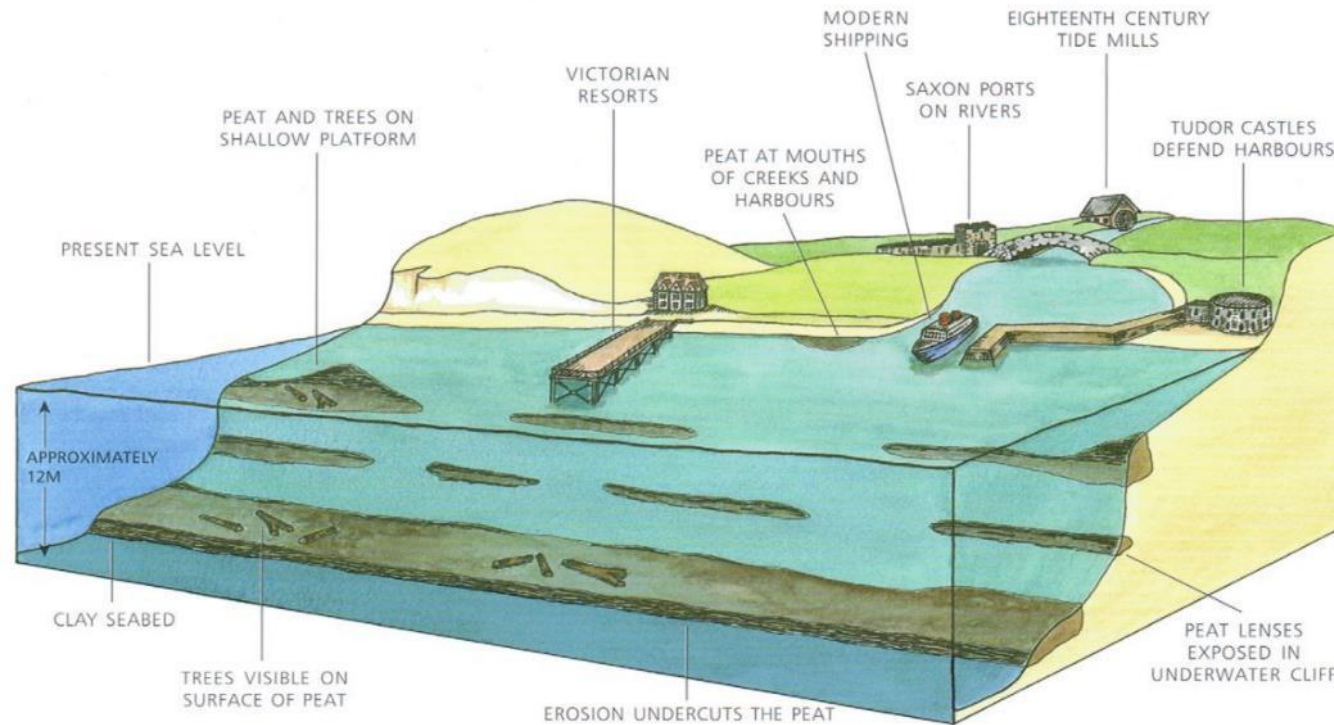
The Story Of Humans Along The Coastline

Over the last couple of thousand years human interaction with the coastline has increased. Structures were built for shipping industries, migration and global trade.
Can you name the types of structures that are built along coastlines.

Answer the following questions.

1. What were built to defend harbours?
2. Coastal erosion can undercut the

3. What has happened to ancient settlements near coastal cities?
4. How can modern shipping effect the coastline?



What do you think will happen to the bridge and the castle?

Go to your Work Book Review on Page 12 and add some notes on Lesson 7.

Discuss your answers with your class.

Pilot Area Case Study Newlyn Harbour

1

Picture 1 and 2 are buildings along the coastline at Newlyn Harbour. Can you spot the differences? List them below and provide a brief description.

2

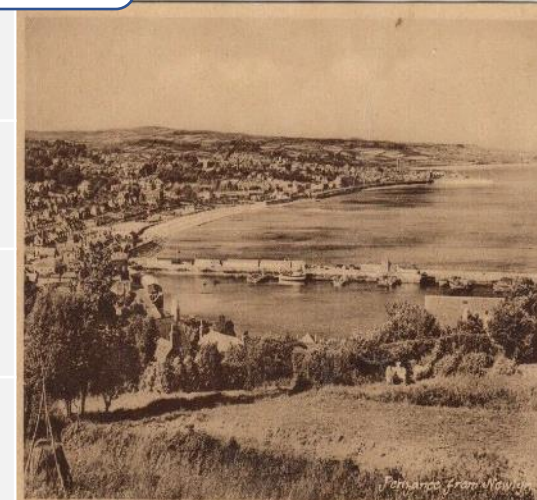


1.

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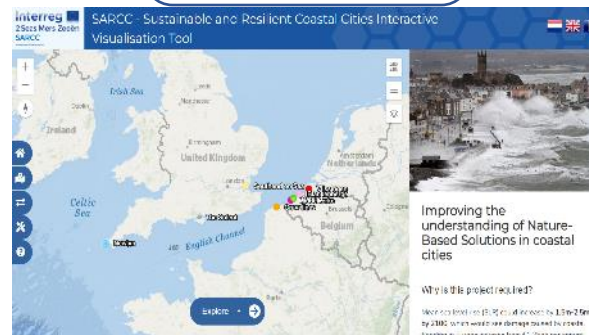


Key questions:

- How will storm surges affect the structures around Newlyn harbour?

- How will rising sea levels affect how people live at Newlyn Harbour?

Go to the Visualisation Tool and look for more images of Newlyn Harbour. How would you protect the harbour from rising sea levels and storm surges?



Extension. See if you can find Gravelines whilst using the Visualisation Tool.



The threatened strip of dunes at Gravelines that has been compromised by the building of houses, against which the sea is funnelled at high tides. How will this affect the people who live in the houses?

Lesson 7 (continued)
The Story Of Humans Along
The Coastline

KEY QUESTION
Which Nature Based
Solution would you choose
to protect our coastlines?
Create your answer in the
Story Board below.

Story Board



Apr'21

Jul'21



Go to your Work
Book Review on
Page 12 and
add some notes
on Lesson 7.

Knowledge Check

What is an
Eco Block?

Lesson 8

Past Changes On The Sea floor

1. By exploring the ocean floor we can understand patterns of change throughout history. One way to do this is to study the life of a shipwreck. Did you know that changes in the marine life on shipwrecks can indicate changes in that part of the ocean?

2. When a shipwreck sinks to the sea bed it becomes a time capsule - a moment frozen in time. Shipwrecks can provide clues from the past for marine archaeologists and reveal who travelled on the ships and the technology that was used. They also show what objects and materials they were carrying and their direction of travel.

3. On the sea floor, the wreck acts as an artificial reef that will provide shelter for numerous species of underwater flora and fauna. For example, coral can grow on hard surfaces while seagrass functions as an anchor, holding sediment in place and protecting fragile timbers and artefacts.

4. When shipwrecks rest on the sea floor, they are broken down over time by the force of waves caused by the weather and tidal currents.

Key Fact
Seagrass meadows can protect shipwrecks and coastal communities from storm surges and erosion.

Climate change and storm surges weaken the seagrass meadows and soft coastlines. When the protective cover of the seagrass is gone, shipwrecks and other sites begin to break down.

We can also look at submerged landscapes. These are landscapes that have been covered over by the ocean as sea levels rise. People that lived on the land left traces of their homes and their lives behind.



Submerged Landscape At Bouldnor Cliff

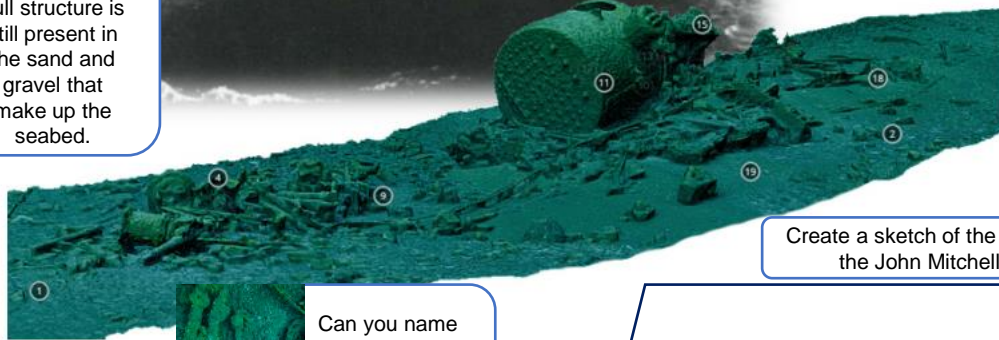
Lesson 8

Past Changes On The Sea floor

Shipwrecks break down but they still contain many secrets that can be revealed for analysis. This shipwreck is called the John Mitchell. It was a wooden steam powered fishing boat and measured 85 foot (25m) in length.

[John Mitchell](#)
[Interactive - Maritime Archaeology Trust](#)

The wooden hull structure is still present in the sand and gravel that make up the seabed.



Can you name the artefact found on the John Mitchell?



Create a sketch of the sea bed and the John Mitchell below.



Go to your Work Book Review on Page 12 and add some notes on Lesson 8.

Knowledge Check

1. What type of vessel was the John Mitchell?
2. What was it made of?
3. What types of marine life would be living on the wreck?
4. What has happened to the wood?
5. How does a shipwreck become a time capsule? Review page 8 for the answers.



	Create an ocean literacy log as you work through this Work Book.	
Eco block	Storm surges	
Erosion The wearing away of rocks, soil, shells and other materials and features.	Submerged landscape	
Global trade	Sustainable	
Nature based solutions		
Peat		
Resilient		
Shipwreck		



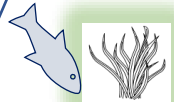
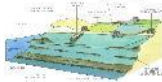
You can also create a recording of your ocean literacy log.

LIFE BELOW WATER: WHY IT MATTERS

Extension research task.
Explore Life Below Water and why it matters. Ask your teacher for the handout.

[14 Why-It-Matters-2020.pdf \(un.org\)](#)

**Cut out the cards and
add a summary.**



SARCC - WHY IT MATTERS

'to help mainstream nature-based solutions (NBS) into coastal management and policy making that will build the capacity of urban leaders, decision-makers involved in coastal flood defenses and understand the additional benefits that they offer in comparison to traditional grey infrastructure'



Knowledge Check

What does SARCC stand for?

GREENING THE GREY

WORK BOOK REVIEW

STUDENT SELF ASSESSMENT



Lesson 6

What did you like about this activity?

Lesson 7

What did you learn about this topic?

Lesson 8

How can I do better?

What did you not like about the activities?

Teacher feedback:

What went well?

Even better if:



- **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](#)
- [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 \(@maritimearchaeologytrust\) \[cc928ba\] \(sketchfab.com\)](#)

- **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 \(un.org\)](#)



SARCC - WHY IT MATTERS

‘to help mainstream nature-based solutions (NBS) into coastal management and policy making that will build the capacity of urban leaders, decision-makers involved in coastal flood defenses and understand the additional benefits that they offer in comparison to traditional grey infrastructure’

Unless stated otherwise, all images and video materials used in these education materials are permissible / owned by the Maritime Archaeology Trust and the SARCC Project Partners collaboratively.

Page	Image Description	Author
3	<p>Picture 1: The sea wall between Ostend and Middelkerke. The shapes in the peat were a result of cutting during the Roman period.</p> <p>Picture 2: A plan of Oostende 1706. Jacobus Harrewijn. Rijksmuseum, CC0.</p>	<p><i>E. Cools, around 1970</i></p> <p><i>A plan of Oostende 1706. Jacobus Harrewijn. Rijksmuseum, CC0, via Wikimedia Commons CC0 1.0 Universal Public Domain Dedication.</i></p>
5	Newlyn Harbour Postcards	<p><i>"Penzance from Tolcarne, Newlyn," Morrab Library Photographic Archive, accessed July 202.</i> http://photoarchive.morrablibrary.org.uk/items/show/13988.</p>
9	Pre – History Village scene Hazelnuts – Wood Post sketch	<p><i>Mike Greeves</i> <i>Rory Quinn</i></p>



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