SeaScapes
Tyne to Tees, shores and seas

Pop-up book

For this activity you need:

- SeaScapes pop up book
- 12 x pop up book cards

How to use this book

- Place book flat and open hinged front cover fully from right to left to retrieve story cards from pockets.
- Half close hinged cover to vertical position, then pull back to prop open the interior pages of the book.
- Use the cards and talking points to help direct your story telling.

Key messages

Our coast has an ancient history as a place of long lost landscapes and civilisations stretching back into geological time.

Our coast has powered the nation, moving from polluting coal, oil and gas to renewable wind power.

Chapter 1
Steamy Swamps (310 million years ago)

Card 1 (back)
Coal spoil fossil

Q&A **What do you think this is?**
It's the fossilised leaves of a tree which lived millions of years ago .

Q&A **What are fossils?**
Fossils are the preserved remains or traces of ancient organisms. Fossils are not the remains of the organism itself! They are rocks. Fossils can preserve an entire organism or just part of one. Bones, shells, feathers, and leaves can all become fossils.

Q&A **Where do you think would be a good place to find a fossil? Has anyone ever found a fossil?**
Fossils can be found on beaches, in sea cliffs, quarries, the stone used to make buildings and in mines.
When coal miners dug out the coal from mines along this coast, they also dug out other rocks which were dumped as unwanted mining spoil. Sometimes this unwanted waste rock reveals spectacular fossil remains.

Particularly after stormy weather you can find rocks containing fossils – mainly fossil plants. You need to take care and watch out for falling rocks from the cliffs if you go fossil hunting on the beach.

Card 1 (front):
Carboniferous swamp scene

Q&A **Where in the world or what kind of place would you find a scene like this?**
In a forest. In a swamp. In the Amazon. In a pond.

Q&A **What kind of creature do you think is shown on the card?**
An amphibian (like a modern frog or toad) which is a creature that lives much of its life in or near to water.

This is a reconstruction of a period of geological time called the Carboniferous (about 300 million years ago). It was a time when this coast was located close to the equator. It was hot and like a swamp with lots of strange looking trees and large insects and amphibians.

By looking at fossils of plants and animals in rocks (e.g. coal) we can learn about our coast's ancient past.

Q&A

What is coal?

Coal is made from dead and decayed plants and trees which have been turned to rock through extreme pressure and/or heat.

DID YOU KNOW?

Diamonds, coal and the graphite in your pencil are all made from carbon. So, why isn't coal worth as much as diamonds?

The reason that it isn't as valuable is that diamonds only form in very special situations deep down inside the earth where it is extremely hot and the pressures are much greater. Diamonds are a much purer form of carbon compared to coal.

Chapter 2
Ancient Seas (250 million years ago)

Card 2 (back)
Section of fossil reef

Q&A **What do you think this is?**
It's a piece of fossilised tropical coral reef.

Q&A **Who can tell me where you might find tropical coral reefs today?**
In warm, shallow tropical seas in places like the Great Barrier Reef.

Back around 250 million years ago this coast was much further south towards the Earth's equator and it lay on the edge of a shallow tropical sea which had areas of coral reef – a bit like the Great Barrier Reef. We know this because of the fossil remains of corals in the Permian Magnesian Limestone rock on the coast.

Card 2 (front):
Permian tropical ocean scene

DID YOU KNOW?

The cliffs along a large part of our coast are made from a kind of rock called limestone. Limestone is a sedimentary rock, which means that it is made up from layers and layers of 'sediment'.

Many of the rock layers that make up the sea cliffs along our coast include fragments of shell and the crushed skeletons of ancient sea creatures which sank to the seabed forming a kind of mud which eventually got buried and squeezed into hard layers of rock.

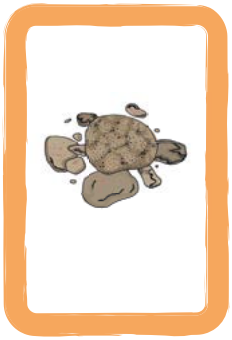
Q **Ask children whether they have tasted or accidentally swallowed sea water.**
If they have, they'll know that it's salty (it has dissolved minerals in it that make it taste salty).

When sea water evaporates under a very hot sun it becomes even saltier and eventually this salt forms hard crusty layers.

This is what happened 250 million years ago when our coast lay on the edge of a shallow sea in a hot, desert-like climate. As sea levels fell, the sea got shallower, and the salt water got even saltier. We know this because there are layers of these salty minerals in among the limestone rocks of our cliffs.

Chapter 3
Ice Age (about 10,000 years ago)

Card 3 (back)
Cluster of glacial erratic pebbles (granite)



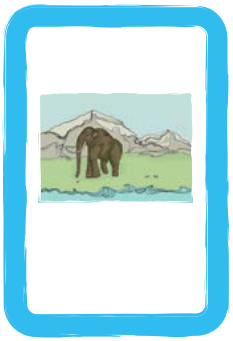
Q&A **Who can tell me why these stones are rounded?**
The stones are rounded because they have been rolled around and smoothed by the sea.

Q&A **Where might you find stones like this?**
On the beach.

DID YOU KNOW?

Some of the pebbles you find on our beaches came here from hundreds of miles away – even from Scotland and Norway!

Card 3 (front):
Ice Age scene



Q&A **How do you think the stones got here?**
Take a look at the other side of the card for a clue.
What is going on here?
The stones originally came to this coast not from the sea but from melting ice sheets and glaciers at the end of the last Ice Age about 10,000 years ago.

Great ice sheets and glaciers covered the whole north of Britain and linked across to modern day Norway. Moving ice ripped up rocks and carried them along. When the ice started melting, powerful streams of water carried these rocks long distances and eventually deposited them close to our coast.

Q **Who can spot the valley along the coast?**
(refer to the coastal scene in the book)
We call these very steep sided and deep valleys 'denes'.

The denes were formed originally around 10,000 years ago at the end of the last ice age when the water from melting ice sheets and glaciers cut through the limestone bedrock. The fast flowing water carried heavy boulders and smaller rocks with it, which bashed and scraped the limestone rock, wearing it away as a deep scar.

Q **Has anyone visited any of the denes along this coast?**

Q **How does it make you feel to be in the dene?**

Chapter 4
Deep Dark Mines and Wind Turbines

Card 4 (back)
19th century miner's lamp

Q&A **Can anyone tell me what this item is?**
It is a miner's lamp

Q **Have you ever been in a really really dark place where you can't see anything at all even with your eyes wide open?**

Q **How do you think this would make you feel?**

Card 4 (front):
20th century miner

Q&A **What is this person digging for?**
Coal.

Q&A **Can anyone tell me why coal was so important in the past?**
It was used to heat homes and to power machinery and industry. It was the main source of energy.

Q&A **How old do you think you would have had to be to work in the mines in 1840?**
3 or 4 years old – both girls and boys.

Q **Do you think this was fair?**

In the 1870s the minimum age was raised so that it was more common for the youngest workers to be aged between 10 and 14 years.

Children often worked in small teams, with those pushing the coal tubs (the name for a wheeled mine cart) from the rear being known as thrusters. The thrusters often had to push the tubs using their heads, leading to the hair on their crown being worn away and the child becoming bald.

Some children were employed as coal trappers, particularly those not yet strong enough to pull or push the tubs.
This job saw the child sit in a small cutting waiting for the hurriers to approach. They would then open the trapdoors to

allow the hurrier and his cargo through. The trappers also opened the trapdoors to provide ventilation in some locations.

Card 5 (back)
Miner in cage

Q&A **How do you think people got down into the mines?**
Miners were raised and lowered in cages by a big wheel and cable. Your grandparents would have seen these pit head wheels up and down this coast.

Q&A **How do you think the coal that they were mining was taken out of the mines?**
In the earliest days of mining horses and then steam powered winches did the heavy work of getting the coal out. In more recent times electric conveyor belts and coal elevators raised the coal from the mines.

Q **What is the tallest or highest place that you have been to?**

The deepest mines on this coast are really really deep. Deeper than the tallest building in the UK.

Pemberton's Colliery near Sunderland reached a depth of 1722 feet / approx. 525 metres. That's equivalent to about 26 Angel of the North statues piled one on top of the other. Can you imagine that?

Card 5 (front):
Mining tunnels

Some of the old coal mines along this coast go out under the sea bed for about 8 miles. That's a lot of digging!

Q **How would you feel about travelling miles and miles in underground tunnels to get to work each day, knowing that you were beneath all that water?**

Q **Does anyone have family members who once worked in the coal mines?**

Q **What stories do they have about life in the mines?**

Card 6 (back)
Sou'wester hat/coat

Q&A **Can anyone tell me the name of this type of hat and coat and who might wear them?**
It is a Sou'wester coat and hat. These are still worn today, and have been for a long time, by crews aboard ships and boats to protect them from the worst weather and sea spray from waves.

You could ask the children if they've seen the sculpture at Seaham Harbour Marina which is of a lifeboat coxwain (helmsman) dressed in full oilskin coat and sou-wester hat.

Card 6 (front):
Collier brig in full sail

Q&A **Can anyone tell me what this boat might be carrying?**
It is called a collier brig and it is carrying a load of coal.

Before the coming of the railways or efficient road transport, coal from along this coast was shipped to other parts of the country and the world to power homes and power the first industrial revolution.

Q **Can you imagine the sea filled with hundreds of sails as these ships set out from places like Hartlepool, Sunderland and Seaham?**

Transporting coal by sea took place right throughout the year, even during the darkest and stormiest winters. The constant flow of coal was needed to power the nation.

Q **How would you feel about you, or your loved ones, heading off to sea in the middle of winter?**

Q **What would you miss most if you were off at sea for weeks or even months at a time?**

The last coal mine along this coast closed in the 1994.

Q&A **Does anyone know why the coal mines closed?**
There are lots of reasons – some of the collieries ran out of coal. Other cheaper forms of energy, like oil and gas, took over. More recently we've started to look at sources of energy that are cleaner and less polluting than burning fossil fuels like coal.

Q **What do you think are some of the good and bad things about coal mining no longer happening along this coast?**

Card 7 (back)
Wind turbine

Q&A **Who knows what one of these is and what is does?**
It's a wind turbine and it generates electricity when its blades turn in the wind.

Card 7 (front):
Turbine service ship

Q&A **Why do you think this boat might be carrying a wind turbine?**
It is carrying it out to sea to build an offshore wind farm.

Q **Who can spot the wind turbine in the book?**

DID YOU KNOW?

Did you know that one of the biggest offshore wind farms in the world is being constructed off our coast?

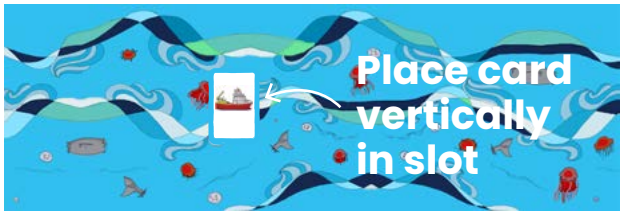
As its name suggests, Dogger Bank Windfarm sits on Dogger Bank - an area of the seabed which is closer to the sea surface than in other parts of the North Sea. The shallower water here makes it 'easier' to attach the wind turbines to the seafloor.

Q **Do you think it is better that wind turbines are out at sea rather than on land?**

Children might think about things such as noise, visual impact, possible impact on wildlife.

Hidden below the waves, the bases of offshore wind turbines can provide sheltered habitat where marine creatures such as crabs, lobsters and fish are attracted to spawn.

You can point to the illustration within the pop up book which shows the base of the wind turbine.



Chapter 5
Sea Mines and Submarines

Card 8 (back)
German airship (Zeppelin)

Q

Who has had helium balloons at their birthday party?

This is a kind of very large helium balloon that has propellers and can fly. It is known as an airship, or in this particular case, a Zeppelin.

In the First World War, Zeppelins were used by the Germans to bomb Hartlepool, Sunderland and other targets along this coast.

Most people had never seen anything like them before and were very scared to see them in the sky.

As an important industrial centre Sunderland became a target for the German bombing. Zeppelins floated over the town at about 10pm on 1 April 1916, dropping about 20 bombs, killing 22 people, injuring many others and destroying several buildings.

Card 7 (front):
Fulwell sound mirror

Q&A

Who would like to have a guess what this strange looking object might be?
It's called an acoustic mirror and it was used to listen out for approaching enemy aircraft during World War I.

You can find one of these sound mirrors at Fulwell, Sunderland. It sits high on a hill facing out towards the sea. It was part of an early-warning system that helped protect the people along the coast in the case of an enemy attack.

GAME

Listen in!
To help explain how it worked you can try a little activity called 'mega ears'. You need a couple of saucers or rounded tea cups.

- Invite children to pair up and stand a short distance apart.
- One child is given a message which they must communicate to the other by whispering – one word at a time.
- Ask the child who's receiving the message to keep their eyes closed and to listen.
- With each word the listener must move a step backwards.
- When they can't hear a word, ask them to hold a cup or saucer to the side of their head, so that open end of the cup or concave part of saucer points toward the person whispering. This effectively amplifies the volume of the whisper.

Q

Can you spot the Fulwell sound mirror in the pop up book?

Q&A

Why do you think that the sound mirror is bowl or saucer shaped?

Sound travels in invisible waves through the air. When these waves 'hit' the curved surface of the sound mirror the sound waves bounce off at different angles and coalesce (join together) at a point. This joining together has the effect of making the sound louder.

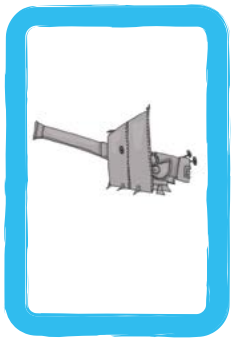
It is a bit like the effect you experienced when putting the saucers/cups to your ears.

Card 9 (back)
Shell

Q&A **Who can tell me what this object is?**
It is called a shell. It was fired from a large gun.

Q&A **Why do you think it is this shape?**
It is pointed at one end to help it speed through the air towards its target. Being pointy also helps the shell break through metal armour.

Card 9 (front):
Trow Point disappearing gun



Q&A **We have just been talking about Zeppelin balloons but how else do you think the enemy might have tried to attack this coast during the First World War?**
By sea, with battleships and submarines.

Throughout the First World War, Germany sent battleships to target this coast because it had important ship building and other industries.

Even before the First World War in the Victorian times there were forts and canon (an older type of gun) all along this coast, protecting it from different invaders.

Q **Who can spot a gun on the coast?**

Sitting up on Trow Rocks in South Shields is a special kind of gun. It's a bit magic as it can disappear, hence it being known as the Trow Rock Disappearing Gun.
A man called Captain Moncrief came up with the idea of a gun that would lower down inside a concrete turret to be loaded and then pop up and fire its shells at the enemy.

Q&A **Can you think why having a gun that could pop up and lower down might be a good idea?**
It took quite a long time for the gun to be loaded with a shell. With a normal gun, the soldiers would be out in the open where the enemy could easily see them, and could shoot at them. The disappearing gun idea meant they spent a lot less time being a target.

GAME

Invaders!
You could play a fun little game where a couple of children are enemy invaders and a couple are in charge of the Trow Point disappearing gun.

The gun could be represented by a big cardboard box which the children crouch down inside and then pop up from to fire their 'shells' at the enemy attackers.

Rolled up paper or sponge balls could be used.

You can visit the gun today at Trow Point. It doesn't pop up and down anymore and it is not the original gun. It was put there in the 1990s by the Royal Electrical and Mechanical Engineers.

Card 10 (back)
Binoculars

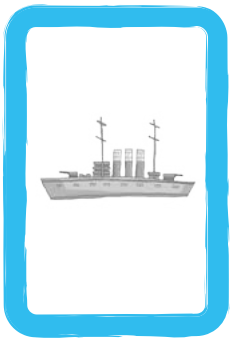
Q&A

Why do you think a pair of binoculars would be particularly helpful to someone during a war?
To spot the approach of enemy ships from the shore, or from a patrol ship.

During both world wars there were gun emplacements (called batteries) and look out points (e.g. pill boxes, battery command posts) along this coast. When someone on coastal lookout duty spotted a suspicious ship they consulted a special book which had the outline shapes of different enemy vessels in it and they could then inform coastal batteries and naval patrols about the threat.

Friend or Foe?
You could play a fun game asking children to draw or colour in different boat shapes and place a small clue which identifies the boats as 'friend or foe' (e.g. a flag of a particular colour). Children on lookout duty would take turns using binoculars to spot the boats on the other side of the room, saying whether they are friend or foe.

Card 10 (front):
German battleship



The soldiers stationed in Heugh Battery in Hartlepool had a really scary experience in the First World War when the town came under attack from three German battleships.

In December 1914, very early in the First World War, Hartlepool became the first place in mainland Britain to come under attack.

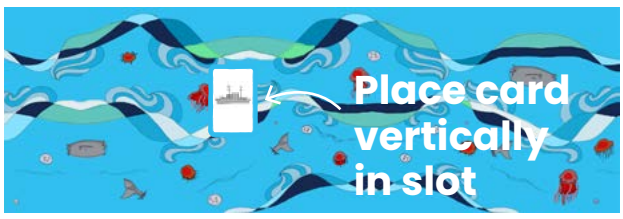
Three imperial German navy battleships set their sights on the town's harbour and defensive positions.

For 40 minutes shells rained down on the town – 1150 in total.

The twin coastal defence batteries, manned by soldiers of the Durham Light Infantry, returned fire – 123 shells in total. Although only firing a small number of shells, they managed to damage the German ships, forcing them to retreat. Sadly there was a lot of damage to houses and businesses in the town and several people died.

Q **Can you imagine what it would have been like to see the approaching German battleships?**

Q **How do you think you would have felt hearing the exploding shells?**



Card 11 (back)
Sea mine

Q&A **Who can tell me what this object is?**
It is called a mine or a sea mine. It floated in the water, often hidden below the waves, and exploded when a ship touched it.

During war time, enemy ships and submarines laid mines in the sea around this coast. Often they would place these mines near the entrance to busy harbours and ports.

Q&A **Why do you think mines were placed near harbours and ports?**
To blow up ships carrying important cargos like coal and other essential supplies to the rest of the country or ships bringing in materials to places like Sunderland where ships were being built.

It was really important to keep safe routes for ships to transport their cargoes up and down the East coast of England during the war. These were called the East Coast War Channels, and it was largely because of the brave actions of local fishermen that they were kept open.

Card 11 (front):
Minesweeper

During the First World War many local fishermen were asked to stop fishing and to take up 'minesweeping'.
This involved trailing wires in the water to hook mines and then winching them to the surface so that they could be shot at and blown up. Minesweeping was extremely dangerous.
So many trawlers were being used as minesweepers between 1914 and 1918 that there was a shortage of fish in England!

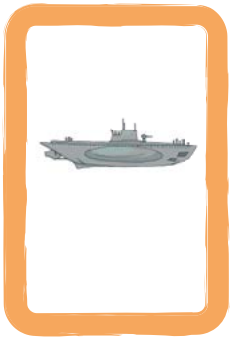
Lots of trawlers were blown up and sunk whilst minesweeping, either because they hit a mine or they were attacked by enemy ships and submarines.

Q **How do you think the fishermen felt about having to go minesweeping?**

Q **How would you feel?**

Unexploded mines are still occasionally discovered either by divers as they explore shipwrecks, or occasionally washed up on the shore. Never ever approach a mine if you see one on a beach, but always let the coastguard or local emergency services know about it.

Card 12 (back)
U-boat U32



Q&A

Who can tell me what this is?
It is a submarine.

German submarines used in the First and Second World Wars were called U boats. They caused a lot of problems as they could sneak up on British ships and boats and fire torpedoes at them. Some of the U-boats could also lay sea mines. They sank a lot of ships in two World Wars.

STORY

A (very) short story – the sinking of UC-32

It's a pitch dark February night in 1917. You're on a dangerous, top secret war time mission. You're positioned in your submarine a few hundred yards out from Roker Pier in the entrance to Sunderland harbour.

A message comes from below "mine deployed". Shortly everything goes crazy. There's a huge explosion. Lights flicker and then go out. Freezing cold water rushes everywhere.

In no time at all your submarine is split in two and drops like a stone to the sea bed. A sudden burst of bubbles forces you clear of the wreck, sending you up to the surface. As you gasp for air you swallow mouthfuls of oil.

Soon there are lights on the water as a local pilot boat approaches. You're scooped on board and taken to shore. You'll have lots of questions to answer, but you'll be looked after as a prisoner of war.

Nearly 100 years later, July 2016, a crowd on Roker Pier watched as an un-exploded torpedo discovered on the wreck of German U-boat UC-32 was blown up by the navy.

Captain Herbert Breyer's wartime mission had been to stop ships leaving and entering the Port of Sunderland. His mission ended in catastrophe with his own faulty mine causing the explosion that sank his submarine. For local minesweepers and shipping it was a small moment of relief in the constant and hazardous task of keeping the seas cleared of mines.

A few days earlier Captain Breyer and his crew had successfully laid six mines in the mouth of the Tyne.

Q **Do you think you could spend days at a time inside a submarine? How do you think it would make you feel?**

Card 12 (front):
A wreck of war

When we remember events like the First World War we tend to think of the horrible conditions of soldiers fighting in the trenches. This coast didn't see anything of that kind, but the hundreds of shipwrecks that lie on the seabed are a reminder of the fierce fighting that took place here and the important role that local people played in trying to keep our country free.

Q **Have any of you visited the sculpture 'Tommy' in Seaham?**

Next time you go there and see him, remember all the fishermen and other seafarers who fought and died in the First World War.