

Marine and Coastal Activities

Screen 1 – Marine and Coastal Activities

This lecture will focus on the range of activities that take place in coastal areas and the reasons why certain types of activity tend to focus on specific coastal areas.

Screen 2 – Learning outcomes

- To recognise the range of competing uses that exist in coastal and marine areas.
- To understand the basic interactions between different coastal and marine activities.
- To appreciate the interactions between marine and coastal activities and the environment in the context of environmental change.
- To recognise Integrated Coastal Management as a mechanism to manage activities within busy marine and coastal areas.

Screen 3 – Coastal and marine uses

Many activities require a coastal location because the activity itself either needs or prefers a coastal location. This might be a result of the functional requirements of an activity (such as the need for access to the sea) or because proximity to the sea provides a commercial or other advantage (such as hi-tech industry or tourism). Ports for example need access to the sea to load and unload vessels. Tourist facilities, whilst not strictly needing a coastal location, a coastal location might allow them to charge a higher price (e.g. a hotel can charge more for a hotel room with a sea view). Arguably, those activities that need a coastal location for functional reasons should have priority access to coastal space, but in many parts of the world, the allocation of activities to coastal space is dictated by the market, with those uses most able to pay gaining most access to coastal space. Coastal planning policies can however reduce the impacts of the market to some extent. Coasts are particularly in demand as they span the land-sea interface. The picture shows the port of Tokyo, Japan, in which uses include: the Tokyo Maritime Museum, a public park, the commercial port, and media industry offices, which reflect the competing uses for coastal space.

Screen 4 - Activities that require a coastal location

Now it is your turn. Take two minutes to write a list of as many coastal activities that you can. Write the list on a piece of paper as you'll need to look at it again in a few minutes. On your list include activities that take place on land and sea in coastal areas. Think about coastal areas you know or use the image on the screen for inspiration. Start your two minutes when you are ready.

Screen 5

Compare the list you wrote with the one on the screen. Fill in any gaps in your list as I go through these answers. If you have any activities on your list not on the screen – well done! Here is a list of possible answers:

- Tourism and recreation facilities, marinas, hotels, leisure facilities
- Fishing harbours, fish markets, fish processing units
- Landing sites for underwater cables
- Servicing bases for offshore energy infrastructure
- Oil refinery and storage
- Power stations
- Rail and road links
- Conservation and protected areas

- Safety infrastructure, lighthouses, navigation
- Aggregate extraction

Screen 6 – representing the uses made of coastal areas

This image shows a simple way of presenting the uses made of coastal areas. We will be using some images like this throughout this lecture. Another way of interpreting this image is that it represents the activities that create a demand for coastal space. When you were thinking about your list of coastal activities, you probably thought about different types of coast. For example, you may have thought about busy commercial coastlines associated with global cities such as New York or Tokyo, beautiful remote rural coastlines typical of those found in the Caribbean or South Pacific, or busy recreation-orientated coastlines in tourism-focused areas such as the Northern Mediterranean coast. It quickly becomes clear that not all coasts are the same and this has implications for the uses that are made of coastal areas.

An additional consideration is the context of a coastal or marine area. In many locations, these areas are changing as a result of global influences, such as climate change, ocean acidification, sea-level rise, increasing human population and many other factors. A key consideration therefore, when seeking to understand the effects of the demands being placed on coastal and marine areas, is the wider context. The wider context has the potential to affect the sensitivity of an ecosystem to other pressures. For example, a coral reef that is already stressed by acidification may be less able to adapt to other pressures, such as a pollution incident. The direct pressures on a marine and coastal ecosystems may have a greater or lesser impact on a coast depending upon the sensitivity of the coast to those activities. The range of activities in specific coastal areas is likely to vary according to the geography of the coast and the state of the economy – which raises the observation that not all coasts are the same.

Screen 7 - Not all coasts are the same!

In the next few minutes of this lecture, we will begin to explore why different coasts attract different uses. We will think about the range of different coasts that exist and identify typical use profiles for those areas. After that, we will begin to consider the factors that explain the different use profiles seen in different types of coastal area. So, we will look at different coastal areas and examine their use profiles in Australia, Canada, the UK and Japan.

Screen 8 – Townsville, Australia

First, this is the main beach in the centre of Townsville, Australia. The beach is heavily used for tourism and recreation in the summer, with many people playing beach games and swimming. You may know that Townsville is one of the main visitor gateways to the Great Barrier Reef, so conservation measures are important here too. Beaches are important in reducing the risk of erosion and flooding as they absorb wave energy – they are a natural form of coastal protection, which is an important role of the beach. Residential properties and also visible in the distance of the picture which shows the coastal area is also in demand as space for people to live in.

Screen 9 – Townsville pressure diagram

So, let's transfer these uses into the pressure diagram. The primary activities on the Townsville coast are conservation, recreation, tourism, coast protection, and residential living. This coastal area is also experiencing sea level rise as a result of climate change. This makes the coast here more prone to flooding and erosion, therefore the use of coastal protection is particularly important. The sea level rise has the additional effect of making the coastal more sensitive to other potentially damaging impacts, such as from tourism and recreation.

Screen 10 – St. Johns, Canada.

This is an image of a remote rural beach near St. Johns, in Newfoundland, Canada. The area is one of the first parts of North America settled by Europeans in the 17th Century and so has significant heritage value. It is a productive fisheries area and has a large fisheries fleet. As the image shows, the area is a focus for recreational activity, particularly kayaking, scuba diving, and sailing. The area is also rich in wildlife and is on a number of known migration routes which has spawned a significant nature watching industry, which includes whale watching and bird watching. Nature watching is therefore a significant tourism activity in the area. Given the rich wildlife and economic importance of nature watching, conservation is also an important use made of coastal space in this area.

Screen 11 – St. Johns pressure diagram

The main coastal uses in St. Johns are Conservation, fishing, heritage, tourism, recreation, and energy production. The sensitivity of this coast is comparatively low. The effects of ocean acidification are limited as it is currently outside the range of significant acidification. The effects of sea level rise are limited due to the largely rocky coastline. The pressures in St. Johns, might be similar to the pressures elsewhere, but because the coast is less sensitive, the impacts of the uses is less substantial.

Screen 12 – Isle of Wight, UK

This is an image of the Blackgang landslide complex on the South coast of the Isle of Wight, UK. It is one of the largest landslide complexes in Europe. It is on a rural stretch of coastline with little human development, except some minor roads and a tourist-orientated theme park. Using the blank diagram on the next slide, write down what you think are the four main activities at this location.

Screen 13 – Isle of Wight pressure diagram (blank)

Pause the presentation and complete this diagram for the uses you would expect in Blackgang, Isle of Wight, UK. If you can think of more than four activities, write these down too. Also think about the context of the coast and what factors might make this coast more or less sensitive to the uses you identify.

Screen 14 – Isle of Wight pressure diagram (completed)

The main coastal activities taking place at Blackgang are erosion, heritage, recreation and tourism. The sensitivity to change of Blackgang is significant. The soft sedimentary rocks that form the cliffs along this stretch of coast mean that it is particularly prone to erosion, which can lead to landslides, which in turn create risk to people using the area for tourism or recreation. The sensitivity of the area to erosion is exacerbated by rising sea levels which is generally associated with stormier conditions.

Screen 15 - Akeshi, Japan.

This is a lagoon area in Akeshi, Japan. It is a Ramsar site, which means it is an internationally important wetland area. The lagoon is used for oyster cultivation. The floats visible in the image mark the position of oyster bags. The oysters grow by filtering nutrients from the water which is brought into the lagoon by the rivers that feed into the lagoon. Oysters have been cultivated for several hundred years in this area and are an important element of the areas identity and history. Wetlands like this also control water levels in the surrounding area which provide a natural buffer to flood events.

Screen 16 – Akeshi pressure diagram (blank)

Pause the presentation and complete this diagram for the uses you would expect in Akeshi, Japan. If you can think of more than four activities, write these down too. Also think about the context of the coast and what factors might make this coast more or less sensitive to the uses you identify.

Screen 17 – Akeshi pressure diagram (completed)

The main activities taking place in Akeshi are: fishing, heritage, conservation, tourism, and flood control. The context here is one of rising sea level. In a low energy sedimentary environment such as that here, any sea level rise may cause a change in the balance of the wetland system, which in turn might pose a risk to the oyster fishery. The sensitivity of this area to sea level rise is significant.

Screen 20 - Locational requirements of coastal activities

It is clear that different types of coastal locations have different patterns of uses. We examined this idea in relation to locations in Australia, Canada, UK and Japan. We noted that the distinctive patterns of coastal uses are related to the characteristics of the coast. This is because any activity requires a coast that is well suited to their specific requirements. However, not all coasts provide those characteristics equally. Therefore activities that require similar coastal characteristics are typically found together. To recap, the key points are:

1. Not all coasts have the same characteristics.
2. Not all coastal activities require the same type of coastal location.
3. Different coasts will accommodate different mixes of uses.

Screen 21 - Factors that influence the locational requirements of coastal activities

There are a broad range of factors that influence the locational requirements of coastal activities. These include the physical form of the coast and the tidal and wave conditions. Additional influences include:

- Access needed to the sea
- Navigability of the local waters
- Proximity to shipping lanes
- Seabed condition
- Marine resource availability
- Proximity to land transport
- Geology of the area
- Water supply and waste disposal opportunities
- Other activities that take place in the same area
- Planning conditions

- Conservation rules and laws

The sensitivity of a coastal area to change may also be a significant locational influence on some activities. For example, a power station would not be ideally situated in a coastal area likely to be vulnerable to sea level rise and any associated flooding and erosion. When examining the locational influences for coastal activities, it is therefore also important to consider its overall sensitivity to change.

Screen 22 - Locational requirements of tourism uses

Pause the presentation. Think about the picture on the screen and write a list of locational requirements that would influence the choice of coastline for tourism activities. It would be helpful to think about what facilities and access a tourism activity would need if it was located in a coastal area – these will be its locational requirements. Possible locational requirements include:

- A sandy beach
- Proximity to dramatic scenery
- Proximity to tourist attractions
- Proximity to road network

Screen 23 - Locational requirements of port uses

Pause the presentation. Think about the picture on the screen and write a list of locational requirements that would influence the choice of coastline for port activities. It would be helpful to think about what facilities and access a port activity would need if it was located in a coastal area – these will be its locational requirements. Possible locational requirements include:

- Deep water to accommodate large vessels
- Flat land to construct the port infrastructure
- Easy links to rail and road network

Screen 24 – Pocket beach

The results of the previous assessments suggest that coastal areas with specific physical characteristics generally have similar coastal uses. The following two examples show the coastal activities typically found in pocket beaches and estuaries in economically developed countries. In the pocket beach on the image typically has uses which include tourism, small-scale fishing, informal recreation, small settlements, agriculture, and limited transport facilities. The physical constraints of the location only support a limited range of uses.

Screen 25 - Estuary

In the estuary on the image, typical uses include energy generation, large settlements, commercial freight and fishing ports, military sites, transport facilities, marinas and recreation facilities. Again, the physical constraints of the location only support a limited range of uses. In this location, it is theoretically possible to find tourism activity, but this sort of location is not usually the preference of tourism activities. Through examining the use patterns in different types of coastal area and the locational preferences of coastal activities, it is clear that the activities and infrastructure in specific types of coastal area are *predictable*. It is also clear that because coastal activities are commonly seeking to use the same space (because they share the same locational preferences), coastal activities are in *competition* with each other over access to suitable and preferred coastal locations.

Screen 26 - Interactions between coastal activities

Many activities that take place in the same coastal areas interact with each other. Some of these interactions can be entirely benign and generate no problems. Other interactions however can be very problematic. For example, a situation in which scuba diving and commercial fishing occurred in the same space at the same time would be very dangerous indeed. Therefore it is important to understand how activities interact to make sure that activities that need the same type of coastal space are compatible with each other. Where they are not compatible, then there needs to be suitable management to ensure that the interaction between the uses does not put human life, the environment, or other infrastructure at risk.

Screen 27 - Classification of the interaction between coastal activities

It is possible to classify the types of interaction between coastal activities using a categorical scale – in which the relationship falls into a specific category. There are numerous systems for categorising the relationship between coastal activities, but one of the most useful and easy to understand uses the following classification:

- Positive – the interaction between the uses creates mutual benefits
- Neutral – the interaction between the uses creates no benefits or problems
- Negative – problems are created by the interaction of the activities

In order to determine which of these categories a use-interaction fits into, it is important to examine the interaction from the perspective of all interested parties and reach an objective judgement. This can be achieved by examining records of past interactions (e.g. accident records, prosecutions, etc.) or by interviewing representatives of both activities to determine the nature of their interaction.

Screen 28 - Coastal interaction matrix

This is a very simple coastal interaction matrix showing the classification of the relationships between five coastal uses. The matrix shows that aquaculture has the most positive relationships with the other activities whereas conservation has the most problematic interactions. Aquaculture is least problematic because it has the most passive interactions with the other uses. Tidal power has a negative relationship with sailing and conservation. In the case of sailing, tidal power turbines may create a risk to vessel movement, while the turbines may change water flows which impact on marine habitats. The placement of the turbine may also directly impact habitats and species. Coastal interaction matrices of this sort are commonly used to identify particularly problematic interactions that require prioritised management. Conversely the positive interactions suggest activities that can be located together and which cause few problems.

Screen 29 - Interactions between coastal activities and the environment

It is important to recognise that as well as interactions with each other, coastal activities also have interactions (or impacts) on the marine and coastal environment. Some of the more common environmental impacts include:

- Habitat destruction
- Reduced habitat quality
- Reduced species diversity
- Introduction of alien species
- Reduced resilience to broader environmental pressures.
- Pollution

- Chemical and temperature changes to water quality

Some environmental impacts of coastal activities can be reduced or worsened by the prevailing conditions of the environment. For example, a marine area that has already faced many challenges (e.g. over-fishing, pollution, invasive species) may be less resilient to impacts of other activities, such as the introduction of a more efficient fishing technique, or aggregate extraction. It is also important to note that some marine environments are facing broader threats which reduce their resilience to impacts from coastal activities, such as warming waters resulting from climate change, or changing marine chemistry resulting from ocean acidification. The overall sensitivity of a coastal area is a significant influence on its ability to deal with the range of activities that either take place, or would like to take place, in a coastal area.

Screen 30 - How can these challenges be managed?

The key messages from these lectures on Coastal and Marine Activities are:

- There are competing demands for coastal space – due to the locational preferences of coastal activities only being met by a limited number of coastal types.
- There are interactions between coastal activities – some of which are problematic and need to be managed.
- There are environmental impacts associated with coastal activities - some of which are problematic and need to be managed.

The main way in which all of the problems identified in this lecture are managed is through a system called **Integrated Coastal Management** which will be explored further in the next lecture.

Screen 31 - Conclusion and learning outcomes

- To recognise the range of competing uses that exist in coastal and marine areas.
- To understand the basic interactions between different coastal and marine activities.
- To appreciate the interactions between marine and coastal activities and the environment in the context of environmental change.
- To recognise Integrated Coastal Management as a mechanism to manage activities within busy marine and coastal areas.

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Screen 26:

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