Photo credit: Hans Hillewaert / Wikimedia Commons (CC BY-

Can we save the Seahorses in the Thames?

Key Stage 4 Programme

Pupil Name	Name
Handbook Designed by	Name

Timetable and Assignment Submission

Timetable – Tutorials

Tutorial	Date	Time	Location
1	12 December, 2018	1:00-4:00	University TBC
2	11 January, 2018	3:30-4:30	HGA
3	25 January, 2019	3:30-4:30	HGA
4	8 February, 2019	3:30-4:30	HGA
5	1 March, 2019	3:30-4:30	HGA
6 (Feedback)	15 March, 2019	3:30-4:30	HGA
7 (Feedback)	29 March, 2019	3:30-4:30	HGA

Timetable – Homework Assignments

Homework Assignment	Description Summary See detailed description of assignment at the end of each Tutorial.	Due Date
Tutorial 1	Research CZMT in the UK and write a 300-word essay using one example from each of the things you have learned in your research.	11 January, 2018
Tutorial 2	Locate, identify and label 3 different ecosystems discussed thus far, describe the different stakeholders that you think are present in each and what values they may have; what potential anthropogenic disturbances might be a result of their activities?	25 January, 2019
Tutorial 3	Research 3 current news articles on Marine Conservation Zones in the UK and look for the following information: Where in the UK are they located; identify the stakeholders involved; what their competing interests are; what management measures are being used, what policies, laws or regulations are driving the process.	8 February, 2019
Tutorial 4	Research on line and find a thematic map with imagery. Be ready to explain to the group the following: identify or critique the essential cartographic elements, identify which stakeholder group it is representative of, what the theme is, and explain the data that is being presented.	1 March, 2019
Tutorial 5	Pick an area in the Thames and research online current issues in CZMT in that area. Use the reflection worksheet to do an assessment of current management in place. Describe 3 positive human/environmental interactions that can promote sustainability in your chosen area.	15 March, 2019

	Make a thematic map of your area with the required elements. This should include a discussion with a minimum of 1000 words of the following: • The boundaries of the area of interest (discuss and draw on map) • The ecosystems present (discuss and label on map) • The natural resources & ecosystem services that are provided • The stakeholders involved, their competing interests and values • Current management measures, policies, laws & regulations in place Write a list of your references in the correct bibliographic style.	

Assignment Submission – Lateness and Plagiarism

Lateness	
Submission after midnight on due date	10 marks deducted
Plagiarism	
Some plagiarism	10 marks deducted
Moderate plagiarism	20 marks deducted
Extreme plagiarism	Automatic fail

Uni Pathways – Pupil Feedback Report

Grade	Marks	Guidance
1st	70+	
2:1	60-69	
2:2	50-59	
3rd	40-49	
Working towards a pass	0-39	
Did not submit	DNS	No assignment received by The Brilliant Club

Lateness	
Any lateness	10 marks deducted
Plagiarism	
Some plagiarism	10 marks deducted
Moderate plagiarism	20 marks deducted
Extreme plagiarism	Automatic fail

Name of PhD Tutor	Ms. Ferran		
Title of Assignment			
Name of Pupil			
Name of School			
ORIGINAL MARK / 100		FINAL MARK / 100	
DEDUCTED MARKS		FINAL GRADE	

If marks have been deducted (e.g. late submission, plagiarism) the PhD tutor should give an explanation in this section:

Learning Feedback Comment 1 - *Enter Key Learning Priority Here*	
What you did in relation to this Key Learning Priority *Enter feedback here*	How you could improve in the future *Enter feedback here*
Learning Feedback Comment 2 – *Enter Key Learning Priority Here*	
What you did in relation to this Key Learning Priority *Enter feedback here*	How you could improve in the future *Enter feedback here*
Learning Feedback Comment 3 – *Enter Key Learning Priority Here*	
What you did in relation to this Key Learning Priority *Enter feedback here*	How you could improve in the future *Enter feedback here*
Resilience Comment	
How you showed learning resilience during the course *Enter feedback here*	How you could build learning resilience in the future *Enter feedback here*

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Course Rationale

The continuing decline of the health of our ocean requires that we find a balance in the multiple and competing interests that exploit our coastal and marine resources. This requires thoughtful and informed policy and management mechanisms that strive towards equitable and sustainable development that meets the needs of this and future generations.

By identifying the ecosystems that provide us with the natural resources and ecosystem services that we rely on as a society, we can strive to maintain their health and sustainable use through evidence based and socially informed policy and management.

This course aims to:

- Give you an introduction to our coastal ecosystems in the UK;
- Present our ecosystems in the UK in the context of natural resources and ecosystem services;
- Explain the concepts and historical context of Coastal Zone Management (CZMT) and Sustainable Development at the international, national and local level;
- Illustrate how these management systems work together to protect our coastal and marine ecosystems;
- Explore human-environmental interactions in the Thames Estuary and the potential impacts on our future.

Mark Scheme

STEM Mark Scheme

Structure and Presentation	• Ideas are presented in paragraphs and arranged in a logical structure that is appropriate for the assignment • The introduction clearly outlines how the essay/report will deal with the issues • The conclusion summarises all the main points clearly and concisely • All calculations, formulas and methods are clearly structured, clear to follow and correct • Tables and graphs are effectively constructed including appropriate headings, units and scales. • All sources are referenced correctly in an agreed format	• Ideas are presented in paragraphs and arranged in a structure that is mostly appropriate for the assignment • The introduction adequately describes how the essay/report will deal with the issues • The conclusion summarises most of the main points clearly • Calculations, formulas and methods are mostly structured, clear to follow and correct • Most tables and graphs are well constructed • Most sources are referenced correctly in an agreed format	• Ideas are presented in paragraphs and arranged in a structure • The introduction mentions how the essay/report will deal with the issues • The conclusion summarises some of the main points clearly • Calculations, formulas and methods are not always structured, clear to follow and correct. • Some tables and graphs are well constructed but contains some errors • Some sources are referenced correctly in the agreed format with occasional errors

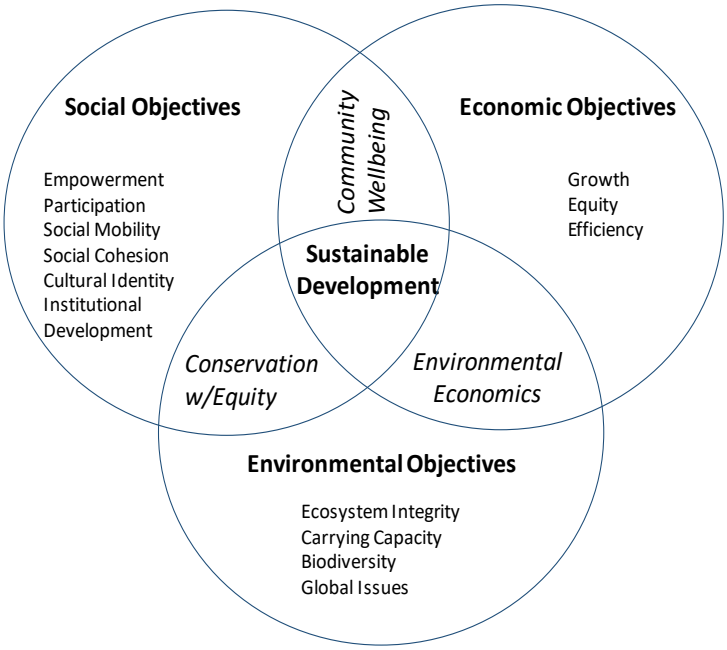
Critical thinking	Critical Evaluation	• Moved beyond description to an assessment of the value or significance of what is described • Evaluative points are consistently explicit/systematic/ reasoned/justified • Effective critiques on the reliability of sources provided	• Mostly description but some assessment of the value or significance of what is described • Evaluative points are mostly explicit/systematic/rea soned/justified • Some evidence of critiques on the reliability of sources provided	• Only description with minimal assessment of the value or significance of what is described • Evaluative points are at times explicit/systematic/rea soned/justified • Limited evidence of critiques on the reliability of sources provided
Written communic ation	Structure and Presentati on	• Ideas are presented in paragraphs and arranged as a logical sequence of ideas • The introduction clearly outlines how the essay will deal with the issues • The conclusion summarises all the main points clearly and concisely • All sources are referenced correctly in the agreed format	• Ideas are presented in paragraphs with some structure • The introduction adequately describes how the essay will deal with the issues • The conclusion summarises most of the main points clearly • Most of the sources are referenced correctly in the agreed format •	• Ideas are presented in paragraphs and are loosely structured • The introduction mentions how the essay will deal with the issues • The conclusion summarises some of the main points clearly • Some sources are referenced correctly in the agreed format with occasional errors
	Language and Style	• No spelling, grammar or punctuation errors • Writing style consistently clear, tone appropriate and easy to follow • Accurate and consistent use of technical language and vocabulary	• Minimal spelling, grammar or punctuation errors • Writing style mostly clear, tone appropriate and easy to follow • Some attempts of using technical language and vocab alary, but not always accurate	• Some spelling, grammar or punctuation errors • Writing style moderately clear, tone appropriate and easy to follow • Use of simple language and vocabulary effectively but struggles to use technical language

Key Concepts

Sustainable Development

To ensure a level and type of development of an area and its coastal resources that is consistent with the continuing productivity and viability of the natural systems upon which the productivity of the area is based (UN, 1982).

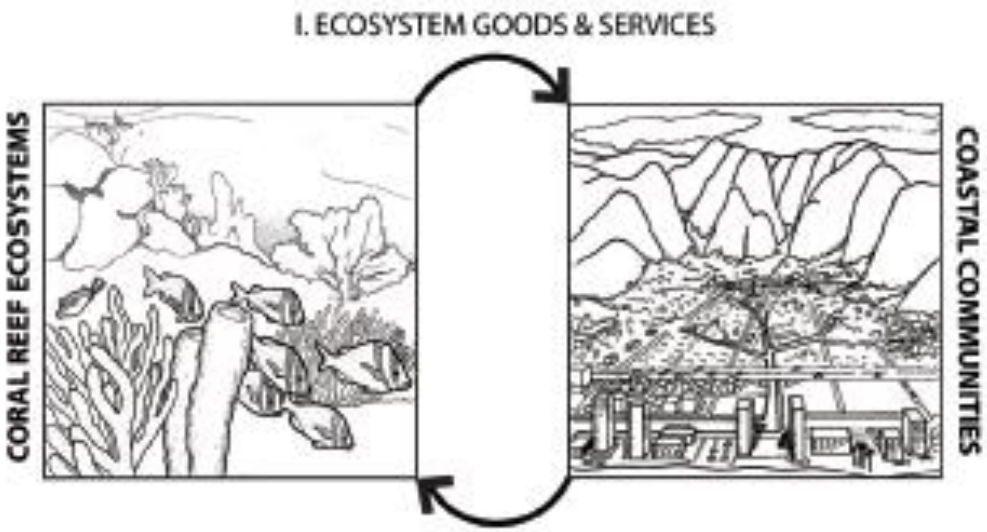
Development that meets the needs of the present without limiting the ability of future generations to meet their own needs. A sustainable city is one in which there is minimal damage to the environment, the economic base is sound with resources allocated fairly and jobs secure, and there is a strong sense of community, with local people involved in decisions made. Sustainable urban living includes several aims including the use of renewable resources, energy efficiency, use of public transport, accessible resources and services. (GCSE)



The 3 pillars of sustainable development: Social, Economic & Ecological, and the many overlapping objectives.

Human – Environmental Interactions

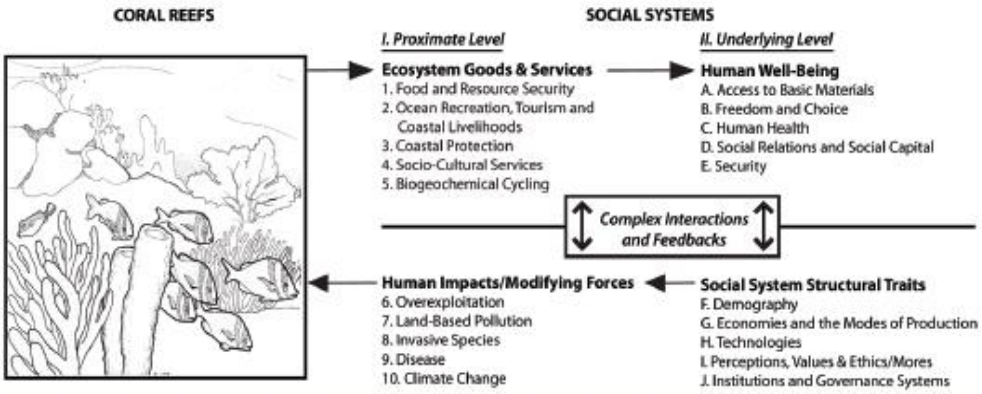
How are the lives of people shaped by place? How is place shaped by what people do? People and their surroundings interact with each other. People change their environment and the environment makes people change.



Key Concepts

Socio - Ecological Systems

Social-ecological systems are linked systems of people and nature, emphasising that humans must be seen as a part of, not apart from, nature (Berkes and Folke, 1998)



Adaptive Management

http://jncc.defra.gov.uk/images/marine-assessment1.png

A systematic approach for improving management through learning by monitoring and evaluating management outcomes. Simply put, it is 'learning by doing' and adapting what one does based on what is learned.

Can we define the different steps in the adaptive management cycle?

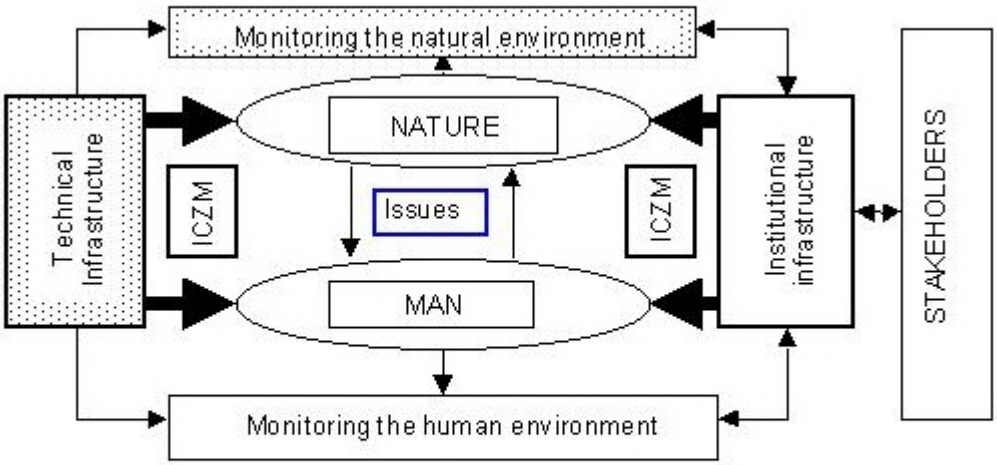
- Targets & indicators
- Evidence collection & monitoring
- Baseline & Trends
- Assessment & reporting
- Management & advice
- Strategy & objectives

Key Concepts

Coastal Zone Management (CZMT) – A term initially used in the USA in its 1972 Coastal Zone Management Act. It was meant to encompass management of all human uses in the coastal zone, but it did not necessarily emphasize integration among uses and policies. As implemented at the time in the USA, CZM programs usually emphasized management of human activities in the land, not marine, areas in the "coastal zone". (https://classroom.oceanteacher.org)

Integrated Coastal Zone Management (ICZM) – a process for the management of the coast using an integrated approach, regarding all aspects of the coastal zone, including geographical and political boundaries, in an attempt to achieve sustainability. This concept was borne in 1992 during the Earth Summit of Rio de Janeiro. The policy regarding ICZM is set out in the proceedings of the summit within Agenda 21, Chapter 17.

The European Commission defines ICZM as "a dynamic, multidisciplinary and iterative process to promote sustainable management of coastal zones. It covers the full cycle of information collection, planning (in its broadest sense), decision making, management and monitoring of implementation. ICZM uses the informed participation and cooperation of all stakeholders to assess the societal goals in a given coastal area, and to take actions towards meeting these objectives.
ICZM seeks, over the long-term, to balance environmental, economic, social, cultural and recreational objectives, all within the limits set by natural dynamics.
(Commission of the European Communities Brussels, 27.09.2000 COM (2000) 547 final).



ICZM FRAMEWORK
The 5 i approach

Ecosystem Based Management (EBM) – an integrated management approach that recognizes the full array of interactions within an ecosystem, including humans, rather than considering single issues, species, or ecosystem services in isolation… utilizing a broad management approach that considers cumulative impacts on marine environments; an approach that works across sectors to manage species and habitats, economic activities, conflicting uses, and the sustainability of resources. EBM allows for consideration of resource tradeoffs that help protect and sustain diverse and productive ecosystems and the services they provide. (NOAA)

Coastal & Marine Spatial Planning (CMSP) – a comprehensive, adaptive, integrated, ecosystem based, transparent spatial planning process based on sound science for analysing current and anticipated uses of marine and coastal resources. (US National Ocean Policy, 2010) More simply put it's the process for planning where and when human activities take place. This is needed due to increased competition for space – from shipping, renewable energy, fishing, leisure and other activities. These activities need to be coordinated in the best possible way to reduce conflict and help meet environmental, economic and social objectives.

Glossary of Key Words

GCSE definitions in Bold
Keep a list of words you need help with in the notes at the back of the workbook.

Word	Definition	In a sentence
Habitat	The environment within which an organism is normally found. A habitat is characterized by the physical characteristics of the environment and/or the dominant vegetation or other stable biotic characteristics.	
Biotope	Biotope = habitat + biological community.	
Biodiversity	**The variety of life in the world or a particular habitat.** The variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.	
Ecosystem	**A community of plants and animals that interact with each other and their physical environment.** A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.	
Coastal Zone	**The coast is the zone between land and sea. The action of the waves and the sea constantly changes the shape and form of the coast, and people manage these changes in different ways.** Coastal zones are dynamic environments in which landscapes develop by the interaction of winds, waves, currents and terrestrial and marine sediments. The coastal zone includes all areas from the deep ocean (up to 320km offshore) to 60km inland.	
Catchment	A drainage basin or catchment basin is an extent or an area of land where all surface water from rain, melting snow or ice converges to a single point at a lower elevation, usually the exit of the basin, where the waters join another body of water, such as a river, lake, reservoir, estuary, wetland, sea, or ocean.	

Natural Resources	Materials or substances occurring in nature which can be exploited for economic gain.	
Ecosystem Services	Grouped into **four broad categories: provisioning**, such as the production of food and water; **regulating**, such as the control of climate and disease; **supporting**, such as nutrient cycles and oxygen production; and **cultural**, such as spiritual and recreational benefits.	
Resource Management	**The control and monitoring of resources so that they do not become depleted or exhausted.**	
Driver	Any natural or human-induced factor that directly or indirectly causes a change in an ecosystem.	
Ecosystem approach	A strategy for the integrated management of land, water, and living resources that promotes conservation and sustainable use. It recognizes that humans, with their cultural diversity, are an integral component of many ecosystems.	
Exploitation	The action of making use of and benefiting from resources, often to gain unfair advantage for oneself.	
Mitigation	Mitigation measures provide for a system to reduce, avoid or offset the potential adverse environmental consequences of development activities. Their objective is to maximise project benefits and minimise undesirable impacts. Such mitigation measures can be in the form of preventative, corrective or compensatory measures.	
Valuation	The process of expressing a value for a particular good or service in a certain context (decision-making) usually in terms of something that can be counted, but also through other measures.	
Inequality vs Equitable	**Differences between poverty and wealth, as well as in peoples' wellbeing and access to things like jobs, housing and education. Inequalities may occur in housing provision, access to services, access to open land, safety and security.** Equitable – fair and impartial	

Well-being	Human well-being has multiple constituents, including basic material for a good life, freedom and choice, health, good social relations, and security. The constituents of well-being, as experienced and perceived by people, are situation-dependent, reflecting local geography, culture, and ecological circumstances.	
Water quality	Quality can be measured in terms of the chemical, physical, and biological content of water. The most common standards used to assess water quality relate to health of ecosystems, safety of human contact and drinking water.	
Policy	Policies - A policy is a document that outlines what a government is going to do and what it can achieve for the society as a whole.	
Policy-maker	A person with power to influence or determine policies and practices at an international, national, regional, or local level.	
Law	Legislation - Laws set out standards, procedures and principles that are mandated and must be followed	
Regulation	Regulations - Enforced usually by a regulatory agency formed to carry out the purpose or provisions of a legislation.	
Remote Sensing	Remote sensing is the science of obtaining information about objects or areas from a distance, typically from aircraft or satellites.	
LiDAR	Light Detection and Ranging. It uses lasers to measure distance. This is useful for measuring heights on the bare ground and its features.	
Geospatial	Records in a dataset have locational information tied to them such as geographic data in the form of coordinates, address, city, or ZIP code. GIS data is a form of geospatial data.	
Geographical Information Systems	GIS refers to a system where geographic information is stored in layers and integrated with geographic software programs so that spatial information can be created, stored, manipulated, analysed, and visualized (mapped).	

Chronology of Key Policies, Laws & Regulations in Coastal Zone Management		
Date	Abbreviation/Name	Purpose
1967-1982	UNCLOS – United Nations Convention on the Law of the Sea	
1982	Exclusive Economic Zones (UN)	
1992	UNCED – United Nations Conference on Environment & Development	
1979	Birds Directive – SPA's (EU)	
1990	Environmental Protection Act (EU)	
1992	Habitats Directive – SAC (EU)	
1994	Conservation Regulations – Marine Environments (EU)	
2006	Natural Environment and Rural Communities (NERC) Act (UK)	
2008	Marine Strategy Framework Directive (EU)	
2009	Marine & Coastal Access Act – MACA (UK)	MMO & MSP MCZ
2011	Integrated Maritime Policy (EU)	
2011	Marine Policy Statement	The framework for preparing Marine Plans and taking decisions affecting the marine environment. It will contribute to the achievement of sustainable development in the United Kingdom marine area.
2014	Common Fisheries Policy (UK)	

Key Terms

Country Parks

CEFAS – Centre for Environment, Fisheries & Aquaculture Science

EMS – European Marine Sites

English Habitat Network

Green/Blue Belt

IFCA – Inshore Fisheries & Conservation Authorities

JNCC – Joint Nature Conservation Committee

Local Nature Reserves

MCZ – Marine Conservation Zones

MMO - Marine Management Organisation (UK)

National Park City

Natural England

NERC – Natural Environment Research Council

Nature Improvement Area (NIA)

RSPB Reserves

SSSI – Sites of Special Scientific Interest

SPA – Special Protected Area

SAC – Special Area of Conservation

SCI – Sites of Community Importance

Management Scale

The Progression of Management Scale
Species → Habitat → Ecosystem → Coastal Zone → Catchment

Online Resources – Please keep a list of other resources you find useful in your notes to share with other students.

Site Name	Subject Content
Coastal Wiki http://www.coastalwiki.org/wiki/Main_Page	Coastal Wiki an Internet encyclopaedia of 2,351 information pages for and by coastal professionals providing quality Coastal and Marine information.
BBC Bitesieze - Geography https://www.bbc.com/bitesize/subjects/zrw76sg	Geography covers a wide range of topics that are important to CZMT including coastal landscapes, ecosystems, rivers and water, development, tourism, conservation and sustainability.
JNCC http://jncc.defra.gov.uk/Default.aspx	JNCC is the public body that advises the UK Government and devolved administrations on UK-wide and international nature conservation.
MarLIN https://www.marlin.ac.uk/	The Marine Life Information Network - information on the biology of species and the ecology of habitats found around the coasts and seas of the British Isles
Marine Conservation Society https://www.mcsuk.org/ukseas/search	The Marine Conservation Society is the UK's leading charity for the protection of our seas, shores and wildlife.
NOAA Digital Coast https://coast.noaa.gov/digitalcoast/data/home.html	Digital Coast was developed to meet the unique needs of the coastal management community...provides coastal data, ...tools, training and information.
European Commission Environment http://ec.europa.eu/environment/index_en.htm	Core information about what the EU is doing to protect its environment – air, water, nature, biodiversity and so on. It was set up in 1973 to protect, preserve and improve Europe's environment for present and future generations.
UNEP https://www.unenvironment.org/explore-topics/oceans-seas	The United Nations Environment Programme (UN Environment) is the leading global environmental authority that sets the global environmental agenda, promotes the coherent implementation of the environmental dimension of sustainable development within the United Nations system, and serves as an authoritative advocate for the global environment.
ESA http://www.esa.int/ESA	The European Space Agency (ESA) is Europe's gateway to space. Its mission is to shape the development of Europe's space capability and ensure that investment in space continues to deliver benefits to the citizens of Europe and the world
Natural England https://www.gov.uk/government/organisations/natural-england	Government's adviser for the natural environment in England, helping to protect England's nature and landscapes for people to enjoy and for the services they provide.

Tutorial 1 What is Coastal Zone Management (CZMT)?

https://doi.org/10.1016/j.ocecoaman.2017.11.007

What is the purpose of Tutorial 1?

To define and understand the following concepts:

- Coastal Zone Management
- Ecosystem Based Management
- Sustainable Development
- Anthropogenic

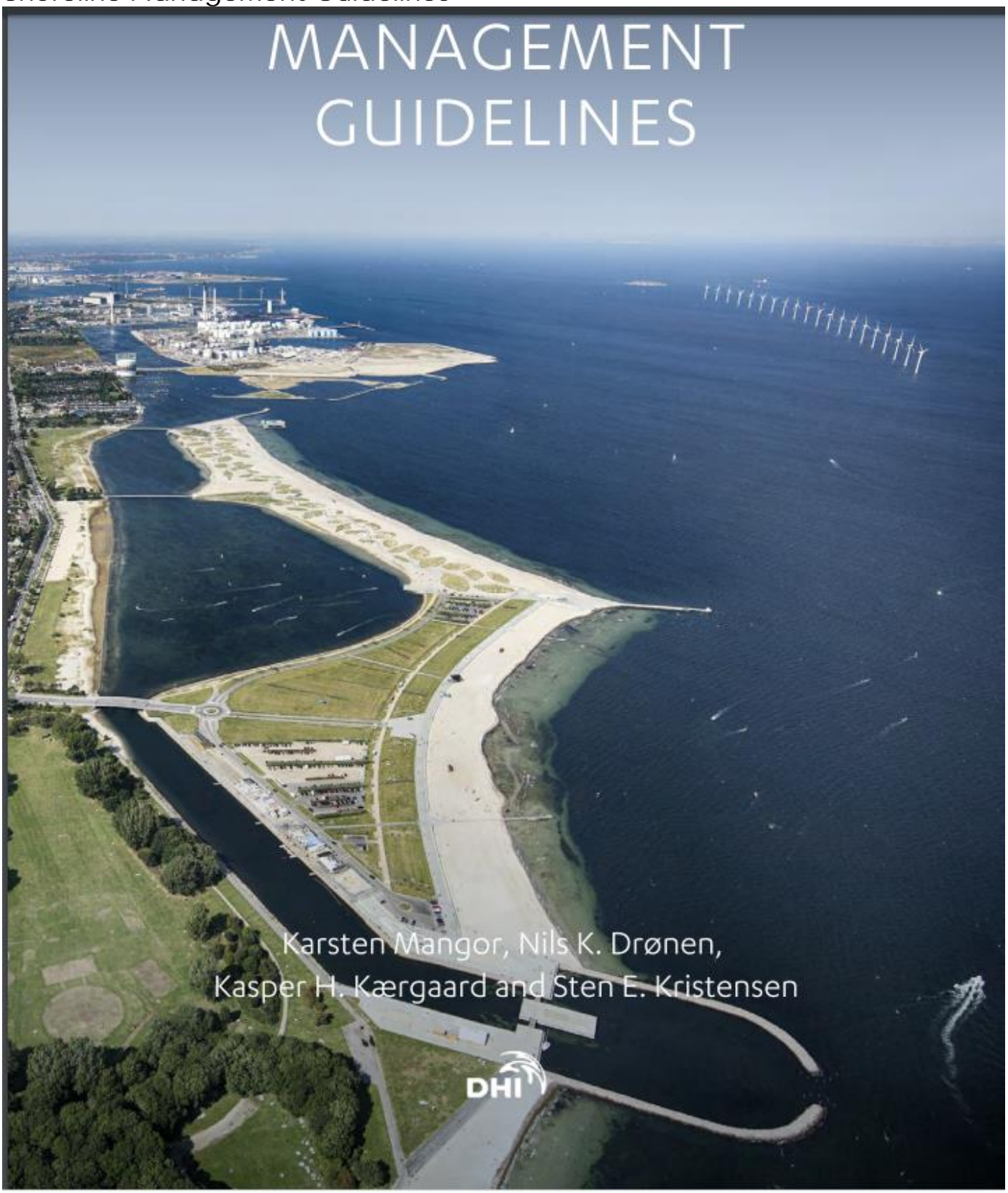
Questions for reflection:

- Did you know that there are seahorses in the Thames? Why would that be surprising?
- Where do you normally expect to see a seahorse?
- Why do you think we would need to 'save' them?
- Why do we need CZMT?
- What are some anthropogenic impacts in the Thames?
- The _____ is an _____ and London's gateway to the ocean.

Knowledge Content

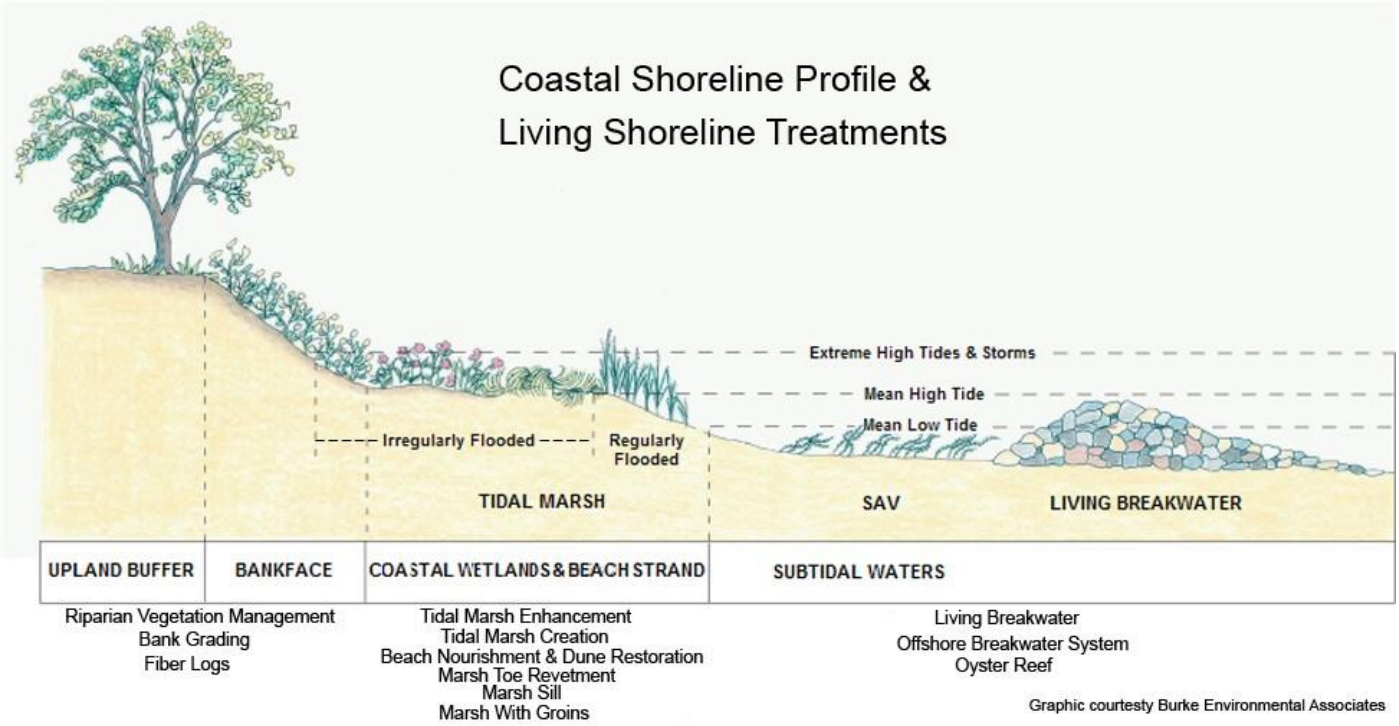
Practice *What kinds of activities do you see taking place?*

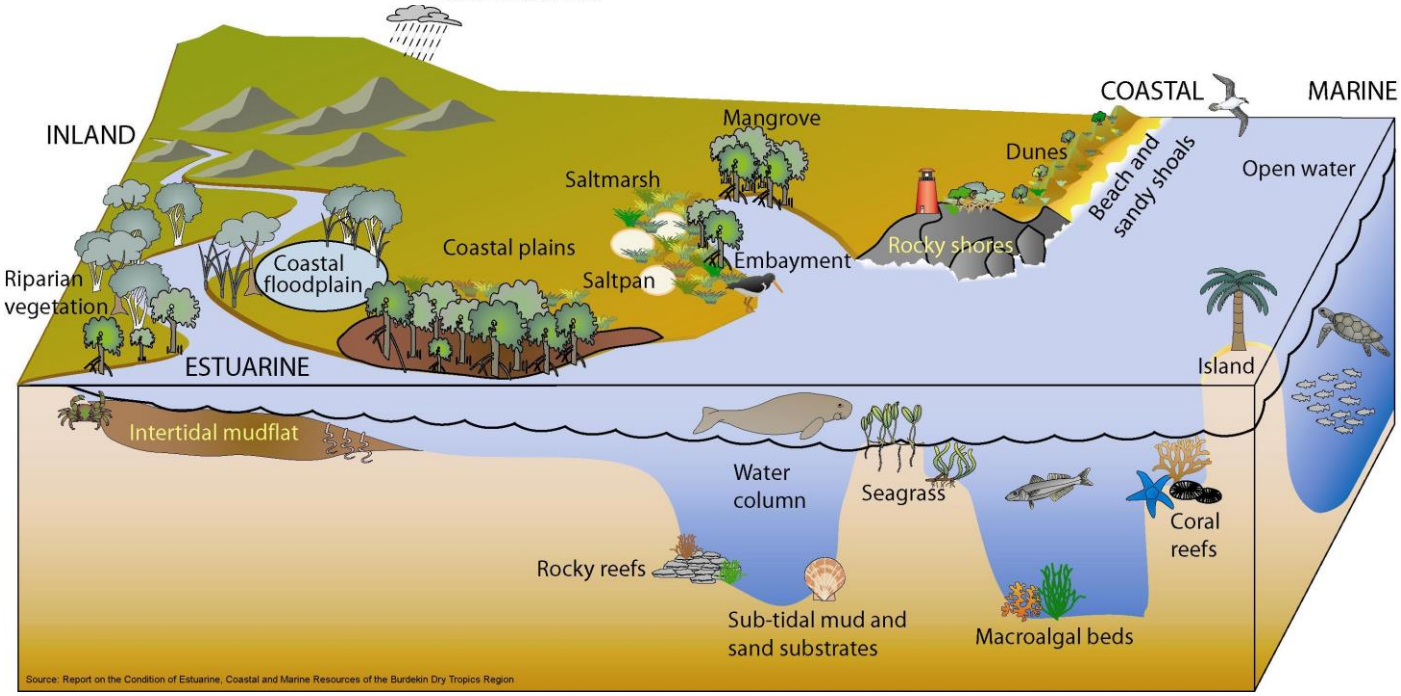
Shoreline Management Guidelines



Mangor, K., Drønen, N. K., Kærgaard, K. H., Kristensen, S. E., Sørensen, P., & Kroon, A. (2017). Shoreline management guidelines. *DHI https://www. dhigroup. com/marine-water/ebook-shoreline-management-guidelines*.

***Practice** Can you identify where the coastal zone is located in these maps/graphics? Where does the coastal zone end?*





Report on the Condition of the Estuarine, Coastal and Marine Resources of the Burdekin Dry Tropics Region

Define the coastal zone:

What is an ecosystem?

What common ecosystems are found in the coastal zones of the UK?

National Geographic

Estuary – The tidal mouth of a river where it meets the sea; wide banks of deposited mud are exposed at low tide.

A partially enclosed coastal body of brackish water (fresh river water entering at its head mixes with saline water entering from the ocean water) with one or more rivers or streams flowing into it, and with a free connection to the open sea. Estuaries form a transition zone between river environments and maritime environments.

© Vicki Read

Salt Marsh – Salt marshes are defined as natural or semi-natural terrestrial halophytic ecosystems. They largely occur in the intertidal zone between land and the sea and are covered by salty or brackish water for at least some of the time. The dominant flora is composed of halophytic plant such as grasses, shrubs and herbs. The sediment consists of mud and sand. The

salt marshes are normally associated with mud flats but also occur on sand flats. They are regularly subjected to tidal movement and controlled by a meandering network of tidal channels. Through these channels sediments, detritus, dissolved nutrients, plankton and small fishes are flushed in and out the salt marshes.

Holyhead, Wales. Photo credit: Nigel Barry

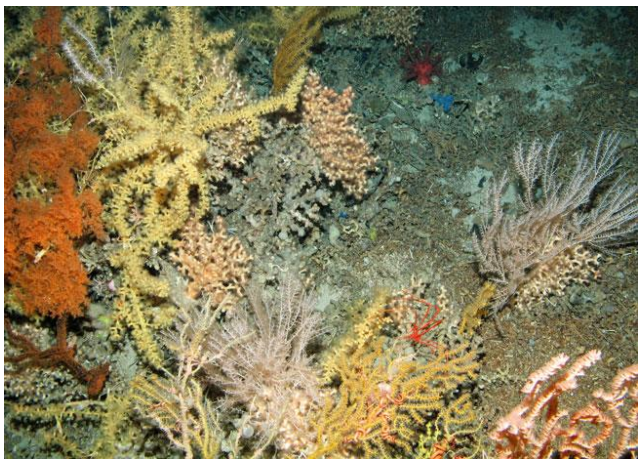
Rocky shore – An intertidal area that consists of solid rocks and can include many different habitat types like steep rocky cliffs, platforms, rock pools and boulder fields. (Töpke, K. 2018).

Telegraph

Beach – The zone of deposited material that extends from the low water line to the limit of storm waves. The beach or shore can be divided in the foreshore and the
backshore **(GCSE).**

JNCC

Dunes – Ridges or loose, wind-blown sand forming on the backshore at certain locations. Dunes are more or less vegetated, acting as a flexible sand reservoir and are typical features of a beach. (Mangor, K. 2004).



JNCC

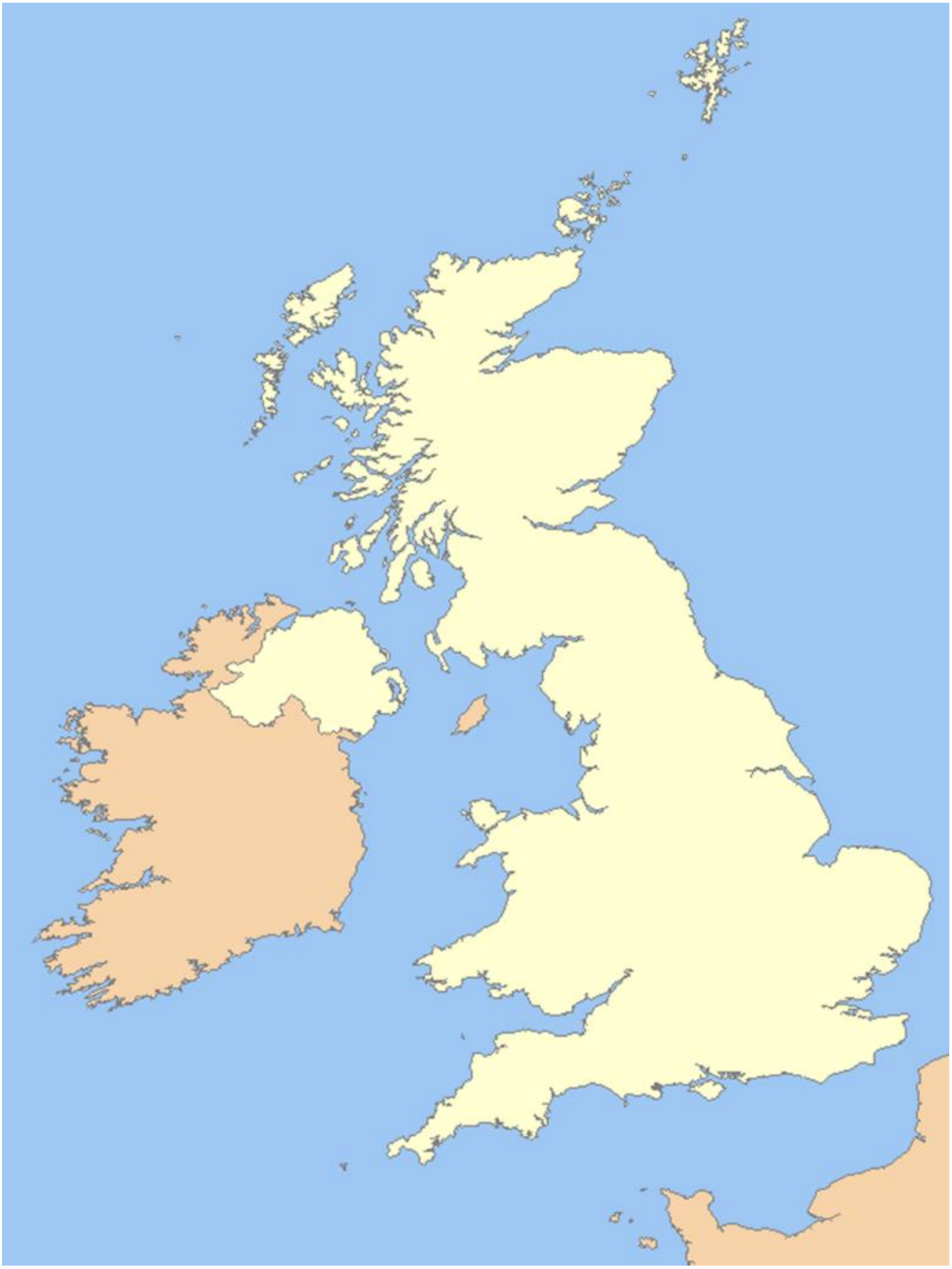
Reefs - Structures in the marine environment that arise from the seabed and cover an extensive area. They are permanently submerged, often hard mineral substrates such as rocks or biogenic hard substrates such as honeycomb (Sabellaria) reefs and often they are overgrown with mussels and a characteristic macrofauna (From, T. 2014).

Paul Kay/JNCC

Seagrass beds – Seagrass is a flowering plant that lives in a marine or brackish environment. Three species are found in England. Seagrasses require a lot of light, so the depths at which they occur in the ocean are limited by light availability. Seagrasses are found in protected coastal waters such as bays, lagoons, and estuaries. Seagrass beds are threatened by pollution, and by increased amounts of sediment in the water, which block sunlight and prevent seagrass growth.

Kelp forests – the kelp bed is one of the most productive and dynamic marine ecosystems on the continental shelf. It occurs worldwide in temperate and polar coastal oceans. Brown macroalgae of the order Laminariales forms the forests. The kelp forests have some specific requirements such as a hard, rocky bottom; cold water and a continuous supply of nutrients to support the high level of photosynthetic activity. (Töpke, K. 2008).

Practice Where do we see these different types of ecosystems in the UK? In London?



Anthropogenic – of, relating to, or resulting from the influence of human beings on nature.

Practice Can we find examples of anthropogenic impacts in the coastal zone?

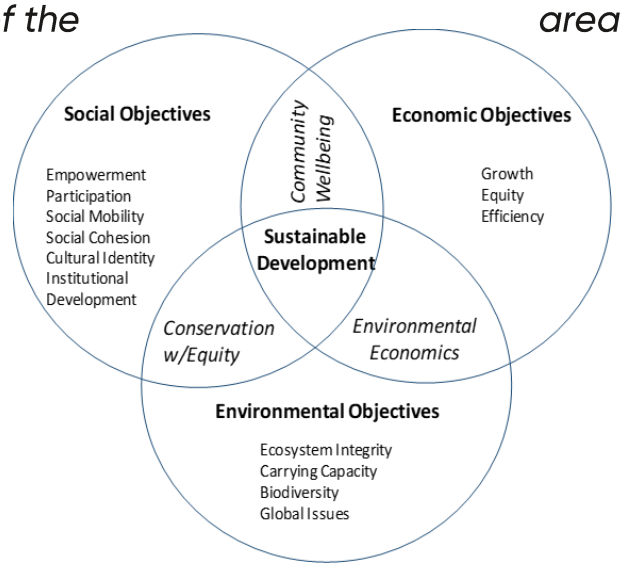
Ecosystem	Anthropogenic Impact

What is sustainable development? Economic development that is conducted without depletion of natural resources.

To ensure a level and type of development of an area and its coastal resources that is consistent with the continuing productivity and viability of the natural systems upon which the productivity of the area is based (UN, 1982).

The 3 pillars of sustainability are:

- Social
- Economic
- Environmental



Ecosystem Based Management (EBM) – an integrated management approach that recognizes the full array of interactions within an ecosystem, including humans, rather than considering single issues, species, or ecosystem services in isolation.

*Practice Can we write a description of **Coastal Zone Management** based on EBM that incorporates the definitions and examples of the coastal zone, ecosystems, anthropogenic impacts in the UK as discussed previously?*

Why is it important that we manage anthropogenic impacts in the coastal zone?

"....THE OCEAN IS EXPECTED TO CONTAIN ONE TONNE OF PLASTIC FOR EVERY THREE TONNES OF FISH BY 2025, AND BY 2050, MORE PLASTICS THAN FISH [BY WEIGHT]."

THE NEW PLASTICS ECONOMY ELLEN MACARTHUR FOUNDATION

WAIT?! WHAT?! NO MORE FISH & CHIPS?!?!

Practice What would happen if we ran out of fish? Write down your ideas about what might happen if we ran out of fish and discuss with your partner.

• *Social Impacts?*

• *Economic Impacts?*

• *Environmental Impacts?*

Why do we need to worry about managing the coastal zone NOW?

https://euccnews.wordpress.com/2015/01/18/ocean-life-faces-mass-extinction/

- **More People**
  - Between 1500 and 1700, London grew from the capital of England with a population of 50,000 to a population nearing 500,000.
  - In January 2015, Greater London's population was estimated to be 8.63 million.
  - http://www.localhistories.org/population.html
- **Lost Traditions/Knowledge**
  - https://irishwaterwayshistory.com/about/irish-inland-waterways-vessels/traditional-boats-and-replicas/
  - English fishermen in the 1600s described the shoals of Grand Banks cod as being "so thick by the shore that we hardly have been able to row a boat through them."
  - (http://www.telegraph.co.uk/culture/hay-festival/8537896/Hay-Festival-2011-Geoffrey-Lean-on- the-future-of-fish.html).
- **Modern Technology**
  - "Cod stocks in the Irish Sea and the west coast of Scotland have collapsed because of overfishing and politicians' refusal to fix low enough catch quotas, according to a leading fisheries scientist who advises the European commission on fish quotas." (https://www.theguardian.com/environment/2011/sep/30/uk-cod-collapse-overfishing

Homework – Research CZMT in the UK

Research the list below of modern CZMT in the UK in and write down the title of the policy, law or regulation and it's use in the UK.

- MACA - 2009
- MCZ's
- MMO

Sign up for a free account with arcgis.com

- **https://www.arcgis.com/home/signin.html**

Follow this link (http://arcg.is/0TGeXL) and **explore CZMT in London & the Thames and find:**

- 3 Priority Habitats with an example of each
- 3 Types of Protections **hint look in each tabbed section*
- 3 Anthropogenic Pressures
- Can you find Harris Garrard Academy on the map?

Write a 300 word essay using one example from each of the things you have learned in your research.

For example:

I learned that the MACA 2009 was a (policy, law or regulation) which was created to _____. You can see this (management mechanism) in use in the Thames. The (priority habitat) was (created, protected, developed) in response to the (anthropogenic pressure).

You can use any examples that you like but you must:

- pick a management tool,
- a priority habitat,
- talk about what protections it has,
- talk about why that habitat is important,
- and discuss what the impacts and uses are for that habitat.

Tutorial 2 – What's more important? Humans or Nature?

"Coastal and marine environments are usually characterized by beautiful landscapes and rich ecosystems of great importance, offering elements such as rich biodiversity. They also attract human activities such as tourism and industrial uses. However, the co-existence of human activities and natural resources often creates conflicts of use in the coastal zone. Management policies are an important means of implementing planning in order to minimise, prevent or resolve use conflicts. " https://www.coastal-management.eu/

http://theconversation.com/marine-debris-biodiversity-impacts-and-potential-solutions-2131

https://www.express.co.uk/news/uk/422307/Can-you-sea-I-me-New-count-reveals-over-700-seals-in-Thames-Estuary

What is the Purpose of Tutorial 2?

To define and understand the following concepts:

- Natural Resources
- Ecosystem Services
- Socio-ecological Systems
- Intrinsic vs. Extrinsic Values
- Stakeholders

Questions for reflection:

- What natural resources do we have in the UK coastal zone?
- What are the benefits of ecosystem services?
- How many stakeholders are there in the coastal zone?
- What's more important – humans or nature?
- Which values are most important?
- What are the possible outcomes of human-environmental interactions?

Knowledge Content

Natural Resources - Materials or substances occurring in nature which can be exploited for economic gain.

Practice – Can we name some natural resources that occur in nature in the UK from each of the ecosystems we discussed in Tutorial 1?
Write down your ideas about natural resources present in each ecosystem that may be exploited for economic gain, then discuss with your partner.

Can you think of any resources that are exploited without being removed from the ecosystem?

Estuary

Saltmarsh

Rocky shorelines

Beach, dunes and sandy shorelines

Reefs

Seagrass beds

Kelp forests

Ecosystem Services - the benefits people obtain from ecosystems, grouped into four broad categories.
"Ecosystem goods (such as food) and services (such as waste assimilation) represent the benefits human populations derive, directly or indirectly, from ecosystem functions "(Costanza et al., 1997).

Practice - Can we find examples in our UK ecosystems that provide each of these services?
Discuss with your partner and write down your ideas for each of the categories below.

- **Provisioning** - production of food and water;
- **Regulating** - control of climate and disease;
- **Supporting** - nutrient cycles and oxygen production;
- **Cultural** - spiritual and recreational benefits.

Ecosystem	Service	Example

Practice – Identify the coastal zone on this map, name the different ecosystems, discuss the natural resources and services they provide.

https://www.niwa.co.nz/file/31826

Social-Ecological Systems (SES) – "*Linked systems of people and nature, emphasising that humans must be seen as a part of, not apart from, nature*" (Berkes and Folke, 1998).

Practice *Working in pairs, discuss an example of a social-ecological system that incorporates our previous examination of ecosystems in the UK, the natural resources present, the ecosystem services provided and who may benefit.*

Extrinsic vs. Intrinsic Values

Extrinsic Value – Placing a monetary value on natural systems based on what we can get out of them or get from them.

Intrinsic Value – Cannot place a monetary value on it but has its own inherent worth, can be moral, ethical, emotional, or spiritual value.

Practice

In pairs discuss the monetizing of nature through resource extraction:

- Timber Harvests
- Mineral Wealth
- Farmland Conversion
- Urban Development
- Game Animals
- Fisheries

Now think about intact ecosystems that nothing is extracted from? Can they also be given monetary value?

- Intact forested watersheds provide water retention and filtering to supply stable water supplies for billions of people.
- Forested ecosystems remove many air pollutants from nearby cities.
- Wetlands to absorb floodwaters and pollutants and protect surrounding communities.
- Reduction in energy usage by shade/wind breaks of trees.
- Wave breaks of coral reefs, beaches and mangroves for coastal communities
- Store of natural chemicals for human discovery and use.
- Carbon sequestration by forests.
- Pollinators provide agricultural services

Where do intrinsic and extrinsic values mix?

- Does nature have a value in and of itself, even if humans cannot "use" it for their own benefit.

- Does Wilderness have value?
- Do we have an obligation to protect nature?

Further reading:
http://nrl.northumbria.ac.uk/21603/
https://www.theguardian.com/sustainable-business/social-psychologists-environmental-values

The Value of Ecosystems
Practice With a partner, put together a list of the extrinsic values or monetary value we can
acquire from ecosystems in the UK. Next, think about what kinds of intrinsic values they may have.

Extrinsic Value	**Intrinsic Value**

Stakeholders – *"...defined as the people and organizations who are involved in or affected by an action or policy and can be directly or indirectly included in the decision-making process. In environmental and conservation planning, stakeholders*
typically include government representatives, businesses, scientists, landowners, and local users of natural resources."
Stakeholder Analysis in Environmental and Conservation Planning by Donna Vogler, Suzanne Macey, Amanda Sigouin. Lessons in Conservation, Vol. 7, pp. 5–16

Is the Environment a stakeholder?
https://www.stakeholdermap.com/is-environment-a-stakeholder.html

Alternatively defined in the business world as individuals who either care about or have a vested interest in your project.
"The natural environment can be affected by a company's activities and, through channels such as climate change, can have an effect upon the company. (Boutilier, R. 2011)."

"The organization has an obligation, not to the non-human natural environment itself, but to the community within which it operates, to be a good steward of at least local environmental resources. (Phillips, 2003, p.146)."

Homework – Ecosystem Services & Valuing Nature

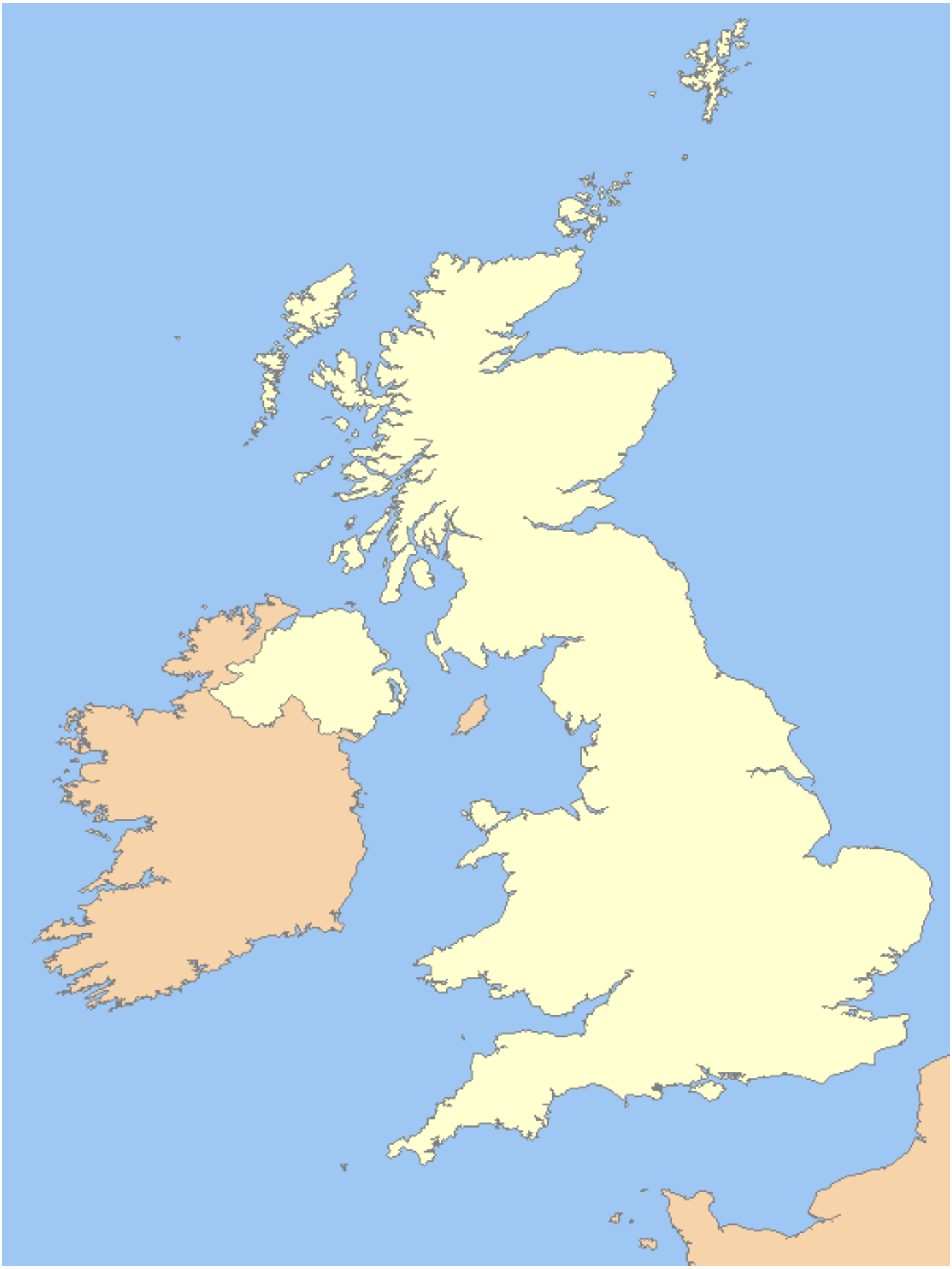
- Research, locate, identify and label on the map 3 different ecosystems discussed .
  1.

  2.

  3.

- Describe the different stakeholders that you think are present in each and what values they may have.

- In each ecosystem, what potential anthropogenic disturbances might be a result of their activities?



Tutorial 3 – Can I fish in your ocean?

https://www.independent.ie/irish-news/worlds-second-largest-supertrawler-enters-irish-waters-30058458.html

What is the Purpose of Tutorial 3?

To define and understand the following concepts:

- Competing Interests
- Policy vs. Law vs. Regulations
- Management Measures & Interventions
- Adaptive Management

Questions for reflection:

- Who is in charge of the coastal zone?
- What competing uses do you think are found in the coastal zone?
- How do you think values (discussed in previous tutorial) influence competing interests?
- How do we manage a dynamic resource like fish?
- Are we managing humans or the environment?
- How could management measures and interventions change over time?

Knowledge Content
Competing Interests – Potentially incompatible special interests of stakeholders in the coastal zone.
There are complex trade-offs that exist between human well-being and conservation goals, and between allocating and managing resource use to achieve social, economic, and environmental objectives.

Practice Identifying stakeholders competing interests
In pairs discuss what you think each stakeholder's special interest would be

Stakeholder	**Special Interest**
Local Fisherman	Catching enough fish to support the family.
Recreational Beach User	
Tourist Boat Owner	
Oil Rig Owner	
Wind Turbine Owner	
Conservationist	Conserve the environment and biodiversity.
Politician	Get elected or serve the community.
Holiday Resort Company	
Local Restaurant Owner	
Retail Store	
Snack Manufacturer	
Waterfront Developer	

Now discuss how some of these uses may not be compatible.

- Can we know the stakeholder's values?
- What trade-offs might they make to meet the needs of all stakeholders?
- Could we make another column for anthropogenic impact?
- How could the competing interests lead to overexploitation?

How do we stop overexploitation?

- **Policies** - A policy is a document that outlines what a government is going to do and what it can achieve for the society as a whole.
- **Legislation** - Laws set out standards, procedures and principles that are mandated and must be followed
- **Regulations** - Enforced usually by a regulatory agency formed to carry out the purpose or provisions of a legislation.

Practice Policy, laws & regulations in CZMT

Which one is which?

- **UNCLOS**
- United Nations Convention on the Law of the Sea -1967-1982
- Malta Ambassador Arvid Pardo - spoke of looming disaster of overfishing and pollution.
- It took them 15 years to put it together!
- **EEZ**
- Prescribed by the United Nations Convention on the Law of the Sea
- An exclusive economic zone (EEZ)is a sea zone, generally extending _____ nautical miles from shore.
- A state has special rights regarding the exploration and use of marine resources in this zone.
- **UNCED**
- United Nations Conference on Environment & Development - 1992 • Rio Declaration guide to sustainable development.
- Human beings are entitled to a healthy and productive life in harmony with nature.
- Equitably meet developmental and environmental needs of present and future generations.

Practice – Stakeholder Group Assignment

Write down all the natural resources your stakeholder group uses and why. Consider all the reasons that this group should be allowed to use the coastal zone. Defend your position against a competing interest.

Stretch: Identify management measures we have previously discussed that would aid in meeting stakeholder needs.

Challenge: Write a management plan that meets all stakeholders needs.

Homework – Do Marine Conservation Zones (MCZ's) work for everyone?

Go online and research 3 current news articles on Marine Conservation Zones in the UK and look for the following information:

- Where in the UK are they located?
- Identify the stakeholders involved,
- what their competing interests are,

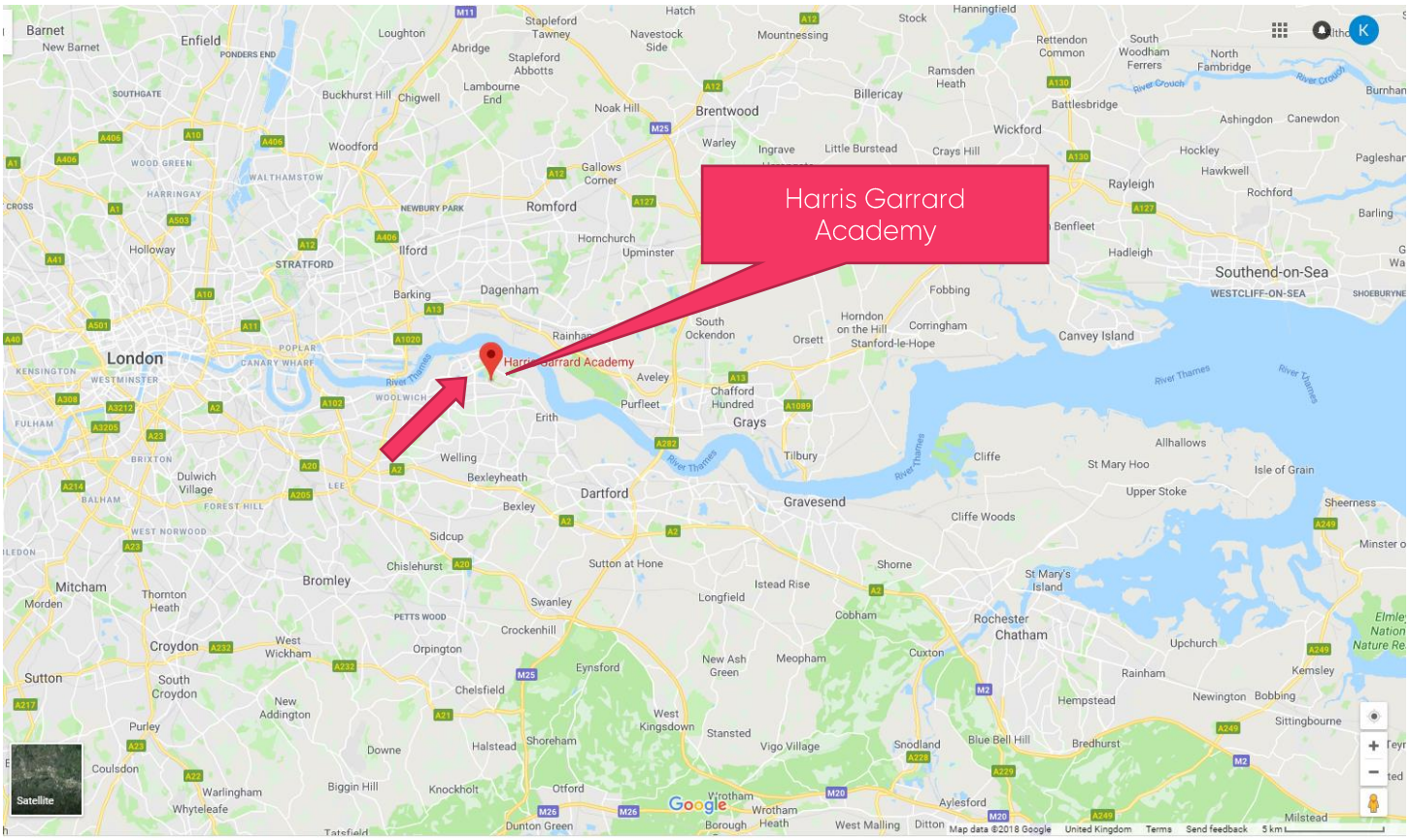
- what management measures are being used, and
- what policies, laws or regulations are driving the process.

Further reading:
Policy Process
https://www.ids.ac.uk/files/dmfile/wp89.pdf

Conflict resolution of competing interests
https://www.iisd.org/project/conflict-sensitive-conservation

Landscape approaches
http://www.pnas.org/content/pnas/110/21/8349.full.pdf

Tutorial 4 – You are here! Maps for CZMT



What is the Purpose of Tutorial 4?

<u>To define and understand the following concepts:</u>

- Cartography & Essential Elements of a Map
- Location Based Knowledge
- Remote Sensing Technologies
- Geographical Information Systems

<u>Questions for reflection</u>:

- What makes a good map?
- How could knowing the 'where' (location information) of natural resources inform the 'why' and 'how' of management interventions?
- How has technology improved our ability to monitor and sustainably manage natural resources?
- What disciplines in science are important to inform the decisions of management in the coastal zone?
- Why would knowing the map projection be important?

Knowledge Content

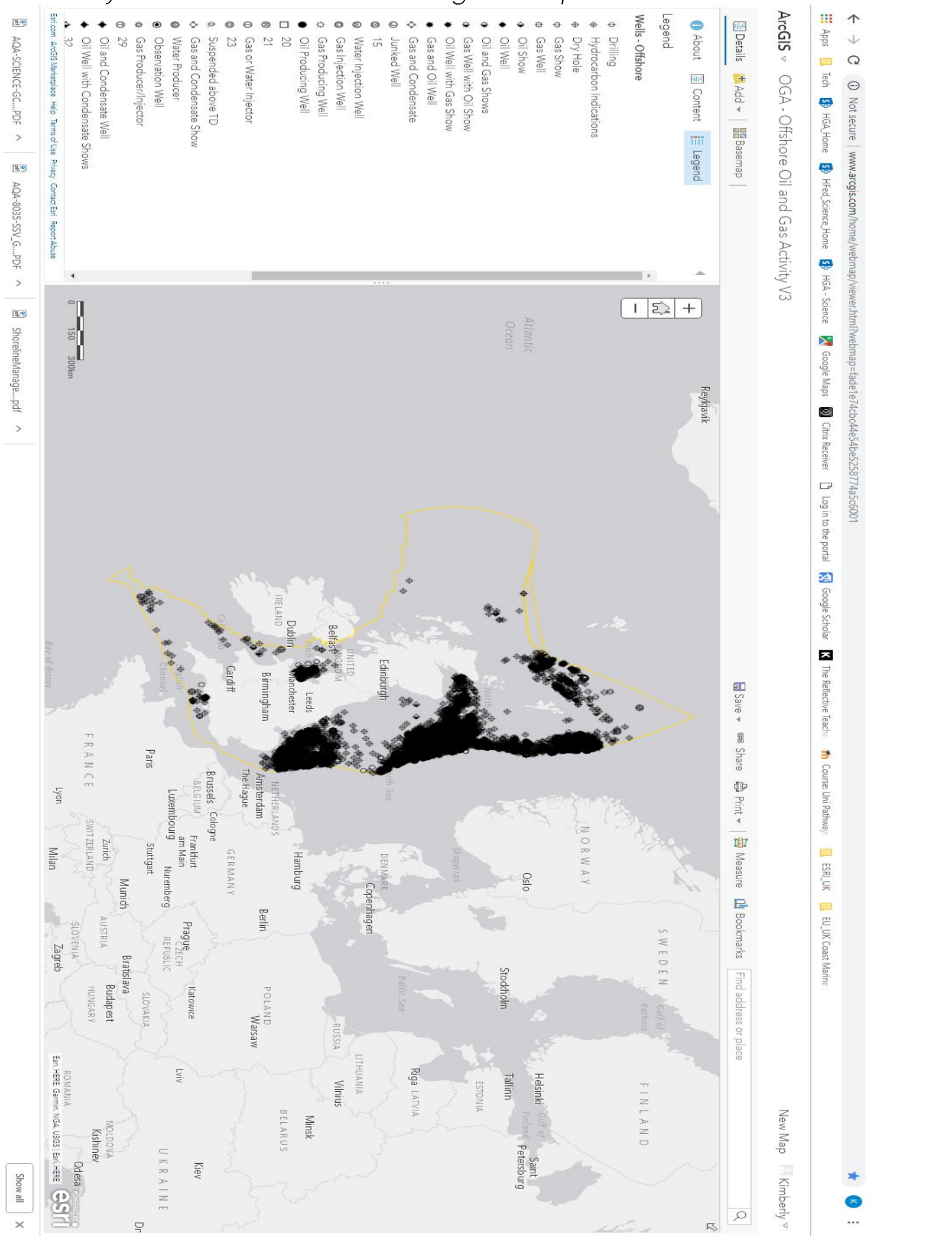
"Almost everything that happens, happens somewhere. Knowing where something happens can be critically important." (Longley, et al., 2011, pp.4)

Cartography – the study and practice of making maps.
Maps are visual representations of where things are in the real world and the primary tools by which spatial relationships are visualized.
Maps convey information to the reader and should be accurate, current, topical, aesthetic, relevant and informative.
Almost all maps must include certain basic elements that provide the reader with critical information. Among these are:

- Title - instantly gives the viewer a succinct description of the subject matter of the map and usually includes your theme and geographic location.
- Scale - explains the map extent to real world relationship, graphically showing the distance of units on a map. A scale showing a 1:10,000 scale means that every one paper map unit represents 10,000 real world units.
- Legend - serves as the decoder for the symbology in the data frame, it is also commonly known as the key.
- Body of the map – the primary map that will convey the necessary information to your viewer.
- North arrow - purpose is for orientation allowing the viewer to determine the direction of the map as it relates to due north. Most maps tend to be oriented so that due north faces the top of the page.
- Cartographer – who made the map?
- Date of production – is the information current?
- Projection - method for taking the curved surface of the earth and displaying it on something flat and every map projection has some distortion.
- Information Sources – reliable and trusted sources of information used to produce the map.
- Theme - What is the map's purpose? Maps help people understand their place on Earth and the purpose helps readers spatially understand a theme or subject.

What do you see missing from the 'You Are Here!' map at the beginning of this tutorial?

Practice *– You are here! Reading maps and exploring interactive maps online to identify the essential elements of a good map.*



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ArcGIS ▾ Global Distribution of Cold-water Corals (2017)

New Map ▾ Kimberly ▾

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- Global Distribution of Cold-water Corals (2017)
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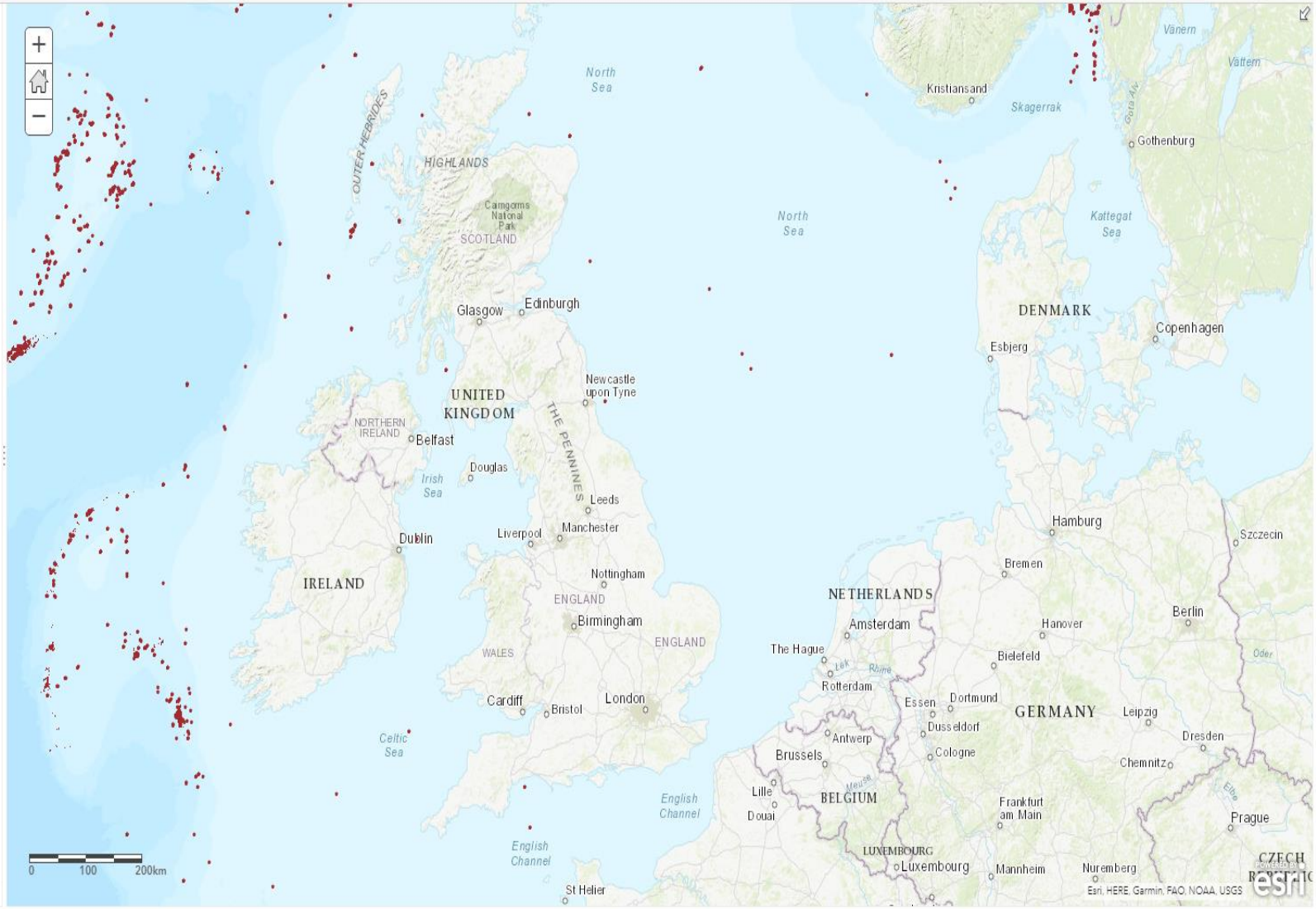
  - 14 001 WCMC001 ColdCorals2017 v4 Py
- Topographic



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ArcGIS ▾ World Heritage Coast

New Map ▾ Kimberly ▾

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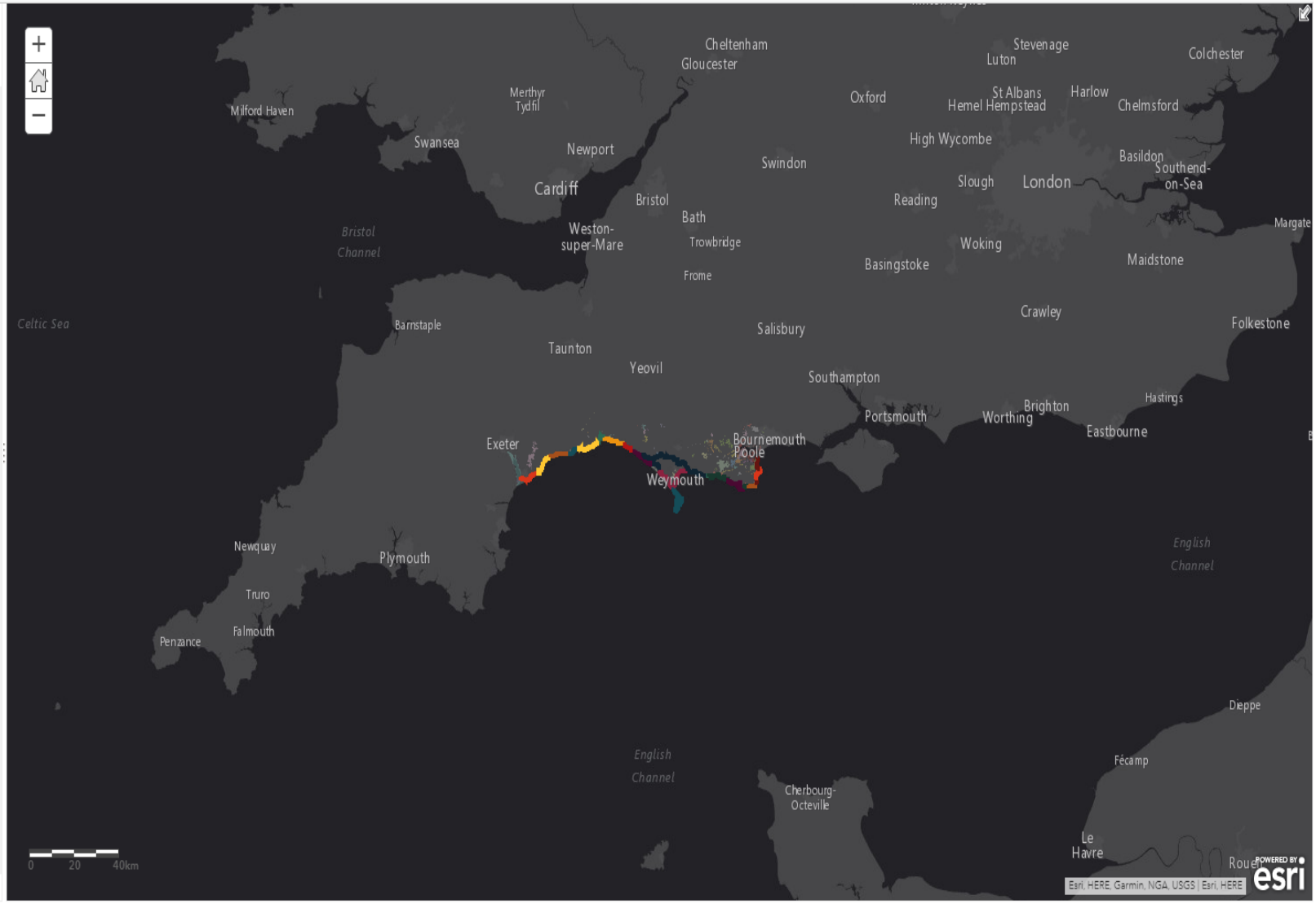
Legend

Southwest Coast Path (East Devon and Dorset)

- Abbotsbury to Langton Herring - One climb to 80 m then descent with another small climb before finally descending to sea level.
- Branscombe to Seaton - four hills to 80 m or so.
- Budeigh Salterton to Sidmouth - initially fairly level then builds to two hills at 136 m and 150 m. before descending again to sea level.
- Charmouth to Seatown - three climbs, 140 m, 80 m and 173 m then back to sea level
- Dancing Ledge to Durlston Head - to 80 m.
- Durlston Head to Swanage - 60 m to 80 m then descent to Swanage.
- Exmouth to Budleigh Salterton - initially level then builds to 123m before descending to sea level again.
- Eype to West Bay - climb up to 60 m then back down to sea level.
- Kimmeridge to Winspit - undulating then two climbs to above 120 m.
- Langton Herring to Wyke Regis - low level undulating.
- Lulworth to Kimmeridge - four climbs from sea level to above 110 m: 100 m, 150 m, 160 m, 130 m then back to sea level.
- Lyme Regis to Charmouth - one sustained climb to 170 m then back down to sea level.
- Osmington Mills to Durdle Door - Gradual climb to 160 m then back to sea level before climbing to Durdle Door.
- Portland circuit - two major climbs to above 100 m then descent to sea level again.
- Seaton to Lyme Regis - the under cliff three climbs to 120 and 100 m. Pretty remote.



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ArcGIS ▾ Marine Conservation Zones (England)

New Map ▾ Kimberly ▾

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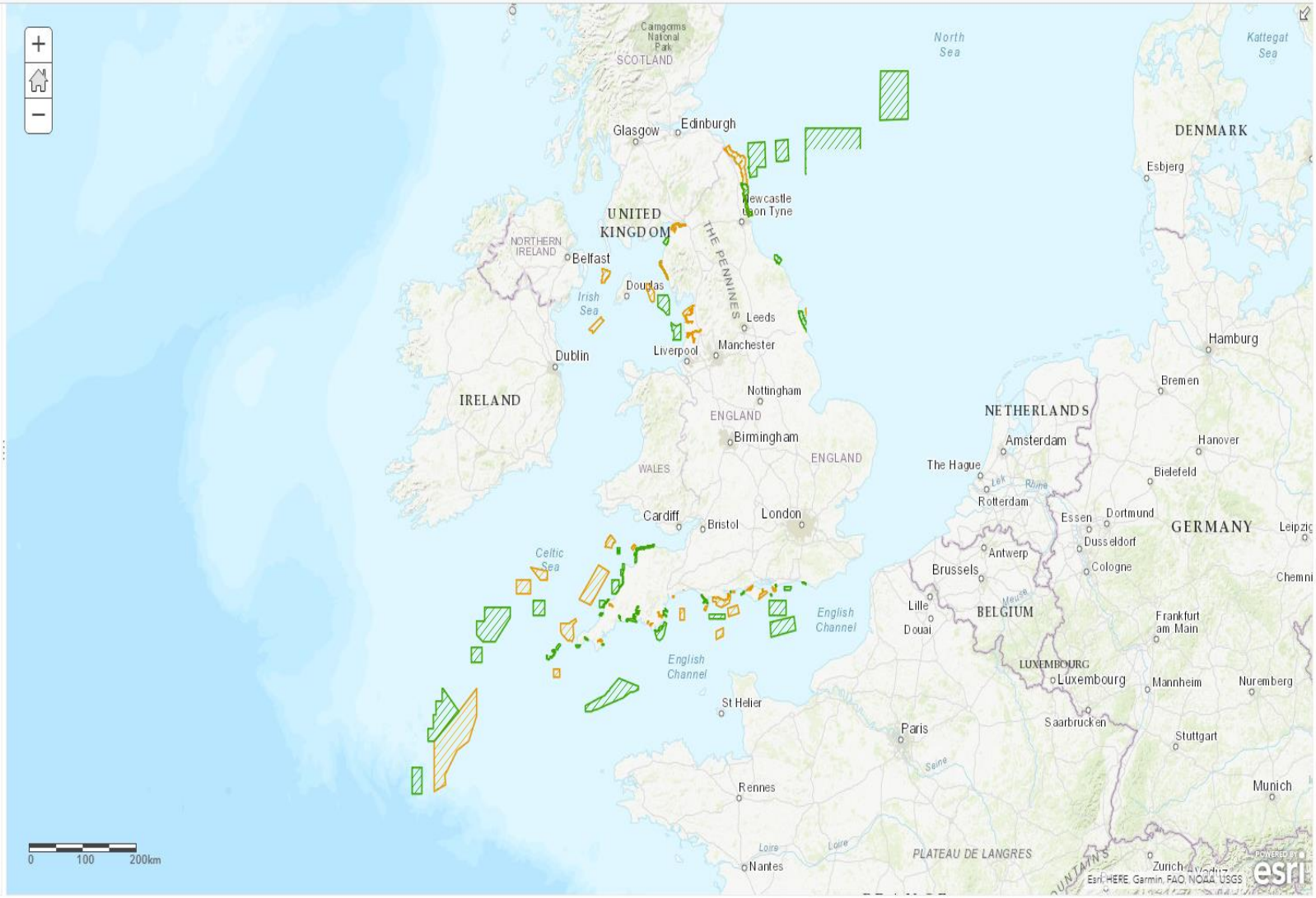
Legend

Marine Conservation Zones (England)

- Designated
- Proposed



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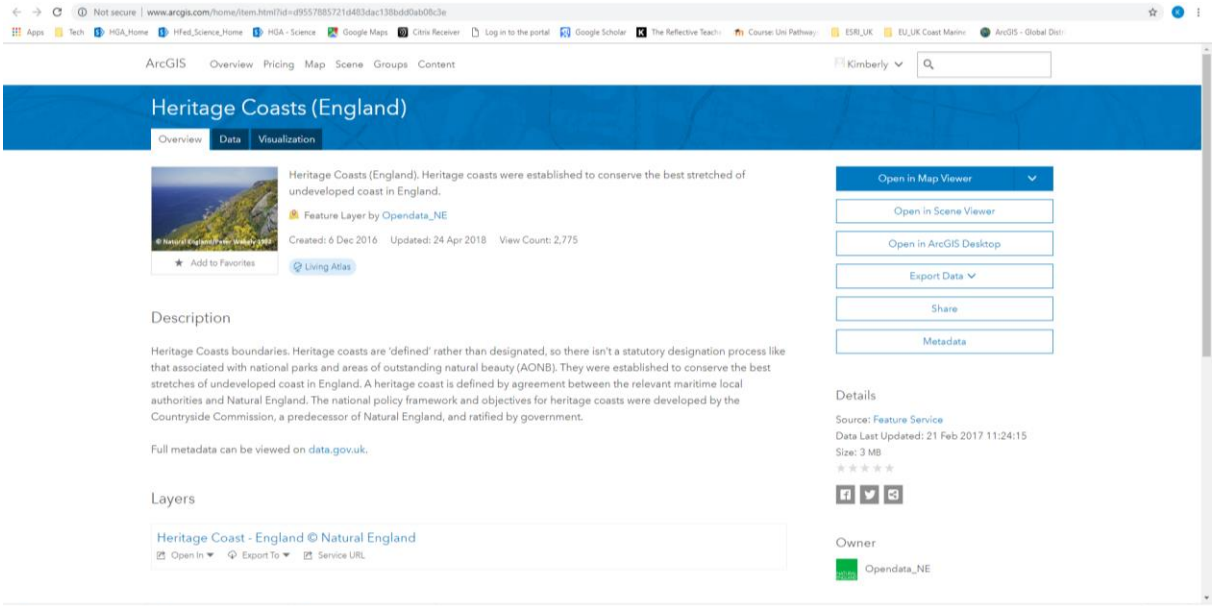
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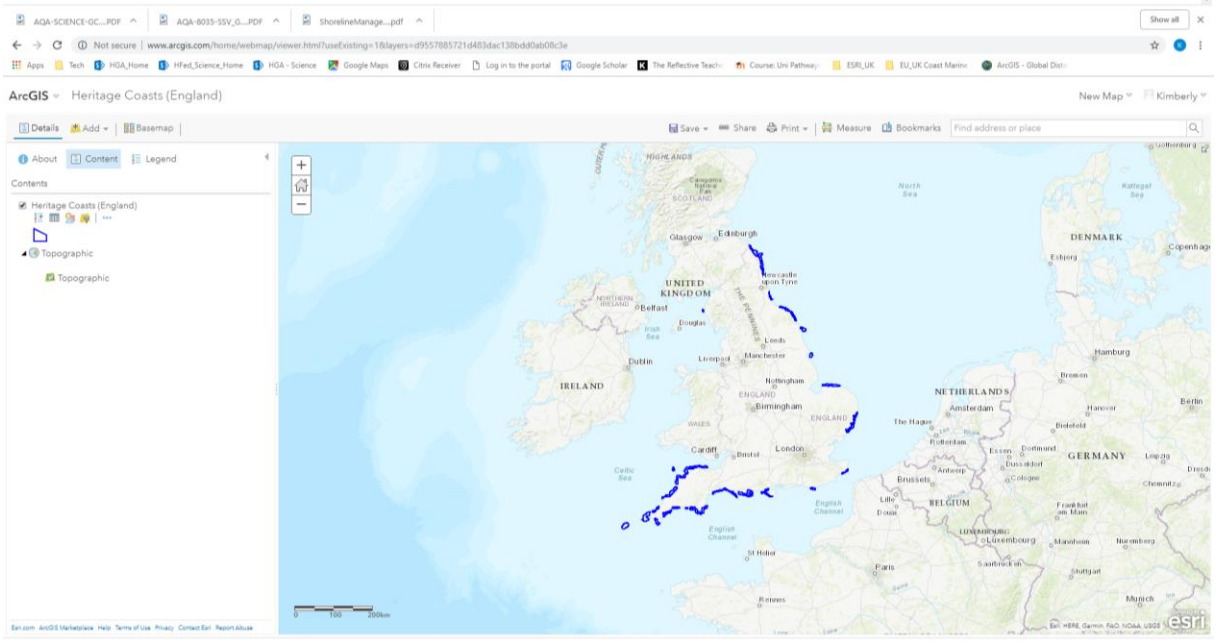
Kimberly
Heritage Coasts (England)
Overview Data Visualization
Heritage Coasts (England). Heritage coasts were established to conserve the best stretched of undeveloped coast in England.
Feature Layer by Opendata_NE
Created: 6 Dec 2016 Updated: 24 Apr 2018 View Count: 2,775
Add to Favorites
Living Atlas
Open in Map Viewer
Open in Scene Viewer
Open in ArcGIS Desktop
Export Data
Share
Metadata
Description
Heritage Coasts boundaries. Heritage coasts are 'defined' rather than designated, so there isn't a statutory designation process like that associated with national parks and areas of outstanding natural beauty (AONB). They were established to conserve the best stretches of undeveloped coast in England. A heritage coast is defined by agreement between the relevant maritime local authorities and Natural England. The national policy framework and objectives for heritage coasts were developed by the Countryside Commission, a predecessor of Natural England, and ratified by government.
Full metadata can be viewed on data.gov.uk.
Details
Source: Feature Service
Data Last Updated: 21 Feb 2017 11:24:15
Size: 3 MB
Layers
Heritage Coast - England © Natural England
Open In Export To Service URL
Owner
Opendata_NE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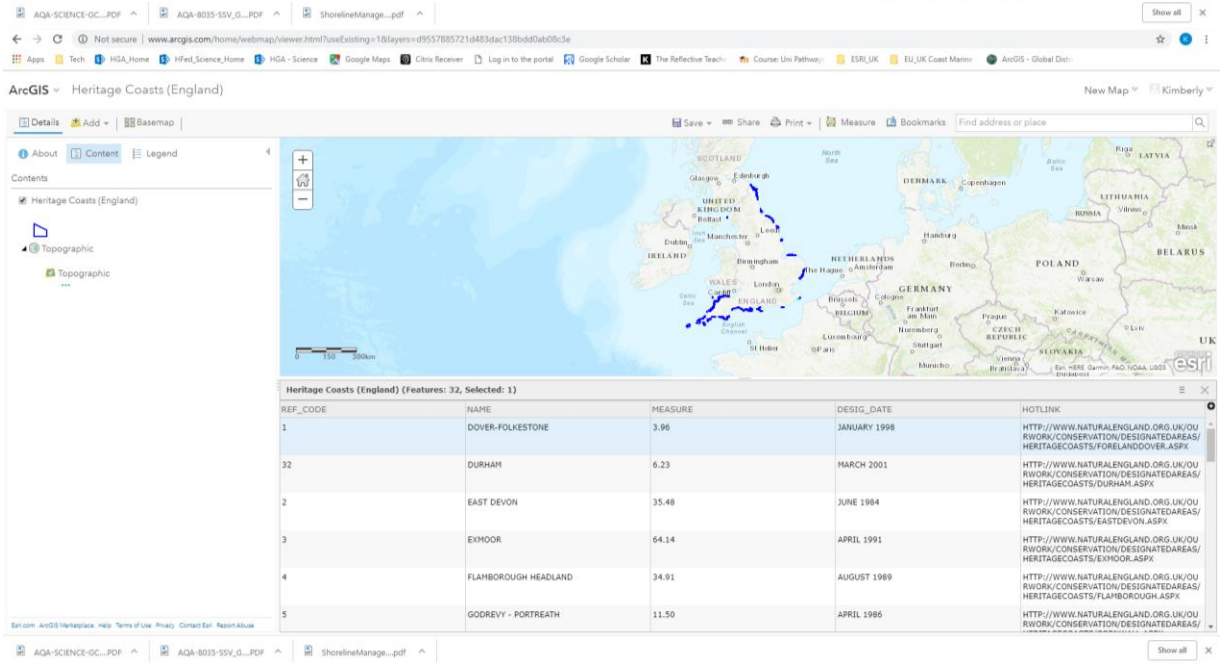
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32 DURHAM 6.23 MARCH 2001 HTTP://WWW.NATURALENGLAND.ORG.UK/OUR WORK/CONSERVATION/DESIGNATEDAREAS/HERITAGECOASTS/DURHAM.ASPX
2 EAST DEVON 35.48 JUNE 1984 HTTP://WWW.NATURALENGLAND.ORG.UK/OUR WORK/CONSERVATION/DESIGNATEDAREAS/HERITAGECOASTS/EASTDEVON.ASPX
3 EXMOOR 64.14 APRIL 1991 HTTP://WWW.NATURALENGLAND.ORG.UK/OUR WORK/CONSERVATION/DESIGNATEDAREAS/HERITAGECOASTS/EXMOOR.ASPX
4 FLAMBOROUGH HEADLAND 34.91 AUGUST 1989 HTTP://WWW.NATURALENGLAND.ORG.UK/OUR WORK/CONSERVATION/DESIGNATEDAREAS/HERITAGECOASTS/FLAMBOROUGH.ASPX
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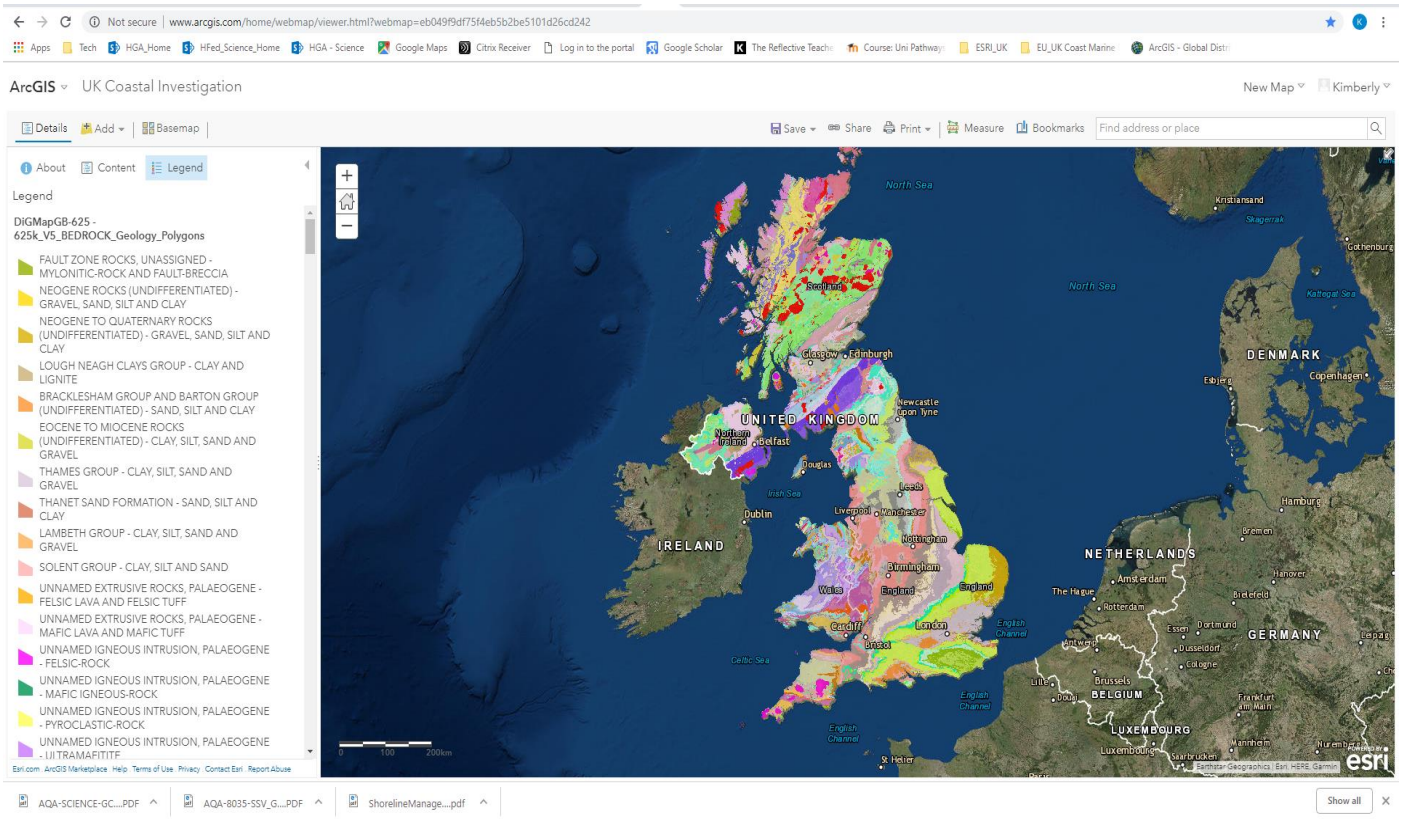
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FAULT ZONE ROCKS, UNASSIGNED - MYLONITIC-ROCK AND FAULT-BRECCIA
NEOGENE ROCKS (UNDIFFERENTIATED) - GRAVEL, SAND, SILT AND CLAY
NEOGENE TO QUATERNARY ROCKS (UNDIFFERENTIATED) - GRAVEL, SAND, SILT AND CLAY
LOUGH NEAGH CLAYS GROUP - CLAY AND LIGNITE
BRACKLESHAM GROUP AND BARTON GROUP (UNDIFFERENTIATED) - SAND, SILT AND CLAY
EOCENE TO MIOCENE ROCKS (UNDIFFERENTIATED) - CLAY, SILT, SAND AND GRAVEL
THAMES GROUP - CLAY, SILT, SAND AND GRAVEL
THANET SAND FORMATION - SAND, SILT AND CLAY
LAMBETH GROUP - CLAY, SILT, SAND AND GRAVEL
SOLENT GROUP - CLAY, SILT AND SAND
UNNAMED EXTRUSIVE ROCKS, PALAEOGENE - FELSIC LAVA AND FELSIC TUFF
UNNAMED EXTRUSIVE ROCKS, PALAEOGENE - MAFIC LAVA AND MAFIC TUFF
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UNNAMED IGNEOUS INTRUSION, PALAEOGENE - ULTRAMAFITITE
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IRELAND
DENMARK
NETHERLANDS
GERMANY
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North Sea
Irish Sea
Celtic Sea
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Dublin
Liverpool
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Leeds
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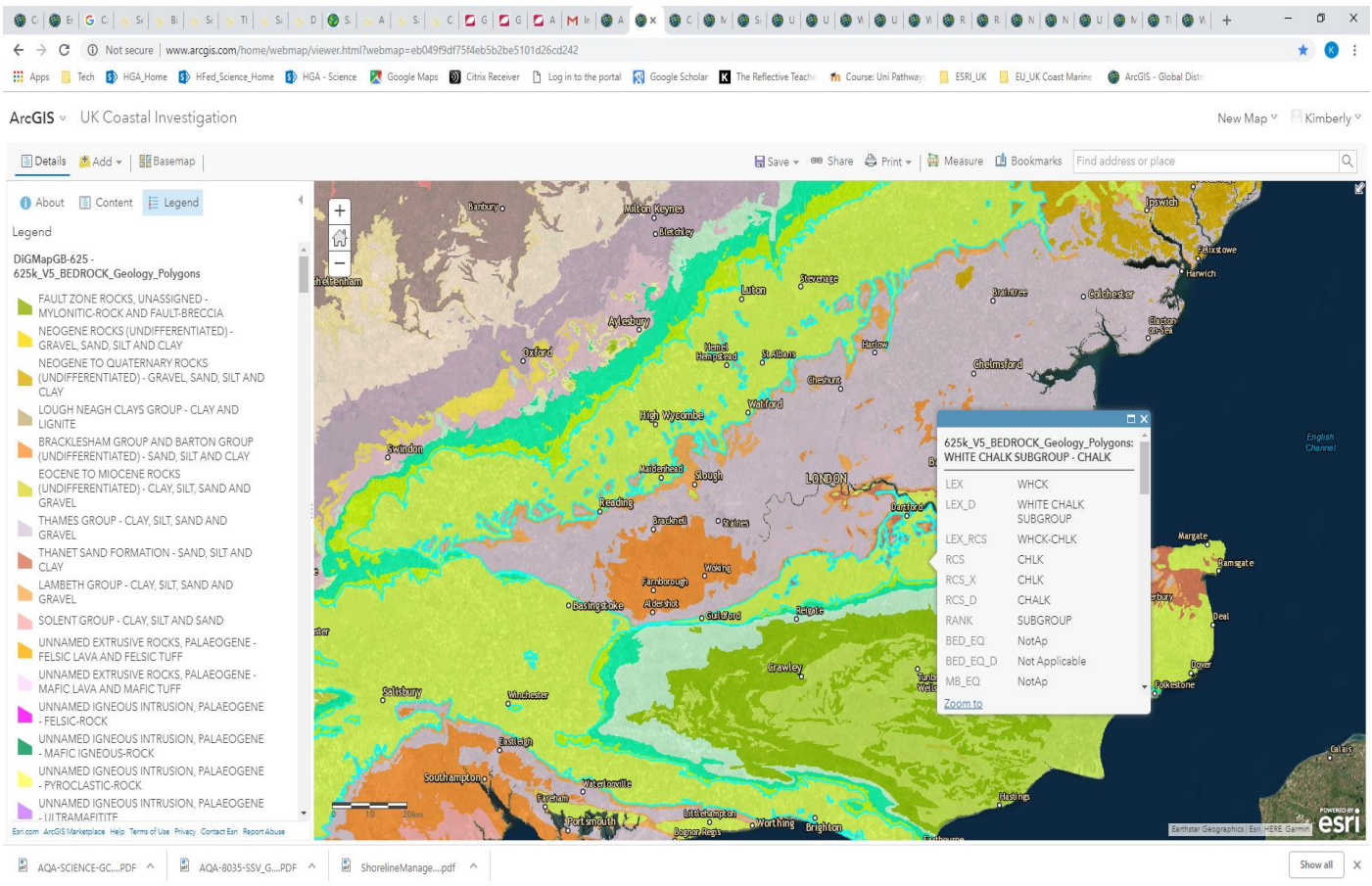
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NEOGENE TO QUATERNARY ROCKS (UNDIFFERENTIATED) - GRAVEL, SAND, SILT AND CLAY
LOUGH NEAGH CLAYS GROUP - CLAY AND LIGNITE
BRACKLESHAM GROUP AND BARTON GROUP (UNDIFFERENTIATED) - SAND, SILT AND CLAY
EOCENE TO MIOCENE ROCKS (UNDIFFERENTIATED) - CLAY, SILT, SAND AND GRAVEL
THAMES GROUP - CLAY, SILT, SAND AND GRAVEL
THANET SAND FORMATION - SAND, SILT AND CLAY
LAMBETH GROUP - CLAY, SILT, SAND AND GRAVEL
SOLENT GROUP - CLAY, SILT AND SAND
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UNNAMED EXTRUSIVE ROCKS, PALAEOGENE - MAFIC LAVA AND MAFIC TUFF
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ArcGIS Cornish_North_Coast_Intertidal_Habitats

New Map | Kimberly

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Cornish_North_Coast_Habitat_Map

NorthCornishCoastHabitatMap

- Artificial
- Barnacle habitats
- Biogenic Reef
- Caves & Overhangs
- Coastal Vegetation
- Freshwater habitat
- Fucoid dominated
- Green algae dominated
- Kelp dominated
- Lichens
- Mud habitats (other)
- Mud habitats (worms)
- Mussel beds
- Red algae dominated
- Rock habitats (other)
- Rockpools
- Saltmarsh
- Sand habitats (amphipods)
- Sand habitats (other)
- Sand habitats (worms)
- Surge Gulley
- Terrestrial Habitat

North_Cornish_Coast_Beach_Access_Guides

BeachAccessGuides

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ArcGIS MMO East Marine Plan Policy PS2

New Map | Kimberly

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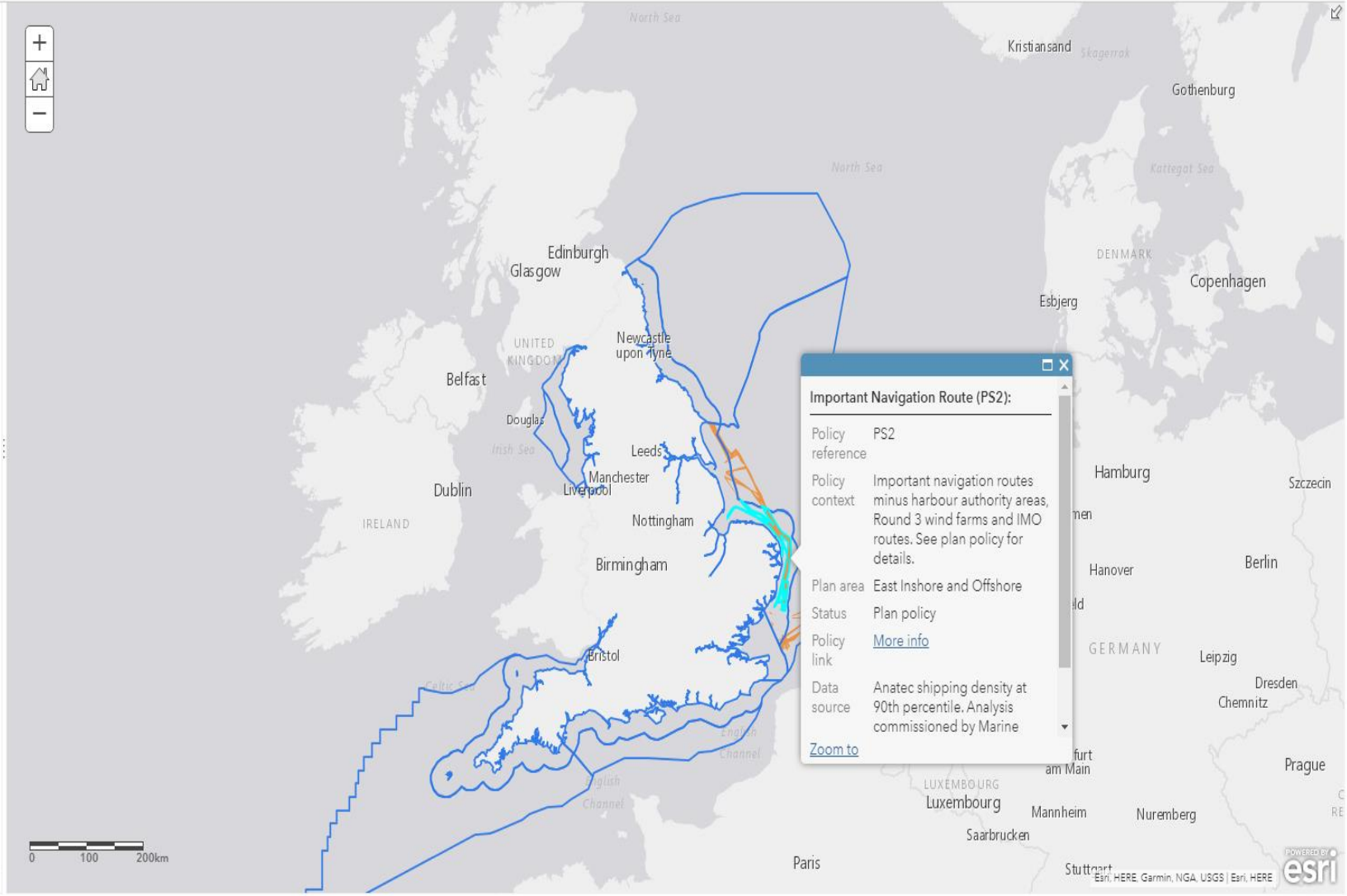
Legend

East marine plan areas

Important Navigation Routes (PS2)



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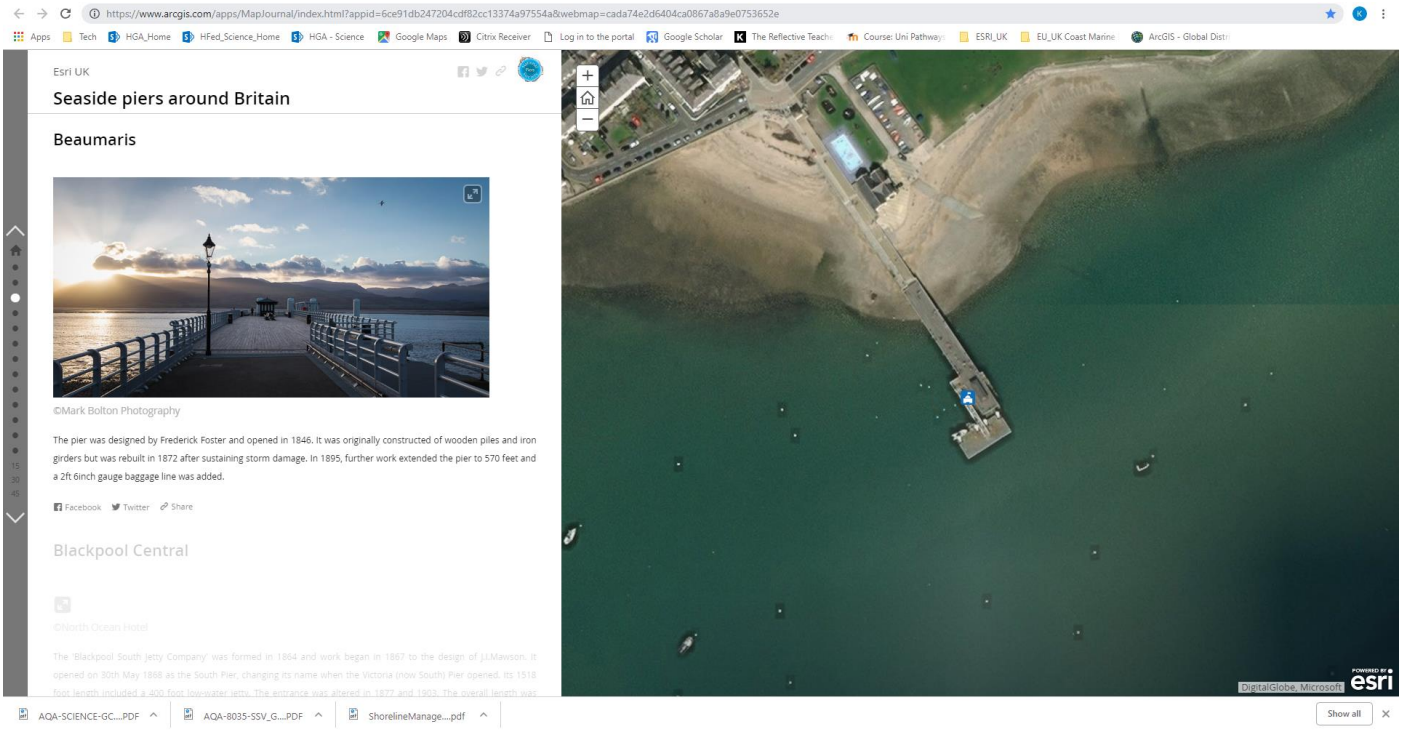
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Esri UK
Seaside piers around Britain
Beaumaris
©Mark Bolton Photography
The pier was designed by Frederick Foster and opened in 1846. It was originally constructed of wooden piles and iron girders but was rebuilt in 1872 after sustaining storm damage. In 1895, further work extended the pier to 570 feet and a 2ft 6inch gauge baggage line was added.
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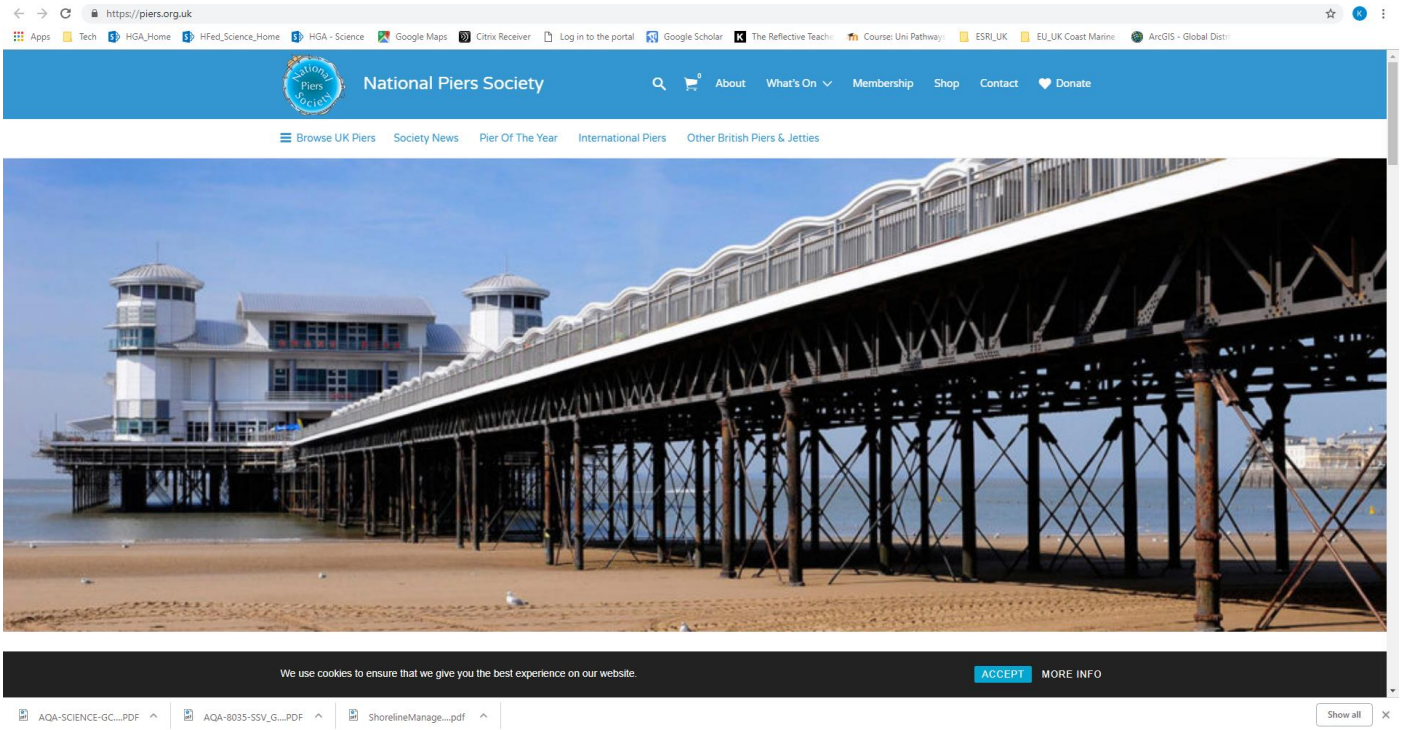
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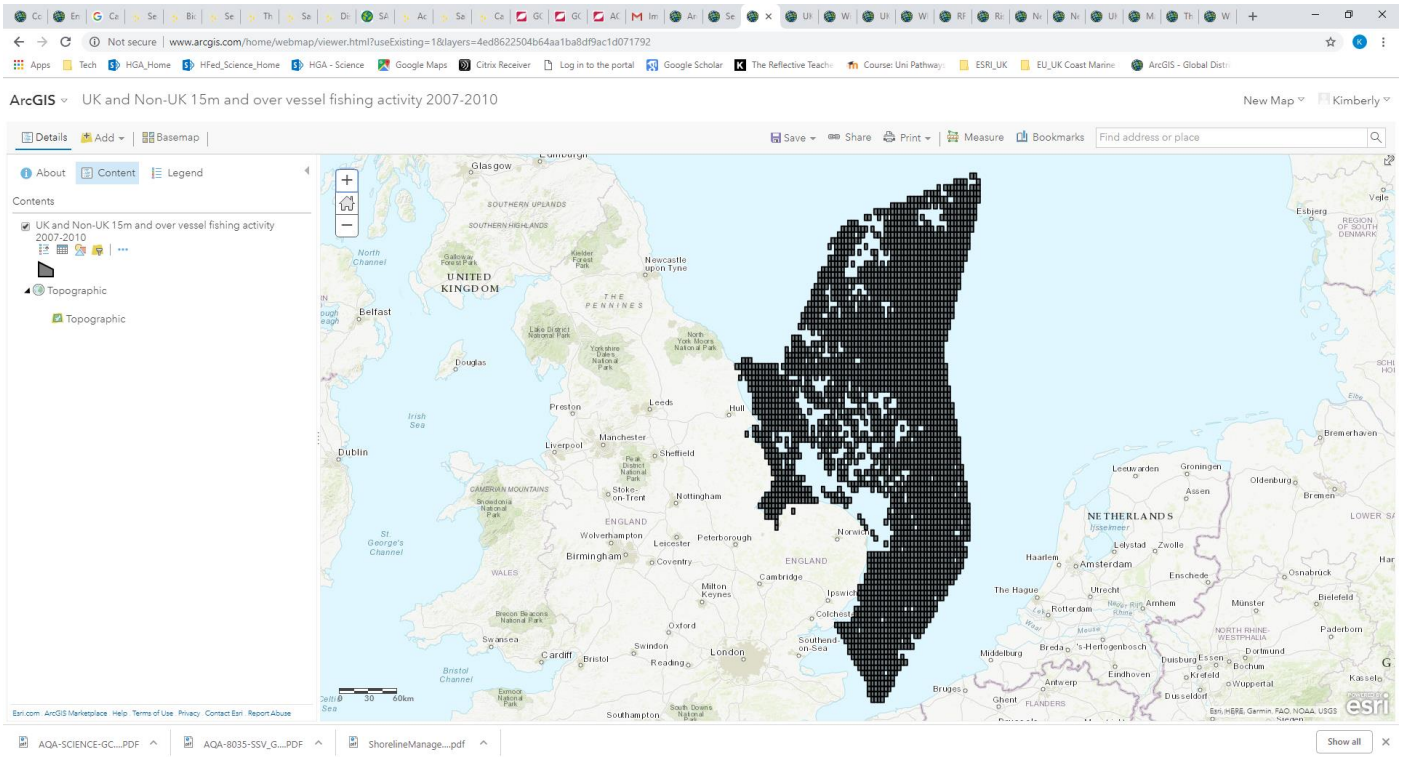
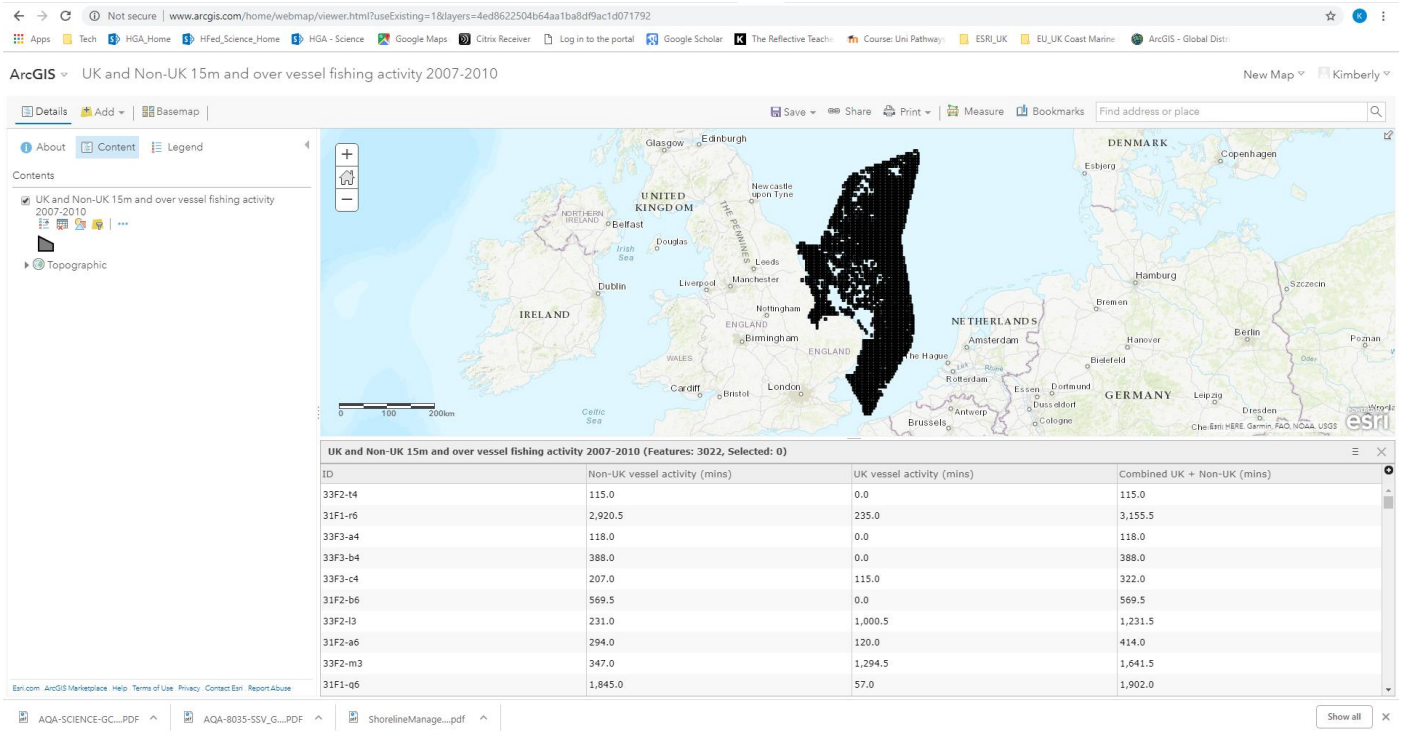
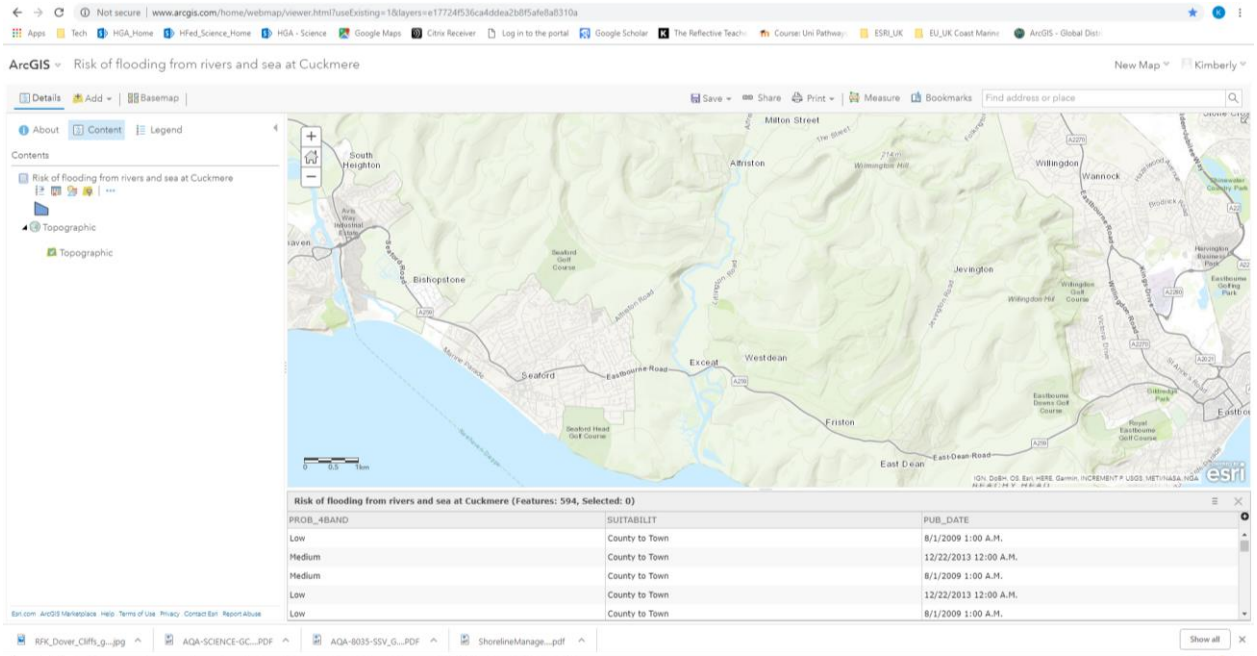




UK and Non-UK 15m and over vessel fishing activity 2007-2010 (Features: 3022, Selected: 0)

ID	Non-UK vessel activity (mins)	UK vessel activity (mins)	Combined UK + Non-UK (mins)
33F2-t4	115.0	0.0	115.0
31F1-r6	2,920.5	235.0	3,155.5
33F3-a4	118.0	0.0	118.0
33F3-b4	388.0	0.0	388.0
33F3-c4	207.0	115.0	322.0
31F2-b6	569.5	0.0	569.5
33F2-l3	231.0	1,000.5	1,231.5
31F2-a6	294.0	120.0	414.0
33F2-m3	347.0	1,294.5	1,641.5
31F1-q6	1,845.0	57.0	1,902.0


ArcGIS
Risk of flooding from rivers and sea at Cuckmere
Risk of flooding from rivers and sea at Cuckmere (Features: 594, Selected: 0)
PROB_4BAND
SUITABILIT
PUB_DATE
Low
County to Town
8/1/2009 1:00 A.M.
Medium
County to Town
12/22/2013 12:00 A.M.
Medium
County to Town
8/1/2009 1:00 A.M.
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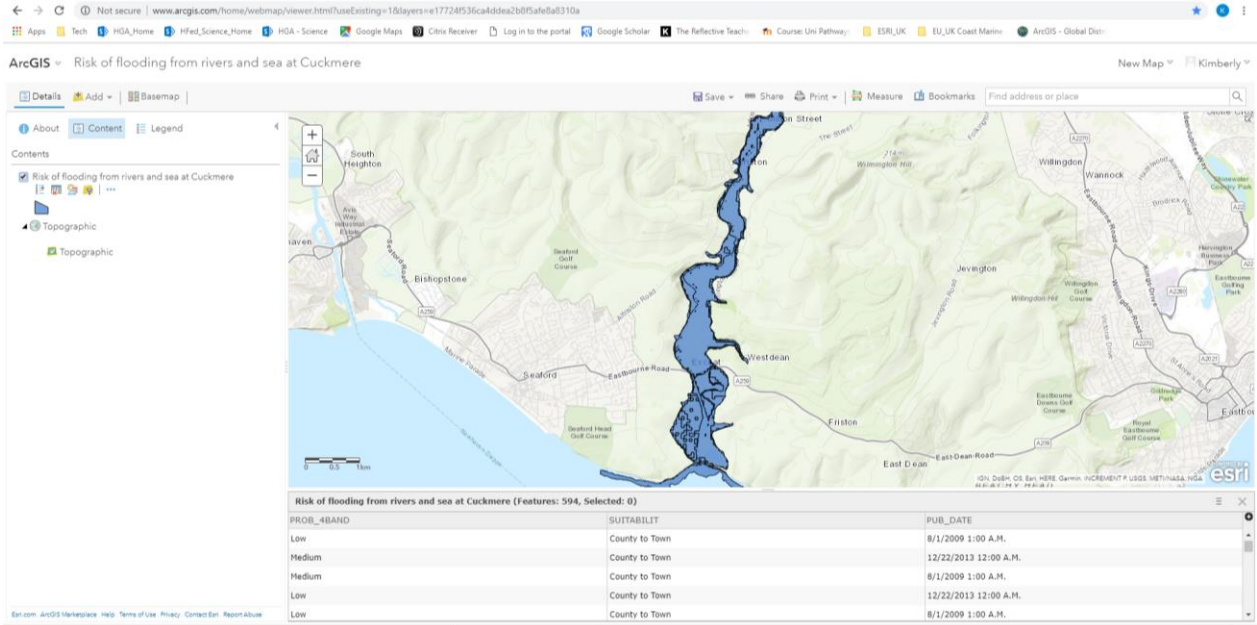
ArcGIS
Risk of flooding from rivers and sea at Cuckmere
Risk of flooding from rivers and sea at Cuckmere (Features: 594, Selected: 0)
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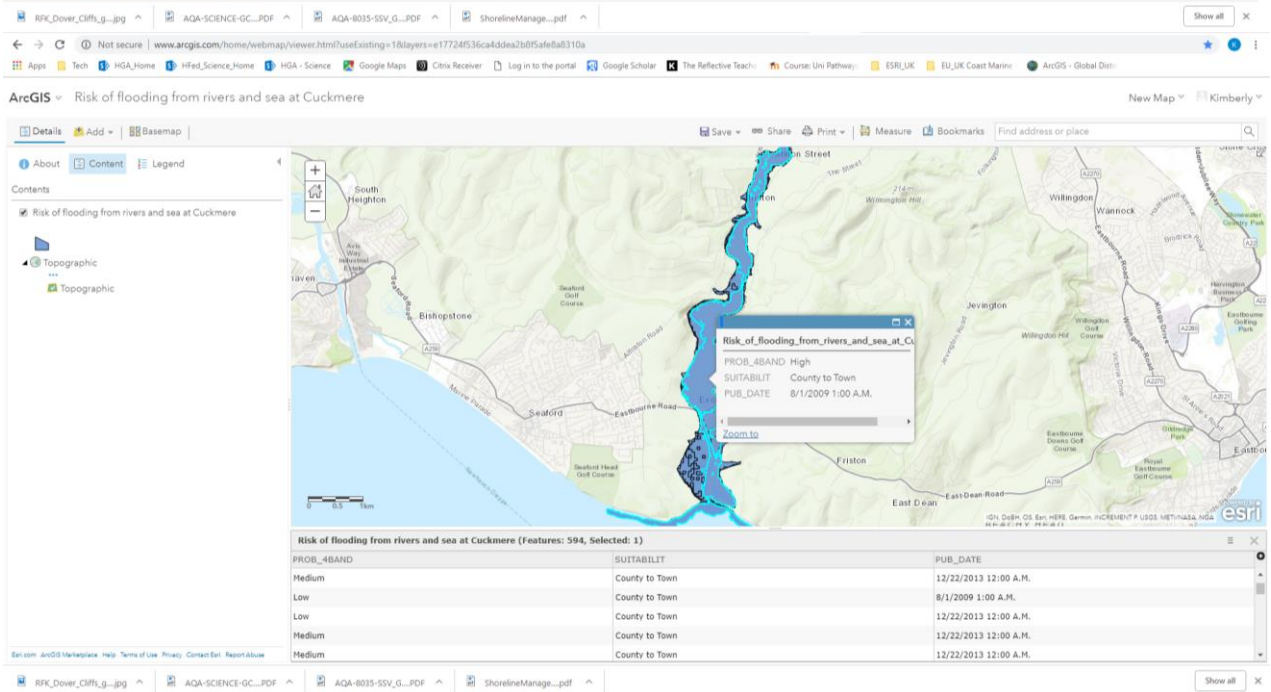
ArcGIS
Risk of flooding from rivers and sea at Cuckmere
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PROB_4BAND High
SUITABILIT County to Town
PUB_DATE 8/1/2009 1:00 A.M.
Zoom to
Risk of flooding from rivers and sea at Cuckmere (Features: 594, Selected: 1)
PROB_4BAND
SUITABILIT
PUB_DATE
Medium
County to Town
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County to Town
8/1/2009 1:00 A.M.
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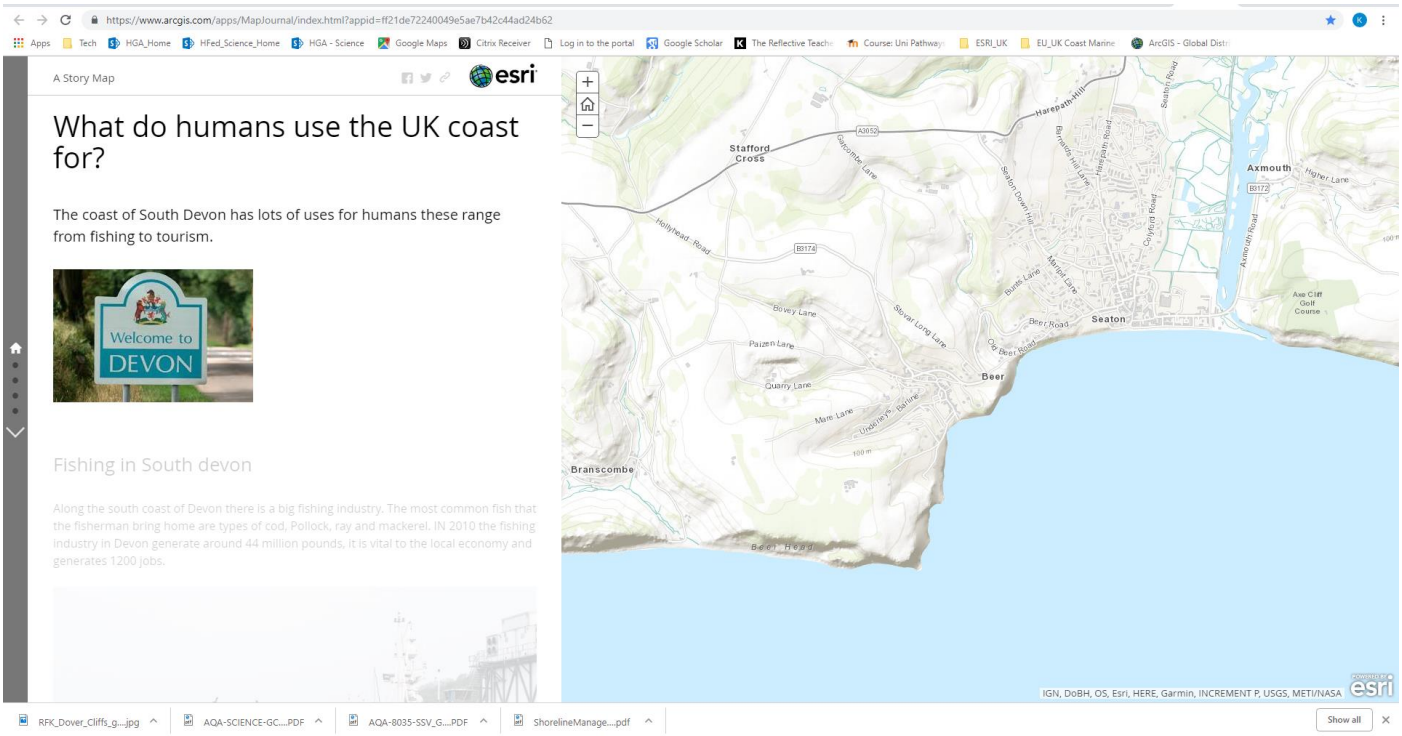


Spatial planning of coastal and offshore cage aquaculture on the Shandong Peninsula, China

This project focuses on the continuing development and application of an existing decision support system (SYSMAR) for the management of cage aquaculture on the Shandong Peninsula in China. Preliminary results of the application of the system for supporting the development of a coastal management planning are presented.

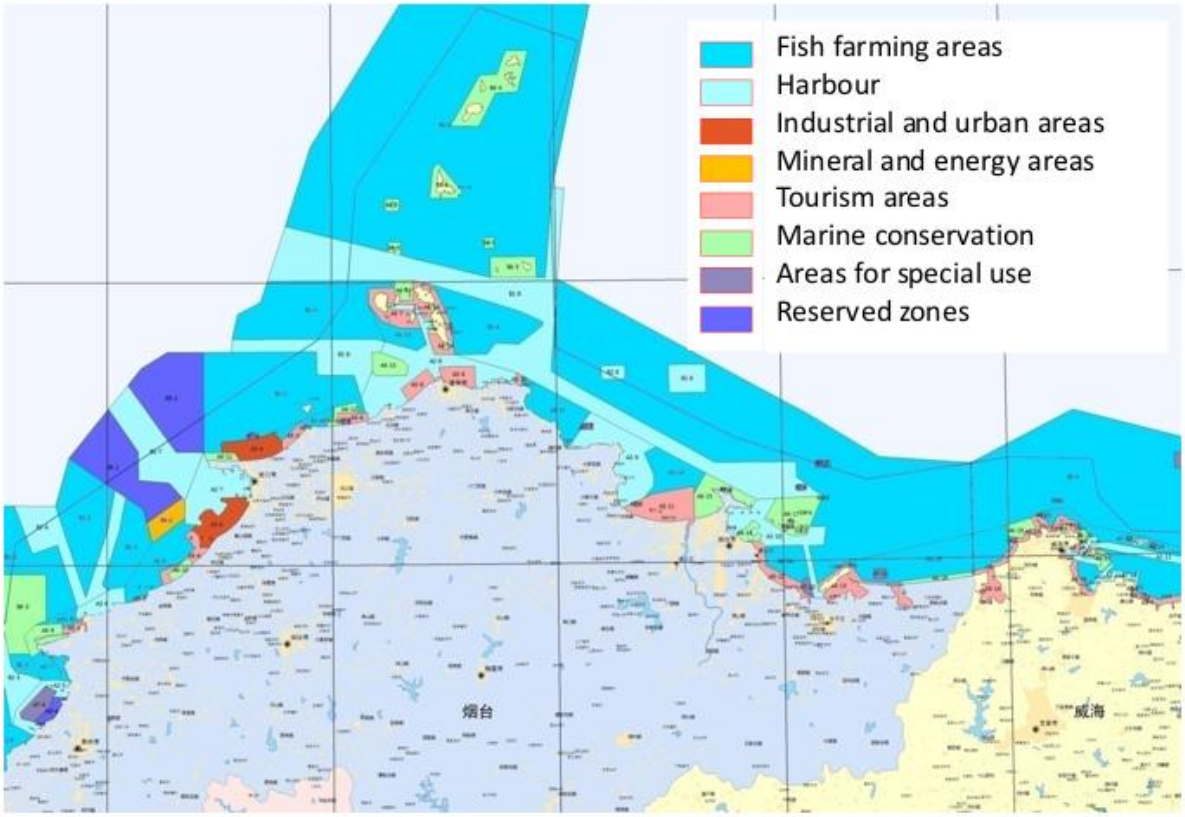
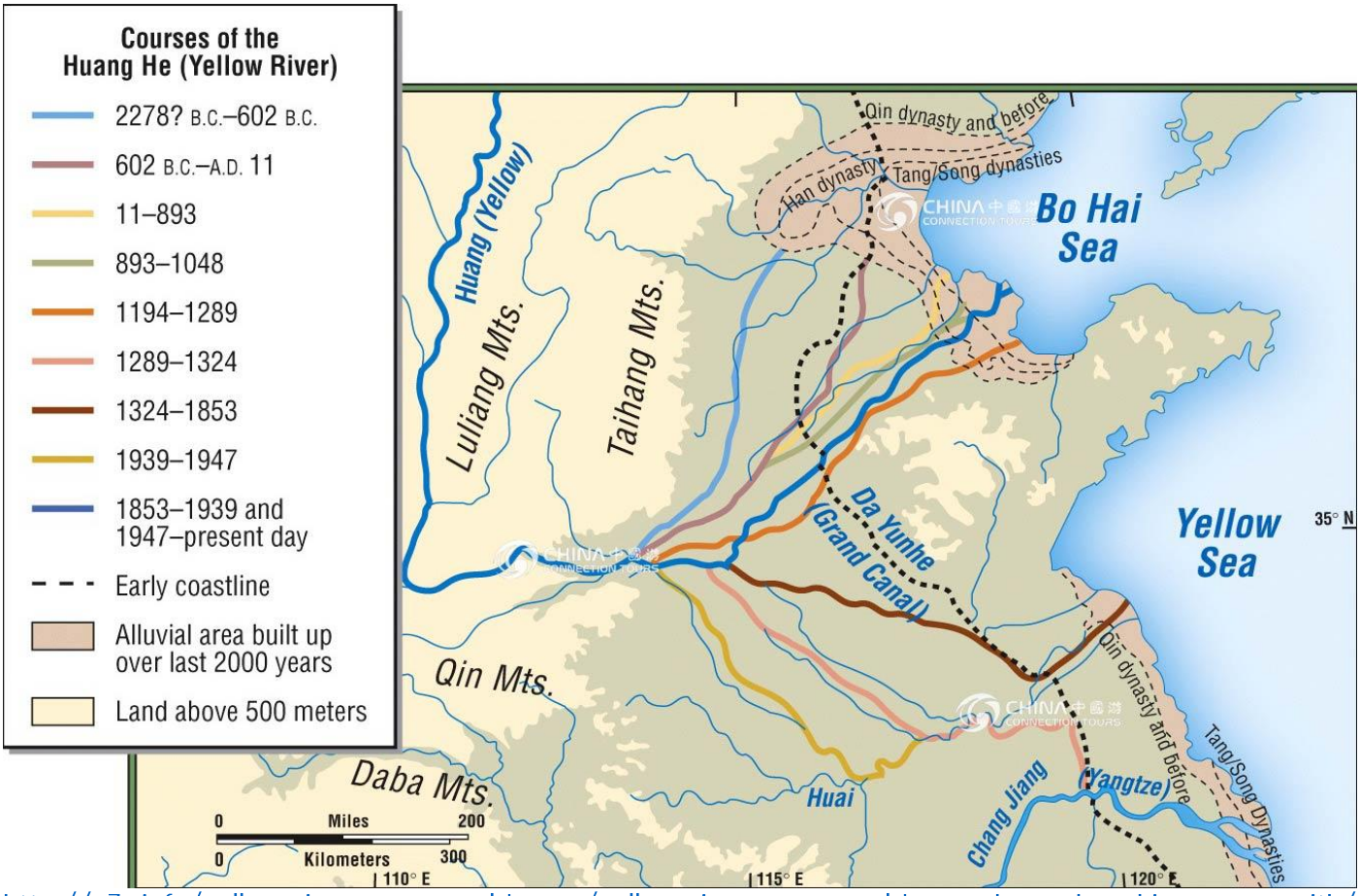


Figure 1. Existing coastal planning of the Shandong Province from 2011 to 2020 (People's Government of Shandong Province , 2012).

https://www.ftz.uni-kiel.de



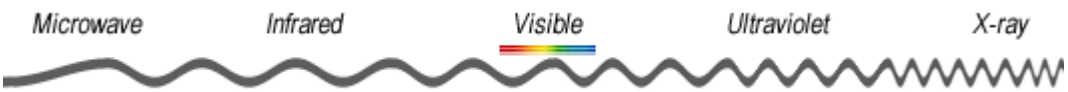
http://n3x.info/yellow-river-on-a-world-map/yellow-river-on-a-world-map-huanghe-china-maps-with/

Remote Sensing

https://gisgeography.com/remote-sensing-earth-observation-guide/

Remote sensing is the science of obtaining information without physically being there. The **3 most common remote sensing methods are by airplane, satellite and drone** which acquire information from a distance. When you're outside, the sun emits light. And each object reflects a mix of red, green and blue colors into your eyes. It's the same for sensors on board satellites work.

There are a whole range of possible wavelengths in the electromagnetic spectrum from short wavelengths (like X-rays) to long wavelengths (like radio waves).

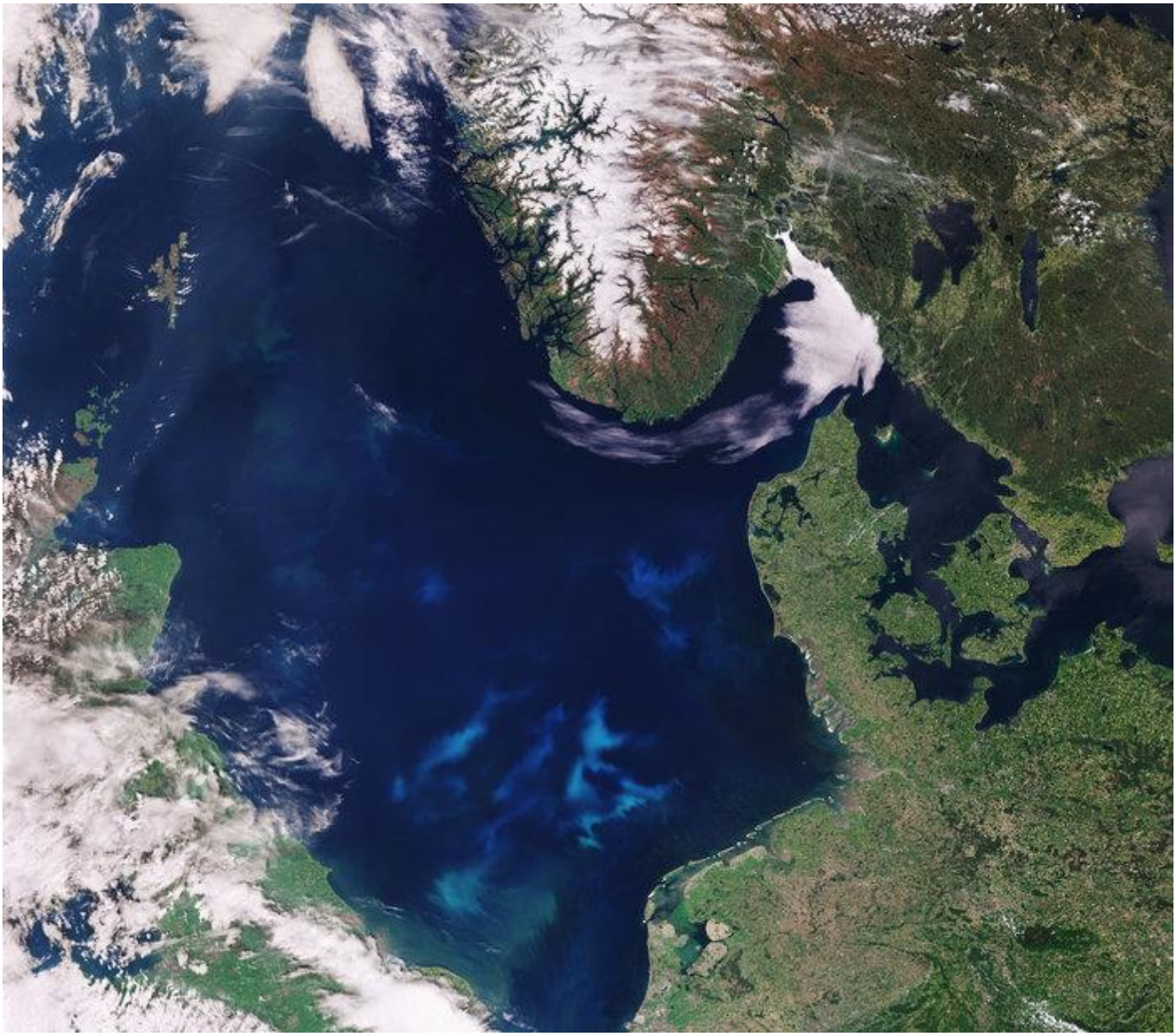


Electromagnetic Spectrum

Remotely Sensed Imagery

Title Coastal erosion in Filey Bay
Released 01/03/2002 11:24 am
Copyright ESA
Description
Near-vertical aerial image of Filey Brigg captured using a microlight mounted DCS 660 digital camera. The photograph emphasises the extent of erosion in Filey Bay in the United Kingdom.

Id 194399



Title North Sea bloom
Released 07/09/2018 10:00 am
Copyright contains modified Copernicus Sentinel data (2017), processed by ESA, CC BY-SA 3.0 IGO
Description
The Copernicus Sentinel-3A satellite takes us over the North Sea, revealing a significant algae bloom covering most of the southern part. One of Europe's most productive fisheries, the North Sea covers an area of 570 000 sq km and is linked to the Atlantic by one of the world's busiest shipping regions – the English Channel.

The image covers a large section of Scandinavia, including Norway, the south of Sweden, and Denmark, stretching down to Germany and the Netherlands in the bottom right. On the left of the image we can see the east coast of Scotland and the Northern Isles, comprising two archipelagos – Orkney and Shetland.

This true-colour image taken using Sentinel-3's Ocean and Land Colour Instrument shows a significant algae bloom.

Harmful algal blooms caused by excessive growth of marine algae have occurred in the North Sea and the English Channel area in recent years, with satellite data being used to track their growth and spread. These data can then be used to help develop alert systems to mitigate against damaging impacts for tourism and fishing industries.

Harmful blooms, which pose a threat to various forms of water life, are thought to carry an annual cost of over 900 million euros to these industries in the EU.

Helping to map algal blooms and providing critical information for marine operations are just some of the ways that the two-satellite Sentinel-3 is used for Europe's Copernicus environmental monitoring programme. Since 2016, Sentinel-3A has been measuring our oceans, land, ice and atmosphere to monitor and understand large-scale global dynamics.

In April 2018, it was joined by its twin satellite Sentinel-3B.
This image, which was captured on 27 May 2017, is also featured on the Earth from Space video programme.
Id 399165

Title Henderson Island
Released 20/04/2018 10:00 am

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Description

Henderson Island lies in the South Pacific, about halfway between New Zealand and Chile. As one of the best examples of a coral atoll, Henderson Island is a UN World Heritage site and one of the world's biggest marine reserves. However, while this remote, uninhabited, tiny landmass may look idyllic and untouched by humans, it's one of the most plastic-polluted places on Earth.

It is estimated that around 10 million tonnes of plastic ends up in the oceans every year. Carried by currents, it can form rubbish patches or eventually be washed up on shores far from where it entered the ocean. On Henderson, for example, items from as far afield as Russia, USA, Europe and South America have been found.

Ocean plastic has serious consequences for wildlife and the environment. Marine animals not only get caught up in this plastic but also ingest it. Even when it has been broken down into microfragments by weathering and waves, it still endangers animals and also enters the food chain, with unknown long-term consequences for animal life and our own health.

Celebrated every 22 April since 1970, Earth Day demonstrates support for environmental protection. This year, Earth Day is dedicated to providing information and inspiration needed to change our attitude towards plastic.

This image, which was captured by the Copernicus Sentinel-2B satellite on 22 March 2018, is also featured on the Earth from Space video programme.

Id 392791

Title Egg Island, Bahamas
Released 30/03/2018 10:00 am
Copyright contains modified Copernicus Sentinel data (2018), processed by ESA, CC BY-SA 3.0 IGO
Description
When it comes to eggs, most of us are probably thinking of the chocolate variety that we hope will pass our way this weekend, but they're difficult to spot from space. Instead, we can offer you this gorgeous Copernicus Sentinel-2B picture of Egg Island in the Bahamas.

Covering just 800 sq m, Egg Island is officially an islet. This tiny uninhabited patch is at the northwest end of the long thin chain of islands that form the Eleuthera archipelago, about 70 km from Nassau. Its name perhaps originates from the seabird eggs collected here.

The image, which Sentinel-2B captured on 2 February 2018, shows the sharp contrast between the beautiful shallow turquoise waters to the southwest and the deeper darker Atlantic waters to the northeast. Ripples of sand waves created by currents stand out in the shallow waters. These shallow waters are a natural nursery for sea turtles and other sea life. Any disturbance to this delicate

ecosystem could spell disaster for wildlife. In fact, Egg Island was recently at risk of being developed as a cruise ship port, which would have meant dredging the seabed and destroying coral reefs. Fortunately, this plan didn't take hold because of the damage it would cause to the environment.

This image is also featured on the Earth from Space video programme.

Id 391953

Title Northwest England
Released 22/09/2017 10:00 am
Copyright contains modified Copernicus Sentinel data (2017), processed by ESA, CC BY-SA 3.0 IGO
Description
The Sentinel-2A satellite takes us over part of northwest England in this image captured on 5 January 2017.

The dark area near the centre of the image is the Forest of Bowland, appearing mostly brown. The area has barren fells and peat moorland. During the Second World War, parts of the Bowland fells were used for military exercises, and unexploded bombs have been found in the area.

In the upper left we can see some of the intertidal mudflats of Morecambe Bay, with the city of Lancaster on the coast. The city of Preston is situated at lower left on the River Ribble, which flows into an estuary where it meets the Irish Sea.

The area north of the Ribble Estuary is the Fylde coastal plain. This somewhat square peninsula was created by the deposition of sediment by the rivers and streams over a long time. Parts were once dug for peat, but today towns and agriculture blanket the plain. The far-west side (not pictured) is mostly urban.

On the right side of the image are three aircraft contrails forming straight lines. Zooming in on one of these, we see that instead of a single white contrail line there are three colours. While this may look like coloured smoke released from the aircraft, it is an artefact created when the Sentinel-2 data were processed.

Captured by Sentinel-2's multispectral instrument, the image has been corrected to show targets on the ground, so the position of the satellite in relation to the ground is taken into consideration when processing these spectral bands. The aircraft on the other hand is high above ground, so the position of the satellite in relation to the plane and contrail is different – but the image is still being processed to focus on ground targets. This results in a 'split' of the spectral bands as the satellite flies over and the angles change.

This image is also featured on the Earth from Space video programme.

Id 383996

Title Irrawaddy Delta, Myanmar
Released 28/07/2017 10:00 am
Copyright contains modified Copernicus Sentinel data (2017), processed by ESA, CC BY-SA 3.0 IGO
Description
The Sentinel-2A satellite takes us over the peninsulas and islands of the Irrawaddy Delta in Myanmar.

Click on the box in the lower-right corner to view this image at its full 10 m resolution directly in your browser.

With a length of over 2200 km, the Irrawaddy River is the country's largest, flowing north-to-south before fanning out into the delta and emptying into the Andaman Sea.

Evident by the brown colour of the rivers and streams, sediments carried by the water are deposited in the delta. These deposits make the area very fertile, and the accumulation of deposits over time causes the coastline to advance.

Owing to the rich soils, the region is the country’s largest rice producer. This image was captured in March after the harvesting season but before the planting, so bare ground appears beige.

Green areas show dense mangrove forests, especially the Mein-ma-hla Kyun Wildlife Sanctuary in the lower right, known for its saltwater crocodiles. Even though this area is protected, some villagers living on the banks nearby sneak into the sanctuary and chop down trees for wood, degrading the forest.

Wood collection, rice farming and fishing – these and other human activities have damaged the delta's mangroves over the years. When Cyclone Nargis hit in 2008, the remaining mangrove forests were not enough to act as a natural buffer against the storm surge, and resulted in an extensive loss of life.

This image, also featured on the Earth from Space video programme, combines two acquisitions by the Copernicus Sentinel-2A satellite in March 2017.

Id 381810

Title Manila Bay and Laguna de Bay
Released 22/03/2017 10:00 am
Copyright contains modified Copernicus Sentinel data (2016), processed by ESA, CC BY-SA 3.0 IGO
Description
The Sentinel-2A satellite takes us over Luzon in the Philippines, with part of the city of Manila in the upper left.

We can clearly see a difference in colour between the two water bodies: the dark Manila Bay on the left, and lighter Laguna de Bay dominating the centre. This is due to differences in depth, with the Laguna reaching a maximum of 4 m during the rainy season.

One of the most striking features of this image are the black plumes of water pollution visible at the outlets of the Taguig and Pasig rivers, as well as the manmade Manggahan Floodway entering the Laguna de Bay at its northern point.

Meanwhile, the nearby Manila Bay has been called a 'pollution hotspot'. Runoff into the water body carry sewage, pesticides, fertilisers and industrial discharges, and other pollutants contribute to the low water quality, as well as sea-based sources of pollution like oil spills.

Celebrated on 22 March each year, World Water 2017 focuses on the theme of wastewater.

Satellites like Sentinel-2 can help to measure water quality and detect changes in both inland water bodies and coastal zones, supporting the sustainable management of water resources.

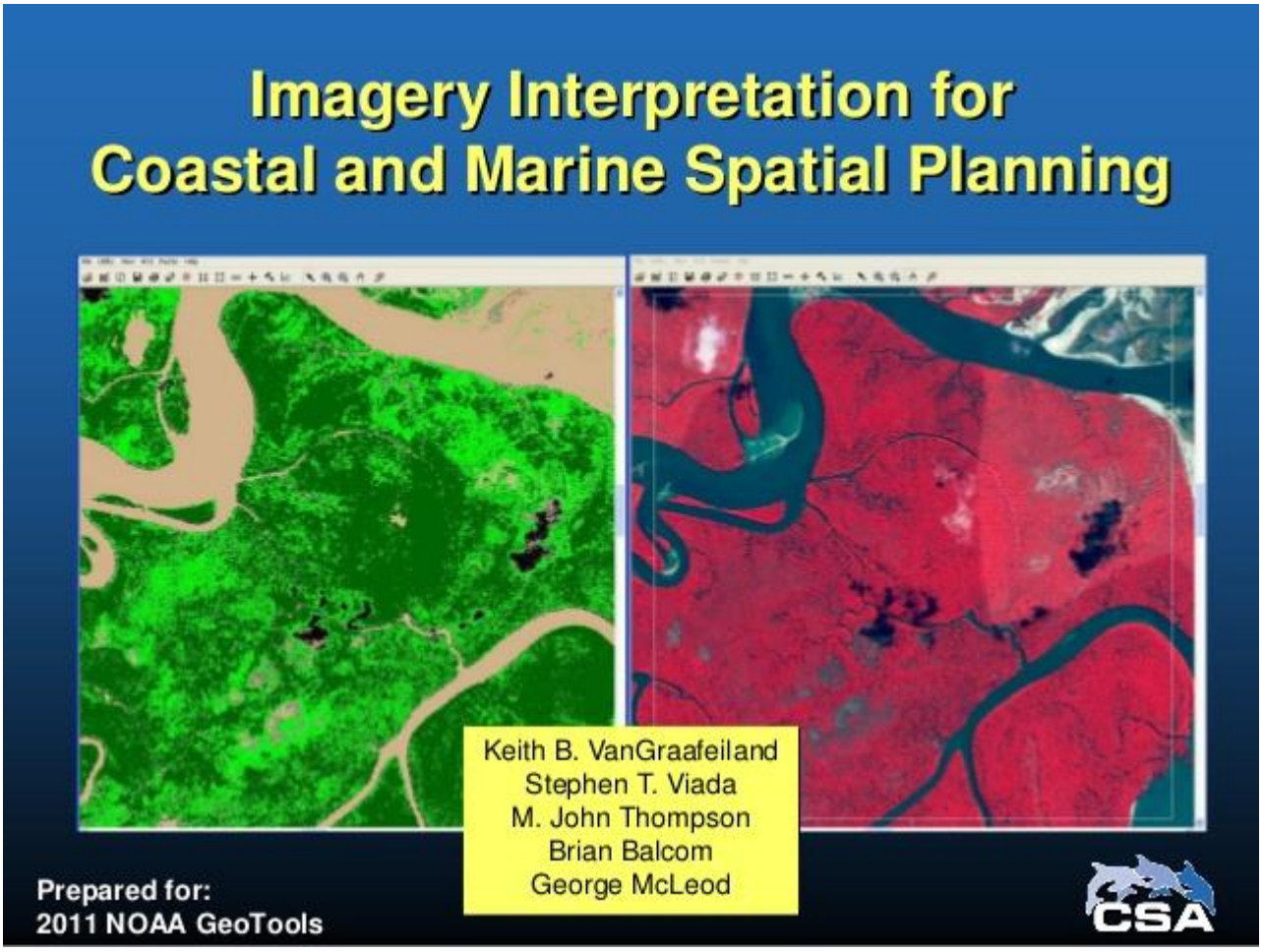
This image was captured by the Copernicus Sentinel-2A satellite on 8 May 2016.

Id 374973

Geographical Information Systems & Science
How can we combine these resources (maps and remotely sensed imagery) to sustainably manage the coastal zone?

"A geographic information system (GIS) is a computer-based tool for mapping and analyzing feature events on earth. GIS technology integrates common database operations, such as query and statistical analysis, with maps. GIS manages location-based information and provides tools for display and analysis of various statistics, including population characteristics, economic development opportunities, and vegetation types. GIS allows you to link databases and maps to create dynamic displays. Additionally, it provides tools to visualize, query, and overlay those databases in ways not possible with traditional spreadsheets. These abilities distinguish GIS from other information systems, and make it valuable to a wide range of public and private enterprises for explaining events, predicting outcomes, and planning strategies. For more, see GIS.com.

Remote sensing is the art and science of making measurements of the earth using sensors on airplanes or satellites. These sensors collect data in the form of images and provide specialized capabilities for manipulating, analyzing, and visualizing those images. Remote sensed imagery is integrated within a GIS. "
Indiana University https://kb.iu.edu/d/anhs



https://www.slideshare.net/KeithVanGraafeiland/imagery-interpretation-for-coastal-and-marine-spatial-planning

Homework – Research on line and find a thematic map with imagery. Be ready to explain

to the group:

- What stakeholder group does it represent or who is it intended for?
- What is the theme?
- What essential elements are present or missing?
- What data or information is being presented?

Tutorial 5 – One Fish, Two Fish…Red Fish, Dead Fish?

What is the Purpose of Tutorial 5?

To examine case studies of successes and failures in CZMT in the international, national and local context:

- International
  - Great Barrier Reef, Australia
  - Other International Examples
- National:
  - England
  - Scotland
  - Wales
- Local: London & the Thames Estuary
  - Marine Conservation Zones
  - Ramsar Protected Wetlands

- Nature Improvement Areas
- Green/Blue Belt

Questions for reflection:

- What similarities/differences do you see among the different case studies?
- How many stakeholders/competing interests are being managed?
- What values do you think are influencing the management decisions being made?
- What are the case studies managing for?
- Can you identify key elements in the management plans of the successful case studies?

Practice – Identify the common elements of a scientific paper, the elements of success or failure in the case studies, the stakeholders involved and critically evaluate the maps being used to present the information.

Worksheet – Reflection on Reading

What ecosystems were being managed?	
How many stakeholders were identified? What was their level of participation?	
What management measures were in place?	
What was the management goal?	

Can you identify any key elements of success present/missing?	
Critically evaluate the maps for the following criteria: • Title • Scale • Legend • Body of the map • North arrow • Cartographer • Neatline • Date of production • Projection • Information Sources • Theme	
Summarise key findings – success/ failure and why	

Final Assignment – How can we *_____ the Seahorses in the Thames?

*...sustainably manage human – environmental interactions to protect....

Homework – Pick an area in the Thames to map and research online current issues in CZMT in that area.

- Use the reflection worksheet to do an assessment of current management in place.
- **Describe & map 3 positive human/environmental interactions that can promote sustainability in your chosen area.**

  This should include a discussion with a minimum of 1000 words of the following:
  - The boundaries of the area of interest (draw on map)
  - The ecosystems present (label on map)
  - The natural resources & ecosystem services that are provided
  - The stakeholders involved, their competing interests and values
  - Current management measures, policies, laws & regulations in place

- Include the following elements in your thematic map:
    - Title
    - Scale
    - Legend
    - Body of the map
    - North arrow
    - Cartographer
    - Date of production
    - Information Sources
    - Theme

- Write a list of your references in the correct bibliographic style.

Tutorial 6 – Feedback tutorial

What is the Purpose of Tutorial 6?

- To receive feedback on final assignments.
- To share examples of best practice with the other pupils in your group.
- To write targets for improvement in school lessons.
- To reflect on the programme including what was enjoyed and what was challenging.

Final assignment feedback

What I did well…	What I could have improved on…
•	•
•	•
•	•

My target for future work is…

Tutorial 7 – Feedback tutorial

What is the Purpose of Tutorial 7?

- To receive feedback on final assignments.
- To share examples of best practice with the other pupils in your group.
- To write targets for improvement in school lessons.
- To reflect on the programme including what was enjoyed and what was challenging.

Final assignment feedback

What I did well…	What I could have improved on…
•	•
•	•
•	•

My target for future work is…

Reflecting on Uni Pathways

What did you most enjoy about Uni Pathways?
•   •   •

What did you find challenging about the programme?	How did you overcome these challenges?
• • •	• • •

Appendix 1 – Referencing correctly

When you get to university, you will need to include references in the assignments that you write, so we would like you to start getting into the habit of referencing in your Brilliant Club assignment. This is really important, because it will help you to avoid plagiarism. Plagiarism is when you take someone else's work or ideas and pass them off as your own. Whether plagiarism is deliberate or accidental, the consequences can be severe. In order to avoid losing marks in your final assignment, or even failing, you must be careful to reference your sources correctly.

What is a reference?

A reference is just a note in your assignment which says if you have referred to or been influenced by another source such as book, website or article. For example, if you use the internet to research a particular subject, and you want to include a specific piece of information from this website, you will need to reference it.

Why should I reference?

Referencing is important in your work for the following reasons:

- It gives credit to the authors of any sources you have referred to or been influenced by.
- It supports the arguments you make in your assignments.
- It demonstrates the variety of sources you have used.
- It helps to prevent you losing marks, or failing, due to plagiarism.

When should I use a reference?

You should use a reference when you:

- Quote directly from another source.
- Summarise or rephrase another piece of work.
- Include a specific statistic or fact from a source.

How do I reference?

There are a number of different ways of referencing, and these often vary depending on what subject you are studying. The most important to thing is to be consistent. This means that you need to stick to the same system throughout your whole assignment. Here is a basic system of referencing that you can use, which consists of the following two parts:

1. A marker in your assignment: After you have used a reference in your assignment (you have read something and included it in your work as a quote or re-written it your own words) you should mark this is in your text with a number, e.g. [1]. The next time you use a reference you should use the next number, e.g. [2].
2. Bibliography: This is just a list of the references you have used in your assignment. In the bibliography, you list your references by the numbers you have used and include as much information as you have about the reference. The list below gives what should be included for different sources.

    a. Websites – Author (if possible), title of the web page, website address, [date you accessed it, in square brackets].

    E.g. Dan Snow, 'How did so many soldiers survive the trenches?', http://www.bbc.co.uk/guides/z3kgjxs#zg2dtfr [11 July 2014].

    b. Books – Author, date published, title of book (in italics), pages where the information came from.

    E.g. S. Dubner and S. Levitt, (2006) *Freakonomics*, 7-9.

    c. Articles – Author, 'title of the article' (with quotation marks), *where the article comes from* (newspaper, journal etc.), date of the article.

    E.g. Maev Kennedy, 'The lights to go out across the UK to mark First World War's centenary', Guardian, 10 July 2014.

Notes

Notes

Notes

Can we save the Seahorses in the Thames?

Key Stage 4 Programme

researchersinschools.org