

Global Governance of the Earth's Oceans

2.2.10

Managing ocean pollution

Specification content

Main sources, causes and consequences of ocean pollution including terrestrial run-off, waste disposal and oil spillage, eutrophic dead-zones, plastic garbage patches and the role of ocean currents

Strategies to manage marine waste at different scales including global conventions, EU rules, awareness-raising and local actions

An ocean issues case study exploring the different geographical scales of governance and the way they interact, for example the local / regional / national / international / global strategies for Arctic Ocean conservation, or a UNESCO marine heritage site

Pollution issues

UN estimates 40% world population lives <100km from sea

Why is this an important consideration?

> 80% marine pollution comes from the land as run-off

How? And where will this be most concentrated?

Regional variations e.g. shipping & fishing v. important litter sources in NE Atlantic – may not be the case elsewhere...

Pollution issues

Sewage

Raw and partially treated where infrastructure poorly maintained or decayed;

Raw sewage was still being dumped in Halifax Harbour, Nova Scotia up to 2008

80% of urban sewage discharged into the Mediterranean Sea is untreated.

Treated sludge or biosolids

Dumping at sea now banned in many countries (UK 1998), but permissible via permit in Australia, for e.g.

MARPOL 73/78 Annex IV permits treated sewage discharge from ships within 3nm of coast, untreated > 12nm (*"It is generally considered that on the high seas, the oceans are capable of assimilating and dealing with raw sewage through natural bacterial action"* <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/Sewage/Pages/Default.aspx>)

From agriculture

Fertilizers and pesticides

Pollution issues

Dead zones (*handout*)

Eutrophication (?) leads to growth of algal blooms

Nitrogen & phosphorous encourages growth of cyanobacteria which are not consumed by zooplankton or fish and so accumulate

Blooms block light and remove oxygen leading to hypoxia (low oxygen condition)

Dead organisms sink to sea bed in greater numbers – decomposition further removes oxygen from water

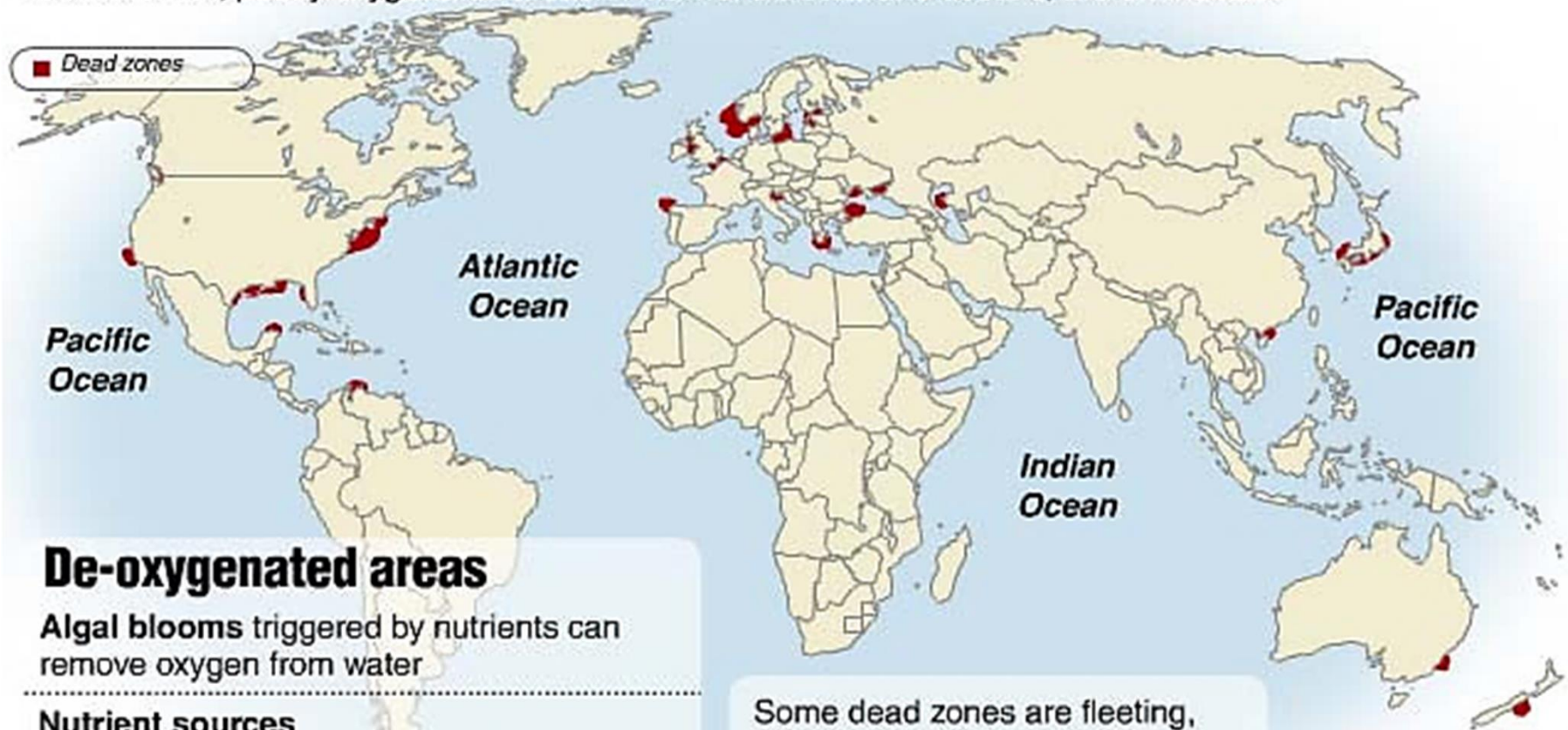
Sea grasses and benthic (bottom-dwelling) organisms severely affected

Impacts on rest of ecosystem

Pollution issues

Marine dead zones

"Dead zones", poorly oxygenated areas in the world's seas and oceans, are on the rise.



De-oxygenated areas

Algal blooms triggered by nutrients can remove oxygen from water

Nutrient sources

Fertilizer runoff, sewage, animal wastes and atmospheric deposits from burning of fossil fuels

Low oxygen levels make it difficult for marine creatures and habitats to survive

Some dead zones are fleeting, others can be static for large sections of the year

Reason for static dead zones:
Lack of water mix, like in the Gulf of Mexico or in the Baltic Sea

© 2007 MCT
Source: UNEP, classzone
Graphic: Jutta Scheibe, Majbrit Hoyrup

Pollution issues

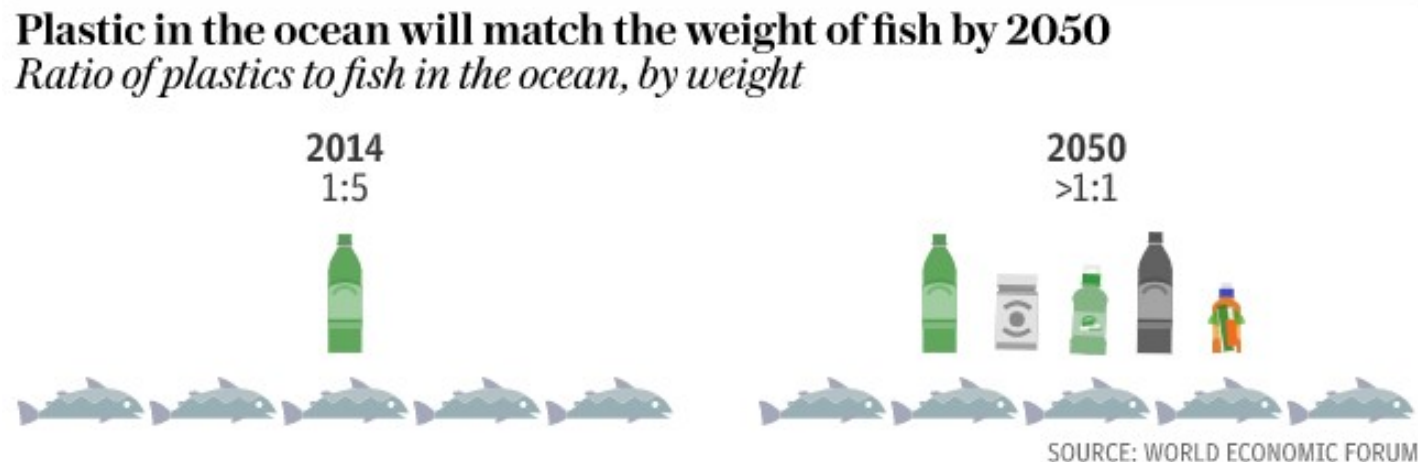
Plastics (*handout*)

Very current - dealt with in detail in Student Guide, including causes

Large plastic litter and microbeads

Handout contrasts surface with sea-floor plastic issue – see also following infographics

There is a great variety of facts about this, e.g.



<https://www.telegraph.co.uk/men/the-filter/five-shocking-facts-scale-plastic-pollution-choking-seas/>

URL for above in Further Reading on handout

Pollution issues

HOW LONG UNTIL IT'S GONE?

Estimated decomposition rates of common marine debris items



Estimated individual item timelines depend on product composition and environmental conditions.

<https://abbeydufoe.com/tag/great-pacific-garbage-patch/>

Source: NOAA / National Oceanic and Atmospheric Administration, US / Woods Hole Sea Grant, US
Graphics: Oliver Lide / Museum für Gestaltung Zürich, Zürich

Pollution issues

79,000 tonnes of floating plastic

The “Great Pacific garbage patch” – a build-up of plastic waste floating between California and Hawaii – is between four and 16 times bigger than previously estimated, and is growing “exponentially”, according to a new study. Researchers used boats and planes to survey this part of the north Pacific, where ocean currents cause debris to converge. They calculate that there are now 79,000 tonnes of it, in the form of 1.8 trillion pieces, ranging from micro-plastics to huge fishing nets (nets account for 46% of the waste). From fragments, the researchers identified other fishing industry gear, as well as plates, bottles and even a toilet seat. Much of it may have been washed into the sea by the Japanese tsunami of 2011, they write in the journal *Scientific Reports*. The patch is found in a section of ocean 1.6 million sq km, more than two times the size of France – but it is not the area that is growing, rather its mass, as the concentration of debris increases.

Separately, a UK government report warned that unless action is taken urgently, the amount of plastic waste in the world’s oceans will treble within a decade.



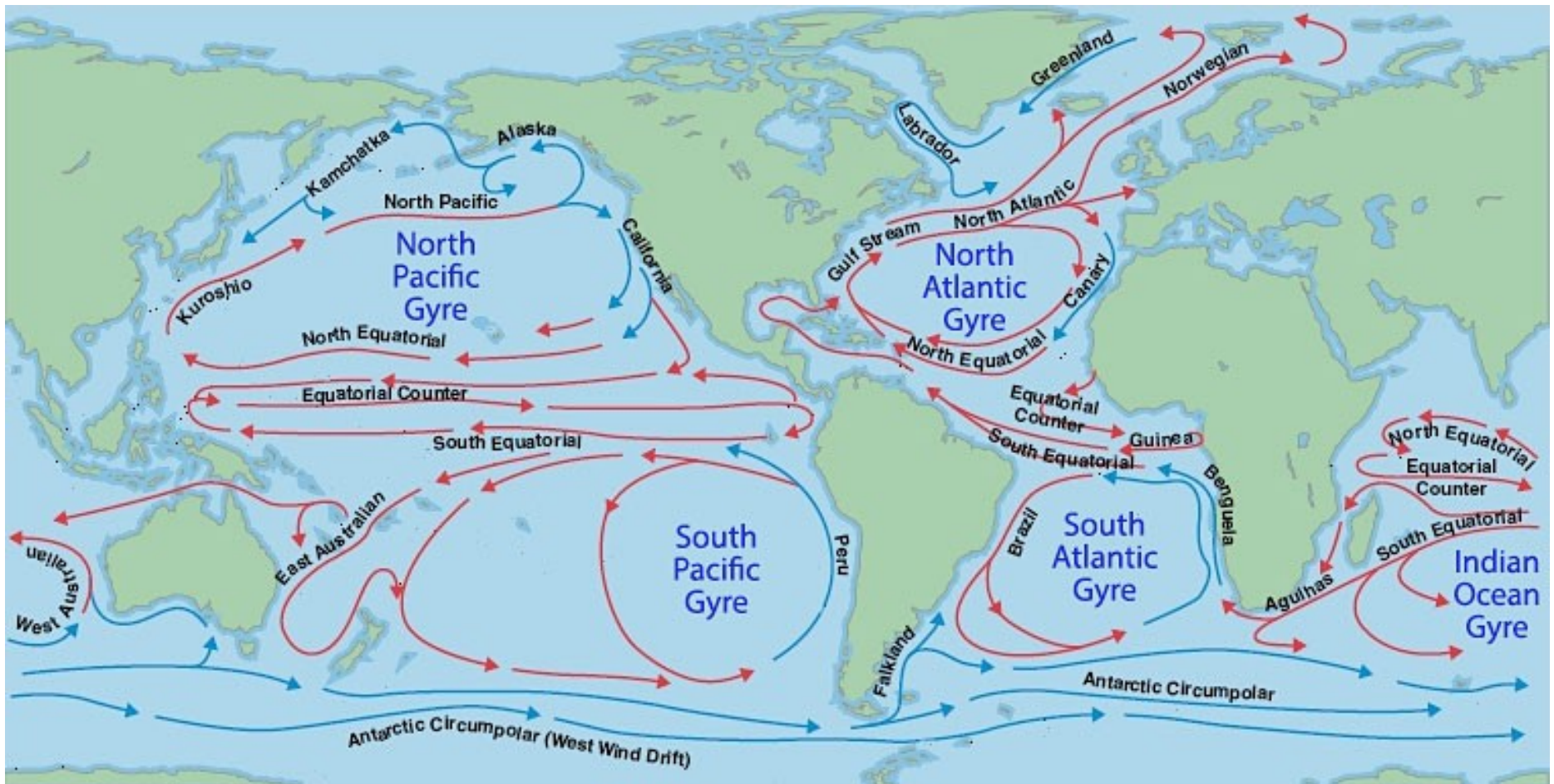
Fishing nets account for 46% of the waste

The Week
31/03/18

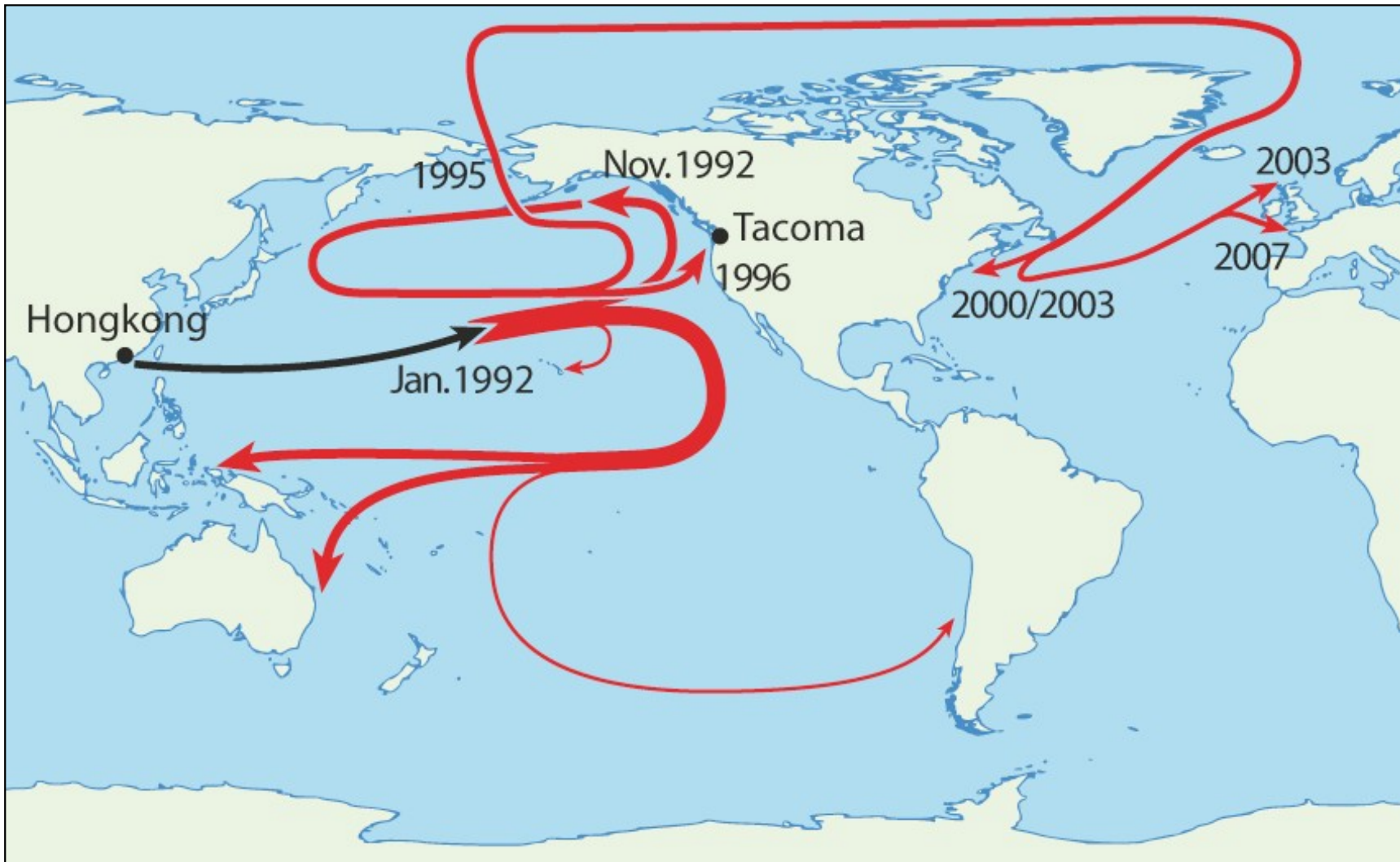
Pollution issues

Role of ocean currents (gyres)

What are these and why are they important in developing plastic garbage patches?



Pollution issues



Friendly Floatees - Charting the paths of 29,000 plastic yellow ducks, red beavers, blue turtles and green frogs, washed into the Pacific Ocean in 1992.

<http://recyclingisland.com/kickstarter/problem/>

Pollution issues

- Home of 'The Great Pacific Garbage Patch'
- Estimated 3.2 million tonnes of trash
- About the size of Texas by some accounts
- Located between Hawaii and California

- Research trips between Bermuda and Azores document floating garbage
- Soup of micro-particles similar to the 'Great Pacific Garbage Patch'

44% of all seabird species documented with plastic in or around their bodies

Plastics have entangled birds and turned up in fish bellies

Searchers for Malaysia Airlines Flight 370 have found ocean garbage instead of crash evidence

NORTH PACIFIC GYRE

NORTH ATLANTIC GYRE

SOUTH PACIFIC GYRE

SOUTH ATLANTIC GYRE

INDIAN OCEAN GYRE

GYRES

Whirlpools of water trapping huge collections of trash in their currents



Pollution issues

Oil spills

Dealt with in detail in Student Guide...but also see Further Reading on handout (Smithsonian Institute web pages on impacts of Deepwater Horizon oil spill in Gulf of Mexico 2010)

Pollution issues

Impacts not just environmental but can also cause serious economic damage:

Potential cost across EU for coastal & beach cleaning estimated at c.€630 million/yr

Est. cost to fishing industry c.€60 million (c.1% total revenues of EU fishing fleet in 2010).

http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/index_en.htm

Management

Management issues:

A wicked problem – difficult/impossible to solve due to its complexity, where solving one aspect may reveal or create other problems

Is multi-scalar, i.e. needs solutions at a variety of scales: global, national and individual

Student Guide looks at plastics as this is easier to see how individuals can play a role

Management

Global scale:

UNCLOS, MARPOL 73/78 – prohibit dumping of waste (within certain limits)

But run-off the issue (nonpoint source)

EU rules:

Waste Framework Directive (2008/9): Member States must establish waste prevention programmes by Dec 2013 – to include separate waste streams to facilitate better recycling, and to prevent packaging waste

Europe 2020 Strategy – to make EU more resource efficient by reducing waste

Various measures being considered to reduce consumption of plastic bags

Urban Waste Water Treatment Directive (1991): coastal populations > 10,000 (and 2,000 in estuarine areas), must have secondary (biological) treatment prior to all sewerage discharges

European Maritime Safety Agency (EMSA) assists the Commission and Member States in monitoring the proper implementation of EU legislation on pollution by ships.

Ship-source Pollution Directive and Port Reception Facility Directive transpose MARPOL 73/78 into EU law

http://ec.europa.eu/environment/marine/pdf/SWD_2012_365.pdf

Management

Awareness raising and local action:


Plenty of good info in the Student Guide on this – make sure you have a range of examples

Tackling “ghost” fishing

The impact of “ghost” fishing nets is a serious concern to conservationists. Lost or discarded by commercial fishing boats, these nets can drift around the oceans for years, trapping fish, turtles and other marine life as they go: according to some estimates, as many as 650,000 marine creatures die in them each year, leading to more losses of already depleted stocks. Researchers in Norway have come up with a new way of reducing this death toll: a tag that can be fitted to fishing gear so that lost nets can be located and retrieved. Known as PingMe, the device reflects acoustic signals transmitted from vessels’ sonar systems in such a way that they can be matched to a particular boat. If a crew lose one of their own nets, they can look for their signal on their sonar, which would reveal the tag’s location and depth (up to 500 metres away); if they come across other tagged nets, the signal should be able to tell them which vessel lost or dumped it. Lost or discarded fishing gear is believed to account for 10% of all marine debris, and includes thousands of miles of highly durable synthetic fishing nets and lines.

The Week
20/10/18

Management



Promoting City, Coast & Countryside

Morecambe South Beach

Morecambe South is a designated bathing water beach and is monitored by the Environment Agency from May to September. Bathing water quality may be affected by the Rivers Lune, Keer and Kent. There are storm outfalls discharging to the River Lune and surface water outfalls close to this bathing water which can cause a temporary decline in water quality, particularly after rainfall.

Where can I find the latest information on water quality?

LED signs can be found opposite Morecambe South Beach and Morecambe North and provide our visitors with daily reports and pollution warnings in Morecambe Bay. The Environment Agency make daily pollution risk forecasts based on rainfall patterns and will issue a pollution risk warning if heavy rainfall occurs to enable bathers to avoid periods of increased risk. These daily forecasts are then sent through to the LED signs where the information is displayed for the public.

Why is this important?

Morecambe South is a designated bathing water beach, and has to meet required standards within the European bathing water directive. The EU revised bathing water directive came into force in 2015 with water quality standards almost twice as strict as in previous years. Each week the Environment Agency carries out a sample behind The Midland Hotel during the bathing season (May to September).

Conditions likely to lead to short term pollution

Short term pollution is caused when heavy rainfall washes raw sewage into the sea from livestock and urban drainage via rivers and streams. The water quality within Morecambe Bay can be affected due to various contaminants coming from sewage treatment works, sewage overflow, private septic tanks, household mis-connections, urban run-off, agriculture and other contaminants from animals such as dogs and birds.

What are we doing to improve water quality in Morecambe Bay?

Lancaster City Council is working alongside agencies including United Utilities, the Environment Agency, Department for Environment, Food and Rural Affairs (DEFRA) and is supporting the LOVEmyBEACH (www.lovemybeach.org) campaign to improve water quality standards in Morecambe Bay.

Further Information


For more information on bathing water and what is being done, visit the bathing water profile for Morecambe South:
www.lancaster.gov.uk/morecambesouth

Last Season's Warnings


64 warnings advising against swimming due to an increase risk of short term pollution were issued in 2016 for Morecambe South bathing water. These warnings were issued because of the effects of heavy rain on the water quality.

What do the signs mean?


No water quality warning issued	Water is at safe levels for bathing
No water quality forecast available	Waiting to receive message from Environment Agency
Advice against Bathing	Water could be at unsafe levels for bathing



A dog ban is in place on the North and South beaches between 1st May and 30th Sep to protect bathers



Good bathing water quality



If you have any further queries about Morecambe's bathing water beaches then please contact customer services Mon-Fri on 01524 582000

May	June	July	August	September
1	16	16	16	16
2	17	17	17	17
3	18	18	18	18
4	19	19	19	19
5	20	20	20	20
6	21	21	21	21
7	22	22	22	22
8	23	23	23	23
9	24	24	24	24
10	25	25	25	25
11	26	26	26	26
12	27	27	27	27
13	28	28	28	28
14	29	29	29	29
15	30	30	30	30
31		31	31	

Computed and formatted by POLTRIP-3, the National Oceanography Centre's Tidal Software

Photo taken 01/04/18

Management - effectiveness?

Why is it difficult to determine how effective these strategies might be?

The Student guide offers some suggestions – but also raises important questions, e.g.

What is likely to limit the effectiveness of strategies, especially at the local scale?

What will be the impacts of rising plastic use (projected 4x by 2050)?

What can be done about less robust waste management strategies in EEs?

What can be done with all plastics currently in the oceans?

What do you think?

How important is the role of each of the following in the creation of oceanic garbage patches:

- i. Ocean currents?
- ii. Global economic systems?
- iii. Poor governance of waste disposal?