

# **DUMPING OF WASTE AND OTHER MATTER IN THE SEA**

***RINA***

***15 January 2015***

***Edward Kleverlaan***

***Head, Office for the London Convention/Protocol  
and Ocean Affairs***

***International Maritime Organization***



# OUTLINE OF PRESENTATION

- Introduction and overview of regulatory framework
- Dredging/disposal application
- Future developments
  - Climate mitigation
  - Marine geoengineering



## THE ISSUE

- Historically, the seas have been seen as a rubbish dump.
- The ability of the oceans to cope was taken for granted.
- Deep concerns grew by the early 1970s.

# WHAT WAS BEING DUMPED INTO THE OCEAN?



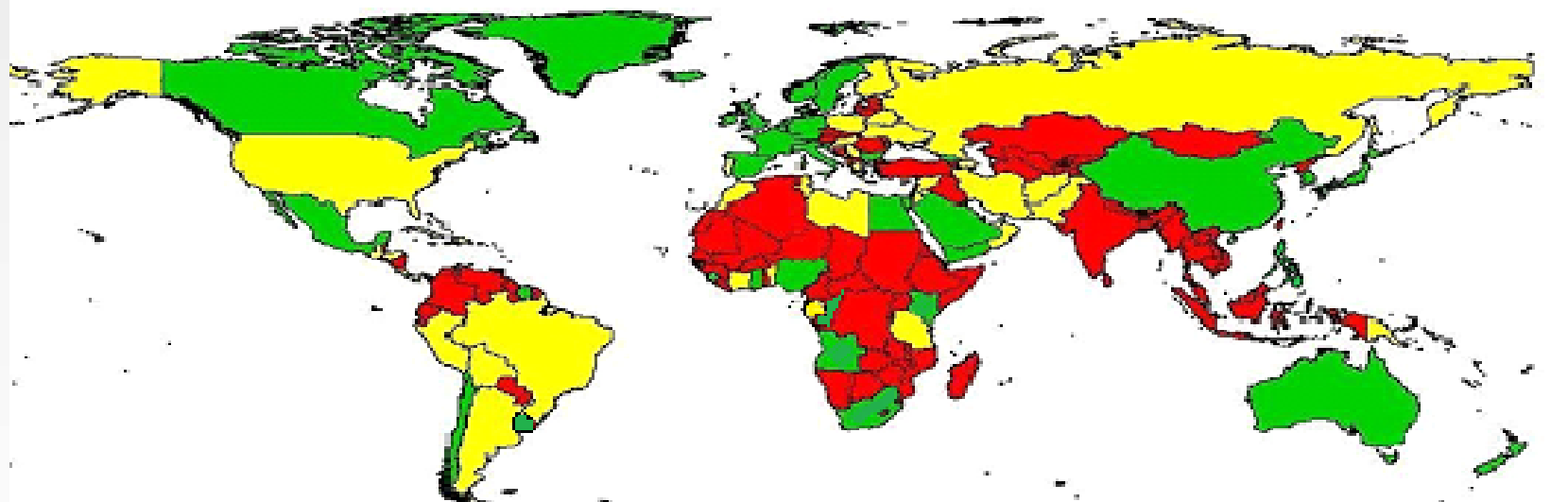
- Industrial Waste
- Sewage Sludge
- Dredged Material
- Vessels
- Incineration at Sea
- Radioactive Waste

# LONDON CONVENTION AND ITS PROTOCOL

- The London Convention 1972 (LC)
  - One of the first global conventions to protect the marine environment from human activities
  - In force since 1975
  - 87 Contracting Parties – dormant!
- The London Protocol 1996 (LP)
  - Designed to replace LC
  - In force since 2006
  - 45 Contracting Parties and growing!

Both administered by IMO

## Parties to the London Convention and Protocol

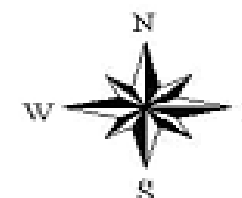


### LEGEND

Yellow - London Convention Parties

Green - London Protocol Parties

Red - Non-Parties



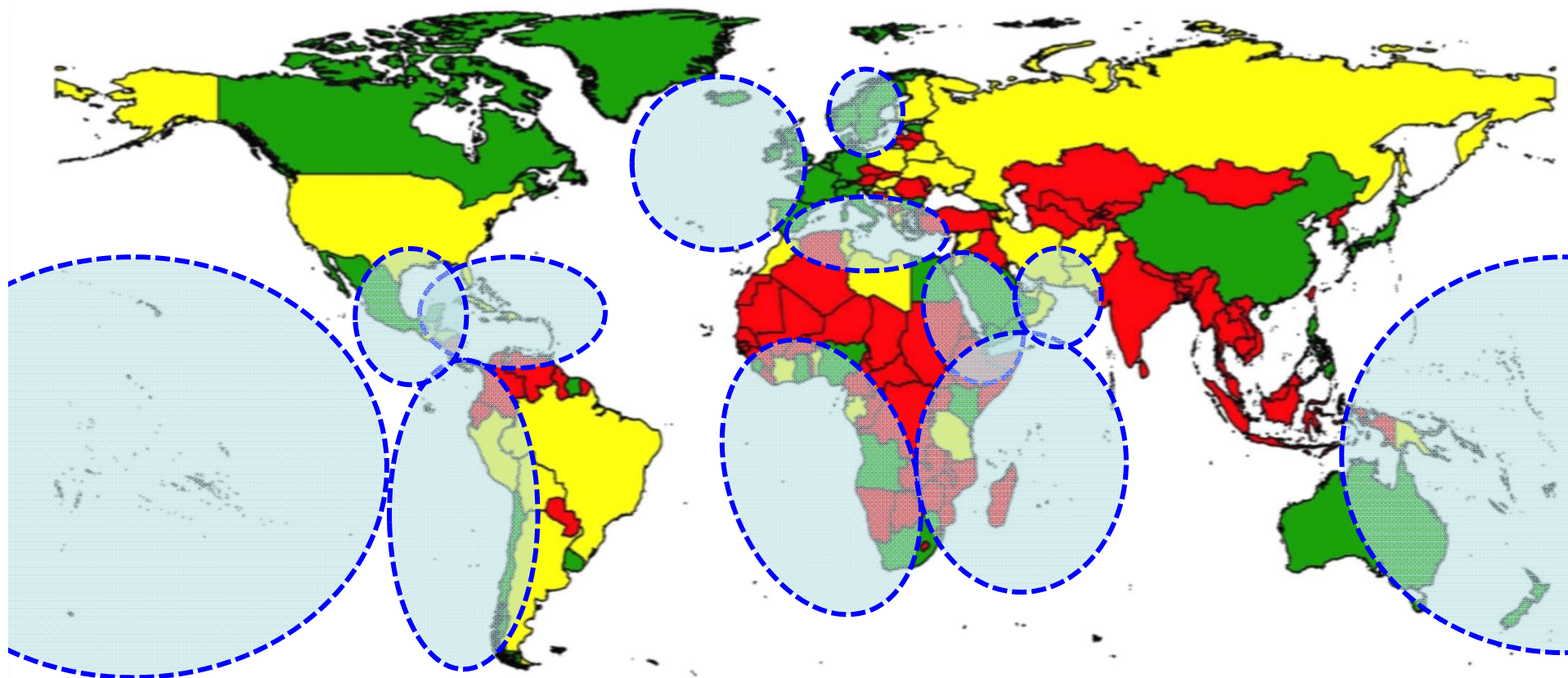
# REGIONAL CONVENTIONS AND AGREEMENTS

- Helsinki, OSPAR, Barcelona
- Jeddah, Nairobi, Abidjan
- Cartagena, Lima
- Kuwait, Noumea

All have Articles or Protocols that regulate disposal of waste at sea (some more stringent) in a similar way to the London Protocol

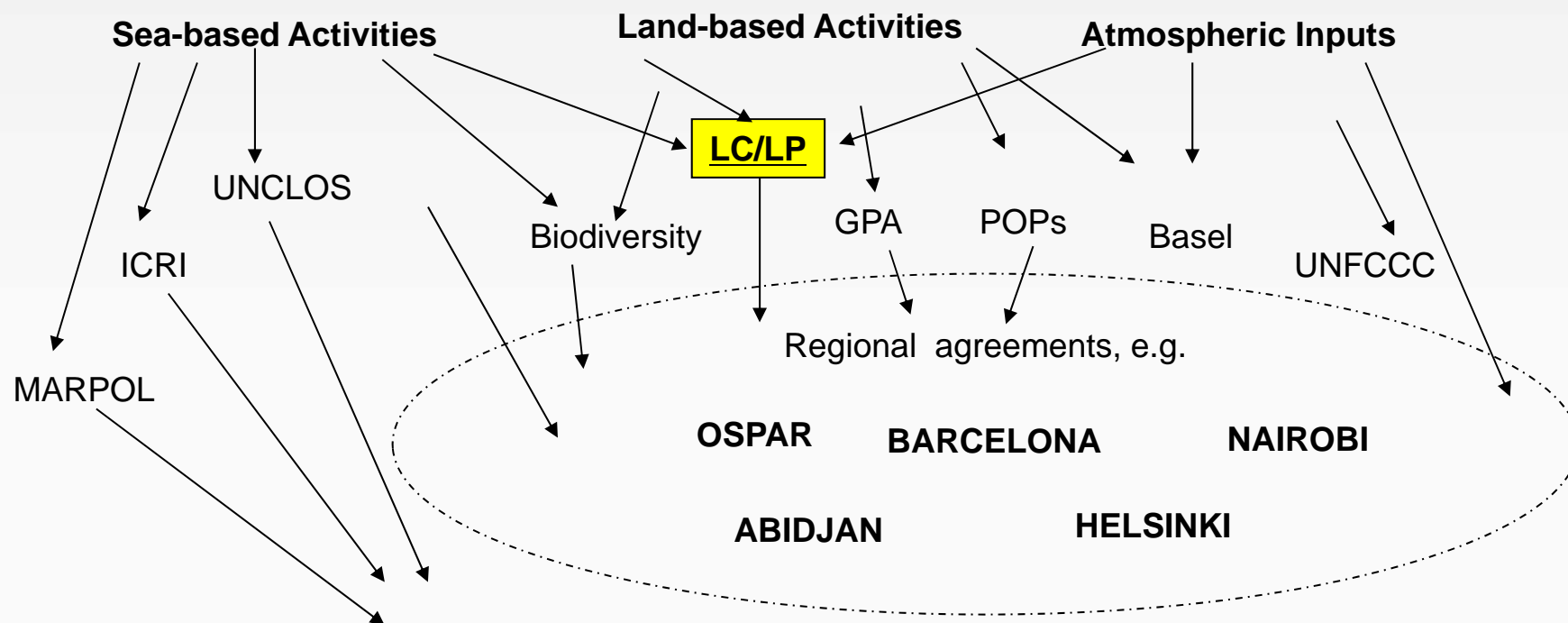


# THE LONDON PROTOCOL – A GLOBAL INSTRUMENT



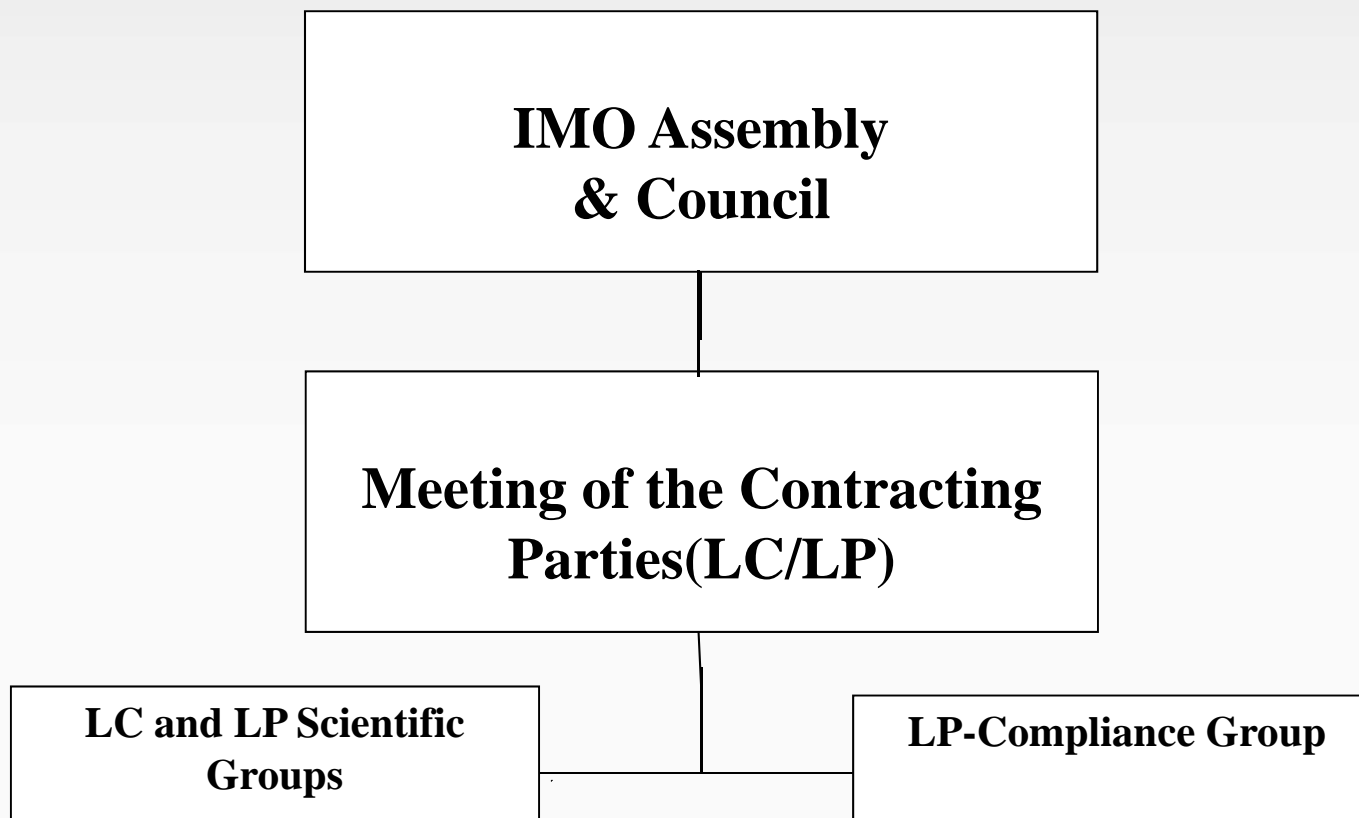


# Relationship between Global and Regional International Agreements



**Healthy Oceans**

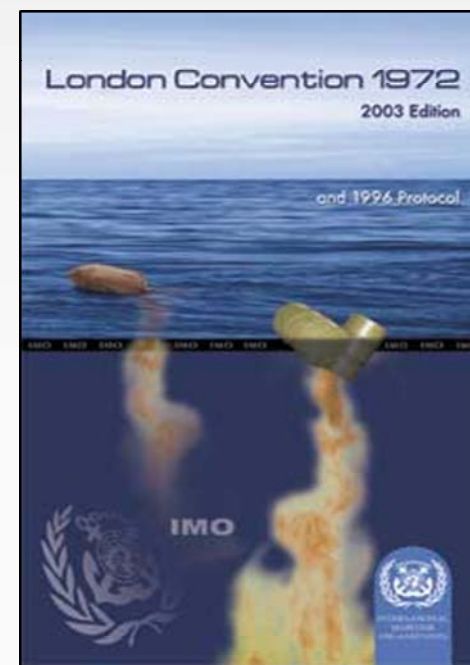
# GOVERNANCE STRUCTURE LC/LP



# THE LONDON CONVENTION 1972 (LC)

Almost anything can be dumped at sea provided key factors are considered and a **permit** is granted by the Administration:

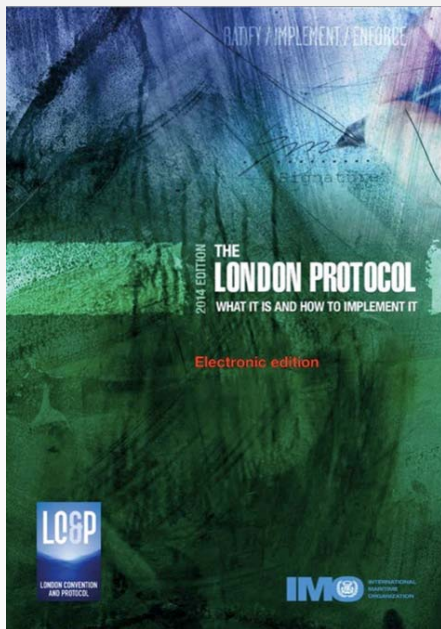
- **Annex I** lists **prohibited** wastes (some heavy metals, PCBs, PAHs, plastics, radioactive material.....)
- **Annex II** lists of wastes that require a **special permit** (some heavy metals, etc)
- **Annex III** lists factors to be considered when assessing the characteristics of wastes that may be considered for dumping under a **general permit**



# THE LONDON PROTOCOL 1996 (LP)

Total prohibition **of wastes.**

**Some types** may be considered following a mandatory waste assessment process, using:



- **Precautionary** approach
- **Polluter pays** principle
- **No transfer of environmental damage** from one media to another – dumping at sea last resort
- **Prevention, reduce, eliminate** wastes

## KEY FEATURES – LP ARTICLES

- Article 1: relevant terminology, definitions
- Article 2: objectives of the Protocol
- Article 3: general obligations of Contracting Parties
- **Article 4: basic prohibition + Annexes 1& 2**
- Article 5: prohibits incineration at sea
- Article 6: prohibits waste export
- Article 7: pollution control in internal waters
- Article 8: exceptions to permit requirements
- Article 9-29: administration, enforcement and arbitration + Annex 3

## KEY FEATURES – LP ANNEXES

Annex 1 – Wastes or other matter that may be considered for dumping

Annex 2 – Assessment of wastes or other matter that may be considered for dumping

Annex 3 – Arbitral procedures





# ARTICLE 1 – WHAT IS DUMPING AT SEA?

- Dumping is “any deliberate disposal into the sea of wastes or other matter from vessels, aircraft, platforms or other man-made structures.”
  - Includes storage of wastes in the seabed.
  - Includes abandonment or toppling at a site of structures.
- Dumping is not:
  - Operational discharges from vessels or offshore installations.
  - Pipeline discharges from coasts or cities.
  - Wastes discharged into rivers and out to sea.
  - Placement of matter for a purpose other than mere disposal.

# ARTICLE 4 AND ANNEX 1 WASTES OR OTHER MATTER

All dumping is prohibited except for 8 wastes that may be considered:

1. Dredged material
2. Sewage sludge
3. Fish waste
4. Vessels, platforms or other man-made structures
5. Inert, inorganic geological material
6. Organic material of natural origin
7. Bulky items
8. CO<sub>2</sub> storage in sub-seabed geological formations



# LONDON PROTOCOL

## SOME BASIC RULES

- Article 1.7 - “Sea” means all marine waters other than internal waters of States, as well as the sea-bed and subsoil thereof.”
  - Article 7.2 - Internal waters are excluded, unless a party chooses to include them.
- Article 6 - No export of wastes to other countries for dumping or incineration.
  - Amendment adopted in Oct. 2009 to allow transboundary movement of CO<sub>2</sub> waste streams.



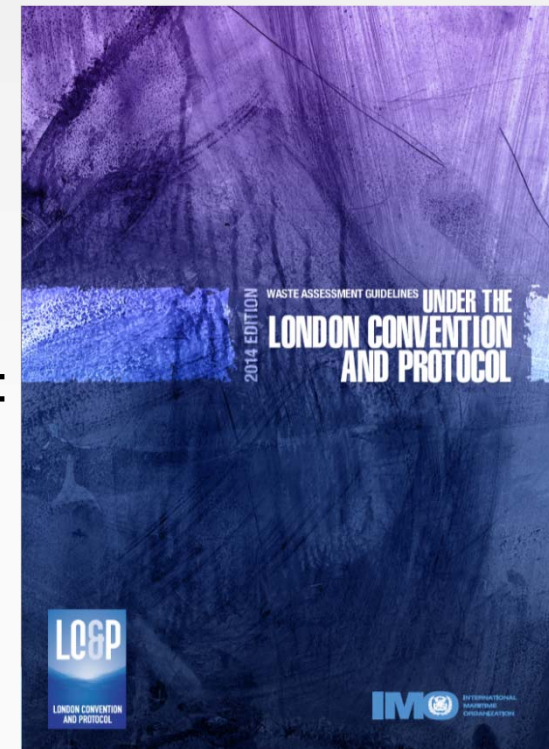
# LONDON PROTOCOL

## SOME BASIC RULES

- Article 9 - Designation of a national authority to implement the LP.
  - Issuance of permits.
  - Keep records and report annually to IMO Secretariat.
  - Monitor condition of the sea and report to IMO Secretariat.
- Article 10.1 - Dumping provisions applicable to all:
  1. Vessels (and aircraft) registered in a party's territory or flying its flag (Flag State responsibility).
  2. Vessels (and aircraft) loading wastes to be dumped, in the party's territory (Port State responsibility).
  3. Vessels (or aircraft and platforms) believed to be engaged in dumping in waters under its jurisdiction (Coastal State responsibility).

# TECHNICAL GUIDANCE

- Annex 2 – Mandatory assessment of wastes or other matter that may be considered for dumping.
- Specific waste assessment guidelines (WAGs) include a step-by-step assessment process for each waste category addressing:
  - Waste prevention audit
  - Waste management options
  - Waste characterization (chemical, physical, biological)
  - ‘Action List’ and ‘Action Levels’
  - Dump site selection
  - Assessment of potential effects
  - Compliance and field monitoring procedures
  - Permitting procedures



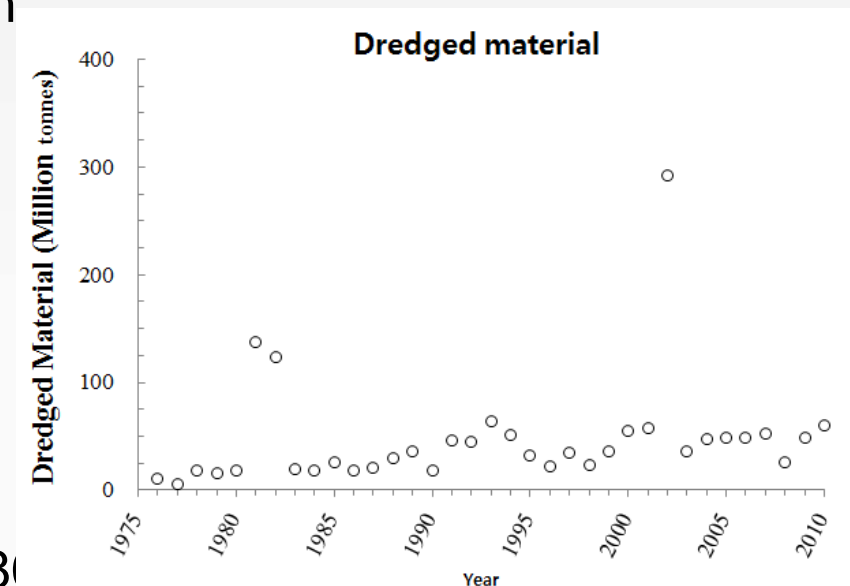
# TECHNICAL GUIDANCE

- Specific guidelines for each waste stream:
  - Dredged Material; Sewage Sludge; Fish Waste; Vessels; Platforms or Other Structures at Sea; Inert, Inorganic Geological Material; Organic Material of Natural Origin; Bulky Items; and Carbon Dioxide Streams for Sub-Seabed Disposal
- Additional guidance:
  - Application of the De Minimis Concept (ultra low-level radioactive waste); Placement of Artificial Reefs; Managing Spoilt Cargoes; Development of Action Lists and Action Levels for Dredged Material, and, Fish Waste; Sampling and Analysis of Dredged Material Intended for Disposal at Sea; and low technology and low cost methods to test dredged materials

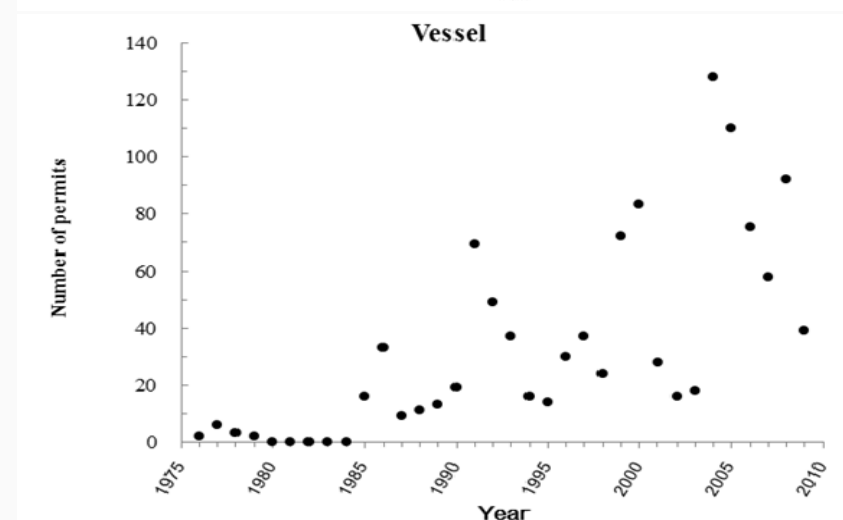
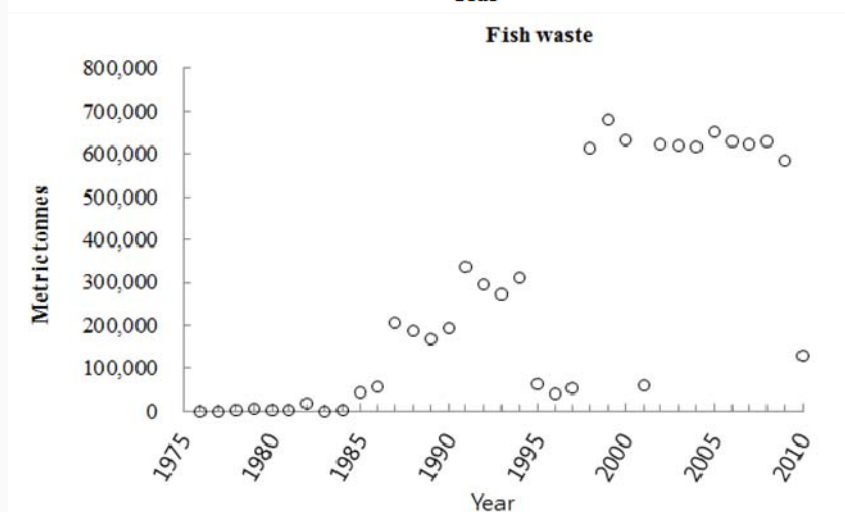
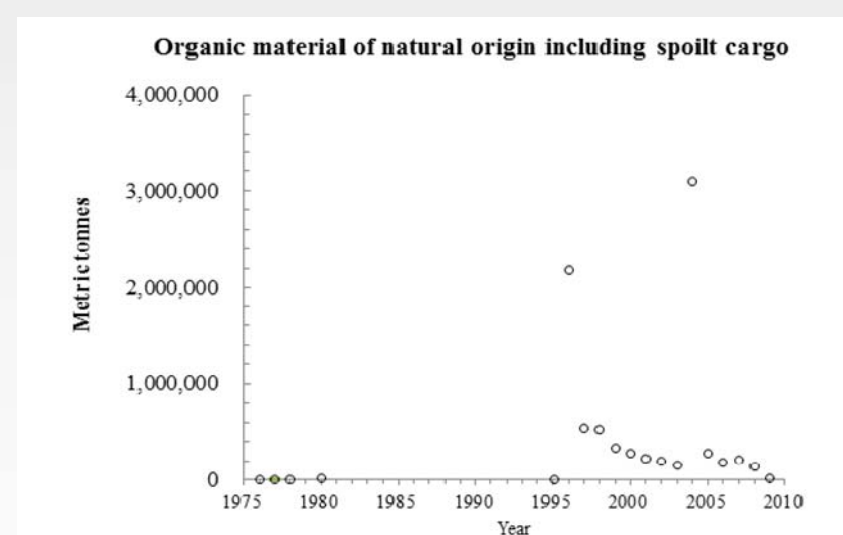
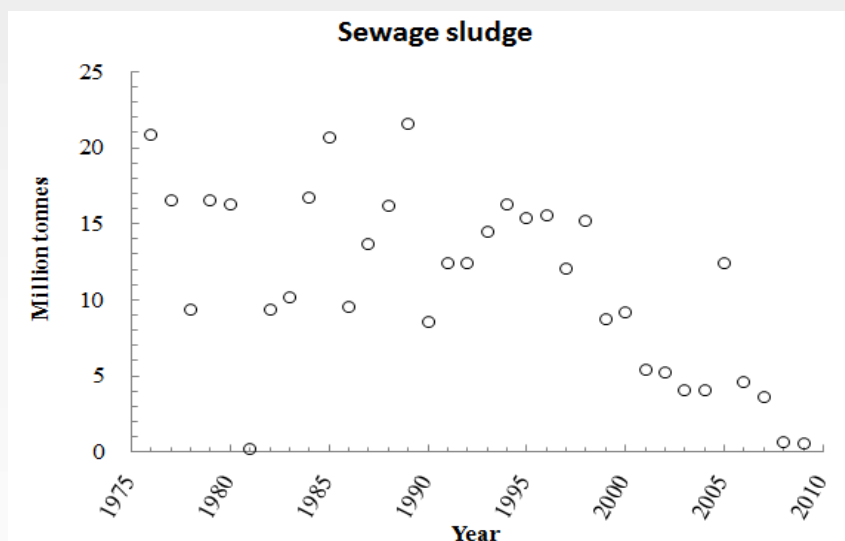


## CURRENT TRENDS IN DUMPING

- Annually, 250 to 500 million tonnes of dredged material from are dumped in Convention or Protocol waters worldwide.
- 10% of the dredged material is contaminated by shipping, industrial and municipal discharges, or land run-off.
- Dredged material constitutes about 80 to 90% of all materials dumped into the sea.



# CURRENT TRENDS IN DUMPING



# WHAT IS DREDGED MATERIAL?



# WHAT IS THE NEED FOR DREDGING?

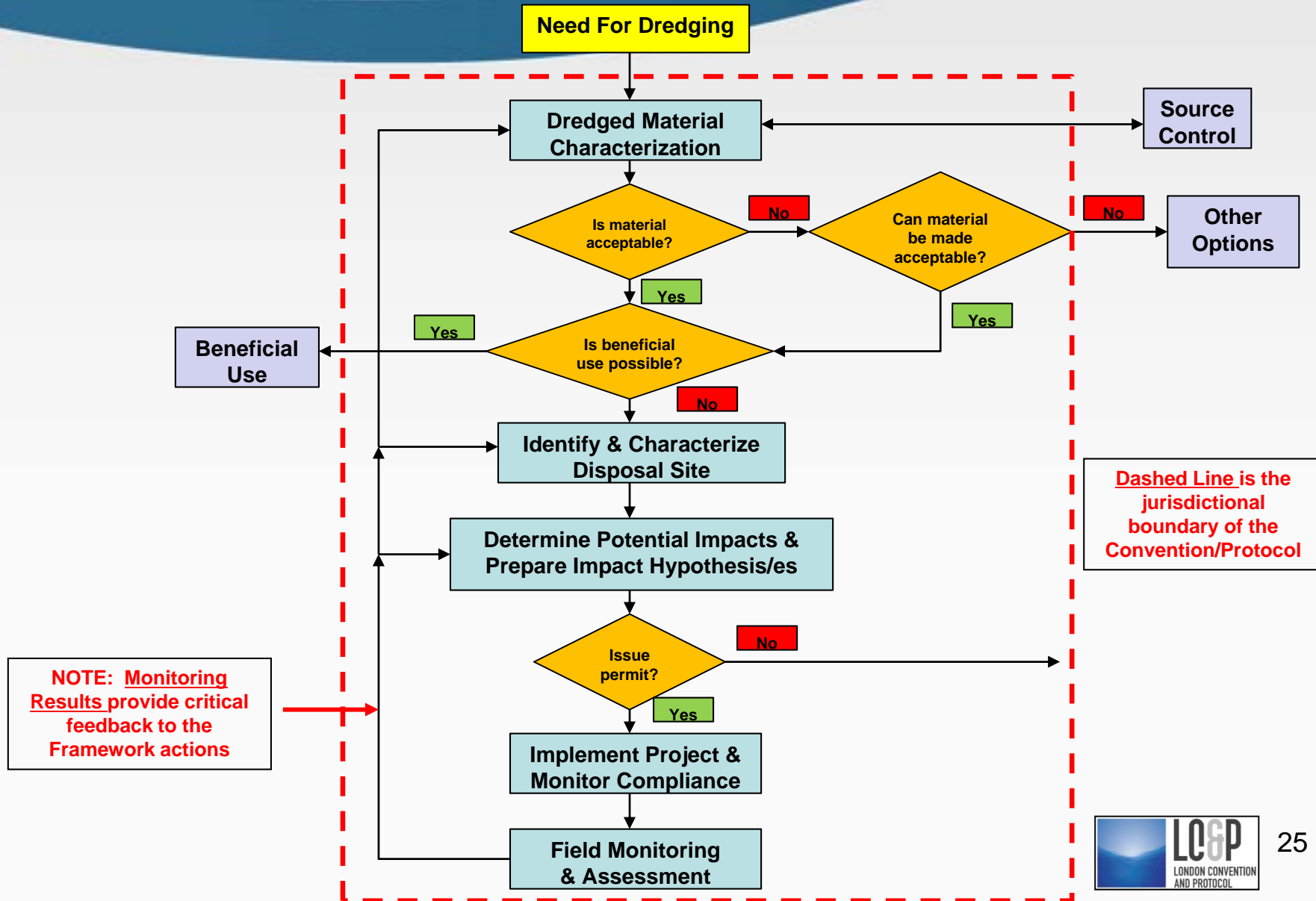
**Capital Dredging** - for navigation, to enlarge or deepen existing channel and port areas or to create new ones

**Maintenance Dredging** - to ensure that channels, berths or construction works, etc., are maintained at their designed dimensions; and

**Clean-Up Dredging** - deliberate removal of contaminated material for human health and environmental protection purposes.



# DREDGED MATERIAL SPECIFIC WASTE ASSESSMENT GUIDELINES





# CHARACTERIZE THE WASTE

- Assess any potential impacts of ocean disposal of a waste on the environment or human health.
- Is the waste or other matter suitable for disposal at sea?
- Can the waste or other matter be made acceptable for disposal at sea?
- Establish origin, total amount, form and composition
- Persistence, Toxicity, Accumulation and Biotransformation





# TESTING AND EVALUATION



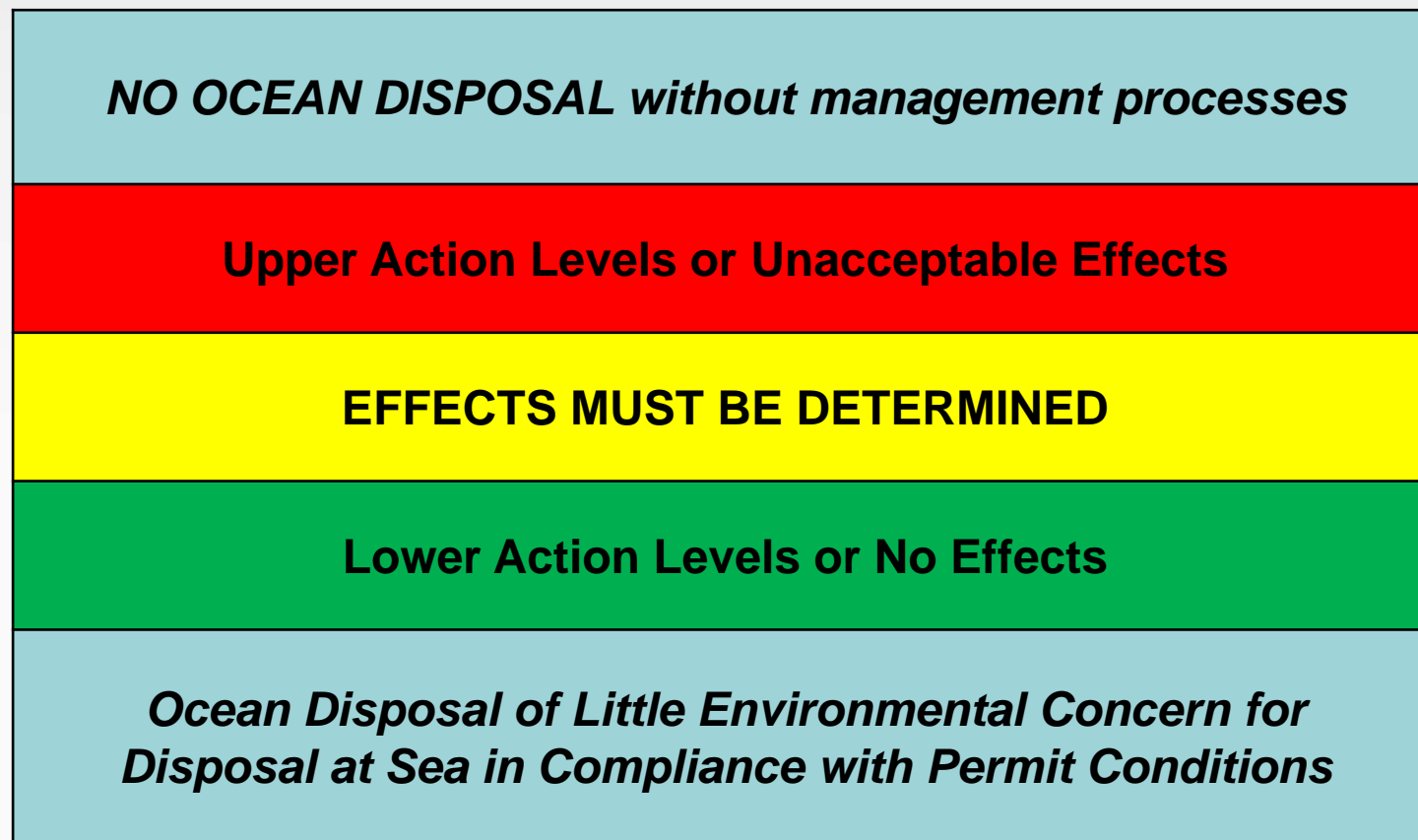
# WASTE CHARACTERIZATION

Waste type	Physical	Chemical	Biological	Exemptions	Notes
<b>Dredged material</b>	Grain size	Metals, PCBs, PAHs	Bioassays, community studies	No historical pollution No disturbance, Course sand only	Large volumes Extraction issues
<b>Organic/Sewage</b>	Specific gravity	Additives, preservatives, BOD	Pathogens, viruses, parasites	NA	
<b>Fish Waste</b>	NA	Growth additives, pharmaceuticals BOD Tainting	Pathogens, viruses, parasites, Endemicity of species	NA	

# WASTE CHARACTERIZATION

Waste type	Physical	Chemical	Biological	Exemptions	Notes
<b>Platforms and vessels</b>	Specific Gravity	NA	NA	No testing if cleaning is done to remove floatables, fuels, lubricants, chemicals, dielectrics, etc	Remove materials to maximum extent practicable
<b>Inert geological</b>	Specific Gravity	Mineralogy	NA	NA	No detailed assessment
<b>Bulky Items</b>	Specific Gravity > 1.2 g/cc	Heavy metals, organics, chemicals	NA	NA	Only physical impacts
<b>CO2</b>	NA	Impurities Additives	NA	NA	

# NATIONAL ACTION LEVELS

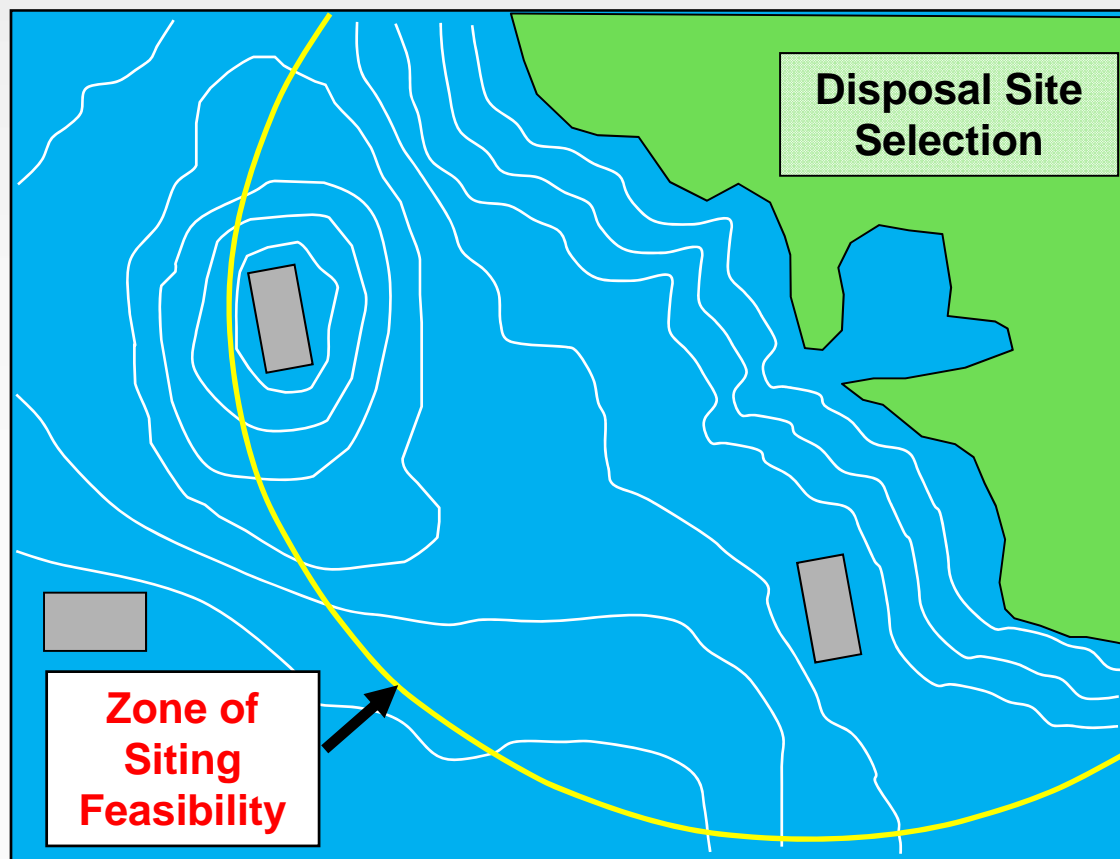


# BENEFICIAL USES



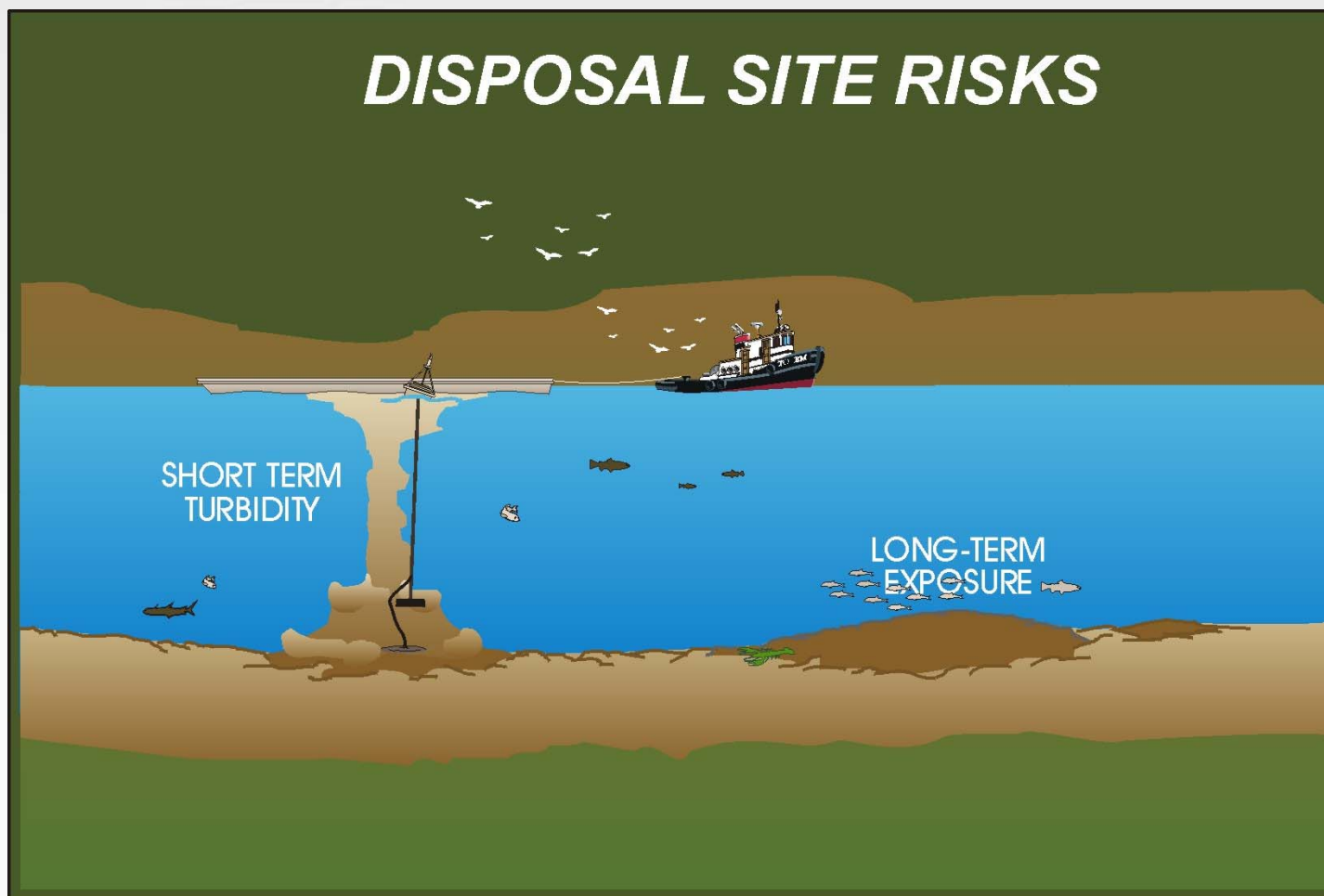


## ZONE OF SITING FEASIBILITY



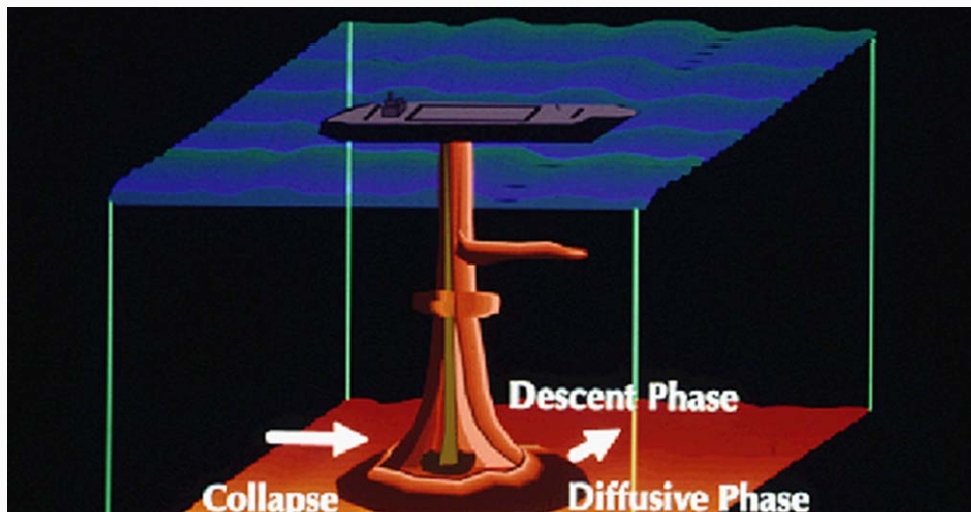


## ***DISPOSAL SITE RISKS***



# PERMIT AND PERMIT CONDITIONS

- The types, amounts and sources of materials to be dumped
- The location of the dump-site(s)
- The method of dumping
- Monitoring and reporting requirements



# MECHANICAL/CLAMSHELL DREDGES





# ENCLOSED CLAMSHELL BUCKET

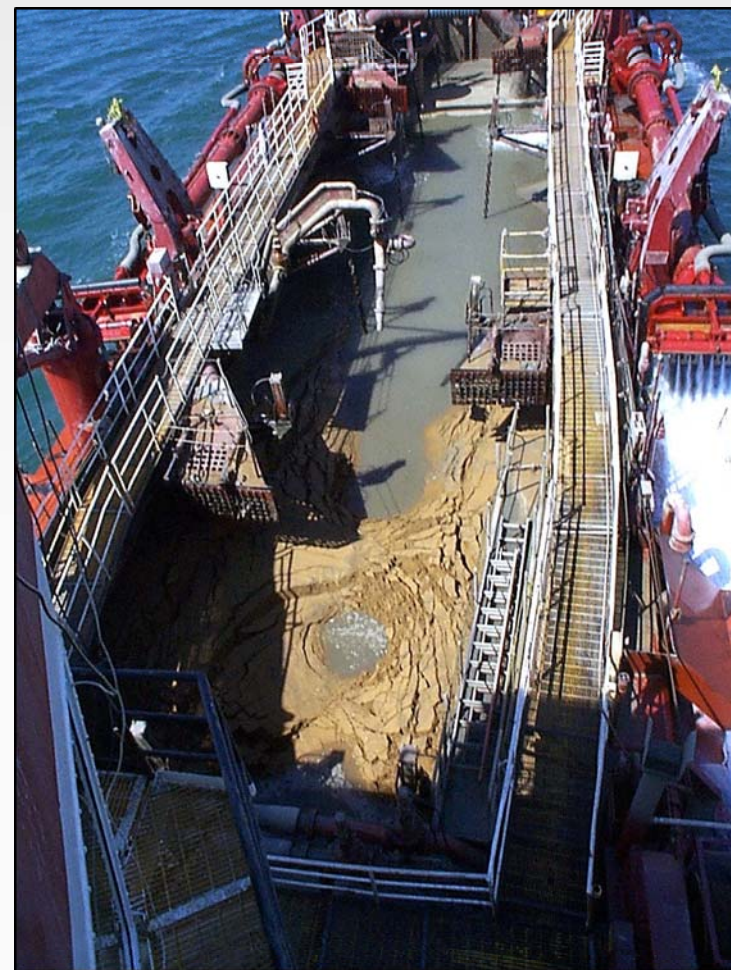


# EXCAVATOR/DIPPER DREDGE





# TYPICAL HOPPER DREDGE





# HOPPER DREDGE DISPOSING



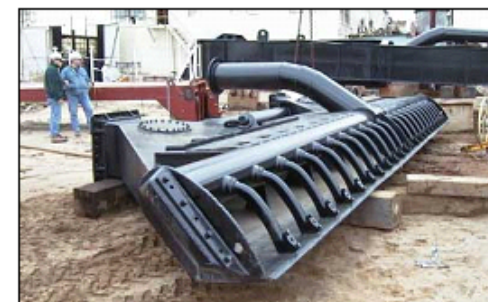
# CUTTERHEAD DREDGE & BOOSTER PUMP





# OTHER TYPES OF DREDGES

- Dustpan
- Bucket Ladder
- Agitation
- Pneuma
- Mechanical/Hydraulic High Solids Slurry



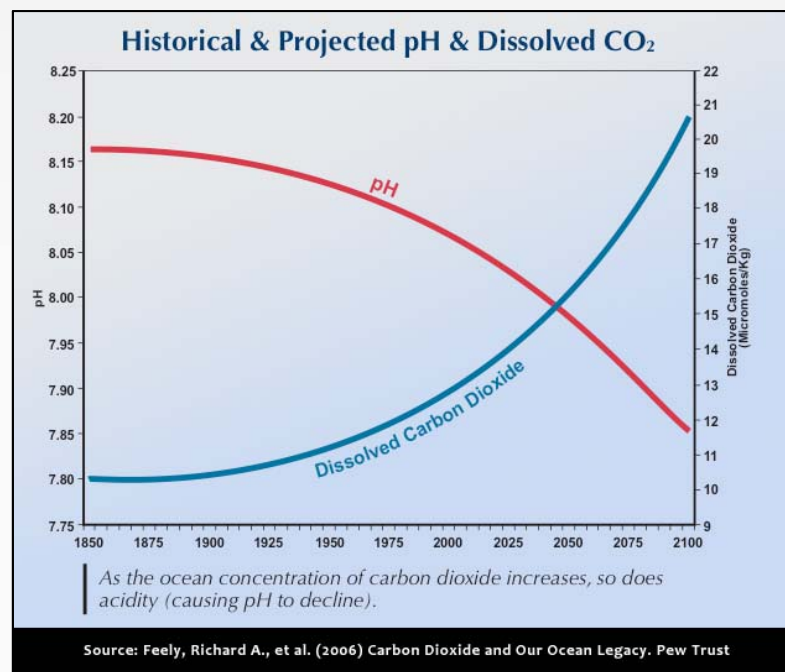
**Dustpan Dredge**

# CURRENT AND FUTURE ISSUES

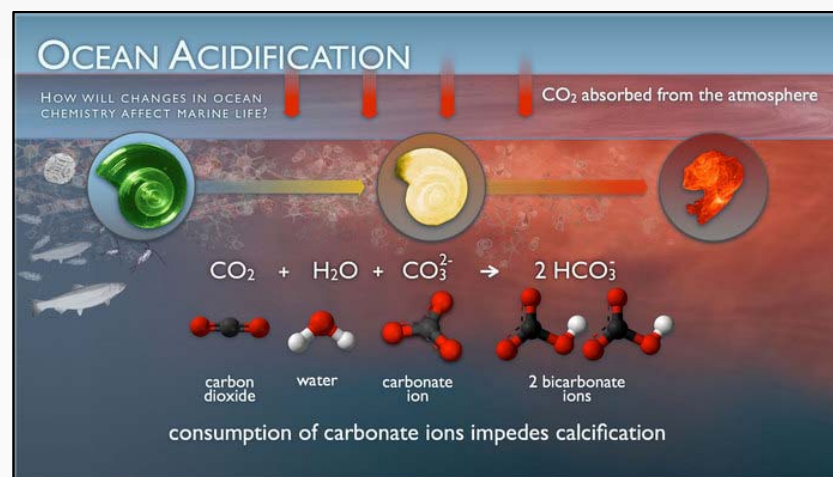
- Carbon capture and sequestration in sub-seabed geological formations (CCS)
- Developments on ocean fertilization and geoengineering
- Mine tailings, habitat destruction/restoration, marine litter and deep seabed mining - addressing gaps in international legal framework

# WHY CO<sub>2</sub> ISSUES?

## Acidification of the Surface Ocean due to Atmospheric CO<sub>2</sub> Increase

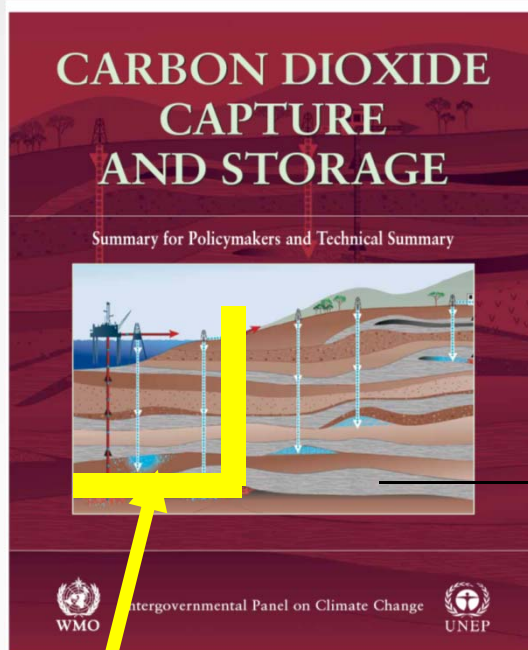


As dissolved CO<sub>2</sub> increases, the ocean becomes more acidic, shown as a lower pH level, and marine life cannot develop shells or coral reef material well.



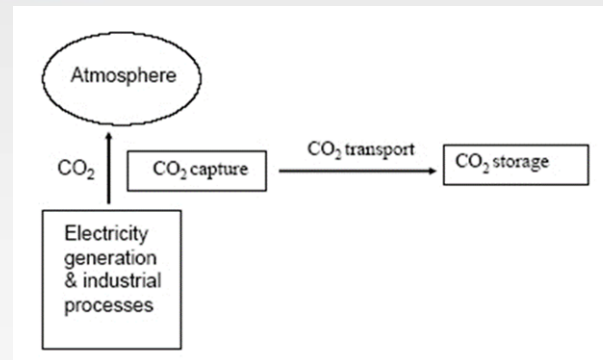


# CO2 SEQUESTRATION

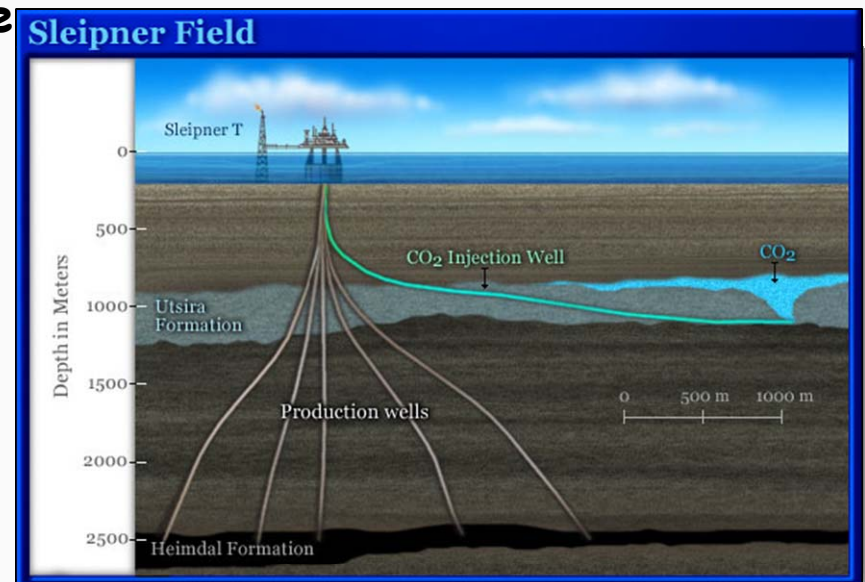


Scope of London Protocol

**Carbon Dioxide Capture and Storage**  
**Approved and accepted by IPCC**  
**Permanent isolation!**



**Sleipner Field (Norway)**





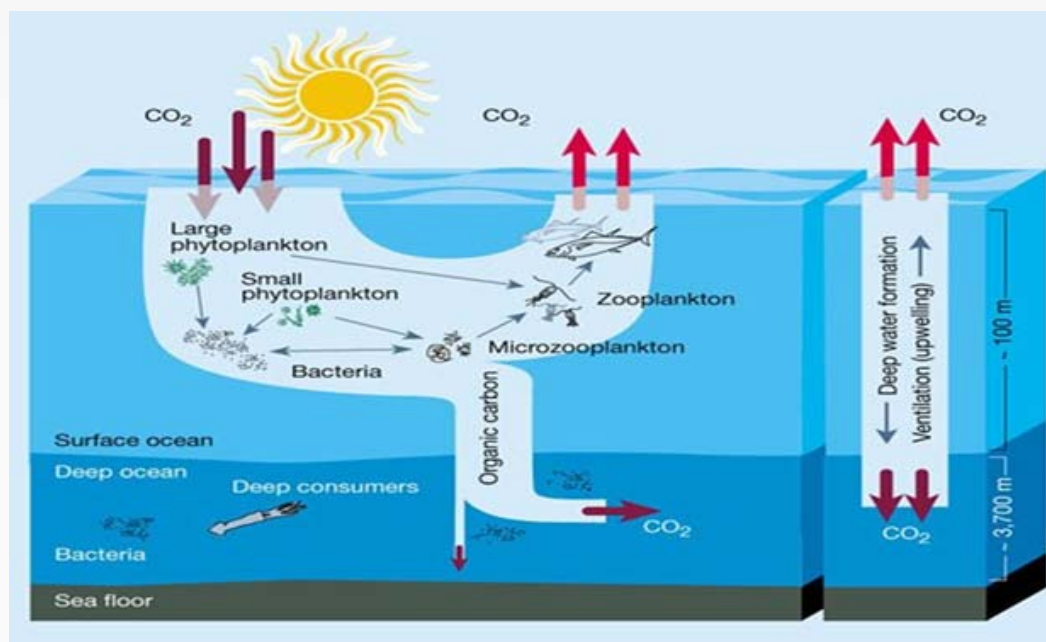
## LP AMENDMENTS ON CCS

1. Adopted in 2006. Regulates the sequestration of CO<sub>2</sub> streams from CO<sub>2</sub> capture processes in sub-seabed geological formations. These amendments are in force since February 2007.
  - Basis created in international environmental law.
2. Adopted amendment to Article 6 in 2009 that allows the export of carbon dioxide streams for disposal in accordance with Annex 1.
  - To date – three ratifications (Norway, United Kingdom, Netherlands)
  - Unintended transboundary migration within reservoir after injection: Not regarded as export
3. Various guidances developed – Waste assessment (purity), Risk assessment framework, Transboundary consent/arrangements.

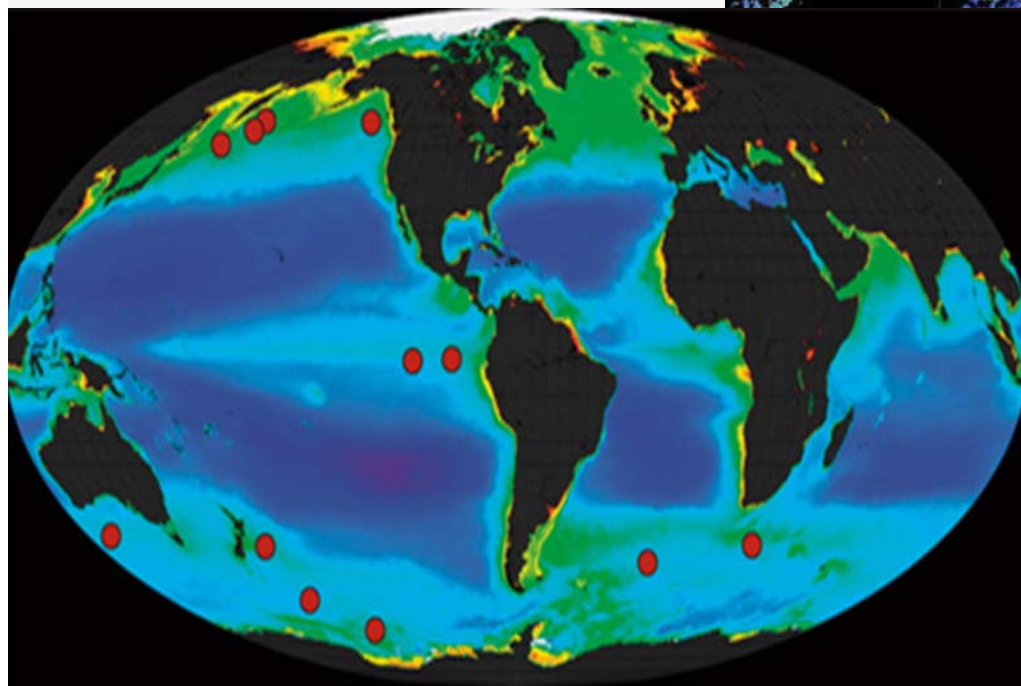
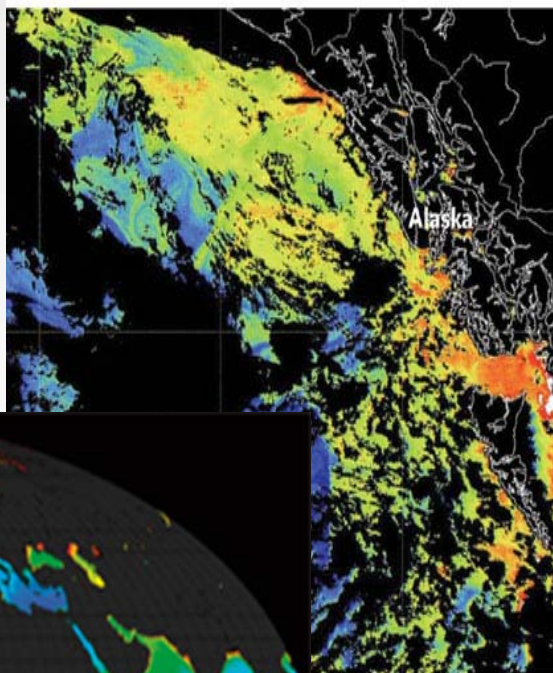
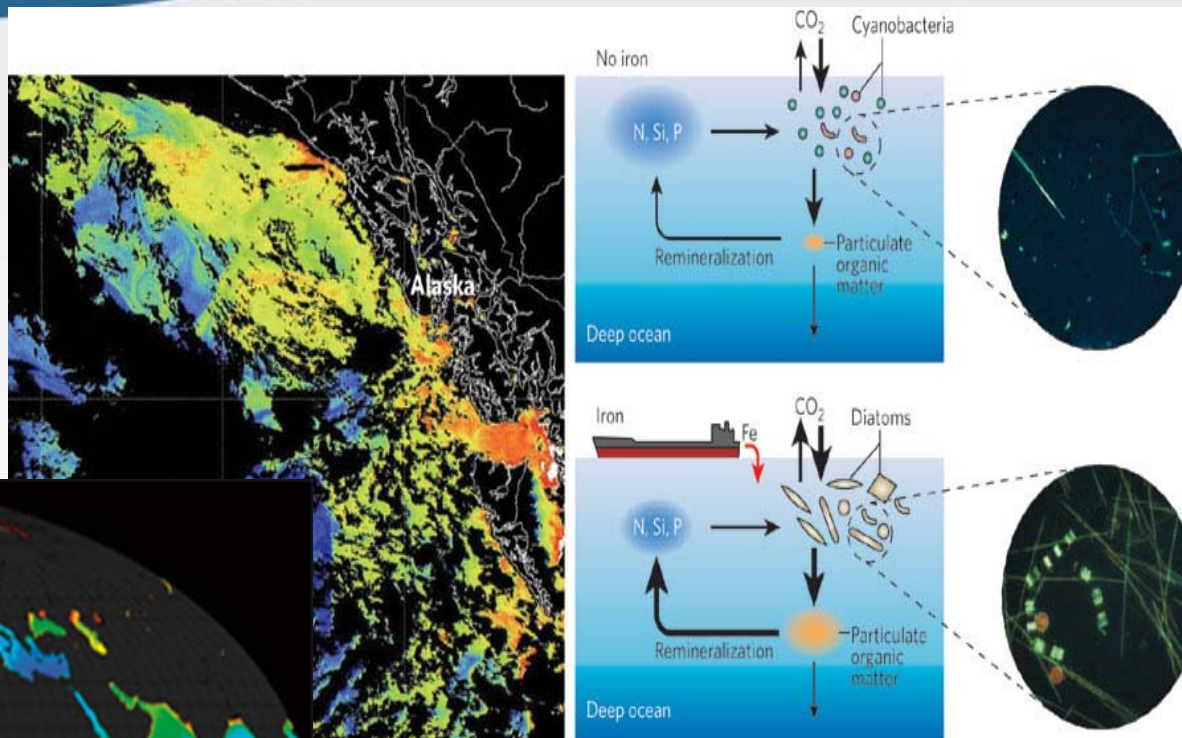
# REGULATION OF OCEAN FERTILIZATION

What is it?: Stimulation of natural photosynthesis through phytoplankton production in the oceans, i.e., by “seeding” with nutrients, to draw down part of the surplus of CO<sub>2</sub> from the atmosphere

Concerns?: (1) effectiveness of the method, does it work? (2) potential irreversible impacts on the marine environment and human health



# IRON OCEAN FERTILIZATION



From Armbrust, E. V. (2009). The life of diatoms in the world's oceans *Nature* 459, 185-192, doi:10.1038/nature08057.

# REGULATION OF MARINE GEOENGINEERING INCLUDING OCEAN FERTILIZATION

Adoption of resolution LP.4(8) in 2013 regulates the placement of matter for ocean fertilization and other marine geoengineering activities

Allows the regulation of marine geoengineering activities to be listed in a new annex in the future if they fall within the scope of the London Protocol and have the potential to harm the marine environment

# MARINE GEOENGINEERING – LP DEFINITION?

“a deliberate intervention in the marine environment to manipulate natural processes, including to counteract anthropogenic climate change and/or its impacts, and that has the potential to **result in deleterious effects, especially where those effects may be widespread, long-lasting or severe**”.

**Exclusions:** direct harvesting of marine organisms, conventional aquaculture or mariculture, the creation of artificial reefs, use of dispersants in oil spill response, or the production of energy from the wind, currents, waves, tides, or ocean thermal energy conversion, deep sea mining, or conventional marine observation and sampling methods.

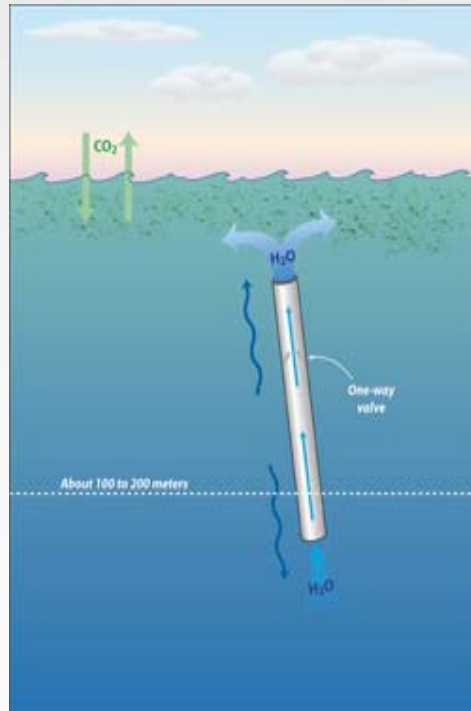


## MARINE GEOENGINEERING – TYPES

- Increase carbon flux to the deep-sea through stimulating additional production by adding iron, nitrogen or raising nutrient-rich deep-waters to the surface
- Depositing organic material on the deep seabed:
  - Crop wastes
  - Charcoal/Biochar
- Increasing the uptake of CO<sub>2</sub> from the atmosphere by :
  - Adding e.g. Calcium oxide, hydroxide or carbonate, directly
  - Enhancing the chemical weathering of silicate rocks



# MARINE GEOENGINEERING –EXAMPLES



## **Floating Tubes** (Lovelock and Rapley (2007))

Deployment of thousands of plastic tubes (~300-600 feet long and ~30 feet in diameter) in the oceans, bridging nutrient-poor surface waters with colder, nutrient-rich waters at depth.

One-way valve would pump nutrient-rich deep water through the tubes to the ocean surface, stimulating phytoplankton activity.

## **Wave-Powered Ocean Pumps**

Bring nutrient-rich deep water to the surface to stimulate plankton blooms (Karl and Letelier, 2008).



# SUMMARY AND ACHIEVEMENTS

- Parties have **stopped unregulated dumping and incineration** activities, including dumping of industrial and radioactive wastes.
- **All dumping is now subject to permitting and controlled by regulatory programs** designed to assess the need for and potential impact of dumping.
- LP- is a **modern, comprehensive and evolving** international agreement providing greater protection of the marine environment.
- Includes **all marine areas and seabed**.
- **Addresses** emerging issues – **climate change mitigation**.

# POINT OF CONTACT FOR ADDITIONAL INFORMATION

International Maritime Organization

Office for the London Convention/Protocol and  
Ocean Affairs

4 Albert Embankment

London SE1 7SR

United Kingdom

Tel: +44(0)20-7587-3122

Fax: +44(0)20-7587-3210

email: [ekleverlaan@imo.org](mailto:ekleverlaan@imo.org)

[www.londonprotocol.imo.org](http://www.londonprotocol.imo.org)

