ENVIRONMENTAL AND ECONOMIC IMPACTS OF OIL SPILLS

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INTRODUCTION TO ITOPF

- Established in 1968, not-for-profit, based in London
- Provides technical advice worldwide on preparedness and response to accidental marine spills
- Total team of 34, technical team with 12 responders available 24/7
- Primarily funded by the global shipping industry (annual fee)
  - *Members: >97% of the world's ocean going tanker fleet*
  - *Associates: >90% of the world's ocean going non-tanker fleet*

ENVIRONMENTAL IMPACTS: PUBLIC PERCEPTION

ECO DISASTER

A golden paradise buried beneath an evil black menace

Oil spill peril spreads

A crime against humanity

ecosystems in peril

'8-11 tragedy'

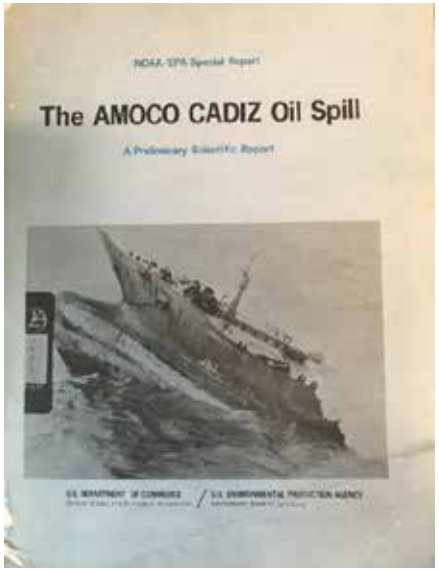
NATIONAL CALAMITY

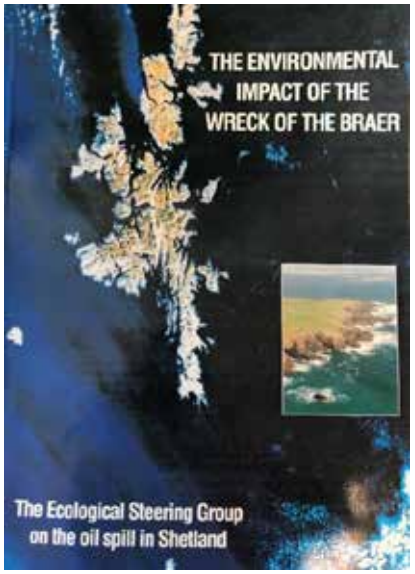
Wrong lessons from Exxon Valdez

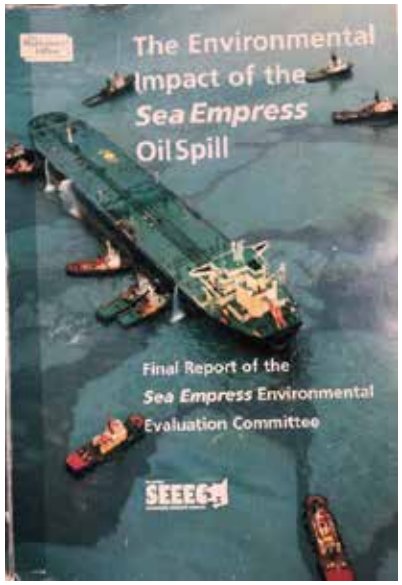
'Oil spill could kill whole Visayan Sea'

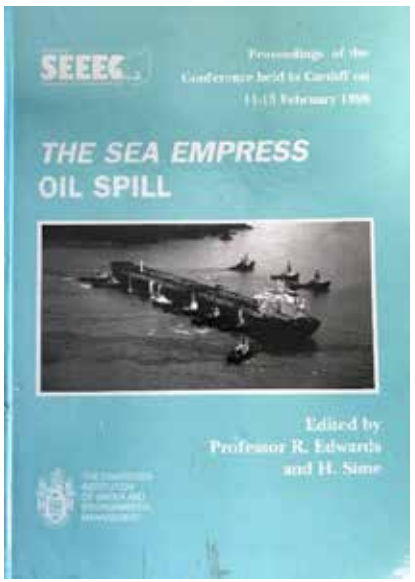
'impending disaster'

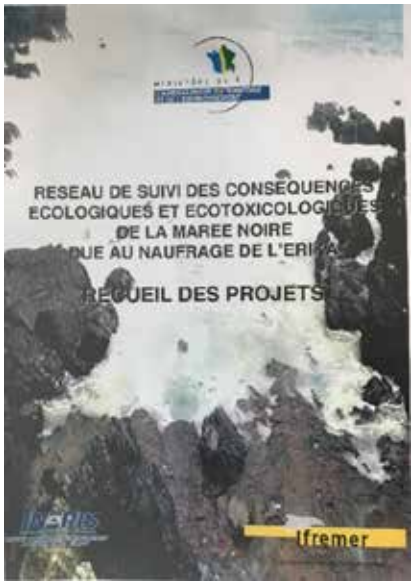
ENVIRONMENTAL IMPACTS: PAST EXPERIENCES

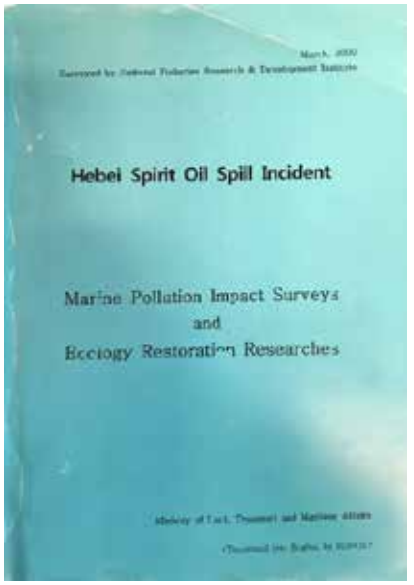










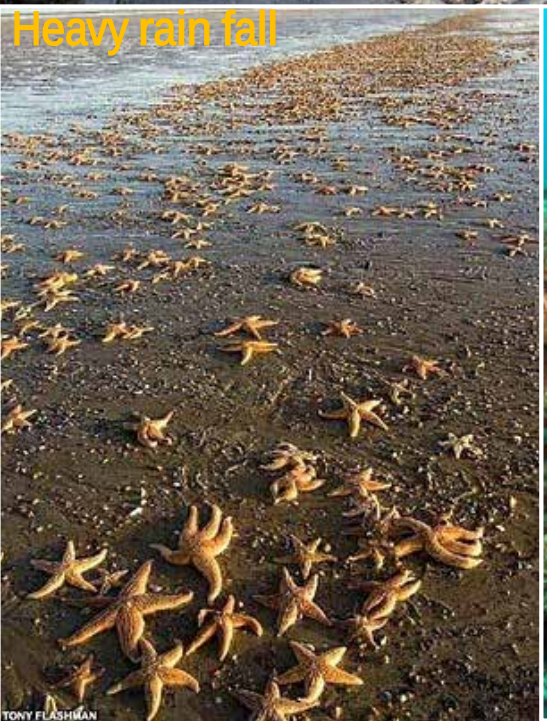


Numerous Environmental Impact Assessments following major oil spills

ENVIRONMENTAL IMPACTS: PAST EXPERIENCES

- Widespread mortalities are typical for large spills
- Populations are naturally resilient to acute impacts
- Natural processes are capable of repairing damage
- Ecosystem structure & function is typically restored

MARINE ECOSYSTEMS: NATURALLY RESILIENT



- Marine ecosystems cope with regular natural disturbances
- Widespread mortalities result from storms, algal blooms, seasonal variations etc. but populations recover rapidly
- Most marine organisms reproduce rapidly and in vast quantities, facilitating recovery

EFFECTS OF OIL ON MARINE ORGANISMS

PHYSICAL SMOTHERING

- **Physiological impairment**
- **Impact on Movement - Feeding – Respiration - Thermal Control**

CHEMICAL TOXICITY

- **Impairment of molecular/cellular function**
- **Lethal or sub-lethal effects (narcosis)**

ECOLOGICAL CHANGES

- **Loss of key organisms from habitat**
- **Opportunistic species takeover (community changes)**

INDIRECT EFFECTS

- **Loss of habitat/shelter**
- **Loss of important food species**

POTENTIAL IMPACTS OF SHORELINE RESPONSE


COAST OIL SPILL SAGA

Stripped by Hamish, our beaches lose more sand

- Extraction of sediment / erosion
- Marine communities disruption
- Physical damage
- Dispersants / increase of oil bio-availability

SEVERITY OF IMPACT: KEY FACTORS

Type and volume of oil spilled

- Physical/chemical characteristics of oil
- Oil weathering

Characteristics of the affected area

- Sensitivity / vulnerability to pollution
- Nature of resources at risk

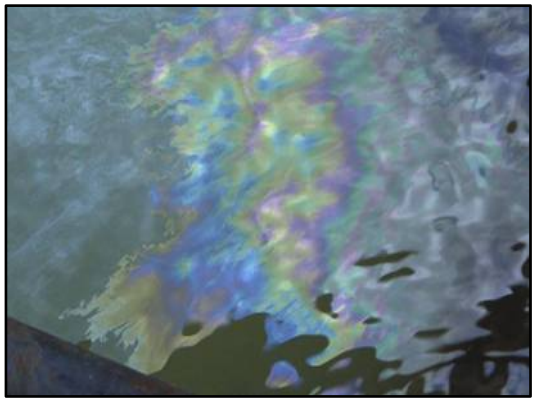
Time of year/seasonality

- Weather/sea conditions
- Likelihood of exposure varies depending on season (presence / absence of migratory species)

Nature and effectiveness of clean-up

- Clean-up should seek to mitigate damages and enhance natural recovery

SEVERITY OF IMPACT: TYPE OF OIL



LIGHT OILS

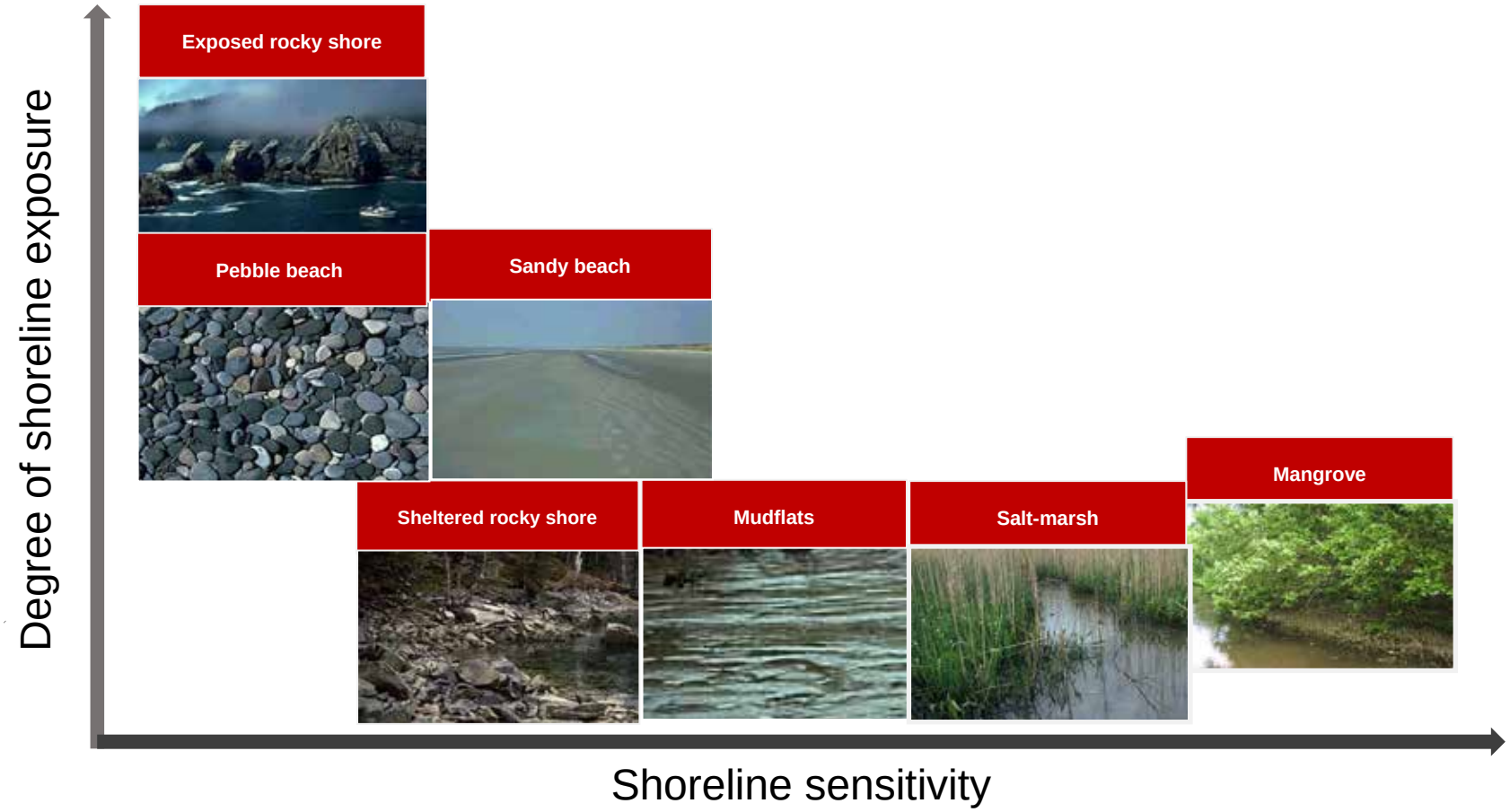
HEAVY OILS

GASOLINE | MARINE DIESEL OIL | LIGHT CRUDE OIL | HEAVY CRUDE OIL | IFO 180 | HFO

TOXIC EFFECTS

SMOTHERING

SEVERITY OF IMPACT: ENVIRONMENTAL SENSITIVITY INDEX



SEABIRDS AND MARINE MAMMAL IMPACTS

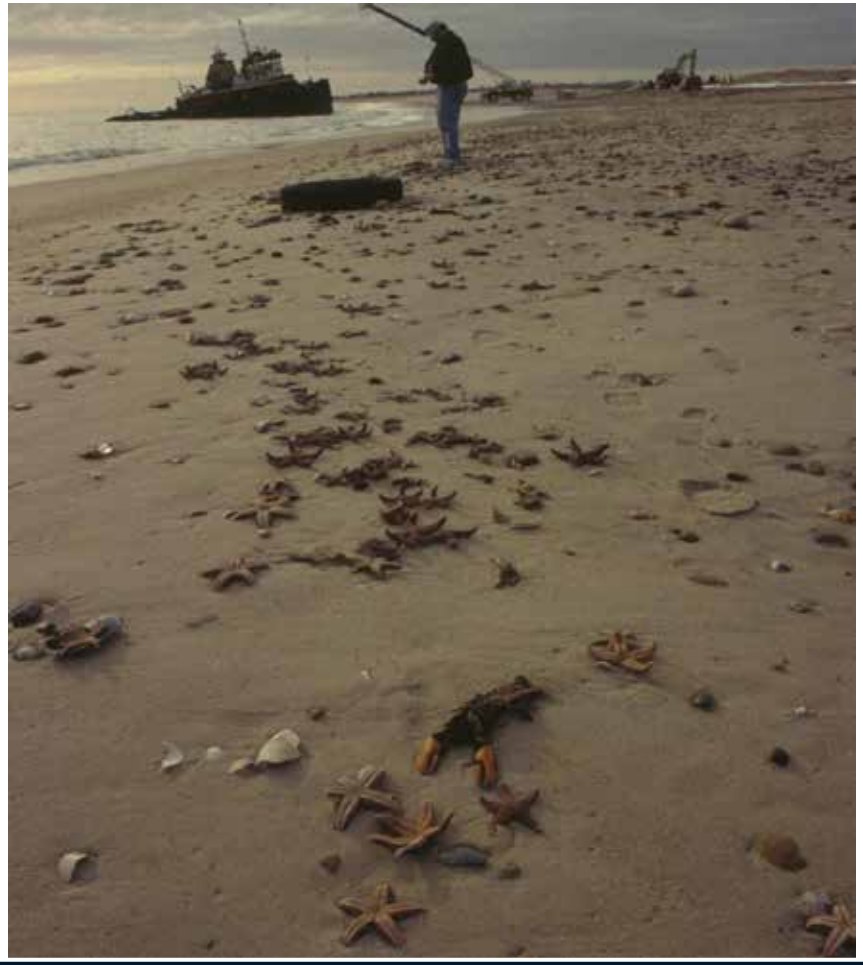
Seabirds

- Highly vulnerable to oil spills / species behaviour dependent
- Mortality typically due to drowning, starvation & hypothermia
- Mass mortalities common, but permanent declines unlikely

Marine mammals

- Very few spills have resulted in observed impacts
- Coastal species & breeding colonies at higher risk than pelagic species
- Mucus membrane irritation & thermoregulation effects are typical

SEABED IMPACTS



- Rarely severe – large inshore spills of light oil can cause mass mortalities
- Sedimentation of heavy oils can cause localised seabed smothering
- Re-recruitment of benthic organisms occurs usually over a short timescale.
- Coral reefs & seagrass beds: sensitive habitats with slow recovery times

SANDY SHORES IMPACTS

- Impacts usually short-term to medium-term on dynamic exposed beaches
- Massive mortalities rarely seen / organism recruitment and recovery is often rapid
- Upper beach / dune vegetation vulnerable to mechanical clean-up

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- Turtle nesting beaches have increased vulnerability

ROCKY SHORE IMPACTS

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- Boulder shores highly vulnerable to heavy machinery damage

SALTMARSH IMPACTS

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- Oil may penetrate sediment & persist for years, relatively slow recovery from seeds and root systems
- Aggressive clean-up leads to aggravation of damages

MANGROVE IMPACTS

- Highly productive & biodiverse tropical soft-sediment habitat

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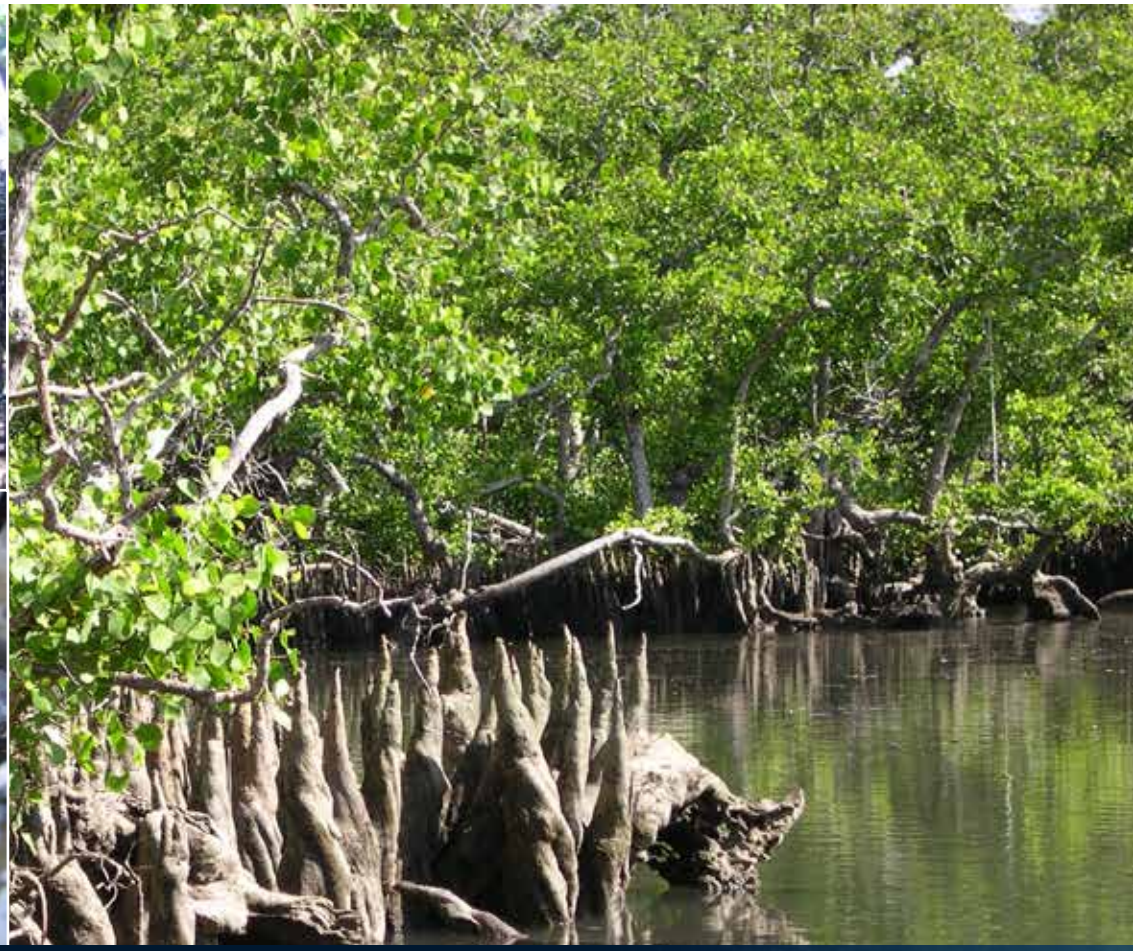

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- Slow recovery if widespread tree mortalities, but strong ability to natural recovery
- Intrusive / aggressive clean-up can increase severity of damage

FISHERIES/AQUACULTURE IMPACTS

MORTALITY / CONTAMINATION / TAINTING

- Low risk: sub-tidal wild stock
- Higher risk: caged & intertidal stock
- Breeding & nursery grounds are sensitive
- Nearshore dispersed oil increases threat

BUSINESS INTERRUPTION

- Oil or response in fishing grounds
- Fishing restrictions imposed
- Oiled vessels or equipment
- Can be severe in short-term.

MARKET CONFIDENCE

- Traders reluctant to purchase
- Public perception of health risks
- Sampling & analysis often required

KEY ISSUE: Identifying spill-specific impacts

IMPACTS ON TOURISM

TOURISM / RECREATION

- Direct contamination of amenity areas
- Losses for associated business
  - Hospitality businesses
  - Diving / sailing schools
  - Shops relying on tourist influx
- Public confidence needed for recovery

IMPACTS ON PORTS AND INDUSTRY

- Ports, harbours & shipyards oiled/disrupted
- Hulls of ships oiled
- Power stations & desalination plants shut down

SUMMARY

- Effects of spilled oil depends heavily on its composition & characteristics
- Weathering processes can increase or decrease bio-availability of oil
- Oil spills can cause a wide range of environmental & economic impacts
- Marine life can recover remarkably rapidly through natural processes
- Socio-economic effects of oil spills can be severe in the short-term
- Effective clean-up response operations can mitigate damage