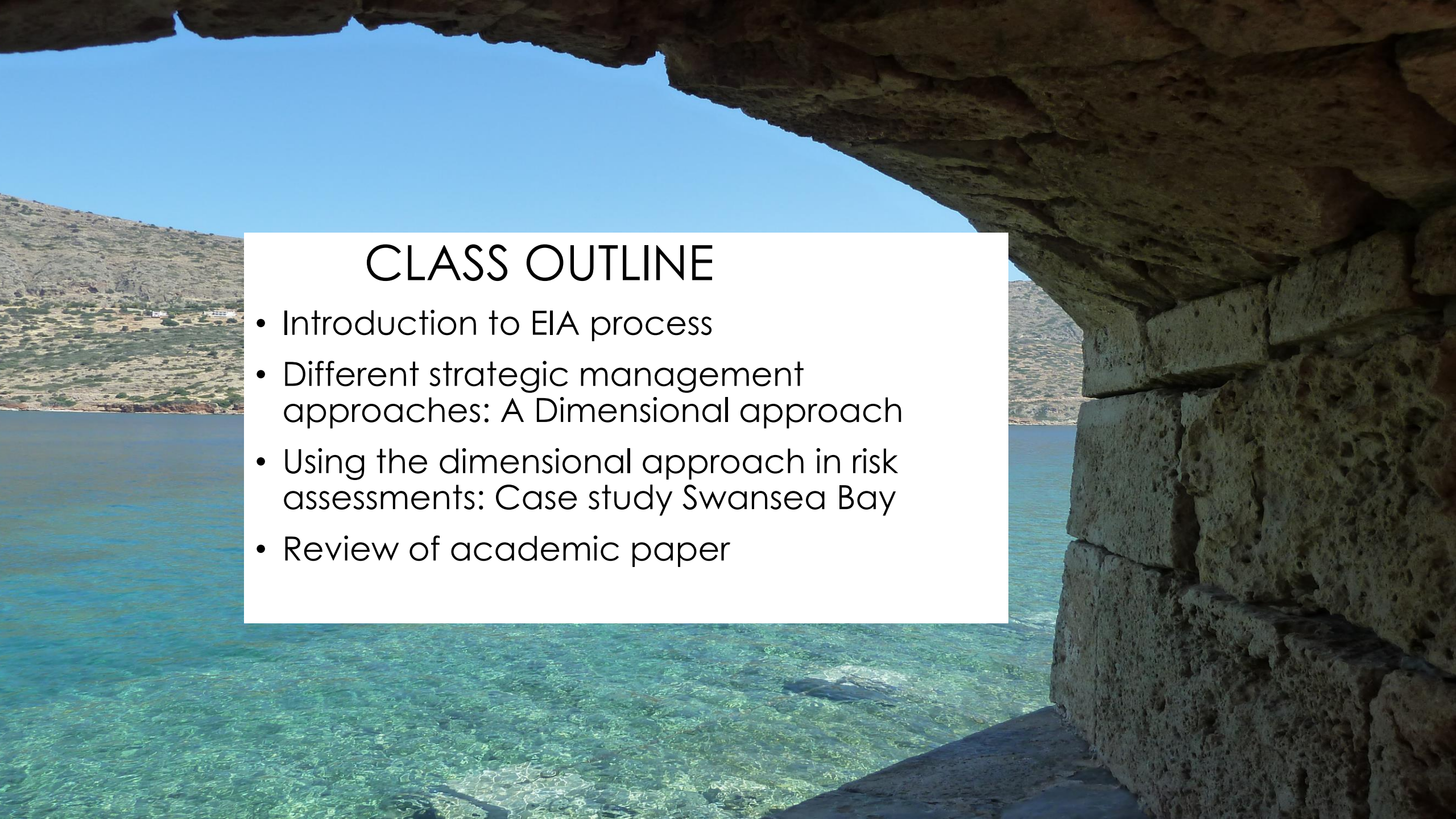




EIA: a method to achieve
sustainable development in
Marine Environments

The background image shows a view through a stone archway. The arch is made of large, rough-hewn stone blocks. Beyond the arch, there is a body of water with a greenish-blue hue, reflecting the sky. In the distance, a hill with sparse vegetation and a few small buildings is visible under a clear blue sky.

CLASS OUTLINE

- Introduction to EIA process
- Different strategic management approaches: A Dimensional approach
- Using the dimensional approach in risk assessments: Case study Swansea Bay
- Review of academic paper

SUSTAINABLE DEVELOPMENT

- Governments subscribe to the notion of SD:

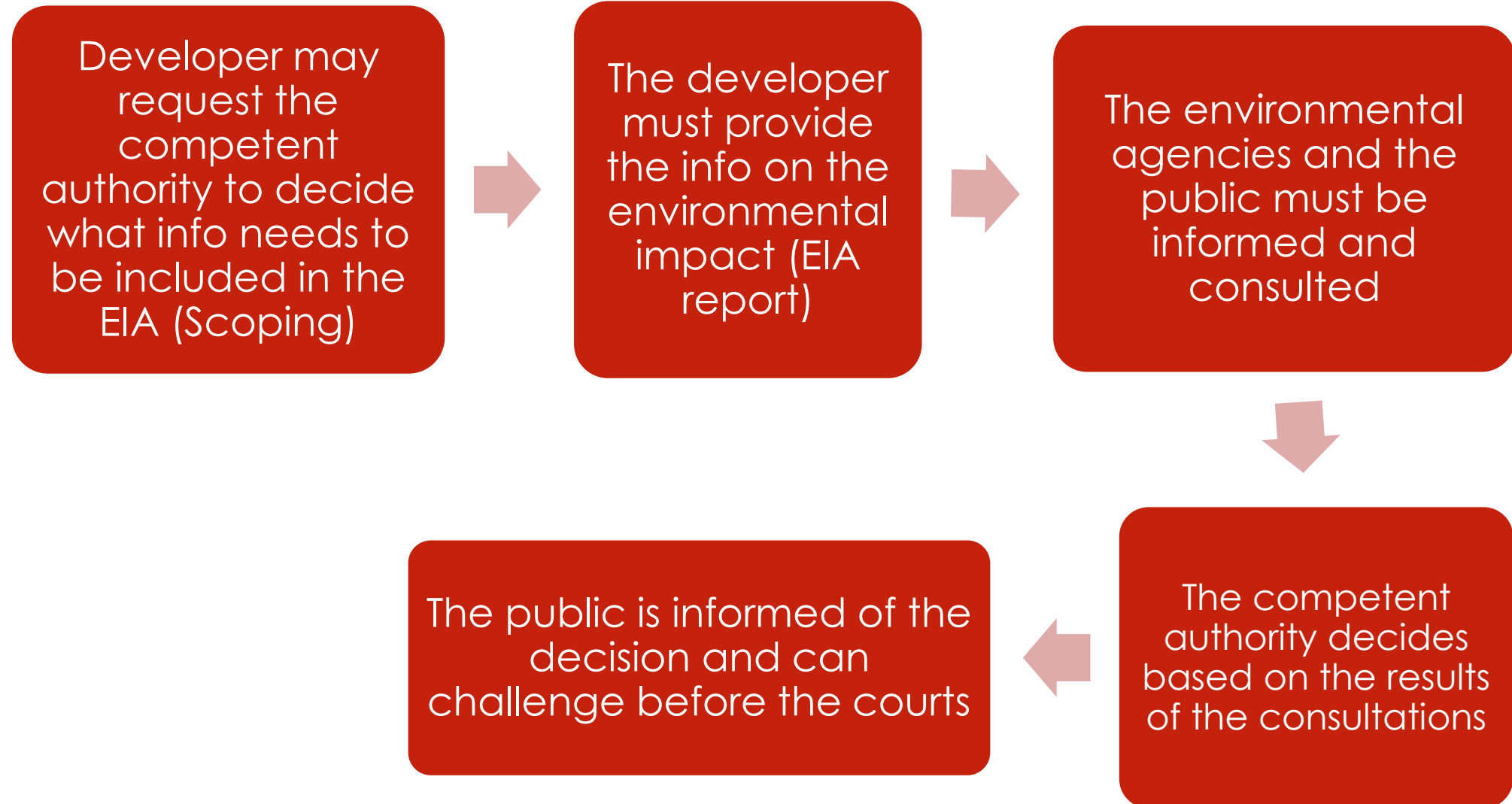
“Development that meets the needs of the present generation without compromising the ability of future generations to meet their needs”
(WCED, 1987)

- Balancing act
- With SD as the goal, EIA is the tool to enable achievement of that goal

What is an EIA?

- Aim – to protect the environment
- Process of EIA is governed by the Town and Country Planning (Environmental Impact Assessment) Regulations 2017
- Most countries – a method of detailed assessment required ahead of a major development
- Paid by developer
- Ideally independent
- A baseline study to determine environmental conditions ahead of any changes
- Ecological survey; Geological study; Economic review; Landscape assessment
- Identify areas or species of importance/conservation value
- Report → EIA or Environmental Management Review or Environmental Impact Statement
- Monitoring essential post construction

SIMPLIFIED PROCESS



ENVIRONMENTAL IMPACT ASSESSMENT

Considers the things we value in our environment

- Physical
- Social
- Cultural
- Biological
- Economic



SCREENING AND SCOPING

- SCREENING – 1ST STAGE
- Initial phase – scale and if a full EIA is required
- SCREENING is a formal requirement under the EIA Regulations (2017).
- EIA is a mandatory requirement for projects listed in Schedule 1 of these Regulations. It is also required for types of projects that meet the criteria for Schedule 2 development and are likely to have significant environmental effects
- Competent authorities decide if EIA is necessary



SCHEDULE 1 DEVELOPMENTS – MANDATORY EIA REQUIRED

- Airport
- Express road
- Nuclear power plant
- Oil refinery
- Waste disposal establishments
- Chemical installations
- Developments handling hazardous waste (asbestos)
- Ports/inland waterways

(for full list see The Town and Country Planning (Environmental Impact Assessment) Regulations 2017)



SCHEDULE 2 DEVELOPMENTS – MAY REQUIRE EIA

- Agriculture and aquaculture
- Extractive purposes
- Energy industry
- Production and processing of metals
- Mineral industry
- Food industry
- Chemical industry
- Textile, leather, wood industries
- Infrastructure projects
- Changes to a development/extension to a Schedule 1



SELECTION CRITERIA FOR A SCHEDULE 2 PROJECT

1. The characteristics of development must be considered with particular regard to :

- (a) the size and design of the whole dvpt;
- (b) cumulation with other existing dvpts and/or approved development;
- (c) the use of natural resources, in particular land, soil, water and biodiversity;
- (d) the production of waste;
- (e) pollution and nuisances;
- (f) the risk of major accidents and/or disasters relevant to the development concerned, including those caused by climate change,
- (g) the risks to human health (for example, due to water contamination or air pollution).

2. The environmental sensitivity of geographical areas with particular regard, to:

- (a) the existing and approved land use;
- (b) the relative abundance, availability, quality and regenerative capacity of natural resources (including soil, land, water and biodiversity) in the area and its underground;
- (c) the absorption capacity of the natural environment, paying particular attention to the following areas
 - (i) wetlands, riparian areas, river mouths;
 - (ii) coastal zones and the marine environment;
 - (iii) mountain and forest areas;
 - (iv) nature reserves and parks;
 - (v) European sites and other areas classified or protected under national legislation;
 - vi) areas in which there has already been a failure to meet the environmental quality standards, laid down in Union legislation and relevant to the project, or in which it is considered that there is such a failure;
 - (vii) densely populated areas;
 - (viii) landscapes and sites of historical, cultural or archaeological significance.

3. Types and characteristics of the potential impact

- (a) the magnitude and spatial extent of the impact (for example geographical area and size of the population likely to be affected);
- (b) the nature of the impact;
- (c) the transboundary nature of the impact;
- (d) the intensity and complexity of the impact;
- (e) the probability of the impact;
- (f) the expected onset, duration, frequency and reversibility of the impact;
- (g) the cumulation of the impact with the impact of other existing and/or approved development;
- (h) the possibility of effectively reducing the impact.

WHAT IS SCOPING?



- The second phase of the EIA process
- Begins once screening is completed
- Identifies key issues and impacts to be considered
- Establishes the content and scope of an EIA report – establishes the Terms of Reference
- The most important step in EIA
- Lays the foundation of an effective process, saves time and money, and reduces conflict

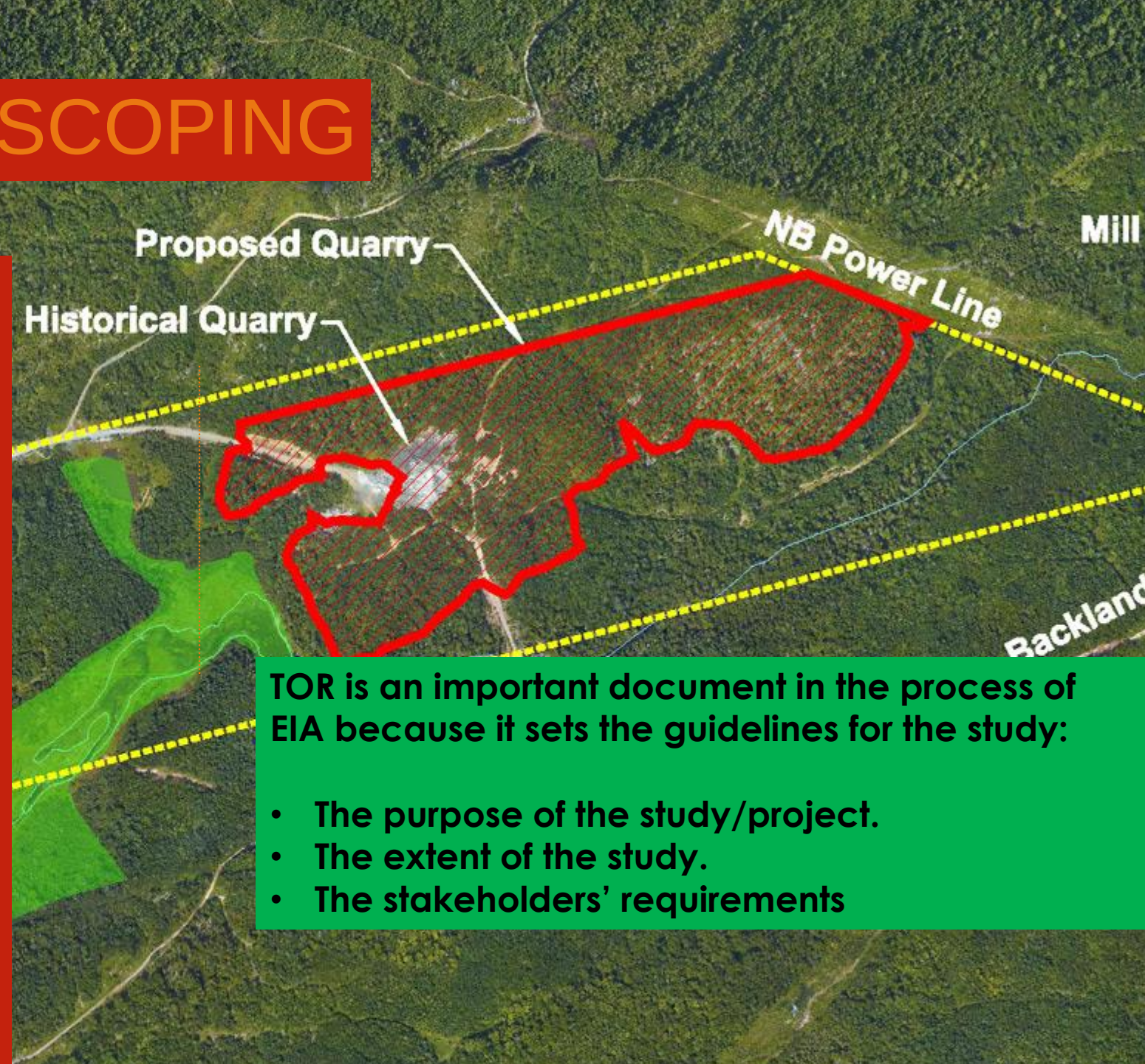
SCOPING – 2ND STAGE

- A 'coming together' of the stakeholders to identify the issues:
 - NGOs
 - NRW
 - Biologists
 - Engineers
 - Utility Companies
 - National Park Authorities
 - Public



ELEMENTS OF SCOPING

- define the parameters of the EIA study – eg seasonality
- consider feasible and practical alternatives
- Identify and inform stakeholders
- identify stakeholder concerns
- agree on the means of public involvement and methods of analysis
- establish 'Terms of Reference' for the EIA



TOR is an important document in the process of EIA because it sets the guidelines for the study:

- The purpose of the study/project.
- The extent of the study.
- The stakeholders' requirements

TOR HIGHLIGHTS THE POINTS THAT NEED TO BE COVERED (THE TOR ITSELF DOES NOT ELABORATE ON THESE POINTS UNLESS REQUIRED):

1. A description of the project, its purposes and extent.
2. All the agencies responsible in the developmental project and the EIA study.
3. A description of the existing environmental conditions in the project site and surrounding areas.
4. The stakeholders that will be benefited and harmed by the fulfillment of the project.
5. The environmental aspects the project is likely to affect.
6. The impacts, both positive and negative, the project will have on the area and the locals.
7. The impact the environment could have on the project.
8. A list/description of the species endemic to the area, which are likely to be effected.
9. How in-depth does the EIA study need to be; whether baseline data is available or whether the study be sourced from secondary data.
10. Possible alternatives for the project in terms of design, site, technology, implementation, etc.
11. If the project site comes under special categories, and the legislation regarding the same.
12. Recommended mitigation strategies.
13. The expertise required for the EIA study.
14. The expected time limit for the entire EIA study.
15. Natural Resource Valuation (NRV), if possible.
16. The budget of the study, also called cost-benefit analysis.

CONSULTATION

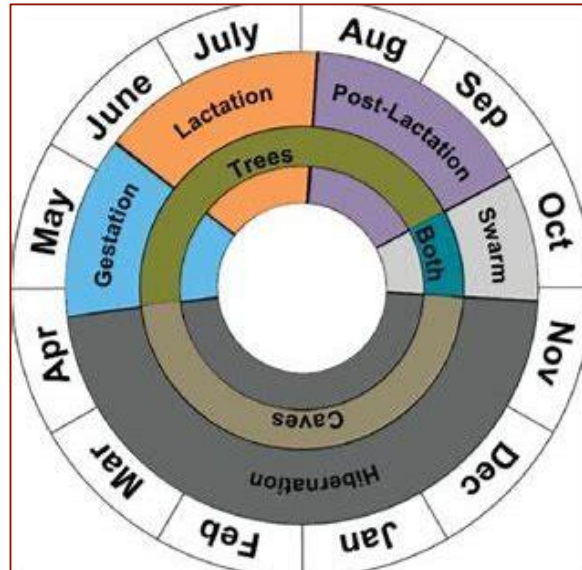
For communities, engagement means a chance to understand what is proposed, to explore how a development can bring value to an area, to identify which options would work best within a local context, to help shape solutions and to have their say on a scheme.

For developers, engaging with the local community can provide vital local knowledge, reduce the risk of challenges and delays, identify how a scheme can bring value to a local area and enhance the reputations of all involved.

For decision makers, good pre-application engagement will have identified those issues of importance to the local community and show how the proposal has responded to these. It will be for the decision maker to balance these alongside planning policy and other considerations, e.g. traffic impact, job creation and make a decision on the application

KEY BENEFITS OF SCOPING

- Early identification of existing data and data gaps
- Early identification of the need for seasonally dependent surveys so that they can be accommodated in the schedule of work



TYPES OF BASELINE DATA



EIA REPORT/ENVIRONMENTAL STATEMENT

- Prepared and included alongside the planning application by the Developer
- Publically available document
- Environmental Statement will typically include:
 - Description of development
 - List of expertise
 - Likely significant environmental impacts
 - Alternatives considered; mitigation options, monitoring schedule
 - A non technical summary



MONITORING

- Monitoring condition is essential pre-, during and post-construction
- Independent regulatory body should visit the site
- May be seasonal restrictions for project to proceed
- Audit is very important – future resource for other EIAs



Project Proposal

EIA Required

No EIA Required

Focus on major issues
Public participation

Baseline Data

Impact Prediction

Mitigation

EIA
Report/EIS

Approval by
independent body

Monitoring during and after

Post development
Audit

PHASES OF THE EIA PROCESS

“Porpoises could derail world's biggest offshore wind farm” (Gosden, 2016)



The importance of collecting data



A failure to assess risk

ENVIRONMENTAL MANAGEMENT TOOLS

1. Jenson (1978) – 5 aspects or dimensions to every problem:

1. Substantive – Harmful? Ceased? Mitigation?
2. Spatial – Local? Widespread?
3. Temporal – Current? Long-term?
4. Quantitative – Single? Cumulative?
5. Qualitative – Cultural/ value assessment

2. Assessment Tools

1. Strategic Environmental Assessment
2. **Environmental Impact assessment**

3. Delivery Tools

1. Activity control (exclusion zones)
2. Best practice (technology)
3. Capacity controls (charge limits)



DIMENSIONAL APPROACH (JENSEN, 1978)

- 5 fundamental questions:
 - What?
 - Where?
 - When?
 - How much?
 - How Serious?
- According to Williams and Davies (1979) – useful to managers at the early stages of strategic management
- Micallef and Williams (2002) see it as a scoping mechanism rather than a problem solving tool.



STRATEGIC MANAGEMENT

- Johnson and Scholes (1988) suggested that strategic management involved:
 - Analysis of the system, its existing management status and whether any action is required
 - Choice of different mitigating options
 - Implementation and monitoring of the chosen option



PROBLEM RECOGNITION

- Ketchum (1972) – problem recognition needs to be addressed from first principles using anthropogenic users of coastal zones as a starting place.
- Six major categories identified:
 1. Industrial and Commercial
 2. Residential and Recreation
 3. Food production
 4. Military and Strategic
 5. Conservation
 6. Waste Disposal





How can a risk assessment on harbour porpoises in Swansea Bay be applied using a Dimensional Approach?

CASE STUDY: HARBOUR PORPOISES IN SWANSEA BAY

- **Aim:**

- Management Framework for the Harbour Porpoise

- **Objectives:**

- Data validation
- Collect habitat dynamics data
- Migration
- Assess legislative effectiveness
- Assess response to vessels

RATIONALE - BASELINE DATA COLLECTION

- IWC (1991) – concern for declining populations of harbour porpoises *Phocoena phocoena*
- Declining numbers across its range (Culik, 2003; Reid et al., 2003)
- Baseline data





RISK ASSESSMENT

Risk assessment is the determination of quantitative or qualitative estimate of risk related to a well-defined situation and a recognized threat (also called hazard). Quantitative risk assessment requires calculations of two components of risk (R): the magnitude of the potential loss (L), and the probability (p) that the loss will occur.

How a dimensional approach was used in the context of porpoise populations

- Dimensional analysis:
 - Assessing habitat dynamics and mortality rates
 - **Substantive** – awareness raising of potential threats and identification of activities which may potentially threaten the system's stability. Also identifies mitigation potential
 - **Spatial** – identifies external developments that may influence the status quo
 - **Temporal** – time factors such seasonality, stochastic changes, future predictions
 - **Quantitative** – generation of long-term datasets
 - **Qualitative** – Subjective! Socio-economic and environmental factors together with the mechanisms influencing policy need to be identified



HARBOUR PORPOISE *Phocoena phocoena*

- Apex predators
- Genetically distinct groups
- 1.5-2.0 m
- 76-89% subsurface (Reed *et al.*, 2000)
- 70% dives <20m
- Air breathers
- Echolocation



THREATS

- Bycatch
- Aggregate Dredging
- Noise
- Pollution
- Climate Change
- Predation



SWANSEA AND GOWER

- High energy environment
- Large tidal range (16.4m)
- Tourism – 4.6 million pa (2016)
- Construction & industry
- Fishing – 90% <10m
- Aggregate Dredging – 150,000 tonnes next 7 yrs
- Carmarthen Bay and Estuaries European Marine Site



METHODOLOGY

- Vessel transects
- Shore:
 - Pilot study
 - Behavioural surveys
 - Boat response surveys
- 25:75
- Stranding analysis
- Environmental Risk Assessment



PHYSICAL DATA COLLECTION

- **SHORE:**

- **260.5 hours**
- **73 watches**
- **118 discrete encounters**



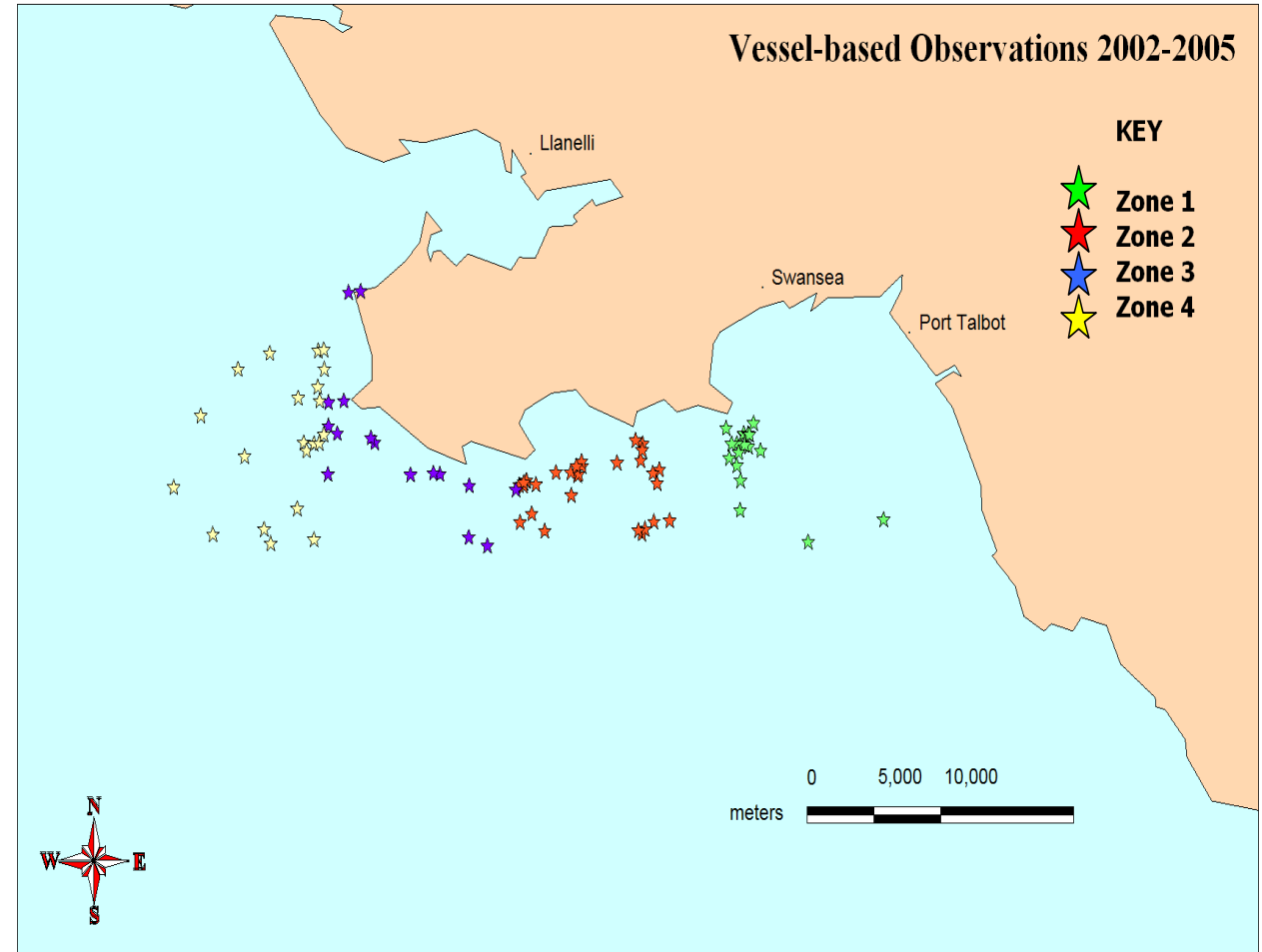
- **VESSEL:**

- **85.75 hours**
- **12 boat trips**
- **78 discrete encounters**

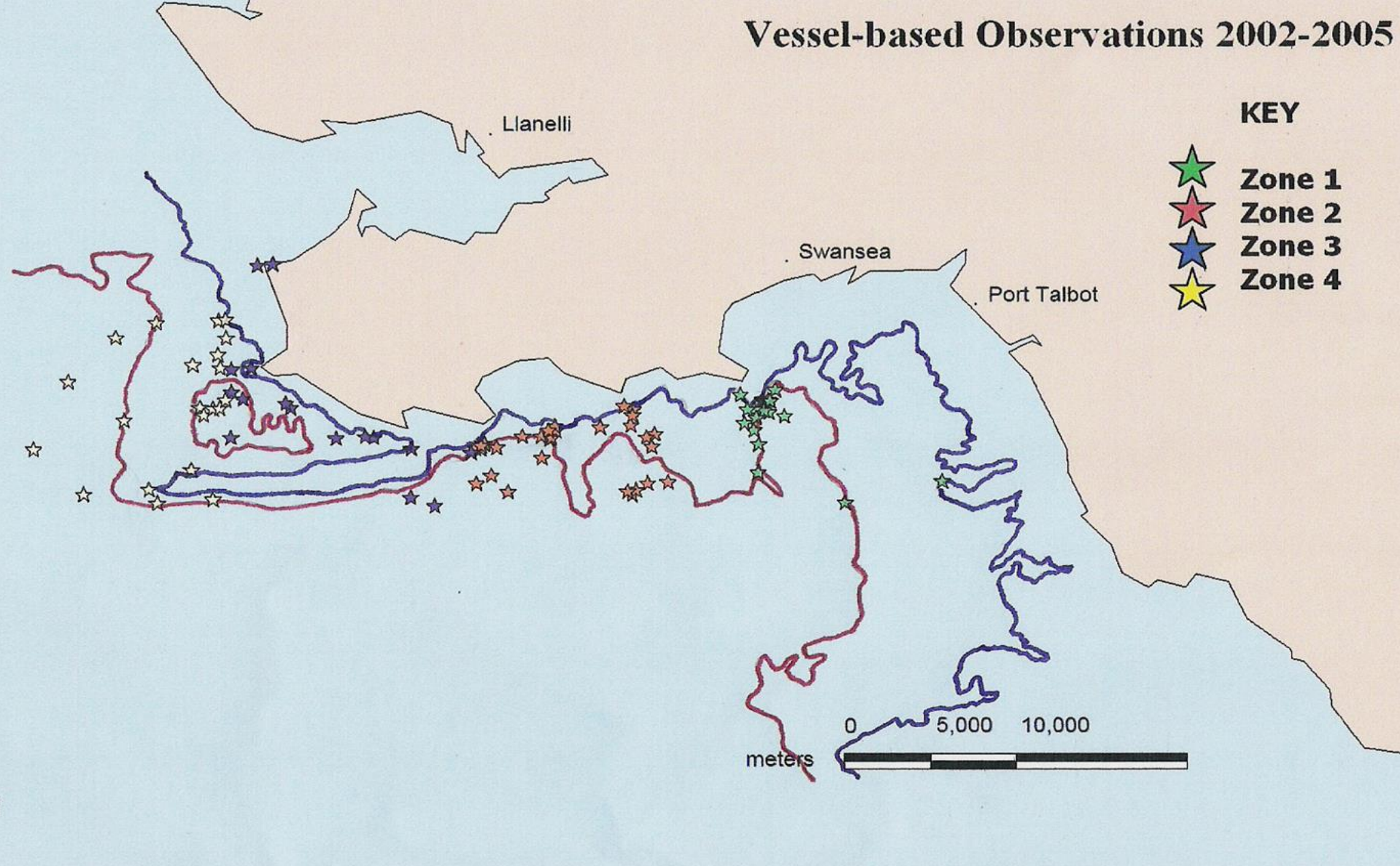


KEY FINDINGS

- Resident inshore population
- Affinity with 20m depth
- Site variation in usage
- Negative response to boats



Vessel-based Observations 2002-2005



SEMINAR SESSION

Read the article Jenkins *et al.*, (2009) and evaluate how a dimensional approach was used to establish baseline data worthy of inclusion in a local Environmental Impact Assessment

For discussion in class next week

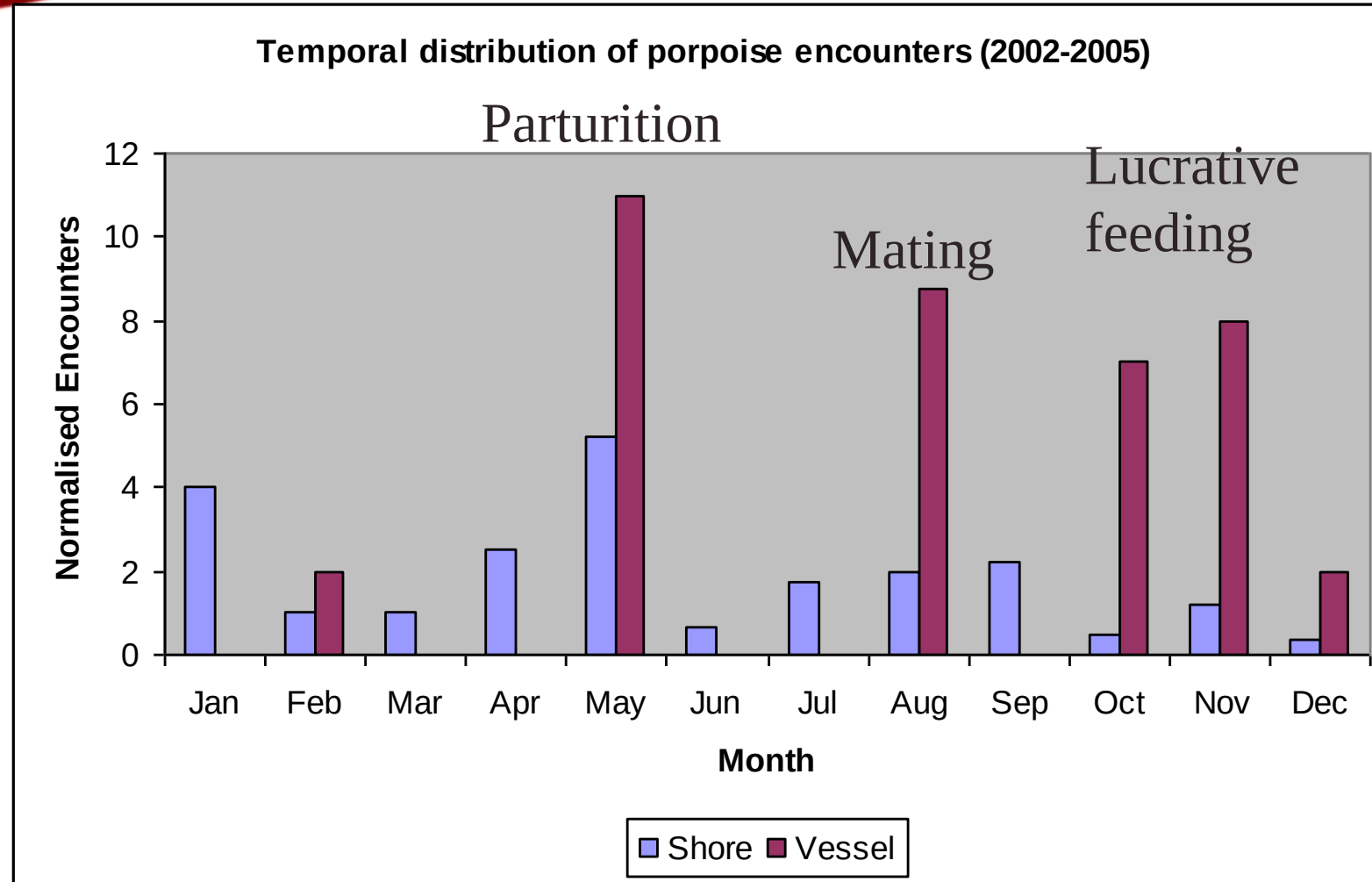


ENVIRONMENTAL MANAGEMENT TOOLS

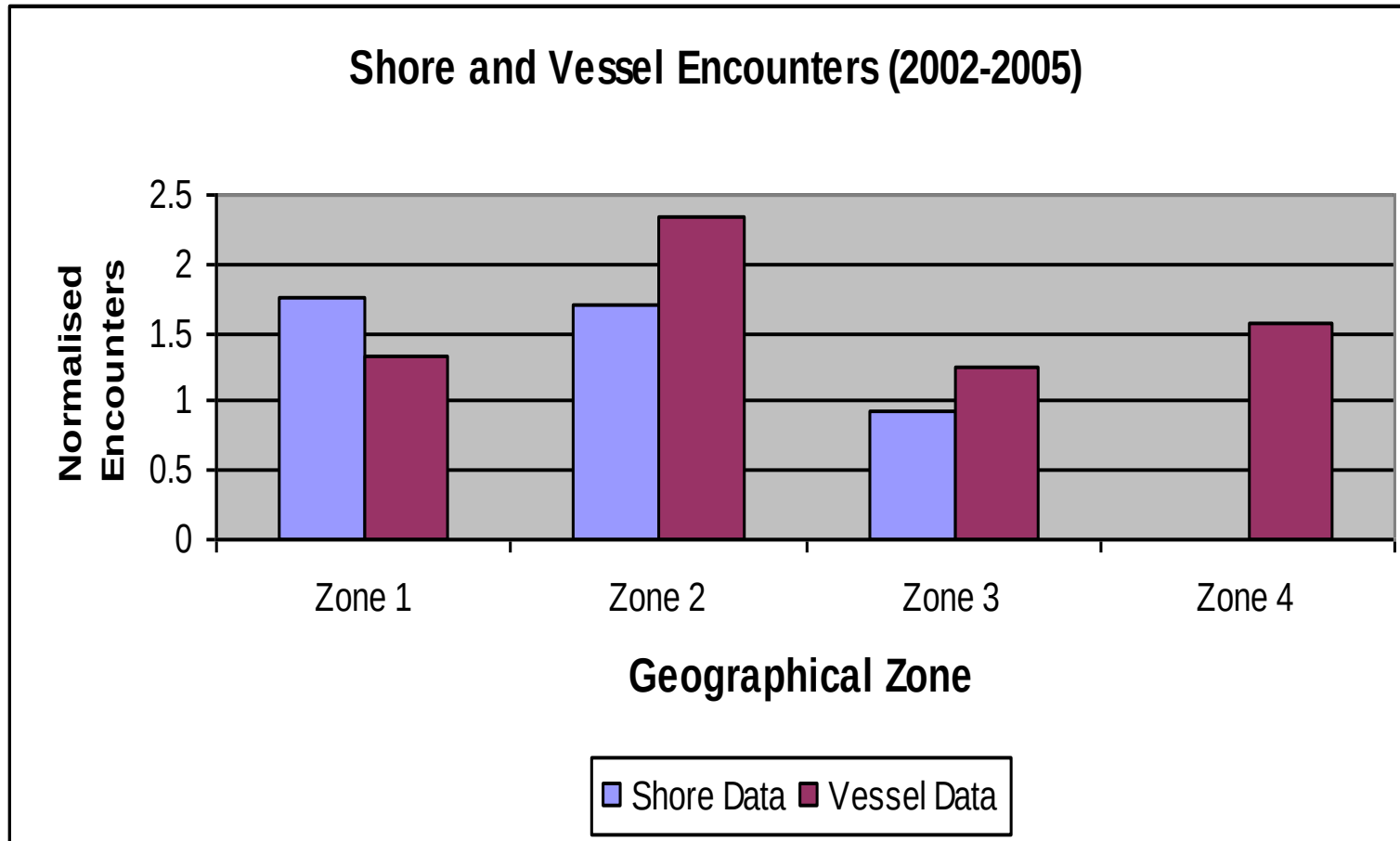
1. Jenson (1978) – 5 aspects or dimensions to every problem:
 1. Substantive
 2. Spatial
 3. Temporal
 4. Quantitative
 5. Qualitative



TEMPORAL: GEOGRAPHICAL DISTRIBUTION



SPATIAL DISTRIBUTION



Definitions of observed activities (Ribeiro *et al.*, 2005; Bristow and Rees, 2001; Lusseau and Higham, 2004)

Interpretation	Observed activity
Feeding	Cooperative hunting; chasing fish; circling; parallel swim formation; fast, directional and synchronised movements; associated seabirds
Foraging	Repeated unsynchronised dives in different directions, in a determined location
Socialising	Frequent physical contact; vigorous movements and aerial behaviour such as breaching; playing – rolling at the surface, particularly young animals
Aggression	Lashing out with tail flukes perhaps to protect a calf, calves being tossed into the air by a conspecific
Resting	Very slow movements or stationary at the surface
Travelling	Directional and persistent movements at a constant speed.

Table 5.35: Limekiln Point (Zone 3): Behavioural observations 2002-2004

	Aug	Nov	o/a	Decimal fracti
	2002	2004		
	16 th Aug (LP)	5 th Nov (LP)		
Encounter duration (min)	94	16	110	
DESCRIPTION OF MOTION				
Slow surfacing		16	16	0.145
Rapid porpoising	94		94	0.854
STATES				
Travelling	4	16	20	0.182
Circling	68		68	0.618
EVENTS				
Holding station				
Breaching	6		6	0.054
Lunging	8		8	0.073
Fluking	8		8	0.073
OTHER FEATURES				
Associated seabirds	82		82	0.745

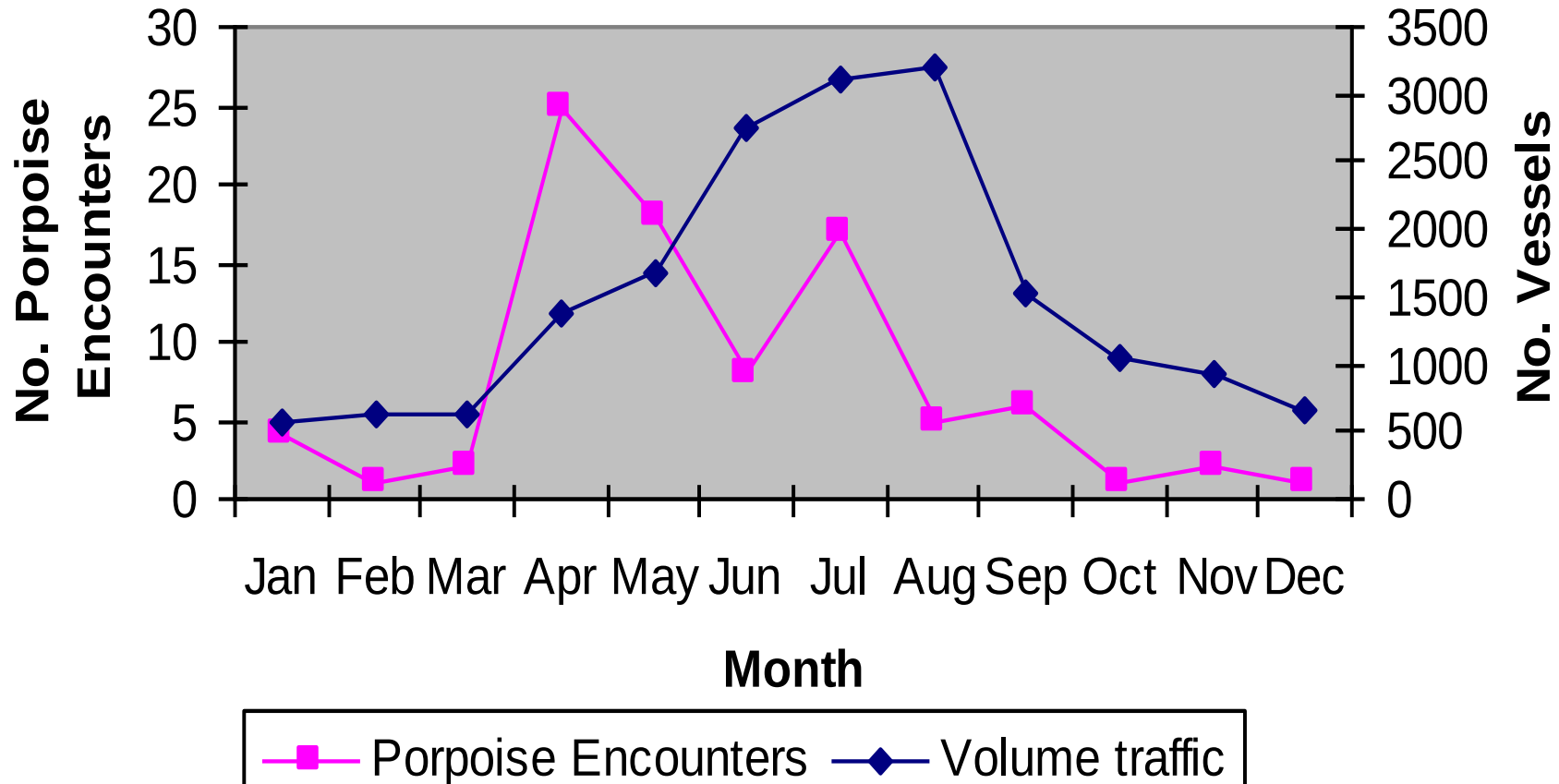
BEHAVIOURAL ANALYSIS

- 47 completed ethograms – 39 analyses as >15min duration
- **Event**: activity of short duration
- **State**: prolonged activities

- Mumbles – events indicative of foraging and feeding
- Oxwich – events indicative of resting
- Limekiln Point – events indicative of socialising and feeding
- Circling increased throughout the year in both Mumbles and Oxwich

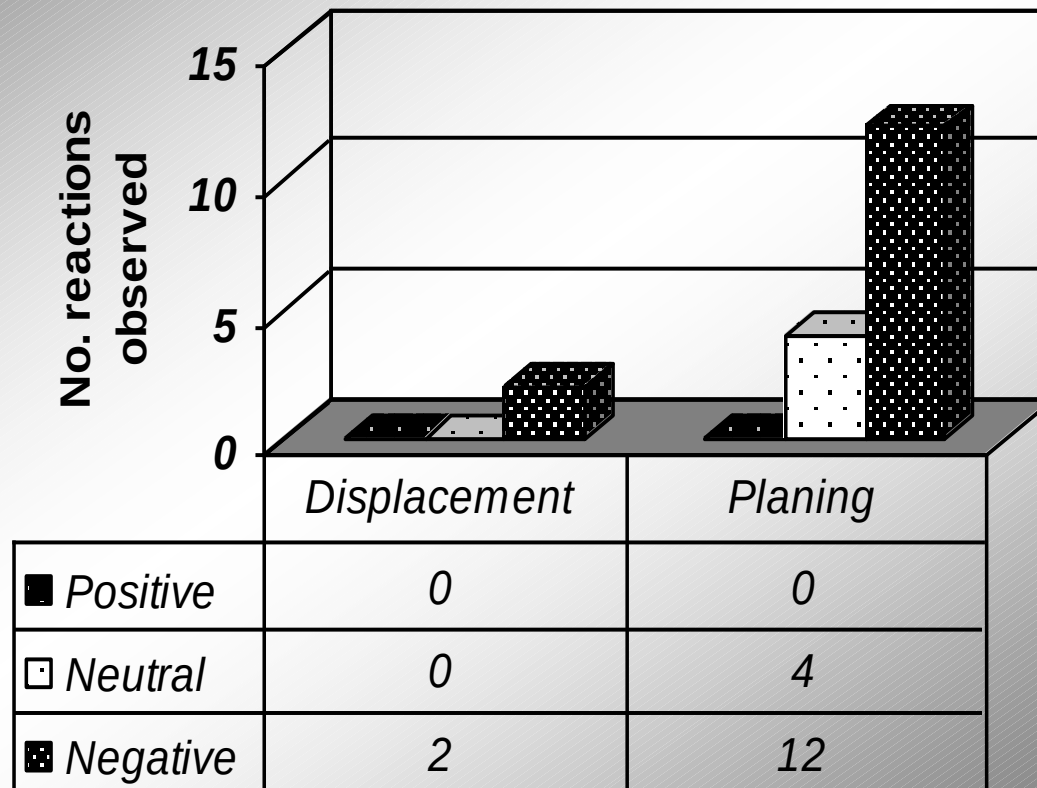
EFFECT OF BOAT TRAFFIC ON ENCOUNTERS

Variation in Porpoise Encounters (Shore and Vessel) with Boat traffic: 2005



REACTION TO MOVING VESSELS

Reaction of porpoises to moving vessels of various categories

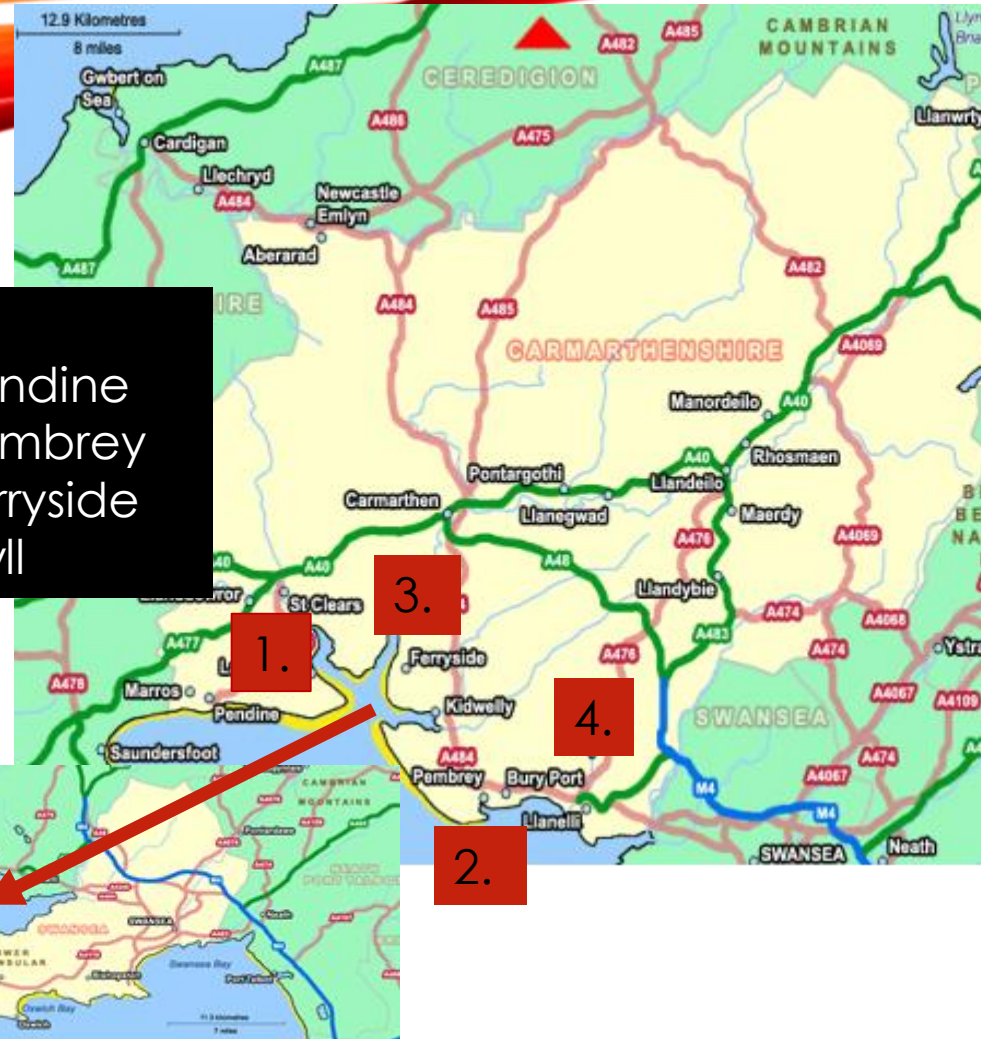


Zone 1: Mumbles	Zone 2: Oxwich	Zone 3: Port Eynon & Limekiln Point	Zone 4: Carmarthen Bay
Sediment: muddy sand	Sediment: sand → gravel offshore	Sediment: sand → gravel offshore	Sediment: sandy
Mean Depth at peak encounters: 22.65m	Mean Depth at peak encounters: 28.45m	Mean Depth at peak encounters: 19.97m	Mean Depth at peak encounters: 25.70m
Boat activity: High	Boat activity: High	Boat activity: High	Boat activity: Low
Peak activity: Jan, May, Aug	Peak activity: Aug, Nov	Peak activity: May, Aug, Nov	Peak activity: May, Aug, Oct
Predominant Behaviour: Foraging	Predominant Behaviour: Socialising, resting and rearing	Predominant Behaviour: Transient & opportunistic feeding	Predominant Behaviour: Breeding & nursery area
Notes: Increase in circling behaviour as year progresses. Summer encounters negatively correlated with survey effort. Importance of 20m contour	Notes: Increase in circling as year progresses. Sibling agonistic behaviour seen as well as parental teaching.	Notes: Dominant flood tide to north of Helwick, ebb tide dominant to south – porpoise encounters positively correlated with dominant tidal direction. Importance of 20m contour	Notes: Incidents of stranded individuals more prominent than other zones.

Year	Total HP strandings reported in Wales	% Total Animals stranded	No. in Surveys area	Months	Cause	Gender		Age			
						M	F	N	C	J	A
2004	126	49% (255 animals stranded) 83% of all stranded cetacea	16 (13%)	Jan, Mar, Apr, Jun, Jul, Aug, Sep, Oct, Dec	Bycatch, physical trauma, starvation parasites	2	5	1	2	3	1
2005	109	58% (189 animals stranded) 87% of all stranded cetacea	8 (7%)	May, Jun, Jul, Oct, Dec	Physical trauma, bycatch, starvation, live stranding	4	1	1	1		1

STRANDING DATA (Penrose and Pierpoint, 1999)

Description	Body condition of carcass
Live	NA
Fresh	As if just died, no bloating, meat is considered by most to be edible
Slight decomposition	Slight bloating, blood imbibition visible
Moderate decomposition	Bloating, skin peeling, organs intact
Advanced decomposition	Extreme bloating, skin peeling, organs beyond recognition, bones exposed through decomposition
Indeterminate	Mummified carcass or skeletal remains, no organs present



Principal Strandings in Survey Area

RISK ASSESSMENT

- Johnson and Scholes (1988) – strategic management:
 - Problem recognition – coastal user identification
 - Ketchum (1972):
 - Commercial and Industrial
 - Residency and Recreation
 - Agriculture, Aquaculture and Fishing
 - Military and Strategic
 - Conservation
 - Waste Disposal
- Harbour porpoise habitat usage:
 - Feeding
 - Breeding
 - Resting
 - Socialising
 - Migrating corridors between critical habitats

COASTAL USER CONFLICT

HP Uses ► Coastal uses ▼	Feeding	Breeding/Rearing	Resting	Socialising	Corridors
Commercial and Industrial	■	■	■	■	■
Residency and Recreation	■	■	■	■	■
Agriculture, Aquaculture and Fishing	■	■	■	■	■
Military and Strategic		■	■	■	
Conservation	■	■	■	■	■
Waste Disposal	■	■			

Key: Impacts upon Harbour Porpoises from Coastal Users

Small potential benefit

Small negative impact

Large potential benefit

Large negative impact

POTENTIAL IMPACT FROM COASTAL USERS

Harbour Porpoise Uses ►				Feeding	Breeding/ Rearing	Resting	Socialising	Corridors
▼ Coastal Uses								
Commercial and Industrial	Commercial	Tourism Developments		▪				
		Marina Services		▪				
		Transport	Ferries					▪
			Shipping					▪
			Customs etc	▪	▪	▪	▪	▪
			Educational studies	□	□	▪ □	□	□
	Industrial	Maintenance dredging		▪				▪
		Aggregate Dredging		■	▪	▪	▪	▪
		Cable laying						
		Ports						
		Steelworks						
		Energy	Wind	▪ □	▪ □	▪	▪	▪
			Tidal Lagoon	□				

▼ Coastal Use _s			Evidence of Interaction Indicators
Commercial and Industrial	Commercial	Tourism Developments	It is felt unlikely that additional tourism development and Marina Services will have a major impact. Existing infrastructure at Swansea Maritime Quarter and SA1 development is in place and Gower's many designations control coastal development. However pile driving and construction works produces variable levels of noise and sediment disruption. Thomsen <i>et al.</i> (2006) suggested that porpoise audibility of pile driving would extend beyond 80km from source. Evans (2000a) acknowledged that blasting and dredging could affect porpoise behaviour, although effects are likely to be short-term. Local Authority plans to redesign parts of Swansea Bay Seafront and Mumbles Promenade (Green, 2007; White Green Young Consulting Ltd, 2007) are currently being explored, and some proposals could potentially affect feeding grounds around Mumbles. As with SA1, construction and demolition phases involving Mumbles Pier could produce sufficient noise and sediment disruption to affect porpoises. Proximity to critical feeding habitats of Mixon Bank and White Oyster Ledge is of particular concern
		Marina Services	
	Transport	Ferries	A Swansea - Cork ferry operated from Swansea Marina once a day and is constrained by draught to main, deep channel routes. Most porpoise habitats will be unaffected except for porpoise corridors. Although no evidence of ship collision exists in this area, a small risk exists for young and injured porpoises transiting between critical habitats, as NOAA (2006) reported a case of a harbour porpoise killed as a result of a ship collision. Larger vessels emit low frequency noise and porpoises are less susceptible to disturbance from these, communicating through higher frequency channels. Detection rates are also higher and so aversive action by porpoises will typically be initiated in good time. Evans (2000a) noted that although porpoises can occasionally react negatively to ferries, they co-exist and only should traffic levels increase substantially would long-term behaviour be disrupted
		Shipping	
		Customs etc	Smaller Customs and RNLI craft etc are faster and typically displacement vessels, which generate high levels of noise They can enter shallow coastal areas and are capable of swift changes in direction. Therefore there is a potential impact to all porpoise habitats. Observations revealed no obvious behavioural changes provided vessels maintained a steady directional course and speed (Table 5.41). However as will be considered under 'Residency and Recreation', sudden directional changes can provoke many negative behavioural responses

ENVIRONMENTAL RISK ASSESSMENT

- ERA – allows an assessment of environmental impacts and judgements and allows consideration of cumulative effects (ABP, 1997)
- Semi-qualitative analysis
- Provides statistical weighting of probabilities as well as a summary matrix of magnitude and probability
- Where impacts are difficult to predict, assumptions are made but it would indicate further work needed



- Precautionary principle is evoked

ENVIRONMENTAL RISK ASSESSMENT

- Impacts, consequences and magnitudes were detailed for each coastal user category
- 4 key impacts were identified:
 1. Effects on water quality
 2. Effects on benthic habitat
 3. Accidental mortality
 4. Habitat exclusion
- For each impacts highlighted, positive and negative consequences were acknowledged
- Impacts could be short or long-term in effect
- If effects were considered temporary then the consequence was adjusted accordingly



ERA - IMPACTS

- Impact 1: **Effects on Water Quality**

- Increased sedimentation
- Mobilisation of toxins
- Elevated nitrate levels

- Impact 2: **Benthic Habitat**

- Removal of benthos
- Habitat degradation
- Alteration to species mix

- Impact 3: **Accidental Mortality**

- Incidental bycatch
- Collision with vessels

- Impact 4: **Habitat Exclusion**

- Industrial noise disturbance
- Electromagnetic disruption
- Vessel noise disturbance
- Agonistic interactions

Box 2: Estimation of Magnitude of Consequences (ABP, 1997: 8)

- Severe:** a significant change in numbers of one or more species, including beneficial and endangered species, over the long-term. This might be a reduction or complete eradication of a species, which for some organisms could lead to a negative effect on the functioning of the particular ecosystem and/or other connected ecosystem.
- High:** a significant change in population densities, but not a change which resulted in total eradication of a species or had any effect on endangered or beneficial species.
- Mild:** some change in population densities but with recovery usually occurring in the short-term and without total eradication of other organisms and no negative effects on ecosystem function.
- Negligible:** no significant changes in any of the populations in the environment or in any ecosystem functions

ESTIMATION OF MAGNITUDE

Box 3: Example of ERA report for impacts considered by Habitat Exclusion

Impact No. 4 Impact: Habitat Exclusion

Impact Explanation: Habitat exclusion can occur as a result of noise disturbance, electromagnetic disturbance or territorial interactions with conspecifics

Consequence No. 3: Vessel disturbance (Noise)

Magnitude: High

All vessels have the potential to disturb but some are more problematic than others. Small recreational craft, emitting high frequency noises have greatest potential to disrupt and exclude from critical habitats. In key resting and feeding habitats, high-speed planing vessels can potentially change population densities (area displacement or long-term health impacts if access to prey is continuously disrupted).

Probability: High

Marine tourists and recreational boat users are increasing, which together with the local fishing fleet are frequently come into contact with feeding, resting and socialising porpoises. Swansea Bay Strategy Consulting (White Young Green Ltd, 2007) is proposing a new marine park and additional trips to and from Mumbles, promoting further boat-based recreation

Relevance: Yes Risk: High

Indirect effect on other coastal users and fish spawning grounds

Estimation of consequence probability for each magnitude:

Severe	Moderate	Mild	Negligible
0.37	0.37	0.25	0.01

Example of ERA report for impacts considered for habitat exclusion



Box 4: Summary Matrix

Count matrix for all consequences

Based on consequence magnitude and probability ratings.

Consequence Probability	Severe	High	Mild	Negligible
High	1	3	0	0
Medium	0	2	1	0
Low	0	1	1	2
Negligible	0	0	0	0

Count matrix for all relevant consequences

Based on consequence magnitude and probability ratings.

Consequence Probability	Severe	High	Mild	Negligible
High	1	3	0	0
Medium	0	2	1	0
Low	0	1	1	0
Negligible	0	0	0	0

Probability of a relevant consequence magnitude occurring based on estimated probability values:

Estimation of consequence probability for each magnitude:

Severe 0.00 High 0.89 Mild 0.11 Negligible 0.00

SUMMARY MATRIX





ERA - ASSUMPTION

- Developed originally to assess proposed projects and their impacts on surrounding areas
- Assumes baseline knowledge so that an assessment pre and post development can be made
- IN this case – little was known beforehand
- Proposed shoreline developments and offshore energy projects – analysis is useful in assisting future management decisions
- Where detailed assessments of boat traffic & industrial outputs available – data used
- Where information is scarce – comparable research from elsewhere

QUALITATIVE DIMENSION – SWOT ANALYSIS

- Using ERA results and maintaining Ketchum's six categories – SWOT analysis
- Identified areas requiring attention and potential opportunities and mitigation
- Stage 2 of Johnson and Scholes (1988) management strategy – having analysed the situation, a choice of different options can be examined



Coastal Uses	Strengths	Weaknesses	Opportunities	Threats
Commercial and Industrial	TCPA, Unitary Development Plan. Natural resources.	No implementation of legislation regarding dumping at sea (litter, etc)	Controlled Development	Noise and vibrations. Impacts of renewable energy schemes (tidal lagoon, tidal barrage). Increased tourism infrastructure. Oil pollution incidents. TBT contamination – antifouling. Removal of benthos at Helwick
Residency and Recreation	TCPA, Unitary Development Plan	No management of recreational boating activities	Improved legislation and control of activities eg zoning and speed restrictions	Unmanaged recreational activity in some areas Political Change
Agriculture, Aquaculture and Fishing	Primary industry and economic driver	Incidental by-catch	Implementation of new technologies eg acoustic devices such as pingers	Changes in benthos (dredging) Run-off/pollution events from agriculture
Military and Strategic	Exclusion zone Employment benefits			Noise impacts on breeding areas
Conservation	Environmental designations, Habitats Directive, Active Stakeholder involvement. Blue Flag beaches and vessels. Regular water quality analysis. Local HE provision	Too many interested parties engaged in management (little integration)	Promotion of ecotourism. Education.	Uncontrolled ecotourism Climate change
Waste Disposal	Urban Waste Water Directive, Bathing Water Directive, Good sewage treatment, MARPOL.	Potential impacts on benthos due to discharges. Sewage related debris not removed during treatment process	Better enforcement of dumping at sea conventions	Pollution from Sewage Treatment Works (industrial accidents etc)

Coastal users SWOT analysis

Zones	Categories	Specific Issues
Mumbles (Zone 1): Feeding & Foraging habitat	Coastal Processes	Sediment movement within Swansea Bay both natural and linked to possible impacts from channel and docklands dredging
	Natural Environment	- Water quality - discharge of sewage into Swansea Bay. Large treatment facility in East of Bay - Statutory designations: Large SSSI across much of Swansea Bay
	Human & Built Environment	- Popular sea and shore angling industry. - Recreational sport: sailing, sea/shore angling, sub aqua, water and jet skiing, wildlife tourism (boat-based) - Conflicts between recreational water sports – launch facility at Knab Rock can become congested. RNLI launch also at Mumbles Head. - Preservation of Mumbles Pier underway (historical importance). Paddle steamer also uses pier during summer months. - Maintenance dredging at Swansea Docks.
	Coastal Defences	Some regular maintenance of coastal defences.
	Development	- Recent proposals to develop Oystermouth area (Mumbles) and other foreshore areas east of Mumbles for tourist purposes. - Renewable energy projects – Tidal lagoon on outskirts of Swansea Marina

Survey area relevant management issues (adapted from SBSMP, 1999 and CBCEG, 2000)

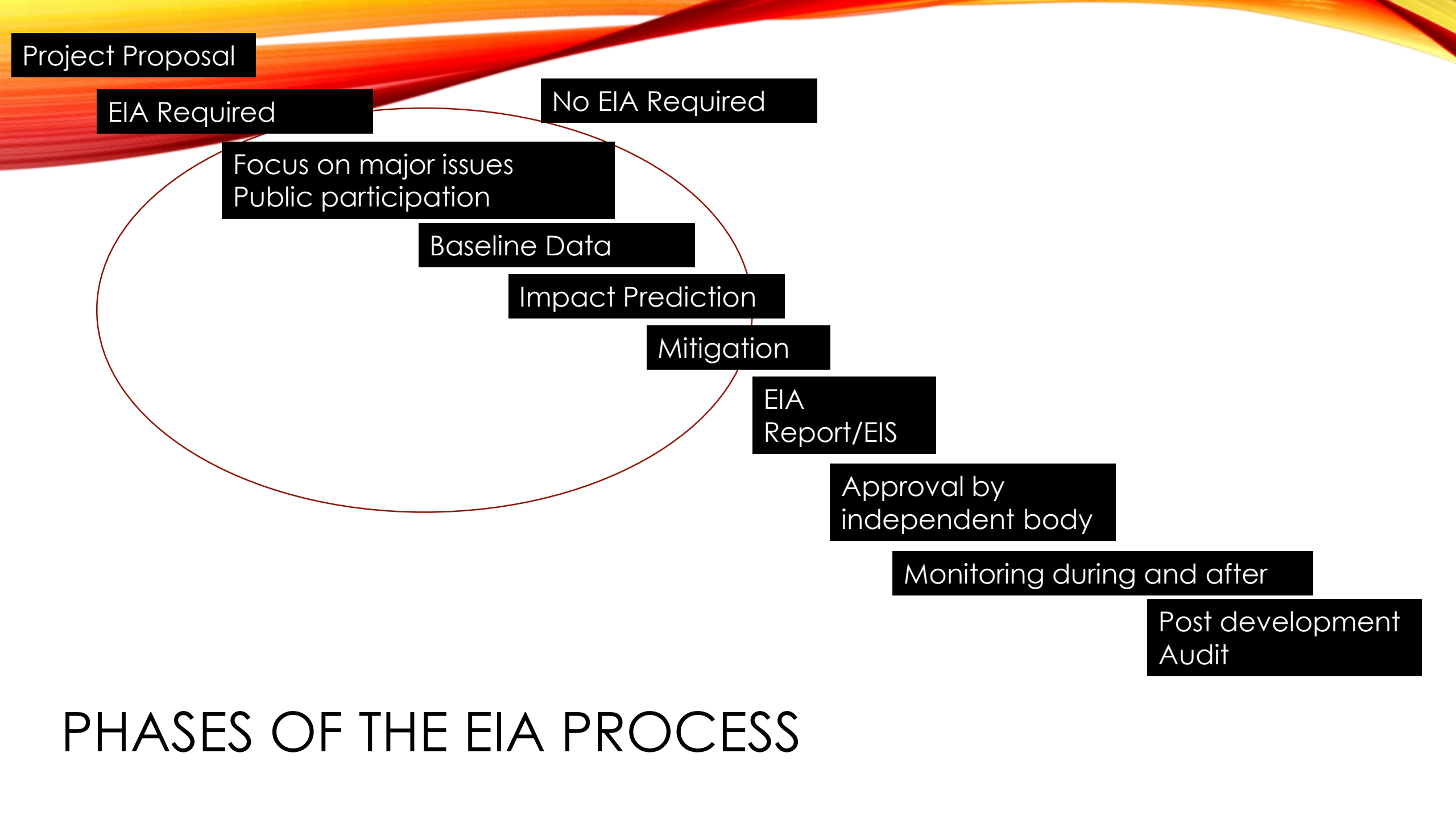
MITIGATING OPTIONS FOR MGT FRAMEWORK

- Industry:
 - Avoid piling during calving season
 - Soft starts
 - Air bubble curtains
- Fisheries:
 - Good working relations
 - Transparency → Bycatch → alerting devices
- Tourism:
 - Voluntary Codes of Conduct
 - Speed restrictions → 20m contour
 - Restricted access
- Marine Spatial Planning



SUMMARY OF PROCESS

- Stage 1 Johnson and Scholes (1988) – dimensional analysis
 - Assessment of porpoise habitats and population dynamics – is there a population to manage and what are the potential conflicts (**Substantive dimension**)
 - Risk Assessment package (**Temporal** and **quantitative dimension**) – a semi quantitative analysis of these interactions (assessment tool)
 - SWOT analysis (**qualitative dimension**)
 - Shoreline management plans consulted and issues defined according to the 4 porpoise zones surveyed (**spatial dimension**)
- Stage 2 Johnson and Scholes (1988) – mitigation options (delivery tool)



Project Proposal

EIA Required

No EIA Required

Focus on major issues
Public participation

Baseline Data

Impact Prediction

Mitigation

EIA
Report/EIS

Approval by
independent body

Monitoring during and after

Post development
Audit

PHASES OF THE EIA PROCESS

KEY REFERENCES

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- Jensen, J.V. (1978). A heuristic for the analysis of the nature and extent of a problem. *Journal of Creative Behaviour*. 12:168-180
- Johnson, G. and Scholes, K. (1988). Exploring corporate strategy. Prentice-Hall, Hemel Hempstead. 218pp.
- Ketchum, B.H. (1972). The Water's Edge: Critical problems of the coastal zone. The MIT Press, Cambridge. 393pp.
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NEXT WEEK

- How this porpoise work fed into the ES for the tidal lagoon and how from a Strategic Environmental Assessment perspective, it also contributed to a national debate

