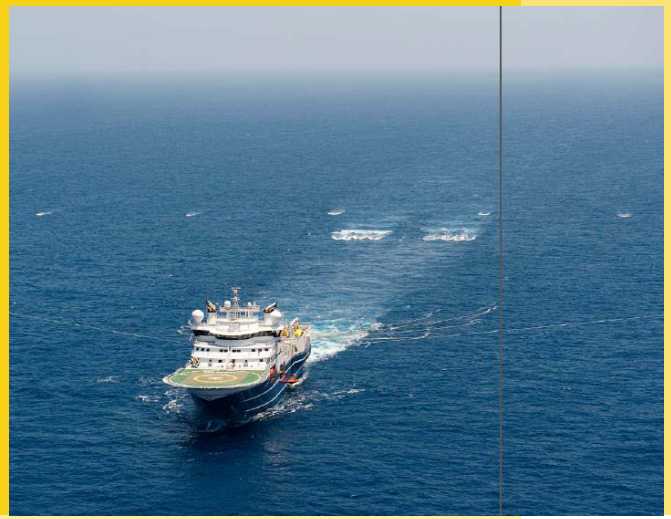
HOW OIL AND GAS COMPANIES WILL APPROACH THE ESIA PROCESS

Mitigating potential impacts

Assessment approach
Aspects and Potential Impacts
Mitigation / controls



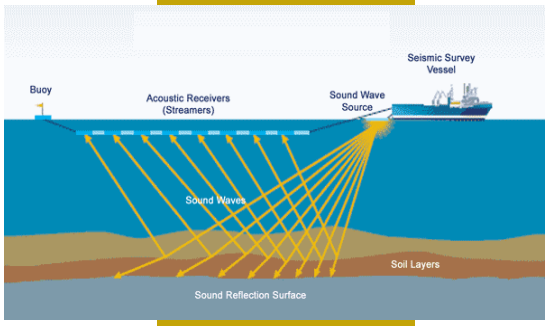
Agnes McLaverty
Safety, Environment & Social Performance Manager
Myanmar Offshore Venture

Shell Upstream International
Asia Region

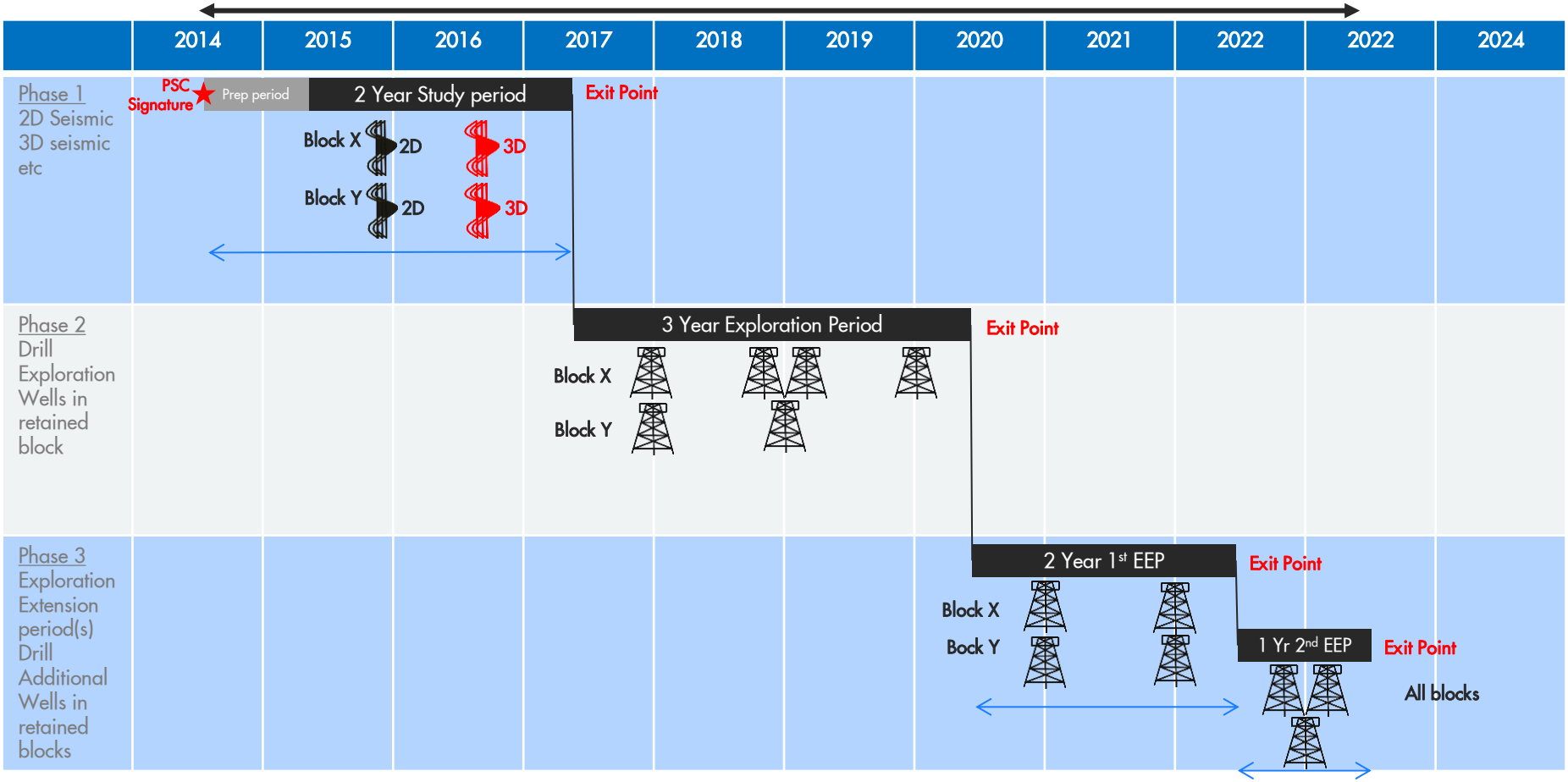
WHAT DOES IMPACT ASSESSMENT MEAN FOR SHELL?

- Management tool for decision-making & planning
- Answers three questions:

1. What could happen to the environment, society or people's health as a consequence of an activity, e.g. seismic or drilling?
2. Is it important, i.e. is the impact material or significant?
3. If yes, what can be done about it? (e.g. changes in project design or activity timing)



TYPICAL MM EXPLORATION COMMITMENTS/PHASES – DEEP WATER PSCS

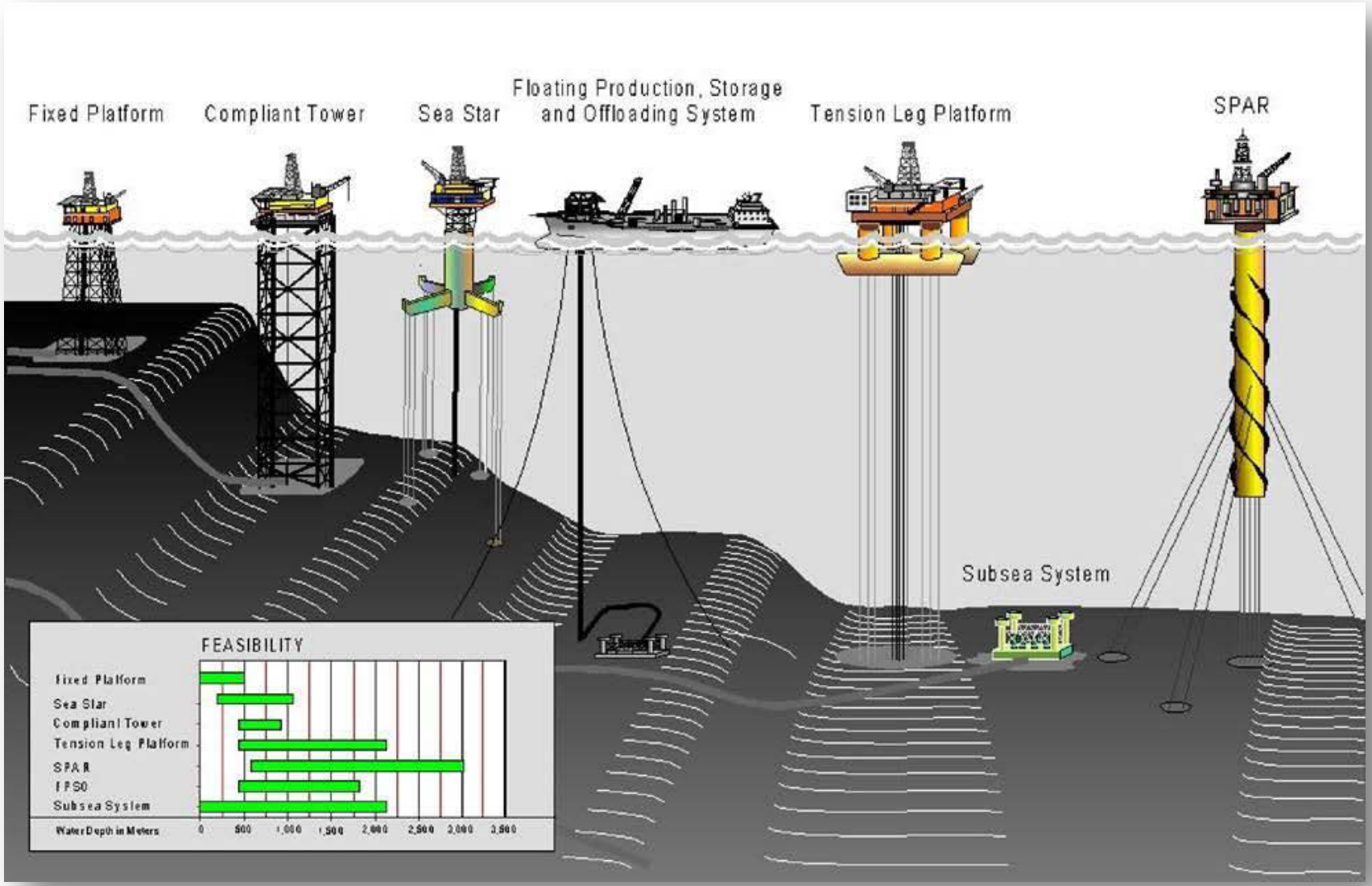


STAGED APPROACH TO EIA/SIA

- Impacts are identified and managed at each operational phase – iterative

- Conduct a systematic approach (fit-for-purpose); assessing and managing the potential environmental and social impacts of the activities.
- Ensure that negative impacts are minimised and benefits are enhanced throughout the project phases.

OFFSHORE O&G DEVELOPMENT OPTIONS



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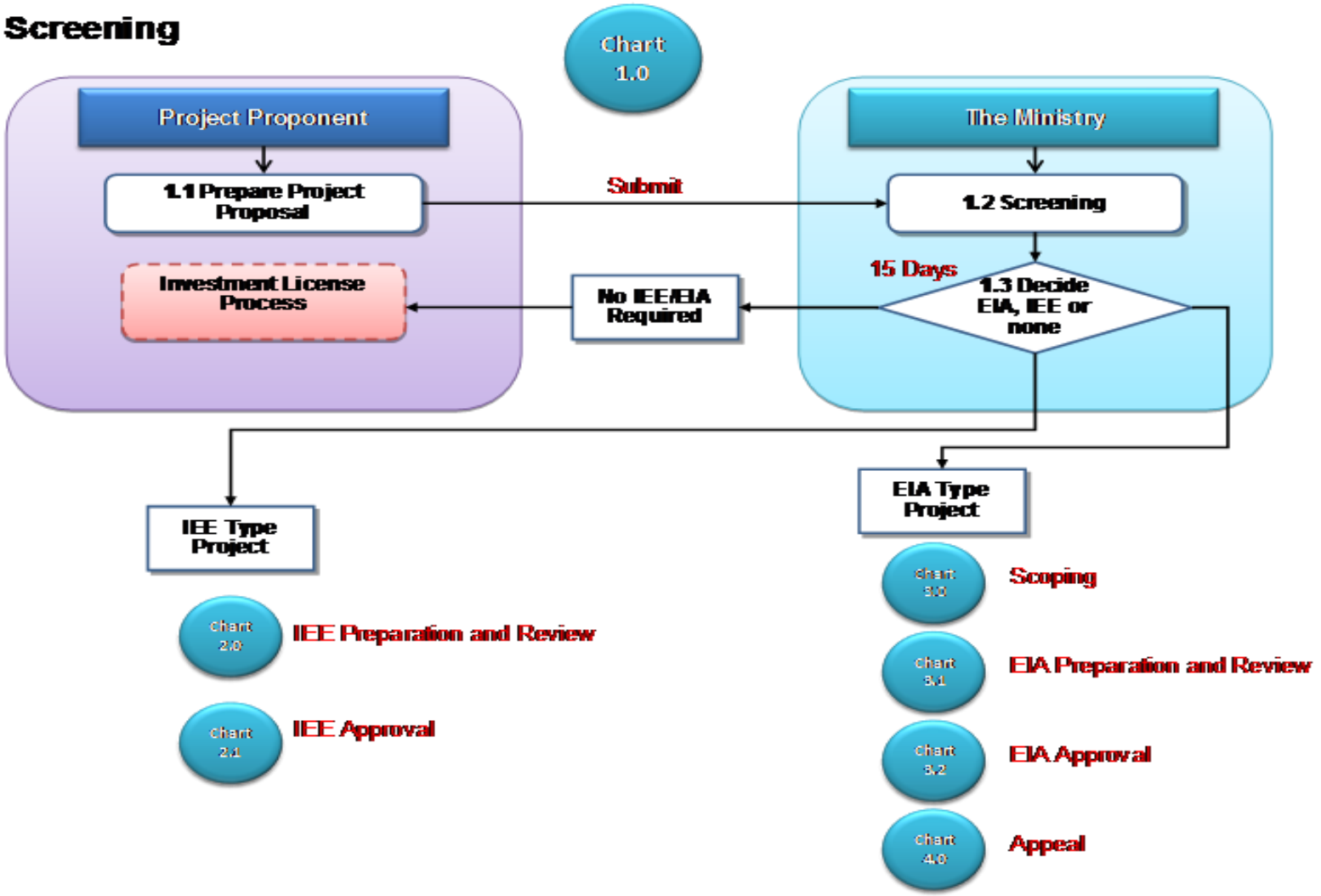
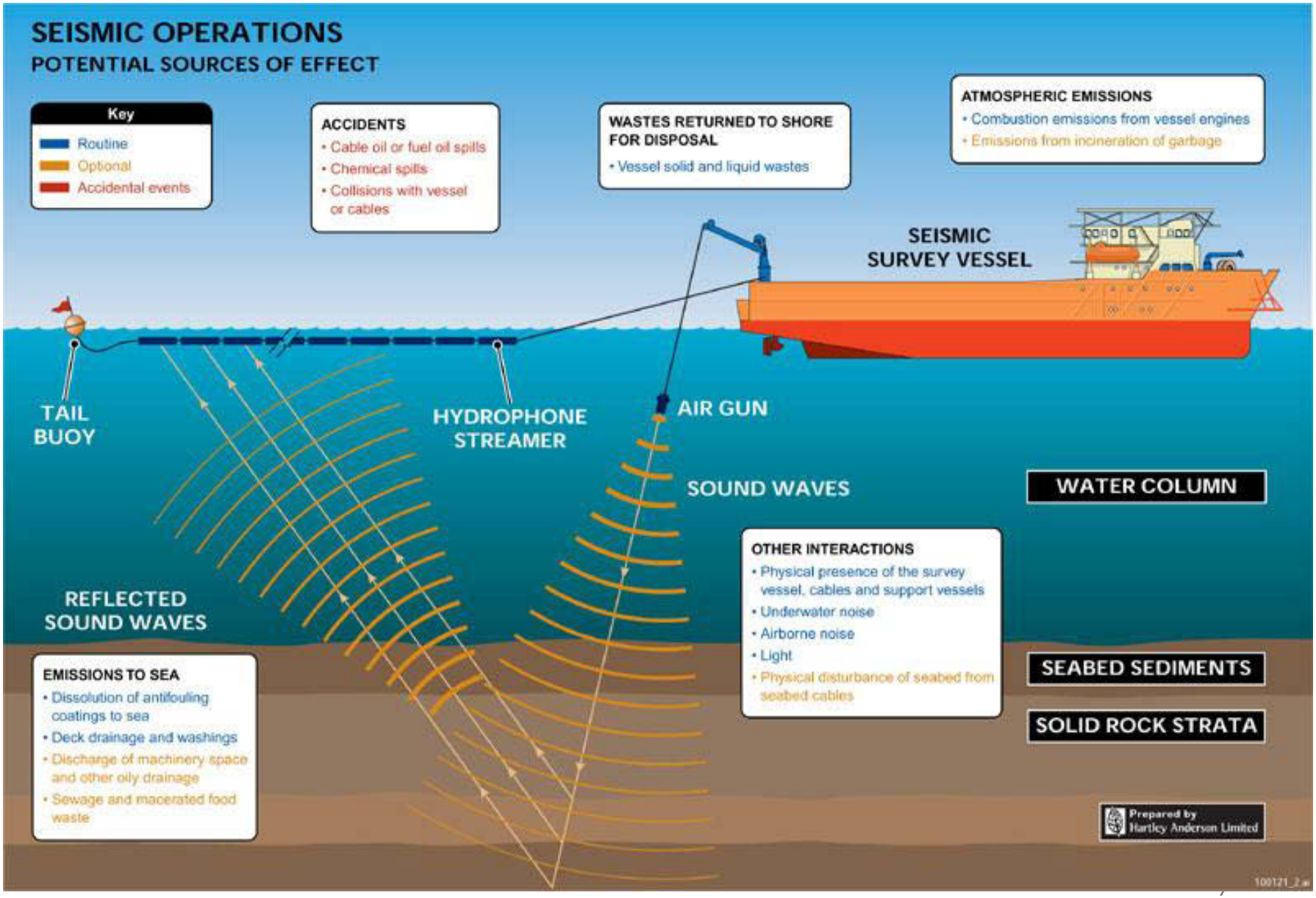
MYANMAR DRAFT EIA PROCEDURE - SCREENING



SEISMIC OPERATIONS

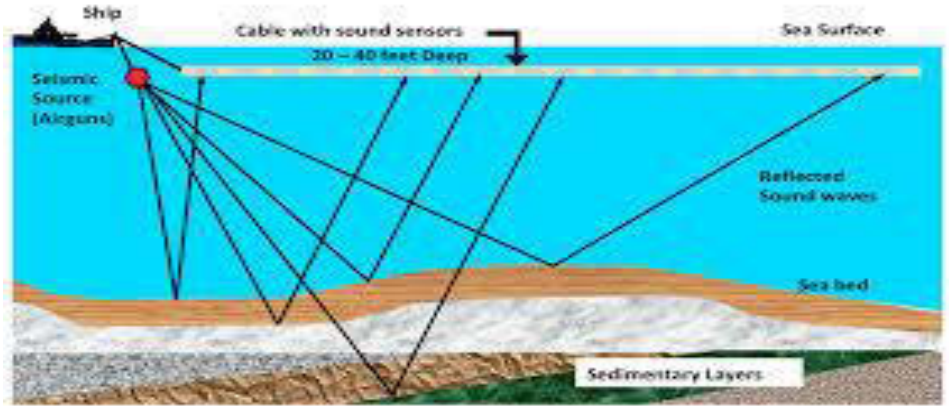


SEISMIC OPERATIONS ENVIRONMENTAL ASPECTS

- Physical presence at sea of seismic vessel including streamers, as well as associated support vessels
- Emissions associated with generation of power for the use and operation of seismic vessel and associated support vessels
- Underwater noise and vibration generated by seismic source
- Crew changes and vessel supplies
- Shore-base support

POTENTIAL ENVIRONMENTAL IMPACTS

- Physical disturbance of Marine Mammals, Fish and Birds
- Interaction/impact on Fisheries
- Interaction/impact on commercial shipping/other sea users
- Impact on Water quality (cooling water discharge, sanitary effluent discharge, accidental spills, leaks, dropped objects)
- Impact on air quality (engine exhausts)
- Material assets (e.g. waste disposal, fuel use, fresh water consumption)



TYPICAL SEISMIC IMPACT ASSESSMENT: SCOPING TABLE

Project Phases and Activities	Resources and Receptors								
	Biological				Physical		Social		
	Marine Mammals	Seabirds	Fish and/or Invertebrates	Ecosystem	Water Column	Air Quality	Commercial Fishing	Marine Vessels	Cultural Receptors
Planned Activities									
Operation of the seismic and support vessels and towing of									
Underwater noise from the firing of the airgun arrays									
Waste discharges from the survey and support vessels									
Unplanned Activities									
Minor spills of fuels, oils and chemicals									
Collisions									
Accidental loss of streamers or other equipment									
Introduction of invasive marine species									

No interaction

Interaction possible, but not likely to be significant

Potential significant interaction

Scoping exercise carried out to help focus the Integrated Impact Assessment on key potential interactions between:

1. *Operational Activities, and*
2. *People & the Environment.*

IMPACTS FROM SEISMIC PROJECT ACTIVITIES, RECEPTORS AND IMPACT SIGNIFICANCE - TYPICAL

Impact Source	Resource/ Receptor and/or Residual Impact Significance
Impacts from Planned Project Components	
Physical presence of the seismic and support vessels	• Marine mammals - *Minor*
On board vessel lighting	• Seabirds - *Minor*
Towing of the airgun and streamers	• Commercial fishing - *Negligible* • Marine vessels - *Negligible*
Firing of airgun arrays	• Marine mammals - *Minor* • Fish and Invertebrates - *Negligible* • Commercial fishing - *Negligible*
Deck drainage and bilge water discharge	• Water quality - *Negligible* • Fish - *Negligible*
Sewage, Grey Water and Food Discharges	• Water quality - *Negligible* • Fish - *Negligible*
Atmospheric emissions	• Air quality - *Negligible*

Impact Source	Resource/ Receptor and/or Residual Impact Significance
Impacts from Unplanned Events	
Minor spills of fuels, oils and chemicals	• *Negligible*
Collisions	• *Negligible*
Loss of streamers and associated equipment	• *Negligible*
Introduction of invasive marine species	• *Negligible*

The summary of the main impacts on the environment & people, and their ranking in terms of significance

KEY MITIGATION MEASURES / CONTROLS

- Selection of vessel (management of air and aqueous emissions)
  - Vessel specification and Compliance with IMO/MARPOL, vessel oil spill response plan (SOPEP)
  - Competency and supervision of crew
  - Emergency response and medical facilities on-board
- Marine notices / notice to mariners (fisheries/sea users)
- Fisheries engagement (fisheries)
- Code of Conduct for protection of marine mammals (underwater noise)
  - Marine mammal observers
  - Pre-start criteria procedure, Soft start/ramp up procedure
  - Monitoring and reporting of sightings

TYPICAL MARINE MAMMAL MITIGATION

- Minimise impact in non-vertical planes from source array;
- Smallest airgun array capacity possible (to achieve the required data quality);
- Trained Marine Mammal Observer(s) onboard;
- 'Soft start'
  - Pre-start
    - •Scan Survey area around source for presence of cetaceans.
    - •500 -1000 m distance required between source array and nearest cetacean; 30 - 60 minutes.
  - Ramp up
    - •Slow and gradual build up of power, from low energy to maximum (or desired) output after 20 - 40 minutes.
  - Visual Survey
    - •Every time the sound source(s) is used;
    - •Soft start cycle limited to 40 minutes;
    - •Once sound source has achieved maximum output (post soft start) it is not necessary to stop the survey should cetaceans approach the vessel.
  - Reporting of sightings.