



**PETRONAS**

# Fostering trusted environment for collaboration and data sharing

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PETRONAS Carigali Sdn. Bhd.

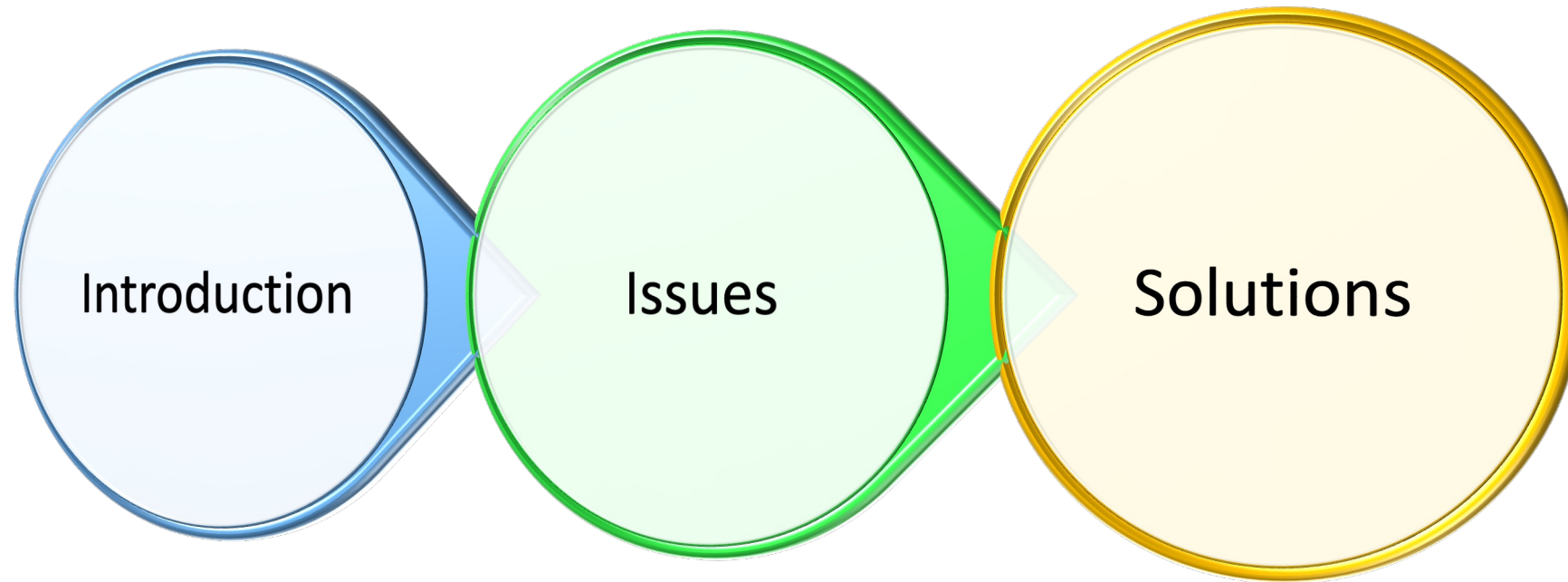
Geospatial World Forum,  
05.05.2023

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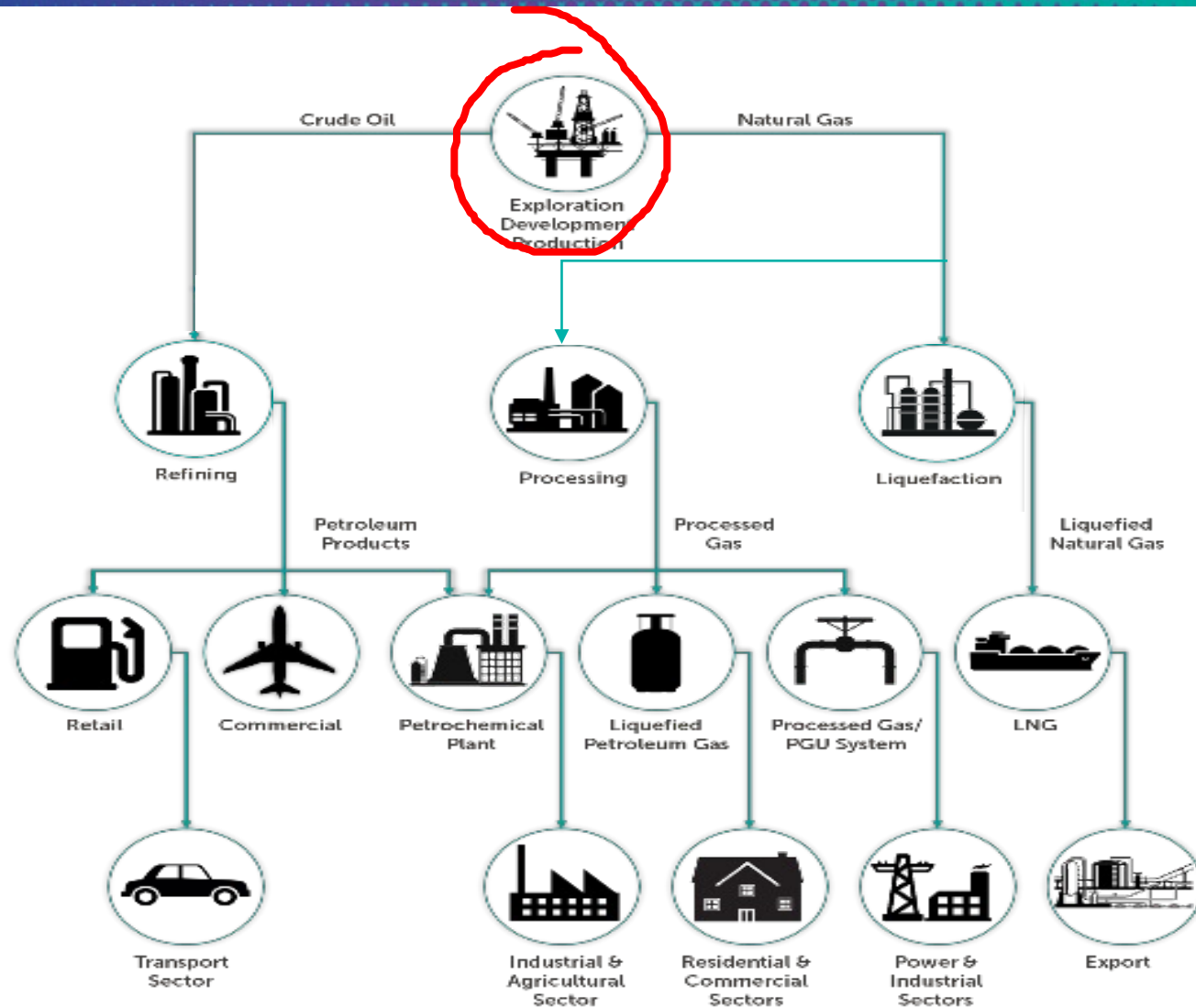
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# About this presentation



# PETRONAS Integrated Business

Adding value to every single molecule through integration across the chain



## PETRONAS

also includes

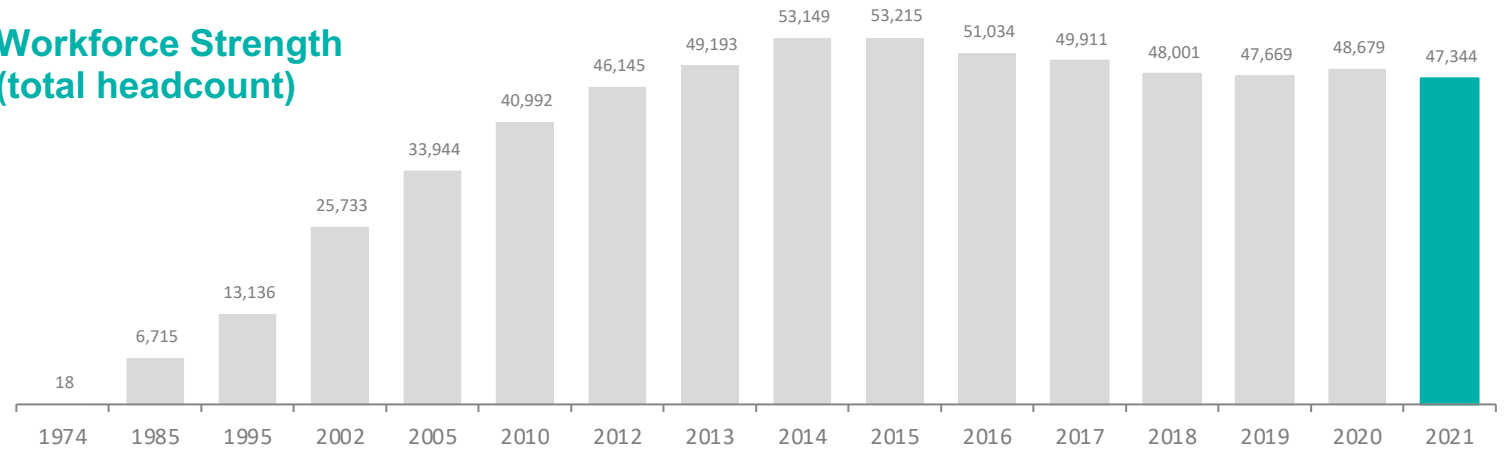




# Our Profile

## Our people are our strength

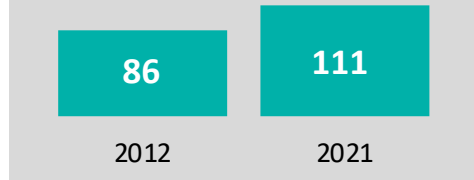
### Workforce Strength (total headcount)



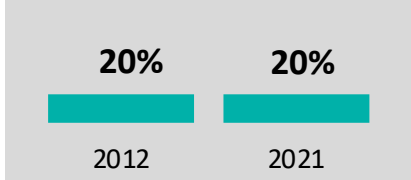
### Workforce Composition



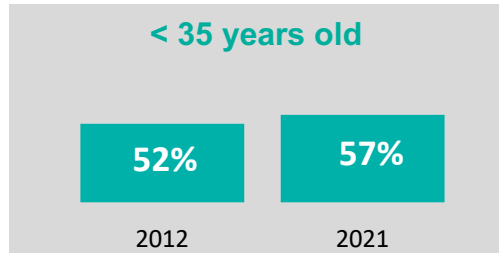
#### Nationalities



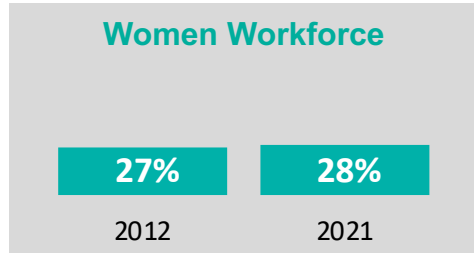
#### Non-Malaysian



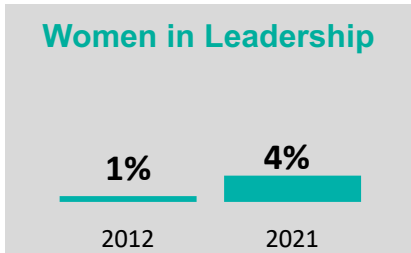
#### < 35 years old



#### Women Workforce



#### Women in Leadership



# International Upstream Ventures

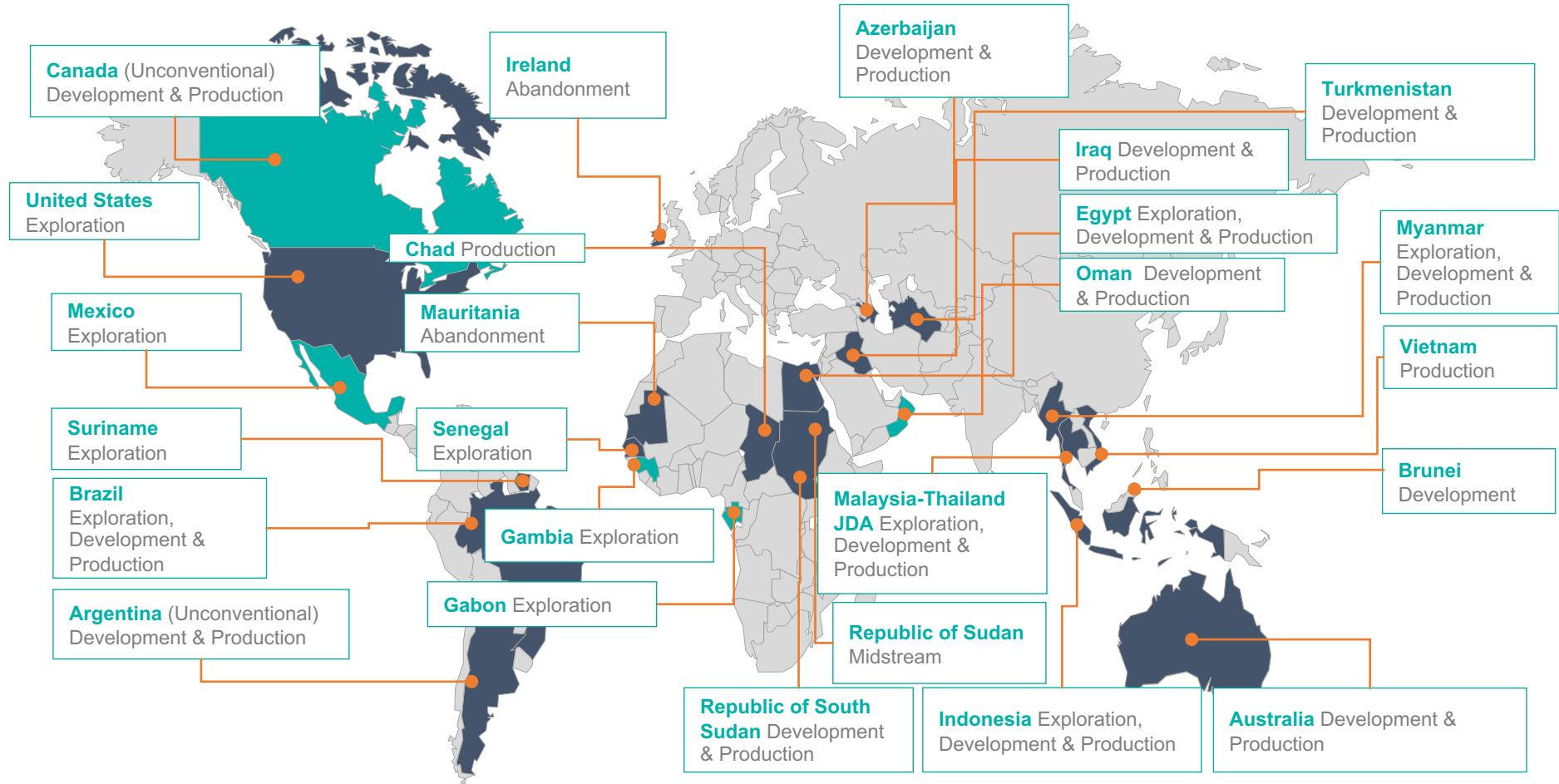
Broad portfolio of resources and play types in more than 20 countries

**570** kboe/d  
oil & gas productions

**>3,160**  
producing wells

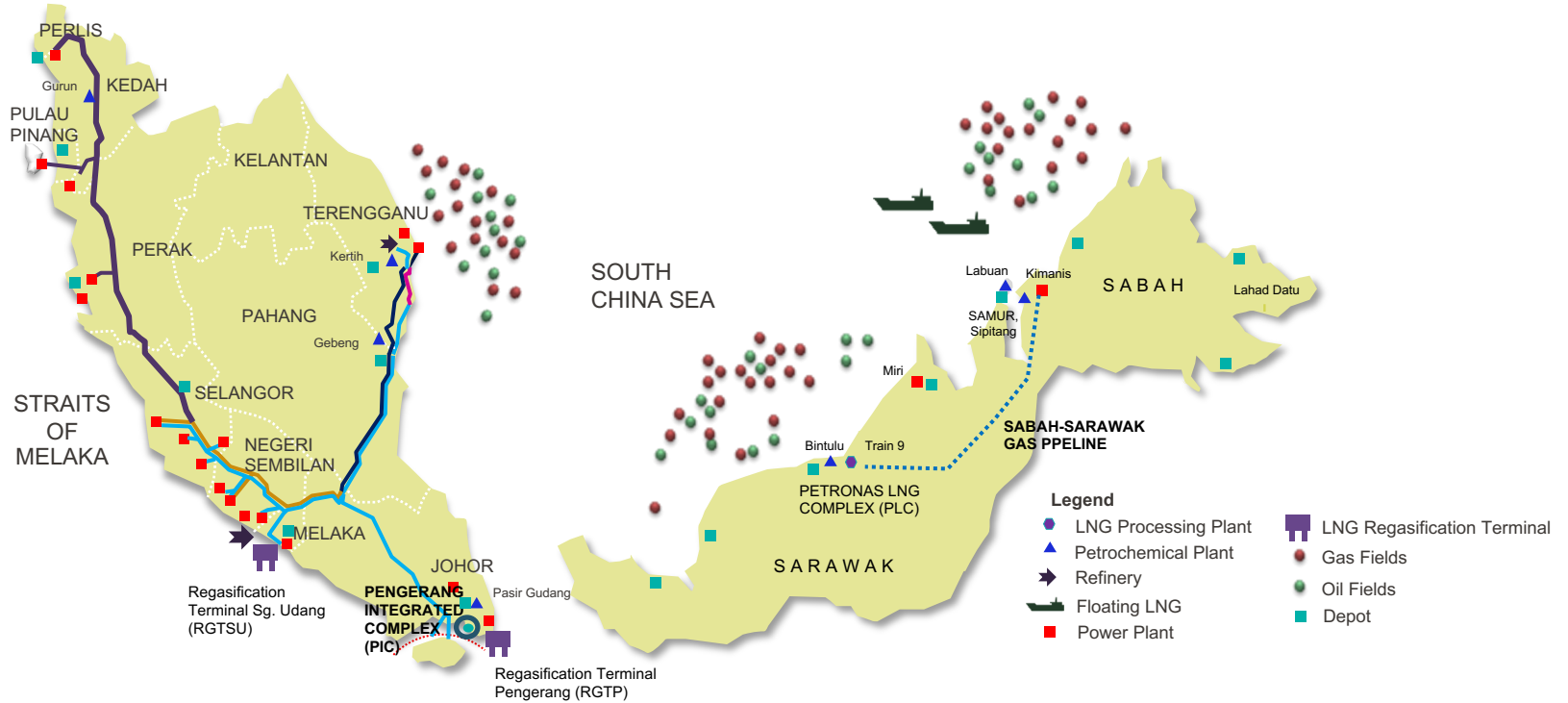
**9,213** km  
pipeline length

**26**  
offshore assets



# PETRONAS Domestic Oil & Gas Assets

Investing in critical infrastructure to connect the reservoir to the consumers



*\*Map is for illustration only and not to scale.*

151 Producing Fields

19 Floaters

4 Refineries

2 Regasification Terminals

387 Platforms & Subsea Structure

10 Bunkering Facilities

8 LPG Bottling Plants

17 Fuel Terminals

100 NGV Fuelling Stations

14 Onshore Terminals

13 Aviation Terminals

1,065 Service Stations

# Geomatics Role - All our investments are location dependent....

## Geo-Information Management

- Conduct assessment and ensure all technical data are reliable to be used, based on the geomatics technical qualification and fit for specific application.
- Review all technical specification related to geomatics, and advice project/asset team for fit for purpose Geo-Information solutions.

## Geomatics Operation

- Conduct on site quality assurance and quality control to ensure all geomatics aspect are meeting the requirements set by the project.
- Review all technical specification related to geomatics, and advice project/asset team for fit for purpose Geomatics Operation solutions.

## Geohazards Assessment

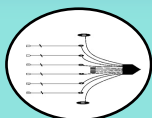
- Conduct the geohazards assessment which include geophysical survey, geohazards identification and risk assessment and mitigation.
- Review all technical specification related to geomatics, and advice project/asset team for fit for purpose Geohazards Assessment solutions.

## Preserving geospatial data integrity is our main contribution.

### Exploration



Geomatics Support for Basin & Block Acquisition



Geomatics Support for Seismic Acquisition



Geomatics Support for Processing/ Imaging and G&G Project



Chronological validation (geospatial), fact findings and geospatial forensic.



Proposed Well Verification



Marine Geohazards Survey/ Geohazards Assessment



Well positioning/ rig positioning

### Development



Dimensional QA/QC during fabrication



Pre/Post Installation Marine Geohazards Survey, surveillance survey and Geohazards Assessment



Positioning support and dimensional control during installation



Platform Integrity Survey / Deformation Survey, Positioning Support for drilling & maintenance.



Well positioning/ rig positioning

### Downstream



Topographic / Detail Survey



Structural Integrity Survey



Areal Mapping

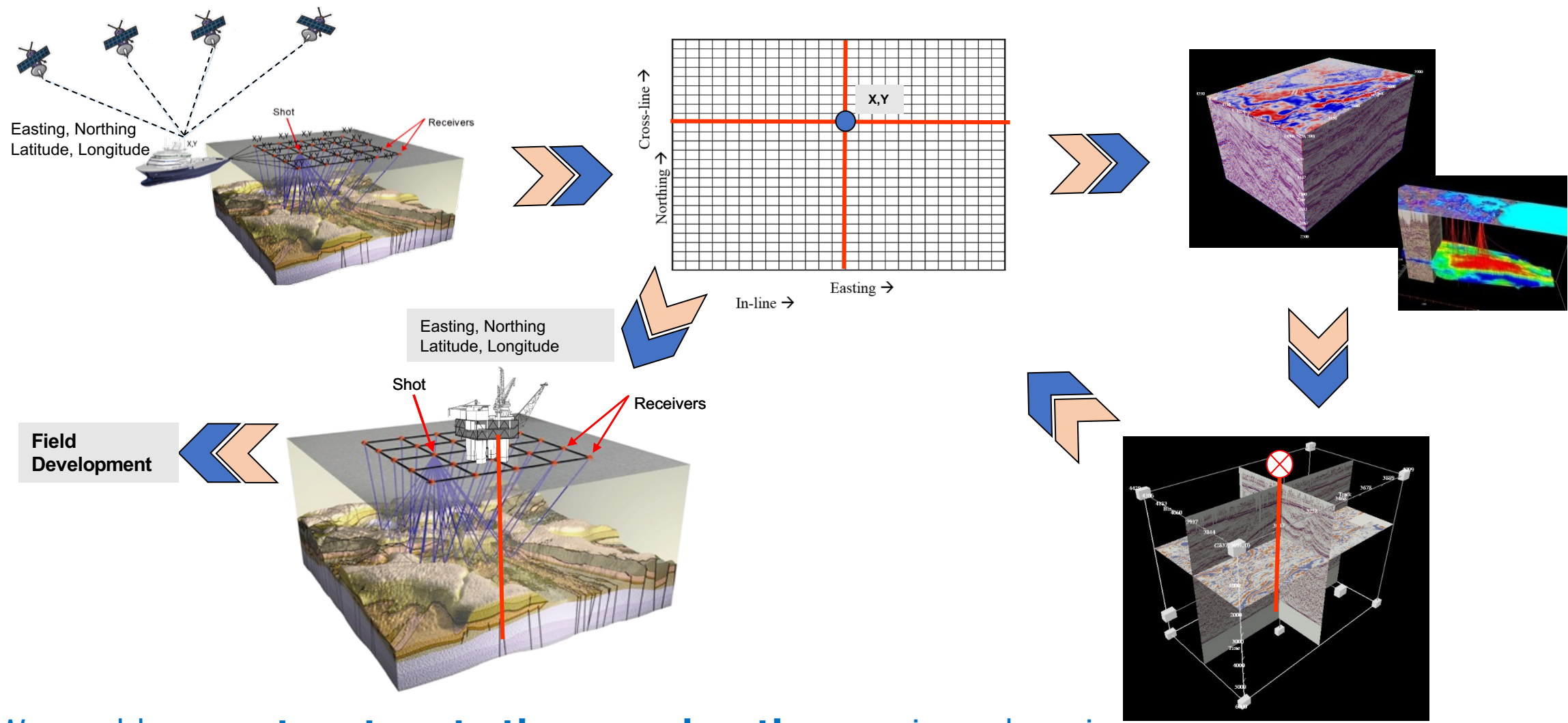


Underground Mapping



Satellite Imagery

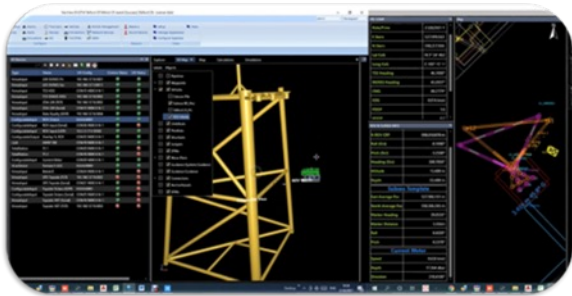
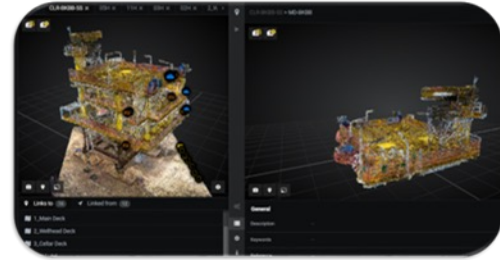
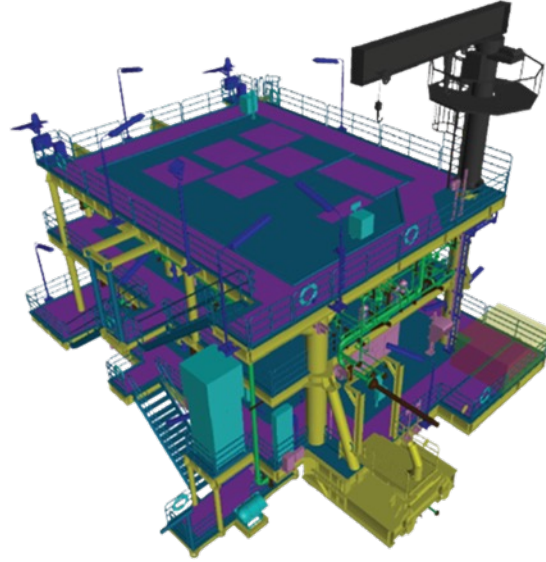
# Generic Role of Geomatics



We enable users **to return to the same location**, again and again...

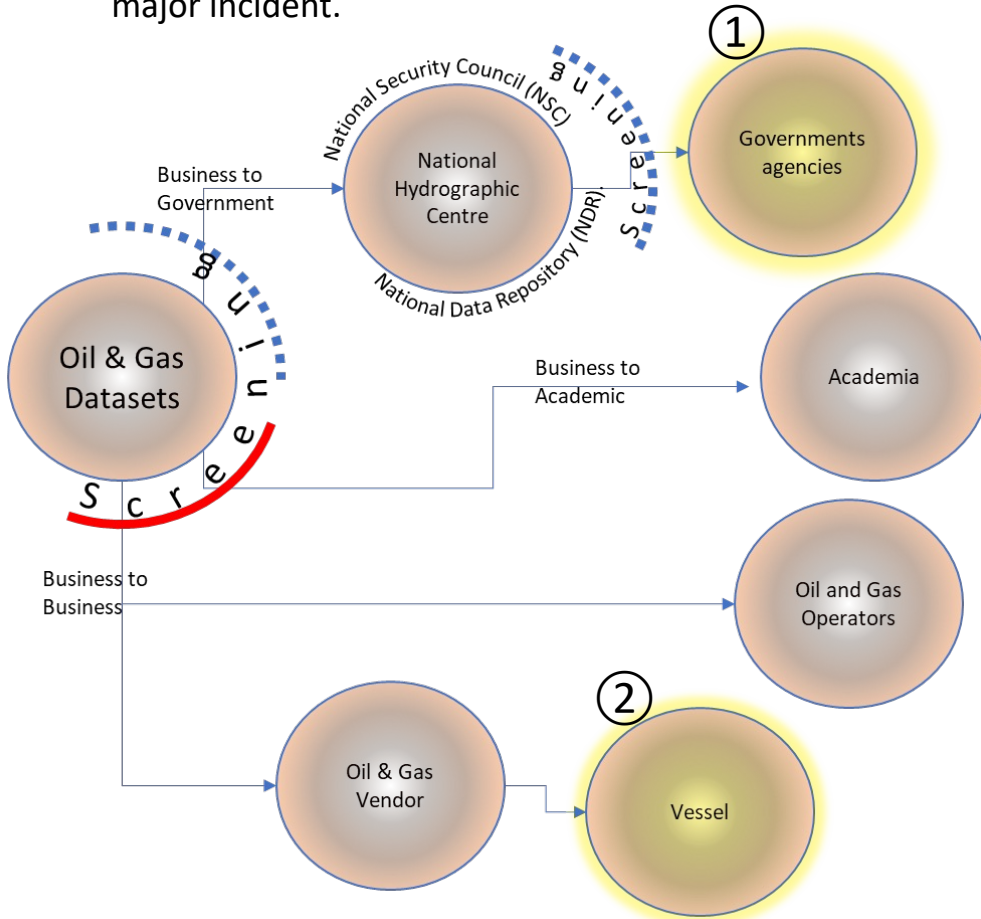


# Remote & Autonomous Operation and Digital Twin



# Introduction

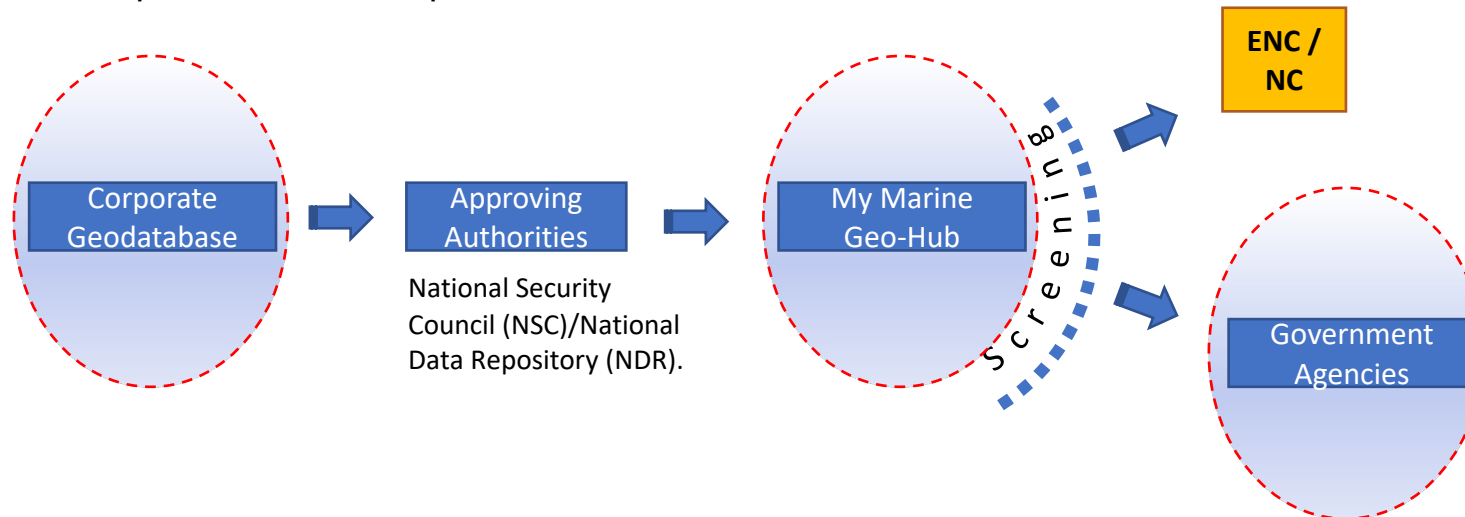
- Offshore oil and gas infrastructure data, e.g., field structures, the intra- and inter-fields, the export pipelines, and subsea well structures, is deemed important to be accessible by mariners and related marine stakeholders to ensure safe navigation and avoid any possible risk that could lead to a major incident.



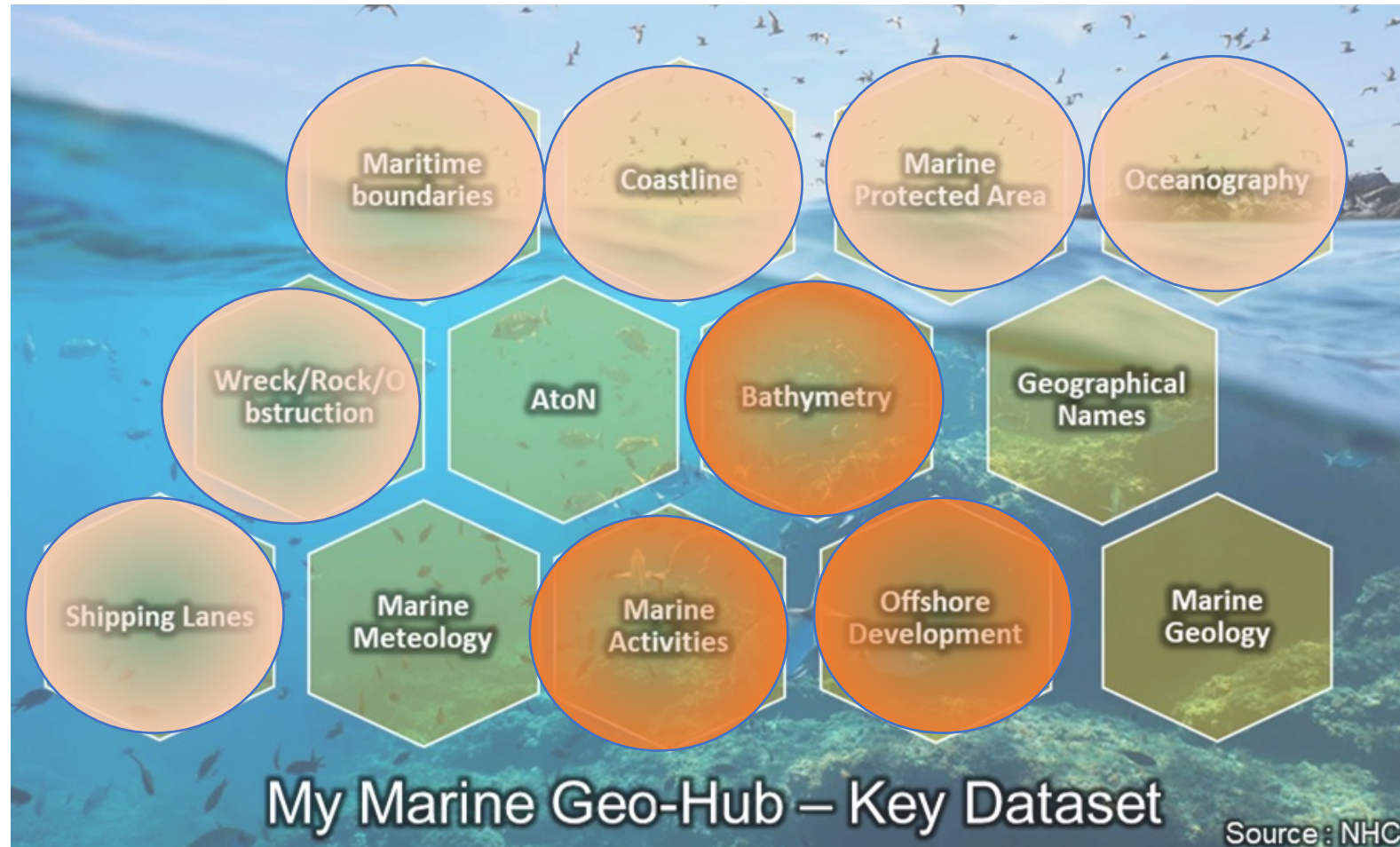
- However, due to security and safety reasons, the authority classifies the data as "restricted". Hence, sharing the information needs to be managed carefully to avoid any potential data leaks and misuse.
- A good governance and approval process has been put in place. Each category of data sharing is being processed according to the needs. A written approval is usually given with the non-disclosure agreement to ensure good data handling and avoid potential data leaks.
- However, there is no stringent security mechanism being applied to the dataset. The data is still exposed to any data transfer that could lead to misuse.
- This paper shares two approaches (① & ②) that have been evaluated to improve data security. Although the test was intended to help resolve issues for those specific applications, with the improvement of the data security method, it may apply to other areas or applications.

# Data Sharing to the relevant government agencies

- The Malaysia National Hydrographic Centre is making efforts to be the leading organisation in promoting the My Marine Geo-hub as the Marine SDI for Malaysia and Marine Chart Services.
- One of the 13 key datasets is "Offshore Development" which includes "Offshore oil and gas infrastructure data".
- Government agencies will be able to access the data through the marine geo-hub. However, it will be still bounded by the confidentiality clauses.
- Due to some requirements or limitations, i.e., data format, the relevant stakeholders will request the primary data, although in actual fact that information is not required. This will expose the data leak or misuse.



# Marine Geo-Hub is introduced to enables accessibility to the marine dataset by respective stakeholders



However, not all data sets can be openly shared with the public. There are some security levels that need to be met while following the right governance policy. Among other sensitive information include but not limited to:

1. Offshore development data types:
  1. Offshore Platforms;
  2. Offshore Pipelines;
  3. Subsea Wells structures; and
  4. Mobile operating/processing units.
2. Seabed profile data and geophysical data.
3. Others supporting marine activities to the oil and gas activities:
  - a. Offshore Geophysical Survey Operation;
  - b. Logistics; and
  - c. Offshore installation and field developments.

# Issues/Challenges

## ➤ Managing the stakeholder expectations:

- Users are expecting to receive the whole dataset so they can conduct all the necessary assessments. For this purpose, they always try to justify obtaining the primary dataset in the form of a physical copy. In addition to the data format and compatibility issues, data quality is also the critical to be de discussed in detail.
- However, in most, if not all, cases, those processes would not require the primary data.

## ➤ Managing the confidentiality issues:

- Giving someone access to primary data may potentially lead to data leaks or misuse issues.
- Having the NDA in place will not guarantee the security, as not all organisation or even personnel have good awareness of cyber security.

## ➤ Information consistency:

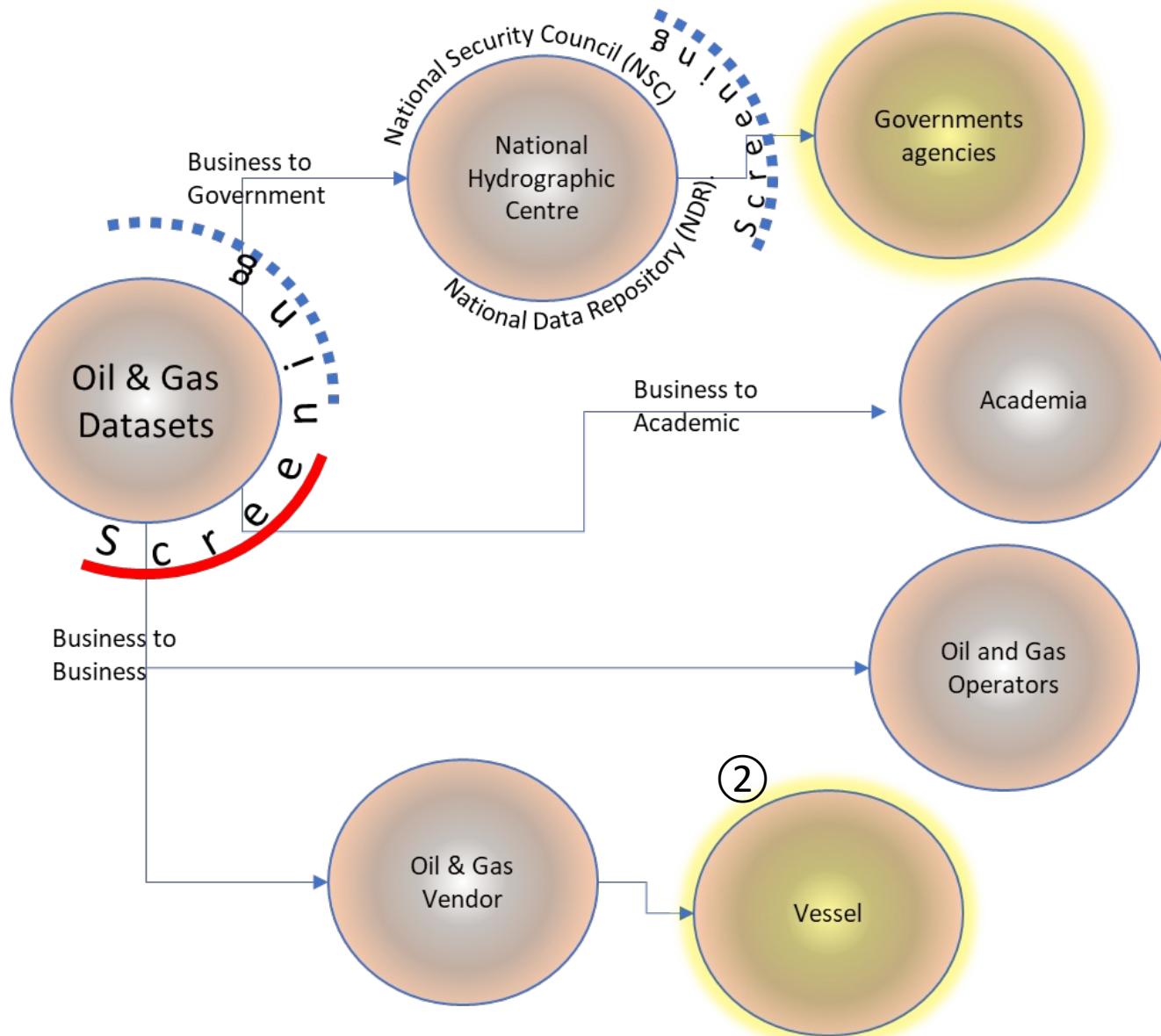
- Giving access to primary data without proper cyber security control will potentially introduce issues in managing data consistency.
- Data is shared with different organisations at different times. There is no structured data maintenance update.



## Solutions: introduce the “non-exclusion zone” dataset

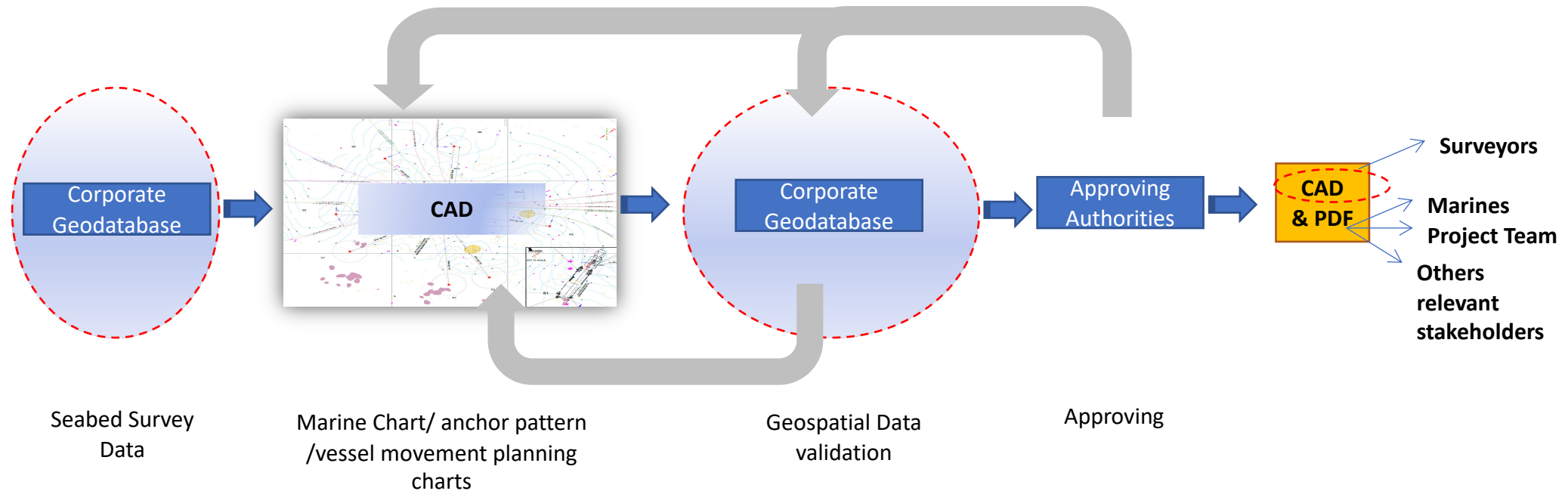


- Through myMarine Geo-Hub, the data owner and the system administrator need to work together to produce the "non-exclusion zone" data layer.
- Without the need to have the primary dataset, the "non-exclusion zone" data layer can be directly consumed by the other stakeholders.
- All security and safety parameters need to be set by the data owner and applied to the system to produce and publish the layer.
- Data owners will have the privileges to maintain the safety of their assets and datasets.



# Data Sharing to vessel for offshore operation within the oil and gas field

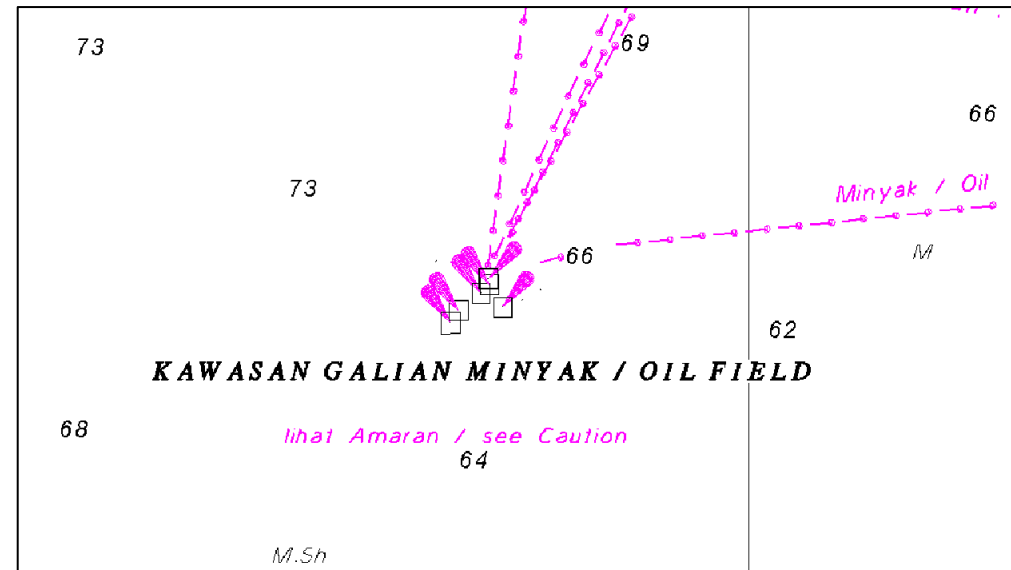
- A marine topographic chart is usually prepared and issued for anchor pattern and vessel movement planning during offshore activities.
- These marine topographic charts were updated with the latest seabed survey results and field infrastructure data. The anchor pattern and vessel movement planning charts were reviewed and approved by the respective approving authorities.
- The approved charts were then issued to mariners and project teams in PDF format for marine and engineering applications, while surveyors loaded the native AutoCAD drawings to the survey integrated navigation system for track guidance.





# However, vessels are unable to load CAD, PDF or GIS into their system

- In marine operations, vessels are highly dependent on the Electronic Navigational Chart (ENC) and/or printed Navigational Chart (NC) published by hydrographic offices.
- Vessels are using the Electronic Chart Display and Information System (ECDIS) to view the ENC integrated with other navigation equipment onboard.
- However, for security and safety reasons, oil and gas (O&G) fields are classified as restricted areas for merchant shipping, fishing, and aquaculture activities. The details and positional accuracy of the O&G fields' structures, including the infrastructures installed intra- and inter-fields, are deliberately reduced.



# Issues/Challenges

## ➤ Spatial data accuracy:

- The small-scale charts used by the mariners will not be sufficient to navigate and work safely in the O&G fields. This becomes more critical for remote operations.



## ➤ Data validity

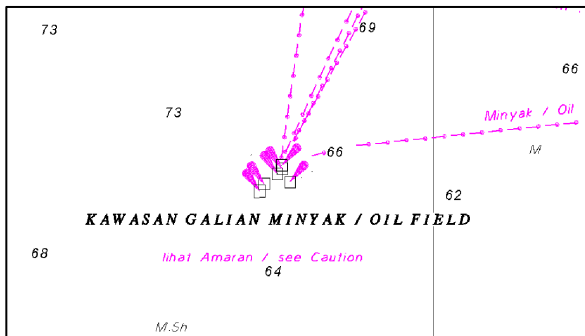
- Although there are instructions to check validity and application limitations, there have been occasions where users ignored the warnings and assumed all information in the chart was valid and good for all applications.
- To avoid any potential HSSE risk exposure, a better mechanism for limiting usage is required.

## ➤ Data security

- There is no mechanism to control the data transmission and sharing. There is a need to implement better security controls to avoid data leakage and misuse of the information.

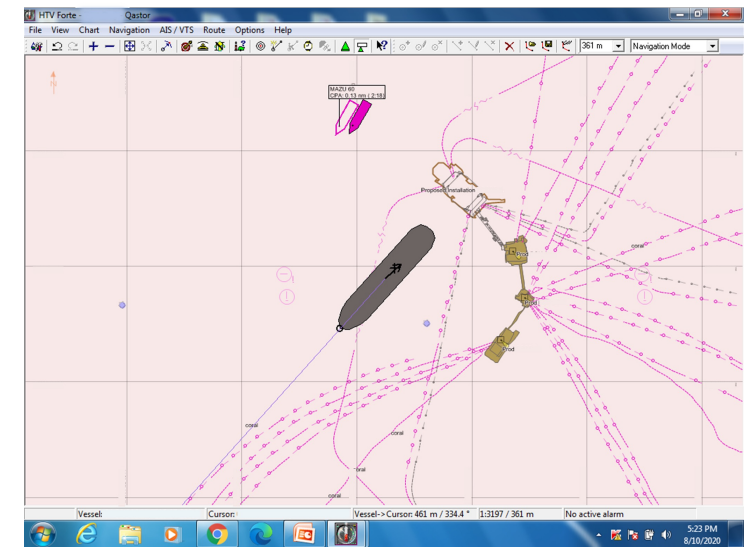
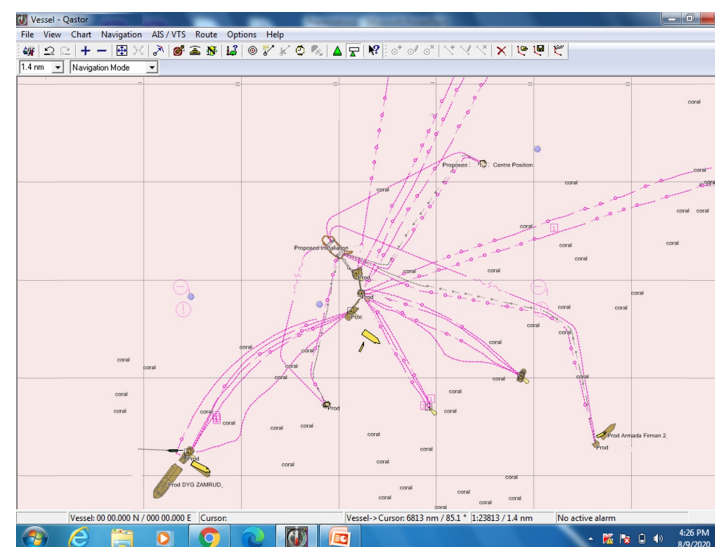
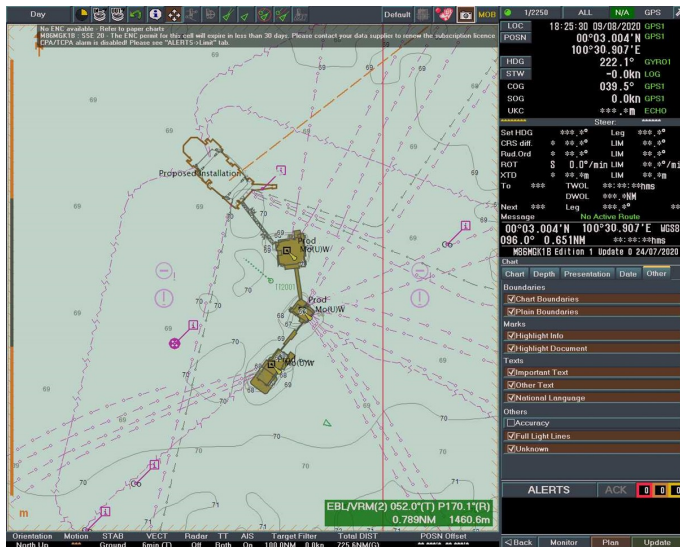
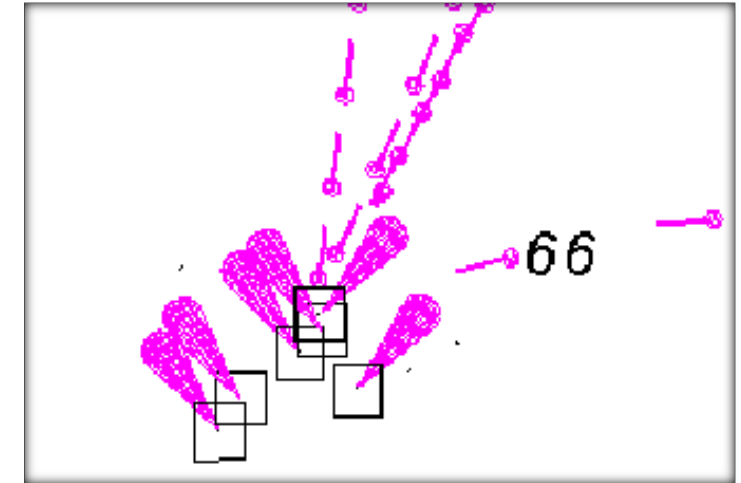
## ➤ Information consistency

- The details and accurate information only appeared on the surveyor's screen, while the mariners use the ENC display on ECDIS to navigate the vessel.
- However, it is critical to ensure all parties involved in the operation have access to the same dataset, especially for simultaneous operations. More critical if it involves remote and autonomous operations.



# Solutions: Evaluations of PCSB-ENC

- PETRONAS is evaluating the use of ENC in our operations with the main objective of enabling access to the high accuracy of spatial data during offshore activities.
- The vessel movement and anchor planning are to be charted in the ENC.
- This specific ENC is to be encrypted and can only be used by a specific vessel for a specific duration.
- PCSB-ENC adheres to IHO S-57 and S-100 standards to ensure compatibility with all ECDIS and marine-approved survey-integrated navigation systems.
- PCSB-ENC is to be encrypted to IHO S-63 standards with limitations set to specific vessels and operational timespans to ensure data security.



# Way forward

- An alternative method needs to be identified to enable data sharing and optimise collaboration across multiple agencies. Not all applications require access to the primary data.
- Similar or better data security than IHO needs to be implemented in other geospatial data sharing, i.e., time stamp, and only to dedicated machines or organisations.
- A regulatory body plays a critical role in setting up the requirements for computer systems and cyber security. This should complement the development of SDI (Spatial Data Infrastructure).



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