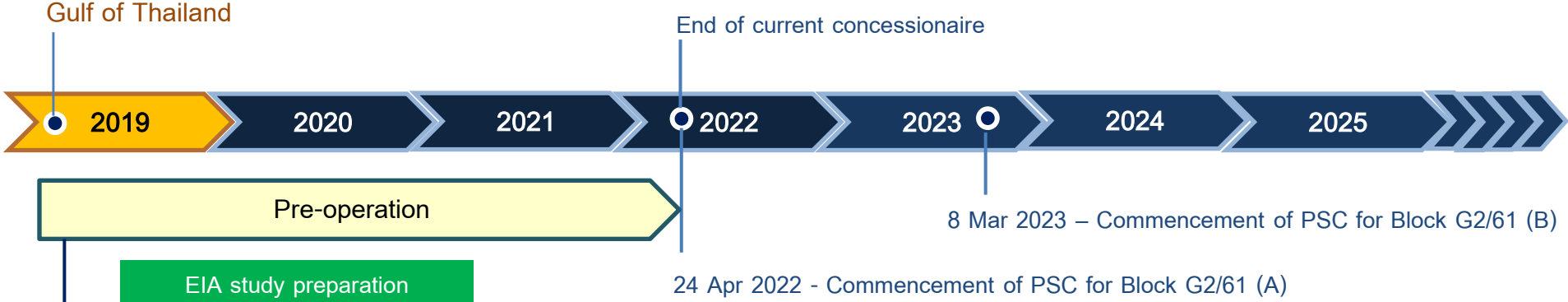
Environmental Impact Assessment Report for Exploration Drilling & Production Phases G2/61 Area

PTTEP

Project Objectives

Project Objective & Background

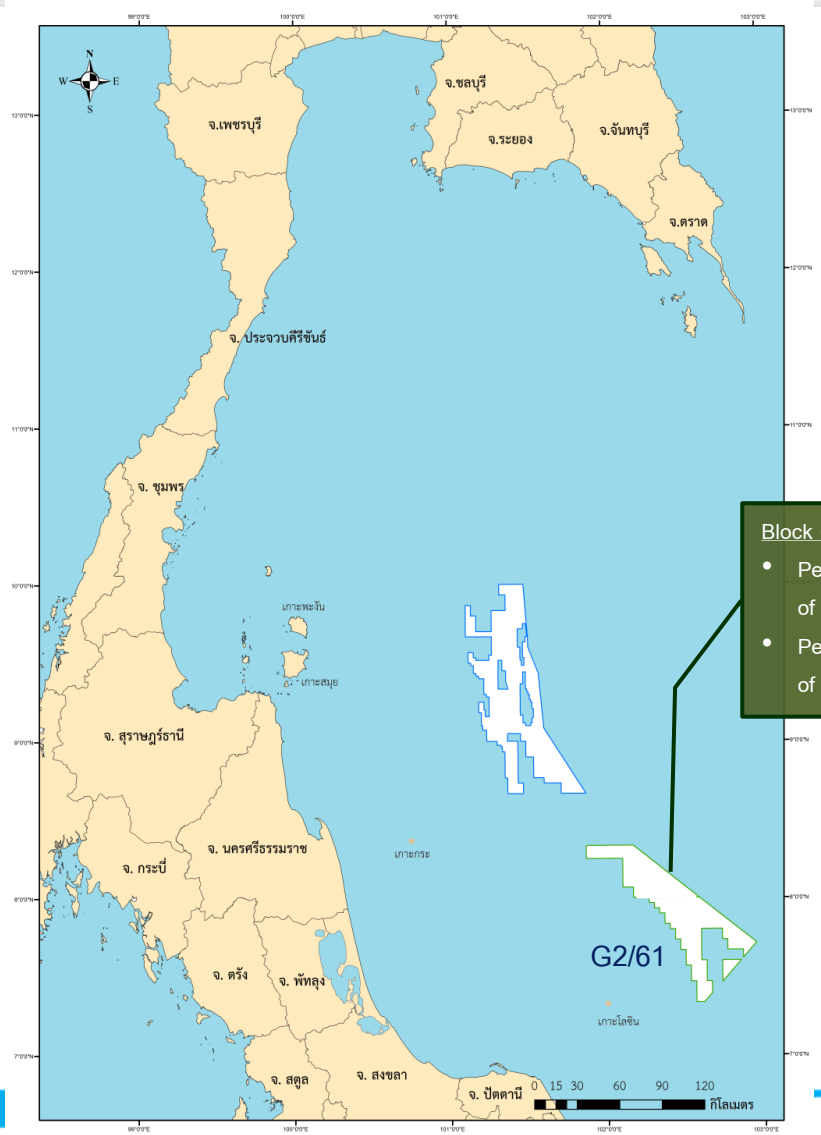
25 Feb 2019 PTTEP ED was awarded from Ministry of Energy for petroleum exploration and production in Block G2/61 in Gulf of Thailand



EIA report must be approved by ONEP before commencement of PTTEP ED operation.

Pre-operation period is to ensure smooth and continuous operation for transitioning from concessionaire to PSC. The key objective of this period is to secureThailand petroleum supply.

Scope of EIA Study



Block G2/61

- Petroleum exploration in Block G2/61 in Gulf of Thailand
- Petroleum production in Block G2/61 in Gulf of Thailand

G2/61 Existing Facilities

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- Central Processing Platforms
- H2S separation platform
- Flare platform
- FSO
- Well Head Platforms
- Living quarter platform
- Subsea pipelines

Project Description

Overview of Project Activities

Petroleum Exploration

- Rig mobilization to designated location
- Exploration drilling
- Well completion & Testing
- Well abandonment
- Rig de-mobilization from designated location

Petroleum Production

- WHP & Subsea pipeline installation
- Production drilling
- Petroleum production
- Maintenance, Modification, and Expanding petroleum production equipment

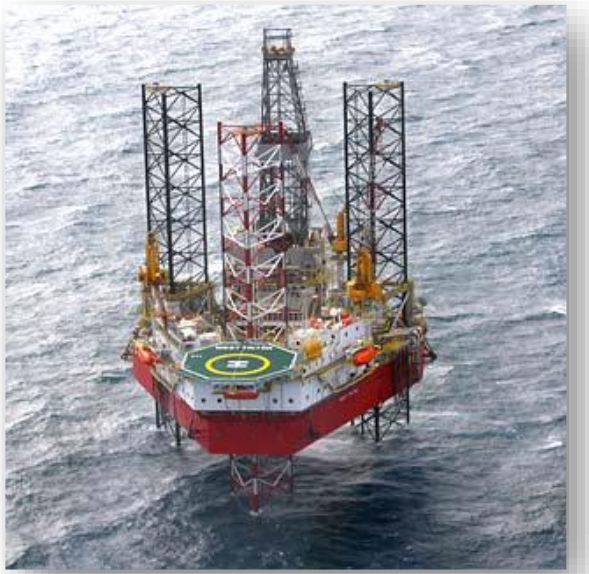
Petroleum Exploration Drilling in Block G2/61

Petroleum Exploration Drilling Activity

Rig mobilization to designated location → Exploration drilling → Well completion & Testing → Well abandonment → Rig de-mobilization from designated location

Rig on location approx. 18 days per 1 location

Rig mobilization/de-moblization to designated location



Jack-up rig on location

Petroleum Exploration Drilling Activity

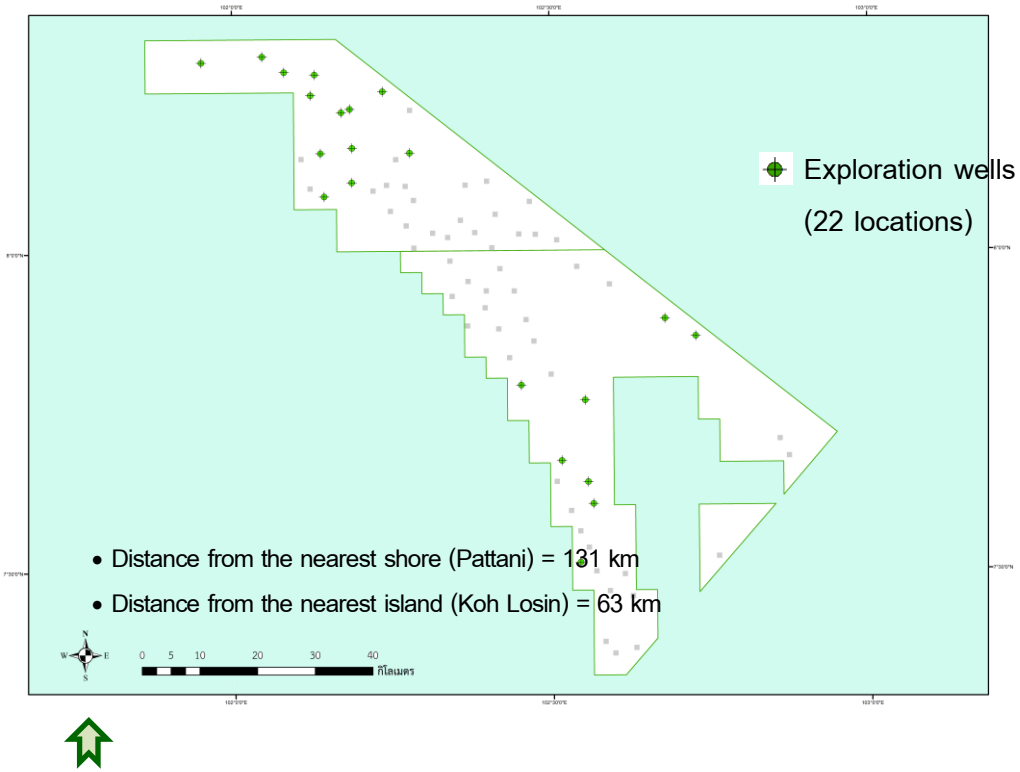
Well logging

- Collect subsurface characteristic data, e.g. electricity properties, porosity, fluid flow rate, etc.
- Study accumulated oil and gas in reservoir
- Evaluate capacilty of petroleum production of wells

Well testing

- Gather adequate data for decision making of petroleum development plan
- Gather key specific info such as well pressure, flow rate, petroleum production efficiency of reservoir

Petroleum Exploration Drilling Plan



Exploration well will be drilled 1 well/time, 1st exploration well will be drilling in Q4, 2563 and continue until end of PSC

Production Phase in Block G1/61 and G2/61

Production Plan in Block G1/61 and G2/61

25 Feb 19 PTTEP ED received award from Ministry of Energy

24 Apr 22 – Start production at G1/61 and G2/61 (A)

8 Mar 23 - Start production in G2/61 (B)

2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025

Production by Current Concession Contract

3 Production Phase by PTTEP ED

EIA Study

1 Installation phase

Q'3 2021 Start Install wellhead platform in G2/61

Q'1 2021 Start Installation wellhead platform in G1/61

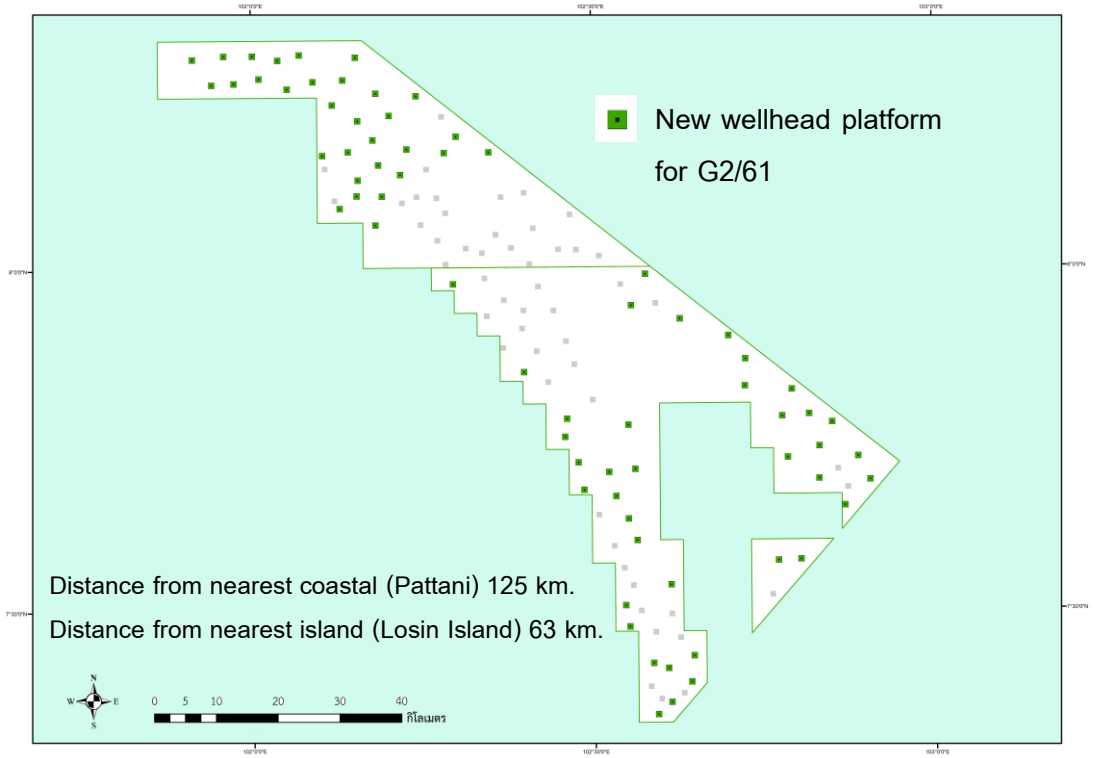
Activities of Petroleum Production Project can be divided to 4 phase

2 Production Drilling Phase

4 Maintenance/ Change/Modification and Extend Production Process Facilities Phase

Wellhead Platform Installation Location for Petroleum Production in block G1/61 and G2/61

Block G2/61 70 New wellhead platform



Step of Wellhead Platform Installation Phase for Petroleum Production

Step of Wellhead Platform Installation Phase

1. Transfer wellhead platform to designated location

2. Lift Jacket from barge to designed location ณ ตำแหน่งที่กำหนด

3. Adjust position of jacket in to Vertical

4. Piling

5. Complete piling

6. Installation Topside of Platform

7. Complete wellhead platform installation

Step of pipeline installation

1. Example of pipeline laying veseel

2. Pipeline laying

Production drilling phase and well preparation phase

- There are 2 type of Rig which are Tender rig and Jack-up rig
- Once the production drilling is completed, rig will be move out from the area

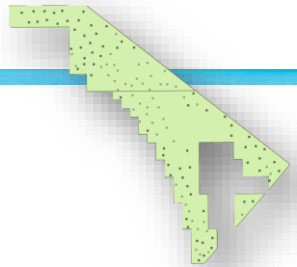
Example of Rig Type during drilling operation

Tender rig

Jack-up rig

Source: http://www.drillingcontractor.org/middle-east-on-the-up-and-up-19341

Petroleam Production Activities in Block G2/61



52 Existing Wellhead platform

Petroleum
Subsea Pipeline

70 New Wellhead platform

Petroleum
Subsea Pipeline

Petroleum Production Process

Existing Production Platform in G2/61

Central Production Platform at GBN

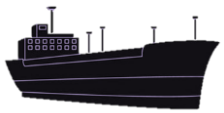
Central Production Platform at GBS

Natural Gas
Subsea Pipeline

Sell via Gas Transportation System of PTT

(Existing Gas Transportation System)

Condensate
Subsea Pipeline



FSO2 at GBN

Produced Water
Subsea Pipeline

Reinjection well

Maintenance/ Change/Modification and Extend Production Process Facilities Phase

- **Develop Maintenance Plan** of production process facilities **for the most** efficient of petroleum production
- **Modification/ Change/ Add/ Extend production process facilities i.e.,** production well at wellhead platform, separator, Natural Gas Quality Control Process, Condensate Stabilizer Process and Produced Water Management System including FSO2 and Subsea Pipeline Transportation System for serving long term petroleum production

Support Base Activities of Project

Support Base Activities of Project

- Store and transfer equipment, staff and waste transportation
  - PTTEP Petroleum Support Based (PSB) at Singhanakhorn, Songkhla
- Staff transportation by Helicopter
  - Helipad in Songkhla Province
  - Helipad in Nakhonsrithammarat Province

Step and Plan of Environmental Impact Assessment (EIA) Study of Project

Step of EIA Study

Study Plan (5 Project)

Scoping

Sep 2019

1st Public Participation

Study of Project Description

Conduct Environmental Fields Sampling Survey and Socioeconomic Survey with Questionnaire

Study Existing Environmental Data

Secondary Date

Assess Environmental Impact

Develop Mitigation measure and Environmental Monitoring Program

Draft Environmental Impact Assessment (EIA) Report

Jan 2020 and June 2020

2nd Public Participation

Feb 2020 to Aug 2020

Submit EIA Report to ONEP

Scoping of EIA study

- Consider scope of the study of project by phasing of project activities and possible impact from project activities

Appraisal and Exploration (A/E) activities of project

- Site preparation and drilling rig installation phase
- Exploration drilling phase
- Well logging and well testing phase
- Well plug and abandon and move rig out from area

Petroleum Production activities of project

- Site preparation and wellhead platform installation phase
- Production drilling phase
- Production phase
- Maintenance/ Change/Modification and Extend Production Process Facilities Phase

Study of possible impact covering environmental and other value component:

- Physical environmental resources
- Biological environmental resources
- Human use value
- Quality of life value

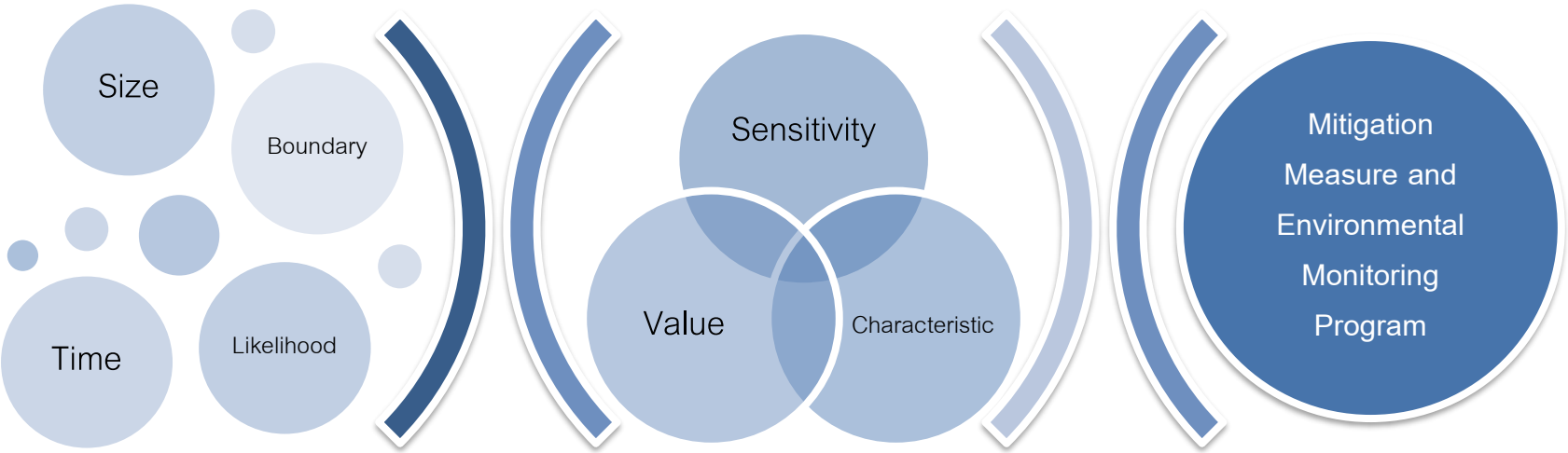
Study and Impact Assessment Plan of Project

Step of impact assessment

Consider severity of possible impact from project activities [(1)] i.e.,

Consider significant level of impact from sensitive receptor data [(2)] i.e.,

Develop Mitigation measure and Environmental Monitoring Program



(1) Consider project activities both plan and unplanned event

(2) Covering 4 components of environmental and other value

Stakeholder Identification of Project

Consider the relevance of project activities and possible impact

Group of people who may affected from project activities

- Commercial fishery who may enter and explore resource in project are
- Community around Petroleum Support Based

Group of agencies who may involved in project activities

- Governmental Central/ Regional/ Provincial agency who has role and responsibility and involve in Energy, environmental fisheries and fleet management in Songkhla province

Group of people who may play a role in expressing opinion to project

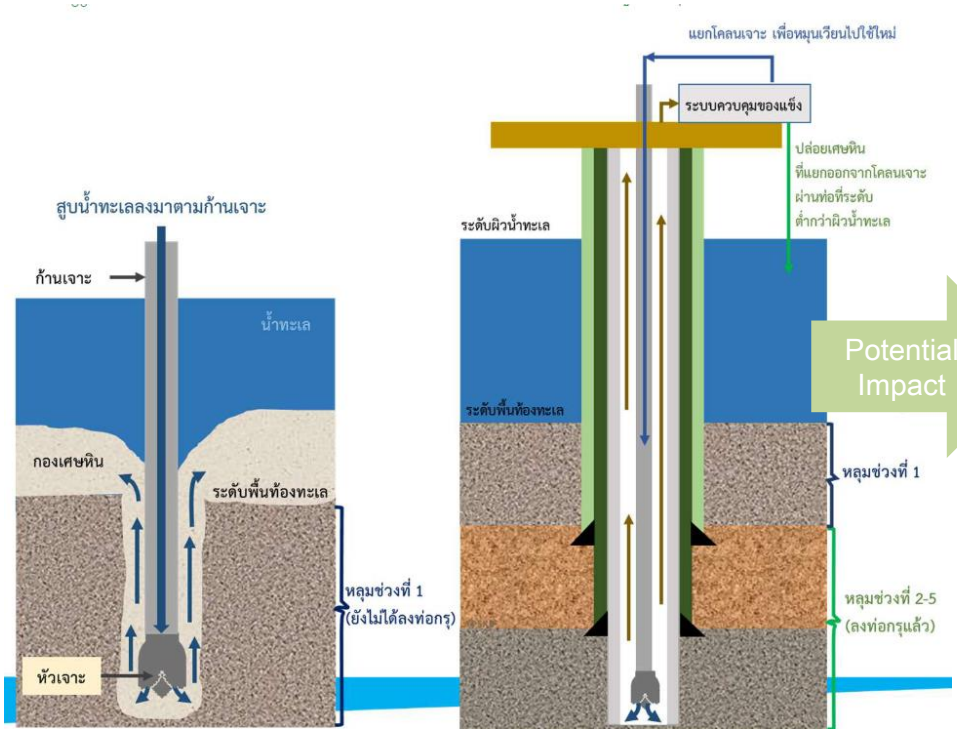
- NGOs
- Institute/Academic
- Media
- Interested people

Environmental Impact Assessment

Impact assessment from drilling mud & cutting from drilling activity

Impact source: drilling mud & cutting from drilling activity

Acute Toxicity Test of WBM and SBM with Penaeus monodon (aged 15 days) and Lates calcarifer (aged 1 months): LC50-96 hrs of WBM and SBM is classified as Non-Toxic



Potential Impact

- Increase TSS and turbidity of seawater
- Change of characteristics and quality of sediment
- Continuous impact to benthos

Mitigation Measures for drilling mud & cutting from drilling activity

- Follow G2/61 Waste Management Plan approved by DMF according DMF's Notification on waste management from petroleum industry (28 Feb 2013)
- Consider to use low toxic mud
- Discharge mud & cutting via a pipeline at 5 meters lower from seawater level for drilling after perforating pipe
- Solid control system available on selected rig to minimize discharge of mud to sea
- Control %OOC to be discharged to sea less than 12.5% and no direct SBM discharge to sea

Impact Assessment to Fisheries and Water Transportation

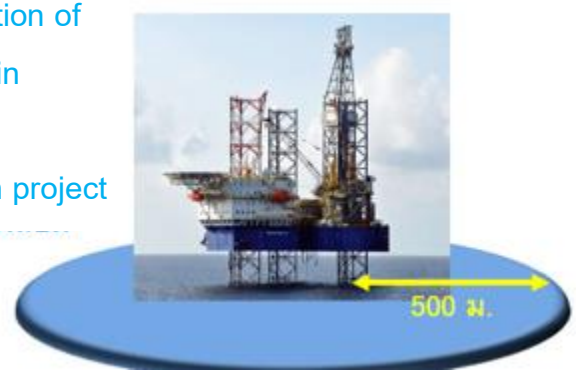
Project activities: Seismic Survey, Drilling Rig Installation, Wellhead platform Installation

- Before any installation, the stationary fisheries devices shall be transferred or removed from an area
- Limit 500 m. safety zone around drilling rig, wellhead platform and FSO2 area

may impact to

- Commercial fisheries and water transportation in project area

The operation of drilling rig in petroleum exploration project



Covering area of 0.8 km^2/location

The presenting of wellhead platform in petroleum production project

Covering area of 0.8 km^2/wellhead platform

- Cannot enter safety zone for fisheries (22 days)
- Commercial fisheries vessel who not use stationary fishing gear can avoid to fishing out of safety zone.
- Can return to fish in area once drilling rig move out from an area.

- Cannot enter safety zone for fisheries
- Commercial fisheries vessel who not use stationary fishing gear can avoid to fishing out of safety zone.

Mitigation Measure for Fisheries Activities

- Before any installation, project shall ensure there is no any fisheries device/gear locating in an area.
- If there is any lost to fisheries device/gear, project shall record the evidence for **proper and fair compensation.**
- Before mobilize the drilling rig into operation area, project shall notify to relevant agency at least 1 month
  - Engage DMF to notify to relevant agencies such as Hydrographic Department, Royal Thai Navy, Marine Department
  - Inform location and operation date to **relevant Fisheries Association**
- During well plug and abandonment, project shall cut casing around 5 m under seabed, **to avoid any structure left over seabed.**
- **Provide complaint channel** which may occur from project activities and communicate to stakeholder on how to inform any issue to project via provided channel.
- In case project receive complaint, project shall **review and response to complaint person as soon as possible**. If it is proven that its impact occur from project activities, project shall **fairly resolve and support** them including conduct root cause analysis to prevent the reoccurrence of the complaint.
- **Conduct CSR program to commercial fisheries in relevant province** such as the program of basic needs, education, environment and culture as PTTEP ED plan.

For Petroleum production project

- Meet and engage Head of Relevant Fisheries Association at least 1 time/year to gather any concerned issue or suggestion for further improvement operation of project.

Mitigation Measure for Water Transportation Activities

- Project shall compile with Energy Minitrial Regulation on “Define safty zones and signs in the area where there are installations and equipment used in petroleum exploration and production B.E. 2555”
  - Define saft zone 500 m. around offshore structure of project and shall warn to anyone who enter close to safety zone
  - Install any lamp at offshore structure to see it clearly such as drilling rig, wellhead platform, central processing platform and FSO
- To move vessel in-out of from petroleum support based, project shall compile with Marine Department Regulation on “Criteria, control and request for government pilot service in port area, Songkhla province B.E. 2541”

Communication Channel

Project Owner

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