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**Extractive Industries and Sustainable Job Creation**

**Environmental Management in Sudan oil & Gas Industry**

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The views expressed are those of the author and do not necessarily reflect  
the views of UNCTAD.



**Republic of Sudan**  
**Ministry of Petroleum & Gas**  
**General Directorate of Environment and Safety**  
**(GDES)**

**Environmental Management**  
**in Sudan oil & Gas Industry**

Presented by :

Mustafa Abdalla Abuagla



Cubic Globe



# Outline

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## 1. Introduction

## 2. Potential environmental impacts

## 3. Environmental Management

### 3.1 Regulatory framework

### 3.2 Environmental Mitigations measures.

### 3.3 Efforts of GDES

## 4.Reputation

## 5.Case study ( **Heglig field operations**)

## 6- Potential Way forward.



# Introduction

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- Oil and Gas industry comprise:-
  - Upstream
  - Downstream
- Significant impacts are expected as a result of these activities .

## Social & Environmental Impacts



# GDES Responsibilities

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- Planning & Policy Development and Formulation of Rules and Regulations.
- Undertaking of monitoring & evaluation programs.
- Promotion of use of Appropriate Operational Practices.
- Carries out periodic safety audits, reviews, and suggests procedures for improvements.



## Cont.

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- Raising environmental public awareness.
- Fostering research and partnership with civil communities' organizations.
- Participation on national environmental programs.



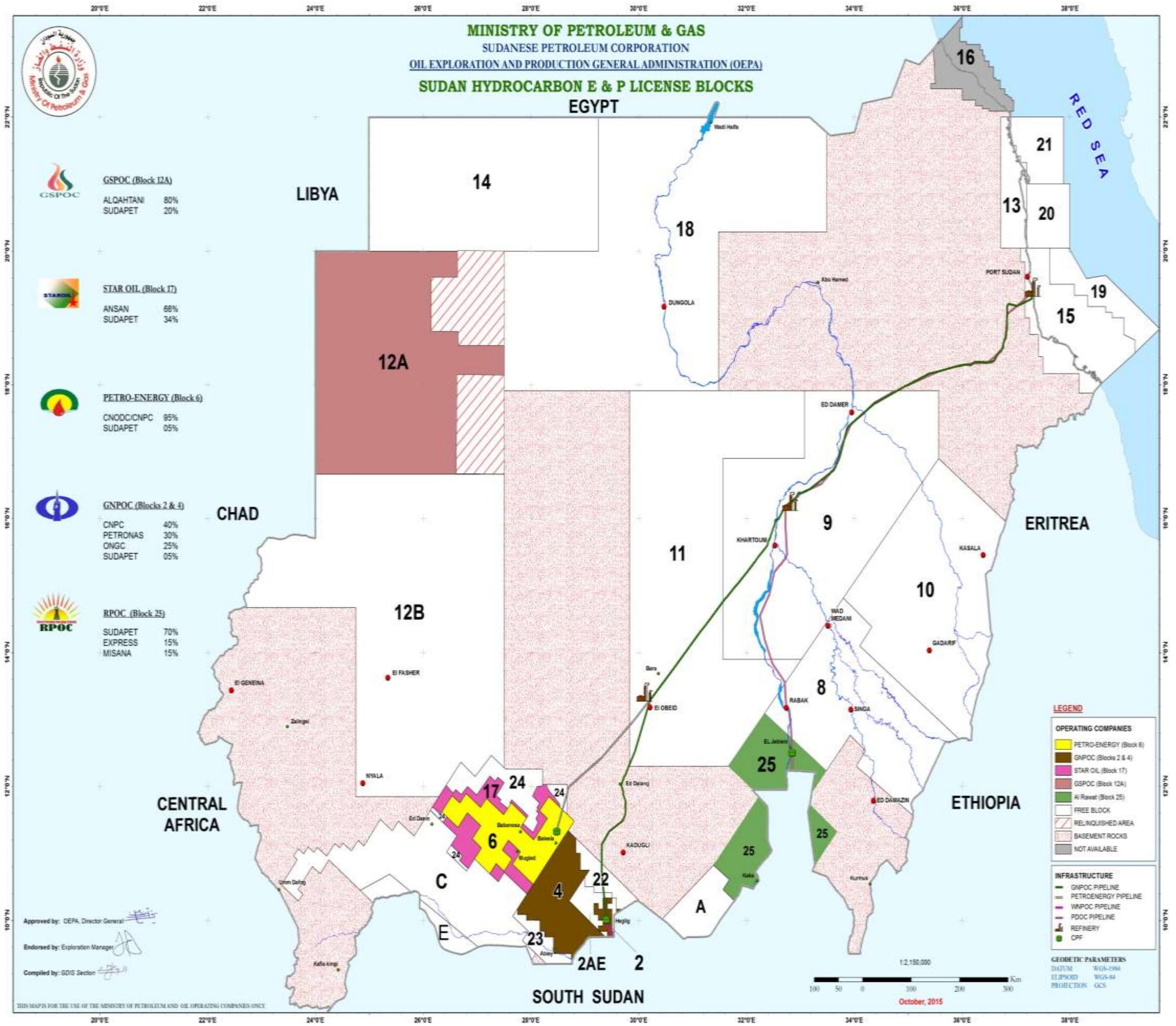
# Oil & Gas Activities in Sudan

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- Locations
- Nature & climate
- Fauna & flora



**MINISTRY OF PETROLEUM & GAS**  
**SUDANESE PETROLEUM CORPORATION**  
**OIL EXPLORATION AND PRODUCTION GENERAL ADMINISTRATION (OEPA)**  
**SUDAN HYDROCARBON E & P LICENSE BLOCKS**



**GSPOC (Block 12A)**  
 ALOHTANI 80%  
 SUDAPET 20%

**STAR OIL (Block 17)**  
 ANSAN 66%  
 SUDAPET 34%

**PETRO-ENERGY (Block 6)**  
 CNODC/CNPC 95%  
 SUDAPET 05%

**GNPOC (Blocks 2 & 4)**  
 CNPC 40%  
 PETRONAS 30%  
 ONGC 25%  
 SUDAPET 05%

**RPOC (Block 25)**  
 SUDAPET 70%  
 EXPRESS 15%  
 MISANA 15%

**LEGEND**

**OPERATING COMPANIES**

- PETRO-ENERGY (Block 6)
- GNPOC (Blocks 2 & 4)
- STAR OIL (Block 17)
- GSPOC (Block 12A)
- Al Rawaf (Block 25)
- FREE BLOCK
- RELINQUISHED AREA
- BASEMENT ROCKS
- NOT AVAILABLE

**INFRASTRUCTURE**

- GNPOC PIPELINE
- PETROENERGY PIPELINE
- WNPCC PIPELINE
- POOC PIPELINE
- REFINERY
- CPF

**GEOMETRIC PARAMETERS**  
 DATUM WGS-1984  
 ELIPSOID WGS-84  
 PROJECTION GCS

Approved by: OEPA, Director General  
 Endorsed by: Exploration Manager  
 Compiled by: GD/G Section



THIS MAP IS FOR THE USE OF THE MINISTRY OF PETROLEUM AND OIL OPERATING COMPANIES ONLY



## 2. Potential Environmental Impacts.

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- ***Human, Socio-Economic and Cultural Impacts:***

Changes in traditional lifestyle of indigenous people i.e.,

- ***Atmospheric Impacts :***

Principal pollutants:  $\text{CO}_2$ ,  $\text{CO}$ ,  $\text{CH}_4$ ,  $\text{VOC}$ ,  $\text{NO}_x$ ,  $\text{SO}_x$  and  $\text{H}_2\text{S}$ .

The volumes of atmospheric emissions and their potential impact depend upon the nature of the process under consideration.



# Cont.

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- ***Aquatic Impacts:***

- **Produced water, Process, wash and drainage water, Sewerage etc.**
- **The **high PH** and salt content of certain drilling fluids and cuttings.**



# Cont.

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- ***Terrestrial Impacts:***

**Impacts to flora and fauna .**

**Constructions disturbance Contaminations to soil**

- ***Ecosystem Impacts:***

**- Plant and animals communities.**



## 3. Environmental Management in Sudan's oil industry

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### *3.1 Regulatory Framework:*

- urge environment conservation and promotion.
- Penalize the acts which causes any sort of Pollution to natural resources or the cause of imbalance .
- Serve restitution of any damage to the environment and natural resources.
- Encourages sustainable development.



# Acts and Legislations

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- ***The Environmental Protection Act 2001:***

framework law for policy and harmonization of the multidisciplinary efforts in the field of management of the environment and natural resources to achieve sustainable development.

- ***Sudanese Petroleum Corporation Regulations, 2002:***

The regulations for Protection of the Environment in Petroleum industry, was established basing on exercising article 35 of the Petroleum Resources Act 1998.



# Acts and Legislations

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- ***Sudanese Oil Standards:***

Issued by Sundaes Standardization Metrological Organization(SSMO)

- **Cover:**

- Air pollution limits
- Water pollution limits
- Soil pollution limits
- Noise pollution



# Maximum Limits for Gas Emissions Resulting from Oil Refineries (SSMO).

NO	Pollutant	Code	Oil refineries Maximum level (mg/m <sup>3</sup> )
1	Volatile Organic Compounds	VOC	20
2	Sulfur oxides	SO <sub>x</sub>	500
3	Nitrogen oxides	No <sub>x</sub>	450
4	Hydrogen sulfides	H <sub>2</sub> S	10
5	Ammonia	NH <sub>3</sub>	15
6	Carbon monoxide	CO	500
7	Suspended particulates	PM	50
8	Aldehydes	CHO	20
9	Benzene	C <sub>6</sub> H <sub>6</sub>	-
10	Hydrogen chloride	HCL	-
11	Finyle chloride	C <sub>2</sub> H <sub>3</sub> CL	-
12	Thli ethane chloride	C <sub>2</sub> H <sub>4</sub> CL <sub>2</sub>	-



# Acts and Legislations

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- *Other relevant regulations:*
  - *Labor Act 1667.*
  - *The Environmental Health Act 1975.*
  - *Atomic Energy Corporation Act 1996.*
  - *Petroleum Resources Act 1998.*
  - *Khartoum State environmental Health Act 1999.*
- *American Petroleum Institute (API)*



# International conventions

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- MARPOL 1973/1978.
- International Convention for the Prevention of Pollution from Ships. ( MARPOL ) - Annex IV (Optional): Sewage (London, 1978)
- MARPOL 1973/1979.
- International Convention for the Prevention of Pollution from Ships ( MARPOL ) - Annex V (Optional) = Garbage (London, 1973)
- VIENNA 1994.
- Convention on Nuclear Safety (Vienna, 1994).
- UNEP 1992.
- United Nations Framework Convention on Climate Change (New York, 1992) .
- MONTREAL 1987 .
- Protocol on Substances that Deplete the Ozone Layer (Montreal, 1987) .
- MONTREAL 1987 Amendment.
- Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer (Copenhagen, 1992) .
- MONTREAL 1987 Amendment.



## 3-2 Environmental Mitigation measures in Sudan oil industry

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- These guidelines and regulations obligate the operators to :-
  - Submit EIA.
  - Establish well equipped Environmental occupational and safety units (HSE).

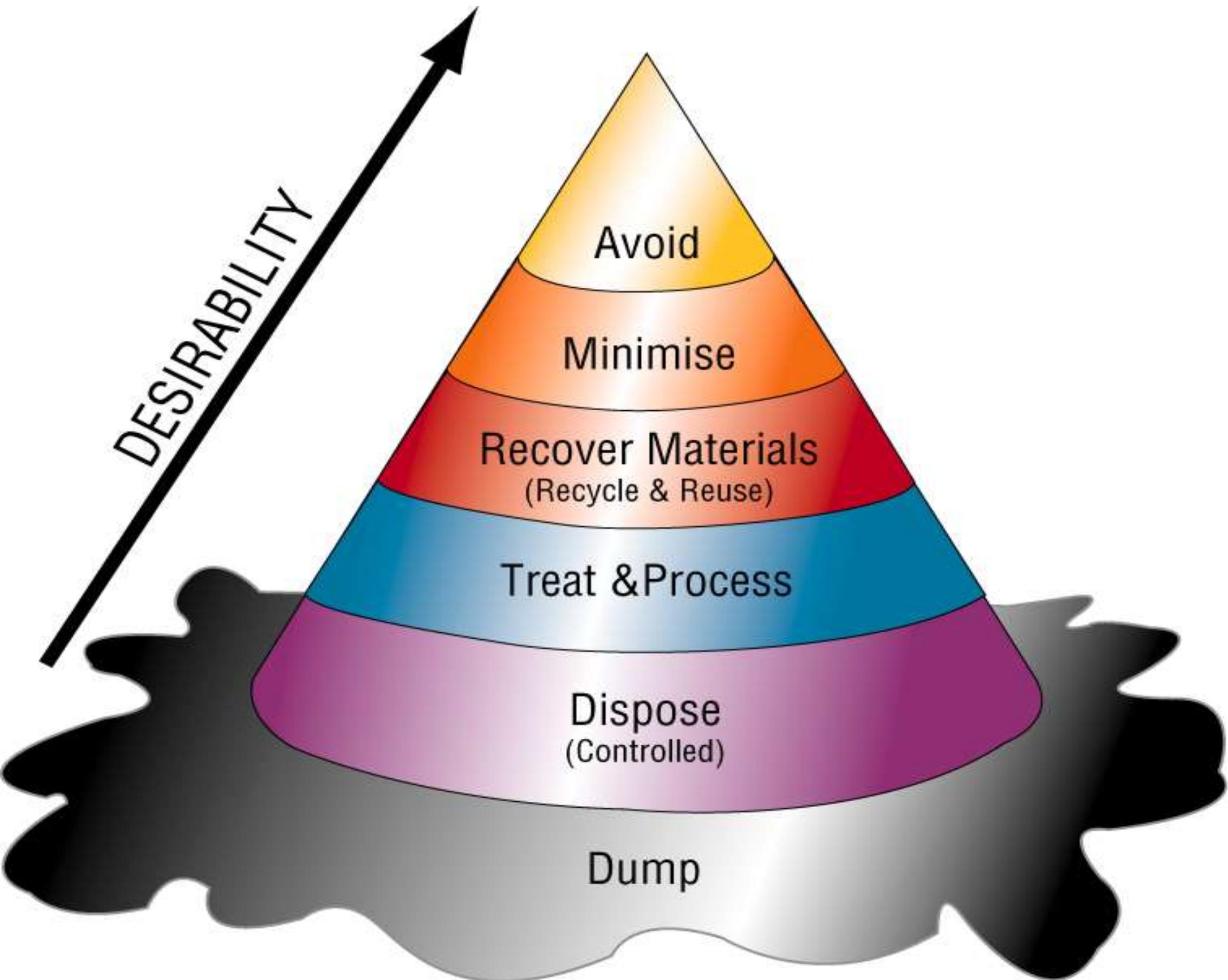


## Cont. Mitigation Measures

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- Sustain water quality.
- Air quality monitoring.
- Vegetation cover.
- Wildlife and grazing animals.
- Ground water.

# Waste hierarchy





## 3-3 GDES Efforts

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### ***1-GDES Manuals and Guidelines:***

- HSE manual Sudan oil industry.
- HSE program
- HSE general guidelines
- HSE engineering standards
- HSE evaluation program
- Emergency response plan.



## Cont .Waste Management

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- Oil industry in Sudan has developed over 15-20 years.
  - Produced water.
  - Drilling waste.
  - Associated wastes.
  - Industrial wastes.
- The current industry waste(legacy and operational) in Sudan (SLR inventory).



# Cont .GDES Effort

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## 3- Sea transport Oil Spill risk

- sources :
  - loading of the ships .
  - navigation of the loaded ships .
- Oil spill response scales:
  - tire 1
  - tire 2
  - Tire3
- Oil spill response station



## Cont. GDES Efforts

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4- GDES making continuous monitoring with:

- Regular visits.
- Auditing.
- Awareness programs.

## 4-Reputation Allegations of some NGOs Media

**Times  
LIVE**



Oil pipe in Heglig, Sudan

### South Sudan threatens tough laws against oil industry

Nov 26, 2010 11:11 AM / By Sapa-AFP

South Sudan officials are concerned at the environmental damage being caused by the oil industry and are promising a tough new line if the oil-rich region gains independence next year.

Before heading out into the field to inspect three installations operated by the mostly foreign-owned **Greater Nile Petroleum Operating Co. (GNPOC)**, a company executive said "we respect the environment."

But on site, north of the state capital Bentiu, among vast marshlands and plains, Garjang Gieng was not happy with what he saw.

At Al Nar, discarded containers were leaking oil into an adjacent marsh.

**BBC  
NEWS**



Sudan White Nile Marshes: Water pollution by oil production around oilfields in South Sudan

### Oil 'polluting South Sudan water'

By Peter Greste /BBC News, East Africa correspondent

- A German aid agency has accused an oil consortium in southern Sudan of contaminating water supplies, affecting at least 300,000 people in Unity State.
- The group, Sign of Hope, said tests found life-threatening metals in wells near two major oil fields.
- It said it had passed the findings to the government and the consortium.
- **The White Nile Petroleum Operating Company (WNPOC)** says protecting water quality is a priority and it has built a water treatment plant for the community.
- But it could not be reached to comment directly on the allegations.



## 5- Case study- Higlig

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### The produced water :

- Not presenting direct harm to the environment.
- Discharged to the bioremediation system.
- B.S. projects consist of six lagoons, reed beds, channels.
- Out to the forestry area (625+900).



# Case study- Higlig

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- The International standard of discharged produced water is **10 ppm** while the Sudanese National standard is **7 ppm**; and the achieved readings after outlet of the last ponds outlets are between **0.00** and **1.1** in all facilities. The Bioremediations outlet are **Zero PPM**.
- All FPF and CPF were certified with **ISO14001**; it implementing the Environmental Management System with following the standard under accreditation international body (BVQI).





# Potential Way-forward

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- Eliminate impact of oil operational activities with zero effect to Ecosystem Impacts , Impacts to flora and fauna Atmospheric Impacts or potential environmental impact.
- Waste management in Sudan's Oil Industry .  
Legacy & ongoing operational .
- Increase of environmental Awareness .
- Comply with international standards and best practice techniques.

