Impacts and business case for mitigation

Module 1b

Learning objectives

- Increase awareness of the need to **manage the impacts of oil & gas development in areas of biodiversity value** to ensure their values are maintained or enhanced;
- Understand **spatial planning approaches to avoid or mitigate impacts** from oil & gas development;
- Learn about **industry best practices on project-level impact mitigation**, drawing on case study examples and guidance materials from leading organisations; and
- Establish how to **integrate biodiversity management best practice approaches** into Mozambique's environmental (and social) impact assessment processes.

Content of Module 1b

Making the case for biodiversity and ecosystem services in the context of oil and gas

- Case-study: biodiversity and ecosystem service management in natural gas projects in Tanzania
- Key biodiversity and conservation concepts and national planning and management

Industry overview of the upstream oil and gas sector

- Putting the industry in a global context
- Industry value chain
- Biodiversity considerations in the industry

Country experience

Roundtable discussion on challenges and opportunities for developing oil & gas in country

Impacts on biodiversity and ecosystem services (BES) throughout the project life cycle

- Impact types
- Impacts across the project life-cycle

1.1 Making the case for biodiversity and ecosystem services in the context of oil and gas

Contents

Case-study: Natural gas projects in Tanzania

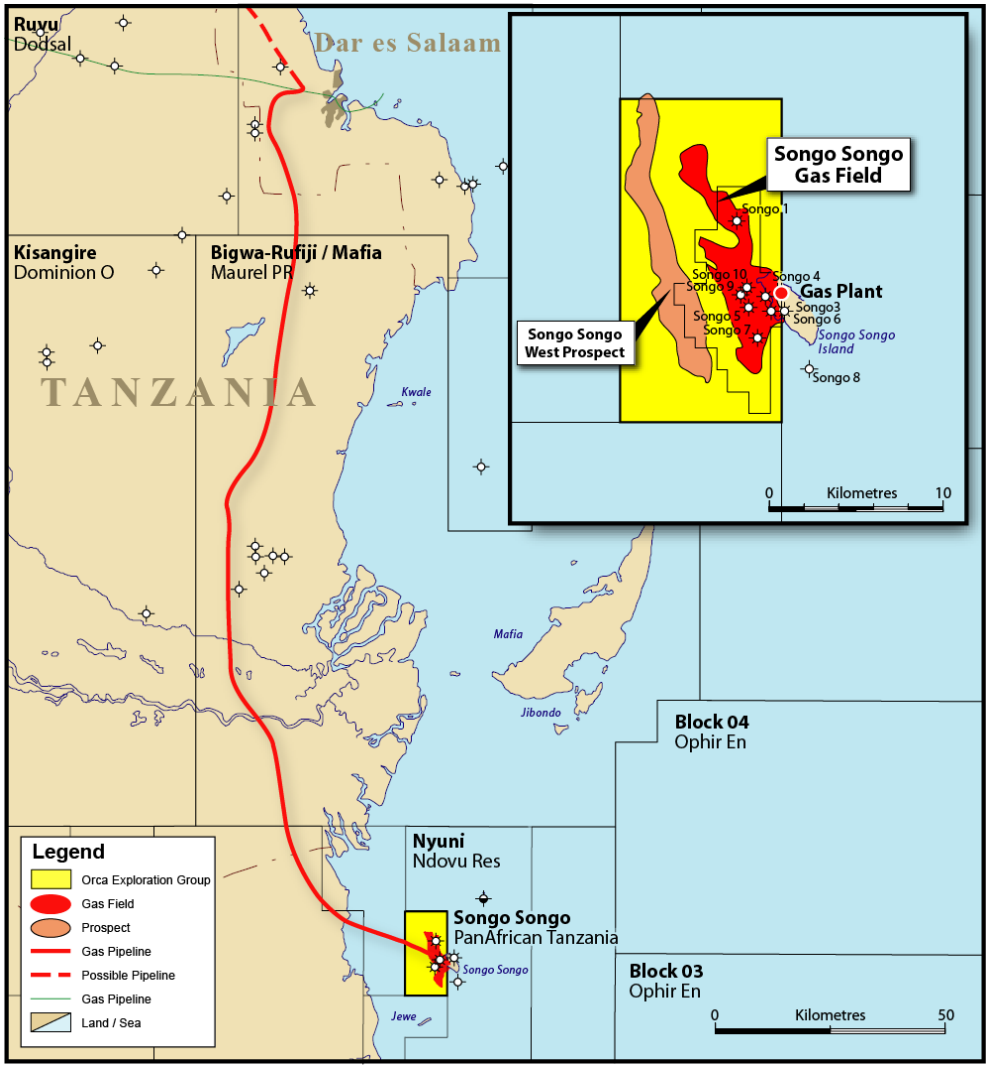
Key biodiversity and conservation concepts and national planning and management

Case-study: Natural gas projects in Tanzania

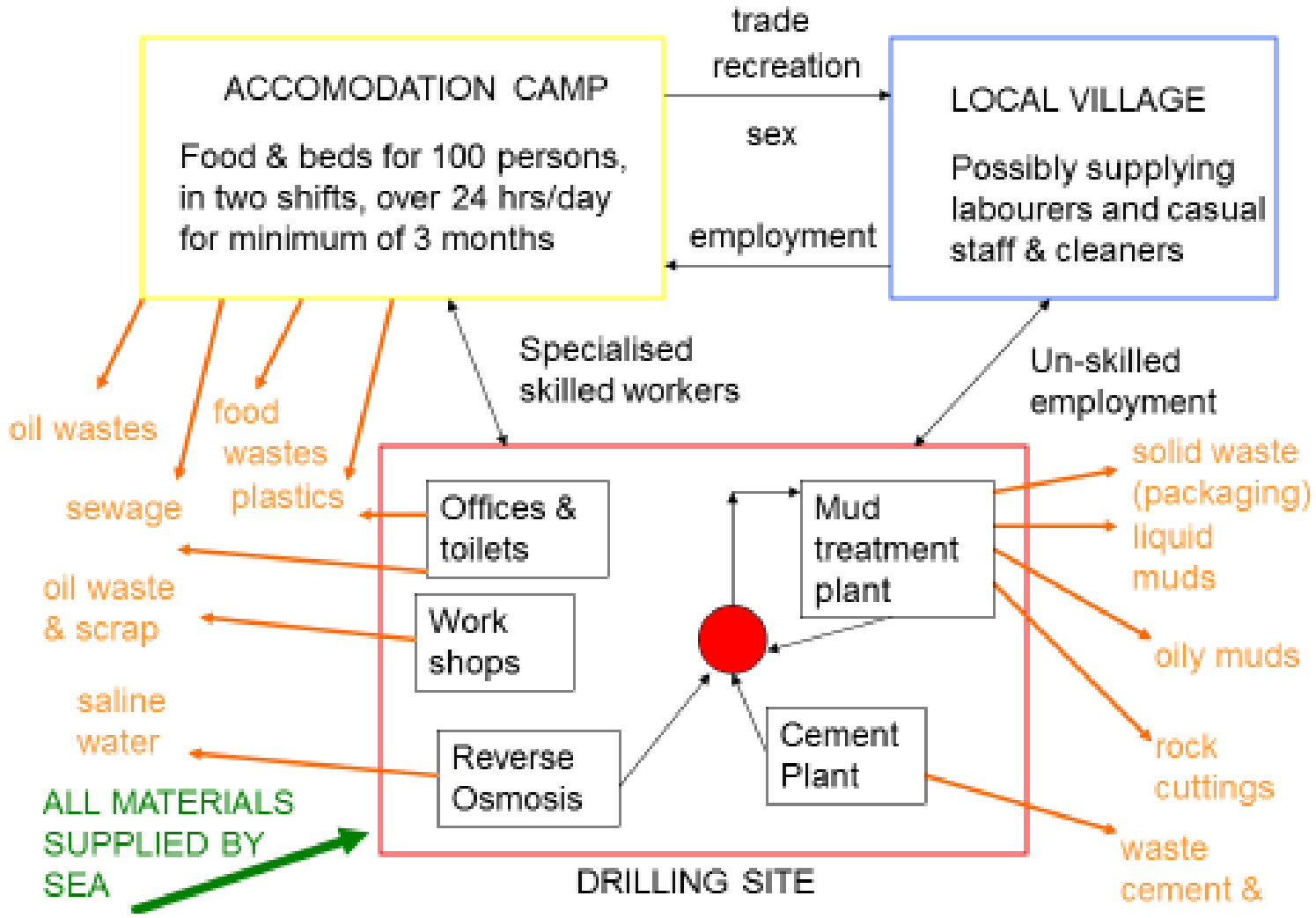
Photo credits: Ton Rulkens

Songo Songo Island gas fields

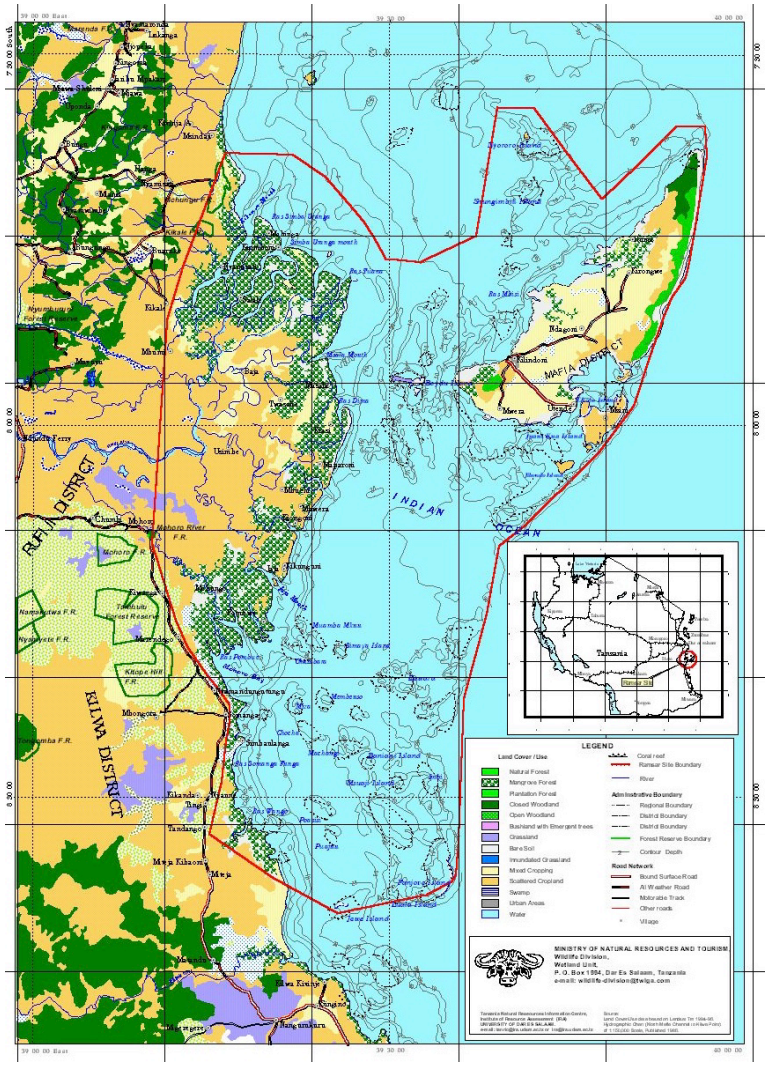
- Initially discovered in 1974
- Seismic survey conducted and 12 wells in total drilled on the license
- 7 wells are currently in use
- In 2004: first gas flowed from the field to Dar es Salaam through the Songas Facilities
- In 2016: Tanzania Government owned National Natural Gas Infrastructure (NNGI) facilities completed



Challenges with gas exploration on Songo Songo Island



Rufiji-Mafia-Kilwa Ramsar Site



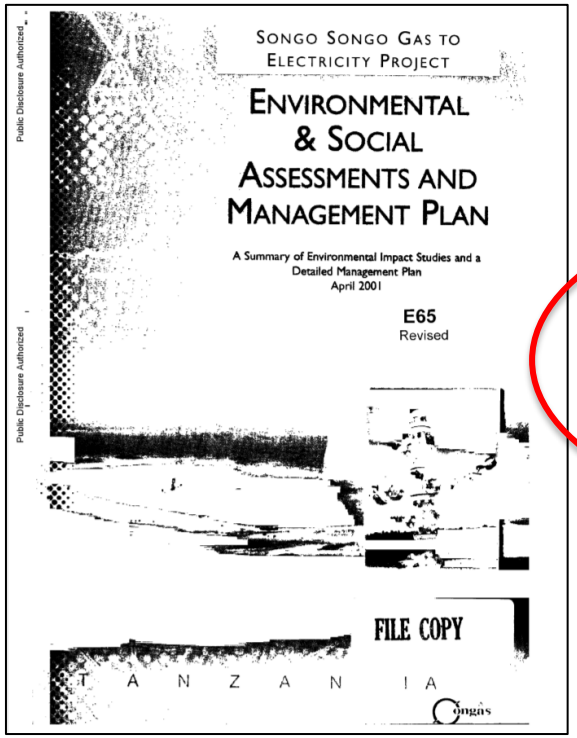
- Songo Songo Island is part of the Rufiji-Mafia-Kilwa Ramsar site, designated in 2006
- Ramsar sites are wetlands designated to be of international importance under the Ramsar Convention due to their biodiversity
- Parties to the Convention are expected to manage Ramsar sites to maintain its ecological integrity

The original Songo Songo Gas project, 2002

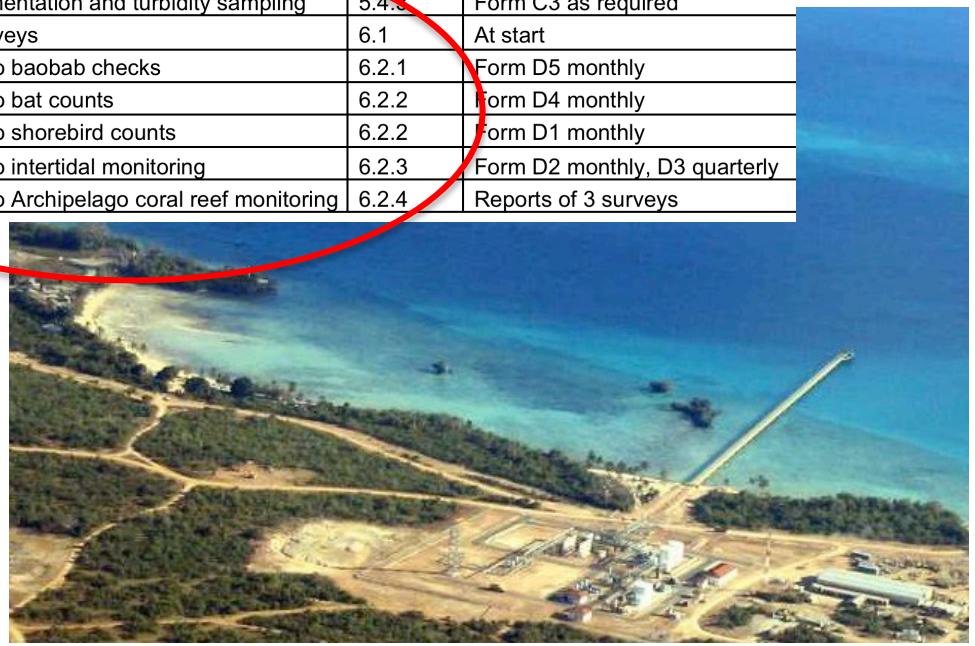
Main sequence of activities:

1. Legislative framework
2. Preliminary surveys and geological evaluations
3. Seismic surveys
4. Exploration drilling
5. Pipeline installation
6. Construction of gas processing plant and production
7. Well and infrastructure maintenance

Songas project's ESMP for construction



Monitoring activity	Chapter section	Implementation method
Prepare inventory of relevant legislation, etc.	4.4	As required
Production/review of environmental regulations	5.1	Monthly
Review Method Statements	5.2	As required
Construction Site Inspection Checklist	5.3	Form C1 monthly
Review Shipping Statements	5.2	As required
Inspection of sewage systems	5.3.4	Form B10 monthly
Vessel inspections	5.4	As required
Marine hydrocarbon sampling	5.4.2	At start
Marine sedimentation and turbidity sampling	5.4.2	Form C3 as required
Baseline surveys	6.1	At start
Songo Songo baobab checks	6.2.1	Form D5 monthly
Songo Songo bat counts	6.2.2	Form D4 monthly
Songo Songo shorebird counts	6.2.2	Form D1 monthly
Songo Songo intertidal monitoring	6.2.3	Form D2 monthly, D3 quarterly
Songo Songo Archipelago coral reef monitoring	6.2.4	Reports of 3 surveys



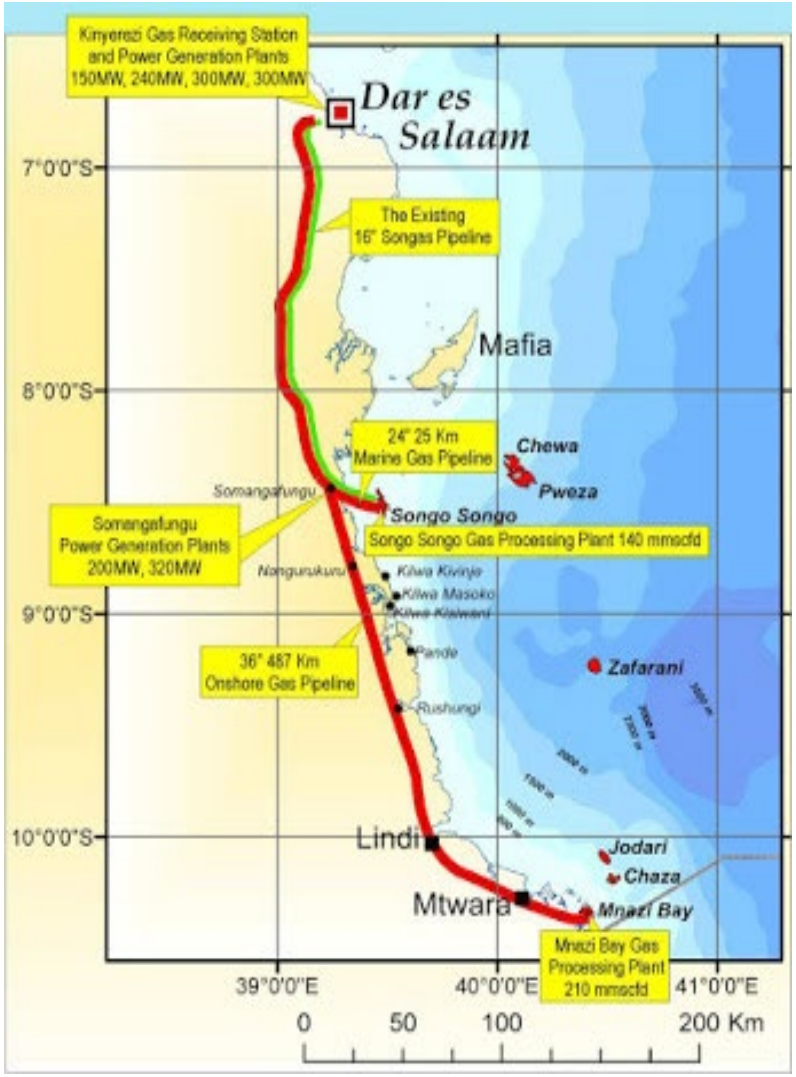
Songas project's ESMP for operation

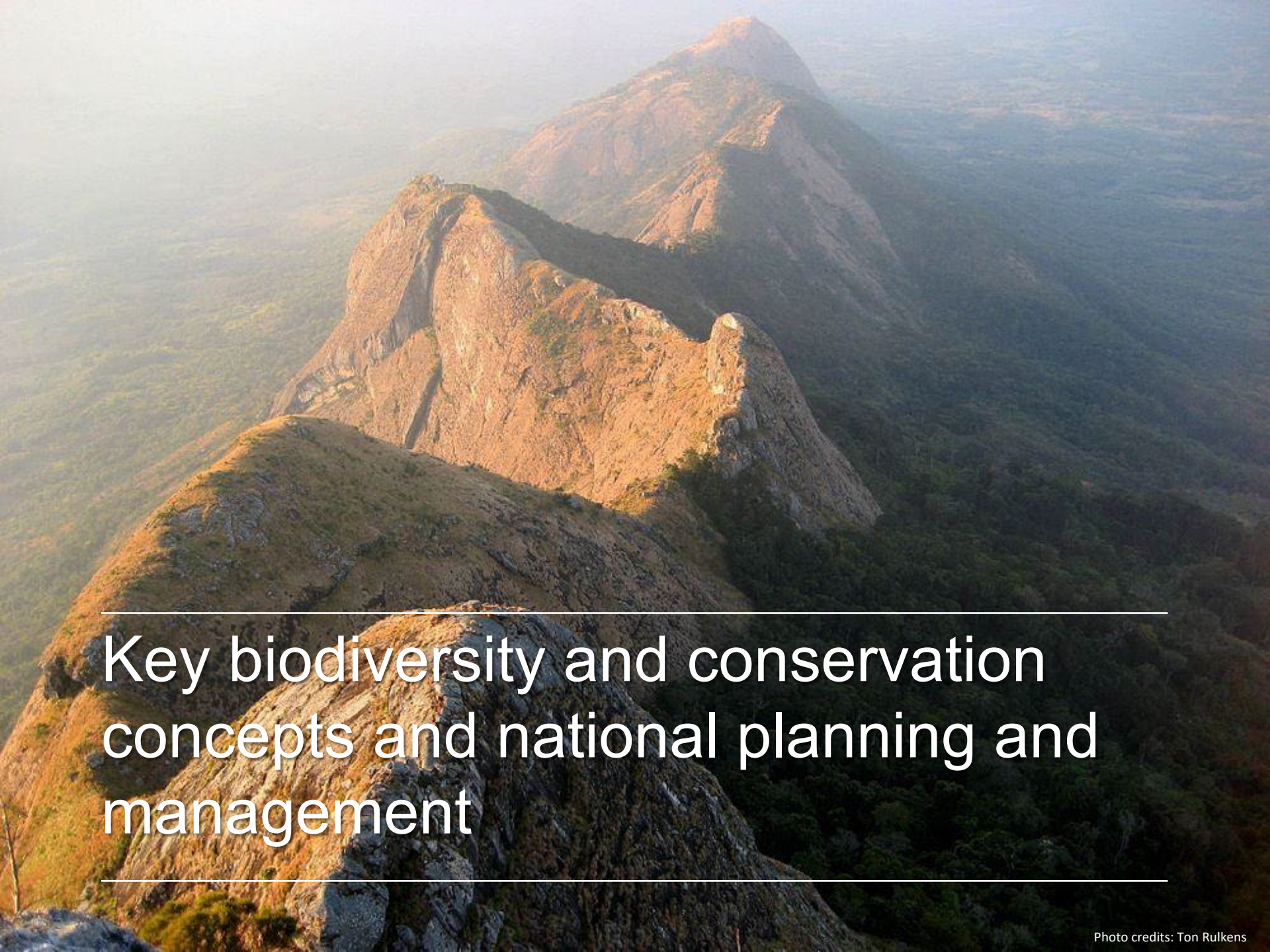
Environmental issues identified:

- Atmospheric emissions
- Marine discharges, especially produced water (PW)
- Noise generation
- Light emission
- Waste generation
- Non-renewable resources
- Accidental events

New SSI Gas Plant on Songo Songo Island

- In 2014-2016, new infrastructure was built by the Tanzania government
- US$1.2 billion project, with 95% financing from Exim Bank of China
- Environmental and Social Impact Assessment (ESIA) and ESMP were never published

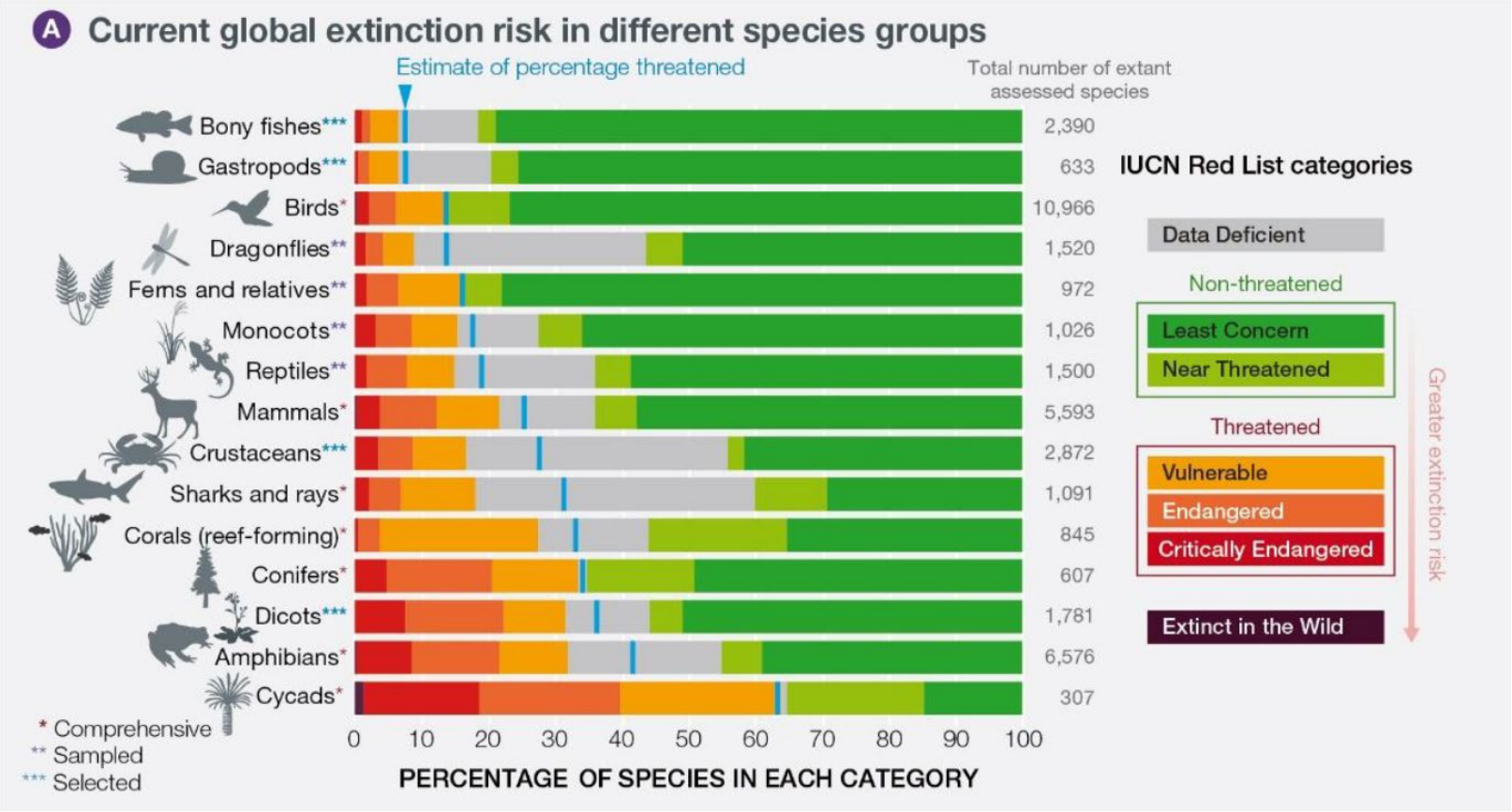




Key biodiversity and conservation concepts and national planning and management

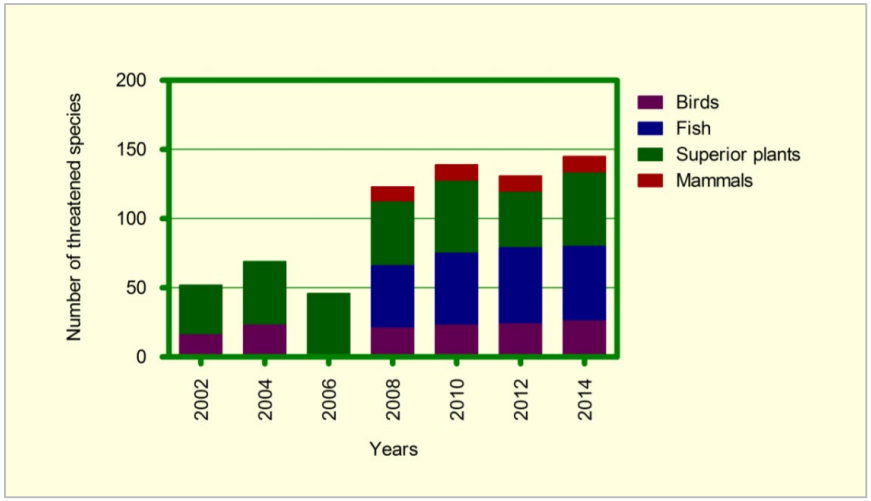
Photo credits: Ton Rulkens

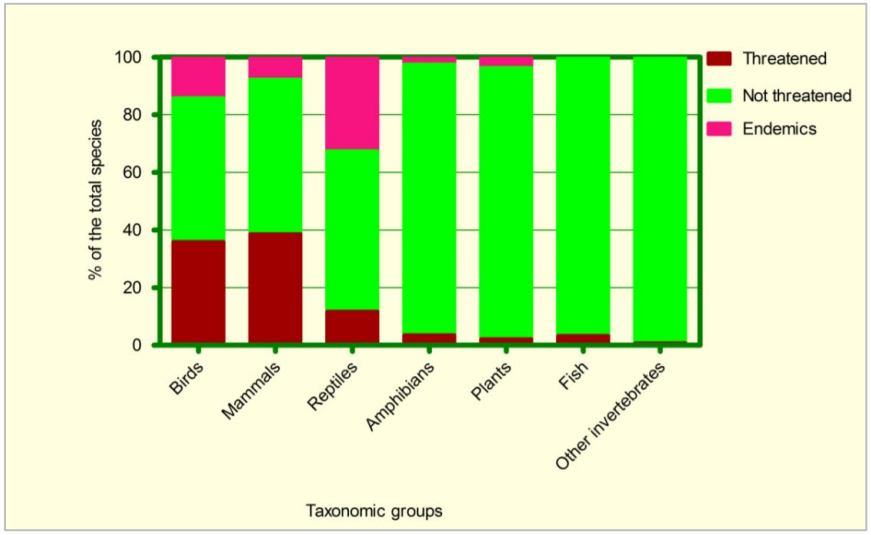
The state of biodiversity globally



Source: IPBES (2019)

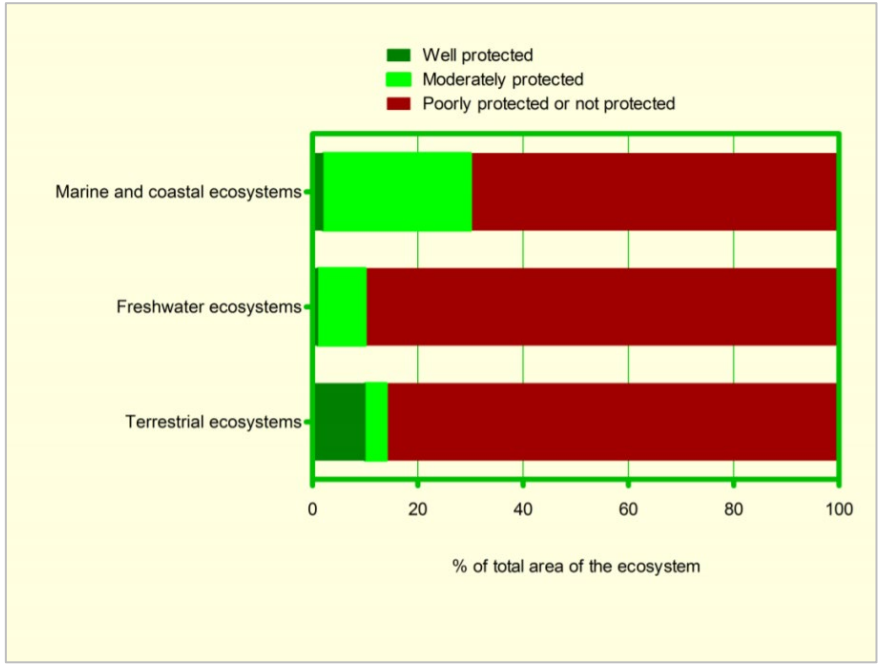
The state of biodiversity in Mozambique





"[…]increased degradation of biodiversity"

National Strategy and Action Plan of Biological Diversity of Mozambique 2015



Source: Ministry for the Coordination of Environmental Affairs, Mozambique *(2015)*

Key habitats in the Northern Mozambique Channel

- 2nd richest area in the world in terms of **coral reef biodiversity**
- Strategic **shipping** passage
- Rich **fishing** ground and reservoir for small-scale fishers

Source: UNEP-WCMC (2018) Global distribution of Coral Reefs

What are ecosystem services?

Benefits people obtain from ecosystems

(Millennium Ecosystem Assessment 2005)

Biodiversity underpins ecosystem services

Key conservation concepts and responses

Protected areas

- Areas which are afforded legal or other effective protection to achieve the long-term conservation of nature

Areas important for biodiversity

- Areas which are identified on the basis of biodiversity values, often using standardised assessment criteria

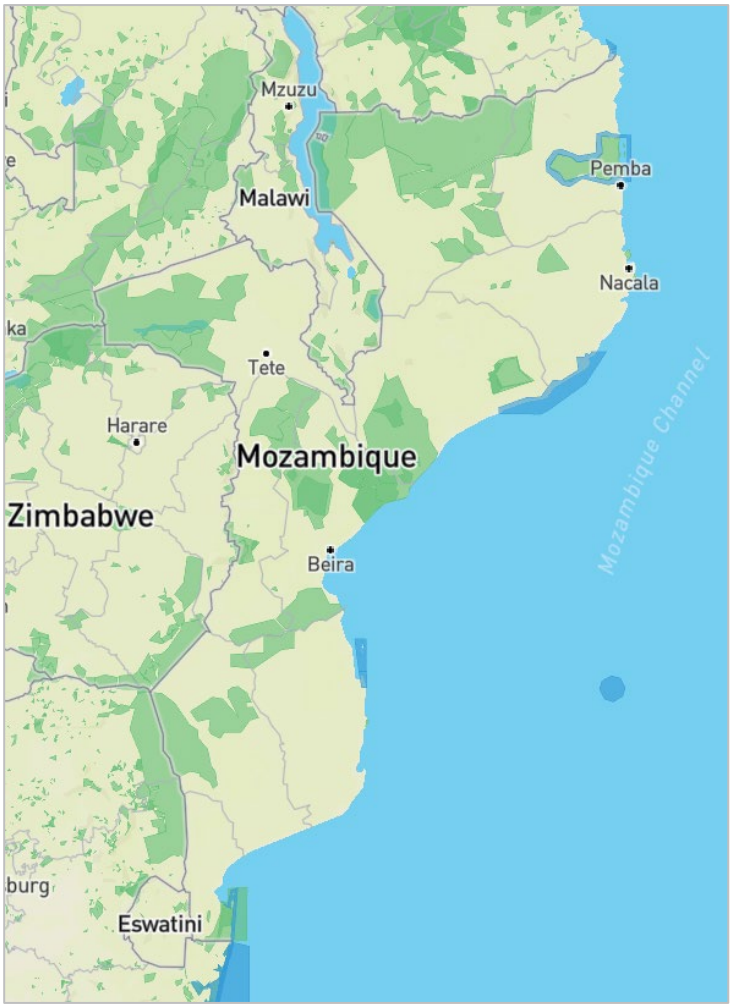
Protected areas in Mozambique

Key features

- Ability to delineate
- Managed for nature conservation

Legal or effective means

- National law
- International conventions and agreements
- Customary law or land tenure

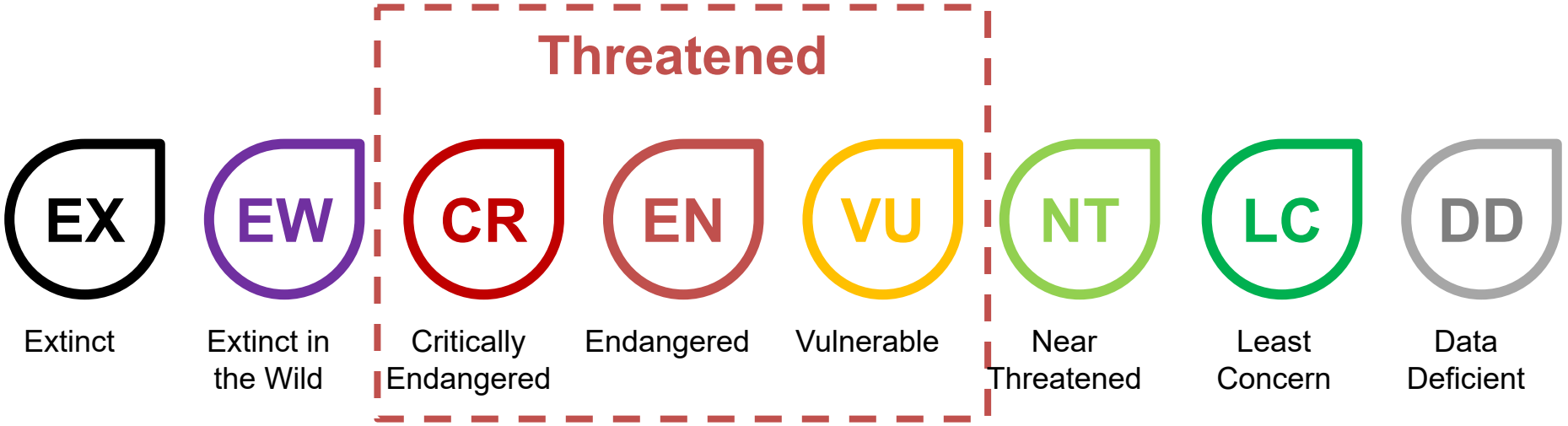


Source: IBAT, 2021

Beyond protected areas

Globally, 20% threatened species occur outside of protected areas

(Rodrigues et al 2004)



It is also important to consider **how unique or irreplaceable** a species or ecosystem is

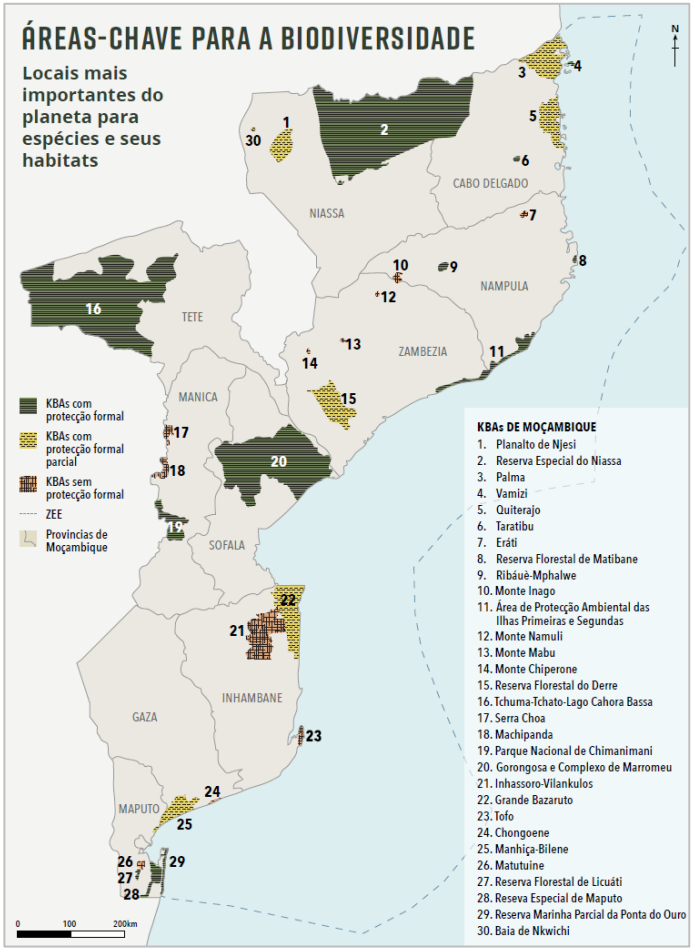
Source: UNEP-WCMC, 2020

What are Key Biodiversity Areas?

Sites contributing significantly to the **global persistence of biodiversity**

(IUCN 2016)

- 24 KBAs are currently recorded in the World Database of KBAs for Mozambique
- Additional KBA sites identied through recent national assessment



Source: wcs Mozambique, 2021

Multilateral Environmental Agreements

Convention on Biological Diversity

- Aichi Target 11 on land and water
- Decision on mainstreaming biodiversity into the energy and mining sectors

UNESCO World Heritage Convention

- Clear position that mineral, oil and gas exploration or exploitation is incompatible with World Heritage status

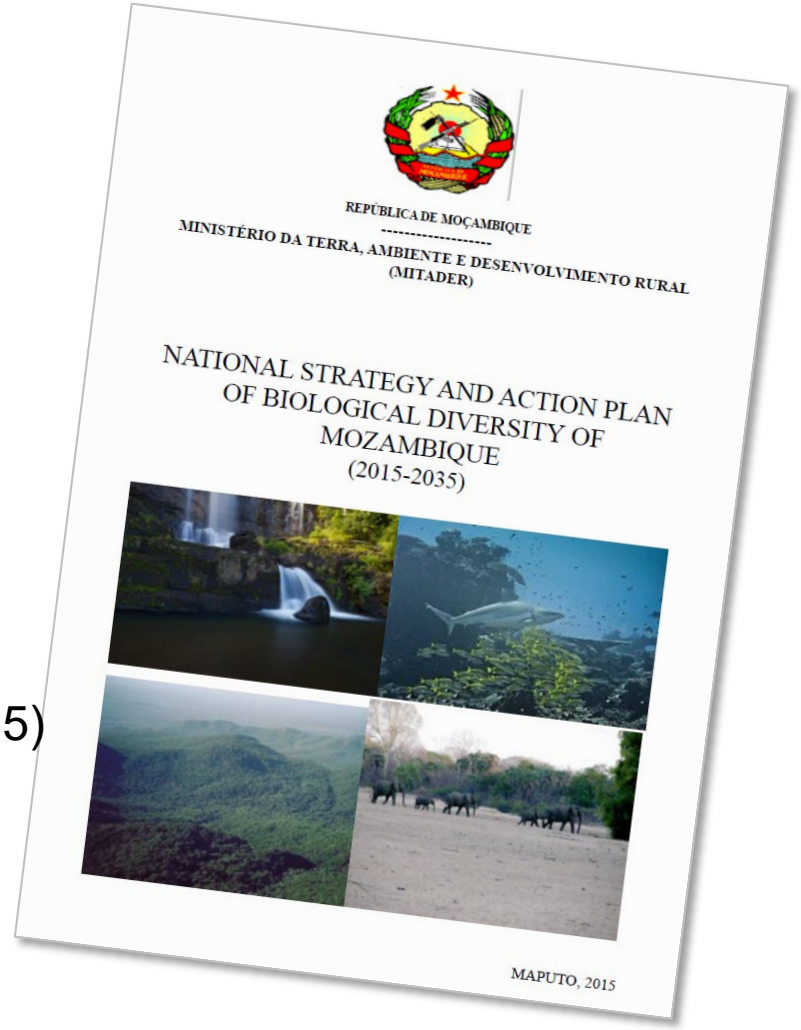
Ramsar Wetland Convention

- Adequate wetland inventory and baseline information in supporting decision-making and permitting procedures related to extractive industries
- Emphasize importance of SEA, particularly in extractive industries

National targets and commitments

"In 2035, the ecological, socio-economic and cultural value of biodiversity in Mozambique will **contribute directly to improving the quality of life** of Mozambicans, derived from its **integrated management**, **conservation** and **fair and equitable utilization**."

(National Strategy and Action Plan of Biological Diversity of Mozambique 2015)



Ecosystems Approach

A strategy for the **integrated management of land, water and living resources** that promotes **conservation** and **sustainable use** in an equitable way

(Convention on Biological Diversity 2000)

Key themes:

- Conservation
- Systems thinking
- Spatial scale
- Sustainable development
- Human interaction

Biodiversity in ESIAs and SEAs

Environmental and Social Impact Assessments (ESIAs) and **Strategic Environmental Assessments** (SEAs) are key components of an integrated management approach

ESIAs need to **consider biodiversity**, including mechanisms for compensation to prevent and mitigate impacts from development projects.

Simultaneously, SEAs **ensure compliance** with existing policies, plans and instruments.

(National Strategy and Action Plan of Biological Diversity of Mozambique 2015)


REPÚBLICA DE MOÇAMBIQUE

Terça-feira, 29 de Dezembro de 1998 — I SÉRIE – Número 51

BOLETIM DA REPÚBLICA

PUBLICAÇÃO OFICIAL DA REPÚBLICA DE MOÇAMBIQUE

3º SUPLEMENTO

SUMÁRIO

Conselho de Ministros:

Decreto nº 76/98:
Aprova o Regulamento sobre o Processo de Avaliação do Impacto Ambiental.

Decreto nº 77/98:
Aprova o Regulamento da Cobrança, do Pagamento e do Reembolso do Imposto sobre o Valor Acrescentado.

Decreto nº 78/98:
Aprova o Regime Especial do Imposto sobre o Valor Acrescentado aplicável às agências de viagens e organizadores de circuitos turísticos.

Decreto nº 79/98:
Aprova o Regime Especial do Imposto sobre o Valor Acrescentado aplicável às transmissões de bens em segunda mão efectuadas por sujeitos passivos revendedores e por organizadores de vendas em sistema de leilão.

Resolução nº 61/98:
Ratifica o Acordo de Donativo celebrado entre o Governo da República de Moçambique e a Associação Internacional de Desenvolvimento assinado em Washington D.C. — Estados Unidos da América — no dia 21 de Dezembro de 1998, no montante de SRD 109 500 000 (cento e nove milhões e quinhentos mil Direitos Especiais de Saque), destinado ao financiamento da "Economic Management Reform Operation (EMRO)."

CONSELHO DE MINISTROS

Decreto nº 76/98
de 29 de Dezembro

O processo de avaliação do impacto ambiental nas suas diferentes formas e fases é o instrumento de política e gestão ambiental apropriado para antever as possíveis consequências para o ambiente e para a comunidade na adopção de uma determinada política ou aprovação de um empreendimento.

A Lei n.º 20/97, de 1 de Outubro, estabelece o regime do licenciamento ambiental com base no processo de avaliação do impacto sobre o ambiente, de empreendimentos ou de actividade de determinado vulto e ou natureza, remetendo a sua normação para regulamento específico.

Assim, nos termos do artigo 33 da Lei n.º 20/97, de 1 de Outubro, o Conselho de Ministros decreta:

Único. É aprovado o Regulamento sobre o Processo de Avaliação do Impacto Ambiental, em anexo, que é parte integrante deste decreto.

Aprovado pelo Conselho de Ministros.

Publique-se.

O Primeiro-Ministro, *Pascoal Manuel Mocumbi.*

Regulamento sobre o Processo de Avaliação do Impacto Ambiental

CAPÍTULO I
Disposições gerais

ARTIGO 1
Definições

Para efeitos do presente regulamento:

a) *Área de Influência:* é a área e o espaço geográfico directa ou indirectamente afectados pelos impactos ambientais de uma actividade.

b) *Comunidade:* é um grupo de pessoas situadas na área de influência de uma actividade proposta, e que não se circunscrevem, necessariamente, a uma aldeia ou a um distrito.

c) *Consulta pública:* é o processo de auscultação do parecer dos diversos sectores da sociedade civil, incluindo pessoas colectivas ou singulares, directa ou indirecta ou potencialmente afectadas pela actividade proposta.

ION PLAN
Y OF

MAPUTO, 2015

Key messages

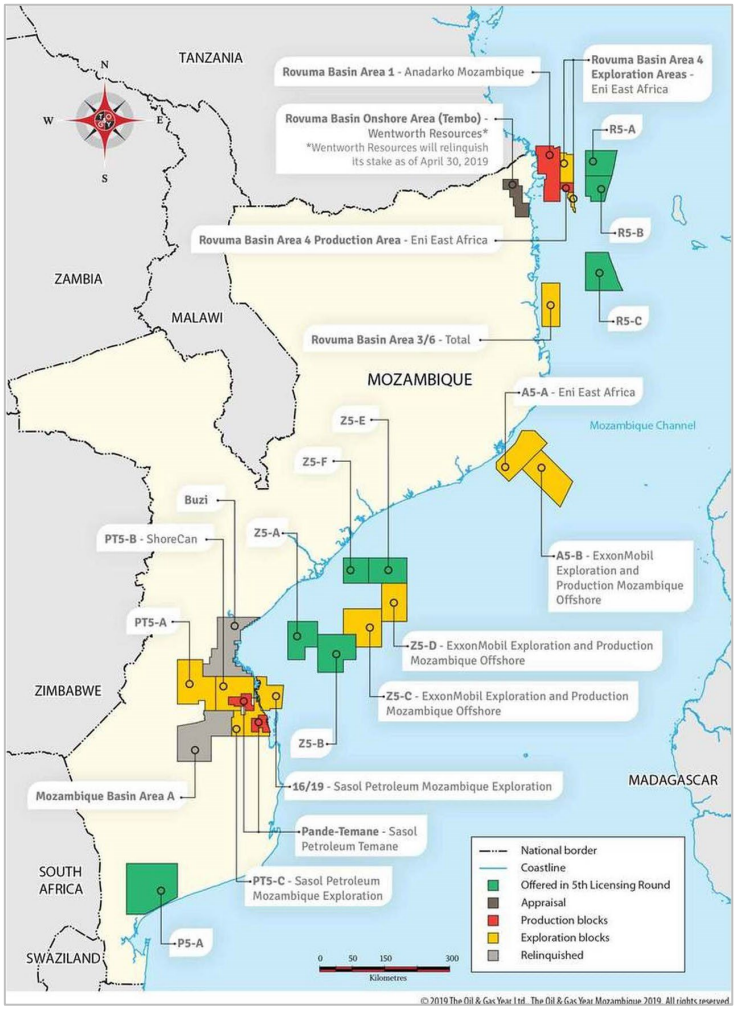
- Biodiversity forms the basis of ecosystems and underpins ecosystem services
- Protected areas are one of the cornerstones of in situ conservation – but significant biodiversity values exist outside protected areas
- Key Biodiversity Areas are always identified based on known biodiversity values – many are not protected
- The ecosystem approach can enable sustainable development that conserves biodiversity through integrated management of land, water and living resources
- ESIAs SEAs need to consider biodiversity and are key components of an integrated management approach

1.2 Industry overview of the upstream oil and gas sector

Contents

Oil & Gas projects in Mozambique

- In 2021, there are several active O&G concessions
- Many of them are located on offshore gas fields

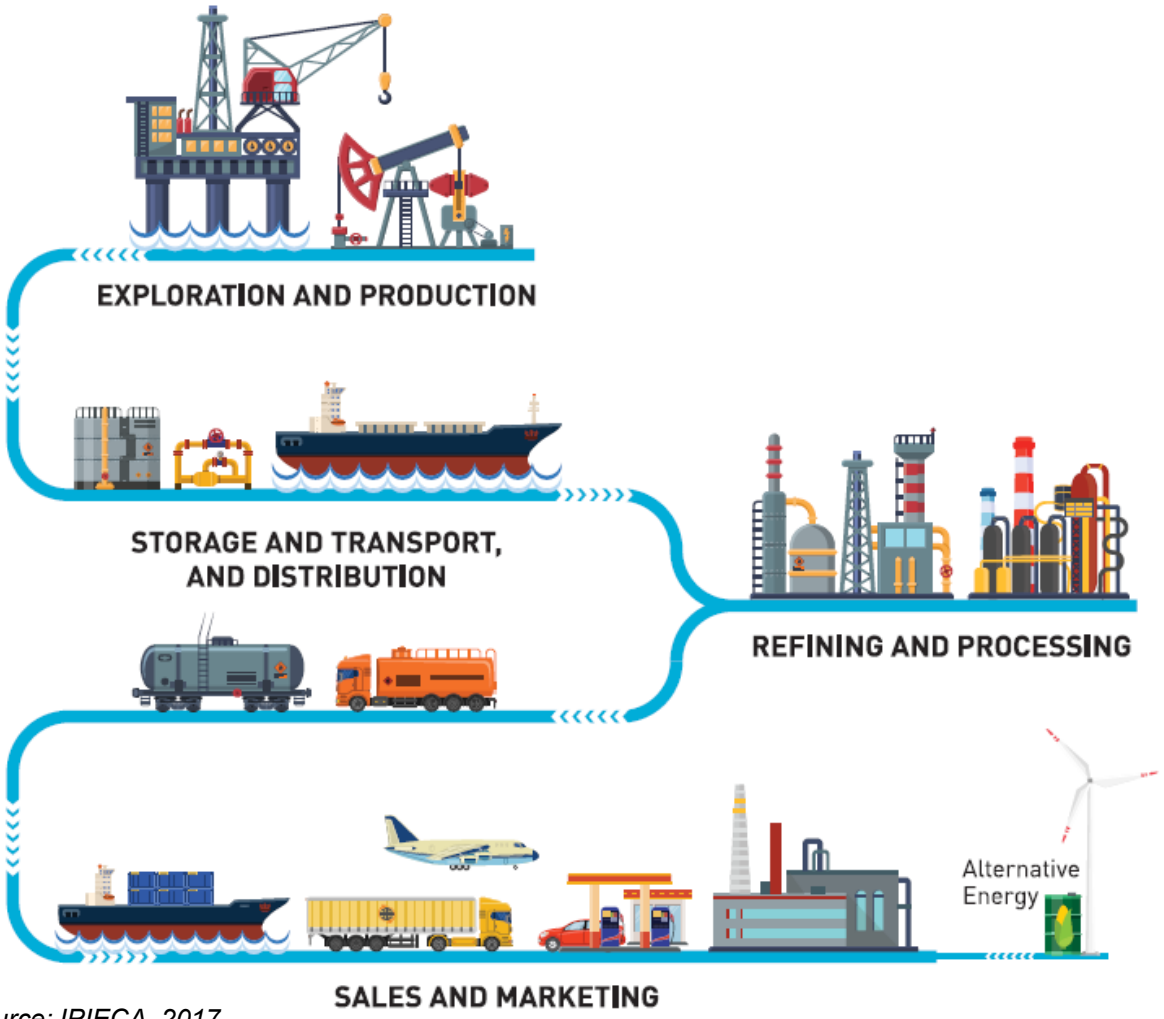


Source: The Energy Year (2019)

Industry value chain and life cycle

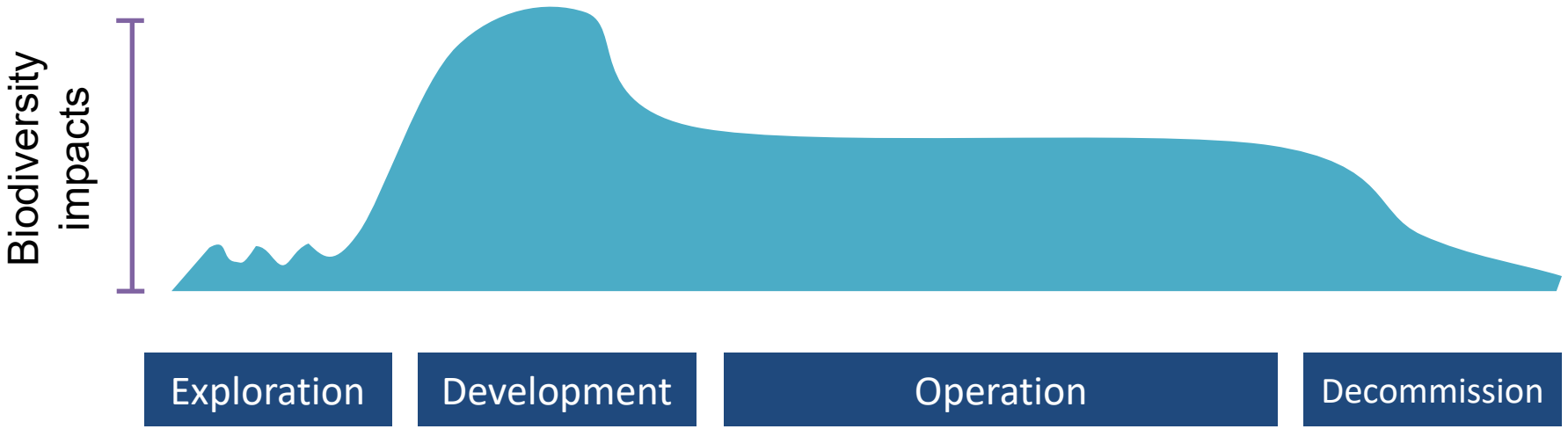
Photo credits: Ton Rulkens

Value chain



Source: IPIECA, 2017

Impacts across the upstream project life-cycle



Upstream life cycle

Exploration	Development	Operation	Decommission

- All stages present potential impacts on biodiversity and ecosystem services, including exploration
- Those impacts will vary in type and significance during the project life-cycle
- The development phase can have significant impacts due the construction work and extra workforce present
- The major risks at production relate to potential oil spills
- Decommissioning presents significant risks and is often neglected

Upstream life cycle

Exploration | Development | Operation | Decommission

- Can last >10 years
- Government seeks investment for own exploration or grants access for firms to explore, through direct negotiation or bidding processes
- Where potentially viable O&G sources are identified, further exploration will occur
- Companies develop work plans for the next phase
- Some limited infrastructure and site development may be put in place

Upstream life cycle

Exploration	**Development**	Operation	Decommission

- The development phase may last 4-10 years
- Infrastructure put in place ready for full production capabilities and initial drilling will take place
- Investment in the technical and commercial components of exploration and also in social and environment impact assessments

Upstream life cycle

Exploration	Development	Operation	Decommission

- The operation phase may last 20-50 years depending on the reservoir type, but it is never certain
- Different extraction approaches may be used at different times to aid in extraction

Upstream life cycle

Exploration	Development	Operation	Decommission

- May take 2-10 years
- Occurs once it is no longer cost-effective to extract remaining reserves
- Operators are responsible for returning the site to as close to original state as possible according to regulations/ standards/ original agreements
- Long-term environmental monitoring may be required

Biodiversity considerations in the industry

Photo credits: Ton Rulkens

Why do businesses manage biodiversity?

Best practice for the O&G industry

Risk management frameworks

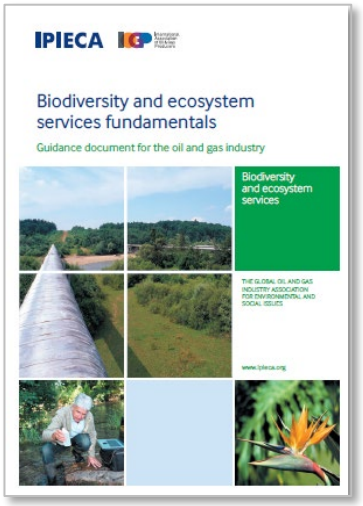
- Risk-based approaches
- Mitigation Hierarchy

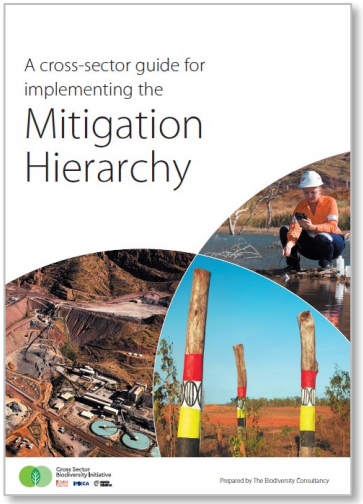
Corporate commitments

- UN World Heritage sites = “no-go” areas
- No net loss of biodiversity

Industry guidance

- IPIECA Biodiversity and Ecosystem Service Fundamentals
- Cross-sector Biodiversity Initiative Timeline Tool



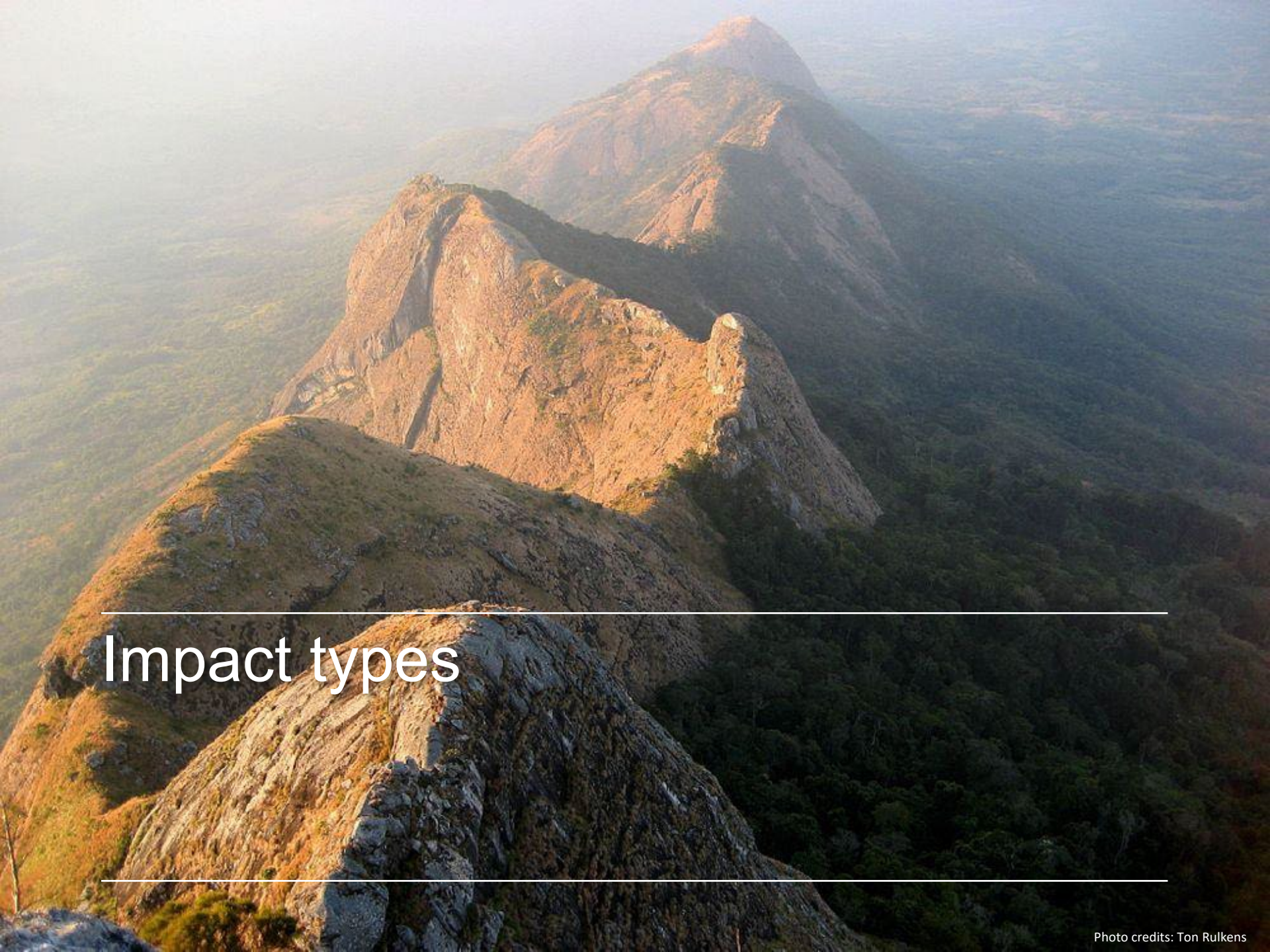


Mozambique's LNG project

- Project financing includes direct and covered loans from 8 export credit agencies, 19 commercial bank facilities, and a loan from the African Development Bank
- Among them are financial institutions adhering to IFC performance standards, such as IFC PS6

Key messages

- Although power generation from renewables is expected to increase, investment in O&G is likely to be maintained in the short term, contributing to economic development
- The upstream O&G life cycle consists of exploration, development, production and decommissioning
- These stages present a number of potential risks for biodiversity and ecosystem services, which all need to be managed
- The biodiversity risk management frameworks for the industry include international best practices and requirements from financial institutions



Impact types

Photo credits: Ton Rulkens

Types of impact

Direct	Indirect / induced	Cumulative
• Direct result of project activities	• Knock on effects of project activities	• Combined effect of multiple actors

Direct impacts

Direct species mortality and disturbance

e.g. seismic impacts on whales, impacts on migration or breeding

Introduction of invasive alien species

e.g. through transportation, and re-vegetation programs

Habitat loss, conversion and fragmentation

e.g. clearance for site footprint, fragmentation by pipelines and access roads

Pollution

Including air, water and soil

Climate Change

Including from direct energy use, flaring, venting and fugitive emissions

Indirect and induced impacts

Social influx and increasing road access

e.g. increasing bush meat hunting / poaching, overexploitation of fisheries and other resources

Changes to local economic conditions

e.g. deforestation and agricultural expansion

Changes to local environment

e.g. soil erosion following habitat conversion, sedimentation of waterways

Climate Change (global)

e.g. changes to species range, behaviour and ecology, changes to habitat structure and extent

Cumulative Impacts

Impacts from several sources:

- Habitat loss combined with operational noise can lead to cumulative and severe impacts on species
- Bio-accumulation of chemicals and heavy metals
- Over-exploitation of water from multiple operations
- Combined land use change from oil and gas, tourism, hydro etc.

Establishing significance of impacts

Severity

- Importance of affected biodiversity / ecosystem services
- Scale of impact
- Duration / frequency of impact
- Reversibility of impact

Likelihood

- Accuracy of predictions
- Under what circumstances would it occur
- Adopt the precautionary principle

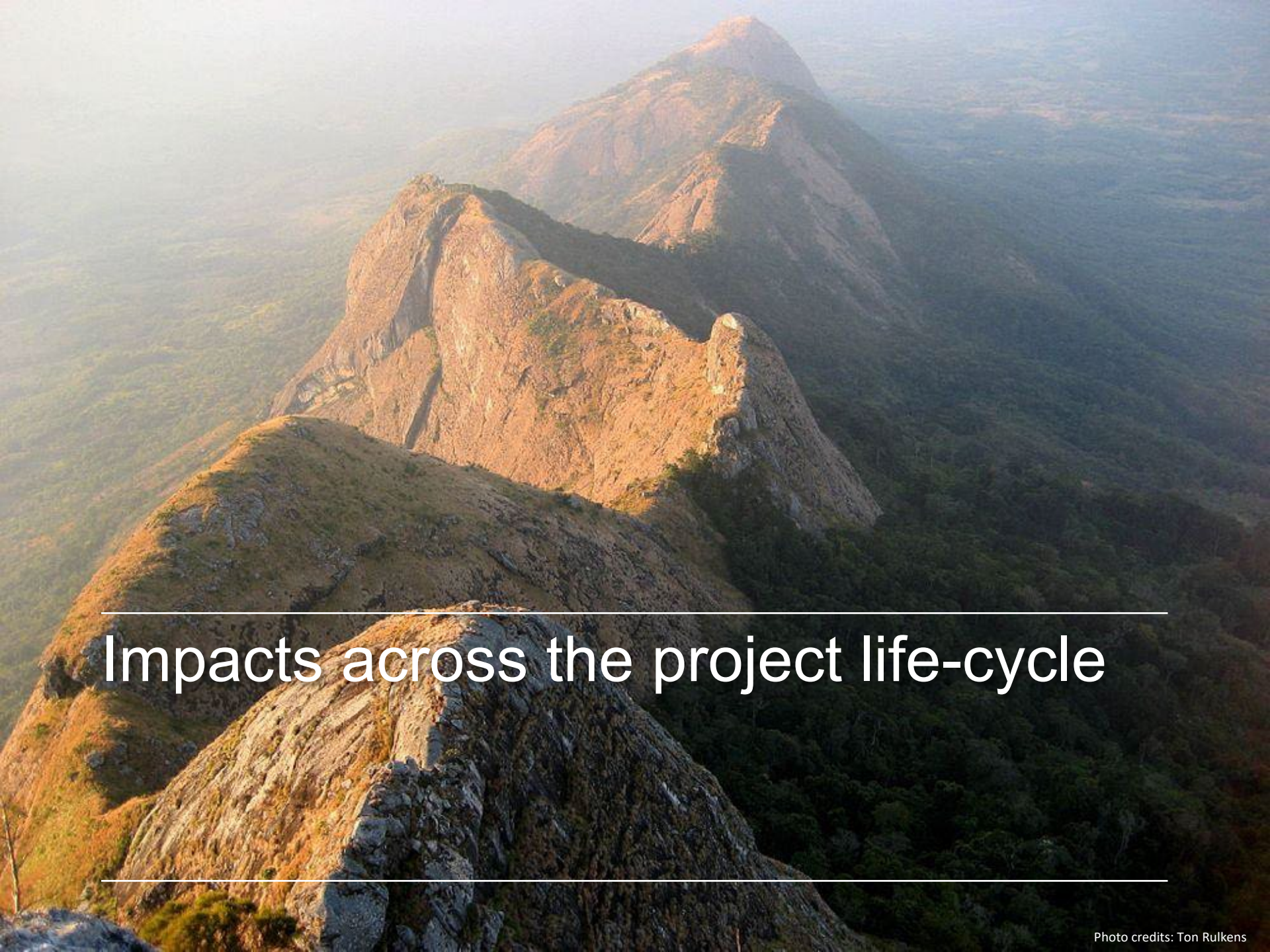
Typical environmental risk matrix

A risk-based approach considers both severity and likelihood of impact:

Impact		Likelihood				
		1	2	3	4	5
Severity	Score	A (Very unlikely)	B (Unlikely)	C (Possible)	D (Likely)	E (Very likely)
	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
		1 to 4 **Low**		5 to 12 **Medium**		15 to 25 **High**

Source: IPIECA, 2020

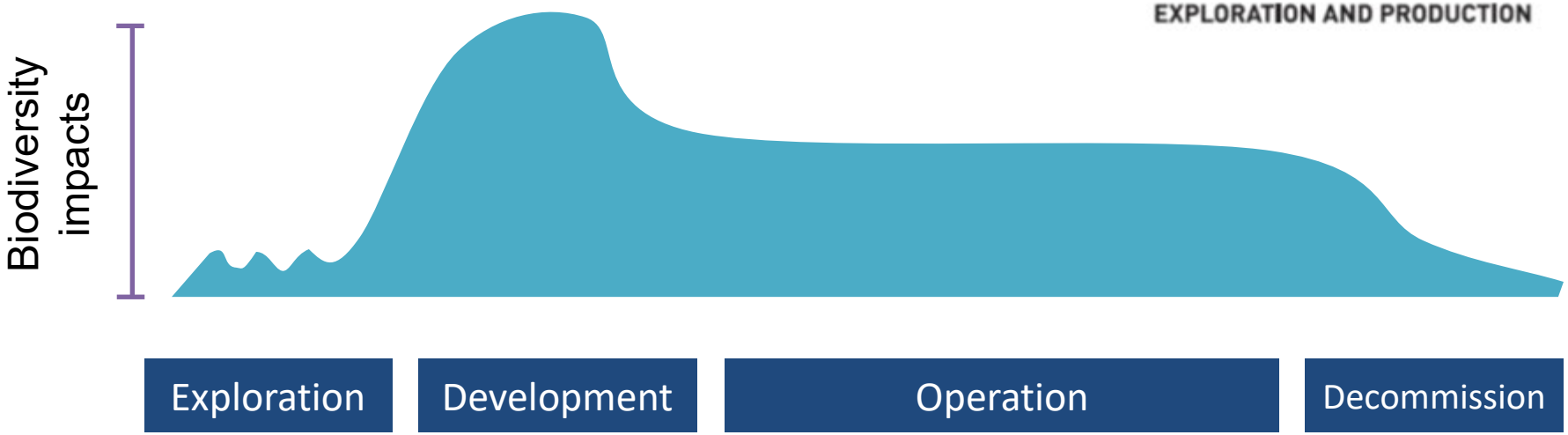
Higher risk projects often require higher levels of approval and often more costly mitigation where impact can't be avoided.



Impacts across the project life-cycle

Photo credits: Ton Rulkens

Impacts across the upstream project life-cycle



Impacts from seismic surveys

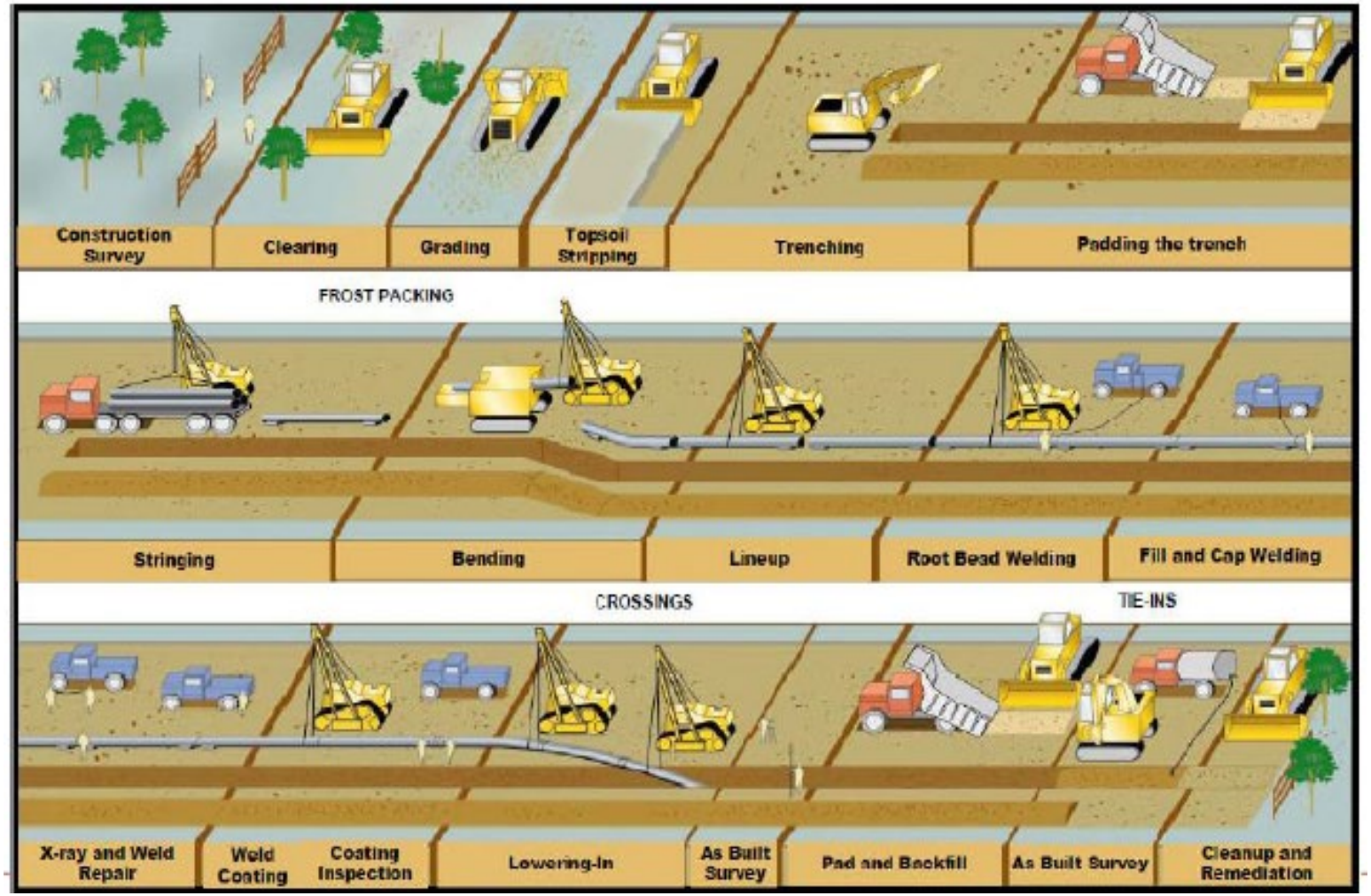
Issue	Possible outcome	Potential impacts
Physical disturbance	Damage to habitats and species from survey equipment	• Coral reef physical damage • Entanglement with marine wildlife
Noise	Emission of sound or shock waves	• Marine mammal migration disturbed (within 50km) • Increase in species stress levels

Source: IPIECA, 2020

Impacts from drilling

Issue	Possible outcome	Potential impacts
Invasive species	Introduction into the area as biofoulants on the drill rig and supply vessels	• New diseases affect local species • Habitat altered by invasive species colonisation • Impact on local fisheries
Waste	Generation of drill cuttings and fluids, of chemical waste from machinery, and of workforce waste	• Cuttings smother benthic biota • Change in seafloor conditions • Bioaccumulation of chemicals in local fisheries • Contamination of soils or water sources
Noise	Emission from drill rig and supply vessels, and machinery	• Marine mammal migration disturbed • Increase in species stress levels • Impacts on eco-tourism

Impacts from pipelines



RSK COWI JSB EnviDep Ltd. EAST AFRICAN CRUDE OIL PIPELINE

Impacts from gas plants construction

Issue	Possible outcome	Potential impacts
Physical footprint	Permanent loss or modification of habitat	• Damage/alteration to species communities and their behaviour • Loss of access to fishing or hunting grounds for local population
Dredging	Removal of benthic habitat	• Smothering of communities • Reduced productivity from sediment suspension and loss of light • Destruction of nursery habitat for local fisheries
Waste	Water discharge, leaching of chemicals, workforce waste	• Local mortality of species • Change in environmental conditions
Noise	Emission from machinery	• Displacement of species

Impacts from oil and gas production

Issue	Possible outcome	Potential impacts
Waste	Generation of inorganic waste, leaching of chemicals	• Ingestion of plastic by marine wildlife (and indirect impacts on human health) • Change in environmental conditions
Noise & Light	Emission from machinery and workforce	• Displacement of species • Long-term changes to species behaviour
Atmospheric emissions	Emission of pollutants (GHG and non-GHG)	• Worsening of air quality • Change in environmental conditions

Impacts from decommissioning

Issue	Possible outcome	Potential impacts
Waste	Generation of inorganic waste, leaching of chemicals	• Change in environmental conditions
Physical disturbance	Removal of infrastructure	• Alteration to benthic structures and established communities

Impact identification with an ENVID matrix

	Project	0337774 Block Wide Environmental and Social Impact Assessment for Offshore Drilling and other Exploration Activ																												
	ACTIVITIES	**ENVIRONMENT & RECEPTORS**																												
		Physical								Biological								Human												
	Project Activity	Ambient Air Quality	Global Climate	Noise Levels (Airborne and Underwater)	Light	Seabed features	Seabed sediment and characteristics	Subsea Geology	Marine Water Quality	Benthic Communities	Corals	Seabirds	Fish & Pelagic Flora & Fauna	Marine Mammals	Marine Reptiles	Protected Areas/ Critical/ Sensitive Habitat	Mangroves	Marine Flora	Community Health, Safety & Security	Local Community	Workforce	Government Stakeholders	Marine Traffic & Transportation	Fishing	Mariculture/marine resources	Navigation	Cultural Heritage	Tourism/ Recreation	Employment & Income	Utilities (eg submarine cables, pipelines, water, onshore waste facilities)
1	**Vessel activities**																													
1.1	Survey vessels mob and demob																													
1.2	Support/chase vessels																													
1.3	Physical presence																													
1.4	Power generation by vessels																													
1.5	Disposal of non hazardous																													
1.6	Disposal of hazardous wastes																													
1.7	Fish trap/net tagging, scouting &																													
1.8	Presence of safety zone around																													
1.9	Disposal of galley waste																													
1.11	Discharge of sanitary effluents																													
1.12	Ballast from support and supply																													
1.13	Cooling water discharge (?)																													
1.14	Provision of potable water																													
1.15	Temporary vessel mooring -																													
1.16	Bunkering																													
1.17	Helicopter transfer																													
1.18	Crew change/personnel transfer																													
1.19	Labour, equipment and services																													
2	**Specific Seismic Survey Activities**																													
2.1	Deployment, operation and																													
	2D																													
	3D																													
2.2	Operating/Firing of airguns																													
2.3	Operating PAM system																													

KEY

	No interaction
I	An interaction with the environment or receptor which is not expected to be significant
S	An interaction with the environment or receptor that could be significant NB. also indicates significant data-gaps (to be identified in the comments)
P	Denotes a positive interaction

Key messages

- Impacts from oil and gas activities can be direct, indirect/induced, and cumulative
- An environmental risk matrix assess impacts based on their severity and likelihood
- Impacts vary during the project life-cycle but include physical disturbance, noise and light pollution, and waste generation