



# MINISTRY OF ENERGY AND ENVIRONMENTAL SUSTAINABILITY (MEES<sub>ty</sub>)



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TEL : 082-374089

An aerial photograph of a city, likely Kuching, Sarawak, featuring a river, a large monument, and modern buildings. The image is overlaid with a semi-transparent dark layer containing text.

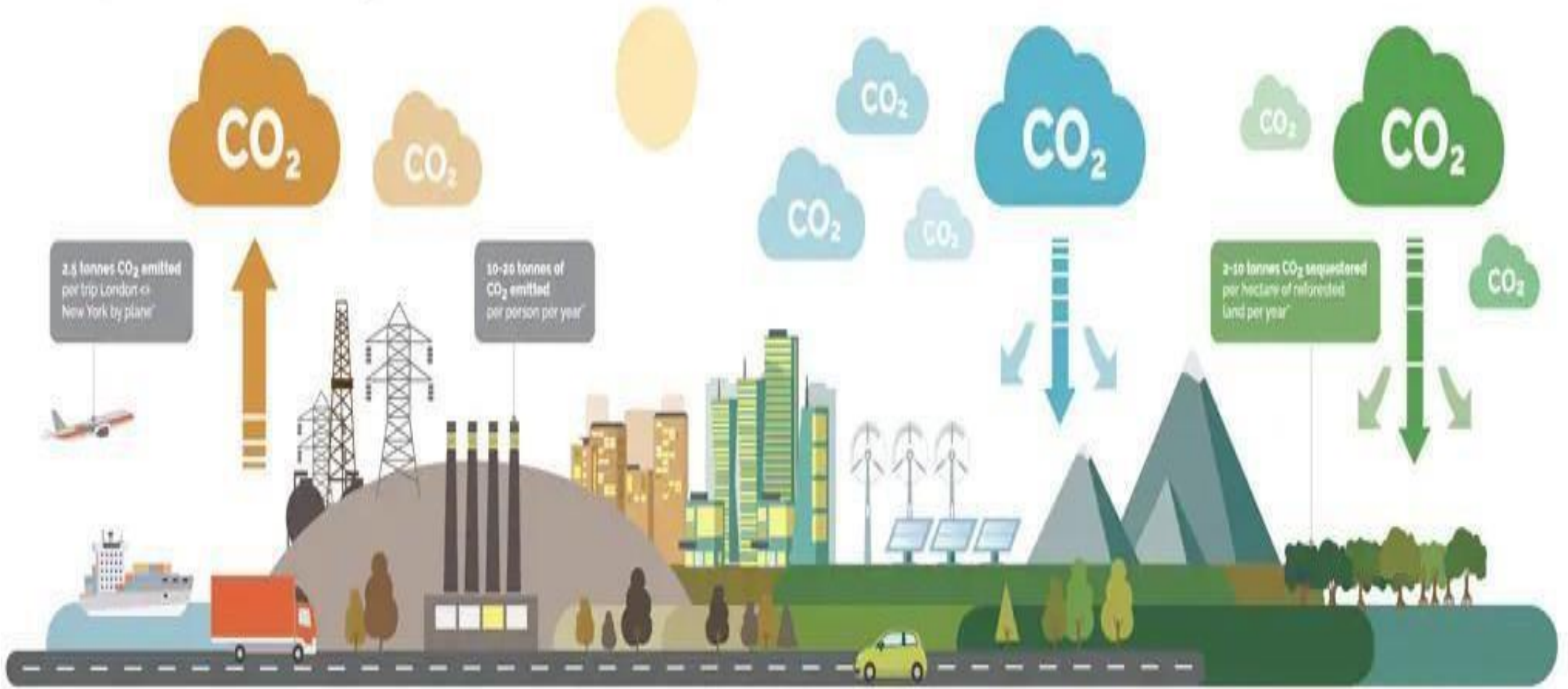
# CLIMATE SOLUTIONS – THE SARAWAK WAY

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**The Right Honourable Datuk Patinggi Tan Sri (Dr) Abang Haji Abdul Rahman Zohari Bin Tun Datuk Abang Haji Openg**

Premier of Sarawak

# SOURCE AND SINK



## Causes of Climate Change

Anthropogenic  
Chemical Fertilizers  
Deforestation  
Increase vehicles  
Emission of GHGs  
Industries

## Natural

- Ocean Currents
- Forest fire
- Volcanic eruptions
- Meteorites
- Sunspot and solar cycle

Source: Climateimpactx

London Underground

# Hot weather alert

Please carry a bottle of water with you at all times. You can use it to beat yourself to death with when the heat becomes too much.

To avoid flooded carriages, make sure to direct all your perspiration into the provided sweat-gutters.

There is a high possibility most passengers will smell like some prawns that were abandoned in an alleyway six months ago.



HAITI

# SPAIN

## La Palma: Thousands evacuated as Canary Island wildfire burns

16 July



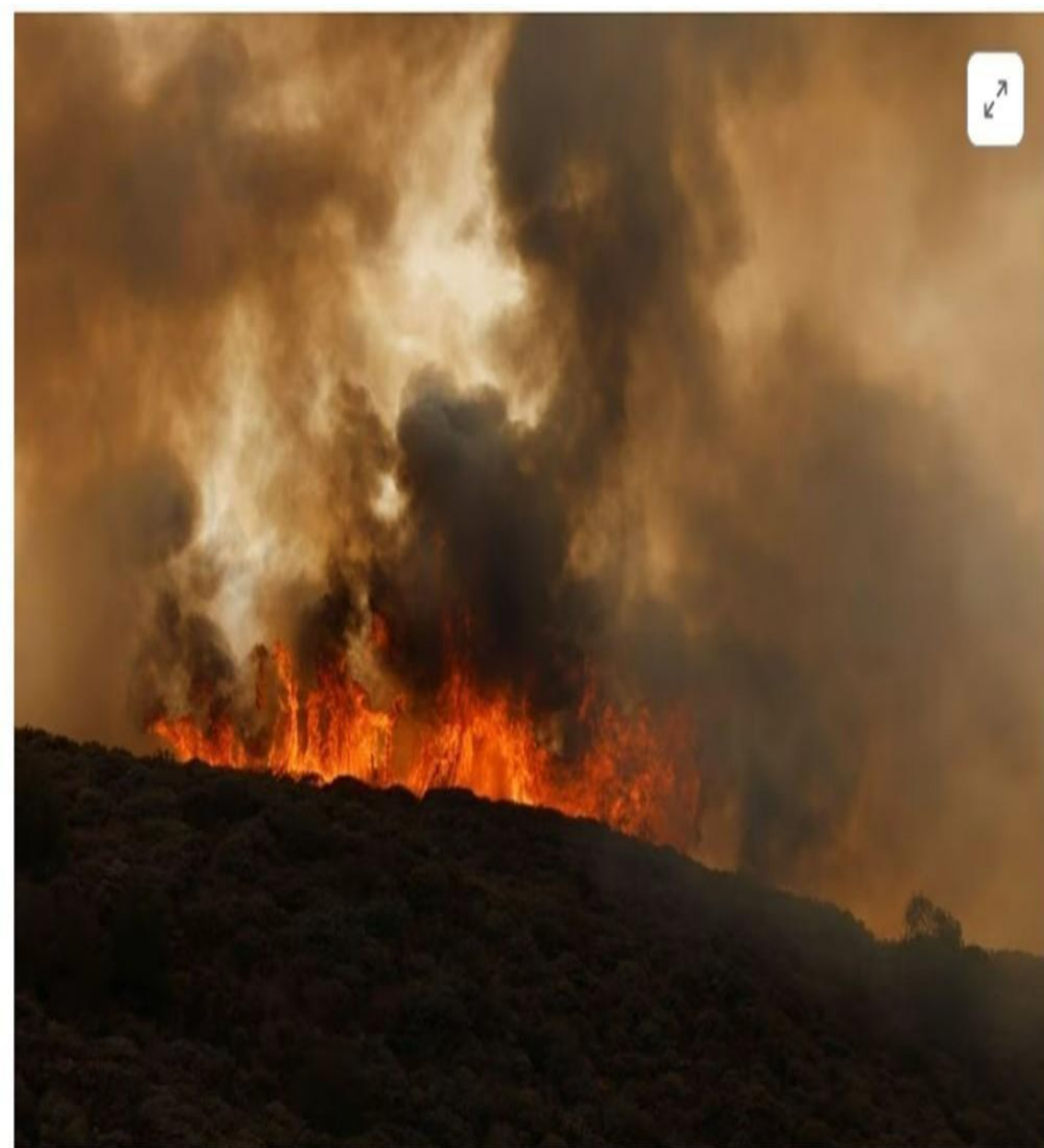
EPA

Smoke was pictured billowing over hills on the Spanish island on Saturday

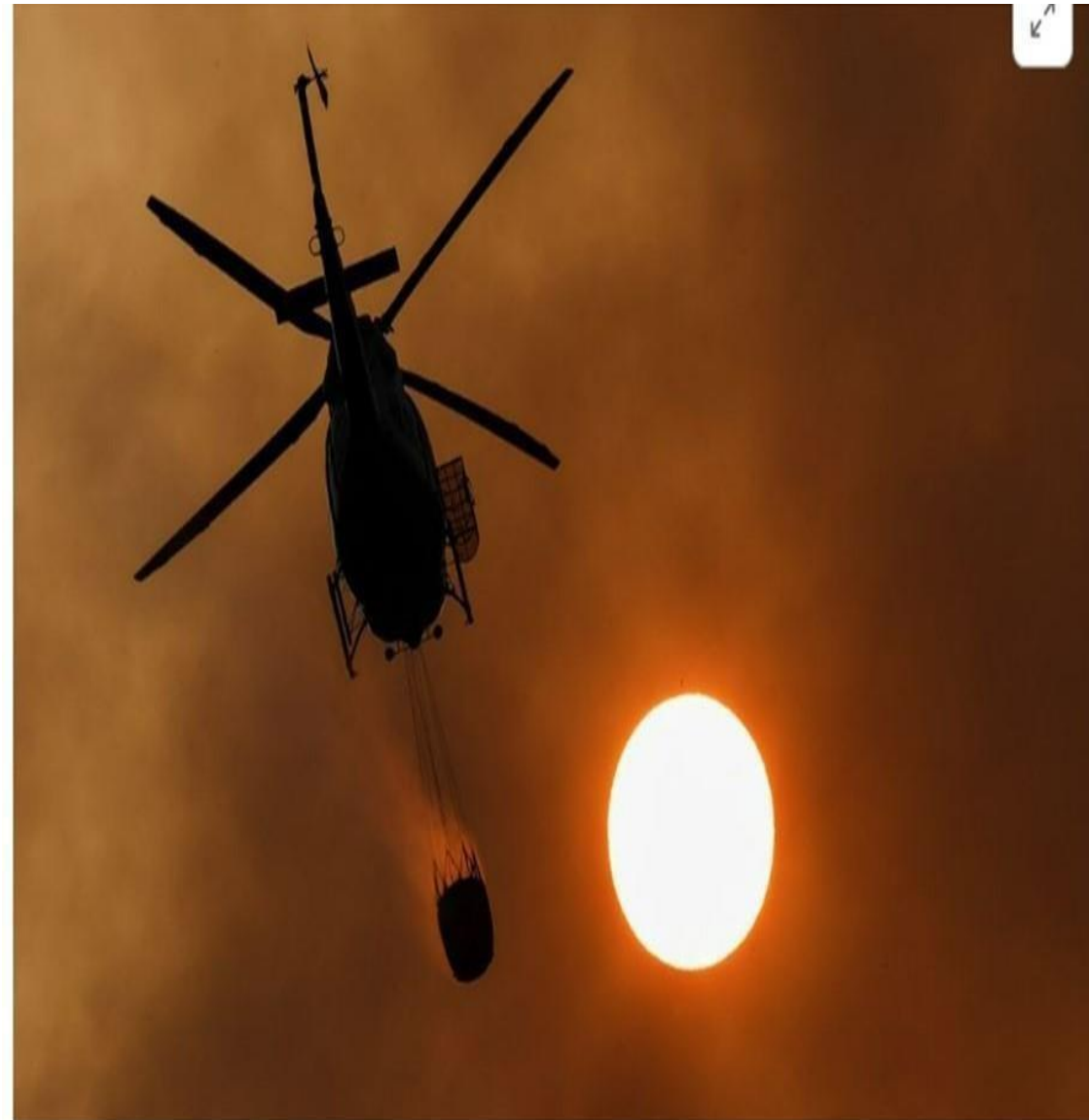


Local residents look on at a burning forest fire, near Puntagorda on the Canary Island of La Palma, Saturday, July 15, 2023. - Europa Press via AP

# IRAQ



[1/5] A wildfire rages, in the area of Pico de las Nieves, on the Canary Island of Gran Canaria, Spain July 25, 2023.



[5/5] A helicopter works to extinguish a wildfire, in the area of Pico de las Nieves, on the Canary Island of Gran Canaria, Spain July 25, 2023. REUTERS/Borja Suarez

# IRAQ



Fishermen stand in a boat as they inspect thousands of dead fish floating by the bank of the Amshan River.



Fishermen's boats lie close to the drying riverbed of the Amshan River. [Asaad Niazi/AFP]





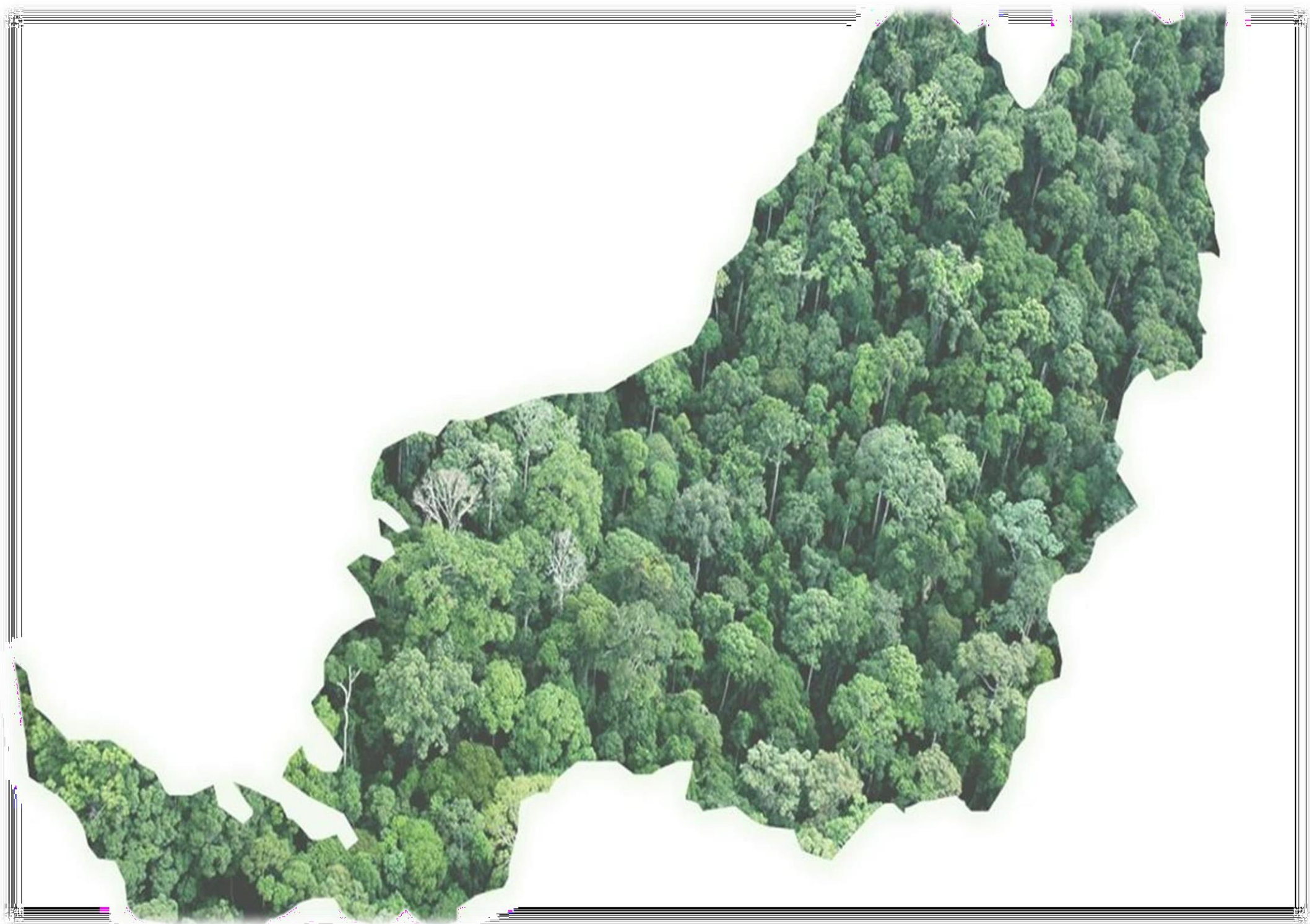
# GREECE

*A man evacuates horses as a wildfire burns near the village of Pournari, Greece, July 18, 2023. -*



# GREECE

*Flames engulf a house as a wildfire burns in Saronida, near Athens, Greece, July 17, 2023. -*





# Sarawak's Renewable Hydropower



## Batang Ai

- 108MW Installed Capacity
- Commissioned in 1985



## Bakun

- 2,400MW Installed Capacity
- Commissioned in 2011



## Murum

- 944MW Installed Capacity
- Commissioned in 2014

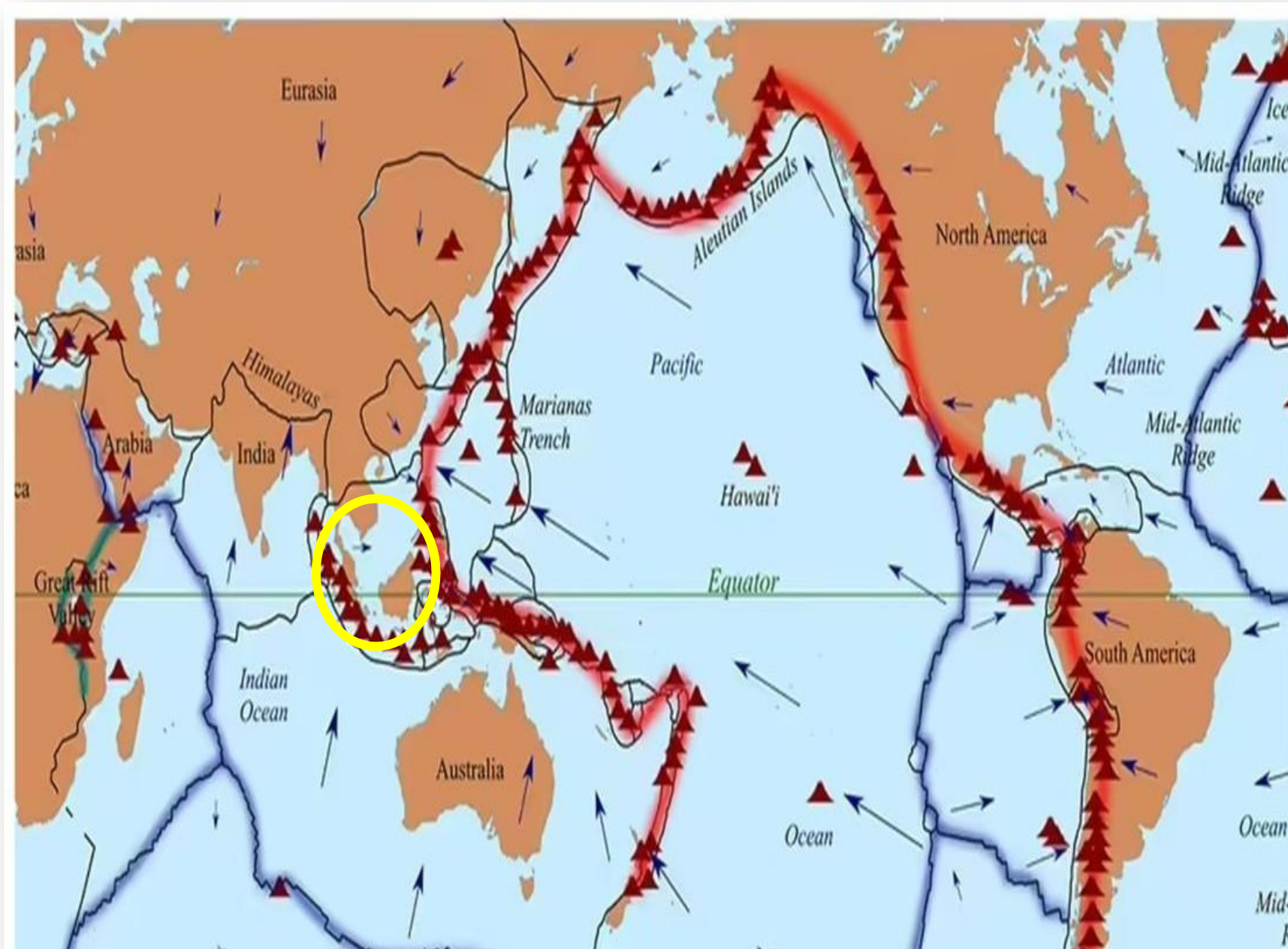


## Baleh

- 1,285MW Installed
- Expected Commissioned 2028

Harnessing 8GW of hydropower potential to power growth and accelerate industrialis

# Ring of Fire



# Political Stability



# Visionary Leadership



Premier of Sarawak



# Enablers for Carbon Capture and Carbon Trading

United Nations Framework Convention on Climate Change



## Kyoto Protocol


*Clean Development  
Mechanism*



## Paris Agreement

*Article 4: Mitigation*  
*Article 6: Enabler for Carbon  
Trading*





**THE  
SARAWAK GOVERNMENT GAZETTE  
PART II**

Published by Authority

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**Vol. LXXVII      9th November, 2022      No. 69**

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**Swk. L. N. 275**

THE CONSTITUTION OF THE STATE OF SARAWAK  
THE MINISTERS OF THE STATE GOVERNMENT (ASSIGNMENT OF PORTFOLIOS)  
(No. 2) ORDER, 2022

(Made under Article 9 (1))

In exercise of the powers conferred by Article 9(1) of the Constitution of the State of Sarawak [G.N.S. 163/63], the Yang di-Pertua Negeri, in accordance with the advice of the Premier, makes the following Order:

Datuk Patinggi Tan Sri (Dr) Abang Haji Abdul Rahman Zohari Bin Tun Datuk Abang Haji Openg	Minister for Energy and Environmental Sustainability	Ministry of Energy and Environmental Sustainability	Policy formulation for development of energy sector and environmental sustainability.
		Sarawak Energy Berhad, SESCO	<p><b>Section I - Energy</b></p> <p>(a) Planning and development for the generation and transmission of power and energy;</p> <p>(b) Policy formulation, development, implementation of green energy, programmes and projects;</p> <p>(c) Planning and development of oil and gas sector.</p>
		PETROS	<p>(e) Planning and development of oil and gas sector.</p>
		Natural Resources and Environment Board	<p><b>Section II - Environmental Sustainability</b></p> <p>(a) All matters relating to environment control including under the Natural Resources and Environment Ordinance [Cap. 84 (1958 Ed.)] and the Natural Resources and Environment (Prescribed Activities) Order, 1994 [Swk. L.N. 45/94];</p> <p>(b) Matters relating to decarbonization and carbon footprint.</p>
Dr. Hj. Hazland bin Abang Hipni	Deputy Minister for Energy and Environmental Sustainability		To assist Minister on Energy and Environmental Sustainability

# Sarawak Government Gazette



## Background

- Established through Sarawak Government Gazette Vol. LXXVII dated 21 January 2022, No. 69
- Policy formulation, planning and development of energy sector and environmental sustainability.

## Key Roles



**Energy**

- Planning and development for the generation and transmission of power and energy
- Policy formulation, development, implementation of green energy, program/ projects
- Planning and development of oil and gas sector



**Environmental  
Sustainability**

- All matters relating to environmental control including under the Natural Resources and Environment Ordinance [Cap.84 (1958- Ed.)] and the Natural Resources and Environment (Prescribed Activities) Order, 1994 [Swk. L.N 45/94]
- Matters relating to decarbonization and carbon footprint.

# Ministers and Executive Leadership



**YAB Premier Sarawak**  
Minister of Energy and  
Environmental  
Sustainability



**YAB Dr. Hj Hazland bin Abg  
Hipni**  
Deputy Minister

**Abg Ahmad Abg Morni**  
Permanent Secretary



**Rusmaliza Mat Darus**  
Deputy Permanent Secretary



**Dr. Nurleya  
Yunus**  
Energy Division



**Dr. Kho Lip Khoon**  
Environmental  
Sustainability Division



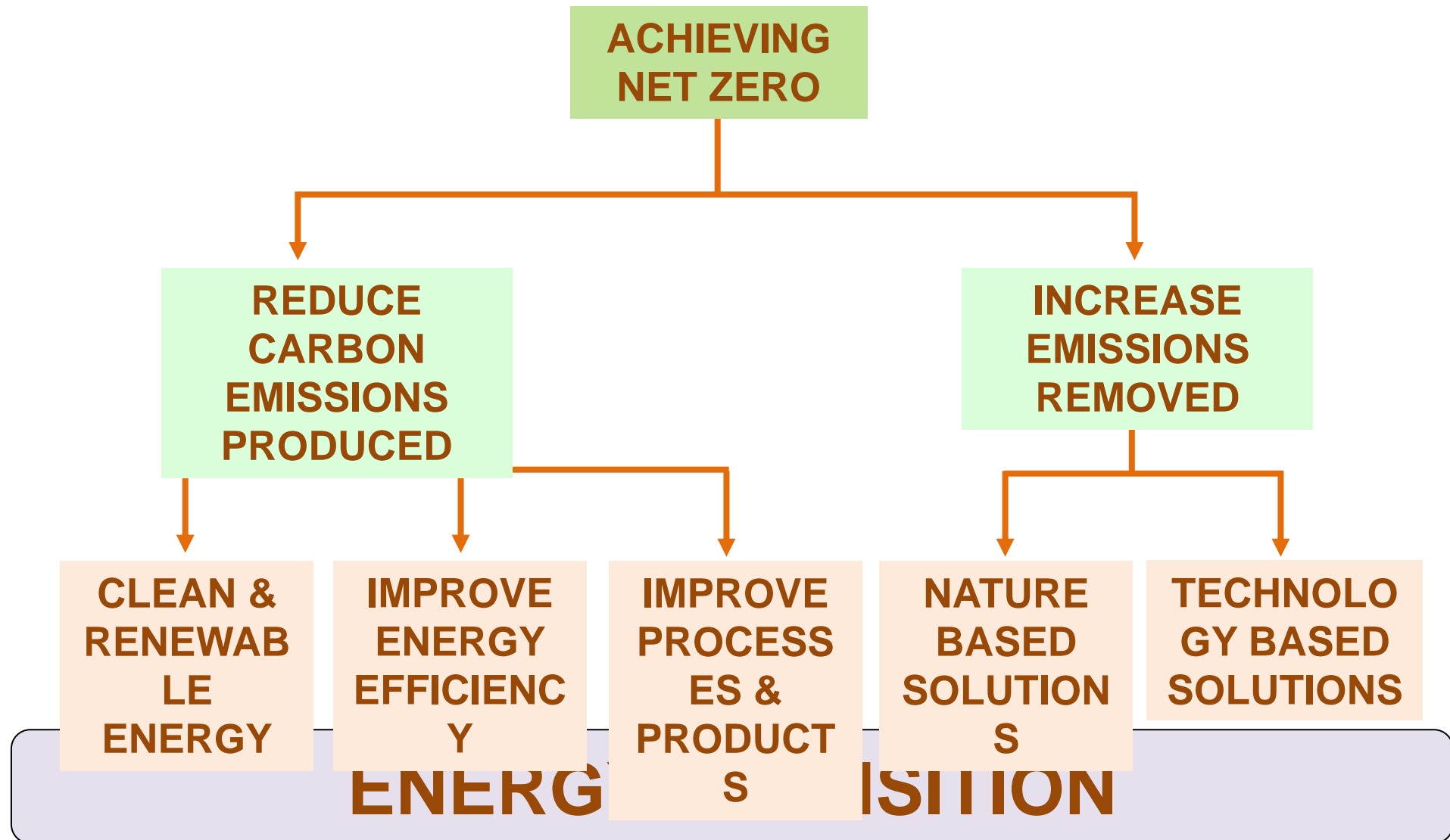
**Najuaa Hj. Masrol**  
Management  
Service Division



**Sharifah Alauyah bt Syed  
Muhd Sibbli**  
Head of Human Resource



# Net Zero Journey





# Key Success Factors for Net Zero

## Regulations

- Clear, Simple and Pragmatic

## Technology

- Clean, Affordable and Efficient Technology

## Finance & Incentives

- Readily Available Green Financing and Incentives

## People

- Collaboration and Partnerships
- Takeaways from Government, Industry, Academia, and the Public



# Net Zero Journey



Sustainable Development Goals (SDGs) through PCDS 2030 - anchored on 3 pillars: Economic Prosperity, Social Inclusivity and Environmental Sustainability

**19 May 2022**  
Amendment to Land Code and Forests Ordinance approved by DUN

**8 Dec 2022**  
MMKN approved regulation on Carbon Capture, Utilization and Storage; and Forest Carbon Activity

**15 – 16 Mar 2023**  
International Carbon Conference, Pullman Hotel, Kuching

**Jun 2023**  
International Energy Week

Green Economy Policy Energy & Hydrogen Policy Environment Policy Climate Change

Carbon Ordinance, Hydrogen Ordinance

**2024**  
Hydrogen Conference

*Ensure a clean and healthy environment for all by having policies on all sectors as well as adoption of new technologies and innovation to support Malaysia's commitment to reduce greenhouse gas (GHG) emissions intensity of GDP of 45% by 2030*



THE  
SARAWAK GOVERNMENT GAZETTE  
PART II

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Vol. LXXVII

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No. 84

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Swk. L. N. 349

THE LAND CODE

LAND (CARBON STORAGE) RULES, 2022

(Section 213(m))

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ARRANGEMENT OF RULES

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PART I  
GENERAL

*Rule*

1. Citation and commencement
2. Interpretation
3. Application





**THE  
SARAWAK GOVERNMENT GAZETTE  
PART II**

**Published by Authority**

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**Vol. LXXVII**

**22nd December, 2022**

**No. 84**

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Swk. L. N. 350

THE FORESTS ORDINANCE, 2015

FORESTS (FOREST CARBON ACTIVITY) RULES, 2022

Made under section 113(1)(bb)

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ARRANGEMENT OF RULES

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PART I  
PRELIMINARY

*Rule*

1. Citation and commencement
2. Interpretation

PART II



**LAWS OF SARAWAK**

—  
ONLINE VERSION  
—

**Chapter 84  
(1958 Edition)**

**NATURAL RESOURCES AND  
ENVIRONMENT ORDINANCE**

*Incorporating all amendments up to 1st January, 2021*

PREPARED AND COMPILED BY  
*STATE ATTORNEY-GENERAL'S CHAMBERS*  
SARAWAK



**LAWS OF SARAWAK**

**Chapter 85**

**ENVIRONMENT (REDUCTION OF GREENHOUSE  
GASES EMISSION) ORDINANCE, 2023**

Sarawak LawNet

# SARAWAK ENERGY TRANSITION POLICY

Secure, Equitable, and Clean Energy Future for Sarawak

## OBJECTIVES

### Energy Security

Maintain adequacy and reliability of energy supply

### Equitable & Just Transition

Achieve affordable and accessible energy for all at the right pace

### Sustainable

Energy from renewable/sustainable sources

### Economic Growth

Ensure continuous economic growth as Sarawak transitions to a clean energy future

## FOCUS AREA



## PILLARS



Renewable Energy



Hydrogen



Energy Efficiency



Green Mobility



Bioenergy



CCUS



Synthetic Fuels



O&G

## ENABLERS



### Policy & Regulatory Support

to pace the transition while ensuring economic growth



### Financing & Investment

To mobilize resources through a combination of public and private sector involvement to accelerate the transition



### Technology & Infrastructure

to encourage collaboration, innovation and technology development to facilitate the transition



### Skills & Talents

to develop intellectual assets and expertise that moves the transition



### Public Awareness

to educate and create demand & support for the transition initiatives

KACA/GELAS

KERTAS/PAPER

TIN ALUMINIUM/TIN KELULU/PLASTIK  
ALUMINIUM CAN/STEEL CAN/PLASTIC



# ZHA ENVIRONMENTAL SDN BHD







**BAKUN SARAWAK**  
Empangan Seluas Singapura







An aerial photograph of a winding river flowing through a dense, green forested valley. The sun is low on the horizon, creating a warm, golden glow over the landscape. The river meanders through the forest, forming several large loops. The sky is filled with soft, wispy clouds, and the overall scene is peaceful and scenic.

# Our Humble H<sub>2</sub> Journey



Source: Sarawak Energy Berhad



South-East Asia's First Integrated Hydrogen Refueling Station (2019)

# PETROS MULTIFUEL STATION (2022)





Source: SEDC Energy



Source: The Borneo Post

## HYDROGEN-POWERED TOYOTA MIRAI (2023)



Source: Wap



Source: Dayak

# SARAWAK HYDROGEN-POWERED AUTONOMOUS RAPID TRANSIT (ART)



Source: Sarawak Metro



Source: Sarawak

Source: The Sun

# SARAWAK HYDROGEN BUS



Source: Sarawak Metro



Source: Dayak Daily



Source: Borneo



# SARAWAK HYDROGEN HUBS



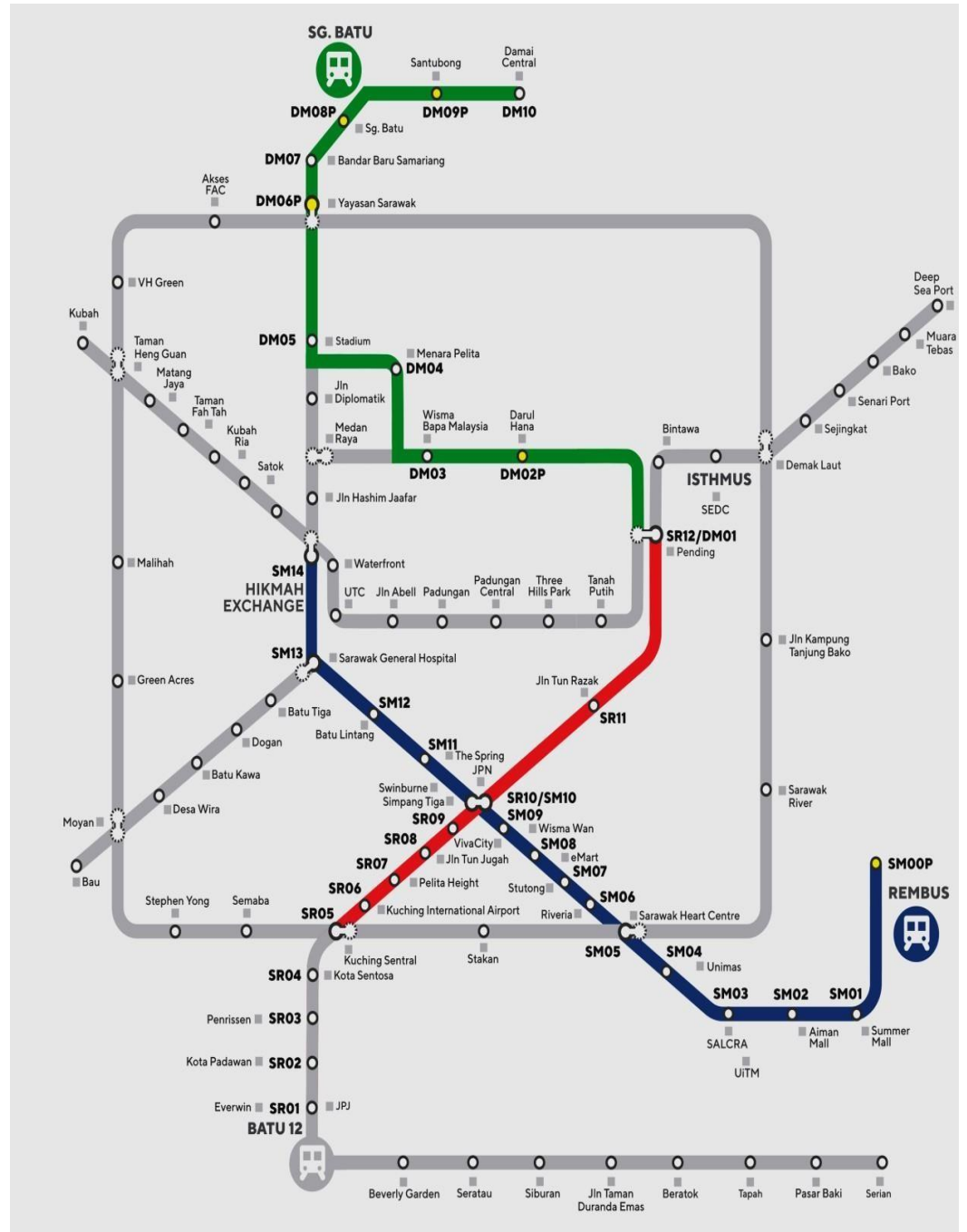
**Sarawak H2 Hub**  
Tanjung Kidurung,  
Bintulu

Source: SDC Energy



**Rembus H2 Plant**  
Kota Samarahan

# Kuching Urban Transport System





**Both projects are targeted to produce:**

- **240,000 tonnes of clean hydrogen/annum for export to Japan and South Korea as early as 2028.**
- **9,000 tonnes of clean hydrogen/annum for domestic distribution and utilization.**



Students measure the concentrations of hydrogen in the exposed soil.  
Source: University of Pretoria



Natural hydrogen sampling by Geological Agency in Central Sulawesi Province, Indonesia  
Source: CNBC



A well for natural hydrogen production in Geneva, Nebraska  
Source: New Scientist



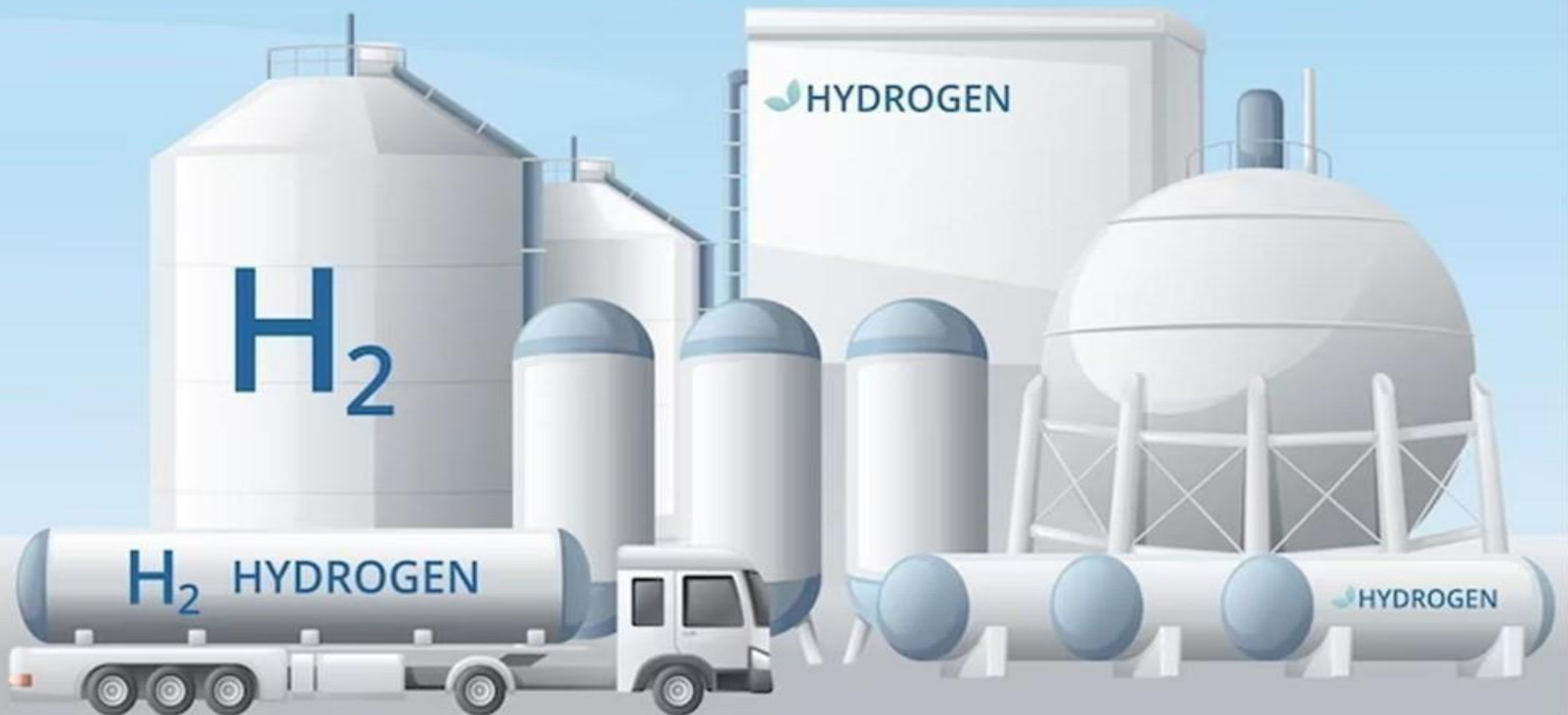
Centre of Excellence  
for Clean Energy

# Sarawak Electrolyser Assembly and Distribution Facility (SEA-DF)

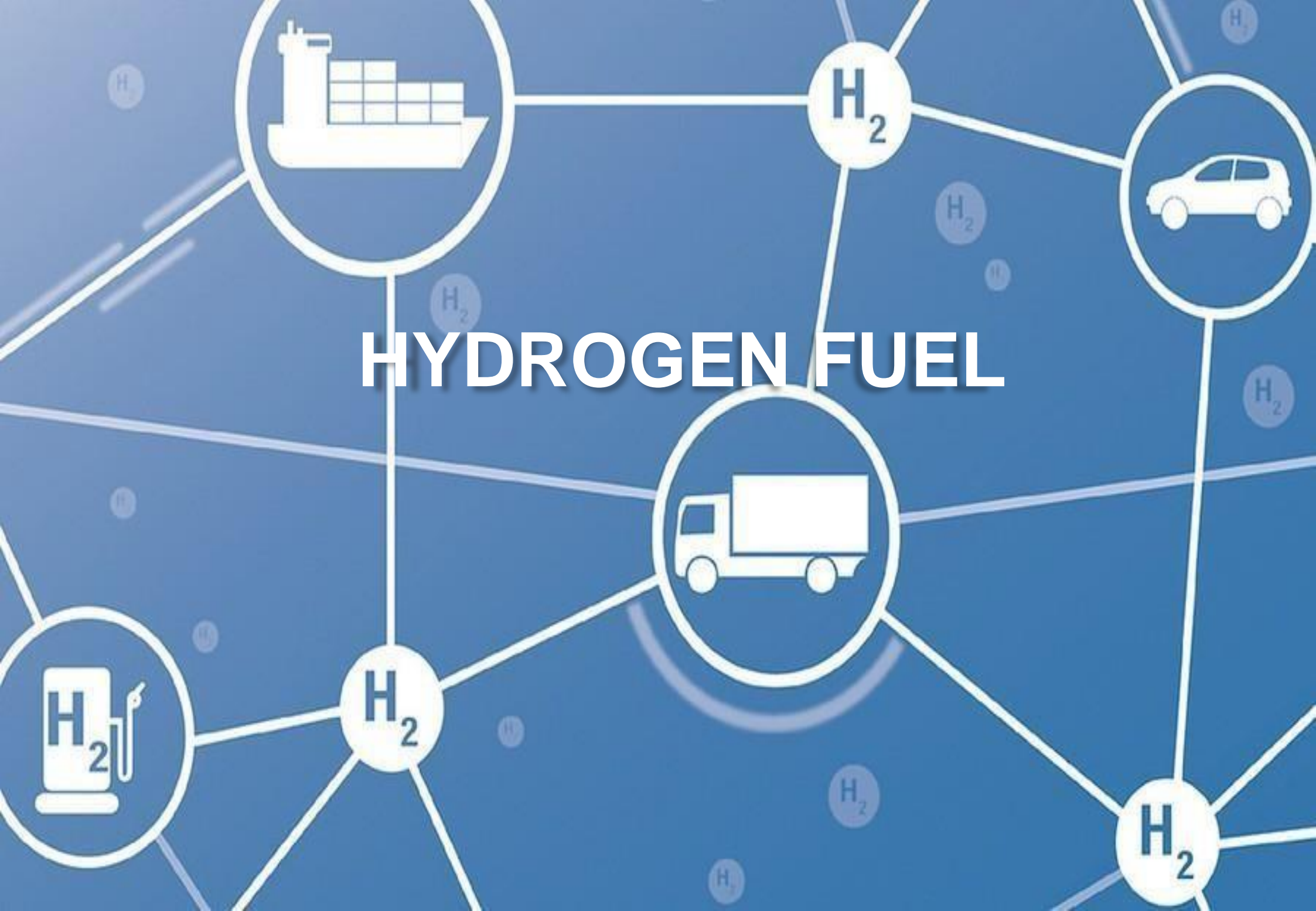


# HYDROGEN STORAGE

Green Energy



# HYDROGEN FUEL





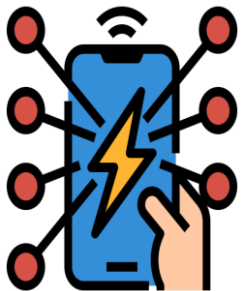
# HOW HYDROGEN FUEL WORKS



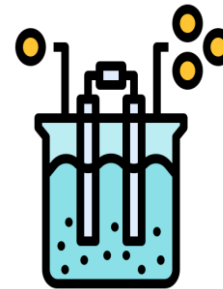
Hydrogen fuel is a type of fuel that consists of hydrogen gas (H<sub>2</sub>).



Hydrogen fuel is considered a clean energy as it produces energy without emitting harmful pollutants or greenhouse gases.



Hydrogen is an attractive fuel option for transportation and electricity generation applications.

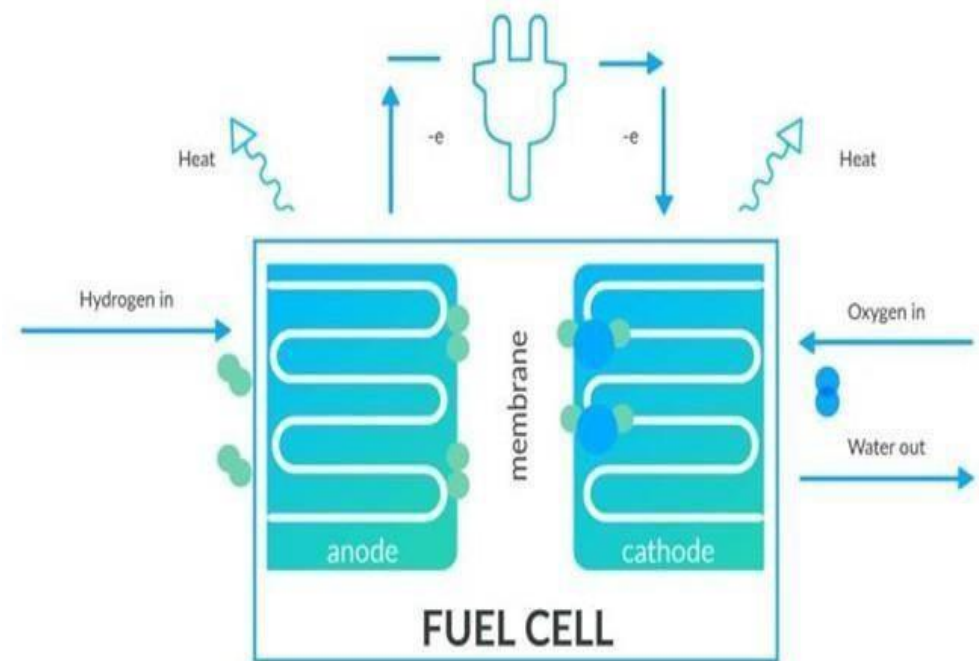


Hydrogen can be produced from a variety of domestic resources, such as natural gas, nuclear power, biomass, and renewable power like solar and wind.

# HOW HYDROGEN PRODUCE ELECTRICITY

Hydrogen can produce electricity by using a fuel cell through an electrochemical process which combine hydrogen and oxygen.

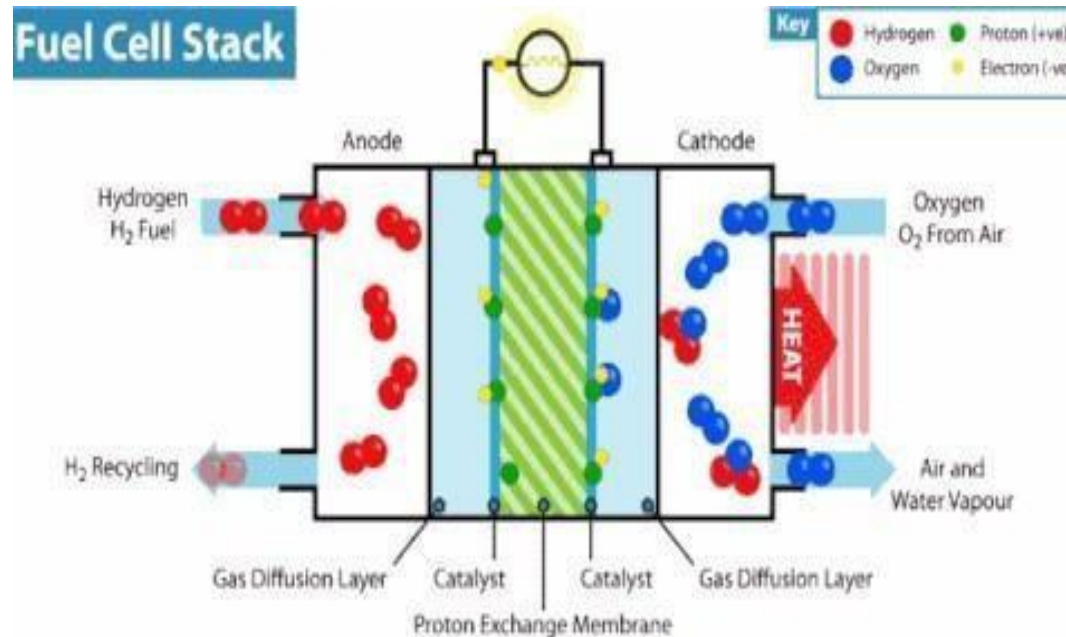
A fuel cell consists of two electrodes—a negative electrode (or anode) and a positive electrode (or cathode)—sandwiched around an electrolyte



# PROCESS OF ELECTROCHEMISTRY

1. Hydrogen is passed through the anode and it will be split into electron and protons. Meanwhile air is passed through the cathode

2. the negatively charged electrons is forced through the circuit to generate electricity excess heat.



3. The positively charged protons will pass through the membrane to the cathode.

4. After the electron is passed through the circuit, the electron will combine with proton and oxygen to produce water.





# HANDOVER CEREMONY OF TOYOTA MIRAI

TO  
THE RIGHT HONOURABLE  
DATUK PATINGGI TAN SRI (DR)  
ABANG HAJI ABDUL RAHMAN ZOHAR  
BIN TUN DATUK ABANG HAJI OPENG  
PREMIER OF SARAWAK  
BY UMW TOYOTA MOTOR AND SEDC ENERGY  
16 JANUARY 2022



TOYOTA



MINISTRY OF  
ENERGY

SEDC  
ENERGY

# CATALYSING MALAYSIA'S GREEN HYDROGEN REGIONAL HUB ASPIRATIONS



**Petronas' proprietary Proton Exchange Membrane technology is Southeast Asia's first commercial hydrogen electrolyser**

In tackling climate change, energy companies in Southeast Asia are stepping up their commitments to net zero carbon emissions through key investments in technology and a portfolio of clean energy assets, which include hydrogen.

In Malaysia, these efforts are aligned with the government's active role in promoting green hydrogen to accelerate climate action and reduce greenhouse gas emissions through the development of policies and regulations to support the sector's growth and attract investments.

Hydrogen is a versatile energy carrier that can be used in various applications, from combustion and electricity generation to industrial processes. The molecule is widely seen as a key element of the future energy system, contributing to a lower carbon future.

A colourless and odourless gas, hydrogen is mostly found bound with oxygen in the form of water and must be extracted through a production process involving a range of feedstocks and technology. Globally, hydrogen is classified into different colour categories based on the production method, as well as the feedstock and source of energy used.

Grey hydrogen is produced using fossil fuels like natural gas and coal through steam reforming and coal gasification, which release carbon dioxide (CO<sub>2</sub>) into the air in the process. Blue hydrogen is made in a similar manner with the introduction of carbon capture technology to prevent CO<sub>2</sub> from being released.

Green hydrogen is considered the most premium as it is produced by splitting water using electrolysis powered by renewable energy like solar and offshore wind, emitting zero carbon emissions in the process. It is therefore recognised as a clean form of energy.

Still, a major hurdle in green hydrogen production lies in its high cost.

Through a collaboration with Universiti Kebangsaan Malaysia (UKM), Petronas has developed a proton exchange membrane (PEM) electrolyser to produce lower carbon hydrogen. This is the first commercial hydrogen electrolyser made in Southeast Asia, as others are mainly produced in Europe, the US and East Asia.

Colin Patrick, the general manager responsible for hydrogen result delivery and Borneo opportunities at Petronas, said efficiency and cost are two critical factors in hydrogen production, especially during the electrolysis process.

"Prioritising high efficiency can lead to an exponential rise in equipment capital costs. My role in both research and business requires me to look at achieving a balance between efficiency and cost considerations," he says.

Petronas' PEM electrolyser achieves around a 20% increase in efficiency compared to the technology that has existed for longer, which uses the current PEM that is in the market and alkaline water electrolyser (AWE). This allows the electrolyser to produce hydrogen at a much lower cost and contribute to achieving economies of scale, which is an all-important factor to push for more widespread adoption of green hydrogen.

Petronas' foray into green hydrogen builds on the company's experience in producing blue hydrogen at its petrochemical plants and refineries. Coupled with advances in electrolysis research and development, the global energy company also positions itself as a competitive green hydrogen solution provider.



A hydrogen-powered buggy and the green hydrogen production testing facility in the compound of Petronas Research Sdn Bhd in Bangi



## ADVANCING THE GREEN HYDROGEN ECONOMY IN SARAWAK

Colin, who hails from Sarawak, played a pivotal role in catalysing lower carbon hydrogen production within the region. During his secondment to Sarawak Energy Bhd in 2018, he developed Southeast Asia's first hydrogen production and refuelling station, while simultaneously formulating the Hydrogen Economic Blueprint for the state.

His efforts have helped propel Sarawak to the forefront of the green hydrogen economy's advancement, making waves not only within Malaysia but also across the broader Southeast Asian landscape. Upon his return to Petronas in 2020, Colin took the lead on its hydrogen technology programme to produce the PEM hydrogen electrolyser and a route to market.

Petronas, through its subsidiaries, and SEDC Energy Sdn Bhd — a wholly-owned subsidiary of Sarawak Economic Development Corp — are collaborating on the commercial production of green hydrogen and the exploration of its value supply chain in Asia to meet the demand for global cleaner energy solutions. This arrangement includes the supply and operation of the PEM electrolyser to Sarawak's Darul Hana and Batu Kawa refuelling stations.

Sarawak had a head start due to its favourable energy mix, in which about 75% of the state's electricity is generated by hydropower, which is considered a form of renewable energy.

Green hydrogen is currently used in Sarawak mainly to decarbonise the transport sector. It is gaining more traction with its impending use to power an autonomous rapid transit (ART) fleet in Kuching that is expected to commence operations as early as 2025.

Colin says Sarawak's active pursuit of a green hydrogen economy also helped attract foreign partners from South Korea and Japan to bring their investments and market expertise into the state. Companies from both countries are collaborating to build Sarawak's first hydrogen plant in Bintulu.

"This is an area where we can develop the technology and see the application in our own country. We envision for this to be a new pillar of growth for both Petronas and Malaysia, and we believe Sarawak is our strategic partner for the launchpad," Colin says.

Colin hopes to follow in Sarawak's footsteps in terms of the growth in hydrogen application, where there are currently 11 fuel cell electric vehicles in the state's market.

"To achieve this, we need to work hand in hand with government agencies, local government and other

industry players such as the mobility and chemical industries to encourage more production of green hydrogen," he adds.

He notes the Malaysian government's recent announcement on the construction of a mobile refuelling station in Putrajaya, marking hydrogen's first footing in Peninsular Malaysia.

"With all these news and developments, we hope to build interest and start seeing hydrogen production being scaled up, industrialised and, ultimately, generate positive market traction," Colin says.

## GEARING UP FOR GREEN HYDROGEN ACCELERATION

To further drive the hydrogen production momentum, Colin says he was tasked with getting the country's supply chain ready.

"Getting the PEM project up and running hinges on nailing down a solid supply chain. A big hurdle is securing the delivery of various components. Finding some of the more specialised components in Malaysia can be a challenge as they are mostly produced in South Korea, Japan and certain parts of China," he explains.

Another piece of the jigsaw is helping to design viable business models for users to accelerate adoption of green hydrogen. In Sarawak, Petronas is working with the state to explore several options, including using hydrogen generation as a service, the potential development of an electrolyser assembly plant in Kuching, and the more conventional model involving engineering, procurement and construction.

"This is where we want to partner with the local industry to advance their knowledge in producing complex and technical components," Colin says.

Syahrudin Hassan, Petronas' group procurement head of industry shaping and collaboration, echoes the importance of industry collaboration and the key role the company plays as an integrated energy solutions provider.

"We encourage collaboration across all industries to ensure that the industry ecosystem remains resilient and competitive. This is to ensure that we meet market demand, harness efficiency, and drive innovation and opportunities for local companies to expand in the new markets from development, manufacturing up to maintaining the energy solutions at scale."

“ This [green hydrogen] is an area where we can develop the technology and see the application in our own country. We envision for this to be a new pillar of growth for both Petronas and Malaysia, and we believe Sarawak is our strategic partner for the launchpad. ”

— Colin Patrick, General Manager, Solution Domain, Project Delivery & Technology, PETRONAS





Office of The Premier of Sarawak

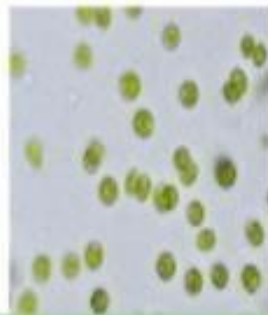




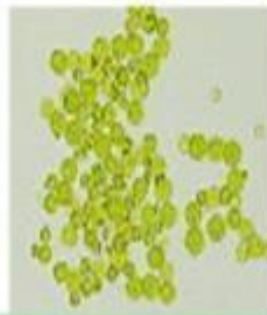
ALGAE CULTIVATION TANKS DELIVERY FROM KUCHING TO BINTULU  
FLAG-OFF

by YAB DATI SRI (DR) HAJI ABDUL ZOHARI BIN MATUK ABANG  
PREMIER OF SARAWAK

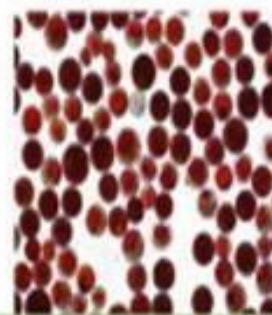
# THE BIOTECHNOLOGICAL POTENTIAL OF REPRESENTATIVE SBC MICROALGAE LIBRARY ISOLATES



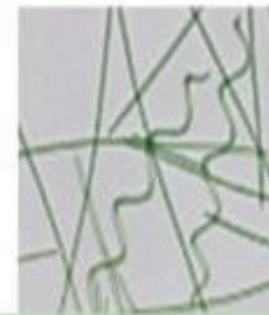
*Chlamydomonas* sp.  
Biofuel  
Feedstock  
Fatty acid



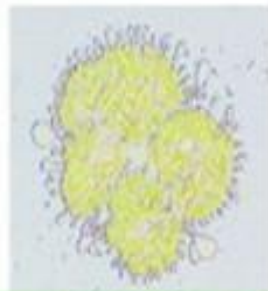
*Chlorella* sp.  
Feedstock  
Fatty acid  
Food and Supplement



*Haematococcus* sp.  
Colour additive  
Astaxanthin  
Food and Supplement



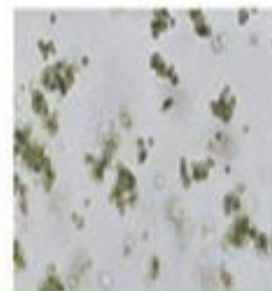
*Arthrospira platensis*  
Colour additive  
Non animal protein  
Fatty acid  
Food and Supplement



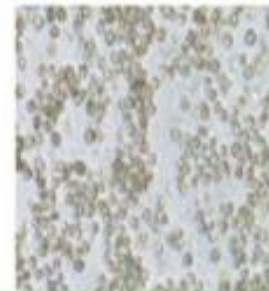
*Botryococcus* sp.  
Biofuel  
Fatty acid  
Hydrocarbon



*Chaetoceros* sp.  
Fucoxanthin  
Feedstock  
Fatty acid



*Nannocloropsis* sp.  
EPA  
Feedstock  
Fatty acid



*Isochrysis* sp.  
DHA  
Feedstock  
Fatty acid  
Food and Supplement



# CIRCULAR ECONOMY IN AGRICULTURE

Commodity : Sago

## OVERVIEW OF INTEGRATED SAGO WASTE RECOVERY, TREATMENT & UTILIZATION DEMONSTRATION PILOT PLANTS



Malaysian Patent  
Application No.  
PI2021001811

System for Treatment of Agricultural Waste  
and Process.  
Filing date: 07 April 2021

Indonesia Patent  
Application No.  
P00202203798

Sistem dan Proses Pengolahan Limbah  
Pertanian.  
Filing date: 29 March 2022

## Phase I – Completed Integrated Sago Wastewater Treatment & Biogas Plant in Kampung Tabo, Mukah



## Phase III – Sago BioCNG Plant & Gas Distribution Network (construction phase)



### Direct beneficiaries of the project :

Location	Number of Piped Gas Connections
Kpg The	93 households (77%) 15 public facilities
Kpg Tabo	37 households (100%) 2 public facilities
<b>TOTAL</b>	<b>147</b>

### Example of gas distribution network

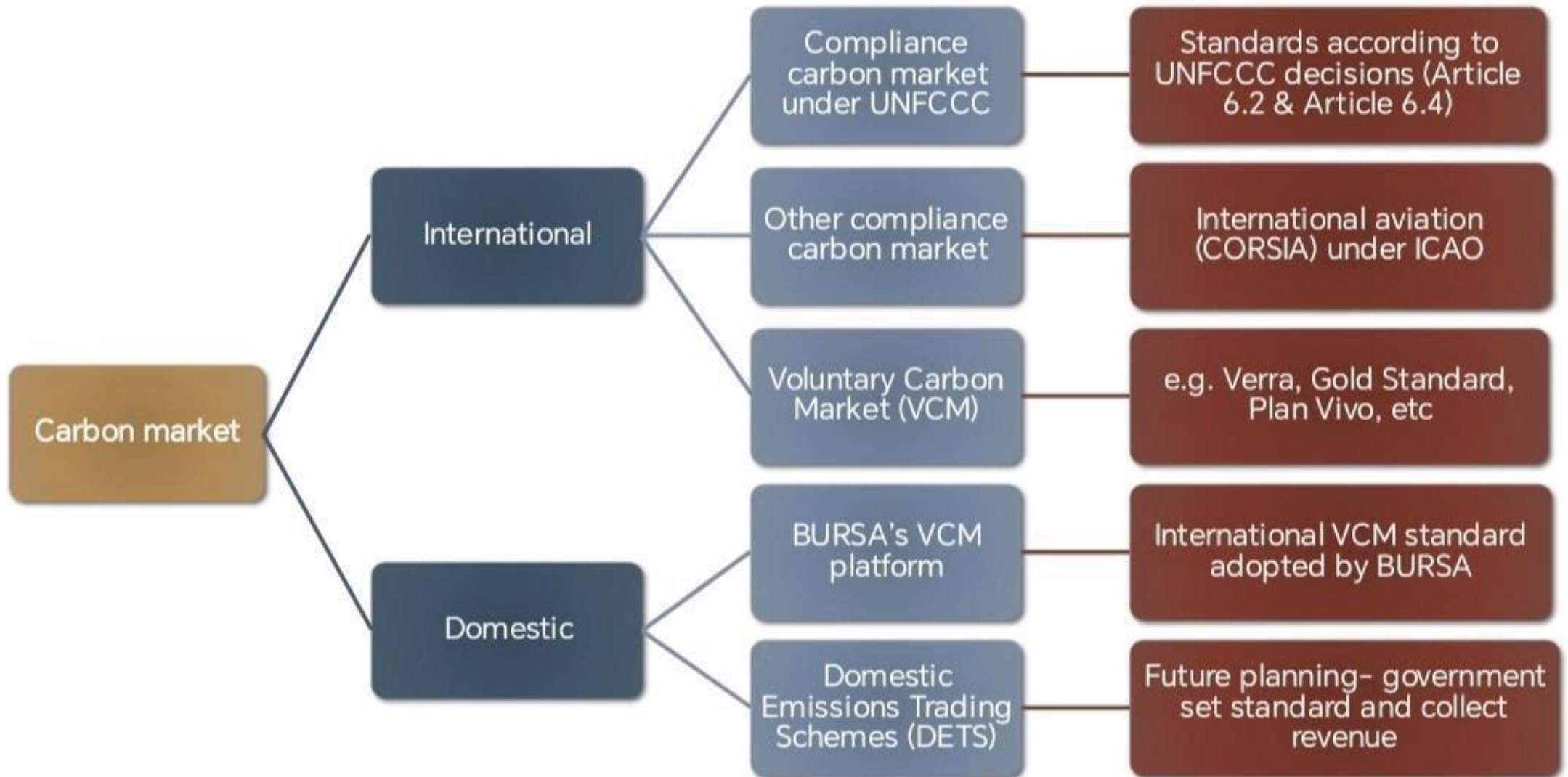


### LEGEND

 Gas Piping Route



# CARBON MARKETS





## High Quality Carbon Offset?



**Additionality:** Projects are unable to exist without revenue derived from carbon credits

**Verification:** Monitored, reported and verified by a credible third party

**Permanence:** Carbon reduction or removal will not be reversed

**Measurability:** Calculated according to scientific data through recognized methodology

**Avoid leakage:** An increase in emission should not occur elsewhere, or account for any that occur





# Forest Carbon Project – ASEAN Region (VCM)

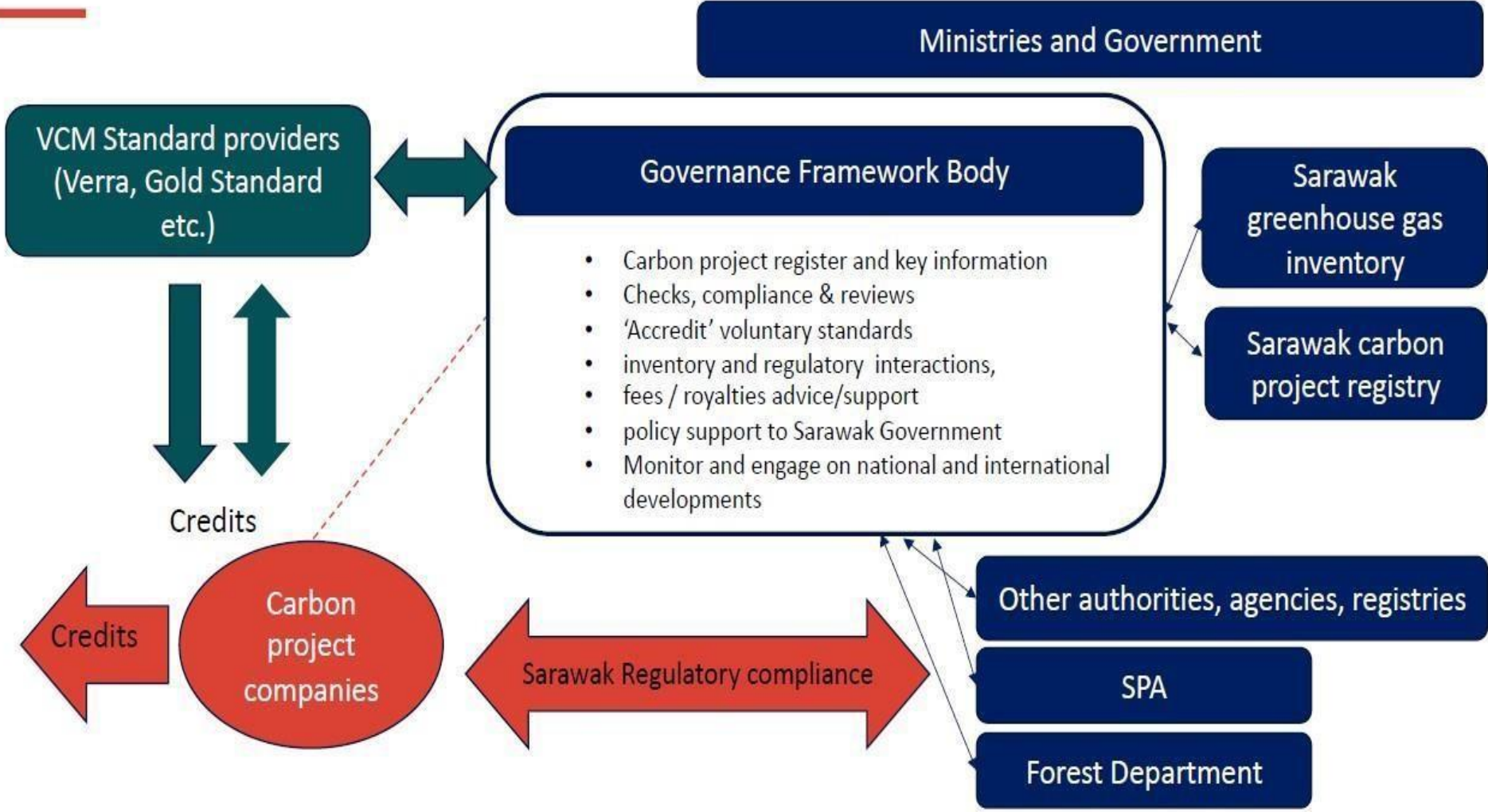
Name	Methodology	Country	Period	Credit period	Land size	Credits p.a.
Katingan	VM1,6,7,9,13,16,17,41,42,44	Indonesia, Kalimantan	60	2010-2070	149,800	7,451,846
OKI REDD+	AM14, VM7	Indonesia, Sumatra	30	2016 - 2045	23,500	181,986
Riau Ecosystem	VM7	Indonesia, Riau	57	2016-2073	130,090	6,545,510
Sumatra Merang	VM7	Indonesia, Sumatra	46	2016-2062	22,922	1,338,569
Kampar Riau	VM7	Indonesia, Riau	20	2014-2034	14,723	1,624,961
Mangrove Restoration	AM14	Indonesia, Sumatra	20	2011-2031	5,000	124,706
Rimba Raya	VM4	Indonesia, Kalimantan	30	2009-2039	91,215	3,527,171
South Cardamon	VM9	Cambodia, Cardamon	30	2015-2044	465,839	3,867,568
Tumring REDD+	VM9	Cambodia	30	2015-2044	67,791	378,434
Keo Seima Wildlife	VM15	Cambodia	50	2010-2069	292,690	1,426,648
Oddar Meanchey	VM6	Cambodia	30	2008-2038	63,831	204,792
Mindanao Tree Planting	ACM3	Philippines	50	2015-2065	30,000	200,000
Bamboo Reforestation	ACM3	Philippines	20	2022-2042	8,421	297,917
# Kuamut Rainforest	VM0010	Malaysia, Sabah	30	2015-2045	83,381	729,030

# Currently being registered with Verra

27,899,538

- From Indonesia : 20,795,149 tCO<sub>2</sub>e
- Indonesian has announced halt in carbon project verification since April 2022
- Papua New Guinea put a halt on all new voluntary carbon forestry projects in March 2022

# STATE CARBON TRADING GOVERNANCE FRAMEWORK AND BODY (DRAFT)





# Sarawak CCUS

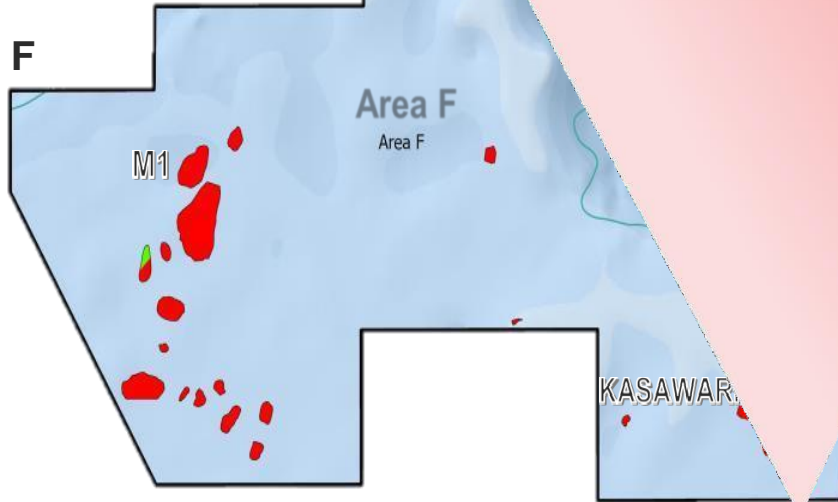
Enabling Low Carbon  
Economy  
& Achieving Net Zero  
2050

# PETROS is the Resource Manager for Sarawak CCUS



Located in the North Luconia province

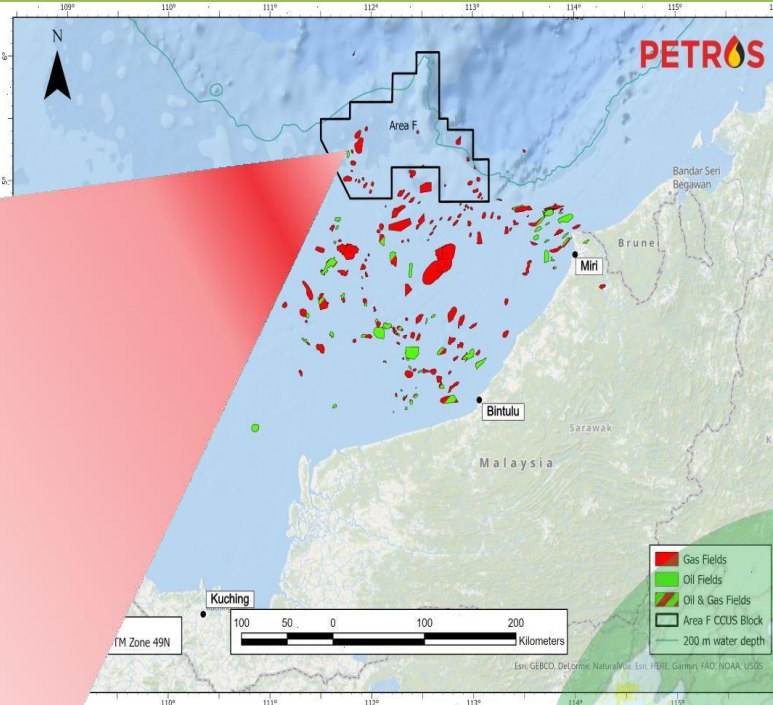
Area F



Area size of ~1.318 million hectares

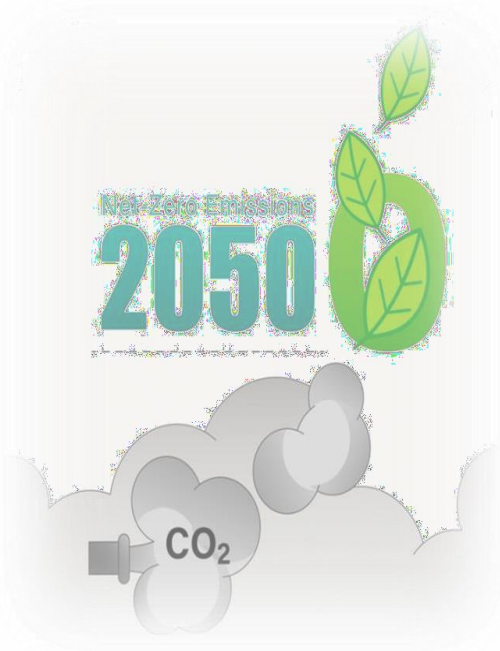


Pontential storage capacity - 6.0 Tscf (310 MM tCO<sub>2</sub>e) from 6 storage sites (depleted reservoirs)





# Why Carbon Capture and Storage?



## Global CCS Context

- UN Intergovernmental Panel on Climate Change (IPCC) - **“CCS as the key necessity to mitigate global warming”**
- To achieve Net Zero 2050, the world needs 8 billion tons per annum of CO<sub>2</sub> sequestration; e.g. Japan alone needs 240 million tons per annum



## CCS in Sarawak

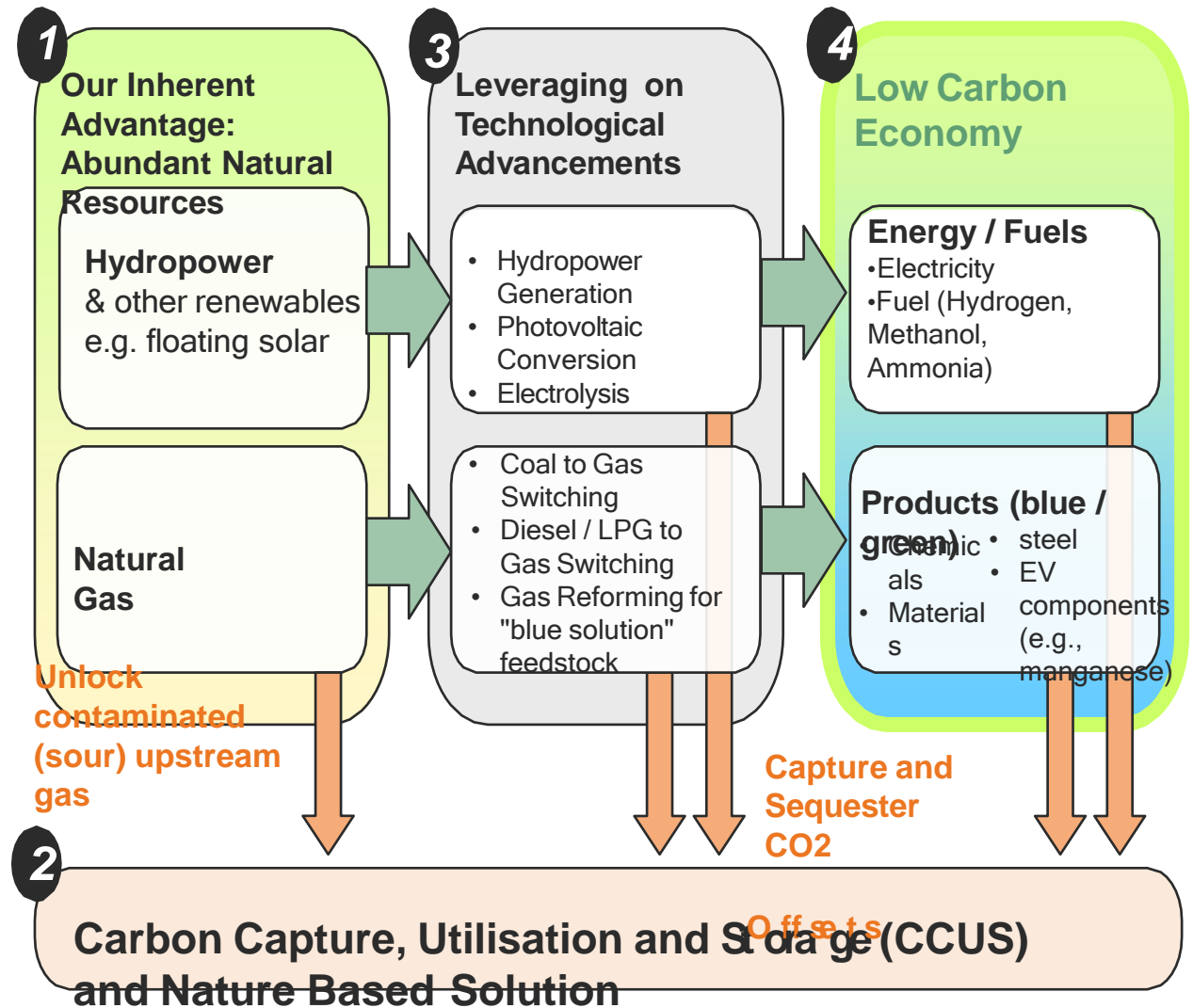
- ~ 9 billion tons CO<sub>2</sub> CCS potential with world class CCS resources.
- PETROS as Resource Manager to maximize value generation from CCS potential.



# Realising Low-Carbon Solutions Potential through Sarawak's Advantages

Sarawak can offer holistic *Low Carbon Solutions* to be a national and regional leader.

- **No. 1 in Hydropower generation** potential in Malaysia
- **No. 1 in Natural Gas** production and reserves in Malaysia (> 60% reserves)
- **No. 1 in CCS potential** in Malaysia (>65% CCS potential)

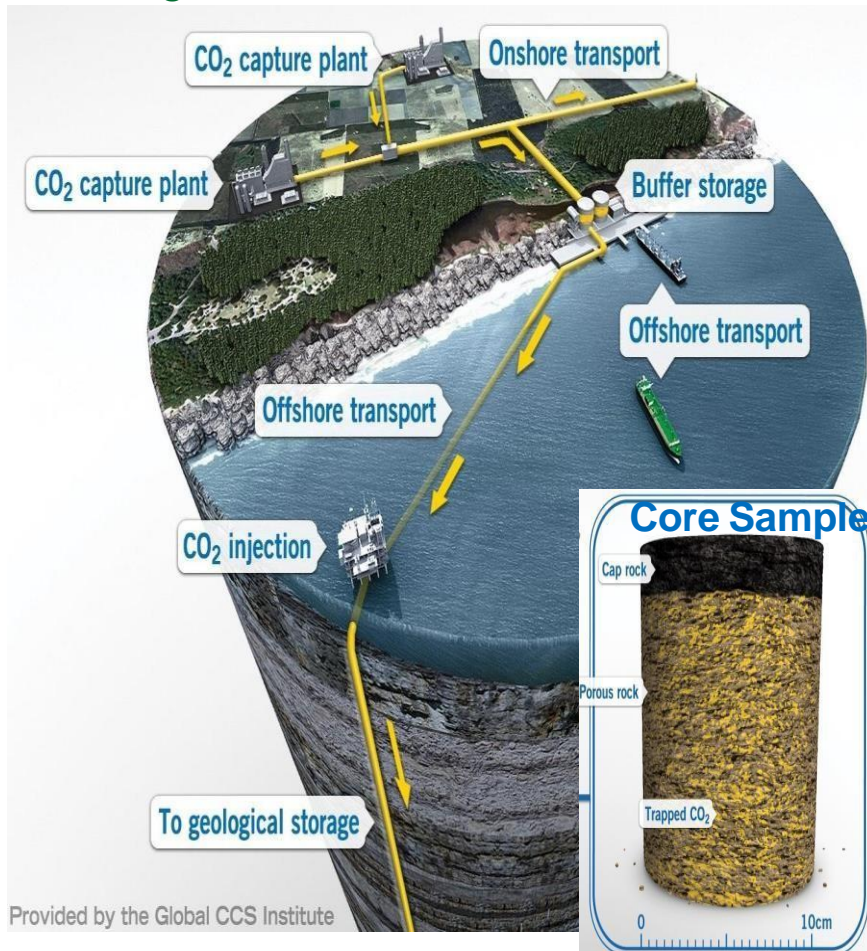




# Understanding CCUS

## CCS Value Chain Overview

Captures CO<sub>2</sub> at the source, transports it, and stores it permanently and safely in a subsurface storage deep underground.

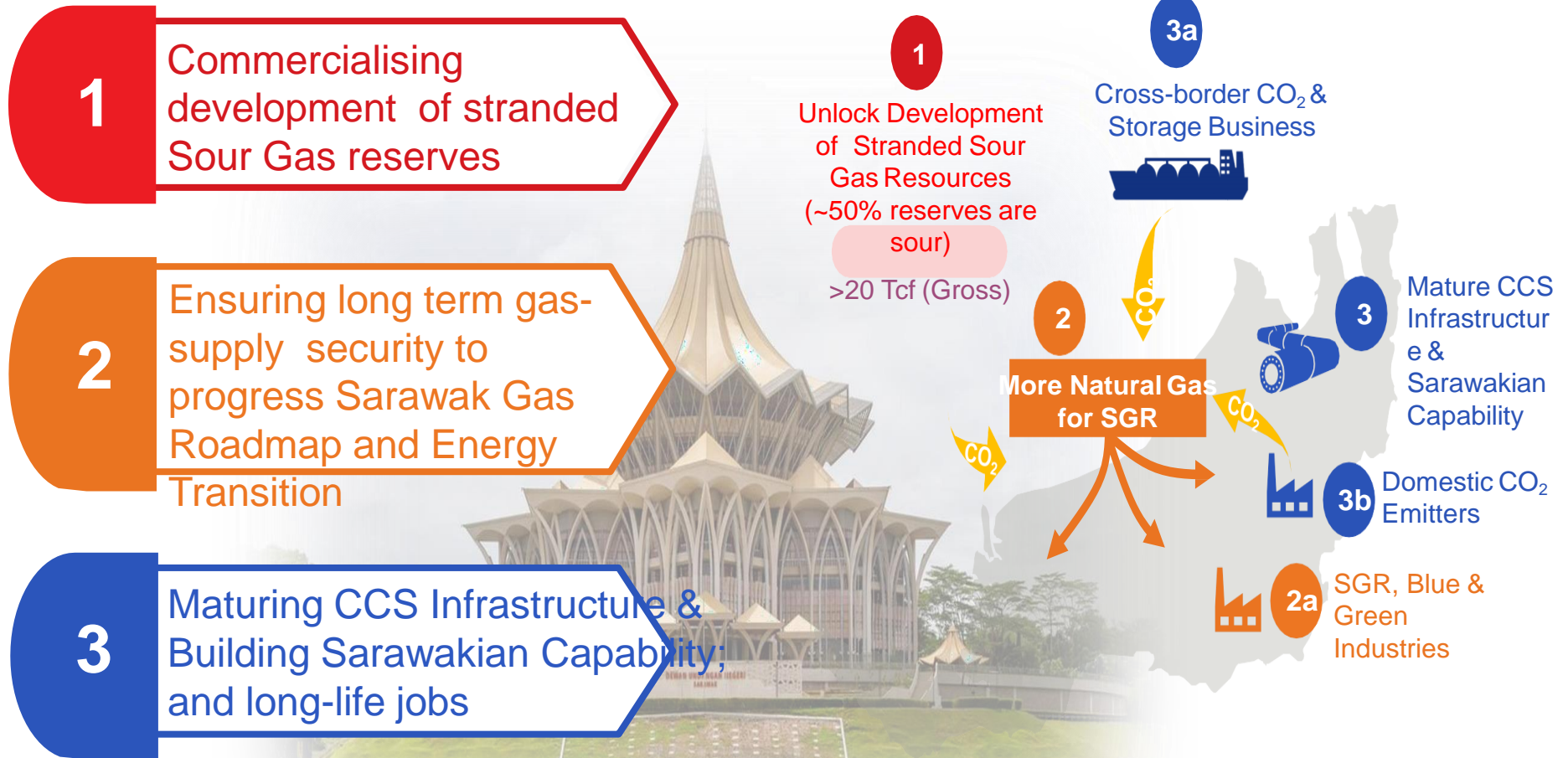


- **Capture:** The separation of CO<sub>2</sub> from other gases produced at industrial facilities
- **Transport:** Separated CO<sub>2</sub> is compressed and transported via pipelines, trucks or ships to a suitable site for geological storage.
- **Storage:** CO<sub>2</sub> is injected into deep underground rock formations (depths > 1 km) - safely and permanently.
- Nascent industry, still a big range in cost at US(\$20)/120-200/ton CO<sub>2</sub>
- **How do we know that CCS works:**
  - ✓ Rocks targeted to store CO<sub>2</sub> are the same type as those storing oil and gas for millions of years.
  - ✓ Close to 300 million tonnes of CO<sub>2</sub> has been injected into storage formation underground successfully.
  - ✓ Monitoring technologies have been deployed, demonstrating ability to measure, monitor and verify injected CO<sub>2</sub>.
  - ✓ Techniques & technologies adopted from oil & gas



# CCUS Value Proposition for Sarawak

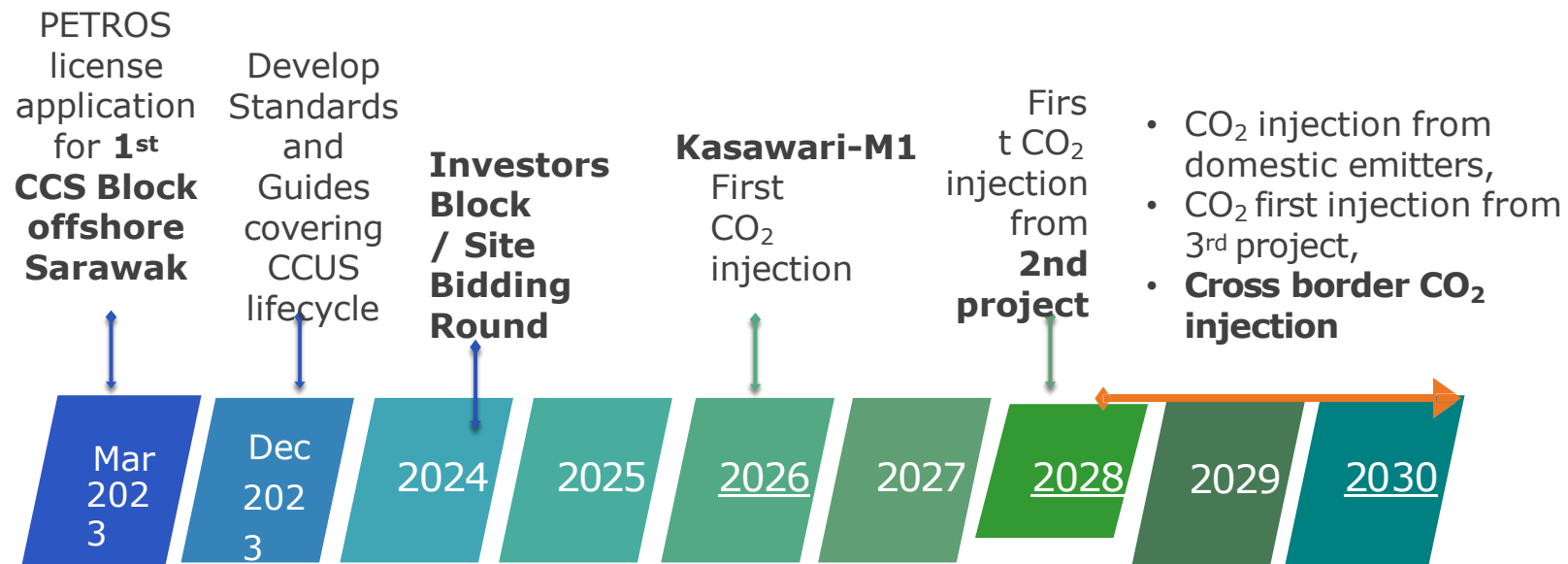
Realising long-term potential of CCUS value chain and establishing Sarawak as the CCUS Heartland in Asia Pacific through:







# Sarawak CCUS Maturation: Timeline



Commercial agreement, Guidelines and Standards, issuance of Storage Permit

Negotiate fiscal incentives with Federal to accelerate/ incentivise development

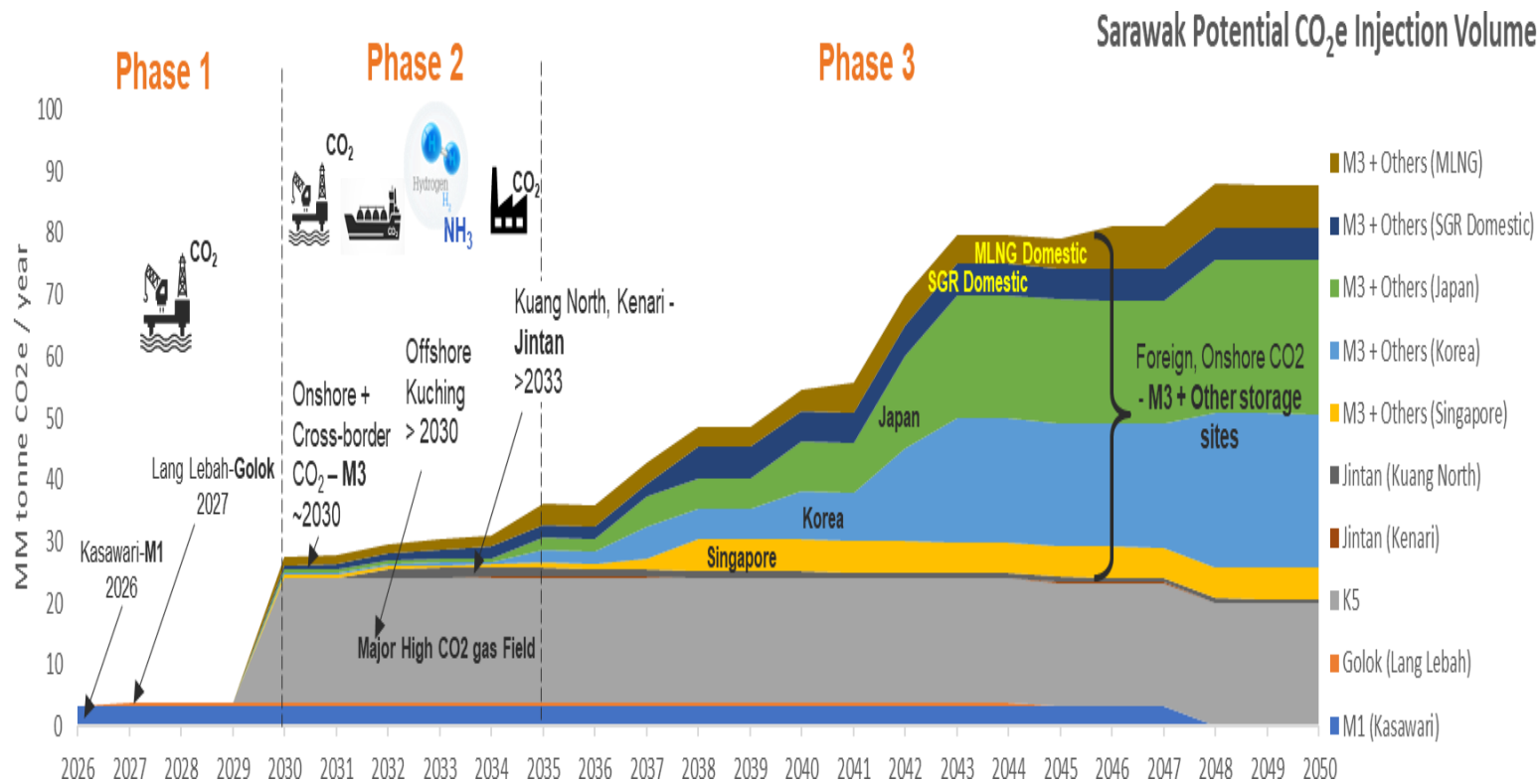
CCS Value Chains (Capture & Liquefaction, Transport, Receiving Terminal & Sequestration) Study and Project

Continue to engage investors and stakeholders, evaluate opportunities



# Sarawak CCUS Roadmap to 2050

- CCUS pioneered by Upstream sour gas developments
- Enabling sour gas production, establishing base infrastructure for future carbon storage for cross-border and local industrial CO<sub>2</sub> emitters
- Establishing Sarawak as CCUS Regional Heartland



~ 80 mil  
tCO<sub>2</sub>e per  
year of CO<sub>2</sub>  
storage by  
2050

Roadmap to increasing CO<sub>2</sub> storage in Sarawak to 2050,  
directly contributing to Net Zero 2050

# Sarawak Opportunity – Pathway Towards a Low-Carbon Future

## **Sustainability:**

*Leveraging Sarawak's competitive intrinsic – abundance of gas, hydro power, CCS resource, and advantaged geo-trade location*

## **Prosperity:**

*Uplifting & providing high quality jobs to support our Vision 2030*

## **Innovation:**

*Adopting latest technologies – gas-to-power, hydro power and CCS to realise blue and green solutions*

*Respect and Trust: Realisation through strategic collaboration, and regional partnerships (G2G, B2B)*



# PRESENTATION OUTLINE



**Introduction on  
Forest  
Carbon**

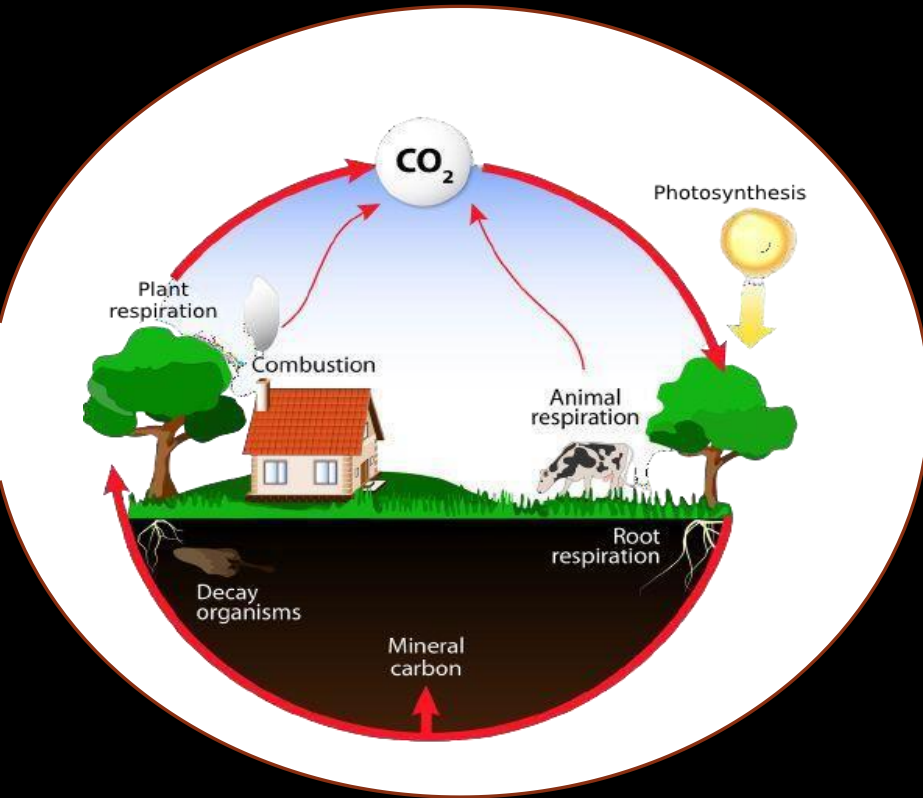


**Forest Carbon  
Regulation**

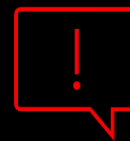
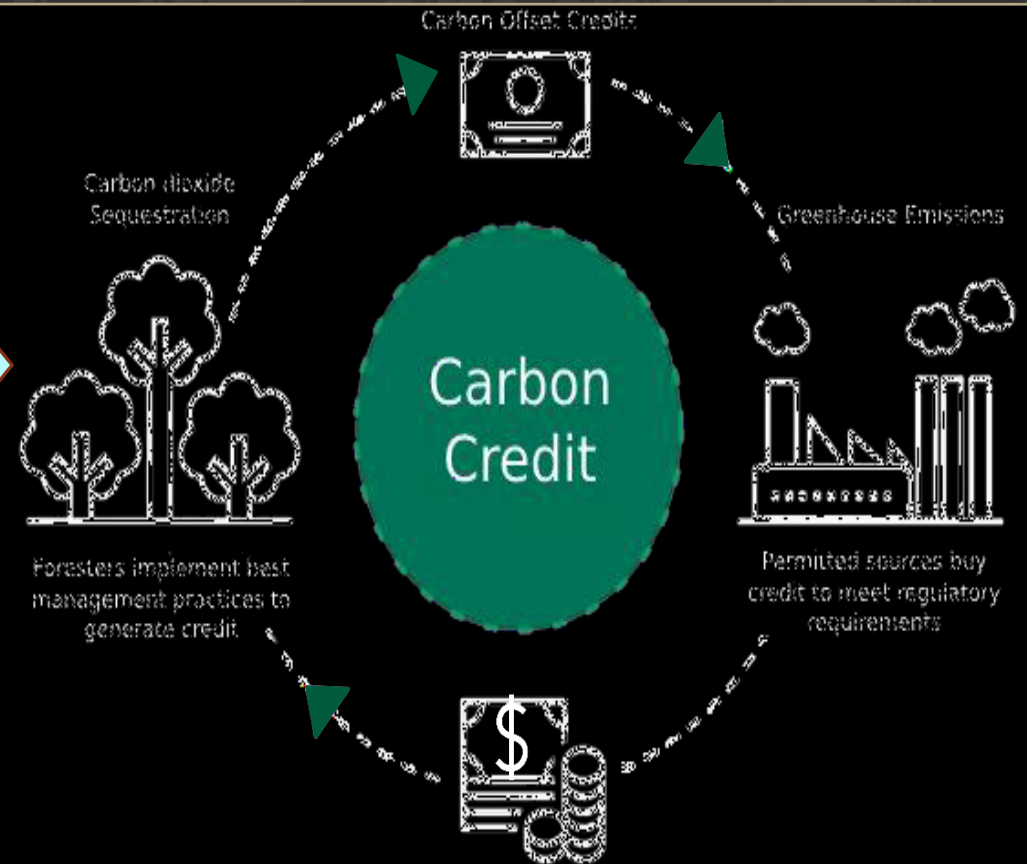


**Requirement &  
Procedure**

# INTRODUCTION

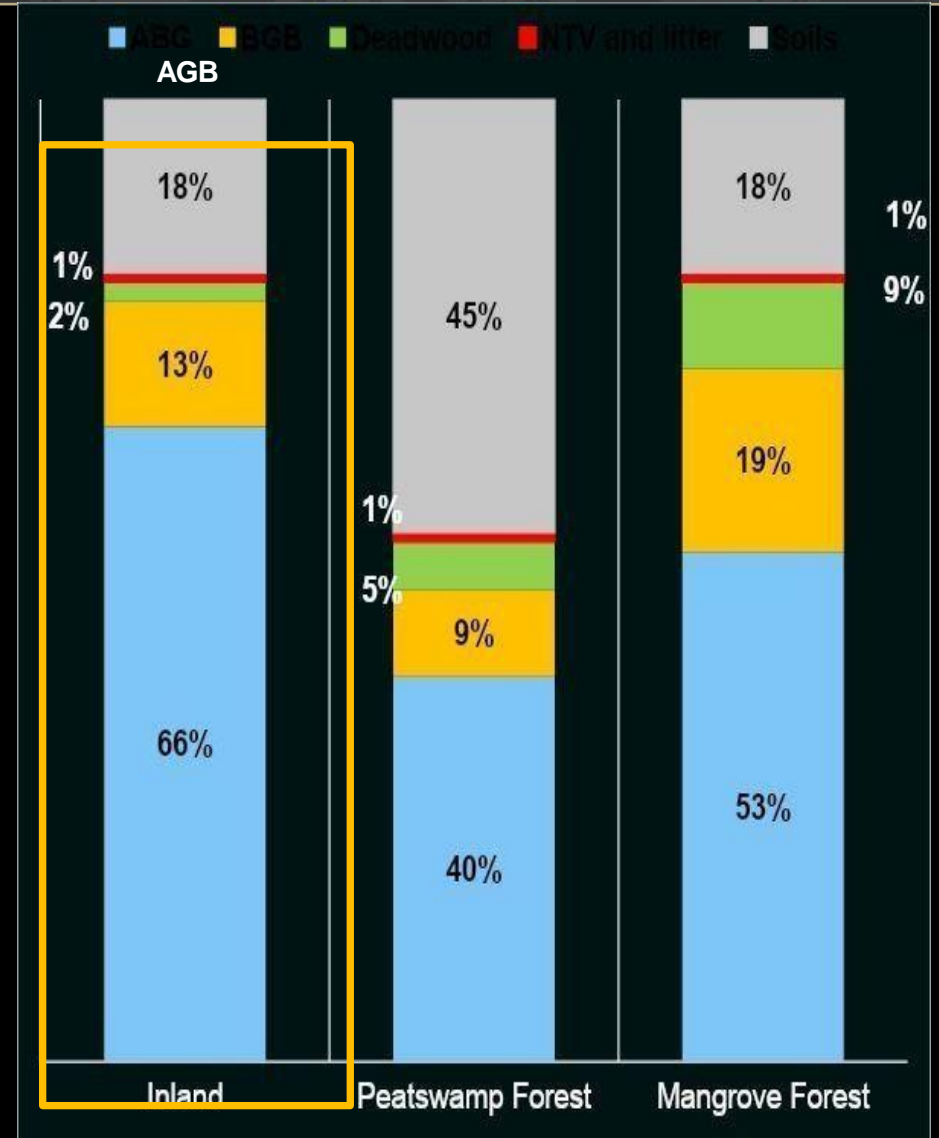
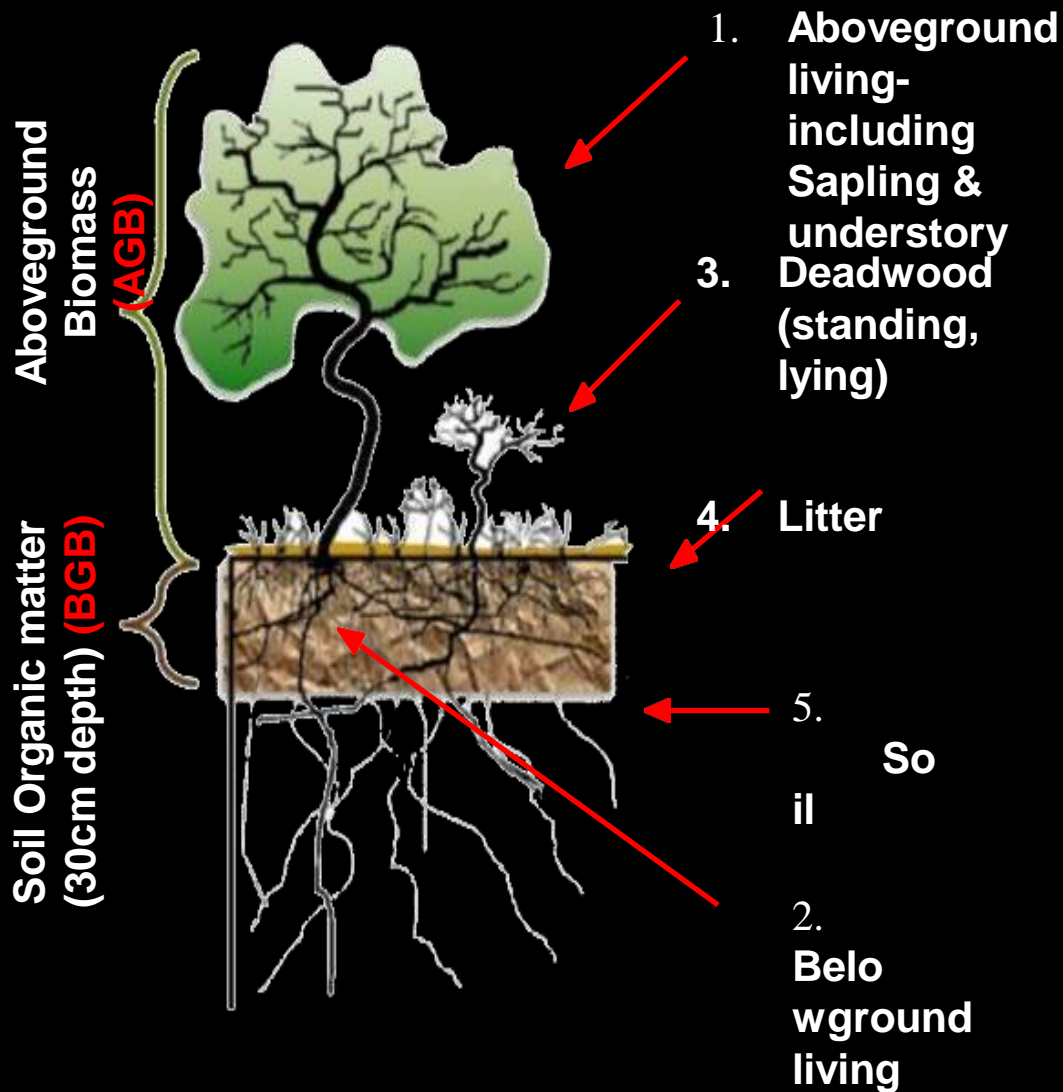


Carbon storage; Tropical forests, store vast amounts of carbon in the trees and soil



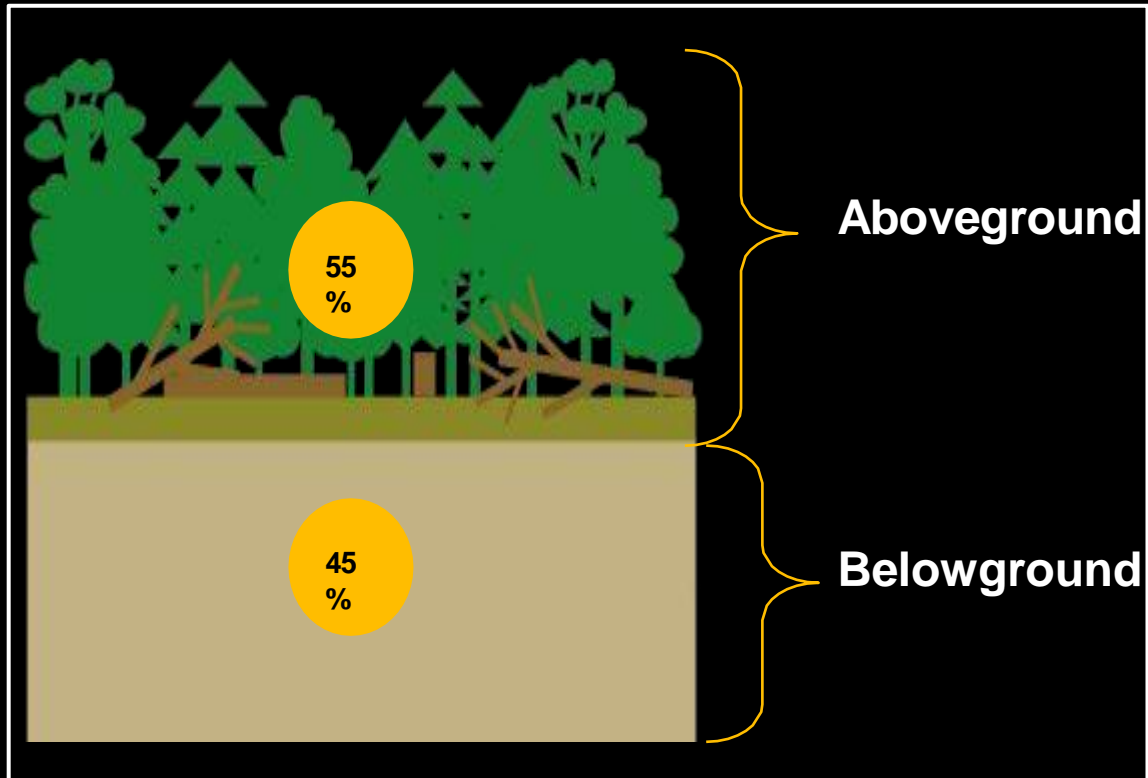
**Forest is important to reduce build-up  $\text{CO}_2$  in the atmosphere**

# PROPORTIONS OF FOREST CARBON POOL



Source: Hamdan *et al.*, 2017

# BIOMASS AND CARBON STOCK



To calculate carbon stock, we have to determine tree volume (biomass) via PSP;

-Aboveground Biomass (AGB) & Belowground Biomass (BGB)

- AGB calculated using Chave *et al.* 2014- widely used formula for tropical moist forest (IPCC classification on forests)
- Generally, BGB for tropical forest (inland) is 34% of total carbon pool

**Converting biomass to carbon:**

Carbon = biomass x 0.5  
(conversion factor)

# Forest Carbon Regulations

Awg Tengah: Amendment Bill to see licences issued for Forest Carbon Activities

BY MABUYN TEN ON MAY 13, 2022, THURSDAY AT 12:28 PM

SARAWAK



Awang Tengah shows a stack of documents related to the Forests (Amendment) Bill, 2022 with Deputy Minister for Natural Resources and Urban Development Datu Len Talfir Salleh. — Photo by Roystein Emmor

S'wak govt tables Forests (Amendment) Bill 2022 to licence forest carbon activities, include carbon and GHG stocks as forest produce

May 19, 2022 @ 10:17



Awang Tengah tabling the Forests (Amendment) Bill 2022 today (May 19, 2022) in DUN. Screenshot of Ulas Inozem.





# (i) PRIMARY LEGISLATION

1. **FORESTS ORDINANCE, 2015 [Cap. 71]**
2. **FORESTS (AMENDMENT) ORDINANCE, 2022 [Cap. A201]**



**LAWS OF SARAWAK**

**Chapter A201**

**FORESTS (AMENDMENT) ORDINANCE, 2022**

# FOREST PRODUCE

includes :-

carbon stocks; or  
greenhouse gas stock

in any forest whether on  
state land, alienated  
land or  
inland waters;

“forest produce” includes—

(a) the following when found in or brought from a forest reserve, protected forest, communal forest, amenity forest, Government reserve, other State land, inland water or alienated land—

*[Ins. Cap. A201/2022]*

(i) guano, peat, rock, sea-shell and surface soil;

(ii) trees and all parts and produce not hereinafter mentioned of trees;

(iii) plants including grass, climbers, creepers and all parts and produce of such plants; or

(iv) tusks, horns, silk-cocoons, honey, wax and edible birds' nests;

(b) the following when found in or brought from a forest reserve, protected forest, communal forest, amenity forest, Government reserve, other State land, inland water or alienated land—

*[Ins. Cap. A201/2022]*

(v) timber;

(vi) firewood;

(vii) charcoal;

(viii) bark;

(ix) wild rubbers; or

(x) cordwood;

(c) carbon stocks or greenhouse gas stock in any forest whether on state land, alienated land or inland waters;

# FOREST CARBON LICENCE

## s. 70A (1) of FO

- issued by Director of Forests, with the written approval of Minister;
- to carry out Forest Carbon Activity;
- in any permanent forest, State land or alienated land (with approval of land owner)

### *Chapter 6- Special provisions relating to carbon stocks*

#### **Forest Carbon Licence**

70A.—(1) The Director may, with the written approval of the Minister, grant a licence, for a specific term, to any person to carry out a Forest Carbon Activity in any permanent forest, State land or alienated land.

Provided that in respect of alienated land, no licence shall be issued except to the registered proprietor of such land or with the written approval of the registered proprietor thereof or his authorized representative.

(2) A carbon licence granted under subsection (1) shall be subject to such payment of fees and other charges and shall grant the holder of that carbon licence full legal and beneficial title to the carbon stock or GHG stock associated with a Forest Carbon Activity as well as any carbon credit units issued by a Carbon Standard in respect of the Emission Reductions achieved by such Forest Carbon Activity.

# FOREST CARBON LICENCE

## s. 70A (2) of FO

- grant the licence holder full legal and beneficial title
- title to the carbon stock/GHG stock/ carbon credit units
- subject to fees and other charges

### Chapter 6- Special provisions relating to carbon stocks

#### Forest Carbon Licence

70A.—(1) The Director may, with the written approval of the Minister, grant a licence, for a specific term, to any person to carry out a Forest Carbon Activity in any permanent forest, State land or alienated land.

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# FOREST CARBON ACTIVITY

## s. 70B of FO

— Forest Carbon Activity|| means

- any activity, action, project or groups of activities
- that lead to the Emission Reductions
- which are verified in accordance with a Carbon Standard;

(ii)  
**SUBSIDIARY  
LEGISLATION**

**FORESTS (FOREST CARBON  
ACTIVITY) RULES, 2022**



**THE  
SARAWAK GOVERNMENT GAZETTE  
PART II**

**Published by Authority**

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**Vol. LXXVII      22nd December, 2022      No. 84**

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Swk. L. N. 350

THE FORESTS ORDINANCE, 2015

FORESTS (FOREST CARBON ACTIVITY) RULES, 2022

Made under section 113(1)(bb)

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ARRANGEMENT OF RULES

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PART I  
PRELIMINARY

*Rule*

1. Citation and commencement
2. Interpretation

# OVERALL OBJECTIVES OF THE RULES



- Regulate carbon projects in designated area

- Ensure carbon projects are sustainable and in accordance with the carbon standards

- Safeguard forest area & State's rights in forest carbon

- Regulate new source of revenue through nature venture business

- Mechanisms for the management of Registry, Monitoring Reporting and Verification (MRV), and carbon accounting for National Determined Contribution (NDC)

- Manifest Sarawak's commitment towards climate change mitigation and adaptation

# **CONTENT OF THE FORESTS (FOREST CARBON ACTIVITY) RULES, 2022**

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- ◆ Part I: Preliminary (2 Rules)
- ◆ Part II: Carbon Study Permit (10 Rules)
- ◆ Part III: Carbon Licence (14 Rules)
- ◆ Part IV: Sarawak Forest Carbon Registry and Licence Register (2 Rules)
- ◆ Part V: Carbon Stock (2 Rules)
- ◆ Part VI: Carbon Credit Unit (5 Rules)
- ◆ Part VII: Crediting period (1 Rule)
- ◆ Part VIII: Monitoring, Reporting and Verification of carbon project (1 Rule)
- ◆ Part IX: Carbon accounting (3 Rules)
- ◆ Part X: Fees and Royalty (1 Rule) Schedules (4 Schedules)
- ◆ Part XI: Miscellaneous (3 Rules)

**44**

**RULES**



# SALIENT FEATURES OF THE RULES



**FOREST  
CARBON AREA**

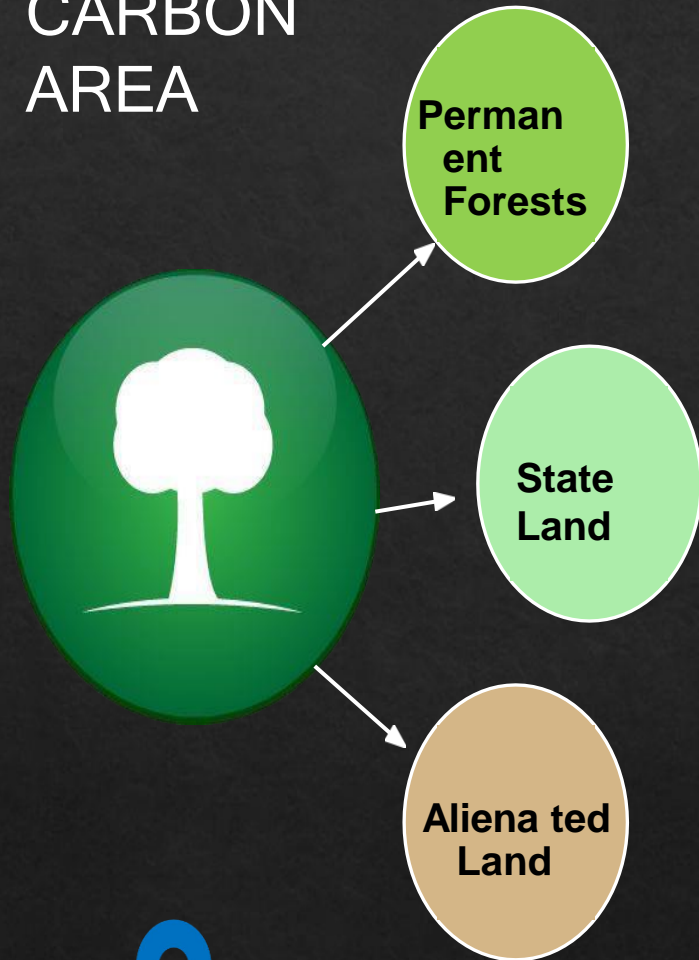


**PERMIT  
AND  
LICENCING**



**FEES  
AND  
ROYALTY**

# RULE 15 FOREST CARBON AREA



Minimum : 100 ha.

## Size of Forest Carbon Area

### Alienated Land

- get written consent from the land owner, if the applicant is not the land owner.

### Existing Licenced Area

(eg. *Forest Timber Licence, Licence for Planted Forest*)

- get written consent from the holder, if the applicant is not the existing licence holder;
- if the applicant is the existing licence holder, the Director may make amendment to the existing licence to enable Forest Carbon Activity.



Maximum : carbon study designated area issued under CSP

# GENERAL REQUIREMENTS



**No overlapping** of forest licences over one particular area



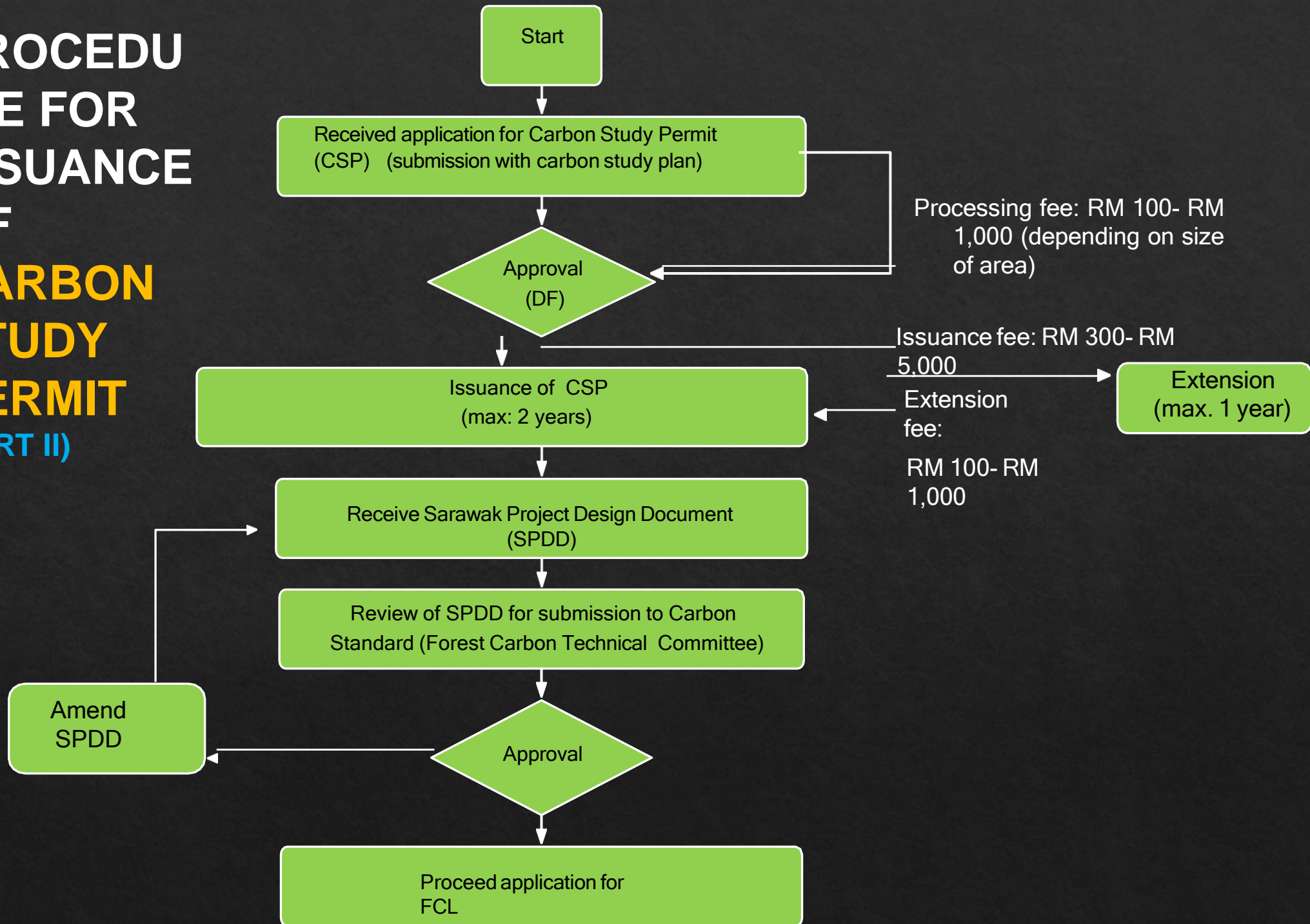
**Written consent** of the landowner/ forest licence holders, if applicant is not the owner/ licensee (**Rule 15**):

- Alienated land
- NCR
- Forest Licence holders



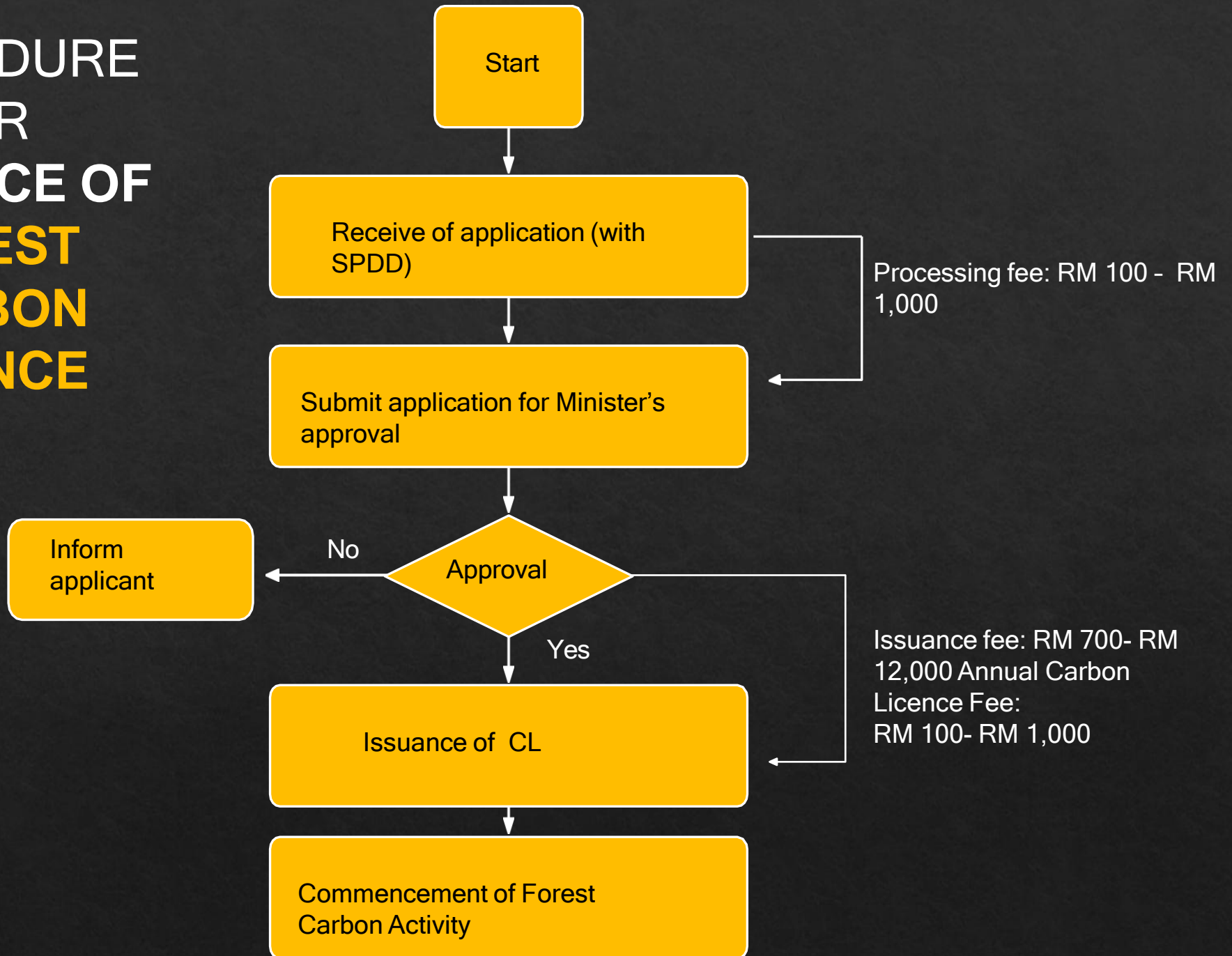
Other terms and conditions specified by the Director (**Section 70A (1)**) (**Rule 4(1), 14 (1)**)

# PROCEDURE FOR ISSUANCE OF CARBON STUDY PERMIT (PART II)



# PROCEDURE FOR ISSUANCE OF FOREST CARBON LICENCE

(PART III)





## **READY TO ANSWER**

Deputy Minister for Energy and Environmental Sustainability Dr Hazland Abang Hipni walks into the State Legislative Assembly (DUN) building with arms wide open, holding the answer to a question posed by Datuk Ibrahim Baki (GPS-Satok) in the august House. — Photo by Mohd Rais Sanusi