



Chandra Asri
Your Growth Partner

Manufacturing
SERIES
TECH-TALK

Indonesia's Petrochemical Industry Sustainability Efforts Through Circular Economy

Edi Rivai

Director of Legal, External Affairs & Circular Economy

Manufacturing Tech-talk: Sustainability in Indonesia's Manufacturing Industry, 21th April 2022

Topics

- Chandra Asri Overview
- Circular Economy for Sustainability & Plastic Waste Management
- Chandra Asri's Circular Economy Efforts

Chandra Asri Overview



Chandra Asri – Indonesia’s Leading and Preferred Petrochemical Company

- **Largest integrated petrochemical producer** in Indonesia and operates the country’s pioneer and only Naphtha Cracker, Styrene Monomer, Butadiene, MTBE and Butene-1 plants.
- **Market leadership** in highly attractive Indonesia and SE Asia petrochemical market, especially for Polypropylene and Polyethylene.
- **Support** from Barito Pacific Group, Siam Cement Group and ThaiOil (part of PTT Group).
- **Vital National Object** status granted by the Government of Indonesia.
- **Transformed in 2016 following the 4Q2015 Naphtha Cracker expansion and Furnace revamping in 2019.** Production capacity increased by some 50% to Ethylene 900 KTA, Propylene 490 KTA, Py-Gas 418 KTA, and Mixed C4 330 KTA.
- **Further downstream expansion completed in 2018-2020,** (1) Butadiene plant up to 137 KTA from 100 KTA; (2) new Synthetic Rubber plant with capacity of 120 KTA (a joint venture with *Michelin*); (3) new Polyethylene plant of 400KTA bringing total Polyethylene capacity to 736 KTA; (4) new expanded capacity of Polypropylene plant at 590 KTA through debottlenecking; and (4) new plant of MTBE and Butene-1 plant with capacity of 128 KTA and 43 KTA respectively which completed the second phase master plan of Chandra Asri integrated complex.

Project Expansion Roadmap To Reduce Import Dependency

2016 Naphtha Cracker Expansion	2019 New Polyethylene Plant Startup Polypropylene Plant Expansion
2018 New Synthetic Rubber Plant Startup Butadiene Plant Expansion	2020 New B1/MTBE Plant Startup
2026 New 2 nd Integrated Petrochemical Complex (CAP2) Startup Plan	



CAP's main integrated manufacturing complex



Chandra Asri Commitment in Sustainability

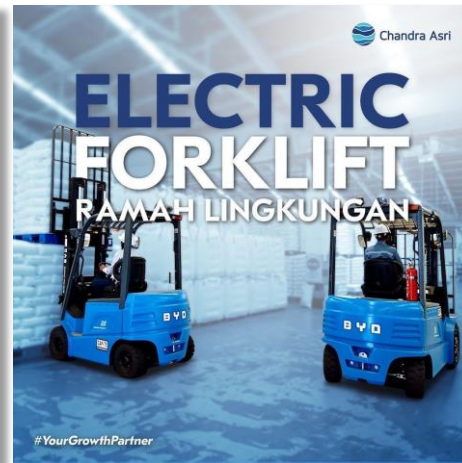
Chandra Asri is committed to maintain its market leader position, underpinned by its commitment to the principle of triple bottom line: **Planet, People, Profit**, through **Environmental, Social, Governance (ESG)** strategy. For us, embarking on the journey of business sustainability means that we **continuously improved performance and create a harmonious living** with our surrounding communities and the environment.



Enclosed Ground Flaring (EGF) is capable of burning **220 tons of hydrocarbons per hour** that operates during the plant startup process and if the conditions are beyond the operating habits.



Chandra Asri started to power our buildings in our plant area with **solar energy** generate **1,500 MWh** annually, avoiding up to **1,080 tons CO₂e/year**. Comparable to planting **18,000 trees** annually.



Chandra Asri committed to handling climate change by operate 53 units **electric forklift** since 2020, potentially reduce **69,445 kg of natural gas and 165,360 liters of diesel** usage



External Recognition From National & International



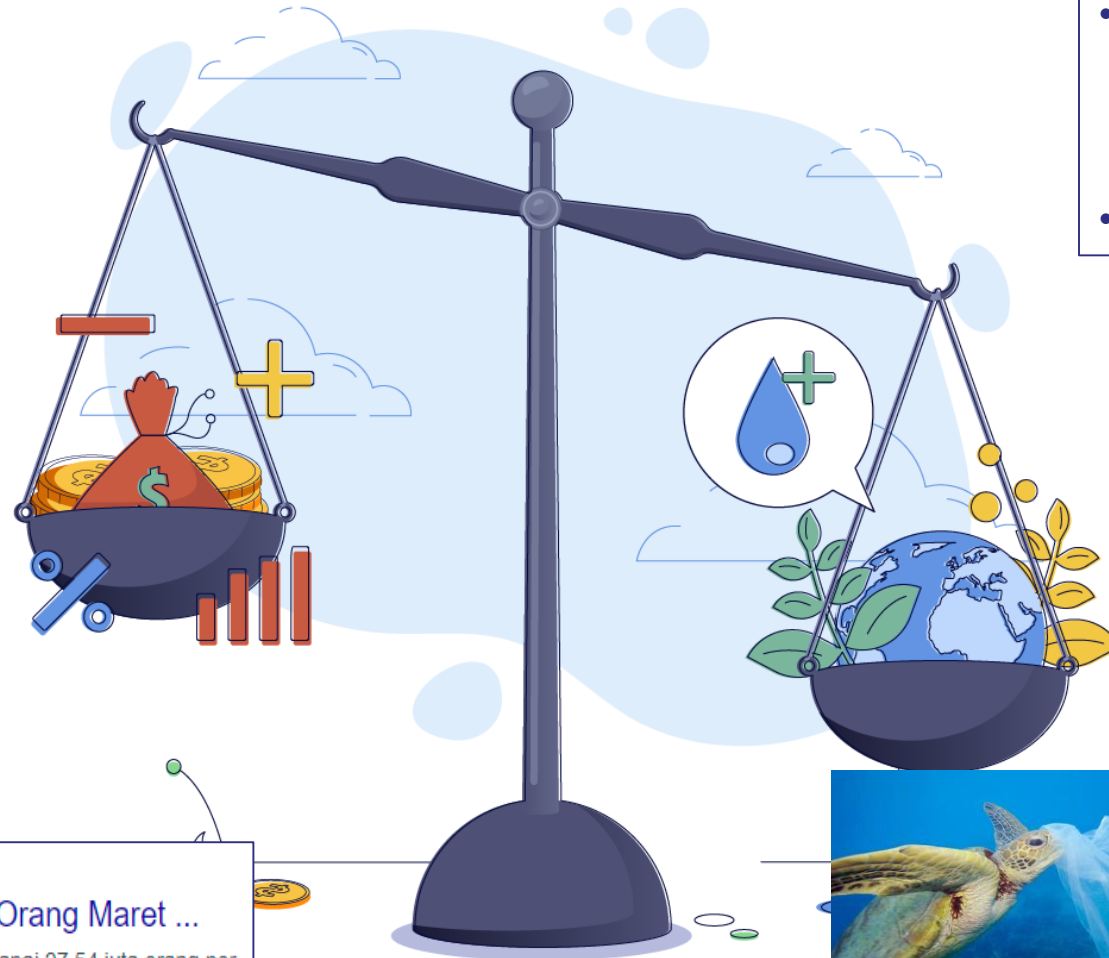
Circular Economy for Sustainability & Plastic Waste Management



Why We Need Circular Economy?

Indonesia did not have excessive consumption, need to managed waste properly

Country	GDP/Capita (USD)	Plastic Cons. /Capita (kg)
Japan	41,380 (7)	71.5
Netherland	54,210 (21)	93.6
Germany	50,922 (32)	98.6
South Korea	42,251 (44)	145.9
Malaysia	26,435 (72)	82.5
Thailand	17,287 (97)	71.6
Indonesia	17,287 (137)	21.6
Vietnam	8,200 (159)	46.6



- **Jakarta:** Today, Bantargebang Landfill capacity already on critical condition. (received waste **7,800 ton/day**)
- **Indonesia:** 56% managed waste



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Jumlah Penduduk Miskin RI Tembus 27,54 Juta Orang Maret ...

Jul 15, 2021 — BPS mencatat penduduk miskin di Indonesia mencapai 27,54 juta orang per Maret 2021 atau 10,14 persen dari total populasi.

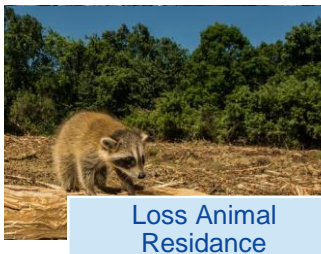


Source: Ourworldindata, Euromap, BPS import, INAPLAS internal, UN, kitabisa (2020)

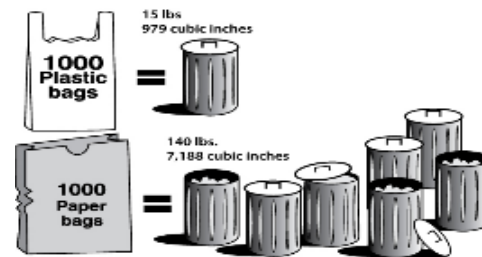
Material Comparison and Its Impacts

Production Impact PAPER VS PLASTIC

Source: TREE by product of OIL

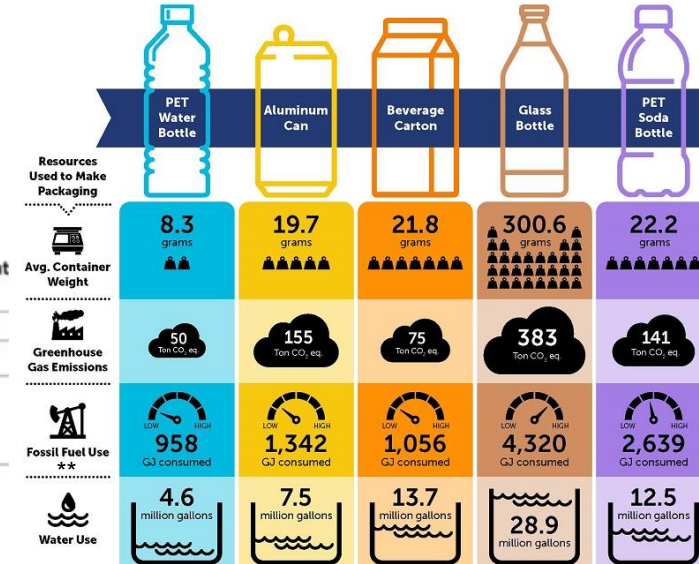


Life Cycle Analysis (LCA)



Environmental Impact of Drink Packaging*

(Weights are for individual 16.9 oz containers. Other values represent 1 million 16.9 oz bottles, cartons, or cans each.)



Source: bottledwater.org and Trayak, 2021

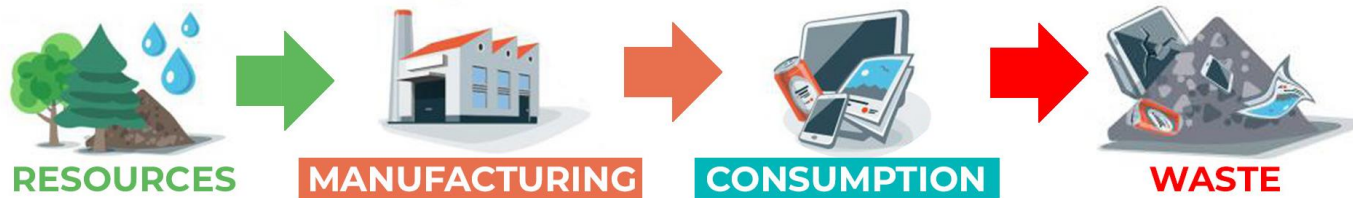
* Weight are for individuals 16.9 oz containers. Other value represent 1 million 16.9 oz bottles, cartons, or cans each.

** Fossil Fuel Use unit was total quantity of fossil fuel consumed throughout the life cycle. Visual representations of numerical values are not to scale.

On production side, plastic was efficient on energy and water used, also low emission

What is Circular Economy?

LINEAR ECONOMY



As the economy grows, we need more raw materials for the production of goods and we produce more waste.

Today, our economies have become so large that we have to question the wisdom of extracting more raw materials and dumping more waste. This current economy of “take-make-use-dispose” is called the **linear economy**

CIRCULAR ECONOMY

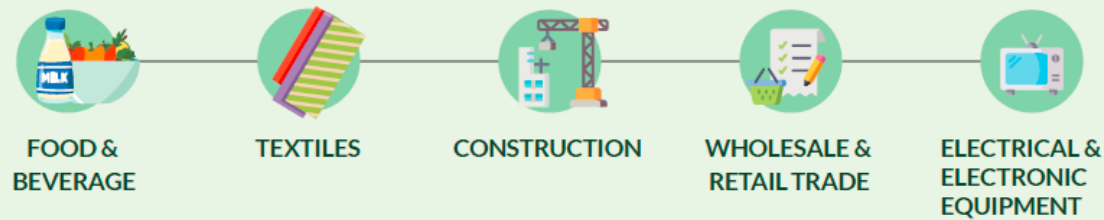


The **circular economy**, aims to maximize circular use of material to minimize production of waste by recovering and reusing as many of the products and materials as possible, in a systemic way, over and over again.

Source: TU Delft University

Circular Economy Opportunity in Indonesia

5 SECTORS IN INDONESIA HAVE LARGE POTENTIAL TO ADOPT A CIRCULAR APPROACH



These five sectors represent **1/3** of Indonesia's GDP and employed **>43 million** people in 2019

A CIRCULAR APPROACH COULD GENERATE MEANINGFUL ECONOMIC, ENVIRONMENTAL AND SOCIAL BENEFITS BY 2030 COMPARED TO A "BUSINESS AS USUAL" SCENARIO



Economic benefits

Potential to generate an additional economy-wide GDP of IDR593 - 638 trillion in 2030; the direct GDP impact on the 5 sectors could vary from IDR -1,563 trillion to IDR312 trillion based on different scenarios



Environmental benefits

Reduce waste in each sector by ~18-52% in 2030
Reduce CO2e emissions by 126 million tonnes and water use by 6.3 billion cubic metres in 2030



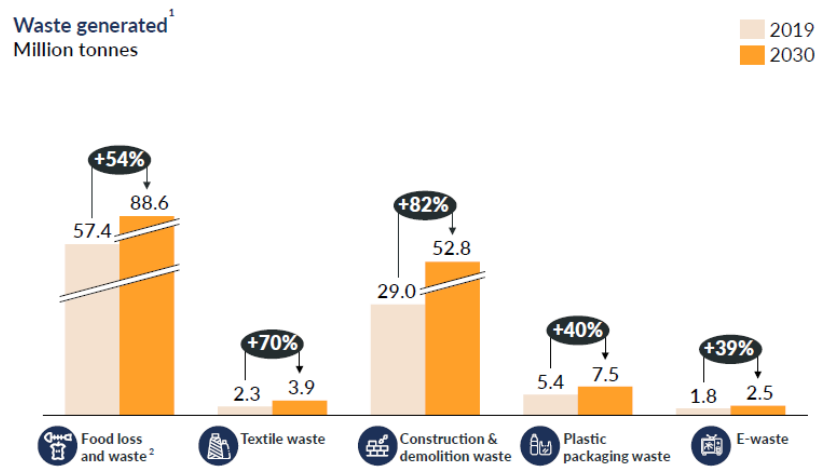
Social benefits

Create 4.4 million net cumulative jobs by 2030
Create annual household savings of almost 9% of their budgets (IDR4.9 million annually)¹ in 2030

¹ Based on IO methodology

Source: BAPPENAS, McKinsey, IBM Analytics, Harvard Business Review, World Economy Forum – Ellen MacArthur Foundation

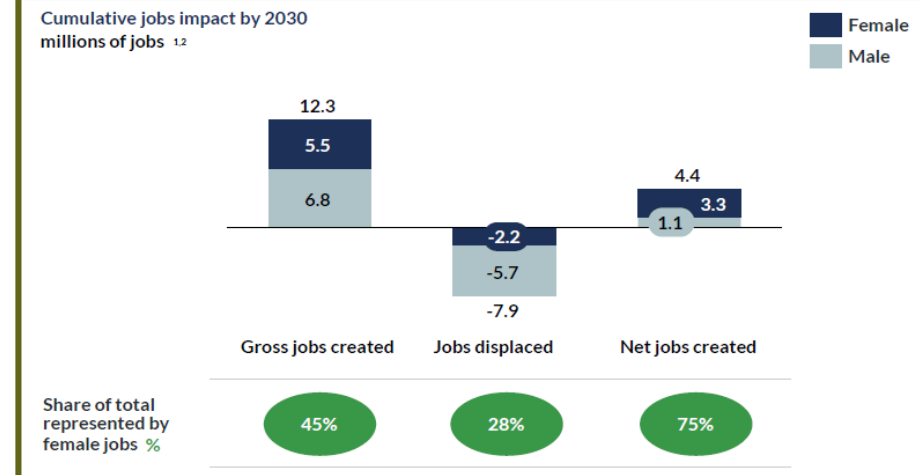
Waste Generated by 5 Key Sectors Under a "Business-As-Usual" Approach



1. Percentages are rounded to the nearest percent
2. Excludes food loss generated at the production stage

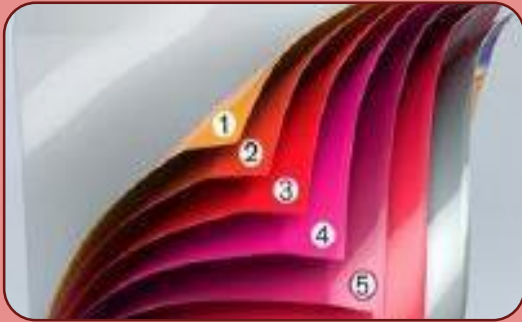
Source: BAPPENAS, BPS, WRI, Ellen MacArthur Foundation, Economic Forum, ITU

The Circular Economy Could Create 4.4 Million Net Jobs by 2030



Source: Bank Indonesia, BPS, World Bank, UN Population Division

Recycling Challenges on Plastics Circular Economy



Technical

Use **multiple materials** makes difficult to recycle



Infrastructure

Insufficient Collection and Sortation

#Pilah Sampah



Consumer Behavior

Bad habit and unclear messaging



Regulation

Lack of law enforcement. communities are still littering

SOLUTIONS



Redesign Packaging



Waste Segregation



End-to-end Ecosystem



Chandra Asri's Circular Economy Efforts



Asphalt Plastic Road

President Decree 83/2018:

Asphalt plastic road become one of national action to reduce marine debris

Every 1 KM asphalt plastic need 1.6 MT plastics waste* or 1.2 Million of plastic bags

* Assumed using road width 6m, thickness 4cm, and 5% plastic on asphalt mixed



CAP Implementation Status with Partners (mid 2021):



Collaboration Partners:

Support DLH DKI Jakarta Program: Jakarta Recycle Center (JRC)



Jakarta
a city of collaboration

Supporting partner:



Chandra Asri



INDONESIAN
PLASTICS
RECYCLERS

JRC is a household waste segregation program by DLH DKI Jakarta, located in Pesanggrahan, Jakarta, with 1,500 household participants. They collected 8 types of waste and sold high value waste, including plastic waste, to recycle industries. This program is supported by **collaboration within Government, recycle industry, and producer industry** to increase community awareness to segregate their waste **JRC can reduce up to 80% waste to landfill at the Ozone area, which was intervened by Chandra Asri through segregated waste plastic bag.**



27,398 kg

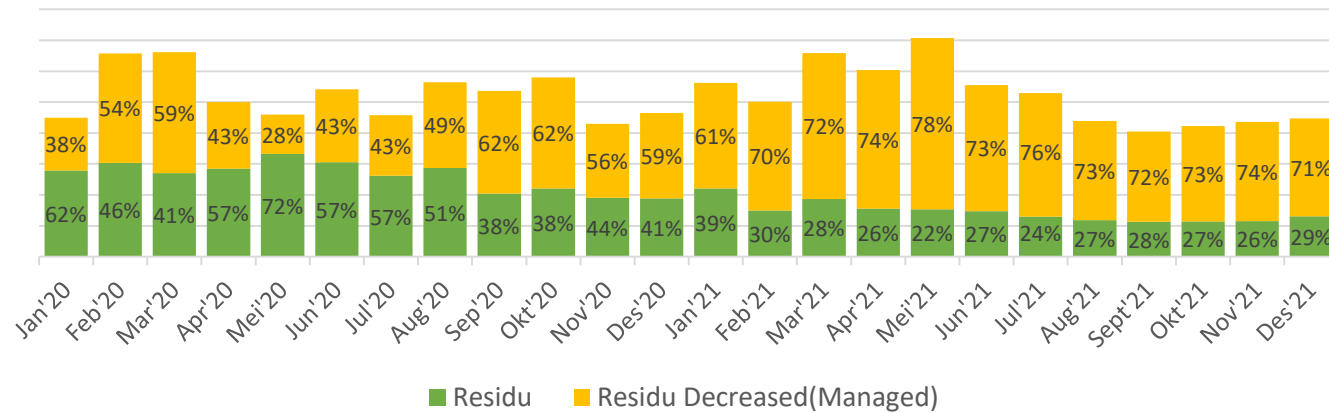
Managed plastic waste avoid to landfill



60

Jobs created

Total Waste and Decreased Residue



End-to End Plastic Waste Management – IPST ASARI



IPST ASARI is an integrated waste management at Serdag, Cilegon which under the guidance of Chandra Asri. This facility has a capacity up to 8,000 kg plastic waste per month and operate pyrolysis machine with capacity 100kg/batch. The pyrolysis machine convert plastic waste into Fuel Plas which can be use for the community for their daily needs.



8,199 kg
Managed plastic waste avoid to landfill



10
Jobs created



3911 liter
Fuel Plas produced



1,412
beneficiaries



SAGARA

SAGARA* is a collaboration program between Chandra Asri and fishers in the Anyer area for **plastic marine debris collection** through the circular economy and community development. The Fishermen segregate and collect plastic marine debris while they are fishing. Chandra Asri collaborated with the Bank Sampah Digital (BSD) to expand the coverage capacity to collect waste from the coastal community.

The plastic waste consists of high-value plastic waste (PET, bottle, cup) and low-value plastic waste (plastic film, multilayer). The high-value plastic waste can be converted into saving accounts for basic necessities of the fishers. Furthermore, the high-value plastic waste will be processed by the recycling industry and the low-value plastic waste will be processed by IPST ASARI (a plastic waste management facility assisted by Chandra Asri) through pyrolysis system into plastic fuel. The plastic fuel products will be used by the community and the fishers.

Notes:

***SAGARA (sansekerta/sunda): Lautan**

S: Sampah, mengenali jenis sampah dan manfaatnya sebagai bahan baku sirkular
A: Angkut, Mengumpulkan sampah, baik dari tempat tinggal maupun dari lingkungan sekitar

G: Golong, Menggolongkan jenis-jenis sampah

A: Adisi, Menerapkan proses nilai tambah berbasis ekonomi sirkular

R: Raharja, Memakmurkan dan mensejahterakan masyarakat

A: Adab, Perilaku dan sikap yang beradab dalam mengolah sampah

Collaboration Partner:

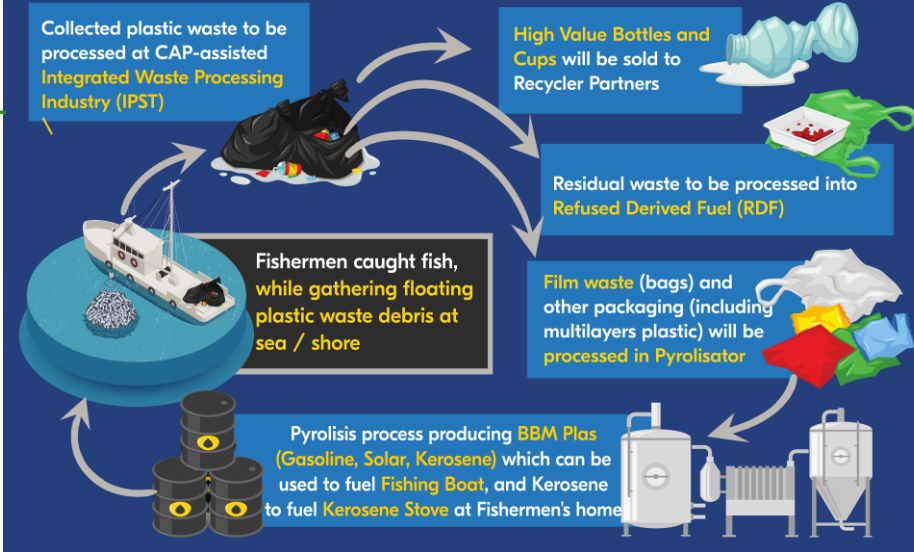


4,588 kg



Waste managed avoid to landfill (2,111 kg plastic waste managed including marine debris)

CIRCULAR ECONOMY BASED MARINE PLASTIC DEBRIS PROCESSING INNOVATION



THANK YOU

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