

Recycled Plastic Road ... One of the Innovation in Circular Economy



2017 Indonesia
2018 India
2018 Thailand

DOW

PAVING A SUSTAINABLE FUTURE IN ASIA PACIFIC

42 km OF ROADS MADE WITH RECYCLED PLASTICS

100 metric tons of waste diverted

equivalent to **25 MILLION** flexible pouches

LONGER ROAD LIFE

POTENTIAL REDUCTION IN GREENHOUSE GAS EMISSIONS

CONNECT WITH US TO LEARN MORE ABOUT BUILDING PLASTIC ROADS IN YOUR COMMUNITY

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Recycled Plastic Road Project in Other Countries

Mohon Doa Restu

PELAKSANAAN PROGRAM TRIAL PENGASPALAN JALAN MENGGUNAKAN SAMPAH PLASTIK SEBAGAI PENGUAT ASPAL DI KOMPLEK MELATI 2 GDC DEPOK, 15 JUNI - 20 JULI 2017

Suadaya oleh: **Warga Melati 2 GDC Depok**

Berkontribusi dengan: **KEPONTONKABUPATEN DEPOK**

Dipaparkan oleh: **DOW**

IRC:SP:98-2013

GUIDELINES FOR THE USE OF WASTE PLASTIC IN HOT BITUMINOUS MIXES (DRY PROCESS) IN WEARING COURSES

INDIAN ROADS CONGRESS 2013

Chandra Asri Petrochemical Builds Plastic Road

SUPPORTING THE GOVERNMENT'S TARGET TO REDUCE 75 PERCENT OF MARINE PLASTIC DEBRIS BEFORE 2025

2 MILLION = 3 TONNES → 6.372 M²

plastic bags → plastic bags, 5-6 percent of asphalt mix → PLASTIC ROAD

Plastic road's stability enhanced up to **40%** compared to regular road

Circular Economy
Aspect of Plastic Road

Recycled Plastic Road Project in Thailand



Key Properties for Asphalt Road

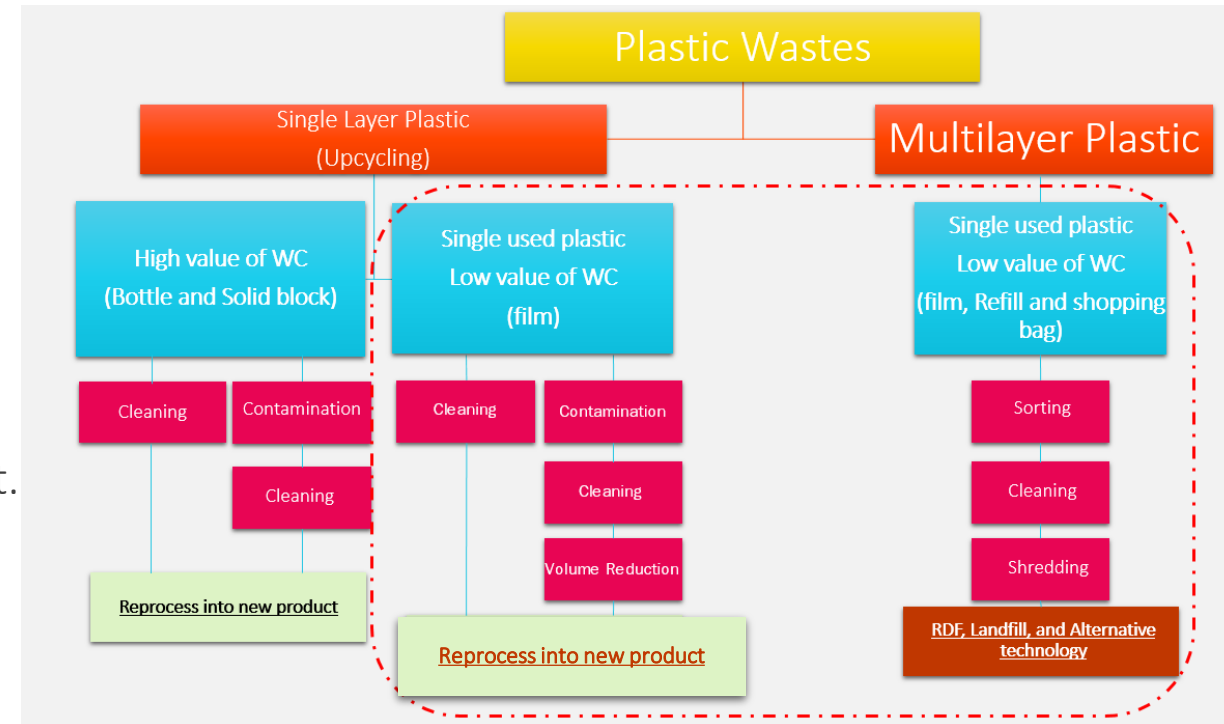
An asphalt concrete mixture must be designed, produced and placed in order to obtain the following desirable mix properties¹:

- Stability and durability : Marshal, density and flow testing
- Skid resistance : Friction testing
- Impermeability (% air void): The resistance of an asphalt pavement to the passage of air and water into or through it.

Why plastic ? As a binder and modifier

- Soften at around 130 °C
- Have a binding property hence used as a binder²
- Enhance mechanical properties as a aggregate
- Excellent water resistance

Reducing the plastic waste which is a **key factor for environmental pollution solving.**



1) <https://civilblog.org/2016/02/03/7-must-have-properties-of-asphalt-concrete/>

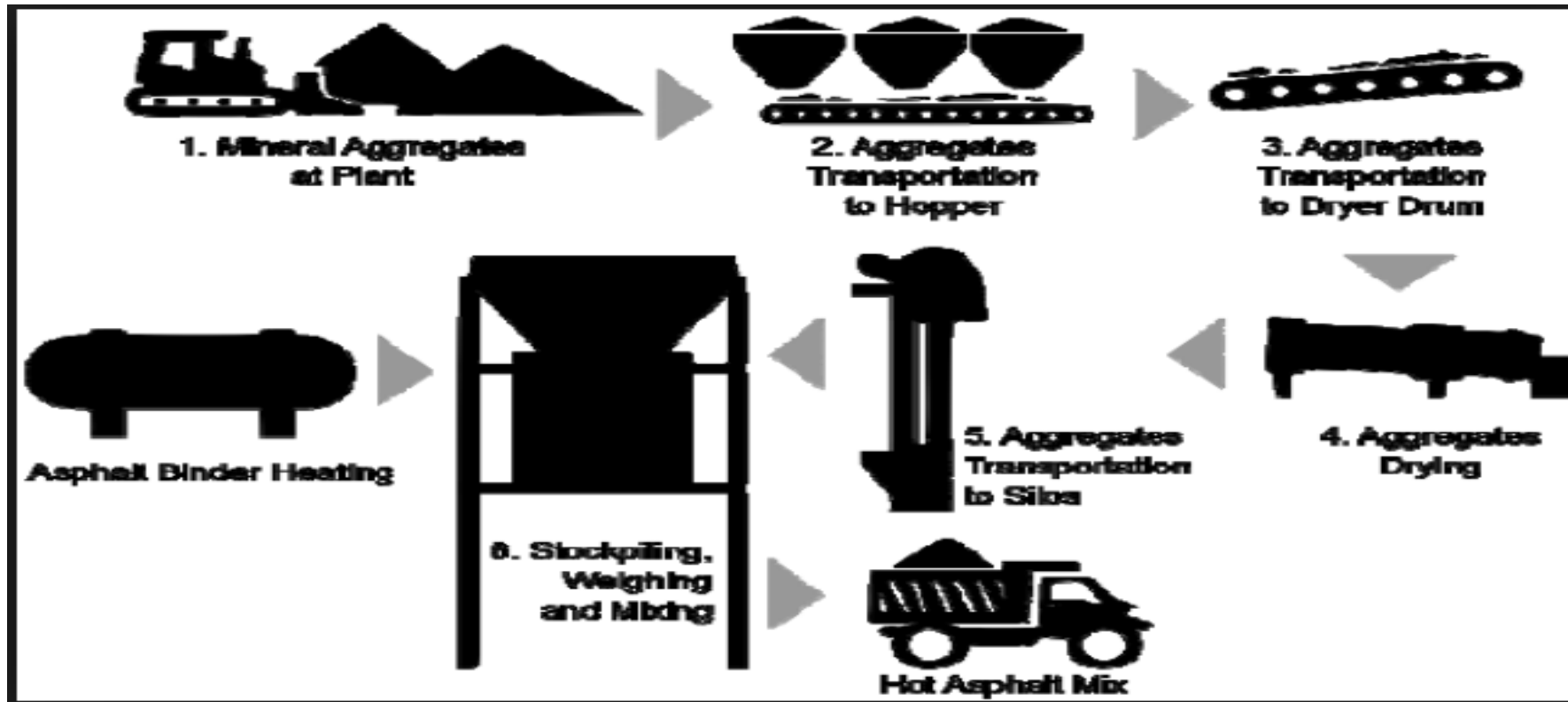
2) R. Vasudevan, et al, Utilization of Waste Polymers for Flexible Pavement and Easy Disposal of Waste Polymers, Proceedings of the International Conference on Sustainable Solid Waste Management, 3-7, Chennai, India, September (2007).

Thailand Material Standard (Department of Highway or Department of Rural Road)

Materials	Temperature °C (After mixing)	Temperature °C (before pavement)	Marshal stability (lbs)	Density	Flow	% Air void
Asphalt Cement (60/70)	159 ± 8	≥ 120	1800	≥ 2.20	8 - 16	3 - 5
Natural Rubber Modified Asphalt (Para AC)	170 ± 10	≥ 140	2200	≥ 2.20	9 - 17	3 - 5
Polymer Modified Asphalt (PMA)	180 ± 10	≥ 155	2700	≥ 2.20	8 - 16	3 - 5

% Air void depend on aggregate sources in each area

Typical Asphalt Road HOT Mixing process



Recycled Plastic Road : Dry Process

Collection

Washing

Shredding

Mixing

Paving



Type of plastic waste can be used in Recycled Plastic Road



PE



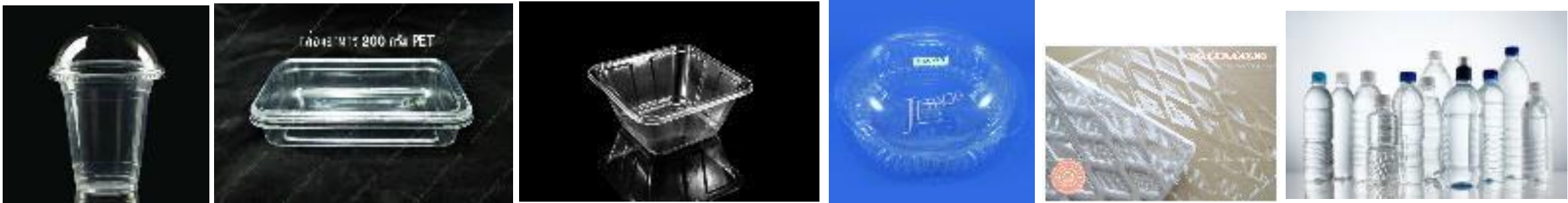
PP



Type of plastic waste can be used in Recycled Plastic Road



PET



PS



Multilayer
eg. PE/PET, PE/Nylon



Type of plastic waste **cannot be used** in Recycled Plastic Road



PVC Shrink Film due to toxic from Hydrochloric Acid



Thermoset Plastic e.g. Melamine

due to unmelt



Type of plastic waste **wait for test** in Recycled Plastic Road

Multilayer Film with aluminum foil and metalized film



Effort & Collaboration



Recycled Plastic Road Benefits

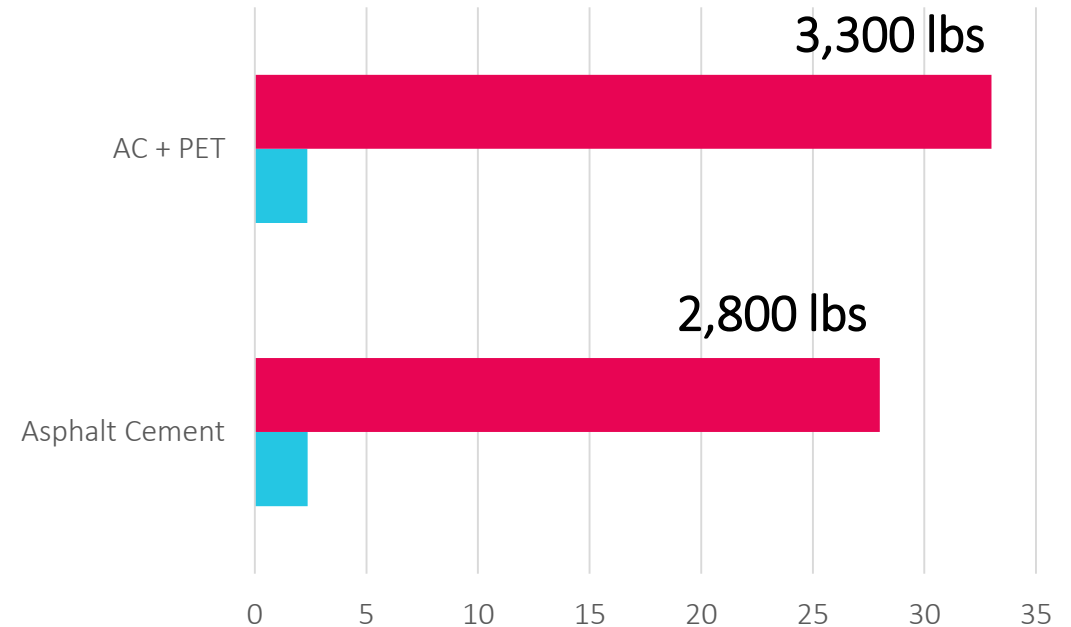
Asphalt – Plastic (PET) get better strength, Marshal Stability is higher than normal asphalt cement 17%.



PET : Polyethylene terephthalate
AC : Asphalt Cement

Test by Department of Highways Officer @ Site

Comparison of Normal Asphalt and Mixed Plastic



	Asphalt Cement	AC + PET
■ Marshal stability (lbs x 100)	28	33
■ Density (g/cm3)	2.364	2.354

■ Marshal stability (lbs x 100) ■ Density (g/cm3)

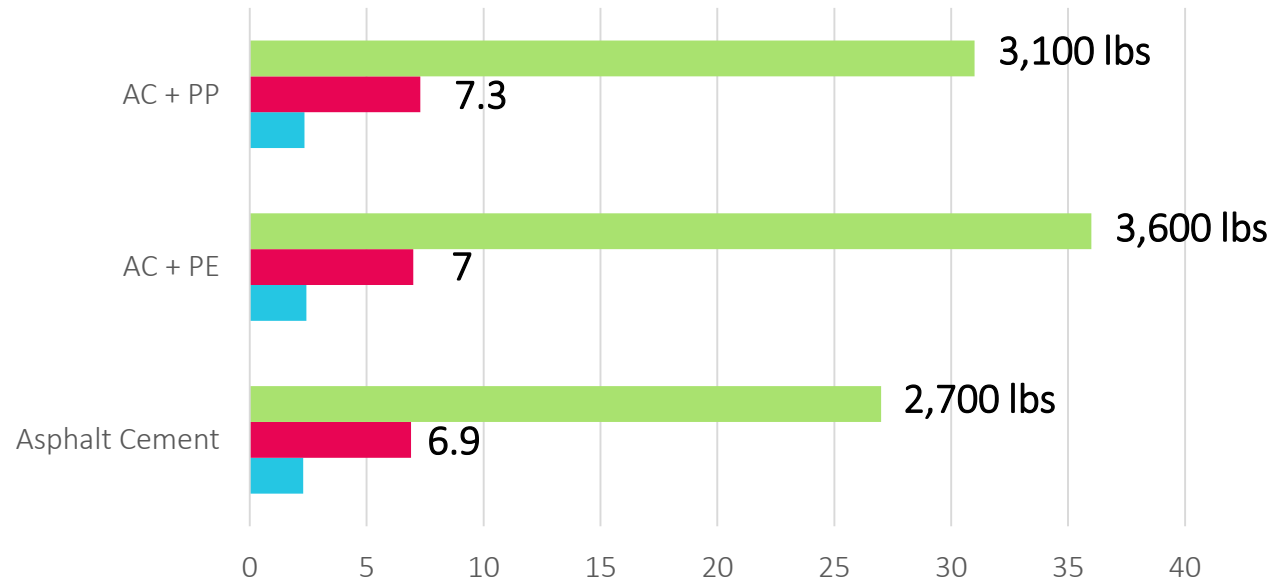
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Recycled Plastic Road Benefits



Comparison of Asphalt Cement and Mixed Plastic



	Asphalt Cement	AC + PE	AC + PP
■ Marshal stability (lbs x 100)	27	36	31
■ Friction (wet state x 10)	6.9	7	7.3
■ Density	2.289	2.416	2.345

■ Marshal stability (lbs x 100) ■ Friction (wet state x 10) ■ Density

Asphalt – Plastic (PE, PP) get better strength

- Marshal Stability is higher than normal asphalt cement 15-33%.
- Friction is the same level as the normal one.

PP : Polypropylene
 PE : Polyethylene
 AC : Asphalt Cement

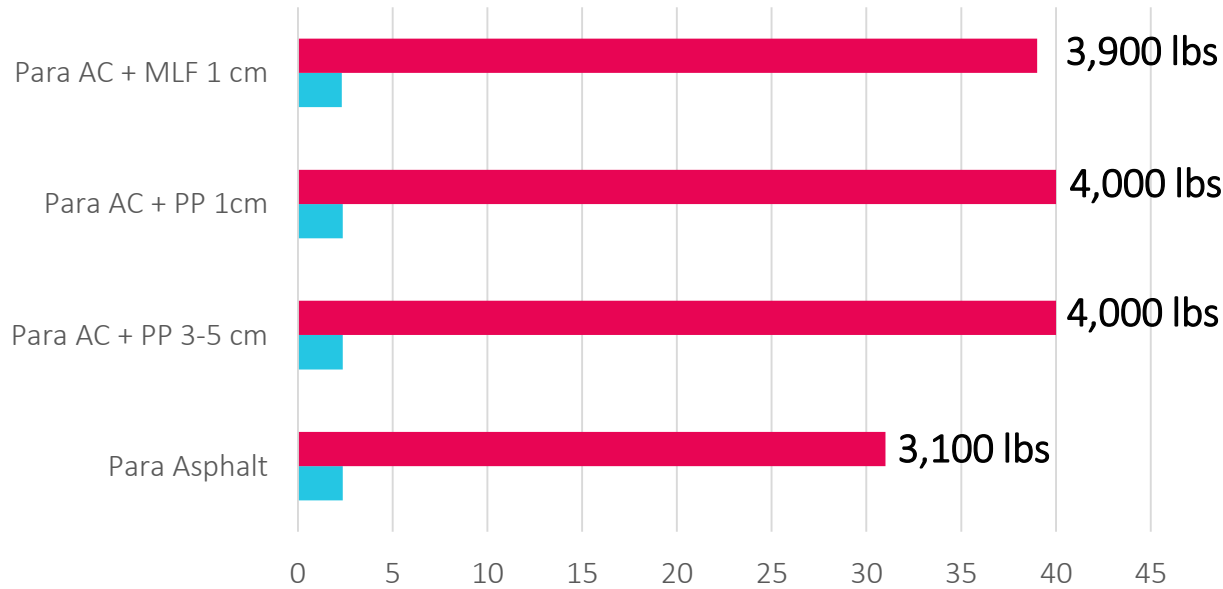
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Recycled Plastic Road Benefits

Better Performance up to 25 - 30%

Comparison of Normal Asphalt and Mixed Plastic



	Para Asphalt	Para AC + PP 3-5 cm	Para AC + PP 1cm	Para AC + MLF 1 cm
■ Marshal stability (lbs x 100)	31	40	40	39
■ Density	2.367	2.367	2.369	2.32

■ Marshal stability (lbs x 100) ■ Density

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Better cost

Asphalt Cement 20.00 THB/KG

Cost of waste plastic preparation 10.35 THB

Industrial waste plastic 0 THB

Wash 0 THB

Shredding 2.20 THB

Packing 2 THB

Transportation 4.62 THB

Labor 1.53 THB

Note: This figure has been calculated from plastic 1.3 tons, the economy of scale reduces operation cost.

MLF : Multilayer film (Polyethylene / Nylon)

PP : Polypropylene

Para AC : Asphalt Cement with natural rubber

Test by Department of Highways Officer @ Site

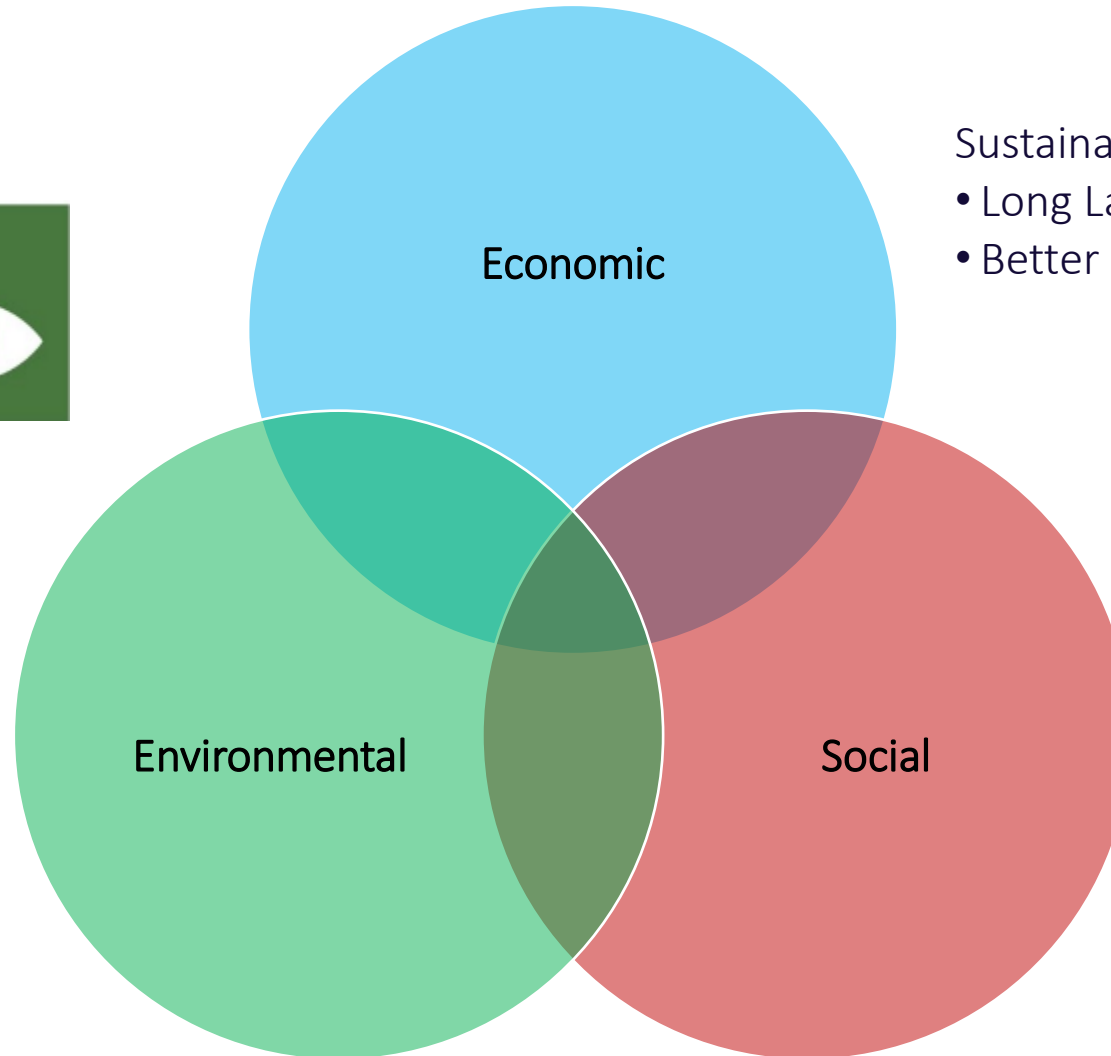
Sustainable Values

Sustainable Development Goals



Waste Management

- Collection
- Reduction



Sustainable Road

- Long Lasting
- Better Performance



Engagement

- Raising Awareness
- Creating Green Job

Pavement at RIL Industrial Estate



Recycled Plastic Road : Length 220 m., 800 m2., utilized plastic waste 400 kg. on Sep18, 2018



Pavement at Amata City Industrial Estate



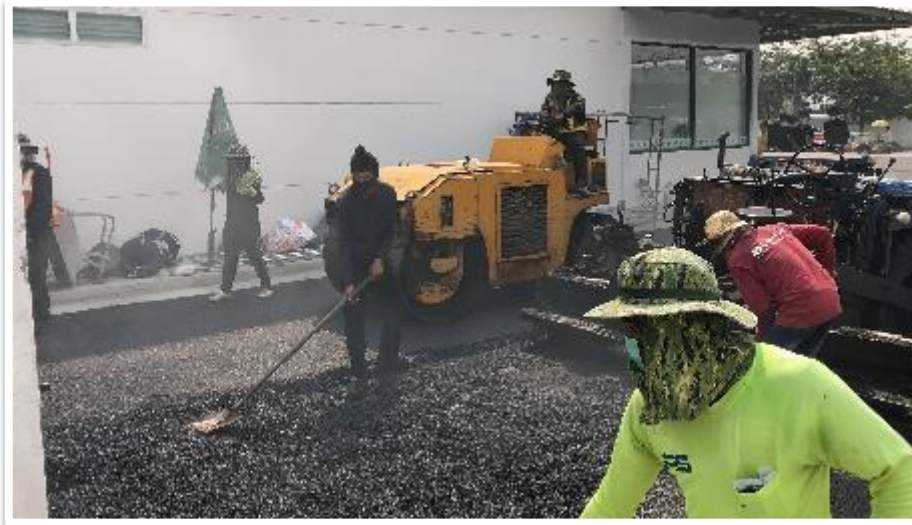
Recycled Plastic Road : Length 240 m., width 6 m., area 1,440 m²., utilized plastic waste 720 kg. on Nov27, 2018



Pavement at 7-11 Saimai Soi 3



Parking Lot : area 825 m2., utilized plastic waste 415 kg. on Jan15, 2019



Pavement at 7-11 Rajpattna Soi 24



Parking Lot : area 905 m2., utilized plastic waste 450 kg. on Jan30, 2019



What's next ... collaborate and develop with Public Sector to prove environmental issues and get approval for nation-wide use.





Thank you