

# UNOSD Expert Group Meeting **Sustainable Application of Waste-to-Energy in Malaysia**

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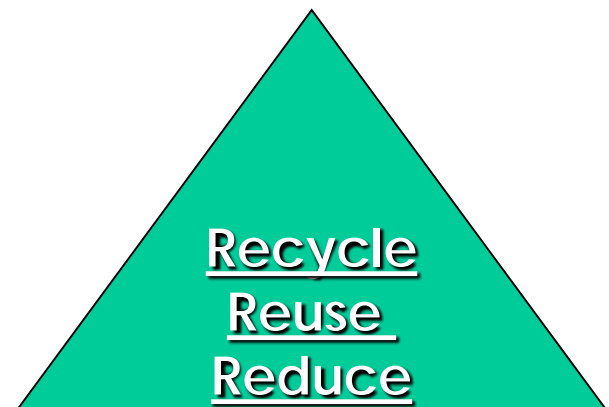


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# Waste Management and Utilisation



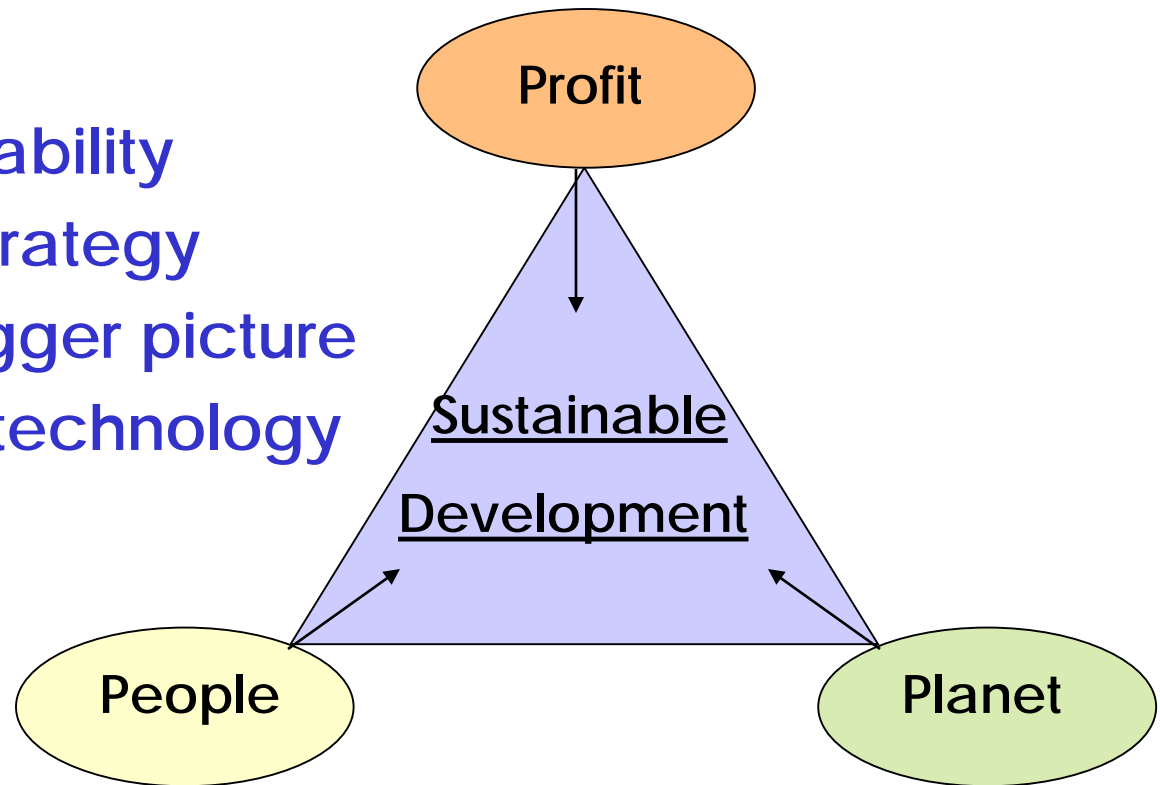
- The 3 stages of waste management
  - 1. treatment to meet discharge standards
  - 2. incorporate 3R strategies
  - 3. zero-emission
- Landfill, incineration
- 3Rs – reduce, reuse, recycle
- Concept of zero-emission
- w2w.. from waste to wealth
- b2b.. from biomass to business!



# Sustainability & Green Technology



- Merging the 3Ps
- Towards sustainability
  - >>> win-win-win strategy
- Consider the bigger picture
- Develop green technology

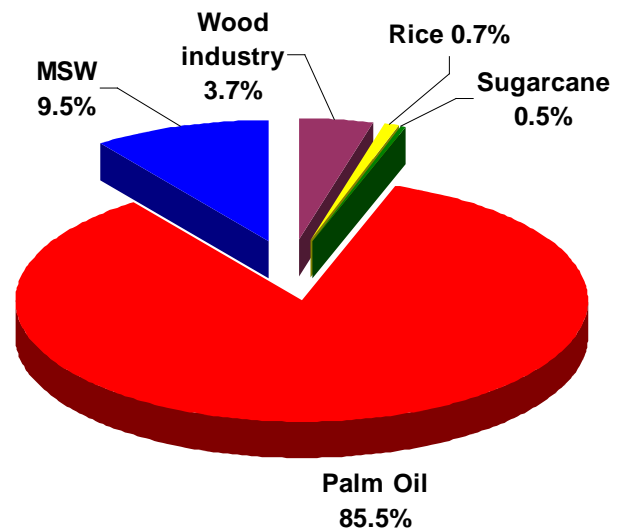


**Biomass**  
**Problem** → **Profit**

# Biomass Resources in Malaysia



- **Wastes? >>> Biomass**  
= renewable organic matter
  - includes forest and mill residues, wood wastes, agricultural crops and wastes, animal wastes and MSW
- Abundant in Malaysia  
~ 70 million tonnes collected / year
- Available throughout the year
  - due to high sunlight intensity/time and high rainfall
- Main contributor of biomass is the palm oil industry (ligno-cellulosics)



# Palm Oil Industry and Malaysian Socio-Economy



## Facts and figures..

- 4.7 million hectares (~10% of Malaysia)
- (more than 50% of Malaysia is rainforest)
- (Malaysia is net carbon absorber/sink)
- 430 mills throughout Malaysia
- Highest oil yielding crop in the world
- Palm oil - Malaysia's gift to the world!
- USD15 billion export in 2010
- More than 600,000 people employed
- Poverty alleviation
  - land ownership & stable income
  - >>> FELDA's success story (50 years!)
- Sustainable Development
  - 3Ps: Profit, People and Planet
  - challenge: "**win**-win-**win**" strategy
  - need to address the bigger picture



# Malaysian Palm Oil Industry



Palm Kernel Oil  
2 million tonnes

Fresh Fruit Bunch  
70 million tonnes

Oil Extraction

Crude Palm Oil  
15 million tonnes



Renewable Resources

**Fronds 80MT!**  
**Trunks 15MT!**

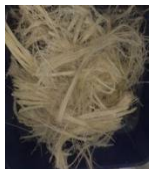
Fiber  
8 million tonnes

Shell  
4 million tonnes

Empty Fruit Bunch  
17 million tonnes



Palm Oil Mill Effluent  
50 million tonnes



# Policy.. ETP, NKEA Palm Oil and EPPs



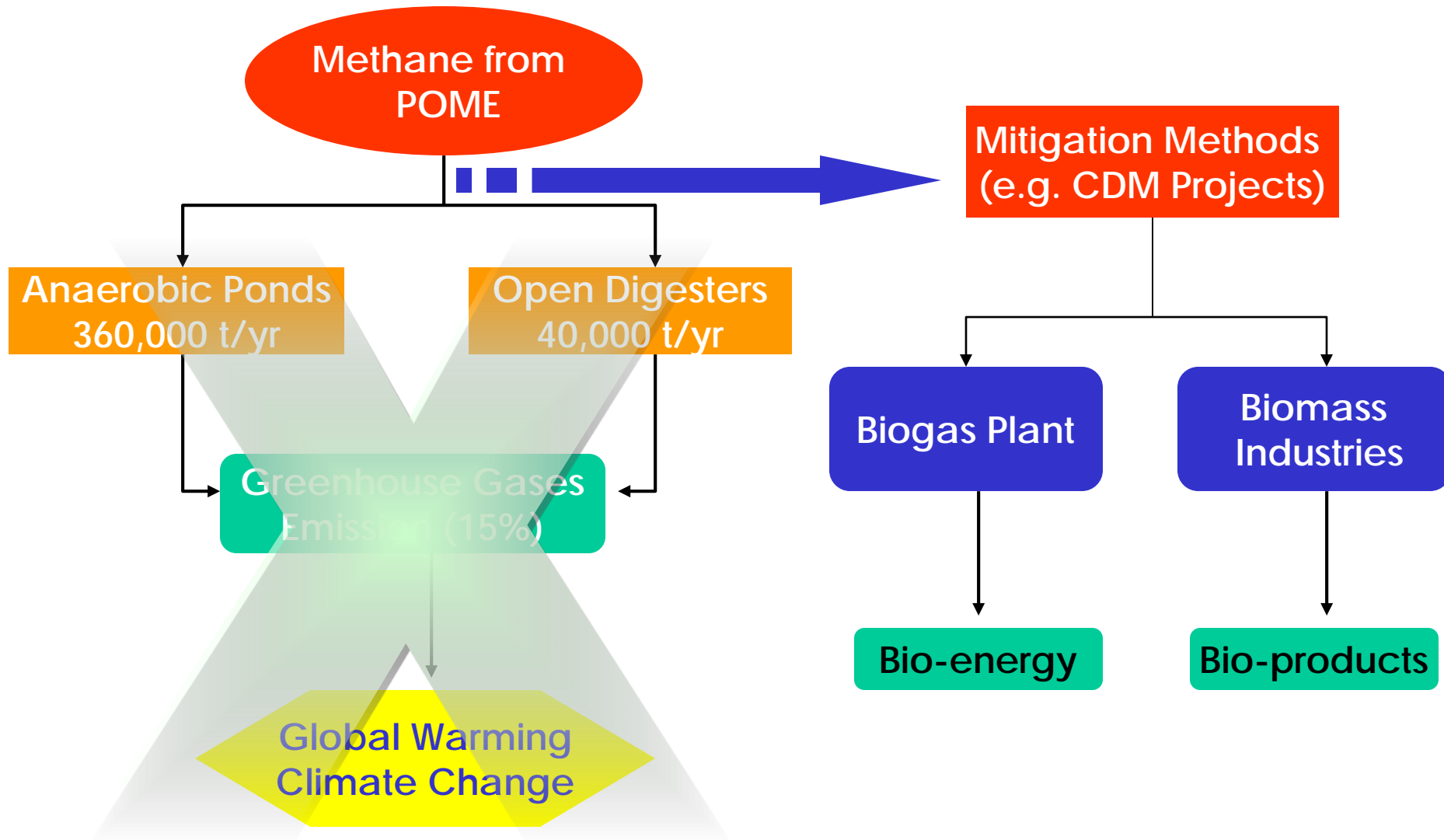
- Biofuel, B5 Programme
- ETP, NKEA Palm Oil and 8 EPPs (low hanging fruits)
- **Focus on  $\uparrow$ GNI,  $\uparrow$ Jobs,  $\downarrow$ Carbon**
- EPP#5 on Biogas Capture (400 mills by 2020)
- EPP#4 on OER (20.5% to 23% by 2020)
- 20mg/L POME discharge
- 0.15 g/Nm<sup>3</sup> mill particulate emissions

# Potential Power Generation from Oil Palm Residues at Palm Oil Mills in Malaysia

Type of Industry	Production (Million Tonne)	Residue	Residue product Ratio (%)	Residue Generated (Million Tonne)	Potential Energy PJ	Potential Electricity Generation ( MW)
Oil palm	59.8	EFB @ 65% MC	21.14	12.641	57	520
		Fiber	12.72	7.607	108	1032
		Shell	5.67	3.390	55	545
	Total Solid			16.670	220	2098
	POME (3.5t/tCPO or 65% of FFB)			38.870		320



# Methane Emission Mitigation





## **FELDA Serting Hilir Mill Biogas CDM Project**

About  
380,000 tons  
CO<sub>2</sub> reduced  
in 10 years

Approved by UN CDM  
9<sup>th</sup> March 2009



# Renewable Energy (1 MW) to Grid



Estimated Costs, RM (million)	
Biogas capture (ponds or tanks)	1.8
Downstream processing (gas scrubber & gas storage)	2.0
Gas engine @ 1000 kW	1.2
Total plant cost	5.0
Yearly maintenance and operation cost	0.5

## Benefits and revenues generated :

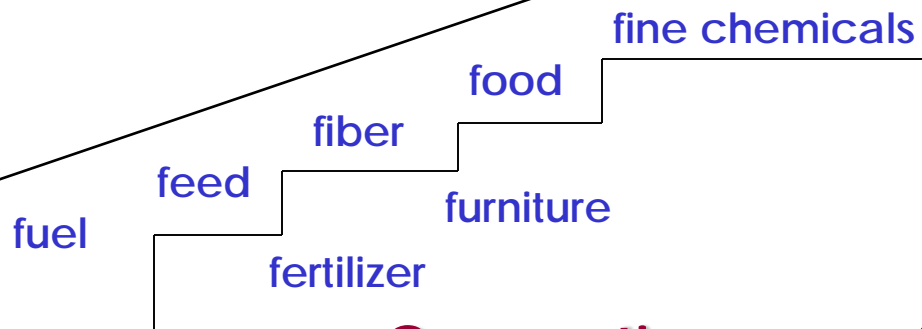
- Internal office use and external lighting ("24/7")  
>>> reduce diesel cost/usage during mill's non-operating hours
- Sale of green electricity to TNB @ RM0.30/kWh ~ RM 1 million/yr
- Aeration system to remove remaining BOD  
increased POME treatment efficiency >>> water re-use >>> zero emission!  
+ reduced land requirement (~70% of total mill area)
- Estimated sale of CER @ €10 per tonne CO<sub>2</sub> ~ RM 1 million/yr

# Adding Value to Palm Biomass



- Paradigm shift towards biomass
  - Not waste
  - Renewable
  - Sustainable Resource
- Uncertainties of biomass
  - Technological proven ?
  - Economically feasible ?
  - Quality, quantity, availability ?

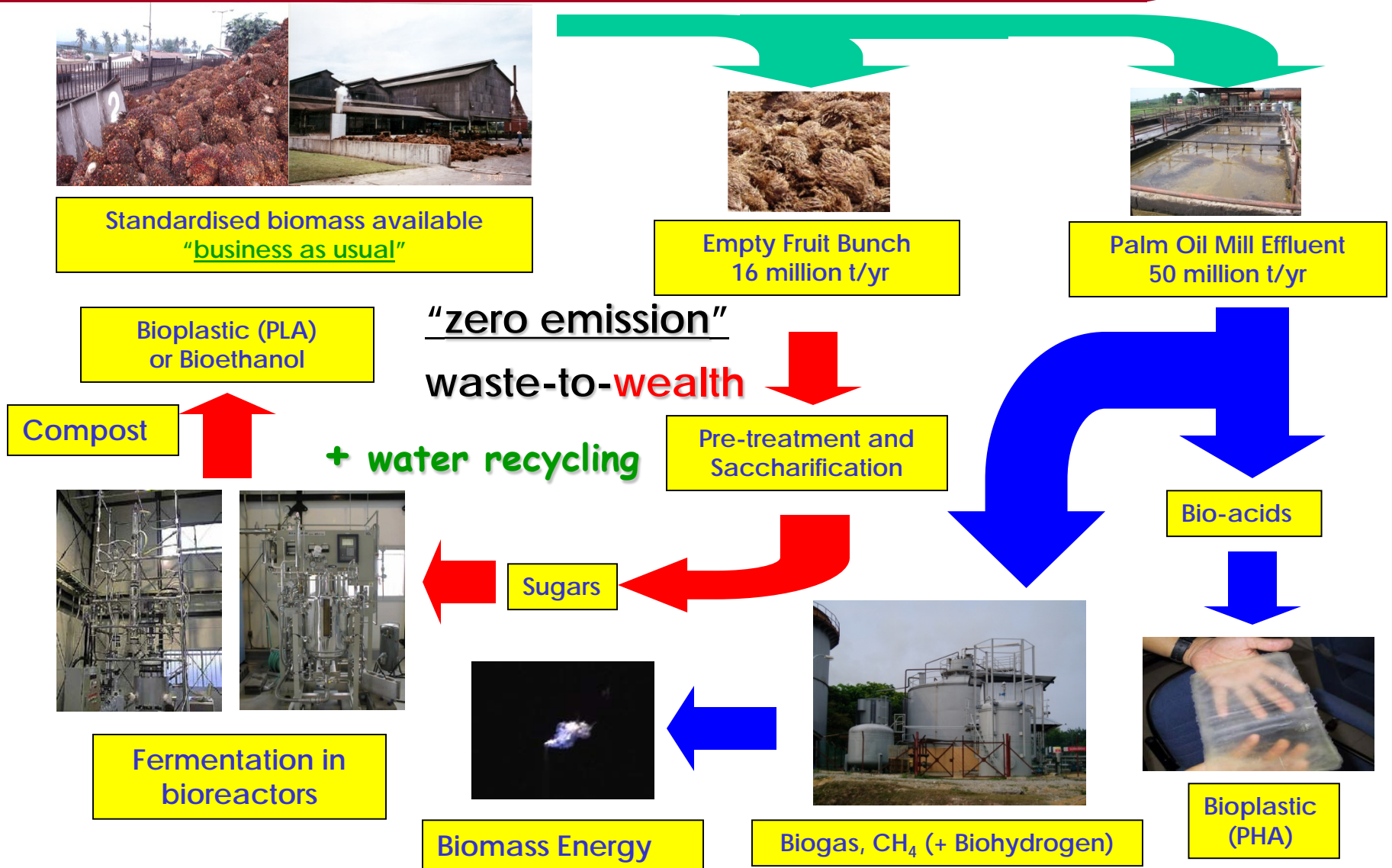
↑ value ladder



**Competing use of biomass!**



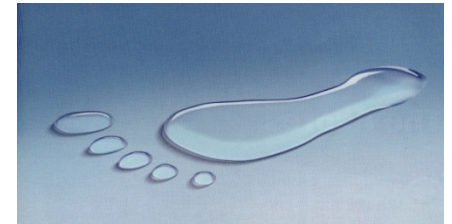
# Sustainable Palm Biomass Refinery



# Current Issues and Opportunities



- Carbon footprint ( $\sim 1\text{tCO}_2\text{e/tCPO}$ )
- Water footprint
- Energy efficiency
- Water footprint
- Roundtable for Sustainable Palm Oil (RSPO)
- Low-carbon economy
- Regional cooperation



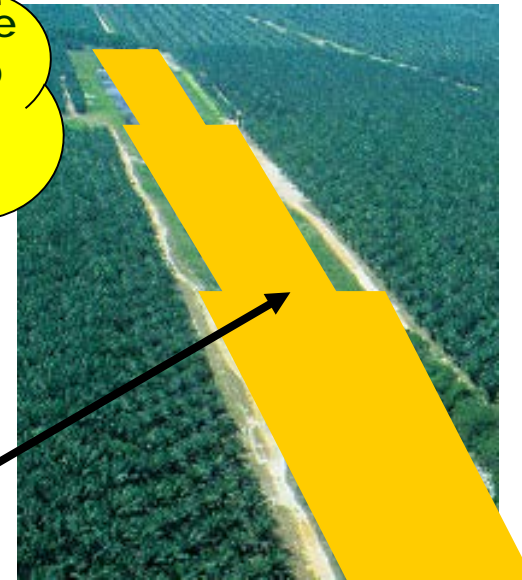
# Towards Sustainable Palm Oil Industry in Malaysia



CDM provides profitable area for new business to which biomass energy can be supplied from palm oil industry at a reasonable price



for new biomass business



CDM provides a complete methane fermentation system and change lagoon area into a profitable area.

CDM provides electricity from methane fermentation system for new business  
>>> towards zero emission and **w2w!**  
(remove "pain" from the industry)

1. Reduction of greenhouse gases emission by sealing the lagoons.
2. Prevention of undesirable smell and water pollution by modern treatment ( + water recycling).
3. Local employment can be encouraged from new business.

Based on the economic growth in Malaysia, the development of new oil palm plantations in the tropical rainforest will soon be no longer feasible.  
In order to meet the increasing demand for palm oil in the future, palm oil industry must co-exist with other industries and people... >>> 3P (**P**rofit, **P**eople, **P**lanet)