Palm Oil Biomass Based Eco-Industrial Cluster in Indonesia

Case Study of Siak Hulu, Kampar, Riau Province

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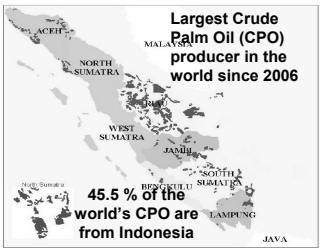
Country Profile - Indonesia

- Area : 1,904,000 km^2
- Population : 222.20 millions
- Growth rate : 1.34%
- GDP per capita : USD 1,946 (2008)



Major Environmental Concerns

- ✓ Water → Surface water pollution due to improper management of industrial waste, agriculture, mining & domestic waste water
- ✓ Energy → Depending on fossil energy
- ✓ Air and atmosphere → Air pollution due to emissions in big cities exceeds the standards
- ✓ Land and forest → Illegal logging and land conversion
- ✓ Coastal and marine → Unhealthy Exploitation practices

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Industrial Development in Indonesia

- Major Foreign Direct Investment (FDI):
  - Asia from Malaysia (16%), Singapore (12.3%), Korea (4.9%), & Japan (2.7%) and since 2004, presently Chinese companies shows interest.
  - European investment approvals from the United Kingdom (6.5%) and Switzerland (2.6%)
- FDI by sector : Agriculture, forestry, and fishery (5.6%); Mining (1.9%); Manufacturing (54.5%); Electricity, gas, and water (8.9%); Construction (15.2%); Services (13.9%)

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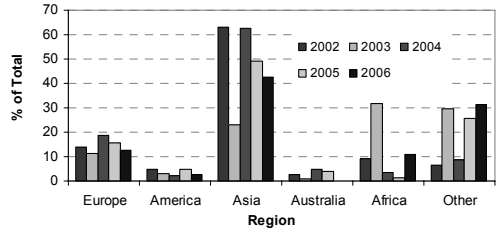
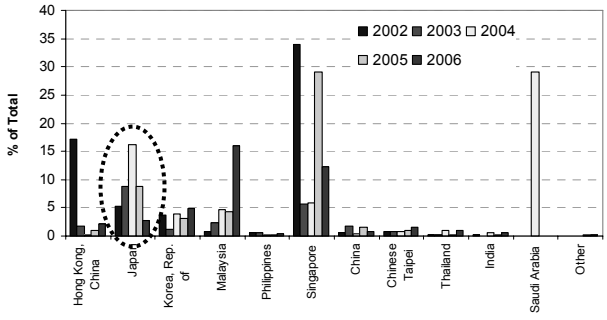
Foreign Direct Investment in Indonesia





Top 10 Industries

- ✓ Food and beverages
- ✓ Sea product processing
- ✓ Textile and textile products
- ✓ Footwear
- ✓ Palm oil
- ✓ Wood
- ✓ Rubber and Rubber Goods
- ✓ Pulp and paper
- ✓ Electrical machinery and electrical tools
- ✓ Petrochemical

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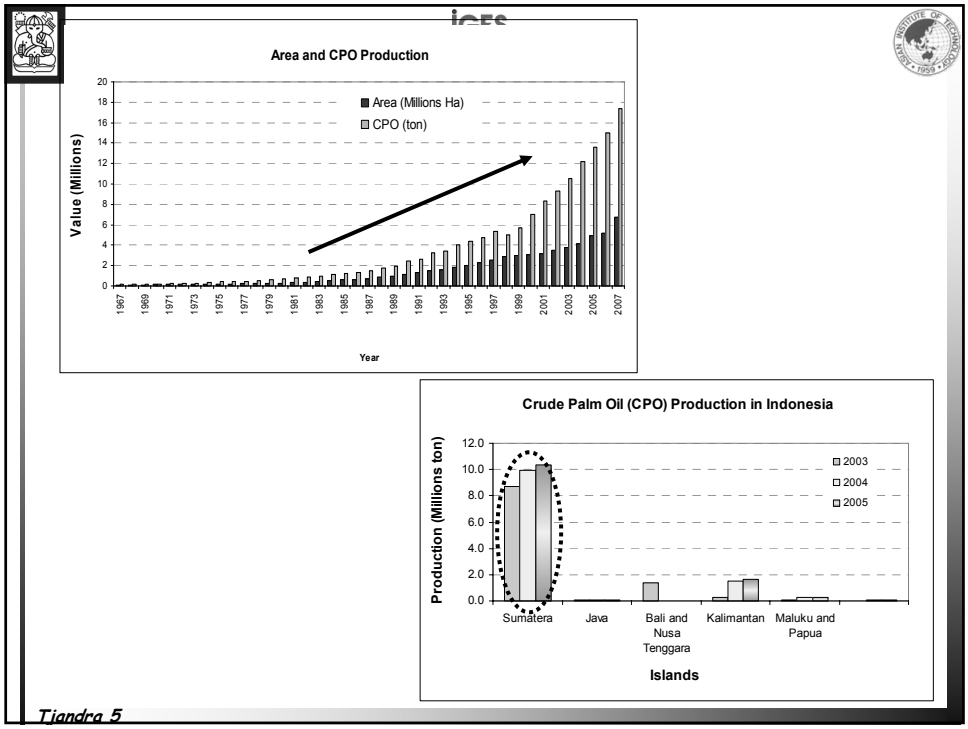

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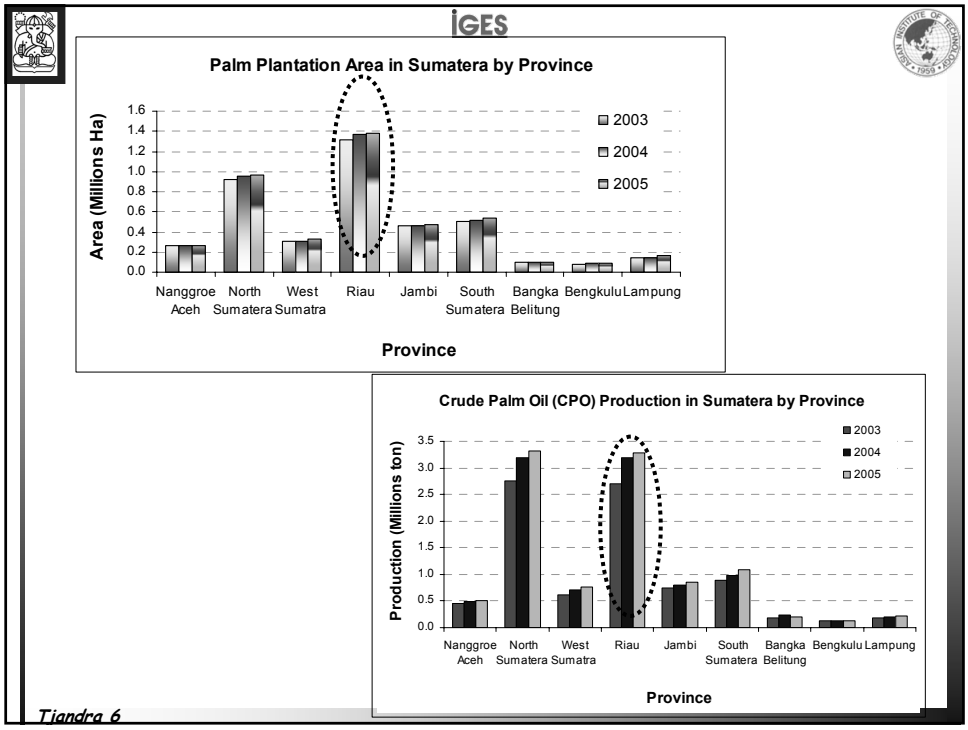

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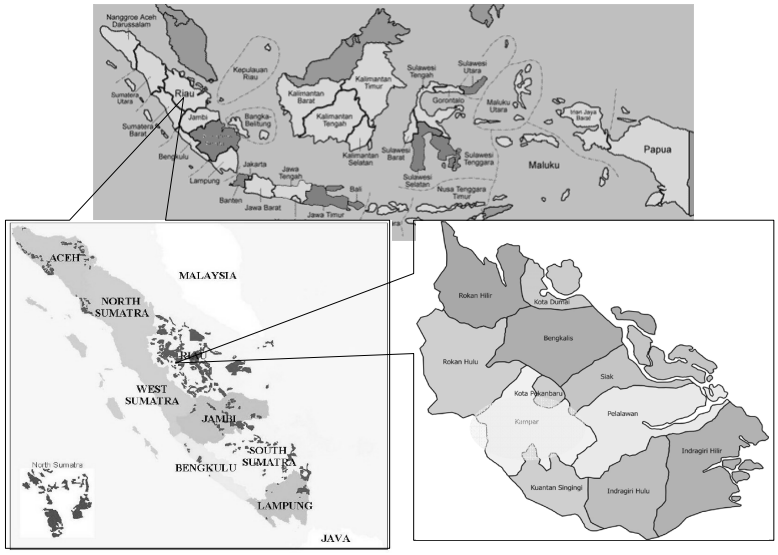
STUDY AREA



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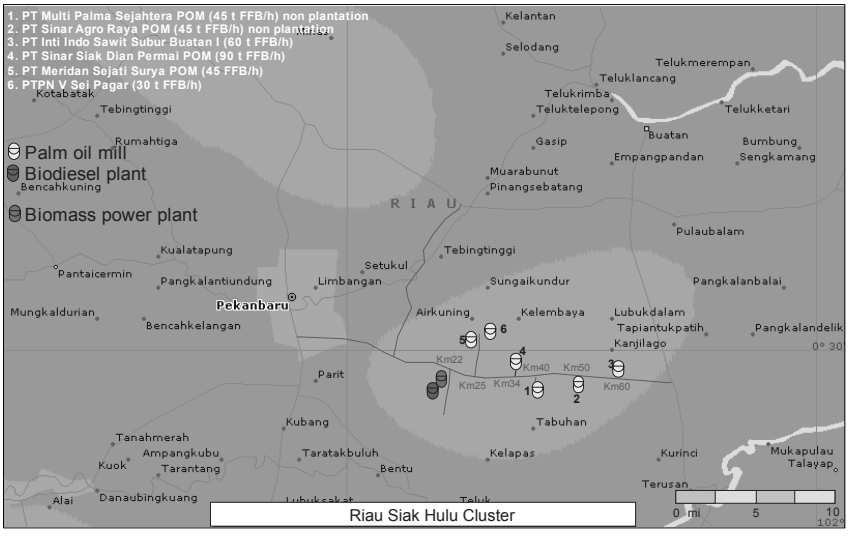
STUDY AREA



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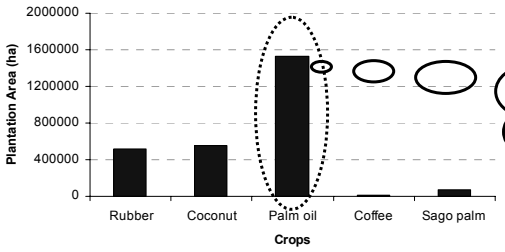
Study Area : Plantation

- Paddy, cassava, corn, sweet potato are main product of agriculture
- Plantation : Palm oil (70.43%), Rubber (26.9%)
- Riau is the largest palm oil plantation in Indonesia
  - Planted area : ~1,400,000 ha
  - Mature area : ~ 1,100,000 ha
  - Palm Oil Production : ~ 3,100,000 Ton (max)
  - Number of Palm Oil Mill : 126 units



Palm oil plantation compared with other crops in Riau Province

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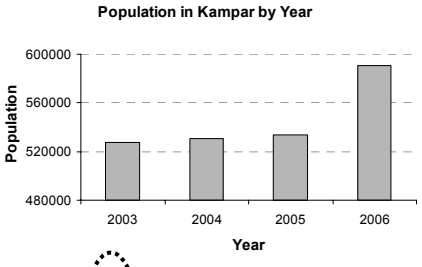
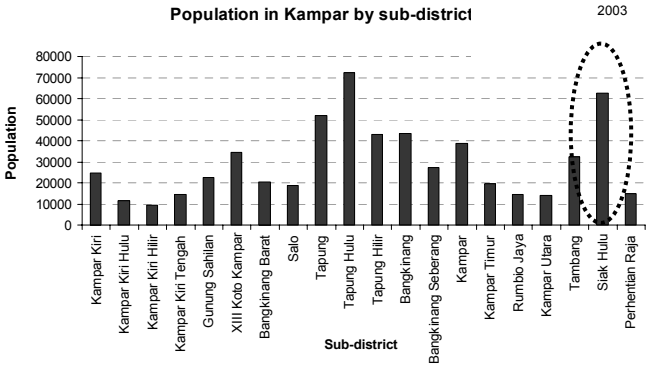
Social Data

RIAU PROVINCE

Population : 4 764 205 people
Average birth Rate: 2.7 % per year
Average Density : 54,64 people /km²





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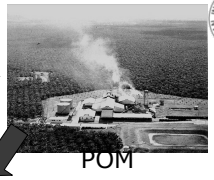
Waste from Palm Oil Activities


FFB


POM

Biomass waste

FFB-Fresh Fruit Bunches
POM – Palm Oil Mill
EFB – Empty Fruit Bunches

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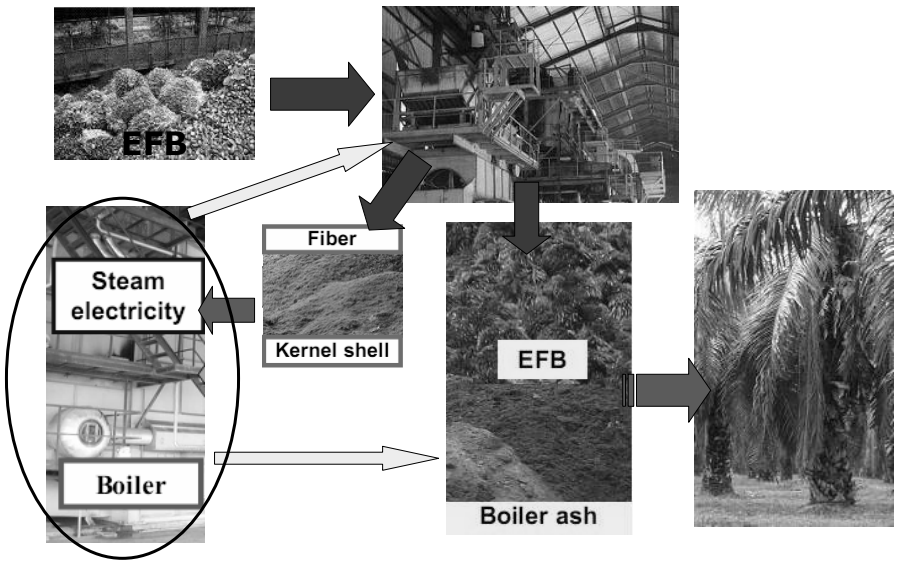
BIOMASS UTILIZATION IN PALM OIL MILL



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Baseline of Waste Management Practices in POMs

- In the palm oil value chain in the area, there is an overall surplus of waste and the utilization rate of these wastes are relatively low, especially in the case for POME and EFB.
- Generation of other mill wastes can be reduced significantly by adopting cleaner production concepts. The field residues like EFB are currently disposed as mulch or utilized as fertilizer.
- Wastes from the palm oil industry lead to severe environmental problems in future and should be utilized as resources to develop a bio-economy and market the carbon neutral products.
- Biomass Utilization: Fibre and kernel shells are used to produce steam and electricity for the boiler. The boiler ash and EFB are used in plantation.
- Liquid waste is digested in open lagoon and thereafter is sent to plantation for land application as fertilizer at a BOD of between 1,000 to 3,500 ppm.

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Potential Environmental Impacts

- Solid waste
  - The utilization is still in a little amount, and the rest is disposed on plantations
- Liquid waste
  - Contribute to surface and ground water pollution, Green House Gasses (GHGs), bad odor

Conversion of forest to palm plantations decrease the area of primary forest

However illegal logging and illegal mining are the major causes of the deforestation

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Palm Oil Value Chain

Possible Uses

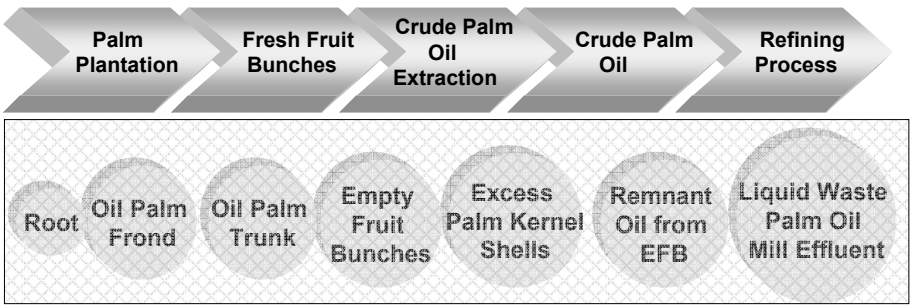
Biogas from POME → existing energy system or for electricity generation

Dewatered EFB → heat and/or electricity or organic diesel

EFB → incineration →mulch or fertilizer

Excess PKS → combustion with the other POM solid wastes

The recovered remnant oil → supplement for CPO production or used to produce bio-diesel



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POTENTIAL SOURCES OF RAW MATERIAL IN SIAK HULU

No	Palm Oil Mill	FFB, ton/year
1	Indo Sawit	210,000
2	Sinar Agro	150,000
3	Multi Palma Sejahtera	150,000
4	Sinar Siak Dian Permai	250,000
5	Sei Pagar PTPN V	150,000
6	Meridan Sejati Surya	150,000
Total		1,530,000

CPO : 336,600 ton/year

Solid waste

EFB : 351,900 ton/year

PKS : 91,800 ton/year

MF : 198,900 ton/year

Liquid waste

POME : 918,000 ton/year

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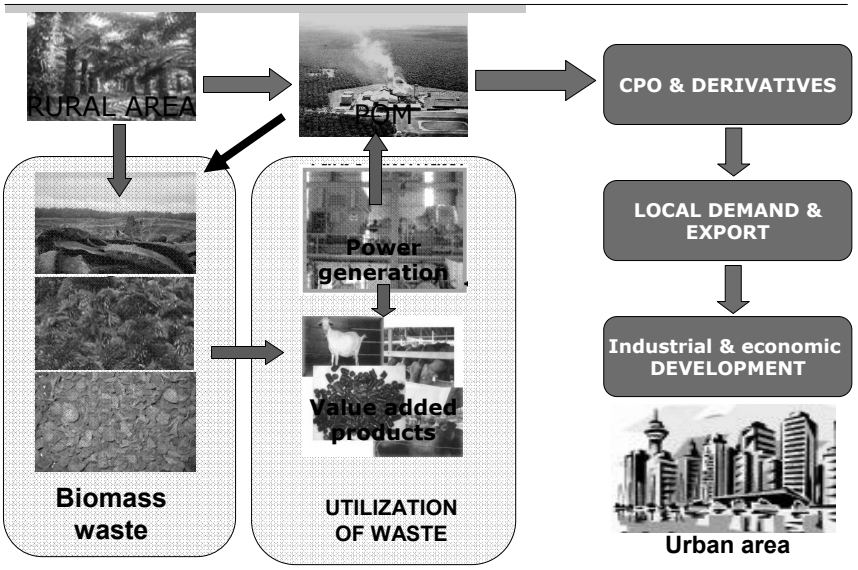
The Possible Eco-Industrial Cluster



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Potential Socio-Economic Impacts

1. Job Opportunities

Creates the need biomass delivery services (transportation & biomass suplai chain)

Raw material strategies:

- Supply of EFB from several POMs in the Kampar District
- The dewatered EFB intended for the incinerator in the POMs will be sent to central biomass power plant that can efficiently convert the energy from biomass into heat and power

2. Local Business Opportunities

Conversion of biomass residues in value added products, such as:

- Gasification of palm kernel shells (PKS) to produce electricity
- Composting of EFB, OPF to produce fertilizers
- Trunk utilization to produce fibre board
- OPF (oil palm fronds): as an animal feed
- MF (mesocarp fibre): to produce fibre board.

Provide support to the plant such as repair and maintenance the machines

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Potential Socio-Economic Impacts

3. Clean & renewable Energy

- Enhance the living standard in rural community
- Generate related benefits and economic activities

4. Reduction in Energy Cost

5. Poverty Eradication

- The big gap of education level and infrastructure → distribution income is well not-spread in Riau province

6. Increase of Electricity Supply Coverage

- Most of the rural inhabitants or households are using kerosene pressure lantern as their source of lighting.

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SWOP-Analysis

Strengths	Opportunities
• Availability of biomass waste as raw material for power generation • Several Palm Oil Mill industries • Government Policies on renewable energy	• Create working opportunities • Prevent the urbanization • Spread-out the development • Reduce the pollution through biomass power generation • Reduce the dependability to fossil fuel
Weaknesses	**Potentials**
• Lack of awareness on technologies to recover the agricultural resources • Low investment on utilization of palm oil biomass waste • Migration to the cities at Riau (Pekanbaru and Dumai)	• Decentralized a power generation systems • Community participation in local natural resources management • Create several value added products from palm oil biomass waste • Organic farming from biomass ash

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Conclusions

- Palm oil plantation and palm oil mills clusters are already exist
- The clusters are located in the rural setting.
- In this cluster, significant amount of biomass waste generated and disposed leading to environment and local health issue.
- Introduction of new technologies, cluster management system, market orientation are essential for a successful transformation of these biomass waste.

Hence, acceleration for transformation of a region into a eco-cluster is possible with technology innovation

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Thank You
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