"Climate change mitigation & adaption in Thai Palm Oil Industry"

Presented by
Mr. Daniel May
(Project Director)

Office of Agricultural Economics

Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit

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Content

- Overall framework
- GHG emission results
- Recommendations
  - GHG mitigation
  - GHG adaptation

Overall framework

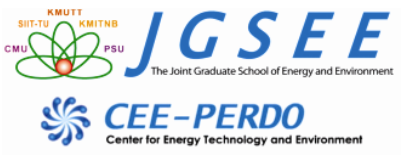
Main objectives are :

1. Development of GHG calculation methodology to promote consistency and good practice
2. Development of emission factors for various stages of a whole palm oil life cycle
3. Development of recommendations on GHG reduction options
4. Recommendations for policy makers

Overall framework

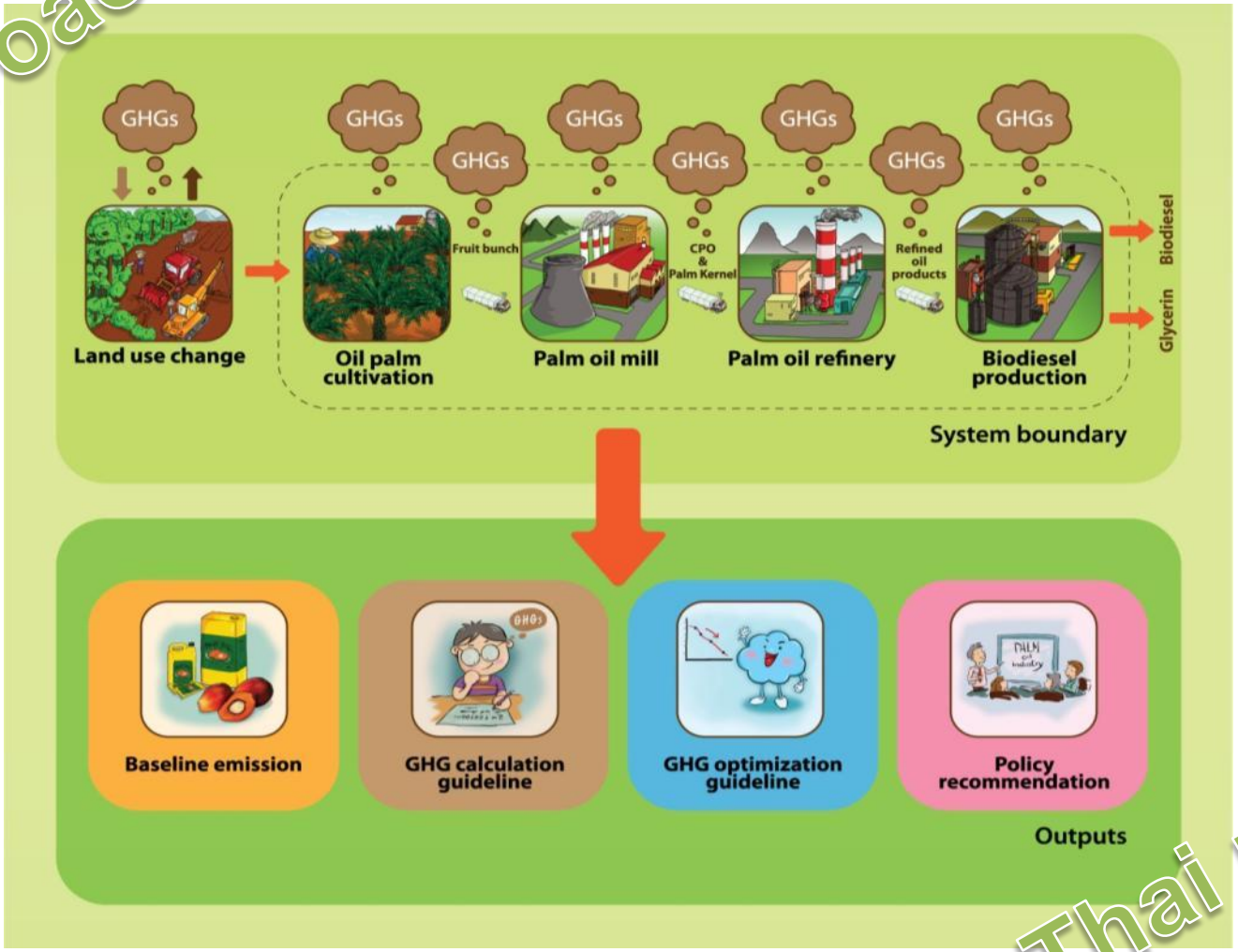
A cooperation of :






LCA approach

Overall framework



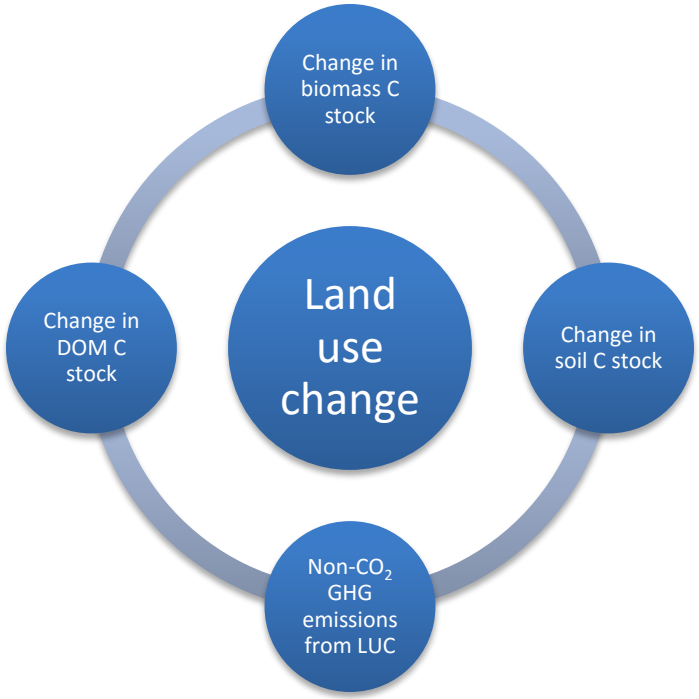
Thai palm oil industry

Land use change

- *Land use change scenarios* were chosen from data collected from 52 farmers in various parts of Thailand
- GHG calculations were done with literature default values and equations based on the farming practices.
- IPCC's 2006 Guidelines for National Greenhouse gases Inventory
  - Stock-Difference method is chosen for the study

Land use change scenarios

- Cropland converted to cropland
  - Rubber to Palm
  - Crop farm to Palm
  - Fruit orchard to Palm
  - Paddy rice to Palm
- Land converted to cropland
  - Forest to Palm
  - Unused land to Palm



GHG balance comparison

Case example	GHG balance (Ton CO_2eq ha^{-1} yr^{-1})	
	First approach[1]	Second approach[2]
Rubber	8.72	-2.16
Field crop	-17.55	-2.67
Fruit orchard	-12.82	0
Paddy field	-17.69	-1.79
Forest	8.51	24.41
Unused land	-18.89	-2.98

Note: 1. Consider crop biomass and dead organic matter as 'carbon stock'

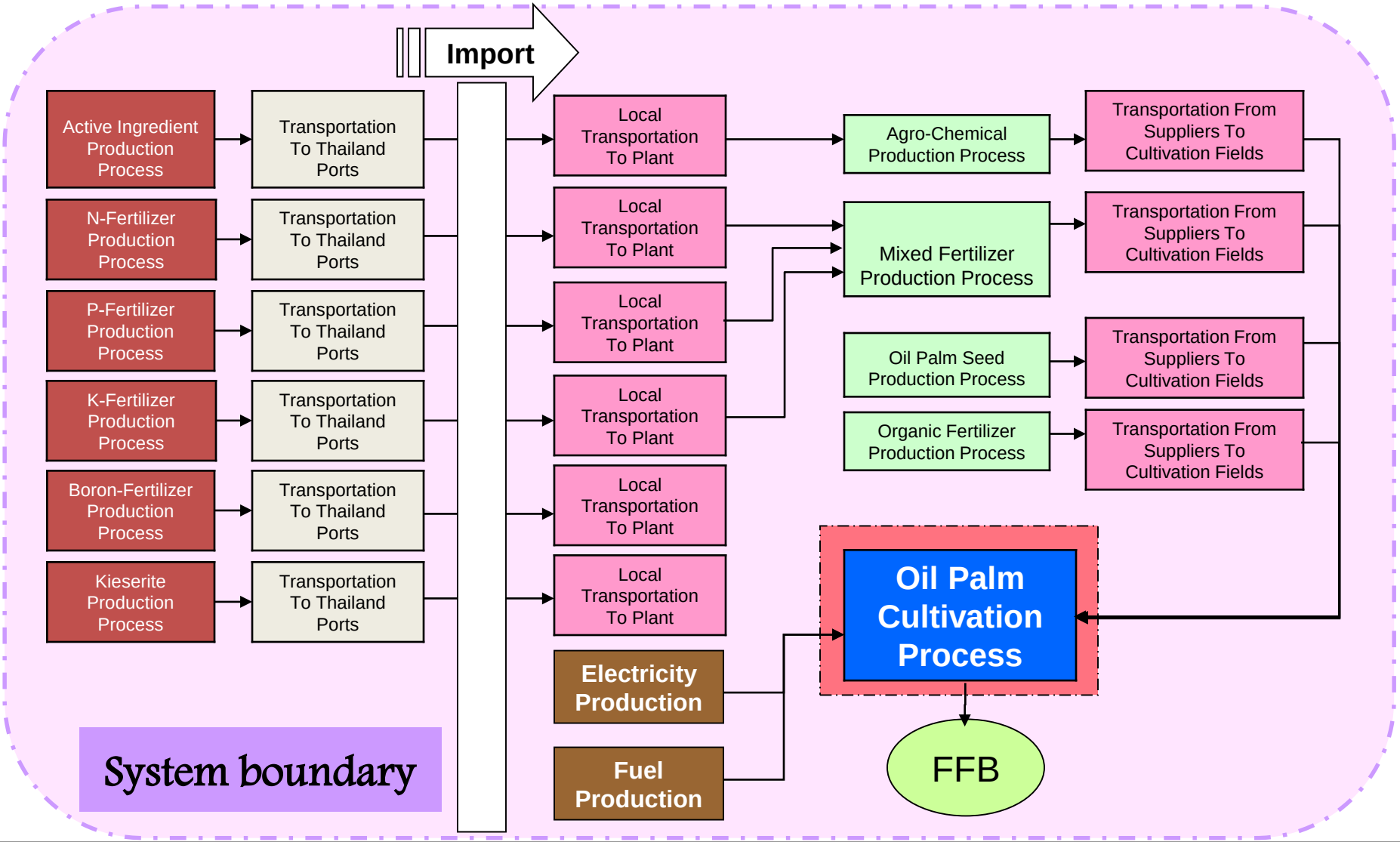
2. Not consider crop biomass and dead organic matter as 'carbon stock'

GHG mitigation :

~ Avoid planting oil palm on (primary) forest.

~ Planting on unused land is the best ⇨ create C sink

Cultivation



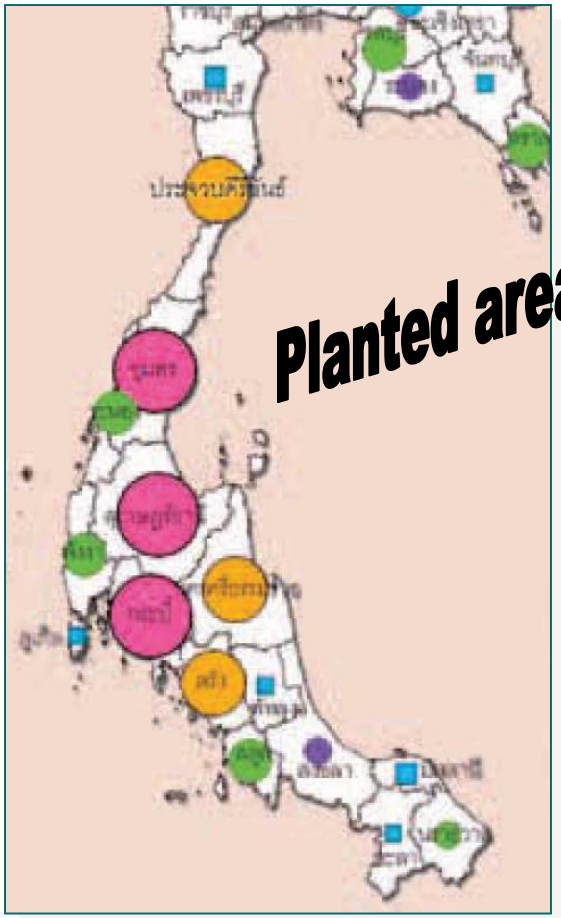
Data Collection

Upper Southern

Phetchaburi, **Prachuapkhirikhan**

Western-Lower Southern

Ranong, Phangnga, **Krabi, Trang,** Phuket, Satun



Eastern

Chonburi, Trat, Rayong, Chanthaburi, Prachinburi, Sakaeo, Chachoengsao

Eastern-Lower Southern

Chumphon, Suratthani, Nakhonsithammarat, Songkhla, Phatthalung, Yala, Pattani, Narathiwat

Large plantation (8 mills)

Small plantation (544 smallholders)

Classified by amount of rainfall annually

Methodology

Functional unit

- 1,000 kg of FFB

Data Allocation

- none

Data Cut-off

- Emission factor of seed production

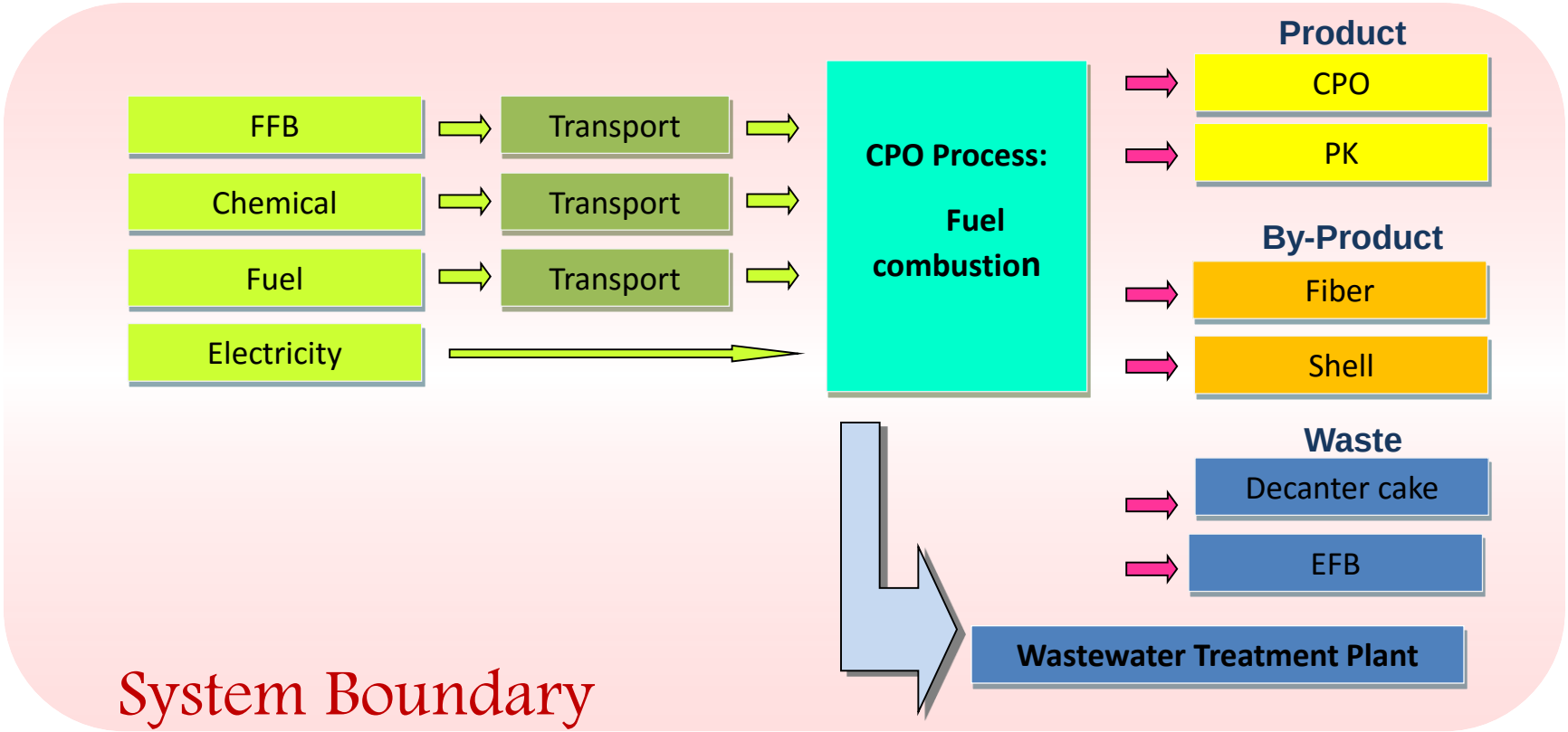
Data substitution

- none

Palm oil mill

Data collected from **14 participating mills** *(10 mills with BG capture and 4 mills w/o BG capture)*

⇨ ~32% of total capacity in Thailand



Methodology

Functional unit

- 1,000 kg of CPO

Data Allocation

- Energy

Data Cut-off

- None

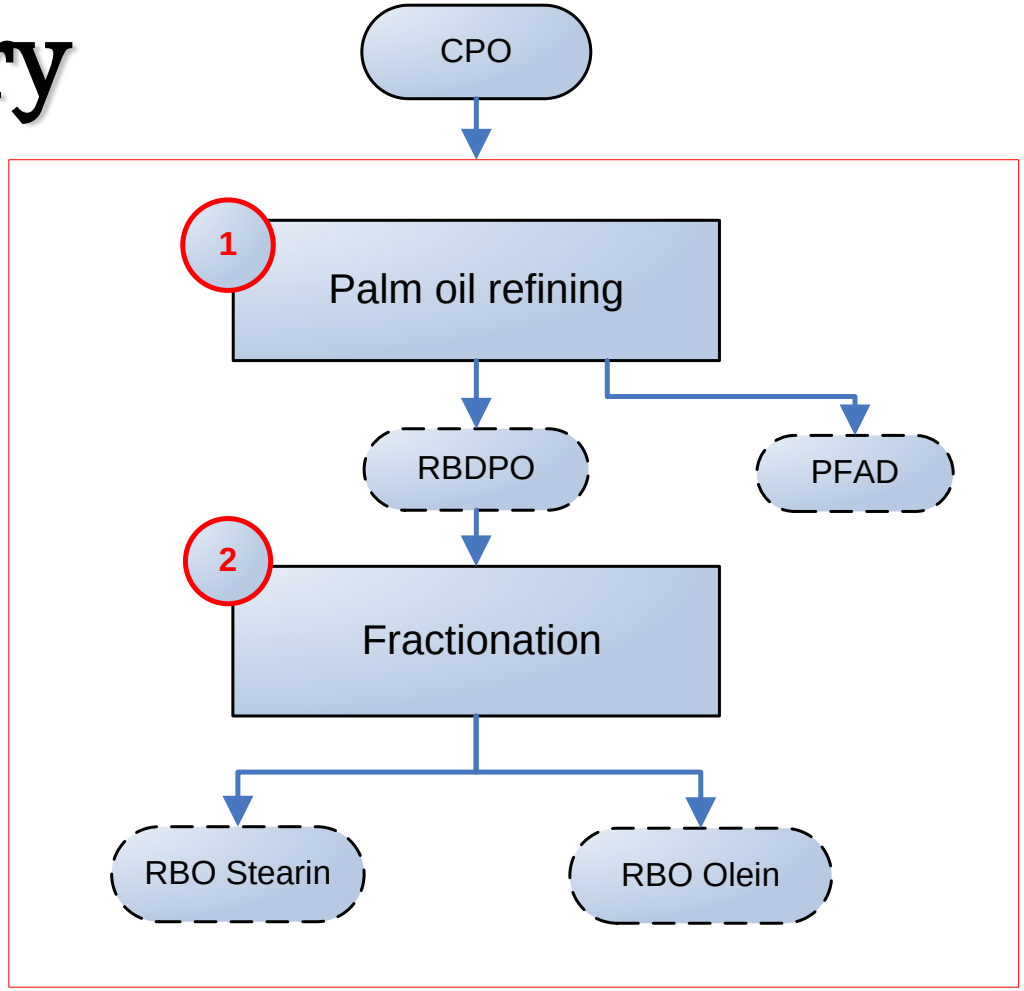
Data substitution

- None

Palm oil refinery

Data collected from 6 participating factories

⇨ ~63% of total capacity in Thailand



System boundary

Methodology

Functional unit

- 1,000 kg of each product

Data Allocation

- By energy

Data Cut-off

- None

Data substitution

- None

Biodiesel production

CPO
Palm Stearine
RBDPO

Data collected from 7 participating factories

Foreign

Methanol
KOH
H_2SO_4
NaOH
HCl
H_3PO_4

Biodiesel production

Product
B100

By-product
Glycerin

Fuel oil
Oil palm sheel
LPG

⇨ ~87% of total capacity in Thailand

System boundary

Methodology

Functinal unit

- 1,000 kg of B100

Data Allocation

- Energy

Data Cut-off

- None

Data substitution

- Emission factor of Additives => substituted by the highest EF of phenolic group

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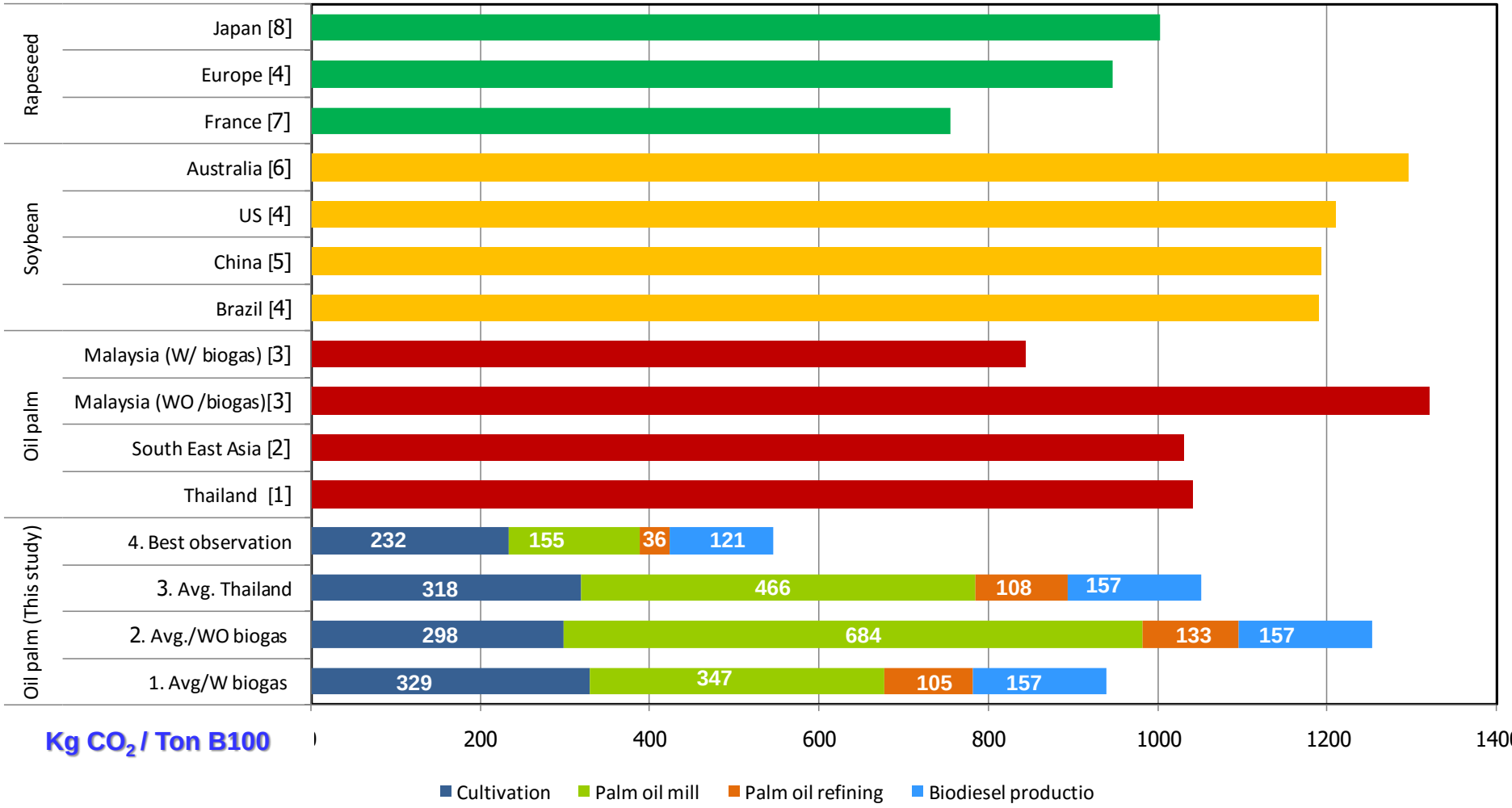
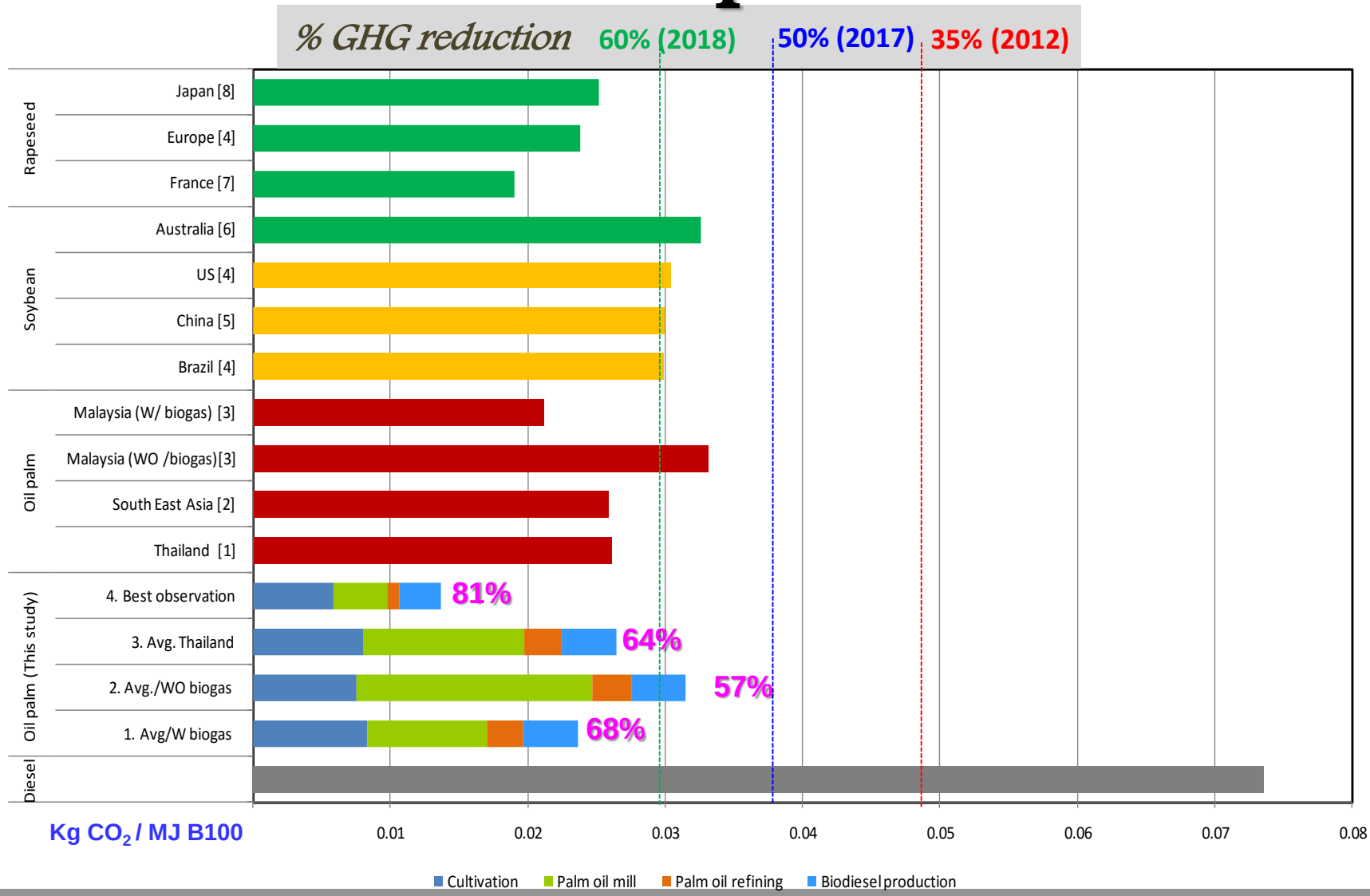
GHG emissions



Note: *GHG emissions w/o Land Use Change*

EU-RED requirement



Reference

Feedstock	Symbol	Research topic	Location	Institute	Year
Oil palm	[1]	Technical, Economic and Environmental Evaluation of Biofuel Production in Thailand.	Thailand	FAO	2010
	[2]	GHG Accounting Methodology and Default.	South East Asia	IFEU	2008
	[3]	Determination of GHG contributions by subsystems in the oil palm supply chain using the LCA approach.	Malaysia	Yuen May Choo,et al	2010
Soybean / Rapeseed	[4]	Final Report Eco-invent 2000," SimaPro 7.0, Amersfoort.	EU, Brazil, US	Pre consultant	2003
Soybean	[5]	Life cycle energy, environment and economic assessment of soybean-based biodiesel in China.	China	Tongji University	2008
	[6]	Comparison of transport fuels.	Australia	Australia Greenhouse office	2009
Rapeseed	[7]	Energy and greenhouse gas balances of biofuels production chains.	France	French Environmental and Energy Management Agency	2002
	[8]	Well-to-Wheel Analysis of Greenhouse Gas Emissions of Automotive Fuels in the Japanese Context	Japan	Toyota	2004

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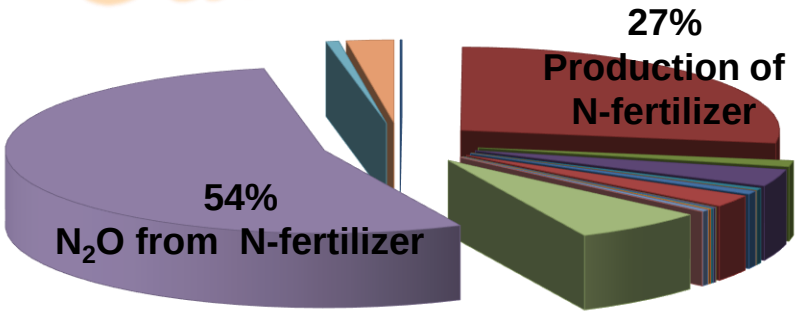
GHG mitigation - I

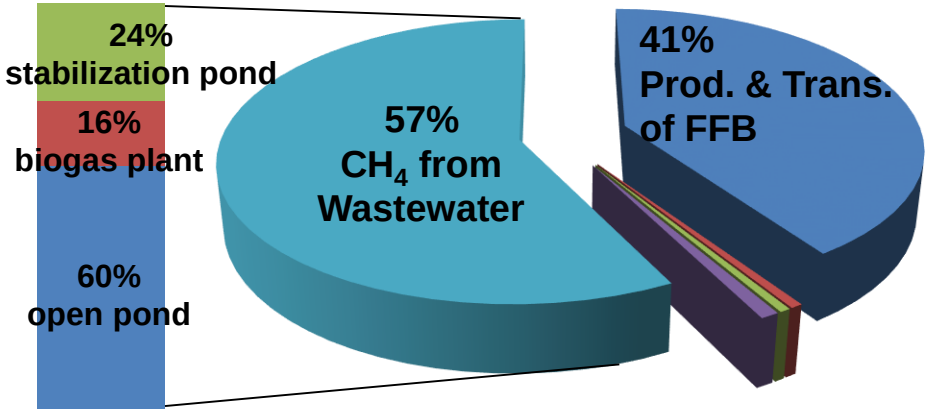
Cultivation



1. Increase productivity and quality (%OER)
2. Optimize fertililzer consumption through:

- Leaf & soil analysis ⇨ Apply fertilizer in the right time at the right amount
- Use slow release (osmocote) N-fertilizer
- Substitute synthesis N-fertilizer by high N- organic fertilizer

Palm oil mill

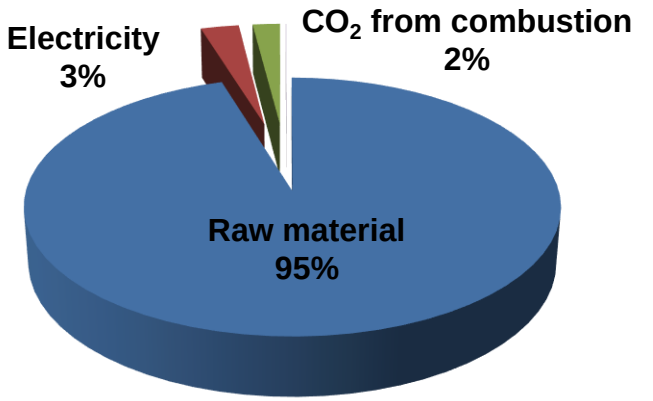


1. Sourcing FFB from the nearest source
2. Wastewater management

- Install biogas system
- Using air stripping tower to reduce Temp
- Upgrading the open pond to be the cover pond
- Enhance the performance of biogas system
- Changing stabilization pond to aerated lagoon

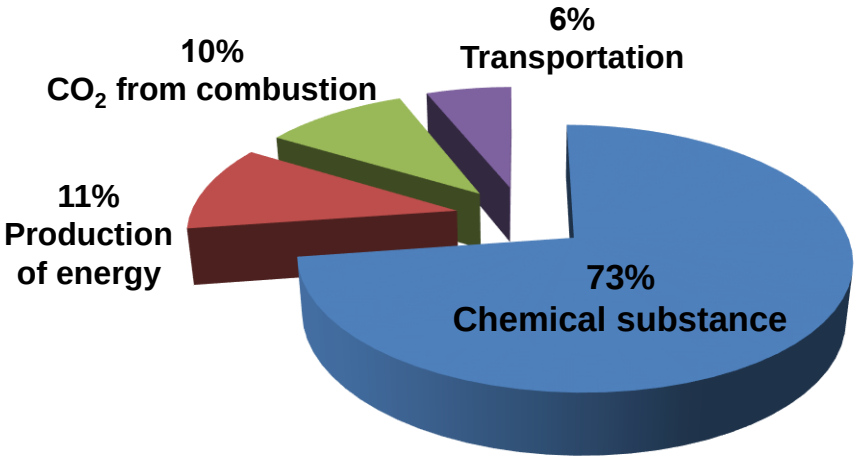
GHG mitigation - II

Palm oil refinery



- Sourcing CPO from the mill with biogas capture.
- Substitute dirty fossile fuel (crude oil, diesel) by cleaner fuel (NG) or renewable energy (biomass, biogas)
- Improve logistic system by selecting the nearest suppliers, transported by marine, full loading truck, and etc.

Biodiesel

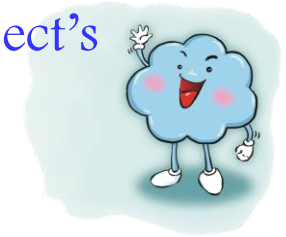


- Subtitute systhesis Methanol by Bioethanol or Biomethanol
- Install biogas capture system ⇨ generate electricity
- Use cleaner fuel instead of dirty fossil fuel
- Apply Co-generation technology (heat exchanger) ⇨ maximize energy efficiency

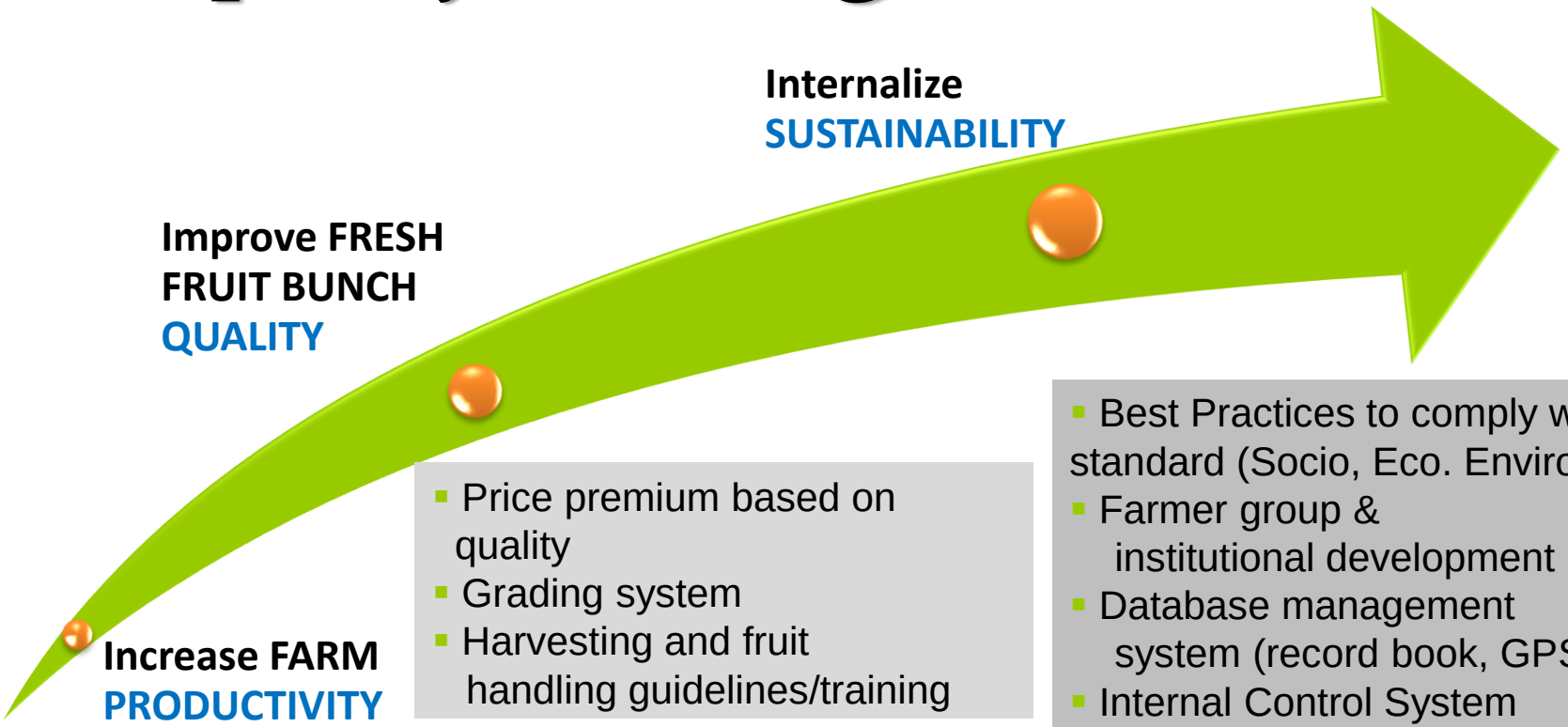
Adaptation

- Integrated analysis to evaluate impact of climate change on oil palm
- Research and dissemination of crop varieties and breeds adapted to changing climatic conditions
- Improving local farmer or stallholder knowledge on good farm management practice ⇨ *these practices are identified reducing GHG emissions*

The project's support



Capacity building : smallholders



- Price premium based on quality
- Grading system
- Harvesting and fruit handling guidelines/training

- Best Practices to comply with standard (Socio, Eco. Environ.)
- Farmer group & institutional development
- Database management system (record book, GPS)
- Internal Control System
- Mutual interest, benefit & information sharing
- Long-term relationship & interdependence

- Training & technical support: Fertilizer Management, Leaf & soil analysis, Oil palm farm management
- Farm inputs coordination: seedling, fertilizer, EFB

Technical Support, Capacity Building, Value Chain Coordination, etc…

Thank you

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Contact Info:

Mr. Daniel May E: daniel.may@giz.de

Ms. Kanokwan Saswattecha E: kanokwan.saswattecha@giz.de