# GEOSMART TECHNOLOGIES IN AGRICULTURE AND ENVIRONMENT : APPLICATIONS IN SUSTAINABILITY MANAGEMENT

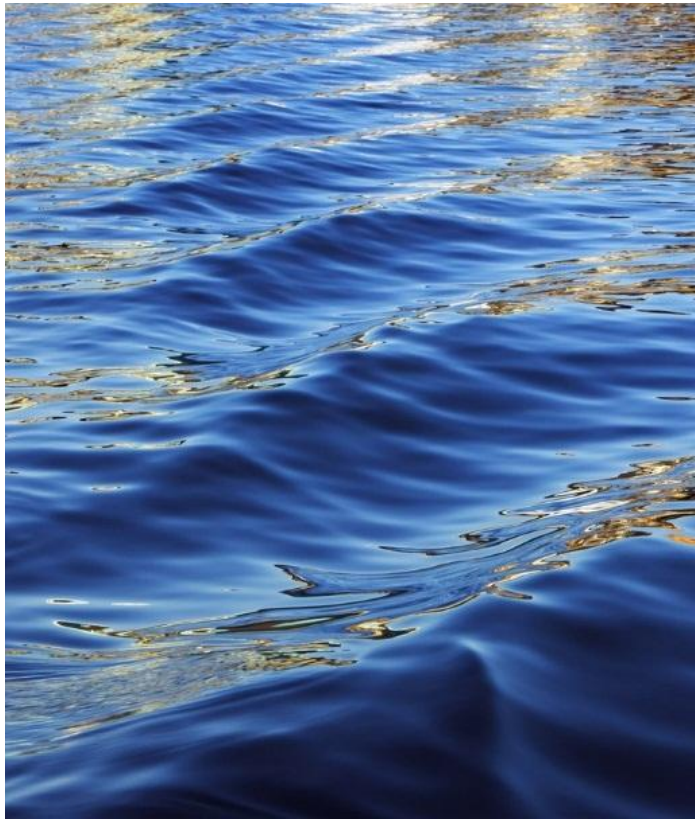
**Khoo Hock Aun**
Managing Director, Cosmo Biofuels Group
Vice-Chair of the RSB Board of Directors

COSMO
BIOFUELS GROUP

GEO SMART ASIA 2015

**GEO SMART TECHNOLOGIES FOR INNOVATION IN AGRICULTURE**

**30th September 2015**



RSB
ROUNDTABLE ON SUSTAINABLE BIOMATERIALS

# FRAMEWORK FOR SUSTAINABLE BIOFUEL SUPPLY CHAINS

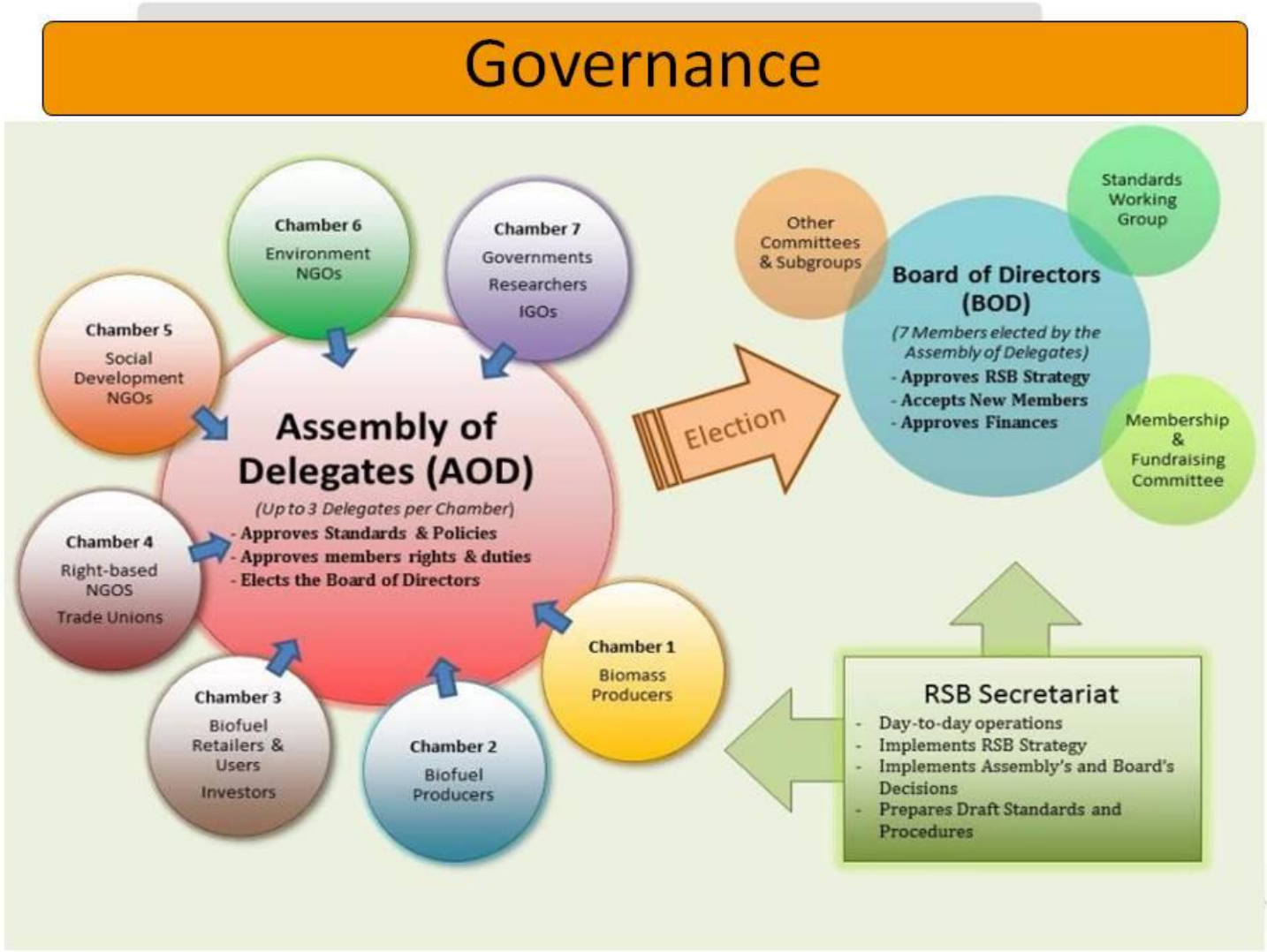
## Roundtable on Sustainable Biomaterials (RSB)

**Vision :**

**Global Sustainable Production, Conversion, And Use Of Biomass.**

**Mission:**

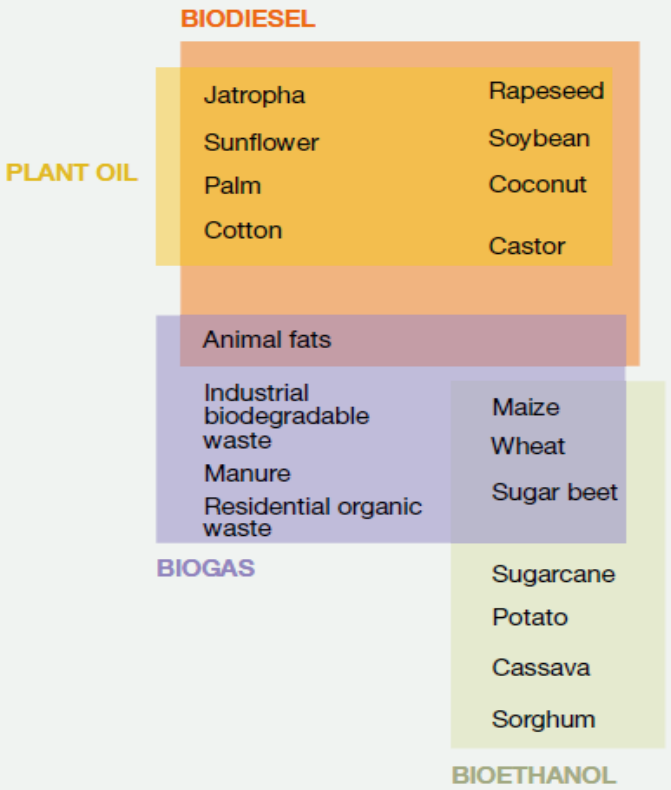
- **Provide and promote the global standard.**
- **Provide a global platform for multi-stakeholder dialogue.**
- **Ensure that users and producers have access to credible, practical and affordable certification.**
- **Support continuous improvement through application of the standard.**



# The enlarged biofuels family

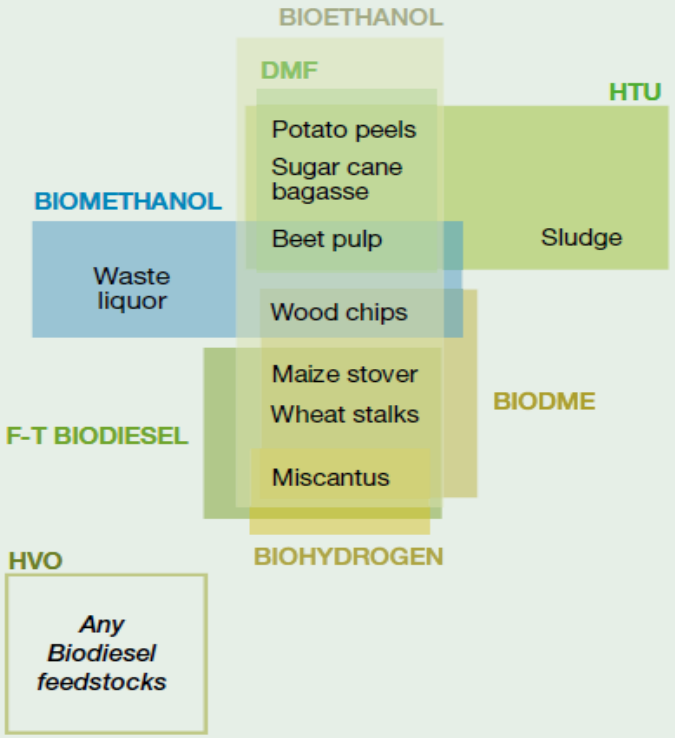
## First generation

Mass production, low technology level



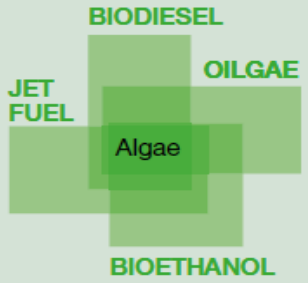

## Advanced

Near-commercial production, high technology level




## Advanced

Test stage production, high technology level, high costs

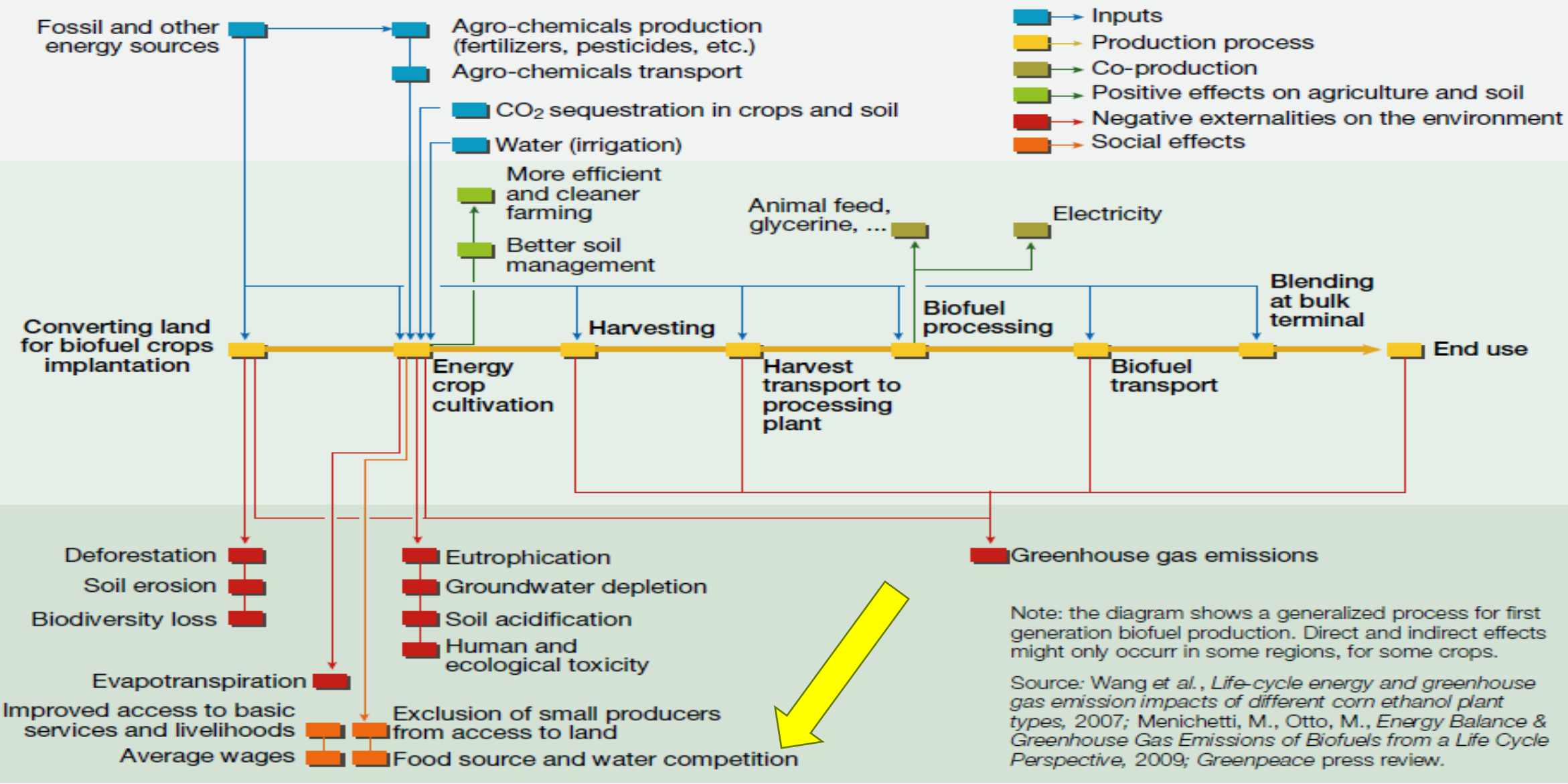



Note:
1.This figure omits traditional and/or solid biofuels. It only considers transport biofuels. The full list of crops includes more than 200 sources. Here only the most representative ones are shown.
2. Many advanced biofuels can be sourced from almost any type of biomass. Listed here are the most common or those used in specific production processes.

Sources: UNEP, *Assessing Biofuels*, 2009; UN-Energy, *Sustainable Bioenergy. Framework for Decision Makers*; 2007; EPA, *Renewable Fuels Standard Program Regulatory Impact Analisys*, 2010; Refuel.eu, accessed 03.03.2010; Biofuel Magazine press review, SAE International, *Hydrotreated Vegetable Oil (HVO) as a Renewable Diesel Fuel*, 2008.

Source: UNEP

# From seed and soil to end use




Note: the diagram shows a generalized process for first generation biofuel production. Direct and indirect effects might only occurr in some regions, for some crops.

Source: Wang *et al.*, *Life-cycle energy and greenhouse gas emission impacts of different corn ethanol plant types*, 2007; Menichetti, M., Otto, M., *Energy Balance & Greenhouse Gas Emissions of Biofuels from a Life Cycle Perspective*, 2009; *Greenpeace* press review.

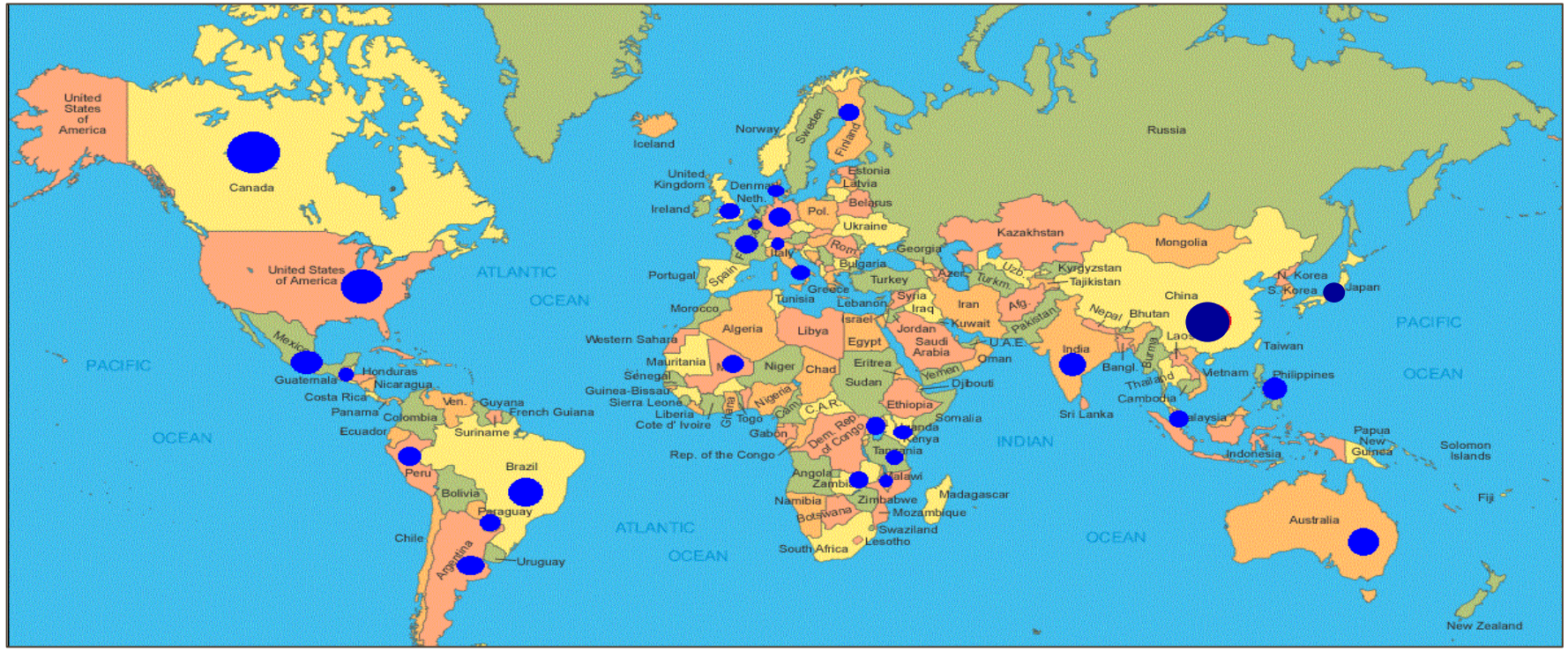
Source: UNEP

# FRAMEWORK FOR SUSTAINABLE BIOFUEL SUPPLY CHAINS

RSB ROUNDTABLE ON SUSTAINABLE BIOMATERIALS

## 120+ organizations from 30 countries including 30 NGOs

## RSB STAKEHOLDERS



# FRAMEWORK FOR SUSTAINABLE BIOFUEL SUPPLY CHAINS

RSB ROUNDTABLE ON SUSTAINABLE BIOMATERIALS

## Companies RSB Works With (RSB Members or Certified Companies)

### Feedstock companies developing novel biomass sources

**Carinata & Camelina**

AGRISOMA

Sustainable Oils

**Jatropha**

GLOBAL CLEAN ENERGY

SG biofuels

**Algae**

Sapphire Energy™

heliae

COSMO BIOFUELS GROUP

### Novel industrial biotech companies targeting biochemicals

AMYRIS

Farnesene

LanzaTech

Ethanol & 2,3-butanediol

gevo®

Butanol

solazyme

Tailored Oils

**RSB is a B2B certification program that works with all steps in the supply chain to ensure sustainable feedstocks for the developing biochemical industry.**

# New Scope – Bioenergy & Biomaterials

- Bio-chemicals
- Bioenergy
- Bio-plastics & Biopackaging
- Fiber & Lubricants
- Food additives
- …

RSB ROUNDTABLE ON SUSTAINABLE BIOMATERIALS

iseal alliance member

# TAPIOCA TO BIODEGRADEABLE BIOPLASTIC - TAPIOWARE

Raw material, manufacturing and finished goods buyback concept
原材料，制造和制成品购回概念

Excellent Icon
(Supply of Tapioca saplings and technical knowledge)
供应幼苗和技术知识

Land Owners
Plough land and plant topioca sapling
地主翻土栽种木薯幼苗

Harvest period 9 months latter
1. Return sapling to Excellent Icon (3 times it supplied)
2. Harvest the tubers and sell to Excellent Icon
木薯收成时期-9个月
1. 返回木薯幼苗给Excellent Icon-供3次返1次
2. 收割木薯卖给Excellent Icon（包销）

Excellent Icon/Regional Mixing Centre
(Supply of Tapioca Starch Dough)
区搅拌中心(供应木薯淀粉团)

Individuals at home (Cottage Industry)
私人家(村舍工产)

Excellent Icon/Regional Mixing Centre
(Buy back finished products
contra against price of dough supplied)
区搅拌中心
(购回完成的产品和除木薯淀粉团价格)

Export sales
输出口外销

Local Sales本地销售

| Description | | Description | |
|---|---|---|---|
| Round Plate | Size:<br>A) 7", 9" & 10"<br>B) 9" & 10" 3 Compartment<br>Colour:<br>White<br>Packing:<br>50pcs x 10 – 500pcs/ctn | 9" x 9" Box | Size:<br>1 Comp & 3 Comp<br>Colour:<br>White<br>Packing:<br>50pcs x 6 – 300pcs/ctn |
| Square Tray | Size:<br>10"<br>Colour:<br>White<br>Packing:<br>50pcs x 10 – 500pcs/ctn | Cup | Size:<br>9oz<br>Colour:<br>White<br>Packing:<br>50pcs x 20 – 1000pcs/ctn |
| Tray | Size:<br>9" x 7"<br>Colour:<br>White<br>Packing:<br>50pcs x 20 – 1000pcs/ctn | Box | Size:<br>650ml<br>Colour:<br>White<br>Packing:<br>50pcs x 12 – 600pcs/ctn |
| Noodles Bowl | Size:<br>950ml<br>Colour:<br>White<br>Packing:<br>50pcs x 6 – 300pcs/ctn | Burger Box | Size:<br>6" x 6"<br>Colour:<br>White<br>Packing:<br>50pcs x 10 – 500pcs/ctn |
| Bowl | Size:<br>360ml & 650ml<br>Colour:<br>White<br>Packing:<br>i. 50pcs x 20 – 1000pcs/ctn<br>ii. 50pcs x 12 – 600pcs/ctn | Cornstarch Cutlery | Size:<br>6.3", 6", 5" & 4.7"<br>Colour:<br>White<br>Packing: |

Kim Ban Marketing (M) Sdn. Bhd.

CONTACT PERSON :
PAUL NYU + 012 - 2480390


# FRAMEWORK FOR SUSTAINABLE BIOFUEL SUPPLY CHAINS

## DIVERSITY OF FEEDSTOCKS

- Algae in the US and Asia
- Sugar cane in Peru, Sierra Leone, Brazil
- Wheat residues in Australia
- Jatropha oil in Mexico and Asia
- Used cooking oil and animal fats in the US, Europe, Canada, China, South Korea
- Camelina in Spain
- Coppice trees – Poplar, US; Gliricidia, Sri Lanka
- Macaúba oil, tobacco, Moringa tree – suited for smallholders

# FRAMEWORK FOR SUSTAINABLE BIOFUEL SUPPLY CHAINS

***RSB Principles & Criteria***

APPLIED ACROSS THE ENTIRE BIOFUELS SUPPLY CHAIN

## Legal

- Legality
- Land rights

## Social

- Human and Labor Rights
- Rural and Social Development
- Local Food Security

## Environmental

- GHG emissions
- Biodiversity Conservation
- Soil
- Air
- Water/rights

## Management and technical

- Planning, Monitoring and Continuous Improvement
- Use of Technology, Inputs, and Management of Waste

# FRAMEWORK FOR SUSTAINABLE BIOFUEL SUPPLY CHAINS

## Standard for Agricultural and other Residues

**Specific standard on residues and byproducts**

- Including bagasse, stalks/leaves, stover, used cooking oil
- Municipal solid waste, forestry operations

**Upstream verification for agricultural residues**

- Ensure enough residues to maintain soil organic matter
- GHG emissions limited to transport and conversion to fuel
- Direct land-use change

# FRAMEWORK FOR SUSTAINABLE BIOFUEL SUPPLY CHAINS

## RSB and Conservation:

- **Principle 7.** Biofuel operations shall avoid negative impacts on biodiversity, ecosystems, and conservation values.
  - **Criterion 7a**. Conservation values of local, regional or global importance within the potential or existing area of operation shall be maintained or enhanced.
  - **Criterion 7b.** Ecosystem functions and services that are directly affected by biofuel operations shall be maintained or enhanced.
  - **Criterion 7c**. Biofuel operations shall protect, restore or create buffer zones.
  - Crit**erion 7d.** Ecological corridors shall be protected, restored or created to minimize fragmentation of habitats.
  - **Criterion 7e**. Biofuel operations shall prevent invasive species from invading areas outside the operation site.

# The Renewable Energy Directive (RED)

- The Renewable Energy Directive (RED) is intended to promote the use of renewable energy in Europe, and stipulates that Biofuel production should be environmentally sustainable and meet certain targets laid down in the directive.
- Furthermore, it states that if land with high stocks of carbon in its soil or vegetation need to be converted for the production of raw materials for biofuels and other bioliquids, some of the stored carbon will be released into the atmosphere leading to the formation of carbon dioxide.
- This could offset the benefits of biofuels through greenhouse gas emissions, and consequently the full carbon effects of such conversions must be accounted for in calculating the greenhouse gas savings of any biofuels project.  The RSB have similar guidelines and standards.

# Identification of Conservation Values

- A fundamental task is to identify the conservation values that are contained in the potential biofuel production areas.
- The operator and impact assessment specialist must be taken through a thorough identification of the conservation values of the land both a combination of desk and field work in consultation with local experts and communities
- Land use assessment includes

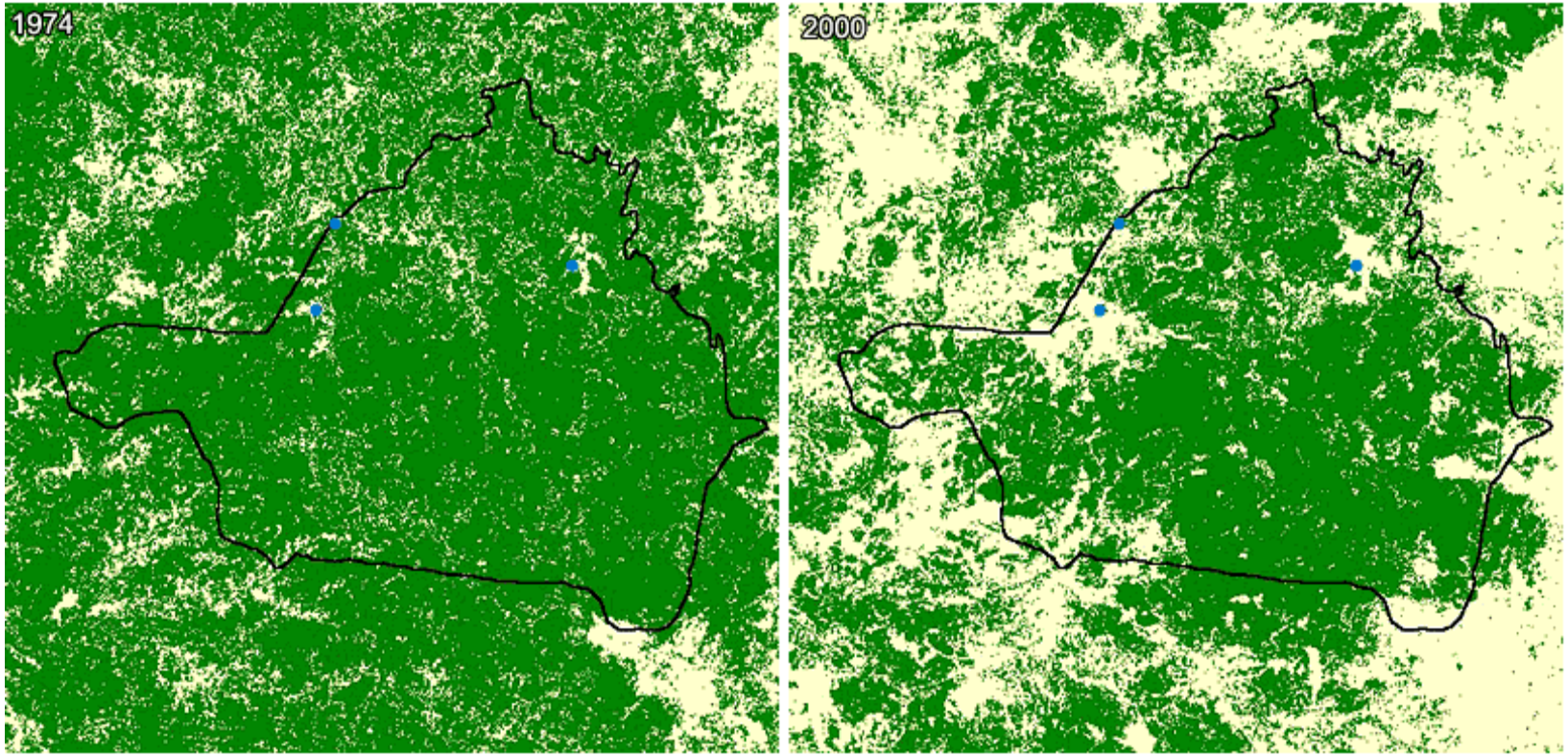
  1) screening ie a review of publicly available data and maps

  2) landscape-level assessment ie consultation of national /regional experts

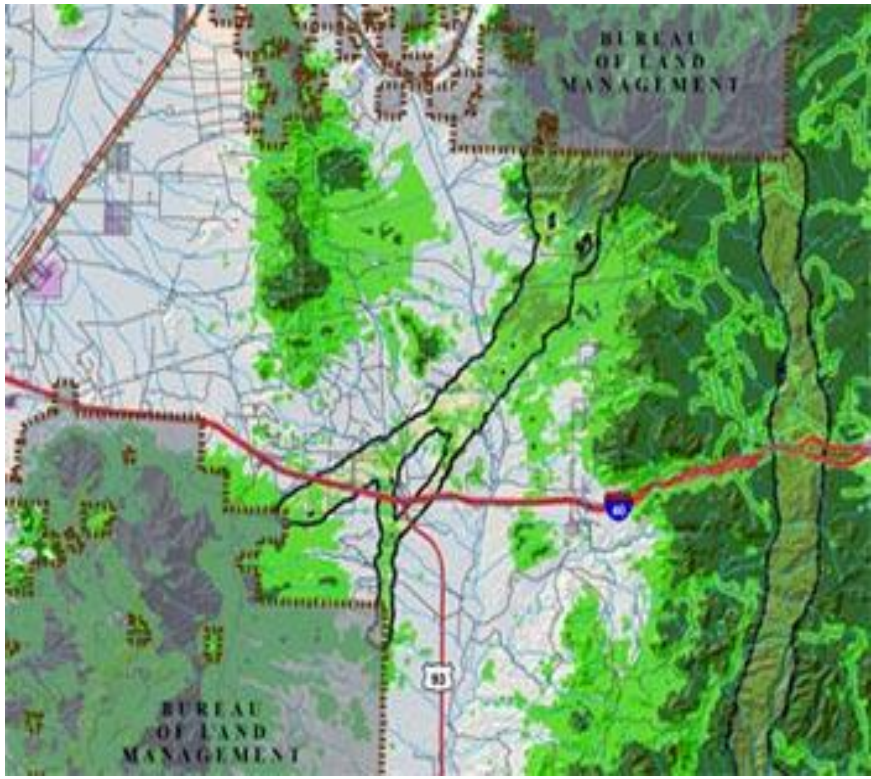
  3) site-level mapping through consultation with local communities

  4) responsible management through which mitigation measures are are proposed.

**RSB Conservation Impact Assessment Guidelines**




Forest (green) and nonforest (beige) areas in and around Chatthin Wildlife Sanctuary.



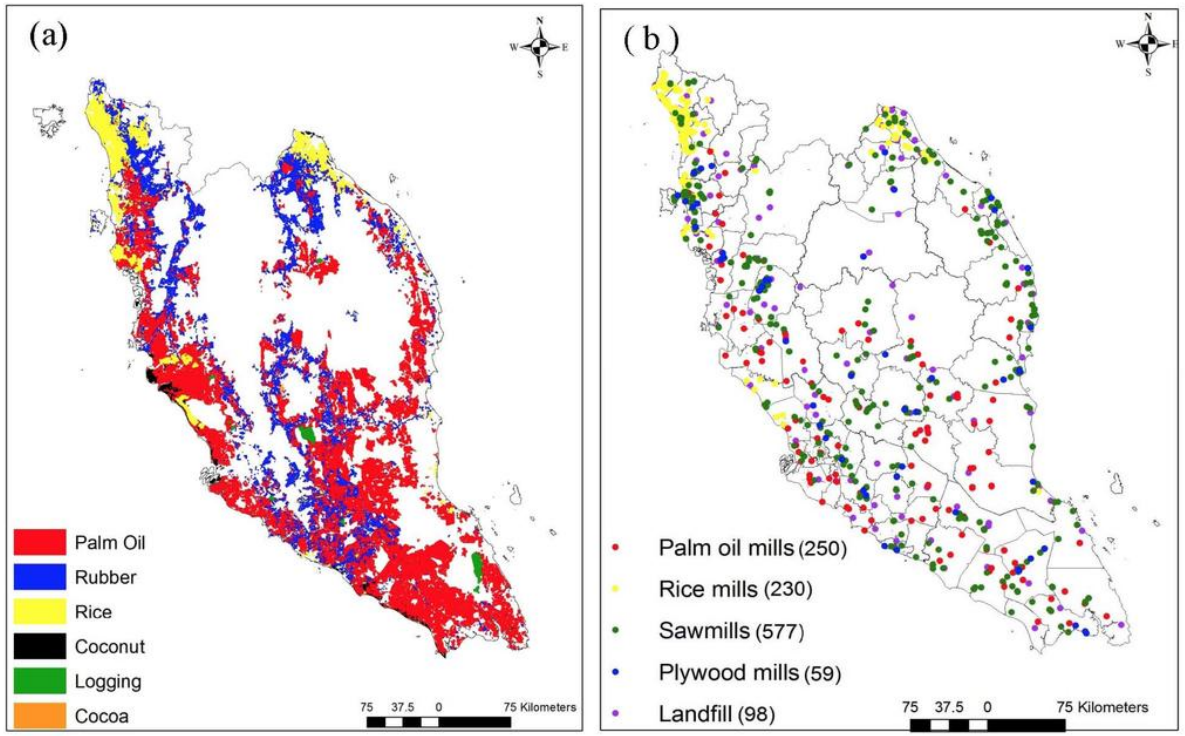

# Out of Bounds for Biofuels/Biomaterial Production

- UNESCO's World Heritage Site
- Ramsar Site
- IUCN Protected Areas 1 – 4
- Alliance for Zero Extinction Areas
- Legally Protected Area
- Ecological Corridor
- Buffer Zone
- Areas Providing Crucial Ecosystem Services
- High Conservation Value Areas
- Key BioDiversity Areas
- Important Bird Areas

- Natural and Semi Natural Ecosystems
- Landscape Scale Forests and Ecosystems
- Highly BioDiverse Grasslands and savannas
- Natura 2000 areas
- Lands with Important Stock of Carbon under soild, liquid or gaseous forms but not limited to peatland and primary forests
- Wetlands eg mangroves

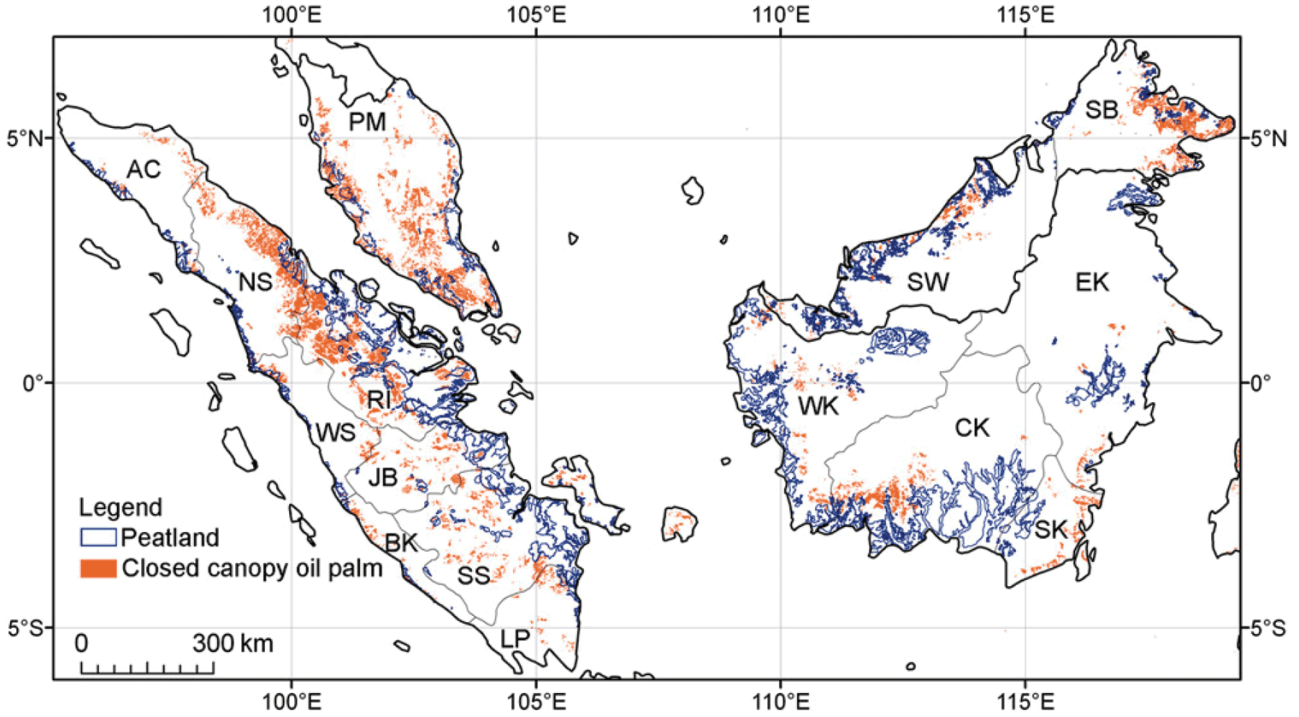
**RSB Conservation Impact Assessment Guidelines**

# Availability of Biomass/Residues




Locations of residues in Peninsular Malaysia: (**a**) field-based residues; (**b**) process-based residues.

**Distribution of closed canopy oil palm plantations and tropical peatlands in the lowlands of Peninsular Malaysia, Borneo and Sumatra**



# RSB and Water: Overview

- **Principle 9:** *Biofuel operations shall maintain or enhance the quality and quantity of surface and ground water resources, and respect prior formal or customary water rights.*

  - **Criterion 9b:** Develop & Implement a Water Management Plan
  - **Criterion 9a**: Evaluate and respect water rights of local communities
  - **Criterion 9c:** Do not contribute to depletion of water resources
  - **Criterion 9d:** Maintain/enhance the quality of water resources

**+ Specialised Guidelines for evaluation of water impacts!**

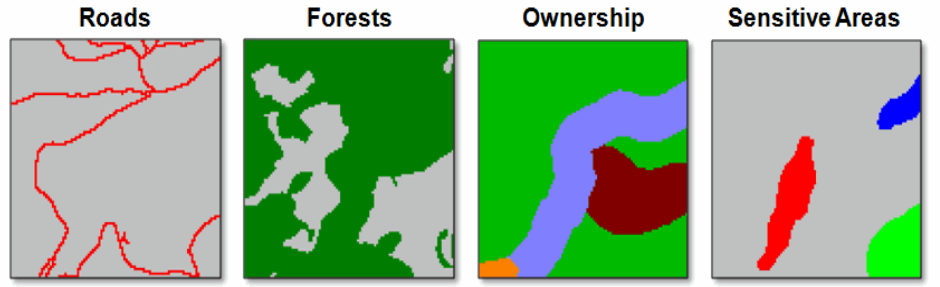
# RSB and Water: in practice (1)

- Water-related requirements are for **feedstock producers, feedstock processors** and **biofuel producers** (not **for biofuel blenders**)
- Evaluation of **water rights and baseline situation** are parts of the **impact assessment process (cf: Principle 2).**
- **Complexity** of the evaluation depends on the **project design and context: irrigation vs rainfed; annual rainfall; occurrence of droughts; possible run-offs; water treatment/recycling; etc.**
- **Simplified process and lower costs** for low risk operations

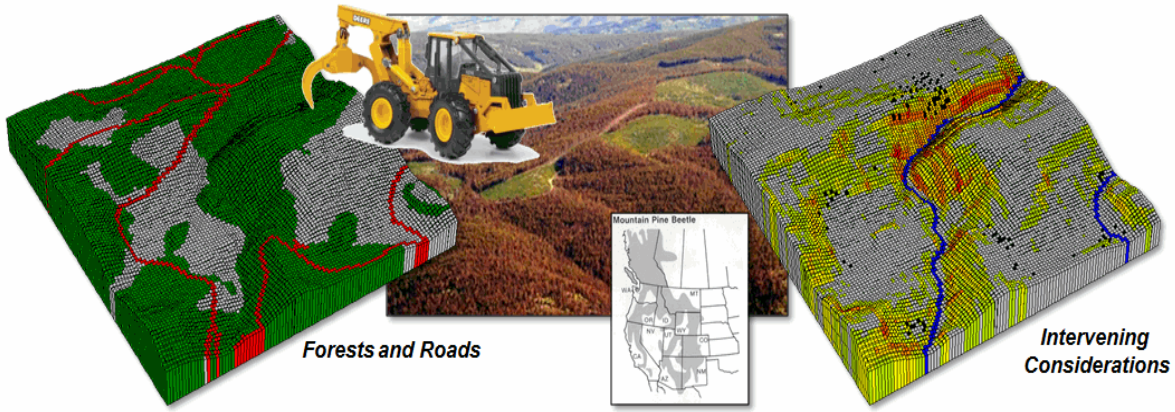
# RSB and Water: in practice (2)

1. **Screening:** Evaluate the water resources used for the project: existing water rights, scarcity, potential runoffs, etc…
2. **If required during the screening:** Specialised impact assessment for water rights, water availability and water quality.
3. Set a **water management plan** (part of the ESMP defined under Principle 2), which describes practices to achieve compliance with Principle 9 and criteria.
4. **Monitor** impacts on water rights, water availability and water quality against Principle & Criteria 9. If required, corrective actions.

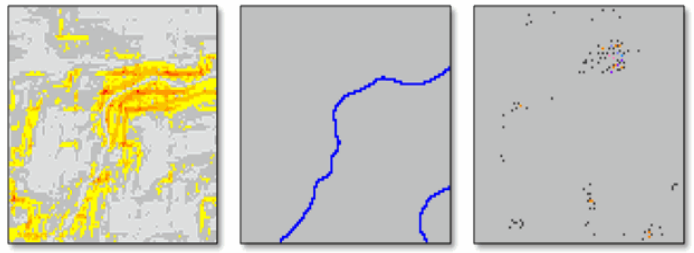
# Use of GIS for Natural Resource Management




*Forested areas are first assessed for **Availability** considering ownership and sensitive area designation…*

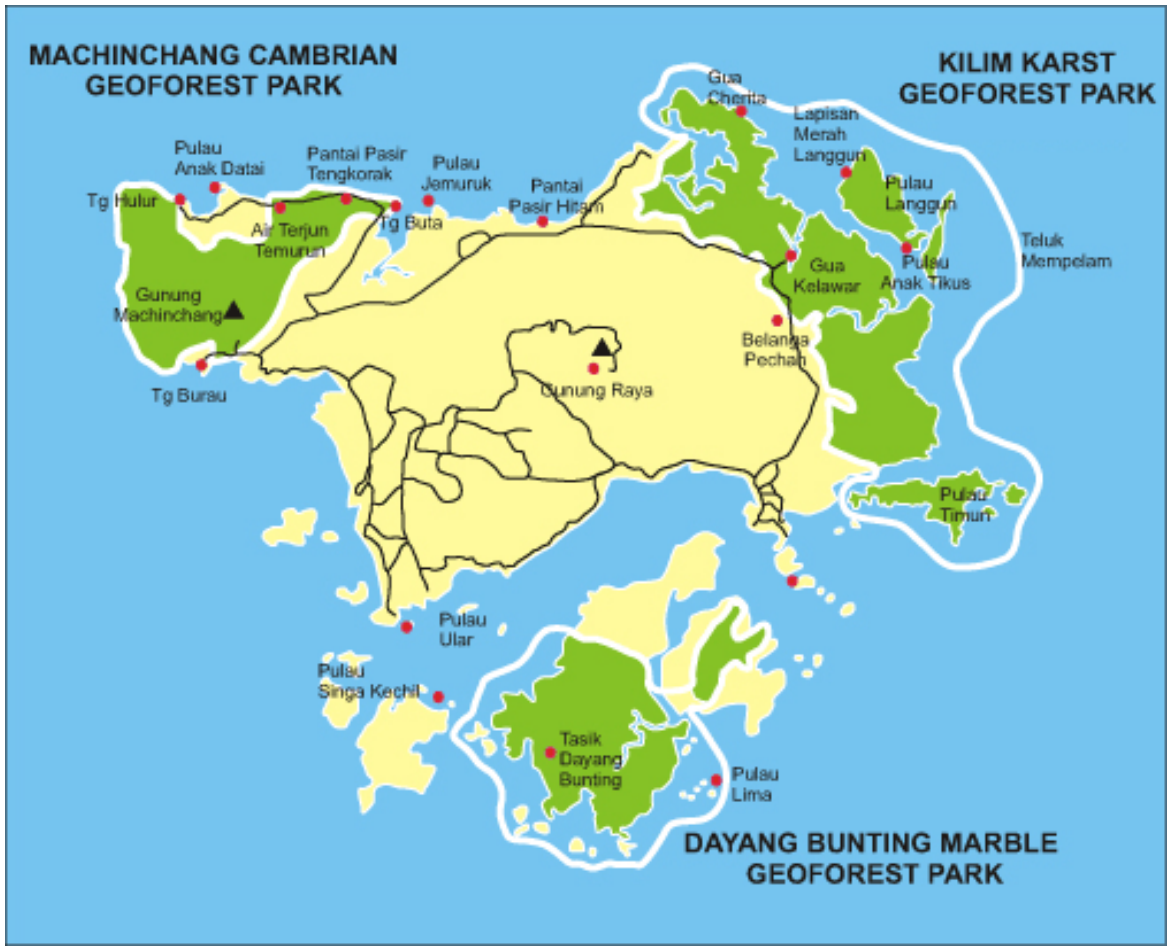



*…then characterized by **Relative Access** considering intervening terrain factors of steepness and stream buffers, plus human factors of housing density and visual exposure to roads and houses.*

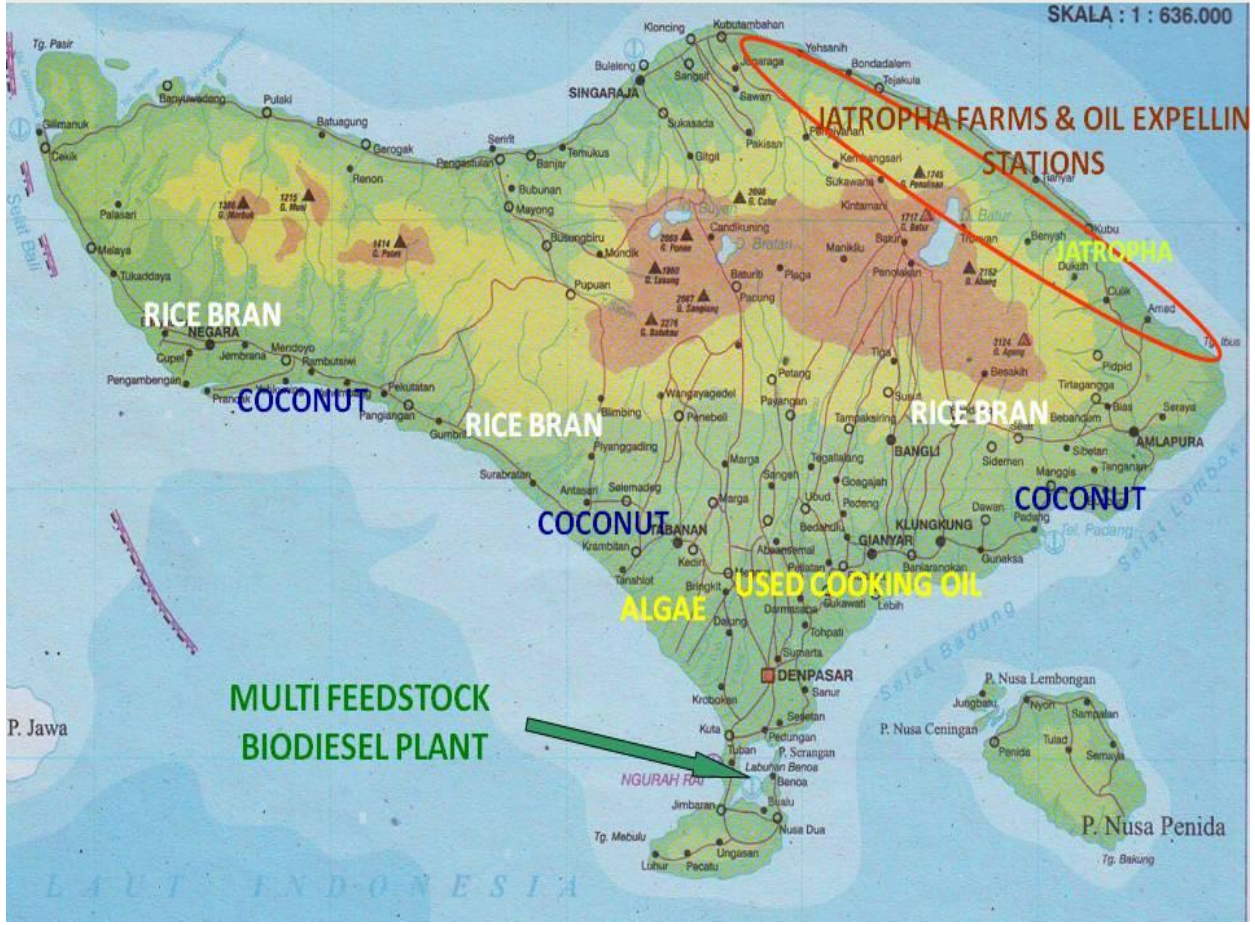


# BEST PRACTICE MODELS

## MULTIPLE FEEDSTOCK PRODUCTION STRATEGIES INTEGRATED WITH FOOD PRODUCTION LANGKAWI




## BALI AREA INTEGRATED JATROPHA PLANTING AND BIODIESEL PROJECT



# BEST PRACTICE MODELS

## 1G TECHNOLOGY, THE MOST WIDELY USED BIOFUEL TECHNOLOGY, REQUIRES FEEDSTOCK THAT INTERFERES WITH THE FOOD CHAIN

- One of the primary concerns about biofuels has been the raging food versus fuel debate, which highlights the risk of food supply disruption due to increased diversion of land for biofuel feedstock.
- Other concerns :
  - include soil erosion,
  - increased pressure on water resources,
  - loss of biodiversity, and
  - environmental imbalance caused by large-scale clear-cutting of forest land for biofuel production.

## 2G & 3 G TECHNOLOGY ADDRESSES THESE CONCERNS

It uses non-food-based feedstock, namely lignocellulosic material, which is currently used primarily for self-consumption as fuel or fodder.

Typical feedstock includes rice husks and straw, grass, empty fruit bunches (EFBs), palm fronds, wood fuel, and corn stover.

The Southeast Asia region has abundant availability of 2G-specific feedstock .

For example, Malaysia and Indonesia are the largest palm oil-producing nations in the world, resulting in high quantities of available palm waste (such as palm fronds and EFB). Wood fuel and rice waste are also available in large quantities, which can be leveraged for biofuel production

# Thank You!


**Khoo Hock Aun**

**+6016-301 4079**

**khoohockaun@cosmobiofuels.com**


**COSMO BIOFUELS GROUP**