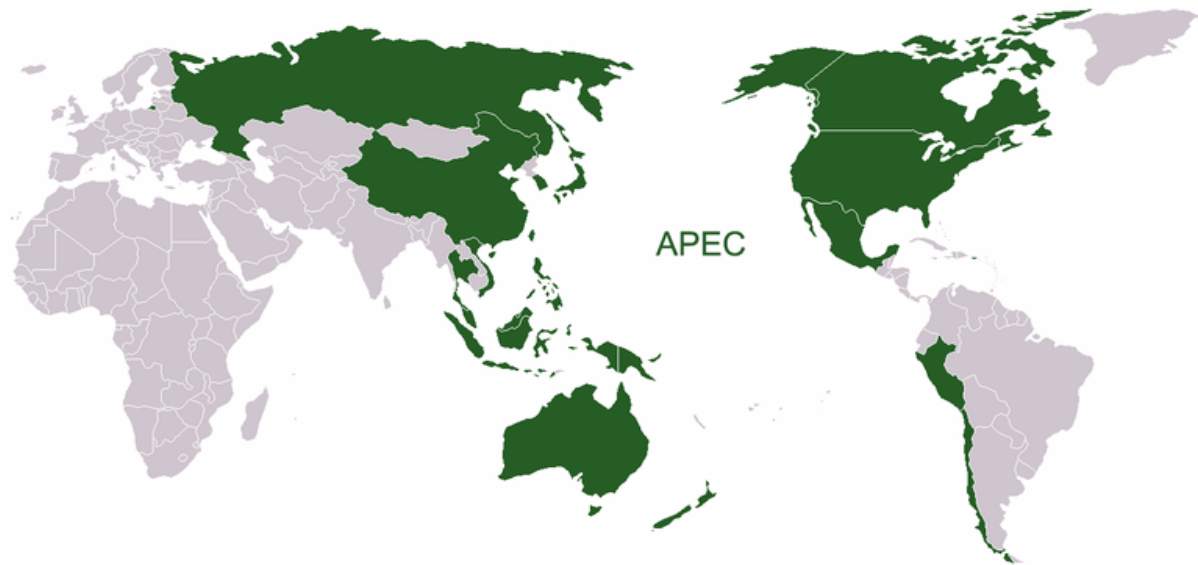


# **Sustainable Biofuel Development Policies, Programs, and Practices in APEC Economies**



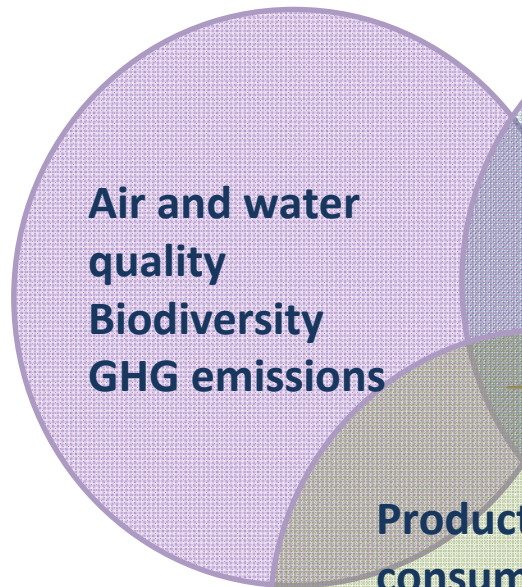
**Asia Pacific Economic Cooperation  
Project No: EWG 19//2009  
November 2010  
Report prepared by Winrock International**

# Objectives

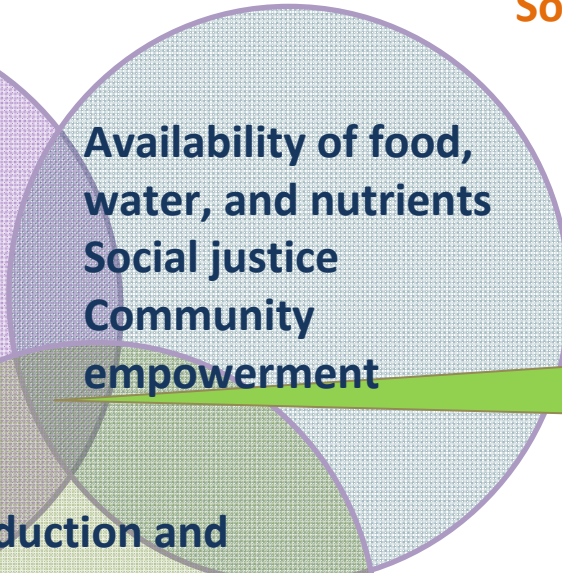
- Survey policies, programs, and practices that can contribute to development of liquid biofuels that are beneficial to the environment, society, and economy

# Sustainability

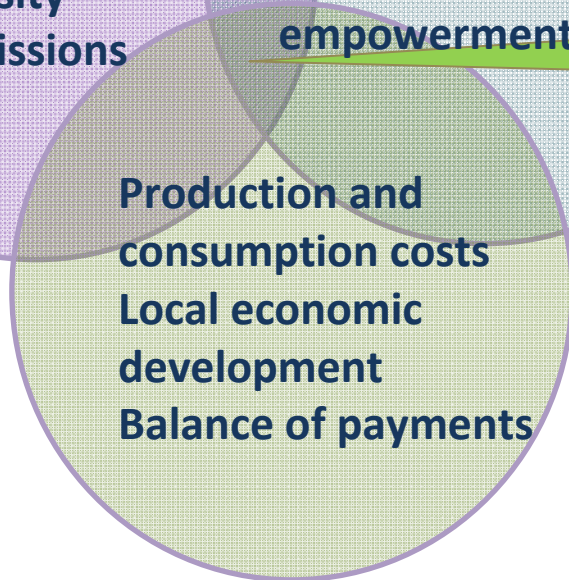
**Environment**



**Society**



**Economy**



# Potential sustainability benefits of biofuels

**Environmental benefits**

Opportunities to address GHG emissions & air quality

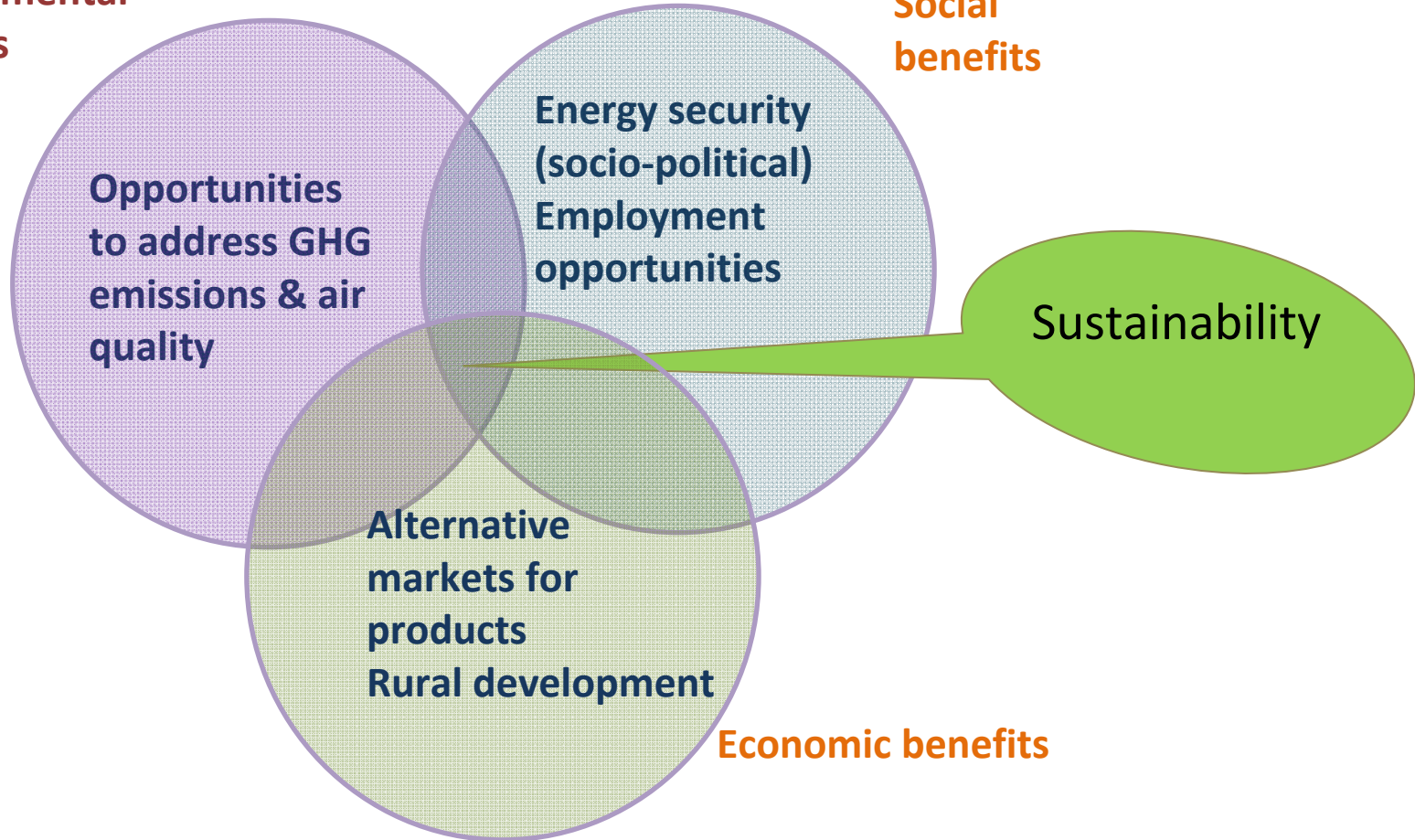
**Social benefits**

Energy security (socio-political)  
Employment opportunities

Sustainability

Alternative markets for products  
Rural development

**Economic benefits**



# Potential sustainability costs of biofuels

## Environmental costs

Carbon from land use change, loss of biodiversity or increase in GHG emissions

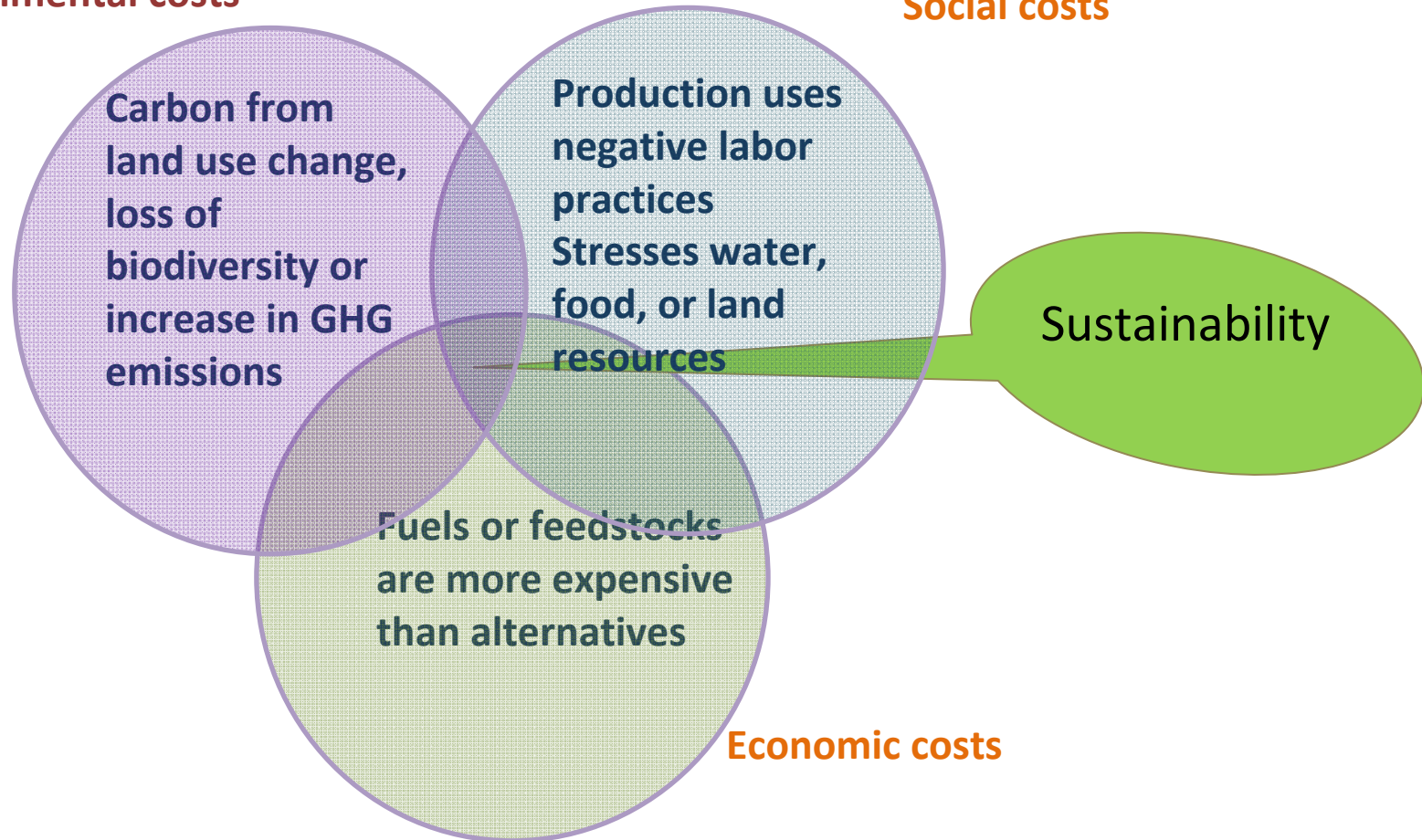
## Social costs

Production uses negative labor practices  
Stresses water, food, or land resources

Sustainability

Fuels or feedstocks are more expensive than alternatives

## Economic costs

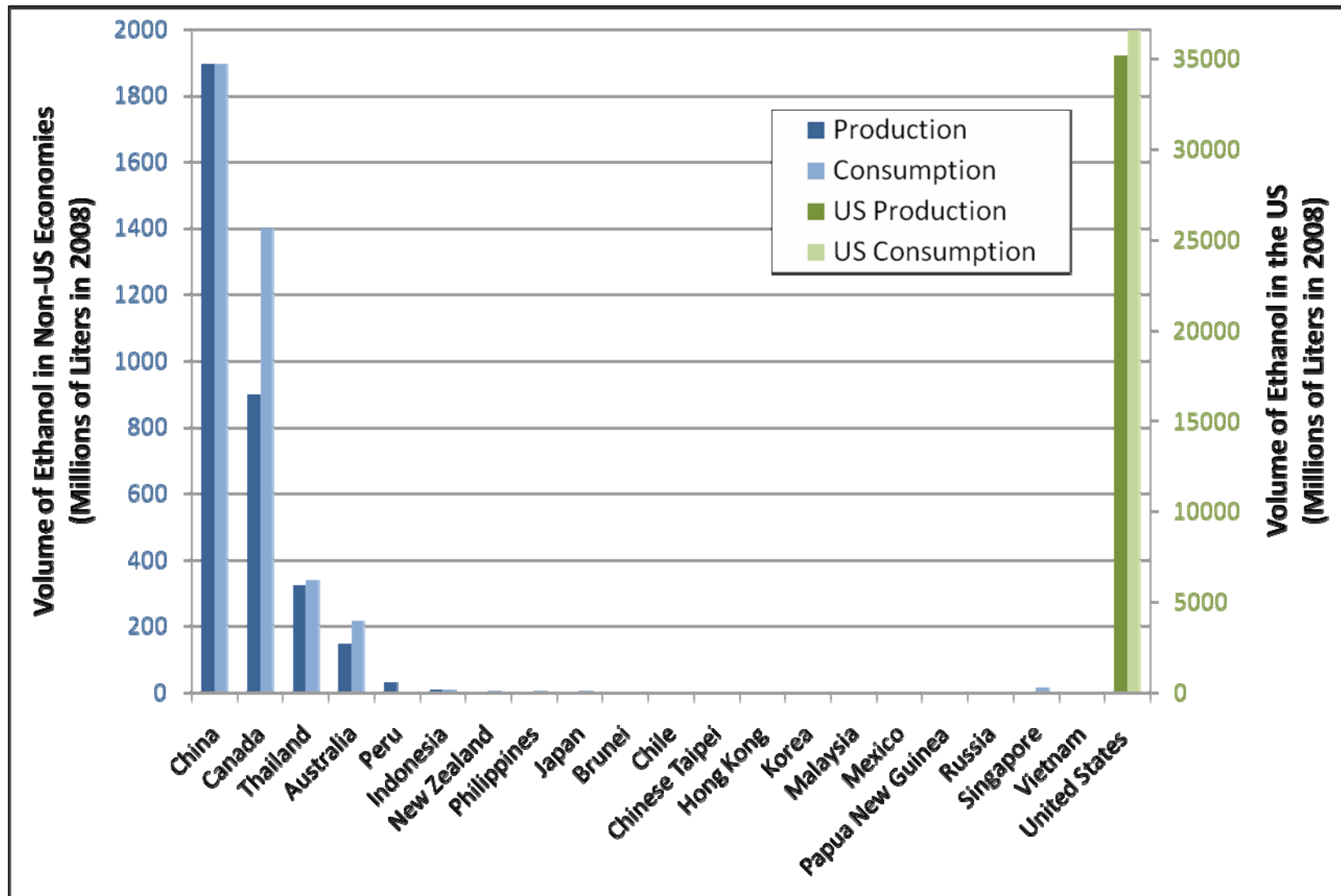




# Sustainable Biofuel Criteria

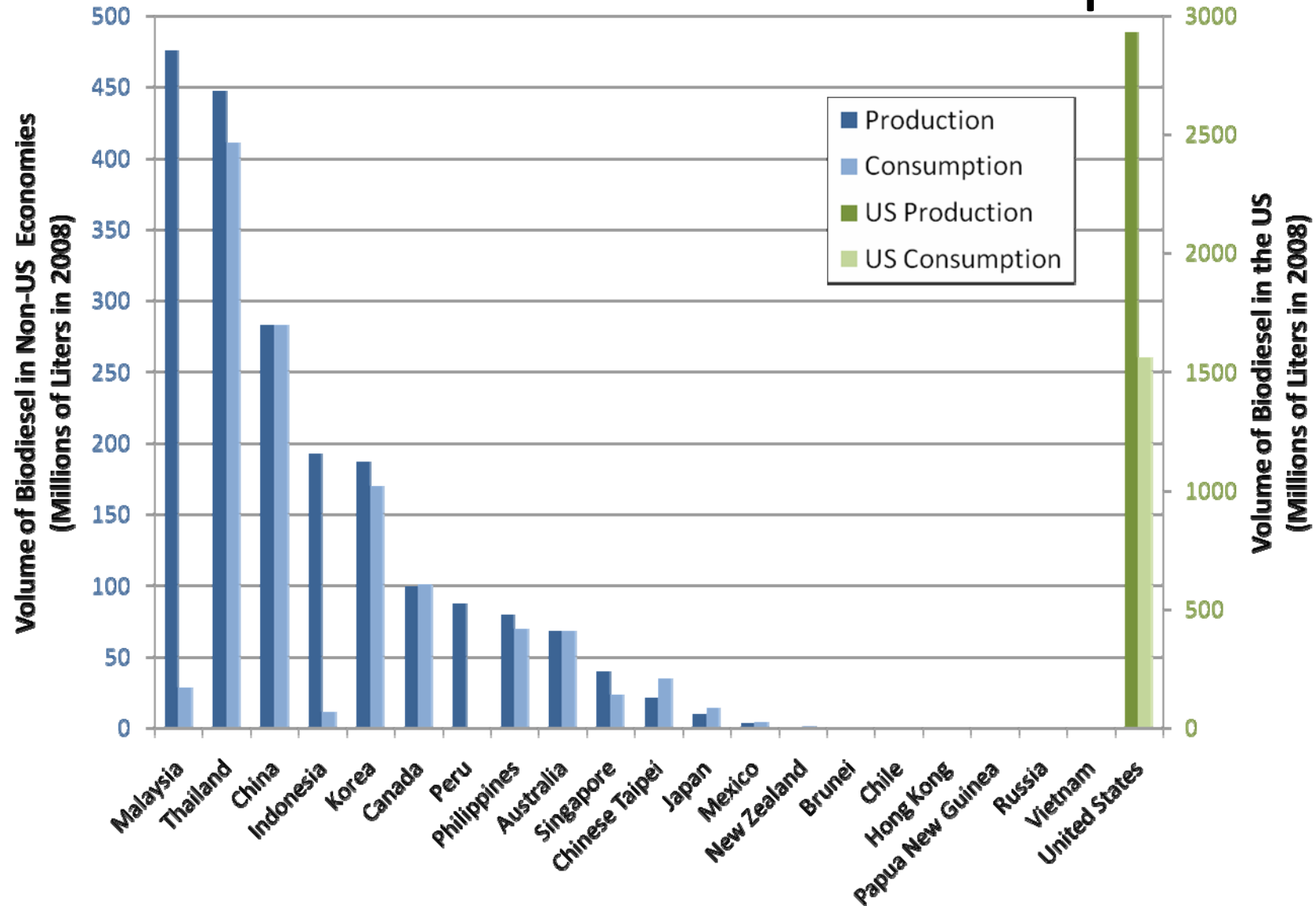
- Some of the most common sustainability criteria include:
  - **Reduce GHG emissions** compared to fossil fuels
  - Conserve carbon stocks
  - **Avoid negative impacts on biodiversity** & ecosystems
  - Improve soil health and minimize degradation
  - Optimize water use and minimize contamination or depletion
  - Do not violate water rights
  - Minimize air pollution
  - Do not violate human or labor rights
  - Ensure decent work and well-being of workers
  - Contribute to the **social and economic development** of local, rural and indigenous peoples/communities
  - **Do not impair food security**
  - Do not violate land rights
  - **Cost-effectiveness** and production efficiency
  - Follow all applicable laws of the country
  - Involve all relevant stakeholders

# Ethanol Production and Consumption



Data Source: EIA, 2010

# Biodiesel Production and Consumption

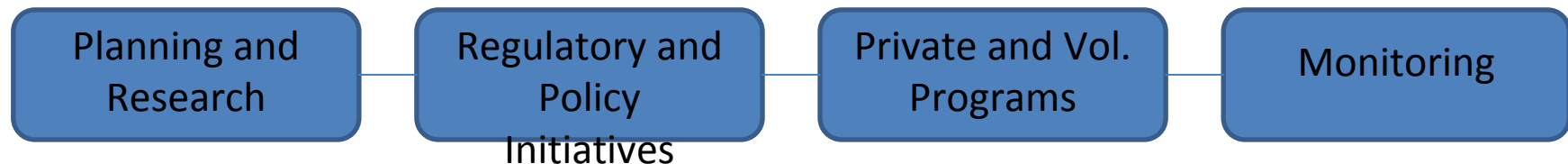


Data Source: EIA, 2010



# Categories of Sustainable Biofuel Policies, Programs, and Practices

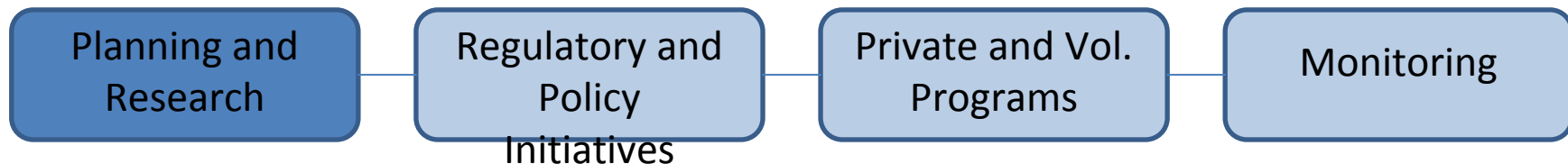
- Planning and Research
- Regulatory and Policy Initiatives
- Private and Voluntary Programs and Initiatives
- Monitoring



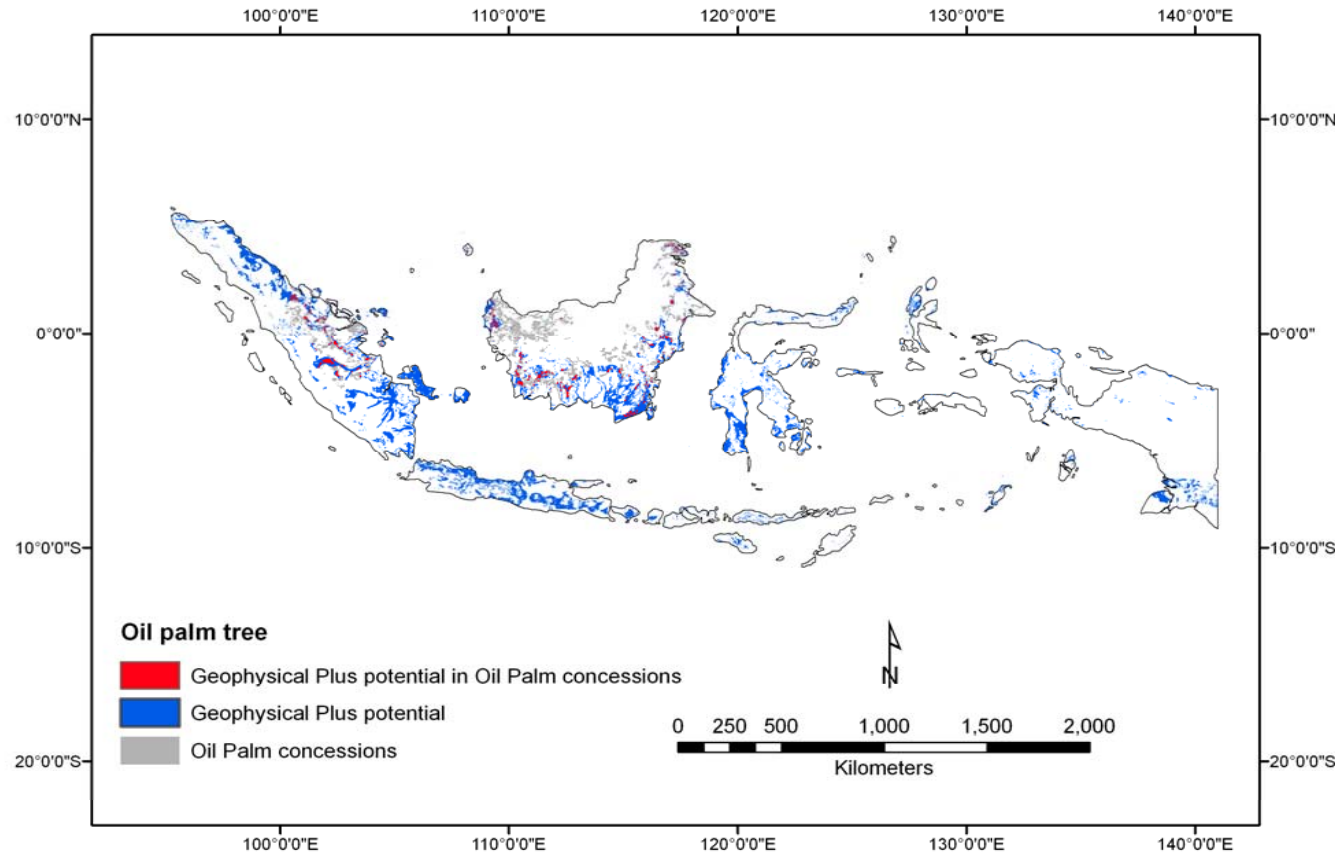
# Planning and Research for a Sustainable Biofuel Industry

Activities found in APEC economies:

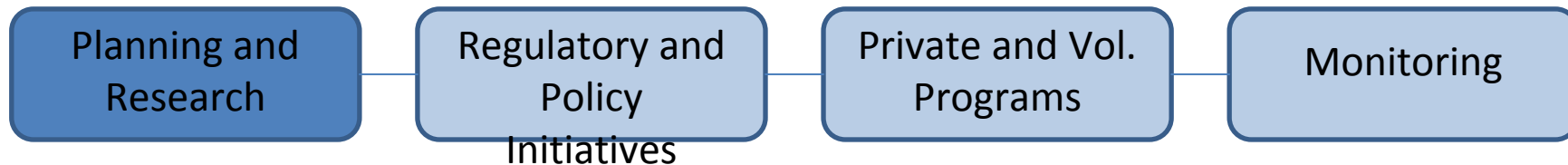
- Mapping to Assess Sustainability of Land Use
- Life Cycle Assessments of GHG Emissions
- Mapping to Assess the Sustainability of Water Use
- R&D of More Sustainable Biofuel Feedstocks
- Development of Sustainable Biofuel Plans



# Mapping to Assess Sustainability of Land Use

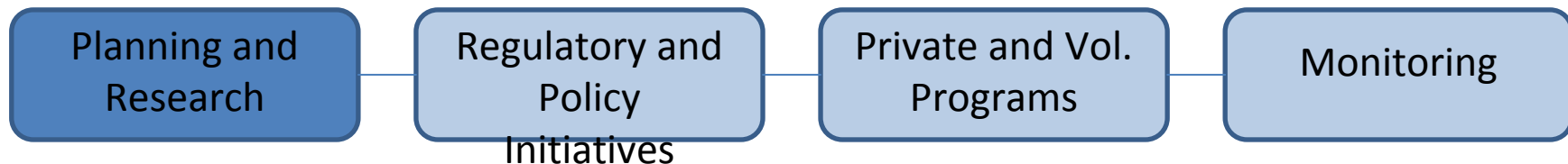


Source: Winrock 2009



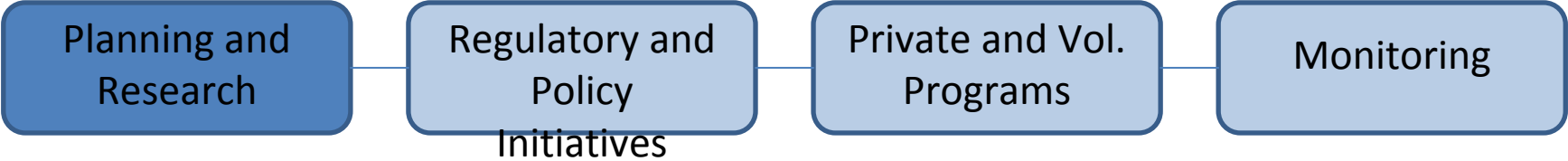
# Life Cycle Assessments of GHG Emissions

- Required by regulatory and voluntary standards to demonstrate GHG reductions:
  - U.S. RFS2: Different levels of reductions required for each of four established renewable fuel categories (20%, 50%, 50%, 60%)
  - EU RED: Increasing reductions required for biofuels over time (35% in 2009, 50% in 2017, 60%2018)
  - RSPO: Biofuel LCA emissions must meet “minimum GHG emission reduction threshold” (not set yet)
- LCAs carried out in several APEC economies:
  - China
  - Japan
  - Malaysia
  - New Zealand
  - Chinese Taipei
  - United States



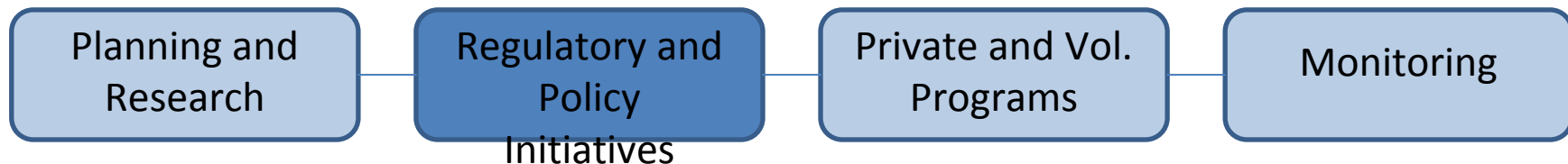
# R&D of More Sustainable Biofuel Feedstocks

Economy	Cellulosic Biofuel Research	Jatropha Biodiesel Research	Algae Research	Waste Cooking Oil Research
Australia			X	
Canada	X			
Chile	X	X	X	
China	X	X		
Indonesia		X		
Japan	X		X	
Korea	X		X	
Malaysia	X			
Singapore				X
Chinese Taipei				X
United States	X		X	
Viet Nam		X		X



# Regulatory and Policy Initiatives

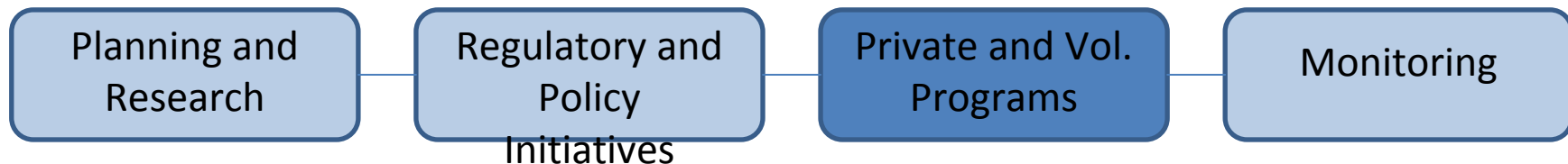
- Mandated Volumes for Sustainable Biofuels
  - Australia
  - Japan
  - United States
- GHG Reduction Targets for Fuels
  - China
  - United States
- Sustainability Regulations for All Biofuels
  - China
  - Hong Kong
  - Indonesia
  - Korea
  - Malaysia
  - Mexico





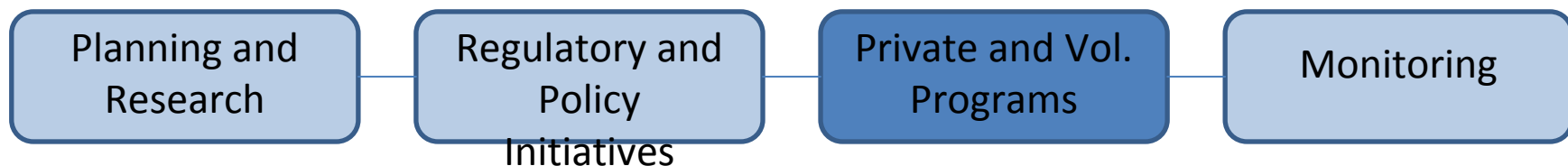
# Private and Voluntary Programs and Initiatives

- Initiatives to Reduce GHG Emissions from Biofuels
- Initiatives to Protect Air, Water, Soil and Biodiversity
- Initiatives to Enhance the Socioeconomic Benefits of Biofuels
- Voluntary Sustainability Standards



# Initiatives to Reduce Land Use Change and GHG Emissions (some examples)

- Greater use of underutilized (marginal or degraded) lands
  - e.g., planting on Imperata grasslands in Indonesia
- Integration of crop and animal cultivation to reduce total land requirements
  - e.g., sugarcane-cattle integration in Brazil
- Improving the productivity of land under cultivation
  - Discussed in next slide
- Capturing and reusing waste streams from biofuel production
  - e.g., methane capture and utilization from POME
- Reducing fertilizer requirements for biofuel feedstocks
  - Discussed later



# Greater Use of Underutilized Lands

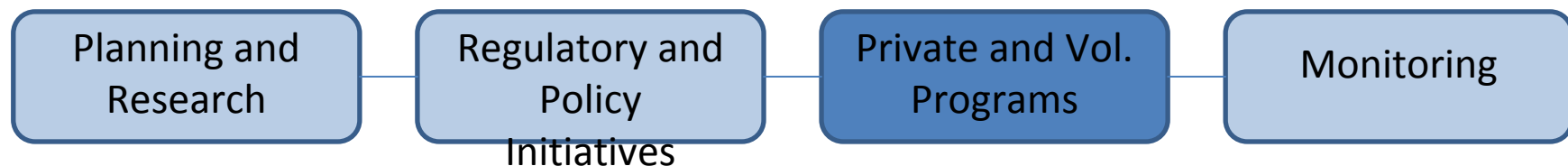
- Indonesia can plant oil palm for biodiesel on marginal lands overrun by imperate grasses.
  - Imperate is an undesirable weed.
  - Palm oil can be cultivated while eradicating imperata, using a combination of mechanical and biological control steps
  - Outcomes: Increased biodiversity (with the weeds gone, other plants can flourish), increased carbon sequestration (from the palm and other plants), reduced risk of fires and floods, extra jobs.

# Sugarcane and Cattle in Brazil

- Sugarcane often encroaches on pasture land.
  - But bagasse can be used for cattle feed.
  - Then cattle and sugarcane can be raised on the same land.
  - Only residues are used – ethanol production is retained undiminished.
  - Sugarcane produced for ethanol without displacing cattle, so

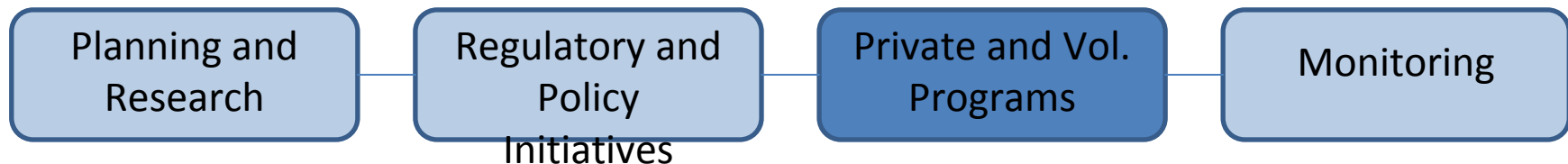
# Strategies for Improving the Productivity of Land under Cultivation

- That is, improving crop yields
- Yield has a profound impact on all aspects of bioenergy: economic, energy, environmental, and societal
- Some APEC economies have ambitious goals to double yields
  - Malaysia
  - Philippines
- Strategies include:
  - Changing planting practices, such as raised beds
  - Drip irrigation, and irrigation timing
  - Selecting higher yielding varieties
  - Legume-fallow rotation systems



# Strategies for Reducing Fertilizer Use

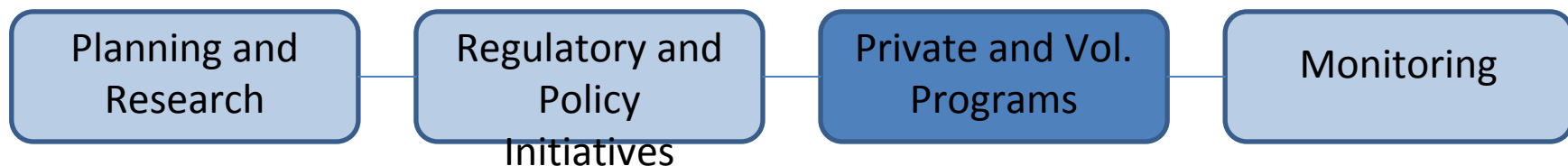
- Nitrogen, a main nutrient in fertilizers, can be emitted as nitrous oxide, which is a GHG 310 times as powerful as carbon dioxide
- Some examples from APEC:
  - Promote organic fertilizers
  - Agricultural conservation efforts and crop rotations that reduce fertilizer requirements





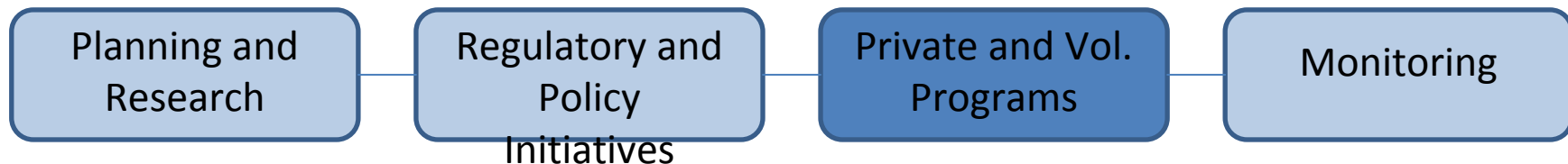
# Initiatives to Protect Soil and Water (some examples)

- Soil quality and conservation
  - No-till conservation practiced on over 62 million acres in the United States
  - Sustainable residue harvest
- Water quality and conservation
  - Control agriculture non-point source pollutants, such as by establishing riparian buffer zone
  - Integrated pest management systems



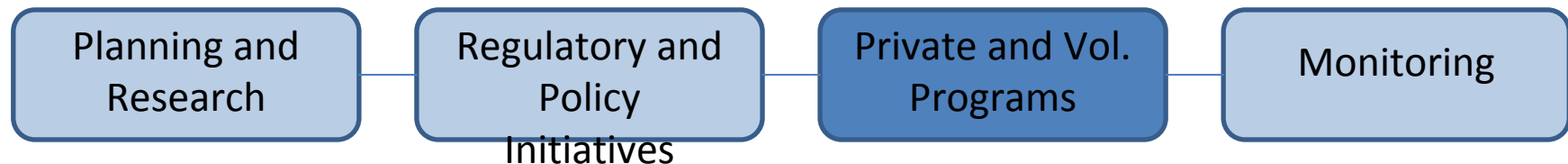
# Initiatives to Enhance Socioeconomic Benefits of Biofuels

- Biofuel Cooperatives
  - Canada, Indonesia, Malaysia
- Direct Support for Small Landowners
  - Canada, Malaysia , Philippines, Papua New Guinea
- Biofuels Employment for Women
  - Papua New Guinea
- Community-Based Initiatives for Biofuels
  - Indonesia, Thailand, Japan
- Biofuel Economics
  - More information to follow



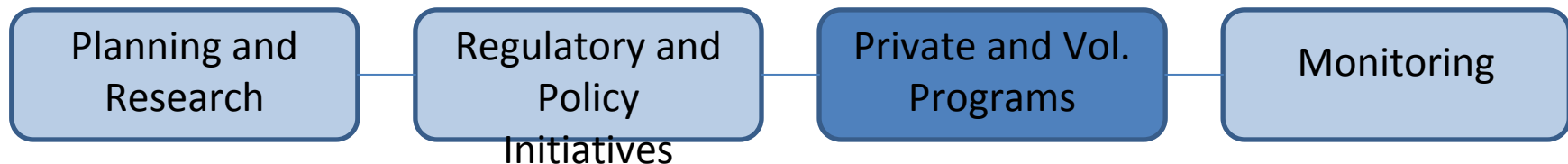
# Strategies for Improving Sustainable Biofuel Economics

- Sustainable biofuel costs = cost of biofuels in general and cost of pursuing sustainability objectives
- Example: Monetization of carbon reductions in Malaysia



# Voluntary Biofuel Sustainability Standards

- Parties certified to meet standard if specific indicators are met
- Performance-based vs. Practice-based

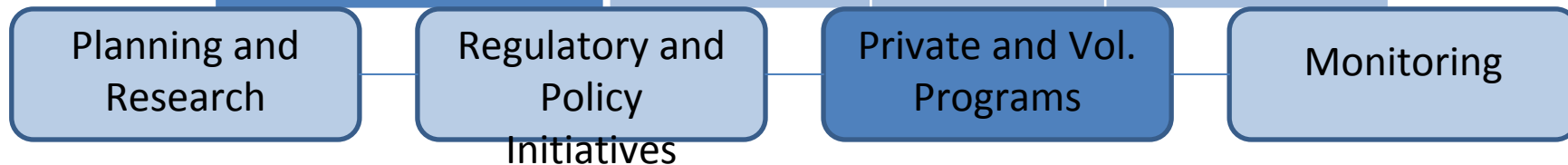


# Biofuel Sustainability Organizations

- Some active in APEC are:
  - Roundtable on Sustainable Palm Oil (RSPO)
  - Roundtable on Sustainable Biofuel (RSB)
  - Global Bioenergy Partnership (GBEP)

# APEC Participation in Vol. Standards

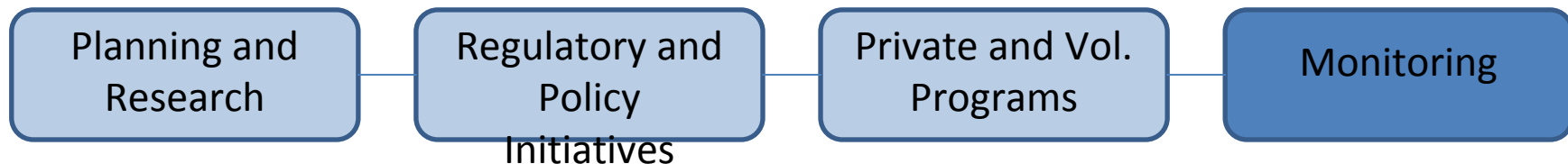
Economy	GBEP Status	# of RSB Members	# of RSPO Members
Australia	Observer	4	7
Brunei		0	0
Canada	Partner	2	1
Chile	Observer	0	0
China	Partner	1	1
Hong Kong		0	0
Indonesia	Observer	0	72
Japan	Partner	1	7
Korea		0	1
Malaysia	Observer	3	79
Mexico	Partner	0	1
New Zealand		0	2
PNG		0	2
Peru	Observer	1	0
Philippines		5	1
Russia	Partner	0	1
Singapore		1	21
Chinese Taipei		0	0
Thailand		0	15
United States	Partner	38	21
Viet Nam		0	0





# Monitoring Initiatives

- May be required as part of regulatory or voluntary sustainability standards
  - US RFS requires certain agencies to report on social and environmental impacts of biofuels
  - RSB 2<sup>nd</sup> principle is *“Sustainable biofuel operations shall be planned, implemented, and continuously improved through an open, transparent, and consultative Environmental and Social Impact Assessment (ESIA) and an economic viability analysis”*
- Traceability throughout the biofuel supply chain is a complex challenge for monitoring



# Main Conclusions

- There are a number of current and potential policies and measures to encourage biofuels to be developed sustainably.
- However, there is no single feedstock, production process, or activity that can be promoted as a universally-sustainable solution.

# Main Conclusions, Continued

- *Planning and Research* activities are key to identifying appropriate feedstocks and practices in different locations and are the precursor to implementing policies and regulations to deliver those benefits.
- Research at present is dominated by technological developments and further work on impacts of biofuels and mitigation techniques at micro and macro-scales is required; tools and techniques to research and plan sustainable biofuel development are available.

# Main Conclusions, Continued

- *Policies and Regulations* related to **biofuels** largely promote specific volumes of biofuel production or consumption. Policies and regulations that aim to promote **sustainable biofuels** generally address specific sustainability objectives.
- *Private and voluntary programs and initiatives* for sustainable biofuels were found in a handful of economies – most were in economies whose biofuels have been most scrutinized (e.g., palm biodiesel from Indonesia and Malaysia and corn ethanol in the United States for accusations of driving increases in global food prices).
- *Monitoring* to ensure that sustainability outcomes are achieved is critical. As sustainability does not have a universally accepted definition or assessment criteria, monitoring for sustainability outcomes must take place against established sustainability metrics.

# Recommendations

- Recommendation 1: Collaborate on sustainable biofuels activities and share lessons learned.
- Recommendation 2: Promote all areas of sustainability simultaneously, rather than look at a select few elements of sustainability.
- Recommendation 3: Incorporate more performance-based approaches to monitoring compliance with, and impacts of, sustainable biofuel policies, programs, and practices to ensure that the intended outcomes of those activities are realized and negative unintended consequences are addressed.