1. Summary

This three-year project will provide guidance to policy makers and other stakeholders in Asia who urgently need competent policy analysis on how biofuels should be promoted with a view to achieving sustainable transport in Asia.

Biofuels have generated considerable interest worldwide as a possible alternative to oil. As oil continues to dominate worldwide energy demand, it has a special bearing on the transport sector which accounts for a quarter of the total energy share and carbon dioxide emissions. Following the worldwide trend of increased interest in biofuels, Asian countries are now exploring the possibility of using biofuels for the multiple benefits of energy security and diversity, reduced air pollution and greenhouse gas (GHG) emissions and poverty reduction. As a result, several countries have, or are in the process of setting up national targets for biofuels. On the other hand, there are also emerging concerns about the serious social and environmental consequences associated with biofuel use such as food-fuel conflicts, deforestation and increased stresses on water resources. In sum, there is a considerable lack of understanding on costs/benefits and advantages/disadvantages of biofuels.

This project aims to assess the benefits and costs of biofuel production at the national level with regional perspectives taken into consideration. It will examine the policy implications for the environment, society, and economy and formulate policy options for optimising the use of biofuels for transport in Asia. In doing so, the study will consider the life cycle of biofuels (from production to their application in transport). Research methodologies will include Life Cycle Assessment (LCA) and Multi-Criteria Analysis (MCA), amongst others.

In the first year, the advantages and disadvantages of various forms of biofuels produced and used in Asia will be identified. Current policies affecting biofuel use in transport and the environmental, social, and economic impacts from trade in biofuels will be assessed in both the first and second years. In the following year, policy options that optimise biofuel use in the transport sector in Asia will be formulated based on the findings of the first two years.

Policy options emerging from this research will contribute to the ongoing discourse at international and regional fora such as the Asian Mayors’ Dialogue on Environmentally Sustainable Transport (EST), Tripartite Environment Ministers’ Meeting (TEMM) between the
People’s Republic of China, Republic of Korea and Japan, Clean Development Mechanism (CDM) capacity building activities, and the promotion of a de-carbonised/low carbon society and sustainable development in Asia.

2. Background/Rationale

Biofuels

In general, ‘biofuel’ may refer to any form of fuel derived from biomass and accordingly its application can be in household energy (cooking and heating), for electricity generation or in the transport sector. The term biofuel in this document specifically refers to those biomass-derived fuels that can be used in the transport sector such as bioethanol, biodiesel, bio-ETBE\(^1\) and bio-MTBE\(^2\) and synthetic biofuels. Currently bioethanol and biodiesel account for more than 90% of the global biofuel use.

Biofuel development globally and regionally: drivers and advantages

“Biofuels for transport can contribute to making energy more secure by diversifying supply sources in an environmentally friendly way.”


World consumption of marketed energy is expected to increase by 71% over the 2003-2030 period, with demand nearly tripling in Asia (IEA, 2006) to power the projected increase in economic growth. In the area of marketed energy use, fossil fuels, especially oil, continue to be the dominant energy source. The demand for oil is mainly driven by the transport and industry sectors. The transportation sector, which accounts for a quarter of the world’s energy and global carbon dioxide emissions (UNEP, 2007), also accounts for one half of the total projected increase in oil use between 2003 and 2030 (IEA, 2006).

The proved oil reserves are concentrated (BP, 2006) in a few regions in the world (Fig.1). Supply security and risk abatement (Slingerland and Lucia, 2005) are the key drivers behind looking at alternatives to oil across the globe. Considering the meager oil reserves of the Asia-Pacific, it is crucial for the region to look for diversification of energy sources to reduce the dependency on oil.

\(^1\) ethyl-tertio-butyl-ether
\(^2\) methyl-tertio-butyl-ether
To add to the security concern, the obligation of OECD countries to reduce GHG emissions to achieve Kyoto targets and the growing international pressure on non-OECD countries to comply post-2012 is another driver for looking at options other than oil. To sum up, there is a pressing need to diversify energy sources, reduce dependency on oil and reduce GHG emissions, and biofuels have generated considerable interest across the globe.

The worldwide attention to biofuels is because of the perceived multiple benefits associated with their use. Energy security and reduced GHG emissions are the main benefits, but other advocated advantages are improved local air quality, waste reduction, improved vehicle performance and enhanced rural economic development (IEA, 2004). As considerable progress has been made regarding the efficiency of biofuel production over the last 25 years, the prices of biofuels in certain countries are already competitive with gasoline; whereas in others, they are already lower than gasoline (Fig. 2). Several countries are expecting to save millions of dollars that are spent on importing oil by blending it with biofuels. Moreover, many net oil importing countries have an opportunity to contribute to the liquid fuel business, thus enhancing their energy security (WWI, 2006). Biofuels may help raise farm incomes and are considered an opportunity for employment generation.
Many of the big Asian cities have high levels of air pollution because of fossil fuels used in the transport sector. Biofuels can prove very beneficial in these polluted cities, as they contain no sulphur and produce low amounts of carbon monoxide, particulate and toxic emissions compared to petroleum-based fuels. Owing to the co benefits associated with biofuels, many countries have set up targets for production and use of biofuels for the coming decades.

The European Union is promoting the use of biofuels in the transport sector and aims to have a share of 5.75% in diesel and gasoline by 2010 (EU, 2006). The State of the Union Address delivered by the President of the United States on 23 January 2007 mentioned that “America is on the verge of technological breakthroughs that will enable us to live our lives less dependent on oil. And these technologies will help us be better stewards of the environment, and they will help us to confront the serious challenge of global climate change” (White House, 2007). Asian leaders recently signed an energy security pact in Manila and agreed to promote the use of biofuels (ABC, 2007). Although no regional targets were agreed upon, many Asian countries have set national targets for biofuels. Thailand has set a target for a 10% ethanol mix in regular gasoline for 2007; Malaysia is beginning to sell a 5% palm oil diesel blend at domestic pumps; Indonesia plans to double the palm oil area over the next 30 years (Slingerland and Lucia, 2005) and set a 10% biofuels target by 2010. The Philippines recently signed a Biofuel Act which “mandates a minimum of 1% biodiesel blend within three months from and at least 2% biodiesel blend within two years upon the effectiveness of the Act, and at least 5% bioethanol blend within two years upon effectiveness of the Act and 10% bioethanol fuel within four years after ” (Clarke, 2007). The Philippines already uses a 1% blend of methyl ester in diesel for public transport. The Chinese
Government in 2004 made it mandatory in five provinces to include 10% ethanol content in gasoline (Slingerland and Lucia, 2005). Already, China accounts for 9% of global bioethanol production (Dufey, 2006). Australia already has a ‘Biofuel Action Plan’ in place, which is to have 350 ML of biofuels by 2010 (PMA, 2005). The Government of Japan announced that it is considering introduction of a new law that will promote biofuel mixed in gasoline (Nihon Keizai Shinbun, 2007).

Biofuels, both bioethanol and biodiesel in the Asian region can be sourced from a diverse range of crops. Sources of bioethanol and biodiesel in Asia are summarised in Table 1. Of the total bioethanol production in China, 80% is grain-based; derived from corn, cassava, sugarcane, rice, and sweet potato (Dufey, 2006). The major bioethanol source in India is sugarcane and India accounts for 4% of the global bioethanol production (Bhojvaid, 2006).

Table 1: Sources of bioethanol and biodiesel in Asia.

<table>
<thead>
<tr>
<th>Country</th>
<th>Bioethanol</th>
<th>Biodiesel</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>Corn, cassava, sugarcane, rice, sweet potato</td>
<td>Jatropha and others</td>
</tr>
<tr>
<td>India</td>
<td>Sugarcane</td>
<td>Jatropha,</td>
</tr>
<tr>
<td>Thailand</td>
<td>Sugarcane, tapioca/cassava</td>
<td>Palm, peanut, soya, coconut, Jatropha</td>
</tr>
<tr>
<td>Indonesia</td>
<td>Sugarcane</td>
<td>Palm oil</td>
</tr>
<tr>
<td>Pakistan</td>
<td>Sugarcane</td>
<td>-</td>
</tr>
<tr>
<td>Philippines</td>
<td>Sugarcane</td>
<td>Coconut oil</td>
</tr>
</tbody>
</table>

Source: Modified from Dufey, 2006

There are innovations expected in the near future to convert cellulosic materials (plant stalks, leaves and wood) into biofuels. These technologies that could convert forestry, municipal and agricultural waste into biofuels are known as second generation technologies (WWI, 2006) and these biofuels are called advanced biofuels.

Biofuel development: future growth and concerns

The IEA (2004) projects that the contribution of sustainable biomass to world primary energy demand would increase from a share of 3.44% in 2002 to 4.15% in 2030. It is feasible that biofuels can replace petroleum fuels by about 6% in the near term (IEA, 2005). Hoogwijk et al. (2005) projects the biomass potentials for 2050 in the world to be equivalent to 33% to 100% of present energy production, using abandoned agricultural lands, low-productive lands and ‘rest-lands’
alone. Slingerland and Lucia (2005) indicate that realisation of the potential expected growth of biofuels depends on a number of geopolitical and economic drivers. They also point out that the major demand and the largest production potentials do not geographically coincide (e.g. the largest demand for biofuels is now concentrated in the industrialised countries, whereas the countries with the largest biofuel production potential are tropical countries including east Asia). Hence, the international market in biofuels is expected to grow with the increase in demand in major consumption centres.

While there is considerable scope for growth of the biofuel market, there are also major concerns that need to be addressed. Although use of biofuels is considered carbon neutral, the “well to wheel” cycle, or the life cycle, will be dependent on a number of factors ranging from the source of biofuel, inputs in production, transportation, and so on (Table 2). Apart from that, there are a number of other socio-economic and environmental concerns being pointed out by many studies carried out recently.

<table>
<thead>
<tr>
<th>Source</th>
<th>GHG</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomass cultivation</td>
<td>CO₂</td>
<td>May be positive</td>
</tr>
<tr>
<td></td>
<td>CH₄</td>
<td>Anaerobic digestion</td>
</tr>
<tr>
<td></td>
<td>N₂O</td>
<td>From fertiliser production</td>
</tr>
<tr>
<td>Biomass transportation</td>
<td>CO₂</td>
<td>From plantation to plant</td>
</tr>
<tr>
<td>Fuel</td>
<td>CO₂</td>
<td>Biofuel processing plant</td>
</tr>
<tr>
<td>Power</td>
<td>CO₂</td>
<td>Biofuel processing plant</td>
</tr>
<tr>
<td>Biofuel transportation</td>
<td>CO₂</td>
<td>From plant to distribution station</td>
</tr>
</tbody>
</table>

Lester Brown (Earth Policy Institute) suggests that the “the unprecedented diversion of the world’s leading grain crop to the production of fuel will affect the food prices everywhere” and that the world needs a strategy to deal with the fuel-food conflict that is bound to emerge (Peters, 2007). World Watch Institute (WWI) raises concerns regarding the potential for fuel crops to be grown on ecologically fragile lands, accelerating soil erosion, and depletion of aquifers (WWI, 2006). WWI study also highlights that biofuels could damage the world’s remaining tropical ecosystems; noting that tropical forests were cleared for plantations for cooking oil in the recent past in south east Asia. The global forest coalition representing NGOs, indigenous peoples’ organisations, and farmers’ movements believe that biofuels are a disaster in the making and voice concerns about the ‘increased land competition leading to further land concentration, the marginalisation of small-scale agriculture and the widespread conversion of forests and other ecosystems, extensive
use of agro-chemicals and use of GMOs, and so on. (Energy Bulletin, 2006). Other concerns associated with the growth of biofuels relate to water scarcity, soil nutrition levels and soil acidification.

The challenge then is to carefully guide the policy makers and advocate timely interventions so that concerns regarding unsustainable biofuel growth are addressed to ensure that one environmental good is not traded off for another. Many studies conducted on biofuels by institutes like IIED, OECD, ECN and CI provide a preliminary understanding of some of the issues around biofuels, but also indicate a need for more research on many aspects that require a better understanding for optimising the role of biofuels for the transport sector (e.g. net costs and benefits of biofuels, trade implications and impacts of biofuels). The current research is proposed to critically look into the questions that would provide a clear understanding of the issues mentioned above in the Asian context.

3. Goals and objectives

The ultimate goal, to which this research will contribute, is to develop an environmentally sustainable transport sector. The project objective is to formulate policy options that will allow the market in biofuels to advance in an environmentally sustainable manner in Asia. Special focus will be given to the transport sector and policy options will be sought at the national level with regional perspectives taken into consideration.

4. Expected outcomes

Successful conclusion of the research will result in policy options being adopted to maximise the benefits and minimise the costs of biofuel use in the transport sector in Asian countries and, where appropriate, regional policy will be coordinated and harmonised.

5. Research questions/assumptions/hypotheses

Four main research questions will be studied at the national/regional level. These questions are sequenced as follows (i) identifying the advantages and disadvantages of biofuel use; (ii) assessing the impacts of the policies that affect biofuel use on the environment, society, and economy; (iii) assessing the environmental, social, and economic impacts of biofuel trade; and (iv) formulating policy options for sustainable use of biofuels in the transport sector.
**Research question 1**
What are the advantages and disadvantages (socially, environmentally, and economically) of various forms of biofuel currently produced or used in Asian countries?

Various studies have shown potential advantages and disadvantages of biofuels mostly identified in developed countries. Some studies even show that there is no net energy benefit from biofuel production. However, little is known about the environmental impacts of biofuels along their life cycle (from production of biofuel crops, harvest, conversion to fuels, export/ import to final consumption) in the context of Asia where diverse conditions among countries exist. Social and economic impacts also vary among countries. The impacts in producing countries are likely to be different from those in consuming countries. This question will respond to this need and comprehensively assess biofuel (such as ethanol from both food crops and feedstock, ethanol from cellulose, and various plant oil used for biodiesel) production and use.

**Hypothesis 1:**
Biofuels may have different benefits and costs depending on countries, sources of biofuels, and their use.

**Research question 2**
How are the current policies affecting biofuel use for transport in Asia?

Although biofuel production and use are promoted in many Asian countries, it is often the case that policies that indirectly affect biofuel use and the interaction among various policies are not well examined and documented. This question will respond to the need to assess the policies that affect biofuel use in transport and identify policy gaps, overlaps, and synergies. Policies to be assessed include laws/regulations, tax, subsidies, and other instruments and measures applied in energy, transport, agriculture sectors, and their related trade policies.

**Hypothesis 2:**
Current policies are causing inadequate adoption of biofuels in the transport sector in Asian countries and/or resulting in unintended negative impacts on the environment, society, or economy.

**Hypothesis 3:**
The impacts of current policies are different between energy-rich and energy-poor countries,
between countries with high-energy consumption and low-energy consumption, between countries with high-population density and low population density, and/or between countries with more advanced technology and less advanced technology.

**Research question 3**
What are the environmental, social and economic impacts of the biofuel trade in Asia?

As a major increase in the trade volume of energy between energy importing and exporting countries in Asia is projected, concerns regarding its extensive impacts on the environment, society, and economy have been raised in various studies. However, there are few studies in which the impacts of biofuel trading have been examined in the context of Asia. In addition, concerns have been raised over barriers to trade in biofuels derived from the agricultural sector and technical barriers to facilitating biofuel trade. This question will identify and assess the possible environmental, social, and economic impacts and associated issues to be addressed from the increased biofuel trade in Asia from the regional perspective, taking into consideration existing trade linkages among Asian countries.

**Hypothesis 4:**
The environmental impacts of the biofuel trade in Asia are different between energy-rich and energy-poor countries and/or energy supplying/exporting and demanding/importing countries.

**Hypothesis 5:**
Regional coordination and harmonisation of biofuel trade policies such as product standards and a certification system are necessary to ensure environmental sustainability in biofuel production and trade.

**Research question 4**
What are the most promising policy options to optimise biofuel use in Asia’s transport sector?

One of the challenges that policy research faces is how to operationalise the balancing of economic, social, and environmental impacts of a diverse set of policy options. This question will generate feasible policy options that can optimise biofuel use in the transport sector in Asian countries by integrating the assessment of benefits and costs and analysis of the policy implications in the previous research questions.

6. Research Components
The four research components are summarised below and the research activities for these components will be spread across three years. Research activities in each component will follow the sequenced set of questions presented in the previous section.

**Component 1 (24 Person months)**

**Identification of advantages and disadvantages of various forms of biofuels currently produced and used in Asian countries**

To optimise the use of biofuels for the transport sector, it is crucial to know the social environmental and economic impacts of biofuels in the Asian countries. Impacts of the biofuels would vary from well to wheel, so it is important to look at these impacts along the life cycle, which would further depend on a wide variety of factors such as biomass source, land used for biomass, agricultural inputs, technologies used, transportation, and so on. To identify the advantages and disadvantages of biofuels in Asia, the following activities will be carried out:

1. Conducting a preliminary review to identify the countries for national level studies. Identifying partner institutes in the selected countries. Four countries will be selected. Potential countries include China, India, Indonesia, Malaysia, Philippines, Thailand, and Viet Nam.
2. Constructing an analytical framework to assess the advantages and disadvantages of biofuels for national studies.
3. Undertaking country level studies to assess the costs and benefits of biofuels. This would include looking at economic aspects (market conditions, production costs of biofuel crops, and biofuel production, transportation costs), social aspects (employment, outmigration, pattern of current land holdings, livelihood), and environmental aspects related to both production and consumption (deforestation, water use, GHG emissions, air pollution). Technological aspects (agricultural production technology, biofuel production technology, including not only advanced ethanol production from cellulose but also locally available technology that utilises agricultural residue) are also crucial to consider.
4. Constructing a regional overview of overall advantages and disadvantages of biofuels based on the country level studies.

**Component 2 (36 Person months)**

**Assessment of current policies affecting the use of biofuels in transport in the Asian region.**
This research components aims to assess the policies that affect the use of biofuels in the Asian region. Because of the co-benefits associated with biofuels- such as reduction of GHG emissions, air pollution reduction, employment generation, improvement of livelihoods, raising farm incomes, reducing imports of oil, increased energy security- many different policies (agricultural, environmental, economic, trade, energy, transport and rural development, etc.) in a country could impact the way biofuels are produced, used and promoted. The research activities that will be carried out to pursue this research component are:

1. Conducting a preliminary review of policies to build a basis for research on the countries selected and drawing lessons from those where policies related to biofuels are in place such as Brazil, the United States and EU.
2. Constructing a framework for assessing national level policies of the countries selected.
3. Assessment of the policies to find gaps, overlaps and synergies between various policies in countries selected in comparison with countries/regions such as Brazil, the United States, and EU. Various policies include legislation, regulations, guidelines, voluntary measures, tax, subsidies, other economic incentives, targets, and so on (transport: vehicle fuel efficiency, fuel standards, infrastructural plans, modal shifts, etc; energy: renewable energy strategies, targets, plans, R&D, mandatory targets for biofuels, technology transfer; etc). Existing findings such as the effectiveness of subsidies and tax related to biofuels will be fully utilised.
4. Carrying out an impact analysis of those policies affecting biofuel use in transport as well as their impacts on the environment, society and economy.
5. Constructing a regional overview based on the national case studies.

**Component 3 (36 Person months)**

**Assessment of the environmental, social and economic impacts of biofuel trade in Asia**

Based on the assumption that biofuel trade in Asia would have some social, environmental and economic impacts, the aim of this research component is to analyse those impacts. The activities that will be carried out for this component are:

1. Review of trade policies for selected countries and the Asian region (tariff/non-tariff barriers such as import/export tariffs, quotas, technical issues and instruments/measures such as FDI, technical cooperation/technology transfer, etc.).
2. Analysing environmental, social and economic impacts of trade policies on the selected countries and the Asian region.
3. Constructing a regional overview based on the analysis of the country studies and also any regional trade agreements. This will include the identification of regional mechanisms that enhances biofuel trade such as a certification system for biofuels.
Component 4 (48 Person months)
Formulation of policy options for optimal biofuel use in transport in Asian countries.

Based on the identification of advantages and disadvantages of various forms of biofuels and the assessment of existing policies that affect biofuel use/biofuel trade and their possible impacts on the environment, society, and economy, this research component will focus on formulating policy options to optimise the use of biofuels in the transport sector in Asia. It will also look at those policies that enhance the benefits of biofuels in the transport sector such as vehicle efficiency and modal shifts.

7. Methodologies

This research project will make use of both primary and secondary data. Both qualitative and quantitative methodologies will be used to analyse the research problem. Since the research will look at biofuel use for transport in Asia—a region with diversified socio-economic conditions among others, quantitative methodologies may be more appropriate for analysing complex relationships.

Beginning with the data collection and literature review, this research project will make use of various established methodologies such as Causal Chain Analysis (CCA), Cumulative Impact Assessment (CIA)/Strategic Environmental Assessment (SEA), Life Cycle Assessment (LCA), Cost Benefit Analysis (CBA), MCA (Multi Criteria Analysis) and GTAP Analysis.

Component 1: Identification of advantages and disadvantages of various forms of biofuels produced and used
- Literature review and data collection
- Causal Chain Analysis (CCA) and Cumulative Impact Assessment (CIA)/Strategic Environmental Assessment (SEA)
- Life Cycle Assessment
- Case studies to illustrate the country specific conditions in relation to the identified advantages and disadvantages

Component 2: Assessment of current policies affecting biofuel use in the transport sector
- Multi-Criteria Analysis (MCA) or Cost-Benefit Analysis (CBA)
- Case studies to illustrate the country specific conditions in relation to biofuel use

Component 3: Assessment of environmental, social, and economic impacts of biofuel trade

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- Causal Chain Analysis (CCA) and Cumulative Impact Assessment (CIA)/ Strategic Environmental Assessment (SEA)
- GTAP trade model analysis (Potential collaboration with Keio University is under consideration.)
- Case studies to illustrate the country specific conditions in relation to biofuel trade

Component 4: Formulation of policy options for optimal biofuel use in the transport sector
- Multi-Criteria Analysis (MCA) or Cost-Benefit Analysis (CBA)

8. Four Criteria

8a. Policy relevance

IGES has been substantially involved in the following policy processes regarding the proposed study. Therefore, findings of this study will be fed into these processes for consideration by stakeholders involved.

(i) Direct involvement in preparation for the Asian Mayors’ Dialogue on Environmentally Sustainable Transport (EST) in collaboration with the Ministry of Environment of Japan, UNCRD and ADB.
(iii) Asia-Pacific Forum for Environment and Development (APFED)
(iv) CDM capacity building activities commissioned by the Ministry of the Environment, Japan.
(v) Execution of co-benefits project commissioned by the Ministry of the Environment of Japan.

8b. Added value

IGES has developed the following expertise to draw upon to properly carry out the proposed study.

(i) Insights into how CDM functions through capacity development activities in the past years,
(ii) Knowledge about policies to promote sustainable energy in selected Asian countries
(iii) Expertise on how to promote local sustainable transport initiatives in major cities in Asia

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3 See pages 8-11 of “Integrative Strategic Research Program of IGES for the Fourth Phase” (IGES/Inf/FY2006/3)
(iv) Expertise to conduct economic analysis regarding costs/benefits of proposed policies

This type of comprehensive policy study, focusing on biofuel use in the transport sector in Asia, is still new to Asia. Drawing upon the expertise held by IGES mentioned above, and in collaboration with other partner institutes in selected Asian countries, this study is expected to produce new insights on coherent, sustainable use of biofuel in the transport sector in Asia.

8c. External Funds

IGES is likely to obtain external funds from the Ministry of the Environment, Japan, for a commissioned study on co-benefits. A part of that fund will be channelled to this project. IGES also serves as the secretariat for Asian Mayors’ EST Forum, so a part of the funds allocated to that forum could be used for this project. Further, some of the funds obtained to carry out the “RISPO-II” study could be used to partially cover costs related to international trade policies and economic analysis. Potential collaboration with Keio University is under consideration. Additional efforts will be made to secure additional external funds for this project.

8d. Regional/international context

Sustainable use of biofuel in transport is an important policy issues for many developing countries in Asia, as clearly demonstrated by the proactive policy initiatives introduced by an increasing number of countries in the region. Most governments recognise the importance of promoting renewable energy and sustainable transport that holds the key to sustainable economic growth for many countries and cities in Asia.
9. Timeline of activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>FY 2007</th>
<th>FY 2008</th>
<th>FY 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kick-off meeting, progress workshops, final workshop</td>
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<tr>
<td>(1) Identification of advantages and disadvantages of various forms of biofuels produced and used in the Asian region</td>
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<td>(2) Assessment of current policies affecting biofuel use in transport in the Asian region</td>
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<td>(3) Assessment of environmental, social, and economic impacts of biofuel trade</td>
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<td>(4) Formulation of policy options optimized for biofuel use in transport</td>
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</table>
### List of activities (FY 2007-FY 2009)

<table>
<thead>
<tr>
<th>Component</th>
<th>FY 2007</th>
<th>FY 2008</th>
<th>FY 2009</th>
</tr>
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<tbody>
<tr>
<td>1. Identification of advantages and disadvantages of various forms of</td>
<td>Conducting preliminary review to identify the countries for national</td>
<td></td>
<td></td>
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<tr>
<td>biofuels currently produced or used in Asia</td>
<td>level studies</td>
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<tr>
<td></td>
<td>Identification of potential partners institutes</td>
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<td></td>
<td>Kick-off meeting for the project</td>
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<td>Construct an analytical framework to assess the advantages and</td>
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<td>disadvantages of biofuels for national studies</td>
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<td>Undertaking country level studies to assess the costs and benefits of</td>
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<td>biofuels. This will include looking at economic aspects, social</td>
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<td>aspects, environmental and technological aspects</td>
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<td>Constructing a regional overview of advantages and disadvantages of</td>
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<td>biofuels based on the country level studies</td>
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<td>Progress workshop with partner institutes</td>
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<td>Publishing paper based on results</td>
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<tr>
<td>2. Assessment of current policies affecting biofuel use in transport in</td>
<td>Conducting preliminary policy review based on the countries selected as</td>
<td>Assessments of the policies to find gaps, overlaps and synergies</td>
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<tr>
<td>the Asian countries</td>
<td>as well as Brazil, the United States and EU (agricultural,</td>
<td>between policies</td>
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<td>environmental, economic, trade, energy, transport, rural development,</td>
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<td>etc.)</td>
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<td></td>
<td>Constructing framework for analysing national level policies of the</td>
<td>Carrying out an impact analysis of those policies affecting biofuel</td>
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<td>countries selected</td>
<td>use in transport as well as their impacts on the environment, society</td>
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<td>Constructing a regional overview based on the national case studies</td>
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<td>3. Assessment of environmental, social and economic impacts of biofuel</td>
<td>Review of trade policies for selected countries and the Asian region</td>
<td>Analysing environmental, social and environmental impacts of the trade</td>
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<td>trade.</td>
<td>(tariffs/ non-tariff barriers, etc.)</td>
<td>policies on the selected countries and the region (continued)</td>
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<td>Step</td>
<td>Task Description</td>
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<td>1.</td>
<td>Analysing environmental, social and environmental impacts of the trade policies on the selected countries and the region</td>
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<td>2.</td>
<td>Constructing a regional overview based on the analysis of the country studies and regional trade agreement</td>
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<td>3.</td>
<td>Identifying a mechanism that facilitates biofuel trade</td>
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<td>4.</td>
<td>Progress workshop on biofuels with partner institutes</td>
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<td>Publishing paper based on results</td>
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<td>4.</td>
<td>Formulation of policy options to optimise biofuel use in transport in Asian countries</td>
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<td>Synthesising results from components 1 through 3 that will assist in the formulation of policies for sustainable transport in Asia.</td>
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<td>Formulate policy options and compile final report</td>
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<td>Final workshop on biofuels</td>
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<td>Publishing paper based on results</td>
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Annex 1: References


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