Financing Alternative Fuels
Opportunities and Challenges

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Outline

• The World Bank Group (WBG) and its Air Transport Portfolio
• The WBG and Alternative Fuels
• Challenges and Opportunities of Alternative Fuels
• Examples of IFC Financing of Alternative Fuels Projects
• Conclusions
The World Bank Group (WBG)

IBRD 1945

IDA 1960

IFC 1956

MIGA 1988

ICSID 1966
The World Bank FY09 Air Transport Portfolio

<table>
<thead>
<tr>
<th>Active Projects</th>
<th>IERD</th>
<th>IDA</th>
<th>IFC</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>(in millions USD)</td>
<td>FY09</td>
<td>FY08</td>
<td>change</td>
<td>FY09</td>
</tr>
<tr>
<td>WB Group Total Active Portfolio</td>
<td>75,752</td>
<td>57,148</td>
<td>32.6%</td>
<td>56,442</td>
</tr>
<tr>
<td>WB Group Active Portfolio-Transport</td>
<td>18,226</td>
<td>15,409</td>
<td>18.3%</td>
<td>8,834</td>
</tr>
<tr>
<td>% of Total Active Portfolio</td>
<td>24.1%</td>
<td>27.0%</td>
<td>-2.9%</td>
<td>15.7%</td>
</tr>
<tr>
<td>Air Transport Active Projects</td>
<td>406.8</td>
<td>372.1</td>
<td>9.3%</td>
<td>283.2</td>
</tr>
<tr>
<td>% of Total Active Portfolio</td>
<td>0.5%</td>
<td>0.7%</td>
<td>0.5%</td>
<td>0.3%</td>
</tr>
<tr>
<td>% of Total Transport Portfolio</td>
<td>2.2%</td>
<td>2.4%</td>
<td>3.2%</td>
<td>2.0%</td>
</tr>
</tbody>
</table>
The World Bank’s role in alternative fuels

- **Strategy:** The development of an energy strategy that includes sustainable liquid alternative fuels.

- **Policy:** Development of a policy framework for developing countries for the production of sustainable alternative fuels. Sustainability must be based on GHG emissions savings, and regulation of land use for growing biofuel feedstocks and define minimal social standards.

- **Finance:** Provide financing for the development of sustainable alternative fuel production.
Research on Alternative Fuels

Bank-internal **Policy Research**:

- Based on prior research done by the Food and Agriculture Organization (FAO), United Nations Environment Programme (UNEP), and the World Bank.
Challenge: Green House Gas Reduction and the Production of Biofuels

• GHG reduction depends on the entire cycle of biofuel production, from the cultivation of feedstocks and the biofuels production process to transport of biofuels to markets.

• Land use change is the main challenge when making the case for biofuels as an answer to address climate change.

• The WBG will be very limited to finance biofuel projects that result in no GHG reduction or in an increase of GHG.
Life-cycle Analysis of various Types of Jet Fuel

- Palm Oils to HRJ Fuel (LUC P3)
- Soy Oil to HRJ Fuel (LUC S3)
- Soy Oil to HRJ Fuel (LUC S2)
- Coal to F-T Fuel (w/o CCS)
- Palm Oils to HRJ Fuel (LUC P2)
- Oil Shale to Jet Fuel
- Soy Oil to HRJ Fuel (LUC S1)
- Oil Sands to Jet Fuel
- Natural Gas to F-T Fuel
- Coal to F-T Fuel (w/ CCS)
- Crude to ULS Jet Fuel
- Crude to Conventional Jet Fuel
- Coal and Biomass to F-T Jet Fuel
- Algae Oil to HRJ Fuel
- Soy Oil to HRJ Fuel (LUC S0)
- Jatropha to HRJ Fuel
- Palm Oils to HRJ Fuel (LUC P1)
- Palm Oils to HRJ Fuel (LUC P0)
- Biomass to F-T Jet Fuel

Graph showing gCO₂e/MJ for different fuel types.

- Biomass Credit
- Recovery
- Processing
- Transportation
- Combustion
- WTT N2O
- WTT CH4
- Land Use Change
Challenge: Food Production

• Wheat, palm oil, soy oil and other vegetable oils prices doubled in 2006-2007.

• Energy prices have tripled and this has increased the cost of fuel and fertilizers.

• Biofuels policies in Brazil, EU and U.S. have encouraged rapid expansion of biofuels production from food crops.
Challenge: Food Production

• The world population is projected to increase from six billion in 2000 to seven billion in 2030, but the World Bank estimates that cereal production will have to increase by nearly 50 percent and meat production by 85 percent during the same period. Yield increases are unlikely, new agricultural land development is necessary.

• Increased demand for agricultural feedstocks for biofuels will add to the growing competition for land.
Challenge: Water

• Agriculture uses 85 percent of fresh water withdrawals in developing countries, and irrigated agriculture accounts for about 40 percent of the value of agricultural production in the developing world.

• The large scale production of crop based biofuels may challenge water availability and distribution in developing countries.
Challenge: Scale-up of Production

The entire world production of jet fuel by biofuels would require large surfaces:

- Jatropha - 2,700,000 square kilometers (sq km) or the size of Argentina,
- Camelina - 2,000,000 sq km or the size of Mexico
- Algae - 68,000 sq km or about the size of Ireland.
Challenges: Certification of Alternative Fuels

- 2009: alternative fuels generated by FT method from a variety of feedstocks, including biomass to liquid and natural gas to liquid, can be used in a 50 percent blend with traditional jet fuel.
- 2010: the certification of a blend of 50 percent hydrotreated renewable synthetic jet fuels blends (e.g. algae), and 100 percent usage of FT synthetic jet fuel coal, from biomass, and natural gas.
- 2013 or sooner: the certification for 100 percent hydrotreated renewable synthetic jet fuel.
Opportunities – Alternative Fuels

- Alternative Fuels, which are sustainable and which have a positive GHG reduction effect, could be financed by a variety of instruments (e.g. Global Environment Facility, Climate Investment Funds).

- Commercial production of alternative fuels in developing countries are already financed by IFC in several countries.
# IFC Projects- Ethanol

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Country</th>
<th>Material</th>
<th>Product</th>
<th>IFC Investment</th>
<th>Time invested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pantaleon Sugar</td>
<td>Guatemala</td>
<td>sugar</td>
<td>ethanol and power generation</td>
<td>$20 million</td>
<td>2008</td>
</tr>
<tr>
<td>Monte Rosa Sugar</td>
<td>Nicaragua</td>
<td>sugar</td>
<td>ethanol and power generation</td>
<td>$50 million</td>
<td>2008</td>
</tr>
<tr>
<td>Maple Energy</td>
<td>Peru</td>
<td>sugar cane</td>
<td>ethanol and power generation</td>
<td>$40 million</td>
<td>2007</td>
</tr>
<tr>
<td>Balrampur II</td>
<td>India</td>
<td>sugar</td>
<td>ethanol and power generation</td>
<td>$40 million</td>
<td>2007</td>
</tr>
<tr>
<td>BHSIL</td>
<td>India</td>
<td>sugar</td>
<td>ethanol and power generation</td>
<td>$45 million</td>
<td>2007</td>
</tr>
<tr>
<td>Nicaragua Sugar</td>
<td>Nicaragua</td>
<td>sugar</td>
<td>ethanol and power generation</td>
<td>$25 million</td>
<td>2006</td>
</tr>
</tbody>
</table>
# IFC Projects - Biomass

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Country</th>
<th>Material</th>
<th>Product</th>
<th>IFC Investment</th>
<th>Time invested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auro Mira Energy</td>
<td>India</td>
<td>biomass</td>
<td>Electric Power</td>
<td>$10.6 million</td>
<td>TBD</td>
</tr>
<tr>
<td>Auro Mira Bio</td>
<td>India</td>
<td>biomass</td>
<td>Electric Power</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>Systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lanco Infratech</td>
<td>India</td>
<td>biomass</td>
<td>Electric Power</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>PT Holcim</td>
<td>Indonesia</td>
<td>biomass</td>
<td>Electric Power</td>
<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>
# IFC Projects - Alternative Fuels

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Country</th>
<th>Material</th>
<th>Product</th>
<th>IFC Investment</th>
<th>Time invested</th>
</tr>
</thead>
<tbody>
<tr>
<td>OEA/Foz</td>
<td>Brazil</td>
<td>ETH, a biofuel company which produce ethanol and energy</td>
<td>$50 million</td>
<td>2010 (signed)</td>
<td></td>
</tr>
<tr>
<td>Bioventures Fund</td>
<td>South Africa</td>
<td></td>
<td>development of biofuels</td>
<td>$2.5 million</td>
<td>2002</td>
</tr>
</tbody>
</table>
## IFC Projects- Jet Fuels

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Country</th>
<th>Material</th>
<th>Product</th>
<th>IFC Investment</th>
<th>Time Invested</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERC Refinery</td>
<td>Egypt</td>
<td>residual oil</td>
<td>ultra low sulfur diesel, jet fuels, hydrogen plant</td>
<td>$100 million</td>
<td>TBD</td>
</tr>
<tr>
<td>Alliance Refinery</td>
<td>Russian Federation</td>
<td>petroleum</td>
<td>diesel/kerosene, hydrogen</td>
<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>
Conclusion

- Various instruments exist to finance alternative fuels that are sustainable, and which have a positive GHG reduction effect.
- The WBG is examining alternative fuels on sustainability, and define an appropriate strategy and policy framework for financing its deployment in developing countries.
- Commercial financing by IFC is already available on a limited basis.