

## **GBEP Task Force on Greenhouse Gas Methodologies for Transport Biofuels**

### **Proposed scope and programme of work**

The Steering Committee is invited to consider and endorse the proposed scope and programme of work for the GBEP Task Force on Greenhouse Gas Methodologies for Transport Biofuels as set out in this paper.

#### **Background**

At its 3<sup>rd</sup> meeting on 8 May 2007 in New York, the Steering Committee decided that GBEP would develop a plan of work addressing methodologies for measuring the greenhouse gas (GHG) impacts of biofuels. A proposal by the United States to focus work on the harmonisation of methodologies for measuring the GHG benefits of transport biofuels was accepted.

A Task Force was established and met for the first time on 9 and 10 October 2007 in Washington DC to consider the feasibility of developing a harmonised methodology and to develop proposals for how the work might be undertaken. *Annex A* provides a draft of their first attempt at developing a checklist for harmonizing methodologies. The meeting was attended by Canada, France, Germany, Italy, Japan, the United Kingdom, the United States, UNEP, the UN Foundation, the International Council on Clean Transportation, University of California Berkeley, Iowa State University, and the GBEP Secretariat. The full list of attendees is at *Annex B*.

The meeting focused on identifying common elements in how different countries and institutions were measuring the GHG impacts of biofuels. Several of the participants presented on their current approaches and it was apparent that there was a large amount of overlap and commonality in what is being included in the various methodologies. There was also significant agreement on issues that will need further clarification, such as whether and how to take account of indirect land-use change in calculating biofuel GHG impacts.

Based on these presentations, the Task Force concluded that it is possible to develop a harmonised approach to what should be considered when conducting GHG lifecycle assessments of biofuels. Its proposals on the scope of this task and a programme of work are set out below.

## Proposal

### *Justification*

One of the main reasons for pursuing increased use of biofuels worldwide is their potential to reduce GHG emissions from the transport sector and contribute to climate change mitigation and increased energy security. Numerous studies have been performed on biofuels looking at this issue with differing results. The majority of the findings are that most biofuels do offer the potential for net reductions in GHG emissions when produced in a sustainable way compared to the petroleum fuel that they replace. However, there remains some ambiguity and uncertainty in how different biofuel GHG analyses are conducted rendering it difficult for any reliable comparisons to be made between biofuels on the basis of their GHG performance. It is therefore important to have a better understanding of this issue and its relationship to policy decisions concerning biofuel use.

### *Description of task*

The Task Force will review existing methodologies for measuring the GHG impacts of transport biofuels and develop a harmonised approach by which the results of GHG lifecycle assessments can be compared on an equivalent and consistent basis. The aim is not to select or indicate a preference for any particular existing methodology or feedstock, or to place limits on the parameters that may be included in biofuel GHG life cycle assessment tools. Rather, this task will seek to define a minimum set of recommended parameters and inputs to be considered when conducting a GHG analysis for potentially any type of transport biofuel and to set these out in a good practice guidance document for policy makers.

In taking this work forward, the Task Force will not seek to reinvent the wheel, but will base its work on accepted methods and protocols for undertaking environmental lifecycle analysis and GHG inventories, such as the ISO 14040 series of standards and the IPCC good practice guidance relating to land use, land use change and forestry.

### *Scope of work*

Although biomass can be used for energy production in a number of applications, this work will focus exclusively on transport biofuels and the biomass used in their production. Broadening the scope beyond this would add significantly to the complexity of the task and the time needed to complete it, whereas the Task Force believes there is considerable merit and justification for progressing more quickly with the development of a harmonised GHG methodology for transport biofuels. The Task Force acknowledges, however, that consideration of the GHG impacts of biomass used for a wider range of energy production could form the basis of a separate and parallel GBEP project.

This work will encompass the full well-to-wheel lifecycle of transport biofuels and address all significant sources of GHG emissions. It will take into account issues such as land use change and deforestation, and other considerations which can be greatly influenced by local laws, policies and practices, but only to the extent that they impact on GHG emissions. The checklist at *Annex A* sets out a preliminary list of parameters

and inputs which the Task Force agreed at its meeting on 9 and 10 October should be addressed when assessing the GHG impact of a biofuel. The checklist includes:

- The GHGs to be covered;
- The effects of direct land use change, both in terms of above and below ground carbon inventories;
- The effects of the production cycle, including fertilizer production, agricultural inputs and processing energy;
- Combustion of the finished biofuel and tailpipe emissions; and
- Corresponding factors to facilitate comparison with the petroleum fuel replaced.

The checklist also includes a number of key issues which the Task Force was unable to resolve at its first meeting, and which will require further detailed consideration at Task Force level as the work proceeds. These include:

- The possible need for common definitions of terms;
- Accounting for co-product emissions;
- Ensuring transparency in default values and parameters used, and assumptions made, in conducting a GHG lifecycle assessment;
- Whether to include consideration of pollutants, such as particulate matter;
- Whether and how to take account of the effects of indirect land use change;
- How to take account of future technologies (e.g. cellulosic) in the design of the methodology.

The checklist is not offered as an exhaustive list of parameters and issues at this time, but a starting point for more detailed consideration and analysis by the Task Force. It is therefore likely to change as work progresses.

The harmonised methodology will be for the use of policy makers in all countries (both developed and developing) and will be applicable to any type of transport biofuel. It will be drafted to be sufficiently flexible to take account of different circumstances, conditions and systems of production (including feedstocks used). Furthermore, the methodology will enable a multi-tiered approach to be taken to the analysis of GHG emissions depending on the level of sophistication employed in the production of the biofuel and the data available.

### ***Work programme and indicative timeline***

The Task Force proposes the following work programme and indicative timeline. The Steering Committee should note that the rate of progress will depend on the resources which Partners are able to commit to the task:

- 1) As the harmonised methodology is intended to be applicable to the widest possible range of biofuels, the Task Force will undertake a detailed analysis of universal biofuel GHG lifecycle methodologies to better understand the extent of the commonalities and differences in current approaches, and the assumptions on which such analyses are based. **This activity will take approximately 5-6 months, up to and including April 2008.**

- 2) **Concurrent with activity 1)**, the Task Force will seek to address the issues identified in the preliminary checklist as needing resolution. It will also review the existing content of the checklist and amend it as appropriate.
- 3) The findings of activities 1) and 2) will be used to inform the development of a draft harmonised methodology. The Task Force recommends **allowing up to 4 months for a draft to be prepared, with a view to publishing it on the GBEP web site for public consultation by September 2008.**
- 4) The draft methodology will be revised in the light of consultation responses. The revised methodology will be presented and discussed at a **workshop hosted by the Task Force, to be held in late 2008.** The feedback received at this event will inform preparation of the final version of the methodology.
- 5) The final version of the methodology will be **published in early 2009.**

### ***Outputs***

The major outputs of this work will be as follows:

- The main deliverable will be the template or best practice guidance on the harmonised methodology for conducting GHG lifecycle assessments of biofuels. This will include a list of the major methodological assumptions necessary for conducting such assessments.
- A list of all methodological and ongoing harmonisation work considered by, or known to the Task Force with a summary and comparison of what is being done.
- A report summarising the work and results of the Task Force.

### **Membership and role of the Task Force**

The work will be taken forward by the Task Force which has been established for this purpose. Membership is open to representatives of all GBEP Partners, including, *inter alia*, from government, industry (both from biofuel and conventional petroleum fuel interests), academia, and other relevant experts.

Because the harmonised methodology is intended for global application, the Task Force will engage with and consult the widest possible range of interested parties, users and producers of biofuels, including countries which are not currently members of GBEP. Particular efforts will be made to involve interests from developing countries in this task. This will be essential if the vision for global application of the methodology is to be realised.

The Task Force will conduct its business efficiently, and in a manner which facilitates wide stakeholder involvement, for example, by working electronically (email, videoconference and telephone) or coinciding Task Force meetings with other international gatherings at which interested parties are likely to have a presence. It will

raise awareness of the project through appropriate means and communicate progress regularly, usually via the GBEP web site.

The Task Force will also collaborate, as appropriate, with other relevant bodies working to develop biofuel standards, such as the International Biofuels Forum and the Round Table on Sustainable Biofuels, to ensure synergy where possible and avoid duplication of effort.

### **Resources**

The success of the project depends on Partner countries and organisations making the necessary resources available to the Task Force. It is envisaged that this will be largely in the form of 'in kind' support, e.g. staff time, expert input, and appropriate resources for possible travel to Task Force meetings.

## **Checklist for what should be included in developing a GHG methodology for biofuels**

1. **Greenhouse gases to be covered** (Note: while a comprehensive methodology would cover all six gases, a methodology covering only carbon dioxide, methane, nitrous oxide could be sufficient).
  - a. Carbon dioxide (CO<sub>2</sub>)
  - b. Methane (CH<sub>4</sub>)
  - c. Nitrous oxide (N<sub>2</sub>O)
  - d. Hydrofluorocarbons (HFCs)
  - e. Perfluorocarbons (PFCs)
  - f. Sulphur hexafluoride (SF<sub>6</sub>)
  
2. **Direct effects of land use change- land directly converted to grow biofuel feedstocks** (note: some changes instantaneous, some gradual)
  - a. **Changes in inventory of above-ground biomass**  
Use IPCC methodologies which include:
    - i. Net carbon emission.
      1. Deforestation (e.g. slash and burn)
      2. Deforestation by timbering
      3. Maintenance burning
    - ii. Neutral (more or less) to carbon emission
      1. Forest replaced by oil seed trees
      2. Deforestation w/energy recovery
    - iii. Net Carbon Sequestration
      1. Perennial energy crops on degraded lands (e.g. Jatropha)
    - iv. Other factors – annual crops or perennial crops
  
  - b. **Changes in inventory of soil carbon**
    - i. Net carbon emission from soil degradation (native lands going under the plow)
    - ii. Net carbon accumulation from change in cropping system (i.e. to no till)
    - iii. Net carbon accumulation when converting from annual crops to perennial crops
  
3. **Effects of production cycle ( GHG equivalents)**
  - a. **On-farm/forest elements (to farm/forest gate)**
    - i. Follow IPCC / ISO guidelines where appropriate
    - ii. Energy used by farm machinery
    - iii. Energy use for delivery of irrigation water
    - iv. Energy content of fertilizers
    - v. Lime: CO<sub>2</sub> emissions from lime stone (CaCO<sub>3</sub>) to lime (CaO) in fields for stabilizing soil acidity
    - vi. Energy content of pesticides
    - vii. Nitrous oxide production on farm and off-farm (downstream)
    - viii. Reduction of energy due to co-products
    - ix. Impact of seed production

- x. Maintenance burning of managed forests
- xi. Field burning of waste biomass .

**b. Processing energy (farm/forest gate to tank)**

- i. Transportation to processing plant
- ii. Energy content of all inputs
- iii. Energy use in processing cycle including credits for any exported energy
- iv. Energy expended in plant construction
- v. Average transportation to retailer
- vi. Distribution storage and dispensing of the finished biofuel\*

**4. Wells to Wheels**

- a. Kilometers per energy unit
- b. Tailpipe emissions
- c. Calorific value of fuel (J/kg)

**5. Comparison to petroleum fuel replaced**

- a. crude oil extraction, type of crude could impact emissions, e.g., tar sands, heavy vs. light crude, etc... Treatment of associated natural gas also important, flaring vs. capture
- b. crude transport
- c. refining, energy use and allocation between co-products
- d. fuel transport and distribution
- e. kilometers per energy unit
- f. tailpipe emissions

## **Key issues still needing resolution**

The Taskforce recognized that there were still some significant issues needing further clarification before a common methodology checklist could be developed. One issue is developing common definitions of terms (e.g. direct land-use change is land directly converted to grow biofuel feedstocks). The other important issues can be grouped into three categories:

### **1. Methodology Issues**

- Energy balance calculations (e.g. are co-products included?)
- If not, how to allocate emissions from co-product (e.g. displacement)?
- Transparency about default values/parameters and model?
- Uncertainty

### **2. Externalities**

- Should criteria pollutants like particulate matter be included?
- Should indirect land-use (shifting of land use patterns due to crops being diverted to biofuel production) be included? If so, how and to what extent?
  - Stimulation of land use changes and biofuel production elsewhere
  - Consumption (how much fossil fuel is being displaced)
- How is N<sub>2</sub>O Fixing accounted for?

### **3. Future Considerations**

- How are future technologies (e.g. cellulosic) accounted for?
- Management of the process – review cycle, updating information, ensuring correct procedure has been followed

### **4. Other suggested additions to this list of issues needing resolution**

- Agreement of the functional unit and final unit of measurement
- Need to state relevant location and period -
- Timeframe for comparison e.g., 30 years, especially important for land use change, on going sequestration, etc.
- Energy use in the manufacture of farm machinery See comment from before about plant construction (may want to add under need clarification, special case, what is alternative, CH<sub>4</sub> capture, use, etc.)
- Maintenance for machinery and plants

<b>GBEP TASK FORCE ON GHG METHODOLOGIES LIST OF PARTICIPANTS 9/10 OCTOBER 2007, WASHINGTON D.C.</b>		
<b>COUNTRY/ORG.</b>	<b>NAME</b>	<b>INSTITUTION</b>
<b>CANADA</b>		
	Don O' Connor	President S&T Squared Consultants inc. Delta BC Canada
	Vernel Stanciulescu	Senior Marketing Analyst Fuels Policy and Programs Natural Resources Canada
<b>FRANCE</b>		
	Jean-Francois Gruson	IFP Economic Division
	Marie-Hélène Vilin	Economic Department, French Embassy, Washington
<b>GERMANY</b>		
	Horst Fehrenbach	IFEU On behalf of the Federal Environment Ministry of Germany
	Birger Kerckow	Government of Germany Agency for Renewable Resources Guelzow, Germany
<b>ITALY</b>		
	Sara Leggio	Expert Italian Ministry for the Environment, Land and Sea Department for Environmental Research and Development
<b>JAPAN</b>		
	Takashi Hayashi	Technical Officer Ministry of Agriculture, Forestry and Fisheries Policy Research Institute
<b>UK</b>		
	Kieran Power	Department for

		Environment, Food and Rural Affairs, Industrial Crops Division, London, UK
	Amy Sullivan	Department for Environment, Food and Rural Affairs, Climate Energy and Ozone Science & Analysis Division, London, UK
	Howard Emmens	Department of Transport Biofuels Strategic Policy Division London, UK
	Anna Evans	LCA expert North Energy Associates, Sheffield, UK
<b>USA</b>		
	Janaki Alavalpati	FSO/Special Advisor to Secretary's Officer
	Bruce Babcock	Iowa State University
	Marilyn Buford	US Forest Service Research and Development Washington DC, USA
	Vincent Camobreco	US EPA
	Arthur Coffing	USDA FAS
	Alex Farrell	Associate Professor Energy and Resource Group University of California, Berkeley
	Jonna Hamilton	USDA/FAS
	Zia Haq	US DOE
	Ken Hinger	USDA/FAS
	Jan Lewandrowski	USDA Global Change Program Office Washington DC, USA
	Bobbie Lippiatt	NIST
	Drew Kodjak	International Council on Clean Transportation Washington DC, USA
	Gregory Manuel	Special Advisor to the

		Secretary and International Energy Co- ordinator US Department of State Washington DC, USA
	Drew S. Nelson	Foreign Affairs Officer Office of Global Change US Department of State Washington DC, USA
	Jeff Skeer	Office of Policy and International Affairs US Department of Energy Washington DC, USA
	Bryce Stokes	USDA/Forest Services National Program Leader for Forest Operations Research, Vegetation Management and Protection Research Staff Washington DC, USA
	Michael Wang	Argonne National Laboratory Section Manager Systems Assessment Section Center for Transportation Research Argonne, Illinois, USA
	Harlan L. Watson	Senior Climate Negotiator & Special Representative US Department of State Washington DC, USA
<b>UNEP</b>		
	Peter Repinski	Programme Officer Regional Office for North America United Nations Environment Programme Washington DC, USA
<b>UN FOUNDATION</b>		
	Melinda Kimble	Senior Vice-President United Nations

		Foundation Washington DC, USA
	Janet Hall	Senior Policy Advisor United Nations Foundation Washington DC, USA
<b>GBEP Secretariat</b>		
	Michela Morese	GBEP Secretariat Food and Agriculture Organisation of the United Nations Via Terme della Caracalla 00153 Rome Italy