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ÉCOLE POLYTECHNIQUE
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White Paper

Sustainable biofuels Program

The need for biofuel certification / labeling

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1. Biofuels Have a Role to Play in a Sustainable Energy Policy Strategy

Energy is crucial to our welfare and has been referred to as the lifeblood of the economy. Moreover, headlines regarding the recent volatility in oil prices, the geopolitical and ethnic conflicts in oil-rich countries, the difficult steps towards still unsatisfactory solutions to mitigate climate change (Kyoto Protocol, CDMs, etc.), the spectacular shutdowns of entire regions through electricity blackouts in 2003 or with societal resistance towards the storage of nuclear waste are just a few elements that show how manifold the energy system affects our welfare.

National or regional energy policies aim at balancing the various downsides of different energy sources. The main objectives of sustainable energy policy strategies are supply security, economic affordability, social acceptability, and environmental viability.

Key elements of modern energy policy strategies include diversification with respect to fuel origins and types to ensure the security of supply, "de-carbonization" of the fuel mix to mitigate greenhouse gas emissions, as well as enhanced energy utilization efficiency and the promotion of "renewables" while keeping as many energy options open as possible.

The world's overall energy demand is steadily growing, with the strong economic growth in China and India playing a significant role. Globally, oil still prevails in the mix of final energy consumption today, followed by natural gas and electricity. **Electricity and fuels for mobility are the fastest growing demand segments.**
Contrary to electricity production, that incorporates a wide fuel mix (hydro, nuclear, coal, oil, natural gas, wind, etc.), **there remain very few alternatives to traditional liquid fossil fuels to feed mobility.**

Recently, the hydrogen economy has received significant attention. However, we are still decades away from a broad implementation of the vision in which hydrogen becomes an energy carrier (similar to electricity) that can be used to fuel mobility. **It typically takes 30-50 years before a technological breakthrough reaches full economic impact**. The development and maturing of the appropriate technology, the construction and financing of the needed fuel distribution infrastructure, and the required car park replacement time (of about 20 years) determine the time horizon for the introduction of such new technologies. Last but not least, the question of the origin of the hydrogen itself needs a sustainable answer. Producing hydrogen from fossil energy would certainly solve neither the climate change problem nor the resource issues.

Total final consumption	World 2002[1)]: 100% = 7075 Mtoe[2)]	Growth rates, 2002-2030, reference scenario[1)]: overall = 1.6%/yr
Coal	7%	0.2%/yr
Oil	43%	1.8%/yr
of which transport	25%	2.1%/yr
of which biofuels	0.1% (8 Mtoe)	4.9%/yr
Natural gas	16%	1.5%/yr
Electricity	16%	2.5%/yr
Heat	3%	0.8%/yr
Biomass and Waste[3)]	14%	0.9%/yr
Other Renewables	0.1%	6.2%/yr

[1)] Source: World Energy Outlook 2004, IEA

[2)] Units: 1 Mtoe = 1 million tonnes of oil equivalent = 42 million GJ

[3)] The biomass and waste category includes solid biomass and animal products, gas and liquids derived from biomass, industrial waste and municipal waste that are directly used by final consumers.

Meanwhile, oil will continue to play a major role in fueling the mobility demand despite concerns regarding the security of supply and climate change. OPEC controls 40% of production, 60% of exports and 80% of reserves. According to IEA's 2004 World Energy Outlook [1], non-OPEC oil supplies are expected to plateau by 2010 while the cartel's ample reserves will allow its production to gain a world market share of over 50% by 2030. The concentration of oil reserves in a small number of countries leaves increasingly less room for origin diversification. This situation, combined with elements such as geopolitical turmoil in the

Middle East or arbitrary state interventions in the energy business as observed in Russia or Venezuela, pushes energy security to the top of the energy agenda, not just in the US but also in Europe.

Biofuels can play a role in the equation and improve the robustness of an energy policy based on oil because they comply with modern energy policy strategy criteria. Biofuels, as partial substitutes for fossil fuels:

- are climate and environmentally friendly as long as produced with best practices;
- are competitive with international oil prices if produced in low-cost countries;
- are socially acceptable as they contribute to development in production countries;
- contribute to (geopolitical) diversification and thereby foster energy security as production countries would not typically be traditional fuel suppliers;
- require only little technology and infrastructure change and can be introduced without delay.

With no or few changes in infrastructure and engine technology, bioethanol or biodiesel can directly be substituted for parts of the fossil fuel demand. Bioethanol can be mixed with conventional gasoline and used by existing engines. Slightly modified flex-fuel vehicles can consume 100% bioethanol and biodiesel can substitute diesel in any percentage.

There is about 10% of grey energy in a unit of biofuel in Brazil (sugar cane) and about 60% in Europe (sugar beet) [2]. This, of course, is only true if the biomass comes from a sustained plantation without initial deforestation, for example. Put in simple terms and considering that the energy content of bioethanol is lower than that of gasoline, the greenhouse gas emissions of a unit of energy of bioethanol produced in Brazil amount to about 15% of the greenhouse gas emissions of a liter of gasoline. As a substitute for gasoline, bioethanol can therefore reduce greenhouse gas emissions by as much as 85%.

Geopolitically, these fuels could come from countries that are often not traditional oil exporters (e.g., Brazil, Ukraine, Indonesia, India) and could thereby potentially contribute to a diversification of origin strategy. Production costs in some of these countries are several times lower than in industrialized nations and reach the competitive levels of international oil prices.

Key barriers that have prevented the wide introduction and trade of biofuels are agricultural trade barriers (quota systems, state-controlled import monopolies, etc.) and fuel legislation (e.g., EU and Switzerland limit the bioethanol share in gasoline to 5% (v/v)). Bilateral trade agreements, on the one hand, and regulatory reforms, on the other, are required to overcome this situation.

Taken together, from an energy policy perspective, the reasons outlined above identify biofuels as a logical component of any sustainable supply strategy. The growth potential for this fuel type is huge. Now is a good time to engage in bilateral trade agreements.

2. Why a biofuel certification / labeling?

Biofuels can be produced in many different ways, from a large variety of crops. Depending on the technologies and processes used, biofuels can have a positive or negative ecological and social impact.

A labeling - certification process can provide some guidance and incentive for the increasingly growing markets to develop in a "sustainable" way.

Today, a broadly accepted label or certification process is not yet available that assesses the value chain of biofuels. The only type of certificate that exists is a guarantee for a certain percentage of biofuel content in gasoline or diesel.

2.1 Relevance of a biofuel certification / labeling

Alert consumers turn to biofuels trusting that by their choice they make a meaningful contribution to the reduction of their environmental footprint related to energy use. A biofuel label providing an assessment of the value chain of the biofuel can be the key to ensuring that this trust is well placed.

The list of critical issues that need to be considered if biofuels are meant to contribute to the reduction of our environmental footprint includes aspects such as potential deforestation, grey energy content and local impacts of production facilities. An increased demand for biofuels is triggering the expansion of agricultural land, with potentially devastating results in some areas. The clearing of land in south-east Asia (e.g. Malaysia) for palm oil production is one of the leading causes of rain forest destruction in the region. Brazil faces a similar problem with Soya plants as primary cause of deforestation. Another often-quoted issue is the competition with food agriculture in the case of a significant scale-up of the biofuels production. Making biofuels from plants already in demand for food, such as sugar beet, sugar cane, soy, corn, and canola/rapeseed, raises the prices of the food versions and reduces available supplies. Finally, there may be utilization-related aspects, such as the emissions of the nitrogen oxides associated with biofuels.

On the positive side there is a lot to be gained as already pointed out in Section 1.

The issue of labeling is complex and requires the support from many stakeholders. WWF has demonstrated, by way of labels such as the Forest Stewardship Council (labeling sustainable forestry products) [3] or the Marine Stewardship Council (labeling sustainable fisheries products), that the concept is feasible and effective.

Some work has been done in the context of grey energy assessment and Life Cycle Assessment (LCA) of biofuels, including the completed EU-study by the Joint Research Center (http://ies.jrc.cec.eu.int/wtw.html) and ongoing SOFE project (http://www.esu-services.ch/bioenergy.htm) in which the Laboratory of Energy systems (LASEN) of EPFL is also involved. From the SOFE project, a detailed environmental analysis of ethanol production from sugar cane in Brazil is available. In the context of "sustainable agriculture" and "fair trade", a more in-depth study of the issues is still required. An academic expertise can be input to the more politically oriented Multi-stakeholder Process.

	Considerable reduction of the ecological footprint	***Small or no reduction of the ecological footprint***	***Increase of the ecological footprint***

Sustainable agriculture (agricultural land degradation, biodiversity, water use)	Use of land with low ecological value (no degradation, improvement) or multiple use of previously used land; production from a variety of crops; yearly alternation of crops; no significant impact on local availability of water resource	Use of land that was previously used as agricultural land (continuity); limited variation of crops; moderate impact on local availability of water resource	Deforestation (degradation); production from a monoculture plantation and/or use of genetically modified seeds; significant impact on local availability of water resource
Grey energy (and/or grey GHG emission)	<10%	10- 80%	>80%, high NOx emissions from fertilizers
Fair trade (social impact)	Contributes to rural development ; existing safety net for urban poor		
Food security (agricultural land and food competition)	Use of land that was not previously used for food production	Use of land previously used for food production for international markets	Use of land previously used for food production for local consumption

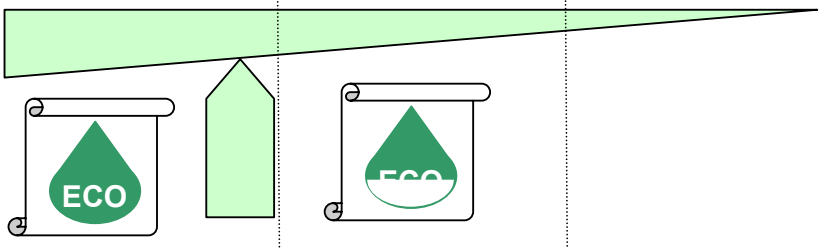

Figure 1 Illustrative example of a qualitative label specification

2.2 Are there any existing biofuel labels?

Today, no labels or certification processes are available that assess the value chain of biofuels. The only type of certificate that exists is a guarantee for a certain percentage of biofuel content in gasoline or diesel. The interest in biofuels certification in Europe and beyond is growing though a precise sustainability certification or labeling scheme is not yet defined. Several countries have started the process to define sustainability criteria in the context of biofuels (Netherlands, UK). There is a need for an international consensus finding process, as well as for quantification methodology.

It is important that not only large potential consuming countries are part of such a consensus finding process, but also countries who are large potential exporters of biofuels (Brazil, Malaysia, etc.).

Directive 2003/30/EC dealing with the promotion of the use of biofuels or other renewable fuels for transport includes a requirement for Member States to ensure by 31 December 2004 specific subsidies at sales points, where the percentages of biofuels, blended in mineral oil derivatives, exceed 5% of fatty acid methyl ester (FAME), or 5% of bioethanol. The same EU Directive (2003/30/EC) set an indicative target of 5.75% biofuels market share (by energy content) in the country members by 2010. The Directive however indicated that an increase in the use of biofuels should be accompanied by a detailed analysis of the environmental, economic and societal impact in order to decide whether it is advisable to increase the proportion of biofuels in relation to conventional fuels. Labeling at the sale points was compulsory for blends of biofuels to mineral oil derivatives that exceed the permitted limit of 5% (v/v). However, this label is NOT considering the broader value chain, but only at the quality of the product.

Interest in biofuels certification in Europe is growing though a precise sustainability certification or labeling scheme is not yet defined. In its Biomass Action Plan issued in December 2005 [4], the European Commission envisioned to ensure, through certification schemes, that the biofuels used to meet the prescribed targets satisfy minimum sustainability requirements (EC, 2005). This was confirmed in its Communication on EU Strategy for biofuels issued in February 2006. Finally, at their June 2006 meeting, the EU Energy Ministers explored the issue of simple and cost-effective measures to guarantee that biofuels are produced in a sustainable way, including certification. A window of opportunity is open for investigating a concept of biofuels labeling that benefits from existing experiences and is compatible with international requirements such as those being discussed in the WTO negotiations.

The Netherlands

A certification system for biofuels was first discussed in a report issued in 2003 by NOVEM, the Netherlands Agency for Energy and the Environment [6]. The scheme proposed was inspired from a certification system for the Electricity market. Presently, the Dutch government is considering the possibility of imposing minimum sustainability requirements and of setting up an international certification system for biofuels [7].

UK

In December 2004, the UK LowCVP Fuels Working group was set up as a subgroup for developing proposals on establishing a single sustainable biofuels standard in the UK. A feasibility study on certification for Renewable Transport Fuel Obligation was conducted by the Imperial College London (ICEPT) and the Edinburgh Centre for Carbon Management Ltd (ECCM), addressing the following issues: What environment and social assurance should be considered in relation with the Renewable Transport Fuel Obligation (RTFO)? Can environment and social assurance be incorporated within an RTFO without amending the Energy Act or leading to challenge under EU Single Market or international trade rules? Should environment and social assurance be a key component of an RTFO? How could greenhouse gas assurance be linked to an RTFO? Can an effective assurance scheme be implemented in a reasonable timescale and at a reasonable cost? Proposals were made regarding the methods to be used for environmental assessment as well as the practical way to certify biofuels in the framework of RTFO in UK [8].

Another study was commissioned by LowCVP and carried out by a consortium that included ECCM and ICEPT. In the framework of that study, a report was issued in July 2006 on a Draft Environmental Standards for biofuels [9]. The proposed concept included "Principles", "Criteria" and "Indicators" covering the headings as follows: Conservation of Carbon stocks,

conservation of biodiversity, sustainable use of water resources, maintenance of soil fertility, good agricultural practice and waste management.

New Zealand

In New Zealand, biofuel blends are required to meet regulatory standards, just as ordinary petrol and diesel are, under the Petroleum Product Specifications Regulations 2002. There are further voluntary industry standards for the biofuels themselves. Until there is new legislation to further control biofuel quality, the Energy Efficiency and Conservations Authority (EECA) has developed a label for biofuels which meet the biofuel quality standard. However, this label is NOT looking at the broader value chain, but only at the quality of the product. The motivation was to avoid bad initial consumer experiences with biofuels, leading to poor reputation for biofuels.

Other international experience

Green labels do exist in the food industry, in electricity, forestry (Forest Stewardship Council), fishery (Marine Stewardship Council) and other agricultural products (www.sustainable-palmoil.org/, www.maxhavelaar.ch/en/). Furthermore, the WWF has invested in improving the sustainable production of sugar cane or palm oil (http://www.panda.org/about_wwf/what_we_do/policy/agriculture_environment/index/our_solutions/better_sugarcane_initiative/index.cfm).

The Swiss Secretariat for Economic Affairs (SECO) is strongly involved with technical co-operations with developing countries in the field of commodities. Switzerland assists these countries in coping with international quality standards, i.e. concerning sustainable forest management, or in the context of sustainable coffee production and trade. The SECO also plays an active role in facilitating the elaboration and implementation of new voluntary standards through Multi-Stakeholder processes involving producers, the private sector and NGOs (e.g. in the timber, coffee, soy and other sectors). Several projects are funded as well by the Swiss technical co-operation in the field of fair trade. The project proposed in this White Paper would rely on experience gained in these fields. Knowledge developed in Multi-Stakeholder Governance [10], ongoing projects on voluntary standards in commodities such are sugar, soy and other basic products linked to biofuels production, as well as the development of criteria for sustainable agriculture and biomass, will provide valuable information to the project. However, it should be noticed that compared to existing projects, the certification of biofuels is more complex due to the high number of possible production and utilization routes, the diverse states of market maturity, i.e. first and second generation biofuels, the variety of activities that are involved, i.e. agriculture, biomass-to-biofuels, car manufacturers, oil and gas industry and trade challenges between producing and consuming countries.

2.3 Sustainable biofuels in developing countries

A growing interest in producing and using biofuels has arisen in recent years in many emerging and developing countries due to temporary surpluses of agricultural products and the surge of oil prices. Domestically producing biofuels is considered as a means to stabilize the prices of agricultural products (cases of China, Colombia, India and Thailand), to substitute imported crude oil or refined petroleum products and to save foreign exchange. Job creation is also

considered as an expected benefit of domestic biofuel production. The Brazilian National Alcohol Program, Proálcool, launched in 1975, is a worldwide showcase that many developing countries are eager to emulate.

China

In June 2002, China launched a pilot ethanol program in five cities in central and northeastern regions: Zhengzhou, Luoyang and Nanyang, in the Henan province, and Harbin and Zhaodong, in the Heilongjiang province. The pilot program was expanded in 2004 to seven additional provinces: Jilin, Liaoning, Anhui as well as parts of the provinces of Hubei, Shandong, Hebei and Jiangsu. The launch of the bioethanol program in China was motivated by concerns regarding the depletion of Chinese oil and gas reserves, the temporarily growing stockpile of maize and a wheat surplus. However, it is questionable whether a wide-scale production of bioethanol from maize in China is sustainable.

Colombia

In 2002, the Colombian government issued a law that requires cities with more than 500'000 inhabitants to add 10% of bioethanol to gasoline starting in 2006. Domestic production of bioethanol will be supported by the government through tax exemptions. According to the Colombian Ministry of Agriculture, an additional 150'000 hectares will be cultivated to produce the sugarcane required as feedstock for ethanol. The launch of the Colombian bioethanol program is a policy response to the concerns raised by the forecasted end of the country's self-sufficiency in hydrocarbons in a few years.

India

The Indian biofuels program aims at reducing the country's dependence on imported oil, at helping the sugar industry to cope with surpluses and at getting benefit to the environment. In January 2003, at least a 5% ethanol blend in gasoline was mandatory in nine states and four Union Territories. The ethanol program is progressing slowly because of domestic ethanol shortages. That raises questions regarding the long term sustainability of ethanol production from sugarcane in India. Indeed, sugarcane is a water-intensive plant and India is facing a serious agricultural water shortage. A biodiesel program based of Jatropha and Karanjia plants was also launched by the government. In early 2005, Gujarat became the first state to put biodiesel on the market.

Thailand

In 2000, the Thai government approved a package of incentives in favor of domestic production of bioethanol. The National Program of bioethanol in Thailand is intended to convert surplus sugarcane and cassava farm products to biofuels.

Other developing countries

Several other developing countries, either with temporary surpluses of agricultural products or without any strong agro-business industry, are considering domestic biofuels production as a new activity that could foster their sustainable development. The possibility for a low-cost production in these countries that enables export to industrialized countries is another factor that

encourages governments and industry to favorably consider domestic production of biofuels. However, the conditions of compatibility of such a production with a sustainable development are not well established to date.

International biofuels initiatives

Several international biofuels-related initiatives have been launched which involve developing countries. On 21 June 2005, a Biofuels initiative was launched by the United Nations Conference on Trade and Development (UNCTAD) with the goal to assist developing countries in seizing the opportunities of greater production, use and trade in biofuel resources and technology. UNCTAD is undertaking assessments for India, Thailand, Brazil and Philippines.

Global assessment of biofuels programs in developing countries

As financial and natural resources are scarce in several developing countries, the economy-wide global assessment of biofuel programs must take into account opportunity costs as well as external costs and benefits. The necessity to subsidize, at least during the early stages, the domestic biofuel production, for instance in the form of tax exemptions, can be an economic hurdle for poor countries in which oil and gas sales provide large fiscal resources often required to meet social needs. Environmental benefits valued at international levels in mechanisms such as CDM and technology spillovers must be as high to compensate for the loss of fiscal revenues. The perspectives to end the subsidies must be real in order to avoid developing a new activity that is not economically sustainable in long term. Such an assessment requires developing an approach that integrates economic, social and environmental models and relies country specific information. The proposed EPFL – Energy Center project will build on reflections which have recently been initiated by the Joint UNDP/World bank Energy Sector Management Assistance Program (ESMAP) [11] that will be deepening in the framework of the EPFL Program. Figure 2 present an outline of the assessment scheme.

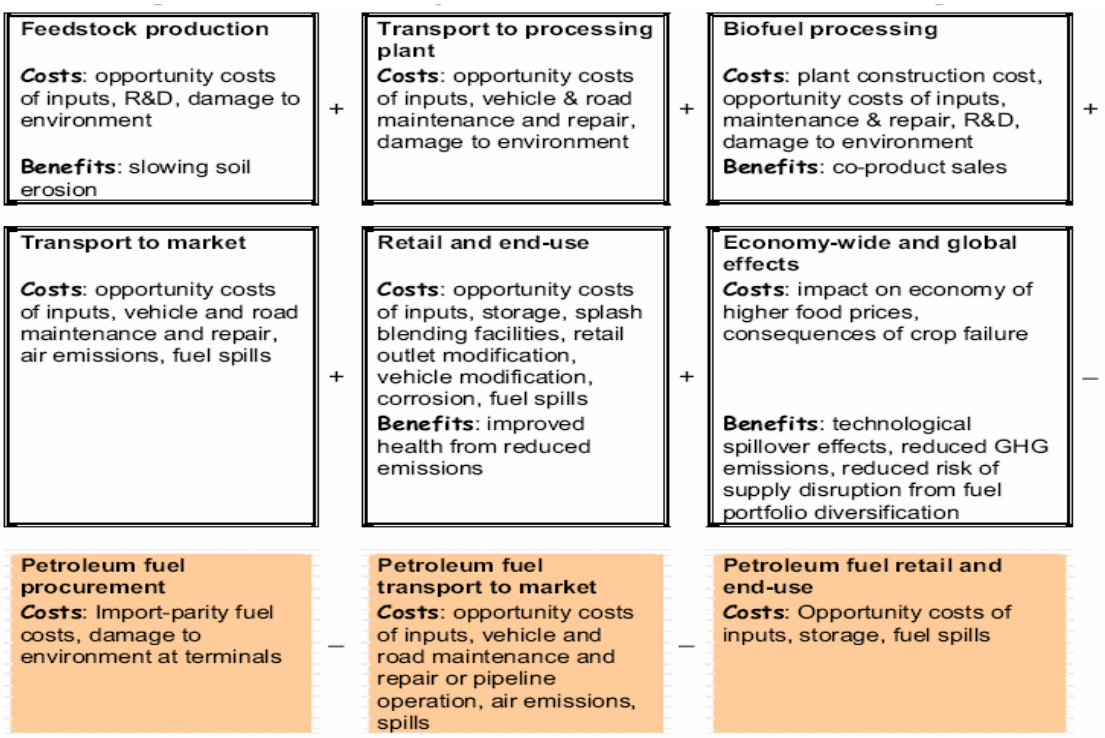

Figure 2 Illustrative global assessment scheme proposed by ESMAP [11]

3. Workplan

The program is divided in two phases. Phase 1 is presented in detail while Phase 2 deals with practical implementation of the certification process and generalization of country assessment of biofuels sustainability based on the consensual indicators and methodologies developed in Phase 1. The tasks of Phase 1 are grouped in two Work-packages. Work-package 1.1 deals with the development of specific recommendations for a biofuels certification / labeling process while Work-package 1.2 emphasizes the development and assessment schemes of sustainable biofuels programs in developing countries as well as awareness and opportunities enhancement in these countries.

The value added of the EPFL Sustainable biofuels Program for developing countries

The Energy Center of EPFL will develop a partnership with existing International initiatives, such as the UNCTAD Biofuels Initiative, in order to avoid duplication, save resources and increase the impact of its project. The expected added value of the EPFL program will consist in the search of a consensual definition of sustainability criteria, indicators and assessment approaches of biofuels value chains. The program will have a valuable impact in the following areas: design of efficient regulatory framework for biofuels development; ease of financing of sustainable biofuels projects; promotion of international biofuels trade based on sustainable criteria. One of the main Work-packages of the program will consist in assessing, for various countries, sustainability indicators of biofuels value chains and to undertake dissemination of the developed knowledge through workshops and other means (e.g. web-forum).

3.1 Phase 1: Initiating a Multi-stakeholders process to design a suitable certification / labeling governance

Phase 1 of the project is intended to last 18 months.

Work-package 1.1: Develop specific recommendations for biofuel certification / labeling process

Main tasks

(1) Identify relevant stakeholders, design and implement a Multi-Stakeholder process.

(2) Assess labeling methodology in other fields.

(3) Assess on-going biofuel labeling and criteria development efforts.

(4) Develop a preliminary set of indicators for a biofuel label and develop an aggregation methodology.

(5) Present/discuss/further develop the indicators set during the inaugural meeting of Stakeholders scheduled **28 November 2006 on the EPFL campus in Lausanne**

(6) Formalize a International Steering Board and a Scientific Advisory Board.

(7) Value chain screening/assessment of reference technologies and benchmarking of the indicators (based on previous LCA experience at EPFL).

(8) Review results with the International Steering Board and formulate voluntary value chain specifications and develop recommendations for a biofuel labeling scheme.

(9) Formulate recommendations for the setting up of criteria assessment methods and of certification processes leading to the creation of labeling institution which could be broadly adhered to by producing as well consumer countries, including the formulation of labeling recommendations.

Work-package 1.2: In-depth design of sustainability assessment methodology suitable for developing countries based on two specific case studies

(10) Assess existing methodologies for sustainability evaluation of biofuels value chains in developing countries.

(11) Review of existing case studies in developing countries.

(12) Carry out additional case studies of a few selected developing countries in close cooperation with the program partners (e.g. UNCTAD).

(13) Create and deliver workshops targeted at developing countries to disseminate information regarding biofuel production technology options, environmental impact assessment, and fair trade issues.

3.2 Phase 2: Advice regarding the utilization of the criteria and the labeling governance

Phase 2 is not part of the project for which funding is sought at this time.

The tasks in this phase will consist in providing advice regarding the utilization of the criteria and potentially the setting up a labeling institution. While it should not be the task of a university to actually operate a labeling organization, it can take a leading role in launching it and then serve in an on-going consultative role.

3.3 Parallel research (non core, with partners, to be incrementally financed)

(a) Assess the economic potential and the penetration of biomass crops and biofuels (estimate supply and demand curves), and their consequences for agriculture (production, employment, etc) and the whole economy (GDP, international trade, etc) (topic suggested by Federal Office for National Economic Supply, conditional on funding by that office). [http://nccr-climate.epfl.ch/webdav/site/nccr-climate/users/106542/public/P43_MIADAC.pdf]
(b) Estimate GHG emission reductions from biomass and biofuels (topic suggested by Federal Office for National Economic Supply, conditional on funding by that office). [http://nccr-climate.epfl.ch/webdav/site/nccr-climate/users/106542/public/P43_MIADAC.pdf]
(c) Potential improvements to biofuel technologies with respect to benchmark specifications of the biofuel label.

4. International Steering Board and Scientific Advisory Board

The intent is to have proposed program management benefit from two separate boards.

4.1 International Steering Board (ISB)

The role of the International Steering Board will be to define the strategic direction of the project.

Agreed and potential members of the international steering board include[1]:

Chair
Claude Martin, ex Director - General, WWF International

International Organizations
- *International Energy Agency (IEA), Paris*;
- *United Nations Conference on Trade and Development (UNCTAD), Geneva*;
- United Nations Foundation;
- *World Economic Forum (WEF)*.

Government Agencies
- *Swiss Federal Office of Energy (SFOE);*
- Swiss Secretariat for Economic Affairs (SECO).

International, Regional or National non government organizations (NGOs)
- *WWF;*
- *South Africa*;
- *India*;
- Ghana;
- Tanzania;
- Vietnam;
- Thailand;
- Peru;
- Romania.
- Others.

Biofuels industry associations
- Bioalcohol Fuel Foundation;
- European Biodiesel Board;
- São Paulo Sugar Cane Agro-industry Union (UNICA).

Industry
- Petroleum
  - *Petrobras*;
- Automobile Industry;
- Biofuels Industry;

[1] Agreed members are written in italics letter

- Agriculture and Food Industry.

Banks and Finance Institutions

Academic Institutions
- *Swiss Federal Institute of Technology Lausanne (EPFL*).
- *University of São Paulo*;

In an effort to ensure proper meeting efficiency, the number of International Steering board (ISB) members will be limited. An **International network of stakeholders (INS)** will be created in order to enlarge the ISB and allow participation of those of stakeholders who will not be members of the ISB. The INS will serve as consultative body. Beginning from a short list, the membership of the ISB will be broadened and tuned up as the project continues, taking into account the recommendations of the stakeholders.

4.2 Scientific Advisory Board (SAB)

The role of scientific advisory board will be to provide the necessary methodology and data needed for the decision making. The scientific advisory board will form as many subgroups as necessary.

The members of the scientific advisory board are yet to be identified – input and suggestions will be sought from the Stakeholders during the November 28, 2006, meeting.

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For the Energy Center at EPFL

Lausanne, November 7, 2006

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