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STRATEGIC ENVIRONMENTAL ASSESSMENT AND BIOFUEL DEVELOPMENT

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BETTER POLICIES FOR BETTER LIVES

Preface

This is one in a series of Advisory Notes that complement the OECD DAC Guidelines and Reference Series *Good Practice Guidance for Development Co-operation: Applying Strategic Environmental Assessment.*

The Advisory Notes are not intended to provide exhaustive, in-depth guidance but rather supplementary advice and links to resources where more specialised information can be found.

Therefore, these Advisory Notes fall into one or more of the following categories.

1. **Applying** SEA in particular situations or circumstances that will require unique sensitivity and awareness (*e.g.* post-conflict environments);
2. **Providing** further perspective, information and guidance on emerging issues that may need to be more adequately integrated into an SEA practice. (*e.g.* climate risk or ecosystem services);
3. **Undertaking** an SEA that focuses specifically on a key emerging issue or policy area that was not sufficiently addressed when the DAC SEA Guidance was prepared (*e.g.* biofuel development strategies).

The target audience of the Advisory Notes are SEA practitioners (to help strengthen the quality of SEA) and specialists in the specific issues or circumstances under consideration (to introduce them to the added value of SEA to their work).

This specific Advisory Note discusses how to integrate the consideration of ecosystem services into SEAs of policies, plans and programmes (PPPs) at various levels. Furthermore, this Advisory Note is one of the SEA Advisory Note series focusing on providing thematic application of SEA. Other notes are available in the following topics:

- SEA and Adaptation to Climate Change
- SEA and Disaster Risk Reduction
- SEA and Ecosystem Services
- SEA and Post-Conflict Development

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Acronyms

CBA	Cost Benefit Analysis
CBD	Convention of Biological Diversity
COMPETE	Competence Platform on Energy Crop and Agroforestry Systems for Arid and Semi-arid Ecosystems- Africa
COP	Conference of Parties
CSR	Corporate Social Responsibility
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
EPA	Environmental Protection Agency
FAO	UN Forestry and Agriculture Organisation
EPFL	École polytechnique fédérale de Lausanne
GHG	Green House Gas(es)
IADB	Interamerican Development Bank
IEA	International Energy Agency
IIED	International Institute for Environment and Development
ILUC	Indirect Land Use Change
IWRM	Integrated Water Resource Management
LCA	Life Cycle Analysis
NBTF	National Biofuel Task Force
NREG	National Resources and Environmental Governance
OECD-DAC	Development Assistance Committee of the Organisation for Economic Cooperation and Development
PISCES	Policy Innovation System for Clean Energy Security
PM	Particular matter
PPP	Programmes Plans and Policies
PPO	Pure Plant Oil
REDD	Reducing Emissions from Degradation and Deforestation
R&D	Research and Development
RCA	Responsible Cultivation Areas
RSB	Roundtable on Sustainable Biofuels
SAIEA	Southern African Institute for Environmental Assessment
SEA	Strategic Environmental Assessment
TEEB	The Economics of Ecosystems and Biodiversity

Strategic Environmental Assessment and Biofuel Development

I. Introduction

Biofuel production in developing countries and its potential is a complex and inherently conflict-ridden issue, which has given rise to much debate over recent years. Some parties see mainly the opportunities for improved markets for agricultural production and rural development coupled with enhancing a low-carbon development. Others fear competition for land and food production with no real gain – or even loss - for local populations or environmental condition. Even the carbon footprint of biofuel production is variable, depending for instance on the selected production systems and method. Increased net greenhouse gas emissions in connection with land use changes and displacement effects have been documented (FAO, 2008; Fargione, 2008). Many conclude that there is potential for finding win-win solutions but this would require careful assessment and policy direction. The ninth Conference of the Parties (COP) of the Convention on Biological Diversity (CBD) urged parties and invited other governments to develop and apply sound policy frameworks for the sustainable production and use of biofuels - that contribute to the conservation and sustainable use of biodiversity, acknowledge different national conditions, and take into account their full life-cycle compared with other fuel types (CBD, 2008). The COP also recommended that full use be made of relevant tools (see Useful Tools and Guidance Sources). Strategic Environmental Assessment (SEA) is such a tool and can help identify development trade-offs in biofuel policy, plan or programme (PPP) developments.

There is a continuing interest in biofuel development. This is driven largely by growing global interest in mitigating climate change and enabling green growth[1] which can provide clear and tangible benefits such as access to new markets and carbon finance. Still, biofuel development requires balancing trade-offs between short-term and long-term needs, and between environmental and social needs and economic development objectives. Well-planned biofuel development can contribute to climate change adaptation as well as mitigation.

Biofuels, including ethanol and biodiesel, will be an increasingly important source of unconventional liquid fuel supply (The US Energy Information Administration, 2009). In light of increasing food demand and limited land resources, biofuel production can however lead to competition with food production and exacerbate environmental degradation and even contribute to raising food prices.

Biofuel will remain a highly attractive sector in developing countries due to its low production costs and large demand from several developed countries as a substitute to the current conventional fuel source. But biofuel development can have a number of important environmental, social and economical impacts on agriculture-based economies. When negative environmental and social impacts occur in the least developed countries, where populations are less resilient to these impacts, special attention must be paid to power imbalances. The impacts of biofuel production depend on the chosen production system and factors such as which land use is replaced, what feedstock (*e.g.* jatropha, palm oil or sugar cane) is used, the location, methods and scale of production, as well as who is the end user.

1 Green growth means promoting economic growth while reducing pollution and greenhouse gas emissions, minimising waste and inefficient use of natural resources, and maintaining biodiversity. Green growth means improving health prospects for populations and strengthening energy security through less dependence on imported fossil fuels. It also means making investment in the environment a driver for economic growth (OECD).

For development cooperation, it is important to consider who benefits from biofuel development. SEA provides the opportunity to ensure that the interests of vulnerable and/or marginalised groups (*e.g.* small holders, vulnerable social groups, indigenous peoples, diversified cultures, migrant workers) are considered in the decision-making process. SEA can inform decision-makers to consider more sustainable development pathways by describing different scenarios based on these factors. SEA can provide a means to release tensions between stakeholders by involving them in transparent planning and implementation, thus also facilitating accountability and good governance. Furthermore, an SEA can help to focus and streamline Environmental Impact Assessments (EIA) for downstream activities, in order to save both time and money.

The purpose of this Advisory Note is to illustrate how SEA can be used as a tool to facilitate sound decision-making through the identification of some of the wider environmental and social considerations associated with the different stages of biofuel development (land acquisition and preparation; feedstock systems selection; cultivation and harvesting; processing, marketing and consumption). SEA can reveal some of the necessary trade-offs to be made to ensure long term sustainability, avoiding costly downstream mitigation measures and contributing to climate change adaptation.

The application of SEA to strategic planning and development decision-making (*e.g* concerning biofuels) is called for in the *Paris Declaration on Aid Effectiveness* as well as guidelines articulated in the CBD (see Useful Tools and Guidance Sources). SEA is mandatory in most industrialised countries, and some developing countries have also begun developing legal frameworks for SEA.

II. Scope of this Advisory Note

This SEA Advisory Note for biofuel development complements the *OECD DAC SEA Guidance* (2006), the *OECD DAC Strategic Environmental Assessment in Development Practice: A Review of Recent Experience (2010)*, and other Advisory Notes. It covers generic and specific considerations and questions to be addressed at the broad-scale in a typical SEA process for biofuel PPP development at national or sectoral level. This Advisory Note outlines how such issues can be considered in an SEA and refers to more detailed specialized guidance and methods.

The Note focuses on crop-based 1st generation[2] liquid biofuels since the production of these is considered to have greater impacts on environment in developing countries, relative to 2nd and 3rd generation biofuels (explained further in Annex 1). Moreover, unlike 2nd and 3rd generation, 1st generation biofuels can be produced with the use of relatively simple manufacturing processes, suitable even for small-scale implementation in remote villages. This may make it more interesting for local production and use in developing countries. First generation liquid biofuels are associated with various environmental impacts along the production-consumption chain which vary depending on the specific system and context.

There is no single internationally agreed list of sustainability criteria for biofuel production, although several initiatives are developing sets of criteria. This Advisory Note does not review or

2 First generation biofuel are most commonly derived from sugar or starch crops (bioethanol) or vegetable oil seeds (biodiesel). Second generation biofuel are derived from cellulosic materials such as timber, waste products from forestry, agriculture or households. Biodiesel produced from *e.g.* algae are referred to as 3rd generation.

recommend which of these sets to use, but recommends them as useful references for check lists for an assessment (see Useful Tools and Guidance Sources).

This Advisory Note illustrates complexities involved in biofuel systems through four impact analysis frameworks related to different stages of biofuel development, these are land acquisition and preparation; feedstock systems selection, cultivation and harvesting; labour marker implication; and processing, marketing and consumption (Figure 1 and Annexes 2-4). These can guide an SEA process applied to biofuel production. Each framework takes a strategic question as the entry point for analysing trade-offs and covers associated issues that need to be considered to ensure environmental and social sustainability.

III. Addressing biofuel production through SEA: key steps and questions to ask

The environmental, social and economic consequences of biofuel production depend on the production-consumption system, including the location and the land use that it replaces, the crops selected and materials used, who farms and processes, what the technology is used, and who is the end-user. Biofuel production is cross-sectoral involving rural development and agriculture, water, energy and infrastructure development, industry and trade, as well as cross-cutting issues such as environment and health. To be effective, an SEA must involve all relevant sectors and consider the whole biofuel system, including land acquisition, crop selection, land preparation and cultivation, harvesting and transport to market or for processing, and final transport to consumer markets. The SEA must be tailored to each specific context. Research studies show that a lack of a system approach can lead to lost opportunities and extra costs. In Ghana, markets for jatropha seed are available, but not for the processed jatropha oil. As a consequence, large amount of land is allocated for jatropha production but without the added development benefits of job creation in an extended supply chain and value addition through processing of the seed to oil (Diaz-Chavez, 2010). The considerations below follow the four main stages of an SEA process, described in more detail in chapter 4.3 of the OECD DAC SEA Guidance:

1) establishing the context for the SEA;
2) implementing the SEA;
3) informing and influencing decision-making, and;
4) monitoring and evaluation.

Stage 1: Establishing the context

Ideally, the SEA process is integrated with the PPP development process to such an extent that its conclusions and recommendations are continuously taken into account in each step of policy / plan formulation. During this stage, the most important activities are: establishing an overview of the decision-making context for the SEA, identifying the need for the SEA, identifying stakeholders and setting the SEA objectives.

Government priorities with regards to energy supply and development, agricultural and rural development, food security, trade, health, environment and economic development will be decisive for the design and effectiveness of an SEA for biofuels.

For example, the Kenyan process to draft a national biofuels policy in 2010 contained elements very similar to those of an SEA. There were several driving factors - the need to respond to:

- the increasing importance of biofuels worldwide (ostensibly driven by the rise in atmospheric GHG);
- existing and projected deficits in petroleum and energy supplies leading to national and economic vulnerability;
- a major wood fuel / biomass deficit, leading to extensive deforestation and poor rural health and livelihoods; and
- a need to fast track and coordinate activities relating to biofuel production and to provide a facilitative and sustainable regulatory framework (Canney 2010).

Understanding the decision-making context

Responsible actors in policy formulation – *i.e.* those who would be expected to take corrective action in the event needed – would normally be the state or central government. For plans, it could be a regional or local government/authority or even an industry operator. The related entry points for corrective action will subsequently be different. An initial analysis of the decision-making context, taking into consideration the role and influence of women and men, the role of formal and informal institutions and legal and regulatory frameworks, is needed to initiate an effective SEA. Effort at this stage can greatly enhance the SEA's influence on decision-making (Stage 3). For an SEA to be effective in influencing a PPP, it is essential to establish ownership of the SEA among those actors who have the power, mandate and resources to take corrective action based on its recommendations. Such recommendations should also reflect the consideration of stakeholders to be impacted by biofuel investments and production. Through its pilot evaluation project on conducting SEA, the World Bank has concluded that there needs to be agreement upfront in the SEA process about who is responsible for taking SEA recommendations forward. At a minimum, effort needs to be applied to the dissemination and communication of the SEA results and the monitoring and evaluation of outcomes (World Bank 2010).

Issues to consider include:

- **What national or international legal / institutional frameworks or overarching strategies are linked to the biofuel production chain?**
- **Which decision makers need to be involved to ensure there is adequate political and financial support of the SEA recommendations?**

Mapping stakeholders

Careful stakeholder and institutional analysis is necessary to ensure that the whole production chain is covered and different population groups as well as men and women are addressed equitably. This was highlighted at an international biofuel workshop in Dar es Salaam (Njau 2009);[3]

"There is need for broad consultations with all stakeholders and for transparency to be upheld in all aspects of biofuel development. Securing equity in biofuel production can only be attained if pro-poor and pro-women actors are made part of the policy development efforts, and thus ensuring thorough, meaningful consultations with those representing the interests' of disadvantaged groups."

3 Participating stakeholders included government ministries (*e.g.* for energy, finance, land use planning and food security), academia, research institutions, private sector, farmers associations and non-government organisations, Tanzanian Investment Centre and Vice Presidents office.

Implementing international recommendations for public participation through the SEA can enhance its effectiveness, which has been shown for example by the Millennium Development Goals Good Practices (UNDG, 2010). But such recommendations are also found in ISO standards, and, especially for African countries, the Africa charter for public participation, Southern African Development Community (SADC) policies and the New Partnership for African Development (NEPAD) environmental action plan (SAEIA, 2005).

Studies have shown that early engagement of the public in meaningful ways will reduce the investment costs for private investors (SAEIA, 2005). The SEA process can assist companies to comply with their Corporate Social Responsibility (CSR) obligation. Through respectful public participation, transparent and good practice, companies and governments can be better able to secure future business opportunities and establish long term partnerships.

One method to identify stakeholders is to recognise which ecosystem services (such as water retention, climate stabilization, pollination, providing food, construction material and medicines) may be affected by the PPP and determine who depends on these services. This will also generate a better understanding of how livelihoods can be impacted. Affected groups may also belong to the poorer and less educated strata of society, who may go unnoticed if not actively engaged in the SEA process.[4] This may especially help to safeguard identification of affected indigenous peoples. How will biofuel development affect their pursuit of customary livelihoods and cultural practices? Will indigenous peoples have the ability to participate freely in planning and monitoring? Will this apply equally to both indigenous women and men?

Issues to consider for effective stakeholder involvement include:

- **Who has an interest/responsibility in the biofuel production/consumption chain? Who will be affected by the proposed development or change? Will indigenous people be affected? Will men and women be affected differently?**

For biofuels policy development, the responsible ministry may be the Ministry of Energy but production and marketing also involves the government bodies governing *e.g.* land and water, agriculture, transport, industry, trade and rural development. In order to develop an effective policy, all these governmental bodies, as well as local communities must be involved and feel strong ownership in contributing to the SEA.

- **What is the capacity of organisations involved and what are the informal institutions / preconditions that will affect the direction or pace of change?**

It is important to assess what institutional capacities exist to assess and manage associated benefits and risks of biofuel development, and how these capacities can best be used or need to be enhanced. A key step is to map and assess the planning / policy process, its actors, capacity, functionality and transparency. Identify if any actors need particular support to participate in the SEA.

- **How can cross-sectoral ownership be facilitated to enable long term commitment for implementation and follow-up? Are there any existing institutions to build on?**

In Tanzania, a National Biofuel Task Force (NBTF) was created in 2006 to ensure cross Ministerial engagement for developing a liquid bioenergy policy as well as a regulatory framework for a sustainable biofuel development. The NBTF has performed a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis and developed an action plan and preliminary guidelines in this regard (Tanzanian Ministry

4 For more information, please see Advisory Note on SEA and Ecosystem services available at: www.seataskteam.net

of Agriculture Food Security and Cooperatives, 2009). **/...cont.**

In Kenya, the proposal for a National Biofuels Policy was drafted in 2009/2010 by the National Biofuel Sub-committee of the National Biofuel Committee, which included stakeholders from the energy department, research institutes, the Kenya Farmers' Federation, private sector, civil society and development cooperation actors. The policy development process was driven by the Ministry of Energy (Department of Renewable Energies), supported financially by the government and development cooperation agencies. The policy proposal is yet to be taken by government but the multi-stakeholder consultative drafting process has been rewarding, resulting in a multi-perspective proposal with a strong cross-sectoral ownership. This process contains elements very similar to those of an SEA process. However, had an SEA been applied in a deliberate sense, it may have enhanced participation from other ministries which could have further facilitated broad ownership for smooth adoption and effective implementation.

- **Who has in-depth knowledge about this production chain? Any active research institutes, experts, civil society organisations in the country or region? Or at international level?**

The case of the Kenyan National Biofuels policy drafting process (above) involved research institutes from agriculture, forestry, agro-forestry and industry and openly invited comments on the policy draft via email to anybody who had an interest.

Establishing objectives

There are few cases of SEA for biofuel development across the world at the time of writing but a Colombian case sets the objectives as follows: to provide strategic guidance on expected impacts of biofuel production on ecosystems and biodiversity and on area-based criteria for mitigation of negative impact (Box 1.).

Issues to consider when establishing objectives include:

- **How does the SEA intend to improve the planning process? What is its role?**

It is important that objectives be realistically set, based on the decision-making context and an understanding of what influence an SEA could have in that context (Box 1 provides an example). Objectives should take the interests of the identified stakeholders into account. The objectives will determine the scope of the recommendations of the SEA.

- **What national or international legal / institutional frameworks or overarching strategies link to the biofuel chain? What policy objectives can be found?**

For example, the energy policy, water policy, rural development policy, food security strategy, agricultural development strategy, trade policy and infrastructure policy are all relevant, as is the CBD, the UNFCCC, and national adaptation strategies - if the country is a signatory.[5] In Africa**,** the East African Legislative Assembly adopted a common strategy for food security in the region in 2010. East African Community partner states are required to resist the leasing or selling of large tracts of land to foreign entities for production of food or bio-fuel feedstock solely for export, which is argued, will be disadvantageous to food security in the region.

5 CBD COP 9 agreed that biofuel production and use should be sustainable in relation to biological diversity and recognized the need to promote the positive and minimise the negative impacts of biofuel production and its use on biodiversity and the livelihoods of indigenous and local communities (decision IX/2, paragraphs 1 and 2).

Box 1. **SEA Case: Colombian Biofuel Development**

In 2006, Colombia developed preliminary policy guidelines for the energy sector, including biofuel, which identified the need to evaluate potential effects of the promotion of biofuels on biodiversity and food security. For this reason, an SEA was developed using the Ecosystem approach.[6]

The SEA was undertaken by a Research Group on Intersectoral Policies of the Policy and Legislation Programme including experts on biology, GIS, economy, anthropology, and agronomy, in collaboration with officers from the Ministries of Environment, Housing and Land Use Development.

SEA objectives included to 1) assess the indirect, cumulative and synergistic effects on the Colombian environment and biodiversity that may result from the development of biofuel production and 2) define environmental criteria for the geographical areas where such crops could be promoted and those where such developments should be avoided due to environmental constrains.

For the identification of suitable crops, several criteria were identified such as national policy priorities, interference with different actors in the production chain (traditional economies, agro industry), implications on food security and cultural practices. Based on these criteria, the study recommended palm oil, sugarcane, panela sugarcane and manioc.

The SEA also included a comprehensive analysis of planning needs and actions required from different actors to ensure food security, minimise negative impacts on biodiversity and promote beneficial effects for local populations.

Some key points:

- Some geographic areas were identified as more suitable to biofuel production based on, for example, water availability, protected areas, family or rural production, national goals for the expansion of cultivated areas, presence of indigenous communities, roads and ports, conflicts related to environmental or land use aspects, forest cover and climate limitations. For example, one project encompassed 15,000 ha of palm oil trees. It was to be developed in areas with drainage restrictions and valuable ecosystems, with soils susceptible to flooding and thus requiring drainage systems to become suitable for palm oil cultivation. Similarly, such soils would require the use of fertilizers which because of the region's high rainfall - could impact negatively on aquatic ecosystems.
- The SEA pointed to successful production systems such as those in the region of Tumaco, where small producers of palm oil trees maintain a proportion of 70/30 (palm oil/current production of total land availability) to guarantee the maintenance of local diversified production.
- The greatest benefits from biofuel production are concentrated in the intermediary parts of the industrialization chain as well as large scale producers. The benefits for the population are generally represented by employment opportunities.
- The unregulated labour market (*e.g.* in general temporary work on seedling and harvesting) needs to change to ensure that job opportunities can effectively enhance the living conditions of rural workers in a more structured and less temporary manner.
- Local expectations have led to higher land prices and conversion of cattle farms to palm oil production. Expectations regarding employment opportunities have attracted new workers from other regions and resulted in new settlements in the region and cultural conflicts
- There is need to strengthen institutional capacity, environmental and ecosystem management capacity, tools for environmental regulation as well as scientific research on the sustainability of biofuel PPPs.

Source: (Conpes 2008).

6 The ecosystem approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. Application of the ecosystem approach will help to reach a balance of the three objectives of the CBD. It recognises that humans, with their cultural diversity, are an integral component of ecosystems (Source: CBD).

Stage 2: Implementing the SEA

Implementing the SEA requires scoping (including identification of indicators of objectives/desired outcomes), collecting baseline data, identifying alternatives and options to enhance opportunities and mitigate risks, *i.e.* balancing trade-offs.

Scope the SEA in dialogue with stakeholders

The SEA should ensure that information and viewpoints from all concerned actors, as well as priorities among them, are considered in a transparent manner. Local communities should be involved in scoping, screening and development planning exercises, enabling their cultural, environmental and social concerns and the interests of indigenous and vulnerable groups, to be taken into account (CBD, 2004). Their feedback should regularly feed into the analytical work of the SEA (and subsequently also into monitoring).

There is risk of unsustainable and unjust decision-making if there is a lack of informed consent. A feasibility study for large-scale biofuel production in Tanzania showed that villagers had little or no knowledge about their legal rights to land and other resources, nor about the size of their village lands. Thus, they had no chance of knowing the extent of areas they could spare for investors without jeopardizing long-term village needs for land, food and fodder. The study recommended that land use plans be prepared and awareness-raising conducted in concerned villages (*e.g.* on the Village Act) before consultations or negotiations (with investors) being carried out and investments approved (Mwamila, 2009).

It is often difficult to involve actors without direct process ownership although they may be highly relevant stakeholders such as the health sector. In Ghana, in an effort to ensure that health issues were adequately considered as part of the SEA, the Ghana Health Service with technical support from WHO became actively involved in the SEA stakeholder engagement activities. Stakeholder mapping was used to generate a better understanding of the different needs and interests of each of the actors / decision-makers involved. As a result of this analysis, the health sector representatives were able to articulate the rationale for including and addressing health in a way that was aligned with the needs and interests of the others.

Issues to consider for the scoping dialogue include:

- Do stakeholders know what is being planned and who is to be affected?
- A participation and communication plan can show in a transparent manner, who, when, where and how the different stakeholders can participate.
- Have local men and women been involved in a way that ensures informed understanding of investment plans and implications for their livelihoods?
- Public awareness/education may be necessary to facilitate real participation (shared analysis and assessment).
- How can the "information inaccessible" stakeholders be involved?
- Stakeholder meetings should be organized and advertised in a way that also allows remote villages, men as well as women, and vulnerable groups to be represented. This will minimize the likelihood of social exclusion.[7]
- How can the local community be involved in a trust-building and equitable way?
- Appropriately qualified communicators are important for relevant community consultations.
- What local institutions are respected and reach most people? Could these facilitate information flow and build dialogue?
- Existing institutions can also provide channels for sustained dialogue once the PPP is implemented. Providing means for local people to point out factors that were overlooked or changes caused by the biofuel PPP is critical for conflict prevention.
- How can contact channels between community and investor be established and maintained?
- Are means in place to handle grievances against industry/private sector operators?

[7] Recommendation from PISCES Stakeholders meeting, University of Dar es Salaam, Tanzania 2009 (Njau 2009)

Collect baseline information

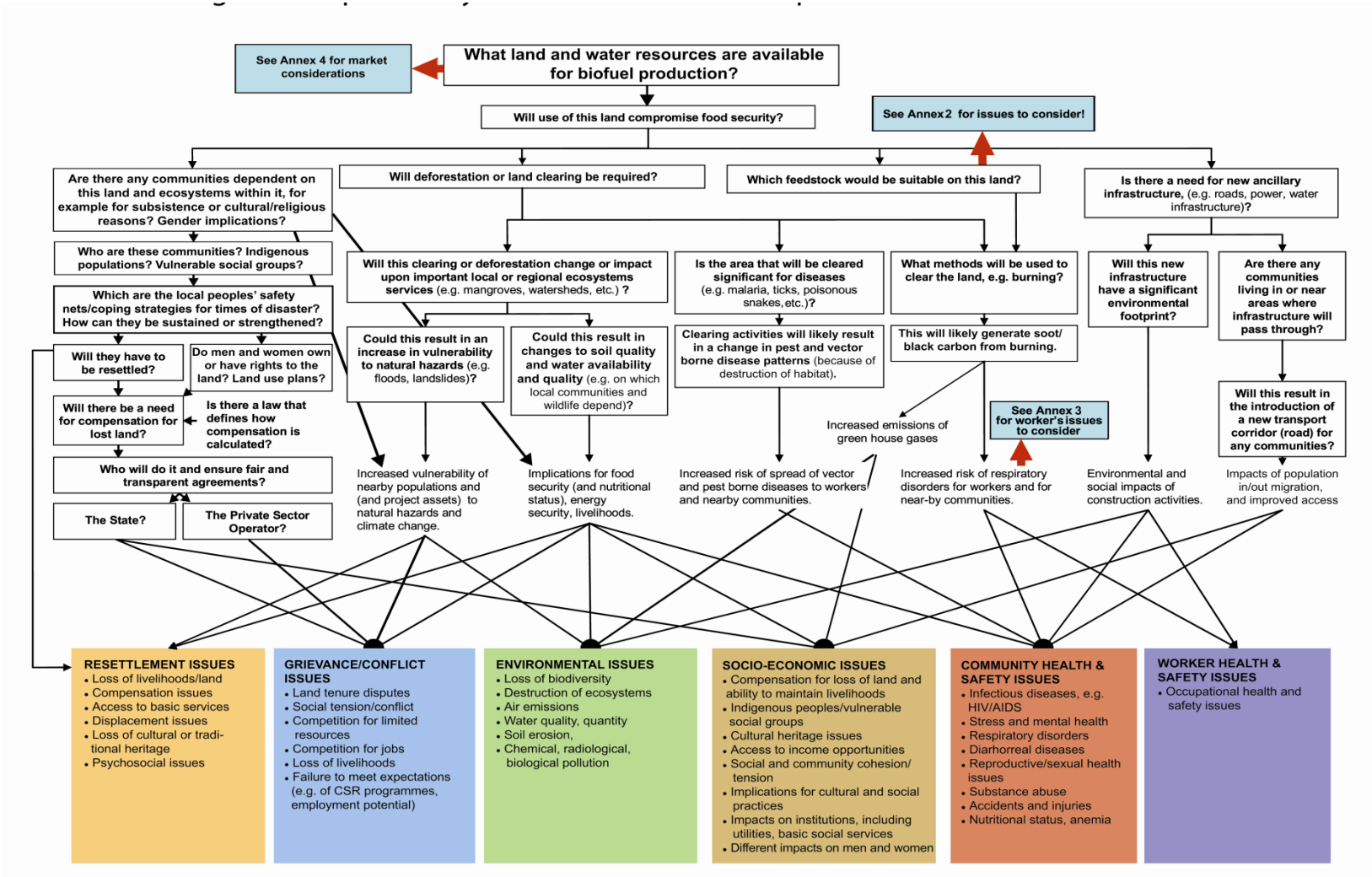
The baseline data should reflect the objectives and indicators identified in the scoping. The indicators chosen should facilitate monitoring of environmental and social impacts and build as far as possible on national systems of information and existing sets of indicators. For example, if a key objective of the SEA is to ensure that access to water and that water quality is not jeopardised by the biofuel investment, the indicators could be water distribution patterns; distance to reliable household water points; groundwater levels and water quality, such as concentration of pollutants near biofuel processing plants. The baseline data collected would then show the present water demand for irrigation, drinking water supply and industrial water supply, water availability and variation over time and space (using *e.g.* hydro-meteorological data), and the no-change starting point, to which demographic information would have to be added (NCEA 2008).

Analyse potential effects of proposals and alternatives

There are different environmental and social issues associated with the different stages of the biofuel production chain - land acquisition; preparation, cultivation and harvesting; processing, marketing and consumption. Potential impacts, which can be very different for men and women (Rossi 2008) can be related to: resettlement issues such as loss of land and livelihoods; grievance/conflict issues such as land disputes and inadequate compensation; environmental issues such as loss of biodiversity and degradation of ecosystems and their services; socio-economic issues such as lost or gained opportunities for income and resilience; as well as health and safety issues (see bottom of Figure 1.).

It is useful to maintain a systematic approach when describing and analysing alternatives and trade-offs. It helps to ensure transparent consideration of the implications of a decision and the compromises they imply. Critical outputs of this step include: identified trade-offs in different system options and different stakeholders' priorities with regards to these; identified opportunities (including economic analysis) to improve the livelihoods of poor and vulnerable women and men *and* to enhance the likelihood of influencing decision-makers thus improving environmental integration and the effectiveness of the SEA.

Figure 1. Impact analysis framework on land acquisition and associated issues



Highlight trade-offs – Who wins and who loses?

Social and environmental issues identified during the scoping stage and through using and adapting the analysis frameworks (Figure 1 and Annexes 2-4) should be added to issues raised during the participation processes. For each stage in the production chain, potential impacts and trade-offs should be identified, making sure to also look for positive impacts. Trade-offs may also be relevant across stages of the system.

It is important to identify and communicate the costs associated with environmental and social impacts – which are not necessarily obvious or understood. One way to visualize these costs is to put a monetary value to them. Based on the objectives and baseline information, alternative scenarios should be specified - including a no-change scenario. Different scenarios will naturally imply different costs and several tools can help identify the cost implications of the choices made and corresponding social and environmental impacts in the production system/chain. Adopting a broader total economic valuation (see links under Useful Tools) can be instrumental in influencing decisions about the use of natural resources, particularly regarding investment, land-use and benefit distribution.

Issues to consider in analysing trade-offs include:

- What are the implications of different markets (export – local)?
- What are the cost implications of prioritising one trade-off before another?
- How is national and household energy security affected by biofuel development?
- Do any of the options reinforce gender inequalities, such as time burdens on women or girls to collect water or firewood for household use?
- What land is available for biofuel production?
- What water is available?
- What current or alternative uses are there for this land/water? Are there gender implications?
- Can expansion of biofuel production lead to conflicts over land and water resources?
- Will devoting land to biofuel production jeopardize food security?
- How does the biofuel PPP relate to existing policies/strategies mentioning food security?
- Will land use change due to biofuel production jeopardize ecosystem services and biodiversity?
- What will be the effects of necessary infrastructural investment? Will investment have social implications?
- How can different feedstock systems impact on environment and social wellbeing?
- Which crop options have the best potential on the available land, and for which stakeholders?
- How are men and women farmers and more vulnerable groups involved in the biofuel production system and/or how are they affected?

1. Market and scale

Biofuel markets depend heavily on government incentives and mandates, but prospects remain uncertain, due to unpredictable factors such as the future trend in crude oil prices, changes in policy interventions and developments in second-generation technologies. Continued expansion of biofuel production will create additional demand for wheat, coarse grains, vegetable oils and sugar used as feedstock (OECD FAO, 2010).

The outcomes of biofuel production can be very different depending on which markets the system is targeting. Supplying a domestic market can reduce dependence on fossil fuel imports, increase local energy security, reduce health impact from traditional biomass stove cooking, and cut national emissions of greenhouse gases. However, domestic markets in developing countries often suffer from imperfections and do not yet attract foreign investment. International or regional markets may be a more immediate and attractive target for investment. Production targeting export markets for commercial gain may need to have a greater scale and may also lead to adopting systems that are profitable rather than sustainable. Benefit sharing requires policy guidance.

Even if policy or investment is targeting both domestic and international markets, the choice of main end user will have implications. National energy security can be affected positively by domestic biofuel production and consumption as expensive fuel imports can be reduced and national budgets can become less vulnerable to volatile fuel prices. Household energy security would be promoted by a policy decision to provide households with access to alternative fuels (*e.g.* biofuels or fuel wood from sustainable production) or efficient cooking stoves. This would also reduce pressure on neighbouring ecosystems (*e.g.* where forests are a key source of fuel) as well as generate rapid and tangible improvements in health outcomes, particularly for the poorest women and children. However, land use change may affect household energy supply negatively if areas for fuel wood collection are impinged upon without adequate compensation.

In the Kenyan Biofuels Policy Draft (see Stage 1), the recommendation was that "liquid biofuels will only be produced to serve domestic demand. Until such a time that the domestic demand has been met, there will be no exportation of biofuels". See also Annex 4 for related issues to consider.

Case studies of small-scale biofuel production have shown social capital impacts which included development of out-grower schemes, producer and consumer groups, collective initiatives for joint action and negotiation. They have also shown positive human capital impacts such as capacity building in agricultural production and processing, entrepreneurship, producer/co-operatives/community organisation, improved health, reduced indoor air pollution, time saving, and skills development and retention (FAO, 2009). In Thailand, there is evidence of livelihood improvement in Rangsit and Krabi provinces, where palm oil producers (individual farmers cultivating one to six hectares) have replaced fruit orchards on saline soils and rubber. Among the reasons for success are attention to environmental issues, and strong government commitment coordinated between different ministries and at different levels of government in combination with a national policy implemented in collaboration with local level participation (Shaw, 2009).

In Indonesia, the government has a policy to actively promote integration of indigenous subsistence farmers into the palm oil industry. Today, nearly half of the palm oil farmland is developed by small holders through out-grower schemes.[8] However, there has been a lot of social unrest and conflict. With unfair agreements with processing facilities, and since palm oil fruits must be processed within 10-24 hours after harvesting, farmers are left with few choices of whom to sell to, and are also vulnerable due to initial loans and fluctuating global market prices.

In Mozambique, an analysis of small holder farmer involvement in sugarcane production showed that out-grower schemes can deliver socio-economic benefits to local people when linked to product buyers and if out-growers are able to negotiate favourable terms for their feedstock (Shumba, 2008).

[8] Roughly 1.5 million smallholders, with an average farm size of 2.0 hectares, developed 44 percent of Indonesia's total palm oil area in 2008. http://www.worldwatch.org/node/6075

2. Land allocation

Which land is acquired for biofuel development and how, will have implications on social, environmental and economical impacts. Appropriate land use planning and clear land tenure rights are crucial for any successful agriculturally-based development, as are clear procedures for land acquisition, consultation and compensation. Consultations/negotiations should be conducted in a way that ensures local participation of all affected socio-economic groups, and gender awareness - and that power imbalances in the process are counteracted (Akesson 2008).

Identifying suitable land for production can contribute to climate change mitigation. For example, palm oil biodiesel has potential to reduce emissions by 80 percent compared to fossil fuels, but if the palm oil is grown on cropland from cleared tropical forests or peat land, greenhouse gas emissions can be up to 800 percent higher (Bringezu S, 2009).

The trend to grow biofuel crops on so-called marginal, degraded or idle lands, can compromise the livelihoods of local people. Among many examples, a study from Tanzania showed that land in Kilwa, Rufiji and Kisarawe Districts, perceived as idle by government and large private biofuel operators, provides a vital basis for livestock grazing and gathering of wild products (Mkindi, 2008).

Small-scale farmers may find it more beneficial to keep on farming rather than sell land and hope for a salaried job. Large-scale investment can use a variety of institutional arrangements to combine the assets of investors (capital, technology, markets) with those of local communities and smallholders (land, labour, local knowledge) for mutual benefit. Arrangements include land rental, contract farming, and intermediate options, such as out-grower schemes around a processing plant (World Bank, 2010b).

Case studies of impacts on livelihoods in countries affected by the more recent land rush for investment in biofuels demonstrate that well-executed investments in agriculture can generate large benefits which can be shared with local men and women (provision of public goods, employment, access to markets and technology, or increased revenue). Studies also indicate that these countries often lack capacity to regulate investments and protect local land rights. Contributing factors include unclear responsibilities, lack of staff capacity, poor documentation of traditional and current land rights and low payments for land compensation and low tax revenue, as well as limited emphasis on consultations with local communities, and inadequate weight given to the economic viability of investments. Negative impacts arise when responsibilities agreed upon in consultations are not recorded and enforced (World Bank, 2010b).

Lack of a transparent and accountable decision making framework can result in loss of control over national land. In Tanzania, for example, it has been reported that the responsible authority (Tanzanian Investment Centre) has no more land to allocate for biofuel investments, and so companies approach villages directly to acquire land.

If land is allocated in a non transparent manner and giving rise to civil unrest and conflict, investments can become costly and unsustainable, and, in the end, the trust of international investors and markets might be lost. The case of palm oil plantations in South East Asia illustrates some important impacts of unclear land tenure. Due to unclear land stewardship policies, there has been conflict over land, requiring mitigation of public protests and incurring legal costs, and ultimately leading to local/international investors and markets losing trust.

3. Competition for water

Biofuel production is dependent on agriculture which, in turn, is defined by water availability. In many areas, water is becoming increasingly scarce and a growing source of conflict, exacerbated by climate change. If biofuel production competes either directly or indirectly for water and firewood

supplies, it could make such resources more difficult to find, particularly for women and adding to their toil and reducing opportunity for income generation (Rossi 2008).

Choosing feedstock with high production of energy per unit area, or unit water used, can contribute to improved energy and water efficiency and lower emissions of GHG (see also Figure 1 and Annex 2 for further guidance).

In Brazil, the biodiversity-rich Pantanal lowlands are threatened by the conversion of the Cerrado highlands to soya and sugar cane, which leads to water pollution and a disruption of the hydrological cycle on which these lowlands depend (BiofuelWatch 2007).

In Kenya, a cost-benefit analysis (CBA) of the Tana Integrated Sugar Project revealed costs of water demand that an EIA had not foreseen. According to the Water Act (2002), water extracted for such use is chargeable at Kenya cents 75/m^3/second. This, together with underestimates of the opportunity costs of pastoral land as well as irreversible loss of ecosystem services, significantly lowered the viability of the proposed project (Mireri 2008).

4. Food security

The overarching question is what are the impacts of biofuel production on food security and whether these are negative or if investments can be shaped to enable agriculture development, rural development and poverty alleviation, and ultimately improve food security. If food crops are used as feedstock for biofuel production, this may drive up food prices and increase the number of food insecure people. However, if existing food markets are more lucrative or stable than the biofuel feedstock market, the negative impact on food security could be contained. This implies the need for care when designing incentives for biofuel production. Farmers producing a surplus are most likely to benefit from increasing prices, especially when producing crops that can be sold on both food and energy markets. From the poor net food buyers' perspective, the key question is whether biofuel investments offer opportunities for improved income / social safety nets, otherwise they risk ending up even poorer (see Annex 2 Framework on Feedstock system selection).

Investment in biofuels could be an important catalyst for regenerating the whole agricultural sector by bringing in new private and public investment. An FAO report finds that, despite profound concern that biofuels may compete with food production, food insecurity in Tanzania has been driven by low food crop yields. Hence, increased public spending to address low yields is vital to avoid competition with biofuels (FAO Bioenergy and Food Security Project 2010).

5. Impacts on ecosystems

Changes to current land use will imply changes directly affecting ecosystems, which, in turn, will affect local communities dependent on ecosystem services for their livelihoods. Intact forests, savannas and wetlands provide services crucial to poor people as well as nations. Large-scale palm oil plantations in South East Asia (a small but growing proportion supplying the biofuel market) are considered one of the largest threats to tropical forests and peat land.

Water pollution is a widespread problem both in palm oil and sugar cane producing areas, as well as from the mills that produce biodiesel and ethanol. Effluents tend to be rich in organic matter, and the decomposition of these reduces oxygen levels in the water, affecting natural biochemical processes and the species that inhabit those freshwater ecosystems (Eklöf, 2007). Sugar cane cultivation is the second biggest user of agricultural pesticides in Brazil which poses a health hazard, as well as potentially threatening rivers, lakes and the ocean wildlife (Engstrom, 2009).

6. Feedstock

It is claimed that jatropha grows well on marginal lands, survives under adverse climatic conditions and needs no irrigation or fertiliser to grow well. But to obtain good returns, the best land possible is often acquired. In selecting feedstock production sites, a matrix of factors is taken into consideration among including rainfall patterns, accessibility to infrastructure, proximity to transportation routes to access target markets (COMPETE, 2008). Marginal land gives unpredictable feedstock yields and farmers' opportunity costs are quite high compared with alternative income-generating options (World Agroforestry Centre, 2009). Studies have found that, even on agricultural lands, feedstock cultivation in Tamil Nadu is unprofitable for small farmers (Ariza-Montobbio, 2010), and recommend that jatropha be considered as an option only for small scale local processing but not for large-scale production (World Agroforestry Centre, 2009).

The FAO Bioenergy and Food Security project (BEFS) calculates the biofuel production cost under different production configurations in terms of feedstock origin and production technology.[9]

7. Impacts on health

Many of the health impacts of biofuels are similar to those in other agricultural investments, and are associated with activities and inputs that occur at different stages of the production processes. Health impacts were attributed to many activities which directly influence the environmental and social factors which determine health, such as air and water quality, access to land and livelihoods, income and employment opportunities, working and living environments.

The types of health impacts associated with biofuel production (see Figure 1) affect different population groups – and men and women, boys and girls – differently. In order to effectively identify and understand how best to avert or mitigate potential negative health impacts, it is necessary to understand what drives them, who are affected and how they affect individuals differently.

Box 2 provides an illustrative list of impacts on health resulting from biofuel development. It indicates the value and importance of taking a systems-based or life cycle approach when analysing the potential health and other social and environmental impacts.

Box 2. **Understanding the linkages between biofuel development and health - the value and importance of applying a system-based lens**

- **Land preparation:** Health impacts associated with clearing of land (*e.g.* deforestation) include nutritional issues (associated with food security and loss of access to land/livelihoods), stress and mental health issues (*e.g.* if resettlement or compensation is required, and/or if there is a loss of cultural heritage), vector and pest borne diseases (because of loss of habitats and increased exposure to communities) and respiratory problems (for example if burning is used as part of clearing process).
- **Feedstock cultivation:** Health impacts primarily affect workers and include issues such as exposure to hazardous materials/chemicals (*e.g.* pesticides, insecticides, fertilizers, etc.), UV exposure (a cause of cancer), heat related illnesses, risk of vector and pest-borne diseases (such as in malaria, dengue fever, tick-borne diseases such as encephalitis, snake bites, etc.), accidents from vehicle/machine operations or from harvesting practices (*e.g.* machetes commonly used for harvesting sugar cane). In India there are problems associated with jatropha, a poisonous crop when unprocessed, sometimes eaten by small children (Nzuki S, 2009).
- **Harvesting:** The harvesting of feedstock often requires additional labour, usually migrant or seasonal workers. These workers are exposed to a number of environmental and social factors which can adversely affect their well-being. For example, they tend to live in temporary, often substandard accommodations (*i.e.* lacking adequate water and sanitation, and overcrowded), work seasonally for minimal wages, and have little or no access to basic health and social services.
- **Processing:** Processing of feedstock (*e.g.* corn, ethanol) generates a number of air emissions including greenhouse gases (carbon dioxide, nitrous oxide and methane) and particulate matter, all of which have associated negative health implications (*e.g.* respiratory disorders, premature mortality - a known cause of exposure to ozone which is affected by methane).

Source: (Pfeiffer, 2010).

9 http://www.fao.org/bioenergy/foodsecurity/befs/61325/en/#module 5.

Identify measures to enhance opportunities and mitigate adverse impacts

The analysis of the identified concrete potential impacts of proposals and alternatives should facilitate the identification of suitable reinforcing or mitigation measures to enforce a contribution to a more sustainable development.

Some sustainability issues concerning commercial investments must be dealt with at government level, while others can be more directly addressed by private investors. Policies and frameworks that will guide investments to the most appropriate land and production chain need to be in place. The respective roles and responsibilities of the government and private sector must be clear.

Issues to consider include:

- Which system choices bring benefits for the poor and vulnerable? Can these benefits be enhanced in any way?
- How can land acquisition and negotiation procedures be improved to become more equitable, transcending power imbalances, including between men and women?
- How can biofuel investors be incentivised to meet their social responsibility goals effectively?
- How can negative impact on valuable ecosystems services be minimized and positive impacts enforced?
- How can agreement between different stakeholders on water use be facilitated?
- Can production methods and technology options be made greener?
- Will the planned biofuel investment together with other investments create cumulative impacts on *e.g.* land access for local communities, water quantity and quality, biodiversity, labour availability that need to be handled? How?

In order to avoid bioenergy development having a negative impact on the local population, the government of Ghana is taking measures to ensure that large-scale production of biofuels creates commercial benefits for people and does not affect food production. This includes flexibility in replanting farmland for food production if food security is threatened and the allocation of degraded and arid dry lands for jatropha production. Additionally, the government is promoting other feedstock crops such as palm oil, groundnut and cassava and other energy crops with additional economic value and existing cultivation experience in Africa (COMPETE, 2009; COMPETE, 2009b). The government of India has tried to mitigate the risk of competition with food production by focusing on small-holder biofuel production on marginal lands (World Bank, 2009). The Bioenergy Food Security project aims to provide tools to assess how bioenergy developments could be implemented without hindering food security to policy-makers who may be exploring opportunities for bioenergy development (see Useful Tools and Guidance sources).

Identified concerns may relate to the choice of technologies and inputs, as well as human agricultural capabilities. For example, clearing new cropland by burning may lose organic matter which are valuable to soils, increase erosion and impact negatively on biodiversity (depending on the scale of clearing), release carbon, and create black carbon without energy gains but imposing health risks. The negative impacts can be mitigated by encouraging more efficient use of existing agricultural land and limiting expansion into virgin areas. This requires investment in the agricultural sector as a whole - from research and higher education and extension, to access to markets, inputs and credit. It can also be mitigated in a more targeted way with investment in capacity development programmes for

feedstock producers through out-grower schemes, as well as with technical support. Joint ventures, where local people with customary rights to land receive an equity share in a plantation that is managed as a single operation, can also help to overcome smallholders' limited access to technology and capital (World Bank, 2010b).

Investors should be encouraged to invest in complying with their social responsibilities and ensure that consultations and negotiations for land are held with the appropriate stakeholders in a respectful manner. In other words, the objective is not just to buy land but rather to agree compensation and / or involvement. Local knowledge is required to know who should be involved and who represents who.

User rights for water are likely to become a growing issue, *e.g.* in the context of Integrated Water Resource Management (IWRM) (see Figure 1 for framework on land availability and related issues to consider).

Draft and review the SEA report

The results and rationale for conclusions need to be reported in an appropriate language and format, which may not necessarily be a report. When engaging stakeholders and public in a process, it is important for the SEA team (or lead actor) to provide feedback to those involved and/or impacted and present findings of the assessment – for quality review and validation - as well as ensure further information on subsequent decisions. How can the SEA report be reviewed to ensure quality? Quality review is generic and guidance can be found in the OECD DAC SEA Guidance (OECD, 2006).

Stage 3. Informing and Influencing Decision-Makers

Ideally, to be fully effective, the SEA process should be integrated into the planning of the PPP. But, if it is undertaken as a parallel process, the results will need to be fed into planning decisions along the way. This entails documenting the findings and communicating in language that will be understood by senior level decision-makers. Experience shows that, to be influential, the SEA must present win-win solutions (Nelson, 2010) or clear and communicable costs for environmental impacts. As mentioned above, using monetary values for ecosystem services may be a useful tool.[10] When the SEA process is more parallel than integrated, suitable entry points for effective communication must be identified, based on, *inter alia*, what incentives there are for decision-makers to consider the long-term sustainability of biofuel production.

The focus in this stage should be on ensuring that the process of environmental mainstreaming is sustained beyond the presentation of SEA recommendations. This is definitely easier to achieve if there is agreement up front in the SEA process about who is responsible for taking the SEA recommendations forward, *i.e.* that clear ownership of the SEA rests with a suitable national actor (Nelson, 2010). A 'Decision-Makers Tool' has been developed (Croal, 2010)[11] to help decision-makers understand and use sustainability-based SEA analyses. It consists of a series of steps and questions which may be helpful to guide the SEA practitioner in the framing of assessment work and provide the foundation for an effective briefing note. It allows for the transfer of critical information to the front of documentation for decision-making (while providing a clear trail so that supporting and comprehensive information may be easily obtained when required).

10 For further guidance, see Advisory Note on SEA and Ecosystem services (page 18), available at: *http://www.seataskteam.net/guidance.php and the TEEB reports at http://www.teebweb.org/*.

11 *http://www.worldscinet.com/jeapm/12/1201/S1464333210003498.html*.

Issues to consider to plan for effective communication:

- How can information from the SEA process best be communicated to senior level decision-makers?
- What are the windows of opportunity for actually influencing the decision process?
- What additional measures are needed for improving communication infrastructure, and for training educators and media to understand and interpret environmental information?
- Are there incentives in place that can assist in realizing recommendations (*e.g.* economic benefits, policy drivers, legislation & enforcement, public demand)?

A communication strategy can help to identify what is needed to communicate with various concerned stakeholders. For example, in order to reach marginalised and vulnerable stakeholders, oral modes of dissemination of SEA recommendations may need to be considered.[12] Ensuring access to information generated by the SEA will strengthen the ability of all those involved in the SEA process - and ultimately concerned by biofuel investment - to have continued influence on policy development and or plan / programme implementation.

Greater transparency in decision-making can be fostered by creating a multi-stakeholder forum for continued exchange of experiences related to biofuels policy, plan or programme development and implementation. Such a forum would empower stakeholders to hold decision makers to account.

Stage 4. Monitoring and Evaluation

It is important to monitor and evaluate the SEA process and/or report, and its influence and effectiveness, as well to plan the monitoring of the environmental and social impacts of the PPP. This requires adaptation of generic advice available in OECD DAC SEA guidance (OECD 2006), particularly by identifying good indicators, relevant to each context, related to the identified potential impacts (positive and negative) and mitigation measures. Research is needed to provide gender-differentiated data on the impacts of biofuel development (Rossi, 2008) which is important for assessment of sustainability. The OECD DAC SEA Generic Quality Review methodology[13] can be used to evaluate an SEA process and has been successfully trialled in the Namibian mining sector (Dalal-Clayton D.B, 2010).

In recent years numerous initiatives have been developed to address the environmental and socio-economic impacts associated with the production of biofuels or specific biofuel feedstock. These include regulatory frameworks, voluntary standards or certification schemes, and scorecards. The Bioenergy and Food Security Criteria Indicators Project (FAO) is compiling a useful portal with information about these different initiatives (available at http://www.fao.org/bioenergy/foodsecurity/befsci/en/). The Global Bioenergy Partnership, GBEP is another useful source of information (see Useful Tools and Guidance sources). The GBEP set of indicators may be a helpful point of entry when developing indicators to be integrated into the performance management framework created for the PPP.

12 ibid.

13 Available at *www.seataskteam.net/library.php*.

A WWF position paper on bioenergy recommends that governments should require biofuel companies (refiners and fuel retailers) to publish annual reports on a representative set of key performance indicators (based on international norms and agreed through stakeholder consultations) for the main environmental and social issues associated with different steps in the production chain, *e.g.* growing feedstock, processing / refining and transport (WWF, 2008).

Issues to consider when monitoring the environmental and social impacts of the PPP include:

- **What national or sectoral monitoring is on-going?**

Are mechanisms in place to collect and analyse sex-disaggregated data to inform indicators, monitoring, reporting and evaluation of policies and measures? Will women and girls directly benefit equally to men and boys?

Existing data collection or information on relevant indicators in overarching strategies/policies could feed into the monitoring of the PPP (*e.g.* energy access and consumption, crop prices, food product prices, farm/household income, etc). The use of health indicators (*e.g.* improvements in child health from reduced exposure to indoor air pollution) can create links to wider development frameworks such as the MDGs – thereby providing a means to measure and report the human development impact of a particular policy decision.

A plan for using existing systems can be created as part of the task for a cross-sectoral working group/forum. If capacity is inadequate, capacity strengthening action to meet needs should be recommended. This could also be coordinated with the communication and participation plan.

- **How does the participation of communities and NGOs in monitoring and reporting activities link to routine monitoring and reporting normally undertaken by local authorities?**

There may be need for clarity on roles and inputs. Again, there may be some important capacity development considerations, e.g. if an NGO or community needs to be trained in what to look for and how to measure and report it. It will be necessary to clarify who will deliver (and pay) for the training activities.

- **How is implementation of Corporate Social Responsibility promises ensured and monitored?**

Studies indicate that negative impacts arise when responsibilities agreed upon in consultations are not recorded and enforced.

IV. Institutional and Capacity Development Considerations

An SEA for a biofuel PPP should include an early institutional analysis that can be further developed during the SEA process to develop recommendations for capacity development. Biofuel development is cross-sectoral, so institutional capacity and linkages are complex and need to be understood for each specific planning and policy context. Outcomes and performance may be shaped as much by forces in the enabling environment (*e.g.* laws, regulations, attitudes, values) as by internal organisational factors (skills, systems, leadership, relationships, etc.). Capacity constrains and solutions need to be considered from a systems perspective, with an appreciation of the dynamics and inter-relationships among various issues and actors at different levels (individual, organisational, sectoral, framework). An effective SEA requires attention to policies, programs, organisations and individuals as part of broader picture rather than as discrete, or loosely connected concerns. This calls for a systems-based institutional analysis to identify not only the capacity of organisations involved, but also the informal institutions / preconditions that will affect the direction or pace of change or implementation – and opportunities for environmental integration.

Capacity development issues to consider:

- What is needed to improve the awareness of how an SEA can inform and improve a planning process?
- Are mechanisms in place for holding decision-makers accountable for environmentally sound decision-making? Do they work?
- What capacity is critical to enhance accountability (*e.g.* monitoring and evaluation, record keeping and ability to answer questions from the public)?
- Are there any feedback mechanisms within organisations that can be built on to enhance continuous internal learning about sustainable development?

Participating in the SEA process itself can promote capacity, but, more importantly, capacity-building and institutional strengthening is also needed *after* an SEA to ensure implementation of reforms or recommendations, and monitoring and evaluation. Capacity-building efforts will almost always be part of the recommendations or outcomes of the SEA process.

Relevant lessons and experiences will be available both within the biofuels sector and in other sectors, and can be built on. Usually, biofuel development involves either many small-scale agricultural producers or large areas of land with potential to affect local populations and many individuals. This makes capacity for 'real' or effective participation in decision-making important, and some lessons can be drawn from documented experiences (see Box 3 and references). Companies investing in biofuels may need improved capacity to interact with local stakeholders in a respectful and equitable manner.

Box 3. Capacity building for effective participation in decision-making

Using EIA as a catalyst for participatory decision-making, the Calabash project (2003-2005) conducted by the South African Institute for Environmental Assessment (SAIEA) was developed from the ground. It researched where public participation was done well in the SADC region and developed tools and resources to enhance participation in decision-making. All Calabash products have had input from a range of stakeholders (regulators, private sector, practitioners and civil society) who are actively involved in community engagement. This ensured that the tools are practical and relevant to the social, cultural, environmental and economic context. Outputs available include:

- A Guide to Opportunities for Public Participation in Environmental Assessment Processes in the Southern Africa Development Community;
- Generic Public Participation Terms of Reference for Civil Society Engagement; and
- A Handbook of Public Participation in Environmental Assessment in Southern Africa (lessons from 6 case studies).

The success of the Calabash project was based on the development of partnerships with institutions, agencies and persons who were also working on public participation issues - perhaps not from the environmental assessment window, but through, for example, democratic reform.

Source: (SAIEA 2005b).

Another source of knowledge is COMPETE.[14] This initiative – focusing on African arid and semi-arid ecosystems - seeks to bring together scientists, researchers, funders and practitioners from different fields, and from across the world, to create a platform for discussion, knowledge exchange, policy and methodology development, and to provide strategic and practical guidance and tools on the provision of modern bioenergy for the sustainable and optimal usage of these special ecosystems. COMPETE has identified urgent capacity needs to ensure sustainable bioenergy development in Africa (Box 4).

Box 4. **African capacity needs to ensure sustainable bioenergy development**

- Capacity to develop and implement clear strategies and regulations.
- Expertise on energy and environmental planning.
- Agricultural and technical expertise, R&D on new biofuel crops and improved crop management systems (capacity-building for farmers and extension workers).
- Standardisation to guarantee adequate quality of bioenergy products.
- Promotion of technology transfer as well as South-South and North-South cooperation.
- R&D on infrastructure needs for the whole supply chain of biomass.

Source: *(COMPETE 2008b).*

Countries exporting biofuels need to focus on capacity issues. For example, they can develop domestic capacity to implement and enforce the standards and policies on sustainable bioenergy production, to ensure adequate quality assurance of private sector reporting on environmental performance, *e.g.* of GHG balances (WWF 2008).

In all, ensuring an effective SEA – and that recommendations for a diligent and sustainable biofuel investment are implemented – will require continuous capacity investment.

14 The Competence Platform on Energy Crop and Agroforestry Systems for Arid and Semi-arid Ecosystems- Africa (http://www.compete-bioafrica.net/).

Sources of further information

Key generic references

The OECD DAC Network on Environment and Development Co-operation (ENVIRONET) SEA Guidance and Advisory Notes (all available at the SEA Task Team website. http://www.seataskteam.net/guidance.php

The OECD DAC Guidance on SEA: *Applying Strategic Environmental Assessment. Good Practice Guidance for Development Co-operation*, OECD, Paris.

The OECD DAC SEA Task Team Advisory Notes on Strategic Environmental Assessment:

- Strategic Environmental Assessment and Adaptation to Climate change, 2008 and 2010.
- Strategic Environmental Assessment and Ecosystem Services, 2008 and 2010.
- Strategic Environmental Assessment and Disaster Risk Reduction, 2008 and 2010.
- Strategic Environmental Assessment and Post-Conflict Development, 2008 and 2010.

Useful tools and guidance sources

- **OECD** has launched an overarching research program on bioenergy, lead by the Trade and Agriculture Directorate. It incorporates expertise from other directorates, the International Energy Agency as well as from other institutions and researchers. The work on bioenergy focuses on comprehensive compilation of data and information on the issue, the categorization of the variety of support policies and the quantitative analysis of bioenergy policy measures. http://www.oecd.org/document/45/0,3343,en_2649_33785_39633901_1_1_1_37401,00.html.
- **Convention on Biological Diversity (CDB)** has developed recommendations for biofuel production available at http://www.cbd.int/doc/meetings/sbstta/sbstta-14/official/sbstta-14-12-corr1-en.pdf.
- **Global Bioenergy Partnership (GBEP)** The Global Bioenergy Partnership was launched, following an agreement by the G8 +5 (Brazil, China, India, Mexico and South Africa), to support wider, cost effective, biomass and biofuel deployment, particularly in developing countries. The homepage can provide indicators, tools and experiences of best practice http://www.unep.fr/energy/activities/gbep/.
- **OECD DAC Generic SEA Quality Review Methodology (draft for comment).** The proposed analytical template comprises a set of key evaluative criteria and supplementary questions that can be used to undertake a generic review of SEA quality. Available at http://www.seataskteam.net/library.php.
- **COMPETE**: serves as a forum to facilitate policy dialogue and information exchange concerning the development of sustainable bioenergy in Africa. A key focus is developing policy mechanisms that enhance local value-added community development. http://compete-bioafrica.net/index.html.
- **World Bank,** 2010 Policy SEA: Conceptual Model and Operational Guidance for Applying Strategic Environmental Assessment in Sector Reform; http://siteresources.worldbank.org/INTRANETENVIRONMENT/Resources/244351-1222272730742/PolicySEAExecSummary.pdf.

- **CBD has developed tools and guidance,** which will be part of a sound framework for sustainable production and use of biofuel under the Convention, which is being developed, including *inter alia*:
    - The application of the ecosystem approach (see Box 1).
    - The voluntary guidelines on biodiversity-inclusive impact assessment .
    - The Akwé: Kon Voluntary Guidelines for the Conduct of Cultural, Environmental and Social Impact Assessments Regarding Development on Sacred Sites and on Lands and Waters Traditionally Occupied or Used by Indigenous and Local Communities, available at http://www.cbd.int/doc/publications/akwe-brochure-en.pdf.
    - The programme of work on protected areas, available at http://www.cbd.int/protected/pow/learnmore/intro/.
    - The Guiding Principles for the Prevention, Introduction and Mitigation of Impacts of Alien Invasive Species that Threaten Ecosystems, Habitats or Species

  For more information, see http://www.cbd.int/doc/decisions/cop-09/cop-09-dec-02-en.doc.

- **Life cycle analysis** (LCA) is the recommended tool, by *i.e.* CBD. For general information, see http://www.epa.gov/nrmrl/lcaccess/lca101.html. For a scientific update, see (Cherubini et al, 2009).
- **Mapping c**an support cost-efficient planning by identifying areas that would be suitable for bioenergy development, and avoid areas with high conservation value in terms of either biodiversity or carbon storage capacity. For example, mapping can provide information on land use practices and ecosystems (and identify ecosystem services provided by these), protected areas, species and habitats as well as livelihoods information. Area-related policies and legislation should be taken into account. In Brazil, a zoning system is being developed for palm oil production that distinguishes between suitable land and land of high conservation value[15] http://www.unep.fr/energy/activities/mapping/.
- **Valuation of ecosystem services:**
    - In OECD DAC SEA Task Team Advisory Note for SEA and Ecosystem services, you can find a guide for decision-makers (annex 2), available at www.seataskteam.net.
    - UNEP's Ecosystem Management Programme provides a four step guidance to the Ecosystem approach, available at http://www.unep.org/ecosystemmanagement/Methodology.
    - Netherlands Commission for Environmental Assessment presents evaluation of ecosystem services, and lessons learned from influential cases (Slootweg and Beukering 2008), available at http://content.undp.org/go/cms-service/download/publication/?version=live&id=2078079.
    - In Tanzania, the Valuing the Arc programme is quantifying, mapping and valuing key ecosystem services that flow from the mountains. These include carbon, timber, non timber products and tourism opportunities, available at http://www.valuingthearc.org/
- **Global Bioenergy Partnership (GBEP)** was established to implement the commitments taken by the G8 +5 (Brazil, China, India, Mexico and South Africa) in 2005, and registered as a Convention on Sustainable Development Partnership. It aims to support wider, cost-effective biomass and biofuel deployment, particularly in developing countries. Its webpage provides indicators, tools and experiences of best practice

[15] UNEP 2009. Assessing biofuel.

(http://www.unep.fr/energy/activities/gbep/). GBEP has compiled further tools (May 2010) available at: http://www.globalbioenergy.org/uploads/media/1005_GBEP_-_Bioenergy_analytical_tools.pdf

- **The FAO Bioenergy and Food Security** (BEFS) project, aims to give policy-makers who may be exploring opportunities for bioenergy development, tools to make informed decisions that take into account food security issues in the broader context of rural and agricultural development http://www.fao.org/bioenergy/foodsecurity/befs/en/.

- **Roundtable on Sustainable Biofuels** (RSB) - an international initiative coordinated by the Energy Center at École polytechnique fédérale de Lausanne (EPFL). RSB brings together farmers, companies, non-governmental organisations, experts, governments, and inter-governmental agencies concerned with ensuring the sustainability of biofuel production and processing. The RSB has developed a third-party certification system for biofuel sustainability standards, encompassing environmental, social and economic principles and criteria through an open, transparent, and multi-stakeholder process, available at http://cgse.epfl.ch/page65660.html.

- **Environmental Due Diligence Guidelines.** The EDD guidelines are intended to provide practical, standardised procedures for identifying and managing environmental impacts associated with investments in particular renewable energy technologies. http://www.unep.fr/energy/activities/ddg/.
- **Environmental flows** – provides guidance regarding water provided within a river, wetland or coastal zone to maintain ecosystems and the benefits they provide to people. http://www.eflownet.org/.
- **IADB Biofuel Sustainability scorecard** aims mainly to encourage higher levels of sustainability in biofuel projects by providing a tool to think through a range of complex issues associated with biofuel, based on the sustainability criteria of the Roundtable on Sustainable Biofuels (RSB). Available at, http://www.iadb.org/biofuelscorecard/.

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Annex 1.
What are biofuels?

Bioenergy

Energy produced from biomass using all types of organic materials, *e.g.* wood, charcoal, energy crops, agricultural and forestry wastes, manure etc.

Biofuels

Often known as agrofuels in developing countries, biofuel is a form of bioenergy and the term is used for all fuels that are derived from biomass (plant and animal material). The most commonly used biofuels today are bioethanol, biodiesel, pure plant oil (PPO) and biogas.

First generation biofuel

First generation biofuels are most commonly derived from sugar or starch crops (bioethanol) or vegetable oil seeds (biodiesel), and can be produced in relatively simple manufacturing processes.

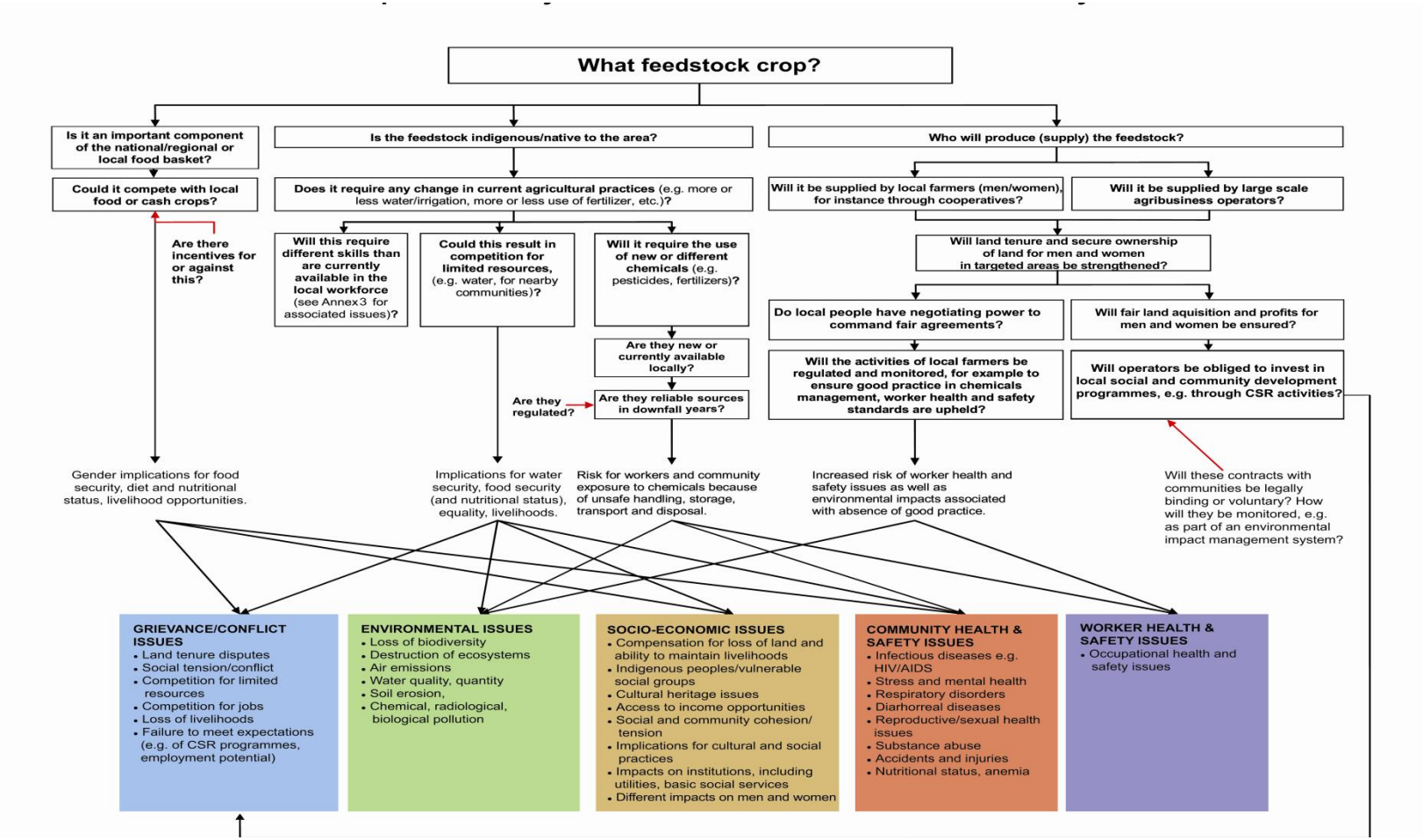
- *Solid fuels*: biomass directly burned for heating and cooking (wood, dried dung).
- *Liquid Biofuels:* Fuel produced from renewable resources, especially plant biomass, vegetable oils, and treated municipal and industrial wastes, for use in combustion engines directly or blended. The most important first generation biofuels are ethanol and biodiesel, but also include pure plant oil.
- *Bioethanol* is an alcohol derived from sugar or starch crops (*e.g.* sugar beet, sugar cane, sorghum, wheat, cassava or maize) by fermentation. Ethanol can be used in either pure form in specially designed engines, or blended with petroleum fuel.
- *Biodiesel* is derived from vegetable oils (*e.g.* rapeseed, jatropha, soy bean, palm pongamia, musine or castor beans) by reaction of the oil with methanol. Biodiesel refers to all biofuels that replace diesel, and low blends (up to 5%) can be used in all diesel engines.
- *Pure plant oil* (PPO) is one of the simplest liquid biofuels. Pure oil, extracted from oil-based plants is directly used as a biofuel. PPO can only be used in diesel engines that have been suitably modified.

Second and third generation biofuels

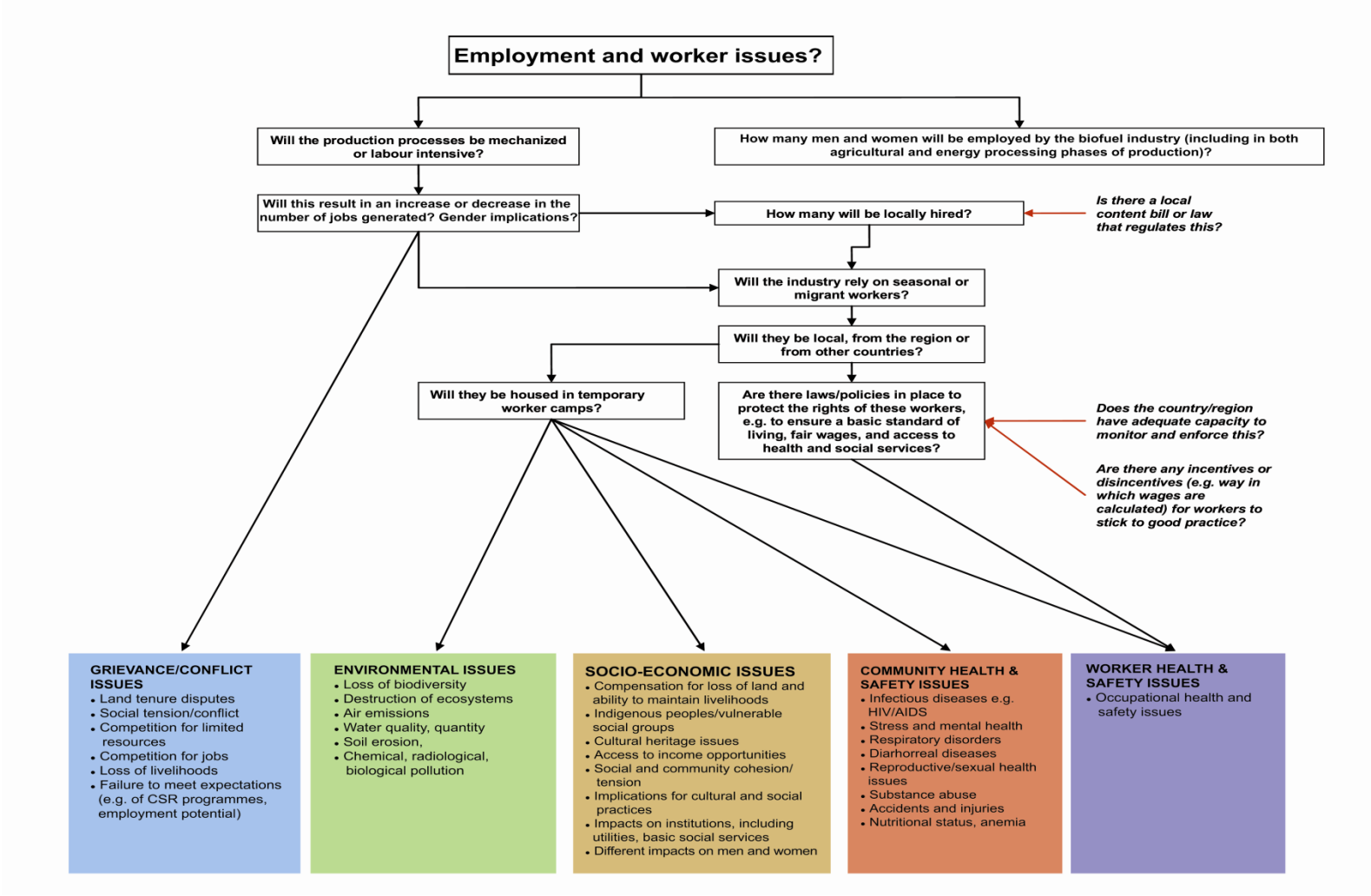
Second generation biofuels are derived from cellulosic materials such as timber, waste products from forestry, agriculture or households. Biodiesel produced from *e.g.* algae are referred to as 3rd generation. Second generation biofuels are beginning to come on-stream, but for the time being most biofuels will be first generation.[16] The manufacturing processes require sophisticated technologies, and are largely still under development, estimated to become competitive at the earliest by 2020.

[16] IIED Fuelling Exclusion - The Biofuels Boom And Poor People's Access To Land. Lorenzo Cotula, Nat Dyer and Sonja Vermeulen, 2008.

Annex 2.
Impact analysis framework on feedstock system selection



Annex 3.
Impact analysis framework on employment and worker issues



Annex 4.
Impact analysis framework on market and associated issues