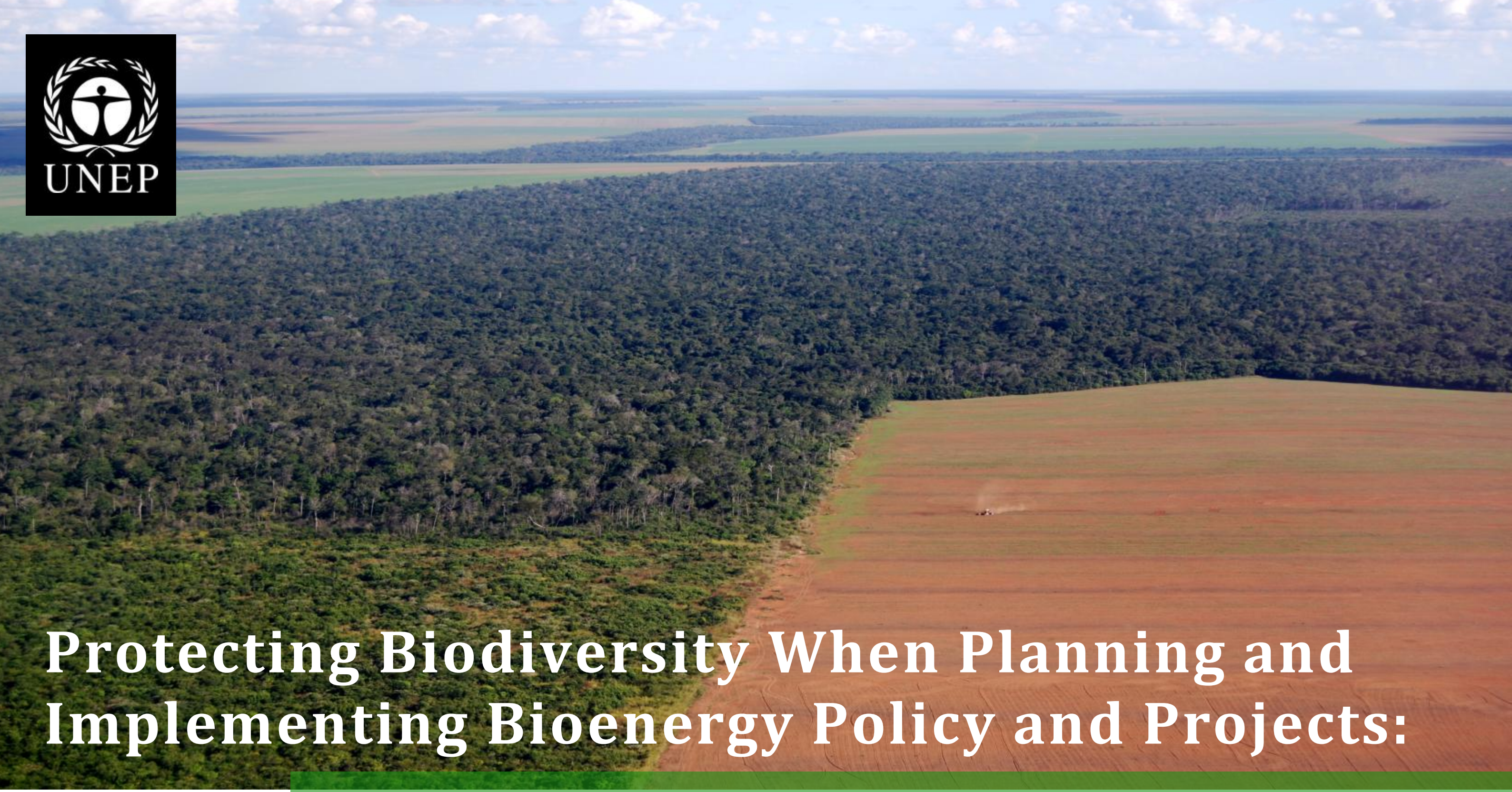


Protecting Biodiversity When Planning and Implementing Bioenergy Policy and Projects:

The Role of Agro-Environmental Zoning

The Challenge.

Evidence has shown that bioenergy development can present a threat to biodiversity. As the thirst for bioenergy (in particular, biofuels for transport) increases, so does the potential that natural lands, including primary forests, will be converted into plantations for these so-called "green fuels". Not only does this direct land-use change affect biodiversity, but indirect land-use change, where bioenergy feedstock production displaces other land use that then encroaches into natural lands, does as well, and in some cases to a greater extent. Land is a limited resource, and a number of global trends put further pressure on it: population growth, changing diets, yield developments and not least climate change. Bioenergy related land requirements impose additional pressure along with these trends, and it is recognised that other sectors that depend on biomass as input have similar risk potential.

Although the complexity of trends and assumptions that are pointed to in the direct and indirect land-use change discussions is still being understood, it is recognised that that impacts affecting the integrity of ecosystems need to be prevented all over the world, as ecosystems are the basis for life and human activities.

Beyond deforestation and land conversion from direct and indirect land-use change, there are a number of additional threats to biodiversity, including materialisation of invasiveness of potentially invasive species used for bioenergy production, GMO proliferation, increased competition for local water resources eventually directing water away from maintaining biodiversity, and increases in agro-chemicals and nitrogen use leading to run off eventually impacting water quality.

The bioenergy sector itself is dependent on ecosystem services provided by biodiversity; losses may come with economic repercussions for the short-term and future biofuel production.

Recognising that these challenges and issues are often times complex, the United Nations Environment Programme (UNEP) has been developing a series of initiatives that seek to answer the question – how do we ensure sustainable use that does not exceed the carrying capacity of ecosystems and thereby protect biodiversity from bioenergy production?

Navigating a Path to Sustainable Bioenergy: Mapping as a Tool.

To avoid creating negative consequences from bioenergy development on biodiversity, solid planning and implementation are needed. A range of methods, processes, and tools exist to safeguard biodiversity, both on a national policy level and on a project level. Mapping and zoning of areas suitable and available for bioenergy development are part of them, and should form the basis for decision-making processes.

As spelled out in the Bioenergy Decision Support Tool, prepared by FAO and UNEP under the framework of UN Energy, assessments should be carried out by using a combination of top-down and bottom up approaches, i.e. mapping and zoning and ground truthing. IUCN has broken down this approach into a four step process. Mapping would be part of step 1, and Box A gives a more detailed view on what is required:

Four step process for land suitability

Box A: Mapping Methodology for Sustainable Bioenergy
(UNEP, 2010)

1.) Data Collection and Compilation
- Identification of key biophysical data sets and compilation of agronomic characteristics

2.) Data Processing to Produce Suitability Areas
- Biophysical datasets are provided a range of values and overlaid in GIS

3.) Calibration of Suitability Map with Field Data
- Calibrating the feedstock suitability map and then ground truthing data collected

4.) Integration of Suitability Layers with Socio-economic Data
- Overlay key sustainability layers into a suitability map including: protected areas and parks, areas outside food and cash crop farming, within arable and non-arable land, wetlands and High Value Conservation Areas (HVCAs), biological corridors, and human conflict areas

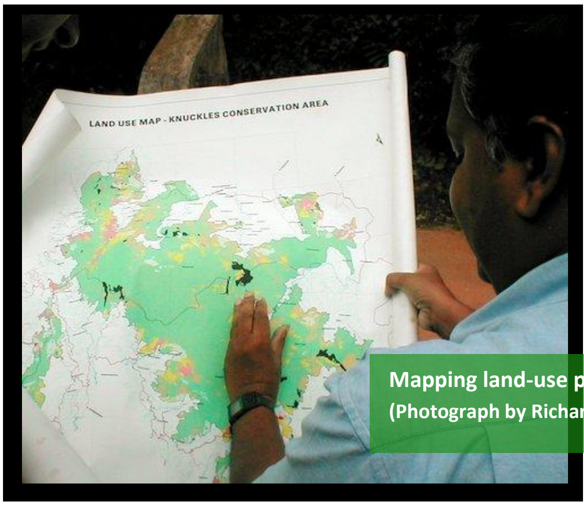
Mapping and zoning, and in particular agro-ecological zoning, is not necessarily new, what is new is using AEZ to plan bioenergy development and designate bioenergy production sites as well as areas where bioenergy is linked to high risks and hence should not take place at all, or only with particular safeguards being applied. A range of governments have started to use this tool for bioenergy planning, and underlying methodologies vary. Sharing experiences and approaches is helpful to forge a better understanding of the results of these mapping and zoning exercises, and eventually define a common methodology.

Agro-ecological zoning (AEZ) is a process that "defines zones on the basis of combinations of soil, landform and climatic characteristic" (FAO, 2010). The method is commonly used to identify feedstock appropriate sites for agriculture. In order to zone the areas that have the best suitability for bioenergy feedstocks, other variables besides AEZ must be considered to make these systems sustainable. Other variables and criteria that can be included on top of AEZ to determine appropriate sites for bioenergy production include: the presence of biodiversity; high value conservation sites; water resources and catchments; rare, endangered or threatened species; bird life areas; protected areas; cultural/historical sites; etc. The overall mapping methodology encompasses a series of activities (Box B).

Currently, mapping and zoning for bioenergy development has yet to be considered a priority mitigation tool for safeguarding biodiversity, as well as other potential impacts, including economic and social impacts. If implemented appropriately, and involving the key target audiences, zoning can help identify "no-go" areas for bioenergy and can illustrate the presence of areas of importance such as:

- Where to produce to provide (rural) energy access and to ensure energy security;
- Food security conflicts of interest; agriculture development;
- Conservation, restoration, eco-system rehabilitation areas;
- Areas with land ownership or land tenure conflicts;
- Disadvantaged socio-economic areas.

A range of data gaps have been noticed, particularly when it comes to biodiversity. It is fairly easy to access information on Protected Areas, designated under the Convention on Biological Diversity, or wetlands designated under the Ramsar Convention. However, beyond this, other areas may carry high levels of biodiversity, and an accessible database or assessment tool adapted to the needs of bioenergy planning would be of great help.

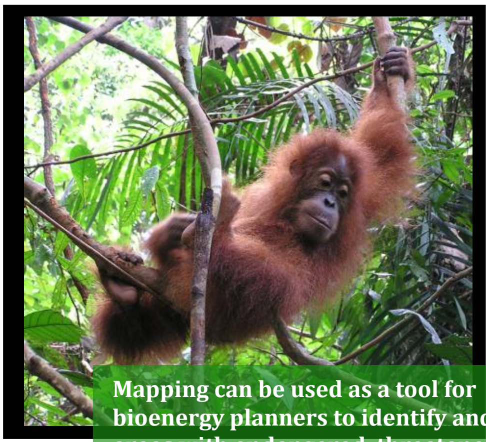


Mapping land-use patterns in Sri Lanka
(Photograph by Richard Forrest)

What are the building blocks for a solid mapping methodology?

Many variables need to be measured when detailing a basic methodology for mapping. The level of detail (i.e. scale and accuracy) for each variable is important for planners to consider; and often times the most optimal data that is able to be gathered is a decision between availability and cost. Below are the minimum variables that build the structure for a bioenergy mapping methodology:

- **Land Suitability**
  - Agro-climatic:
    Water Balance
    Temperature
  - Edaphic:
    Topography (altitude and slope)
    Soils
  - Climate change outlook/ adaptation
- **Land availability**
  - Environmental screening/ sensitivity areas
  - PA
  - Ecosystem services
  - Wildlife
  - HCV
  - LCV/degraded land
  - Land cover
- **Social**
  - Cultural / medicinal use areas
  - Current land use / Food/Fodder
  - Urban
  - Conflict
  - Archeological
  - Land tenure
- **Infrastructure / logistics**



Mapping can be used as a tool for bioenergy planners to identify and avoid areas with endangered, threatened, and/or rare species.

The bioenergy sector itself is dependent on ecosystem services provided by biodiversity.

Guidance for bioenergy planners and decision makers: A timeline for developing a bioenergy mapping methodology
What needs to be done when by whom?

Completed

	Getting paid (much of the EIA could be done – get compensated for that)	
1 – 2 Weeks	Finalize & present model (w/metadata)	Team & Client
7 days – 1 month + depending how complex	Field verification; clarify with clients / end user	Specialists & locals
2 months	Refine data appropriate and go for the 'optimal set'/ ideal data set	Team
	Identification of feedstocks	Team leader & client/ end-user & agronomic experts
1 week	Validation	Team leader & client/ end-user, and if necessary involve experts on both sides
20 days	Draft map	Team
1 week	Analysis of quality of the data; filter; final check	Team
1 month	Collect data	Team
1 day	Validation of the team's methodology with the client	Team lead & client end-user
1-2 days	Discuss and clarify TOR; methodology; kickoff meeting	Team
Days – 1 m	Establish final team; drawing from international institutes, contracting	Team lead
Best case 1 month, but take time needed to get it right	TOR to clarify expectations, incld. initial range of feedstocks	Client & team lead & end-user
When?	**What?**	**Who?**

Day 0

Selected UNEP Activities.

The ongoing work with suitable land identification for bioenergy facilitates the dialogue, exchange and research that are necessary to protect the environment and vulnerable communities. Below a few activities that involve land planning processes to protect biodiversity are highlighted:

Zoning of Kenya for biofuel production

- *Description*: Undertaken in Kenya, together with ACTS and PISCES, the study identifies key areas in the country such as exclusion areas, biodiversity areas, areas that have competition with food production, etc. and overlays it with data layers on the agricultural potential for biofuels for a selection of crops.

- *Outcome*: The result is a methodological approach that integrates sustainability layers and a set of zoning maps of the country which identify areas that are suitable and available for biofuel production. This activity was closely linked to the bioenergy policy development process, and complemented with a stakeholder outreach meeting. This approach is being replicated in other countries, for example in Senegal building on a cooperation agreement with the Brazilian Fundacao Getulio Vargas.

Regional workshop on methodology for agro-environmental zoning for bioenergy production

- *Description*: This workshop brought together several GIS experts that have been involved in their respective countries' mapping and zoning undertakings, and representatives from IUCN and UNEP to develop and propose a refined methodology for agro-environmental mapping for bioenergy based on lessons learnt from previous experiences in these countries.

- *Outcome*: A set of key indicators for sound mapping and zoning was developed, and research and data gaps were identified. A practitioners network was started amongst the experts present at the workshop; the network is open for other interested parties.

Two expert workshops on: Bioenergy and Biodiversity: Criteria and Processes for Identifying High Conservation Value Areas and Sustainable Use of Degraded Lands

- *Description*: UNEP, the Oeko Institut and the Roundtable on Sustainable Biofuels, in collaboration with Conservation International, IUCN, FAO and the WWF organized this first workshop to flag the issue of identifying suitable land for bioenergy. Building on the first workshop, the second workshop zoomed in on the need for a common process to define 'go' and 'high risk' areas.

- *Outcome*: Participants identified the challenges in developing definitions for degraded land and exchanged research on respective areas of work. Experts began a process to define a methodology for appropriate land identification for sustainable bioenergy to be fed into ongoing policy formulation.

This work feeds into several other platforms, on the national policy and the project level:

- *Global Bioenergy Partnership (GBEP):* GBEP is currently identifying sustainability indicators for bioenergy, including indicators for biodiversity.

- *Roundtable on Sustainable Biofuels (RSB):* The RSB has defined a set of principles and criteria for sustainable biofuels and is currently testing the certification on the ground, including the applicability of its indicators related to biodiversity protection.

Shifting the Paradigm Not the Impact.

Guided by concerns of sustainable resource management, the question that should be asked prior to decision making is – what is the best use for a hectare? Answering this question entails an assessment of bioenergy development in light of the full set of policy objectives. These may vary from country to country, but should always be formulated taking a holistic approach and not a specific lens. This can be addressed with comprehensive solutions, such as mapping and zoning, taking into account a range of impact categories, which not only protect the integrity of our Earth's natural resources, but also address economic development and social development at the same time. In the end, all depends not only on where bioenergy development takes place but also how it is done (UN-Energy Bioenergy Decision Support Tool, 2010).

For a complete list of projects that UNEP is involved in and accessing publications mentioned throughout the document please visit: http://www.unep.fr/bioenergy

For further information on the bioenergy program at UNEP please contact Martina Otto, Head Policy Unit, Energy Branch, Division of Technology, Industry and Economics, at: Martina.Otto@unep.org