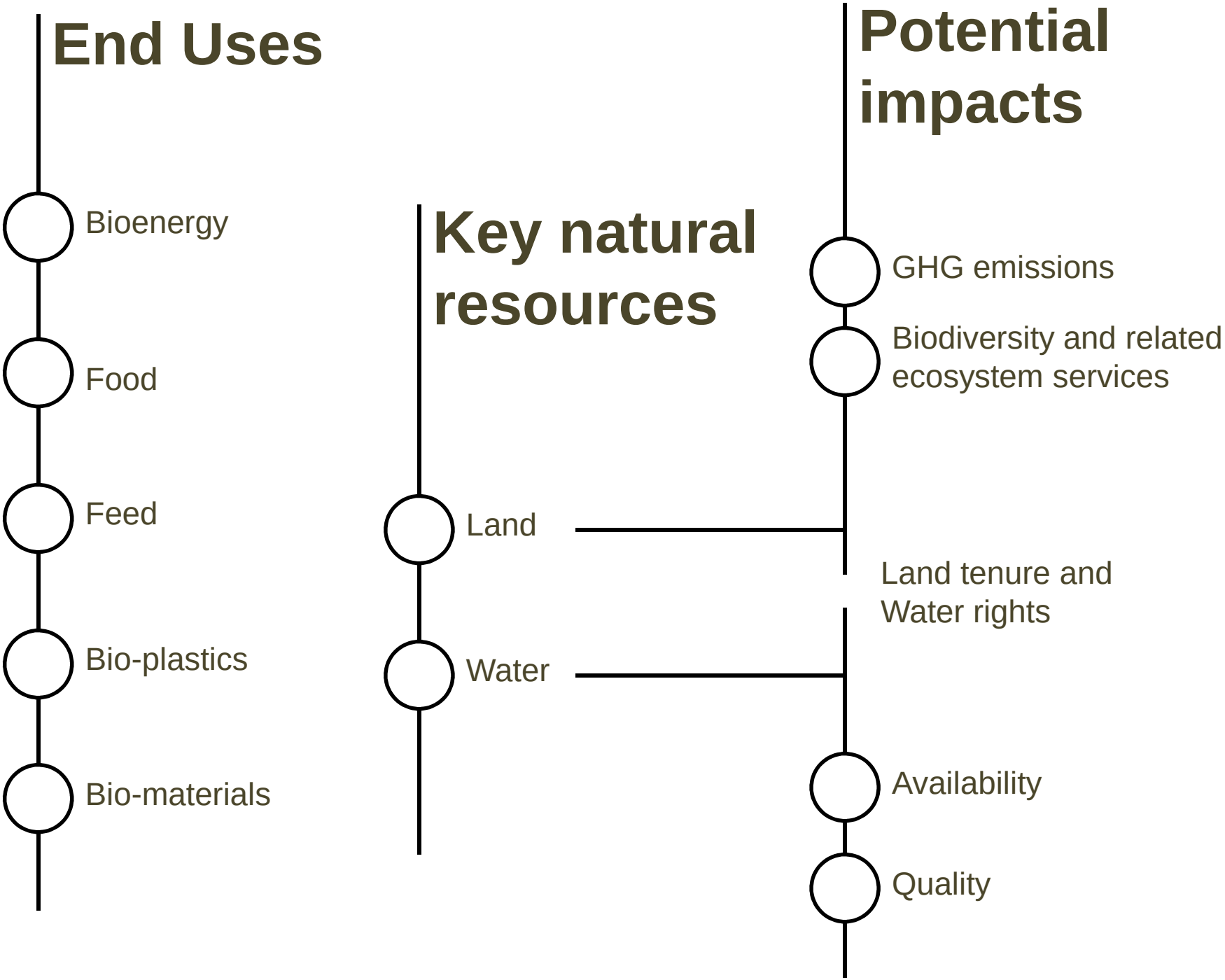
Natural Resource Efficiency

Why does it matter?

What can we do?


End Uses
Bioenergy
Food
Feed
Bio-plastics
Bio-materials
Key natural resources
Land
Water
Potential impacts
GHG emissions
Biodiversity and related ecosystem services
Land tenure and Water rights
Availability
Quality

Relevant findings from UNEP GEO-5

Land:

Gross expansion of cropland under business as usual conditions is estimated to be increasing from 21 - 55% from 2005 to 2050. **This threatens the very basis for human development and well being**: Since 1970 land conversion and degradation has resulted in declines of 20 per cent of some natural habitats.

Water

Global water withdrawals have tripled over the last 50 years. **Aquifers, watersheds and wetlands are increasingly at risk**. Today, 80 per cent of the world's population lives in areas with high levels of threat to water security. Some 90% of the total global water footprint is related to agriculture.

Bio-diversity

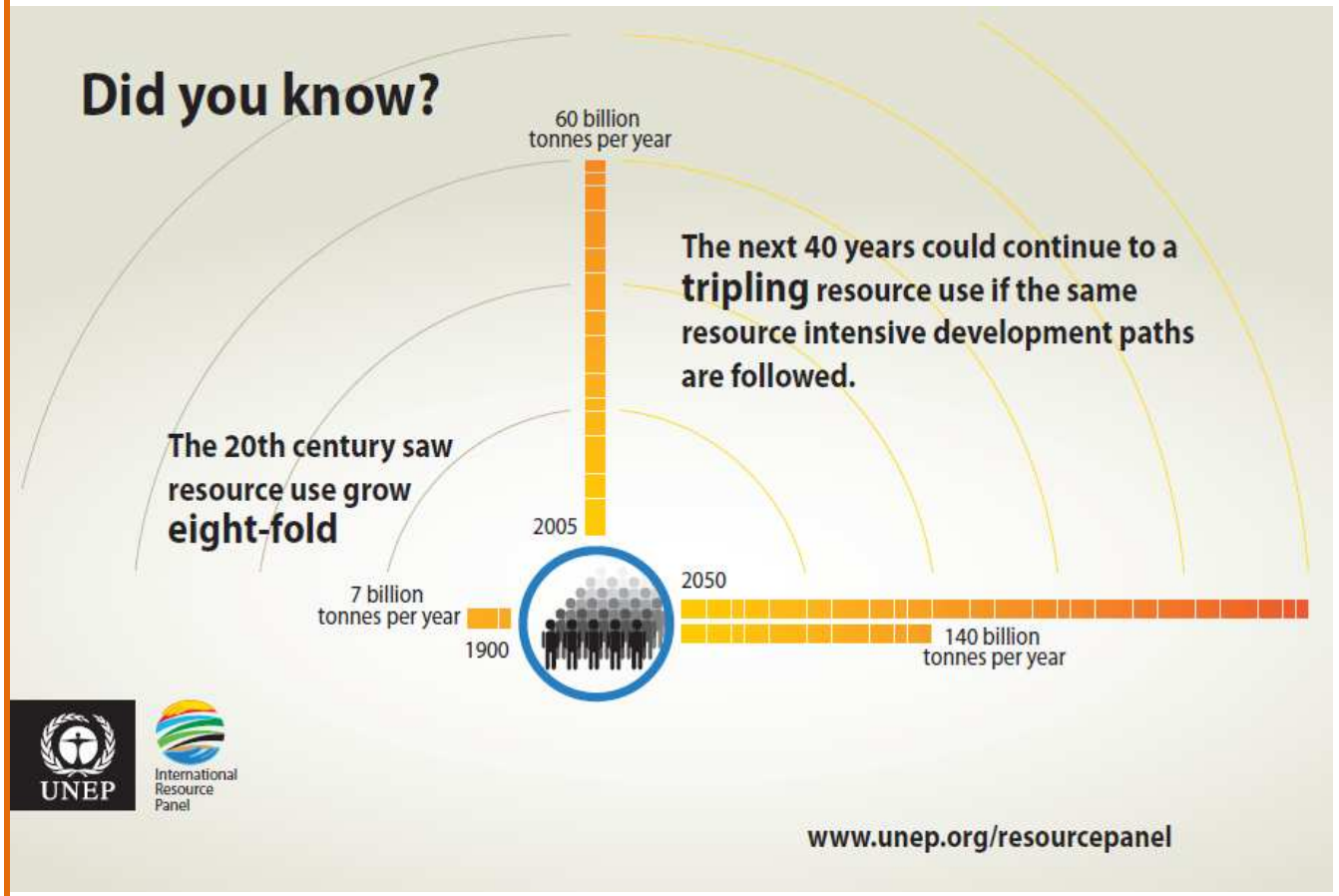
Habitat loss and degradation remain predominant threats to terrestrial and aquatic biodiversity. **Species are declining.** Since 1970, vertebrate populations have fallen by 30%.

Climate Change

Reducing global GHG emissions so as to hold the increase in global average temperature **below 2°C** above pre-industrial levels will require transformative change towards a low carbon global economy.
Climate Change will have profound impacts on biodiversity.

UNEP GEO-5 and International Resource Panel:

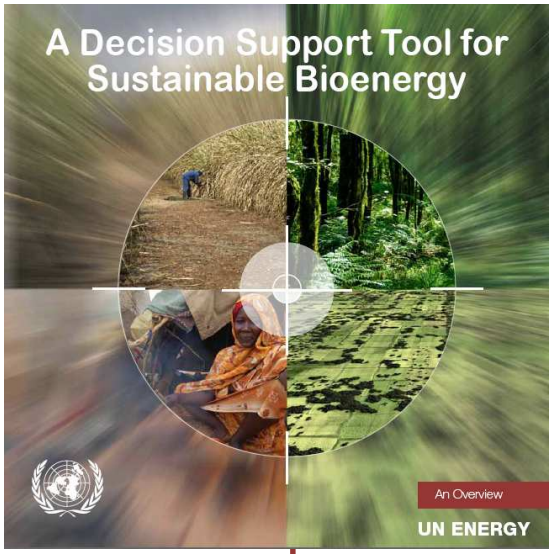
- We are already observing unprecedented changes to the Earth System.
- Efforts to slow the rate or extent of change have resulted in moderate success but not in reversing adverse environmental changes.



- We need transformational changes and innovative integrated solutions based on integrated assessments.

Good planning and management of bioenergy development is critical, both on the policy and project levels.

Integrated solutions need to be developed and incentivised.



www.bioenergydecisiontool.org

a web-based tool and living document
developed by FAO and UNEP
under the framework of UN Energy
to assist countries to manage risks and challenges,
in a process anchored in each country's specific context:

- **step-wise guidance** for strategy formulation and investment decision-making processes
- **repository of technical resources** and links to existing tools, guidelines and resources
- **guidance on identification and inclusion of stakeholders** in the bioenergy decision-making process and on adopting transparent processes for good governance

What?

Feedstocks. Technologies. End uses.

- Identify feedstock options
- Evaluate technical capacity
- Assess conversion platforms, inclusion of pre/post-processing and transport infrastructure requirements
- End-uses and Energy services

Where?

Land use. Land use change. Land use planning.

- conduct a land suitability assessment
- identify and map areas of special sensitivity, i.e. ‘high risk areas’ in terms of potential damage to vital ecosystem functions
- identify and map existing agricultural production areas
- overlay infrastructure information to evaluate market accessibility and the economic feasibility of feedstock production
- conduct ‘ground-truthing’ in areas with potential for feedstock production, involving local communities and other relevant stakeholders

How?

Scales. Business Models. Good practices.

Integrated Food Energy Systems:
integrate, intensify, and thus increase the simultaneous production of food, and energy

Co-products:
improve energy balance and economic viability;
energy cascading, e.g. CHP non-energy: chemicals and materials

Sustainable Agriculture Practices:
Agro-Forestry; Conservation Agriculture; Eco-Agriculture; Good Agricultural Practices; Integrated Pest Management; Invasive Species

Sustainable Forest Management:
ensure long-term availability of resources while maintaining ecosystem services such as soil and watershed protection

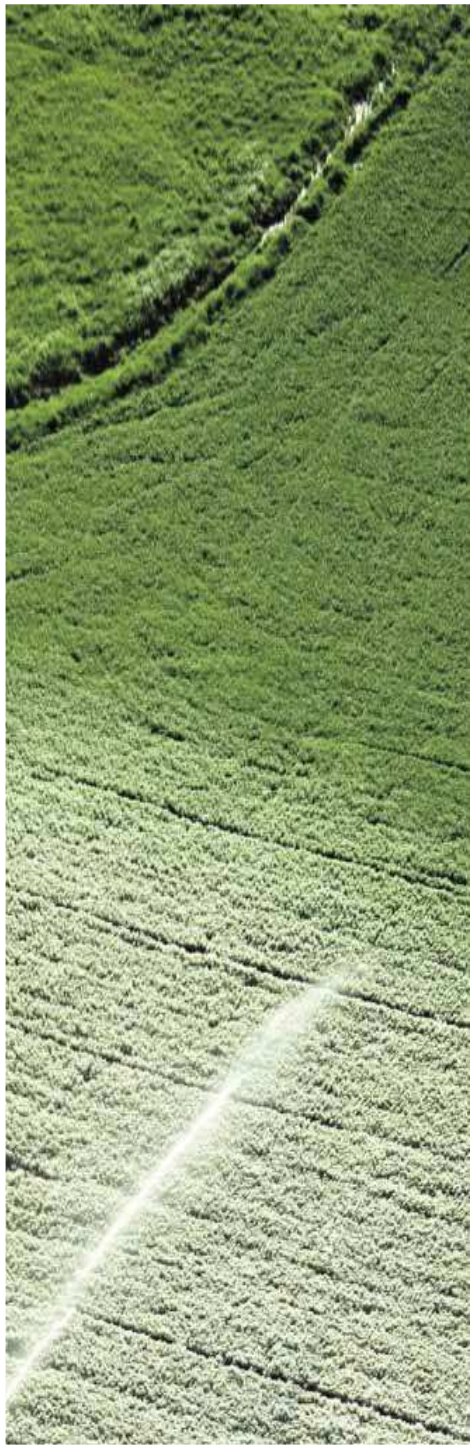
GBEP indicator 8: Land use and land-use change related to bioenergy feedstock production

• Total area of land for bioenergy feedstock production, and as compared to total national surface and agricultural and managed forest land area

• Percentages of bioenergy from yield increases, residues, wastes and degraded or contaminated land

• Net annual rates of conversion between land-use types caused directly by bioenergy feedstock production, including the following (amongst others):

- o arable land and permanent crops, permanent meadows and pastures, and managed forests;
- o natural forests and grasslands (including savannah, excluding natural permanent meadows and pastures), peatlands, and wetlands



GBEP indicator 5: Water use and efficiency

- Water withdrawn from nationally-determined watershed(s) for the production and processing of bioenergy feedstocks, expressed:
  - as the percentage of total actual renewable water resources (TARWR) and
  - as the percentage of total annual water withdrawals (TAWW), disaggregated into renewable and non-renewable water sources
- Volume of water withdrawn from nationally-determined watershed(s) used for the production and processing of bioenergy feedstocks per unit of bioenergy output, disaggregated into renewable and non-renewable water sources.

→ Water demand of bioenergy/availability; efficiency in use
→ Threat to water bodies – scarcity
→ Competing uses
→ Best practices to promote efficiency
→ Integrated Water Management and Planning

Water Resource Management
Water Policies

Enabling conditions

institutional and legal environment in which water is supplied and used.; e.g. water rights, collective action (e.g. water user associations that manage water allocation within irrigation systems as a group), privatization of utilities;

Market-based incentives

incentives to conserve water, including water pricing, water markets (e.g. tradable water use rights and water pollution trading), effluent charges);

Command and Control

water quotas, licenses and pollution controls (e.g. water standards);

Direct inter-ventions

investments in efficiency or conservation programmes, including rehabilitation and restoration of water infrastructure in all sectors.

Example 1
EU Water Framework Directive

WFD covers surface and groundwater, and uses a river basin approach. It mandates supporting **river basin plans** to be introduced in all Member States, **deadlines for reaching "good ecological status"** for all water, and **sets emission limits and quality standards**.

Implementation of the WFD strongly depends on the **development of agriculture and land use,** which is influenced by the EU's Common Agricultural Policy (CAP) and bioenergy-related policies.

Rural Development Regulation provides **financial support**, e.g. agro-environmental and agro-forestry payments, and farm investment support.

Perennial herbaceous and short rotation woody plants can lead to improved water quality. Hence, **the integration of such plants into the agricultural landscape has been proposed to help achieve the WFD objectives.**

Example 2
National Water Act, South Africa

In the NWA of South Africa, the **impacts of land use and land use change on the hydrological cycle and their potential impact on water resources are recognised**.

Through '**stream flow reduction activity**', "any activity … [that] … is likely to reduce the availability of water in a watercourse to the Reserve, to meet international obligations, or to other water users significantly", the potential water use and likely impact of biofuel feedstock production needs to be **assessed before** permission is granted for production, incl . water use **license.**

Production of biofuel crops under irrigation is allowed only under exceptional circumstances by the Department of Minerals and Energy. Farmers with existing water use licenses cannot be prevented from converting their output from food/fodder crop production to biofuel feedstock production, but license applications for biofuel processing plants will not be approved if the plants are to receive irrigated feedstock. **An industrial water tariff is considered,** effectively charging much more than the usual subsidized agricultural tariff.

Key take-aways

action areas

Bottom up – land use planning and water management as the basis

Coordinated policies – balancing drivers; inter-ministerial cooperation

Integrated systems – new business concepts

Best practices – ag extension services

Monitoring performance – taking corrective action

guiding questions

How to best use a ha/drop of water?
Manage the cultivated ha/watersheds efficiently

What is the best use of a ha?
Manage demand to keep land and water use within sustainable limits

What is the best use of biomass?
Competing uses – assessing the alternatives

- Food: address food waste
- Feed: changing diets
- Fuels: avoid-shift-clean
- Biomaterials: cascading use

UNEP's approach to bioenergy

**Bioenergy is neither good nor bad per se;
to avoid unintended consequences in the short and long-term,
bioenergy development requires solid planning and management,
both on the national policy and strategy and the project levels.**

Scientific assessments:

International Panel for Sustainable Resource Management: Assessing Biofuels report (2009)

The Bioenergy and Water Nexus, UNEP, IEA Bioenergy Task 43, Oeko Institut (2011)

Issue Paper series on emerging issues: Land use and land use change ; Bioenergy and Water; Invasive species; Stakeholder consultation; Group Certification; Facilitating Energy Access; REDD+

Assessments & Guidelines for Sustainable Liquid Biofuel Production in Developing Countries, funded by GEF, implemented with FAO and UNIDO, providing guidance on environmental, social and economic performance of biofuel projects.

Tools:

Global Bioenergy Partnership (GBEP):
-Methodological framework for GHG calculations
-Sustainability criteria & indicators

Roundtable on Sustainable Biofuels (RSB):
-solid multi-stakeholder process
-all major issues are covered

UN Energy Decision Support Tool for Sustainable Bioenergy (DST), developed by UNEP and FAO to provide stepwise guidance to decision makers in governments to develop sustainable bioenergy policies and strategies, and to assess investment proposals.

Finance:

CASCADe: enhancing African expertise to generate carbon credits in the forestry and bioenergy sectors by providing technical assistance, institutional support and training workshops.

Jatropha-based PoA: assessing the feasibility of a CDM Programme of Activities for rural energy generation from Jatropha oil in Mali.

African Rural Energy Enterprise Development promoting rural energy enterprises, includes a bioenergy component that allows to demonstrate additional environmental and social benefits resulting from 'local production for local use' projects.
performance of biofuel projects, using a settings approach.

Regional and national support:

Bioenergy Policy Support Facility, providing advisory services to governments developing and implementing bioenergy policies, strategies and measures, mobilizing local and international experts: targeted consultations; science-based information for decision making; advice on legal frameworks, planning and management tools; and guidance on processes to facilitate integrated decision-making.

Mapping of land suitable and available for bioenergy development:
-Methodology refined (GIS and groundtruthing)
-completed in Kenya, Uganda, Senegal

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www.unep.fr/energy/bioenergy