Environmental sustainability in biomass supply: local to global issues

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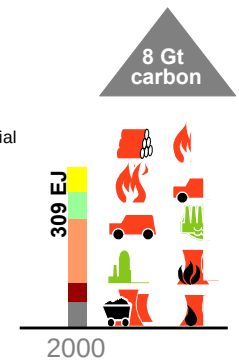
Today's energy infrastructure

Source: WBCSD

Final Energy
- Electricity
- Gas
- Liquids
- Solids
- Non-commercial



Direct burning of fuel	3-4 Gt
800 million vehicles	1+ Gt
700+ coal power stations	1.5 Gt
Non-commercial biomass	1 Gt
800 gas or oil power stations	0.7 Gt
Non emitting technologies	0 Gt
	8.0 Gt

25EJ per year Solar | 500,000 5MW wind turbines | 1000 1GW coal power stations | 1000 1GW coal stations with sequestration | 1000 1GW oil power stations | 1000 1GW gas power stations | 1000 1GW nuclear plants | 1000 1GW hydro/ tidal /geothermal | 500 million vehicles (Biofuels) | 500 million low CO_2 (Biofuels) | 50EJ non-commercial fuel | 100 EJ direct fuel use (Biofuels)

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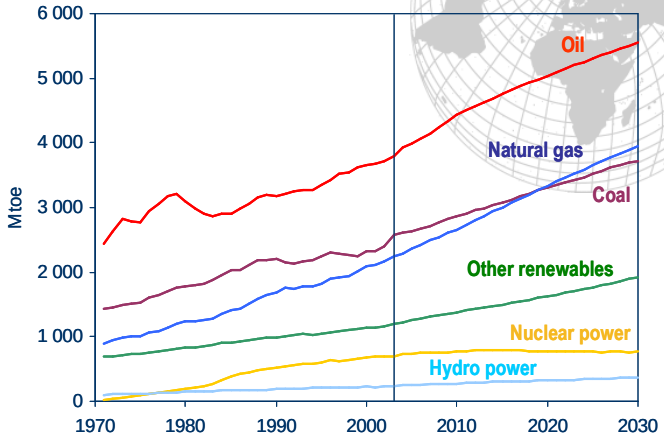
World primary energy demand

Source: IEA

Oil, gas and coal together account for 83% of the growth in energy demand between now and 2030 in the IEA WEO Reference Scenario



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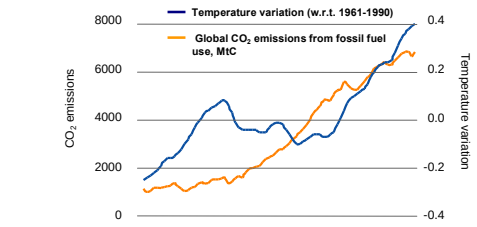
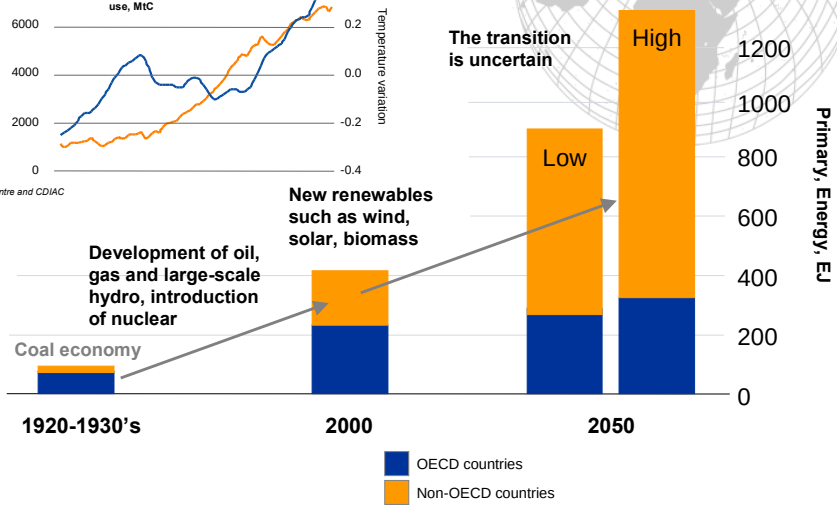
How will our energy system develop?

Source: WBCSD



Source: *Hadley Centre and CDIAC*



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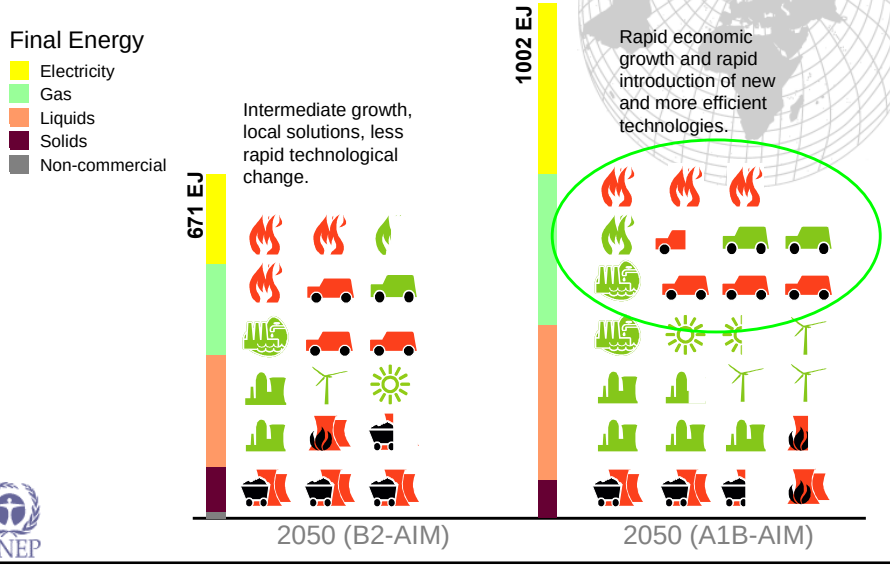
Meeting future energy needs

Source: IPCC and WBCSD



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There is no energy source without drawbacks …

- *Environmental risks of biofuel production*
  - Potential negative local impacts:
    - Biodiversity loss
    - Water depletion
    - Excessive use of chemical fertilizers and pesticides, eutrophication
    - Degraded soil
  - Potential negative global impacts
    - Net GHG emissions can be positive (or perhaps not as favorable as anticipated in terms of emissions reduction)
- *Social risks of biofuel production*
  - Increased food prices
  - Conflict between local and international interests

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There is no energy source without drawbacks …

Sugar rises as Brazil looks to increase ethanol output

By Claudia Carpenter and Marianne Stigset

LONDON: Raw sugar in New York rose by the largest amount in two weeks on speculation that Brazil, the world's biggest grower, will divert more sugar cane to produce ethanol.

"Brazil is coming to the tail end of this year's crop and ethanol prices are giving a better return than sugar," said Michael McDougall, a broker at Fimat USA in New York.

Brazilian ethanol makers urged President Luiz Inacio Lula da Silva of Brazil last month to increase the mix of ethanol in gasoline to 25 percent from 20 percent.

Sugar has dropped 27 percent this year as Brazil harvested its biggest sugar crop on record.

Raw sugar for March delivery rose 0.06 cent to $11.17 cents a pound on the New York Board of Trade, the biggest gain since Sept. 13.

On Sept. 25, prices fell below 10 cents a pound for the first time since August 2005. That "brought buyers back in again," said Judy Ganes-Chase, president of J. Ganes Consulting in New York.

The October contract, which expires in two days, rose as much as 6.1 percent. Sugar traders are obliged to deliver 53,085 contracts for October, more than twice the number that had been due to be settled for July, data from the New York exchange showed.

"You have the big trade houses playing on the delivery," McDougall said.

White, or refined, sugar for March delivery rose $9.20 to $345 a metric ton on Euronext.liffe.

Gold in New York rose $6.20 to $603.30 after oil prices increased. The rise was credited to a jump in the price of oil.

Gold has dropped 18 percent from a 26-year high of $732 an ounce on May 12, partly because crude oil has declined 22 percent from a record in July.

Crude oil rose on speculation that the Organization of Petroleum Exporting Countries may act to prop up prices that have plunged almost $16 since mid-July.

Crude oil for November delivery rose $1.95 to $62.96 a barrel on the New York Mercantile Exchange.

European Futures | *Wednesday, Sept. 27*

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… and tradeoffs exist

There can be a conflict between issues of local and global environmental concern

But local environmental concern can push global environmental achievements

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Example: palm oil production in Malaysia

- High demand from Europe
- Linked to conversion of tropical rainforests
- Threat to indigenous people and endangered species of wildlife (orangutans, tigers, rhinos)

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What is required to ensure environmental sustainability?

- Correct policies, institutional and legal frameworks in developing countries
- Enforcement of environmental laws and regulations
- Institutional capacity building and efforts that strengthen skills
- An internationally agreed system (certification or other assurance) to ensure sustainability of biomass intended for biofuels production
- Knowledge and technology transfer
- Near-term research involving developing countries

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What is UNEP doing?

Working with the private sector, NGOs and governments in developing:

- Assessment schemes and sustainability criteria
- Development of sustainable business models for biofuels development in developing countries

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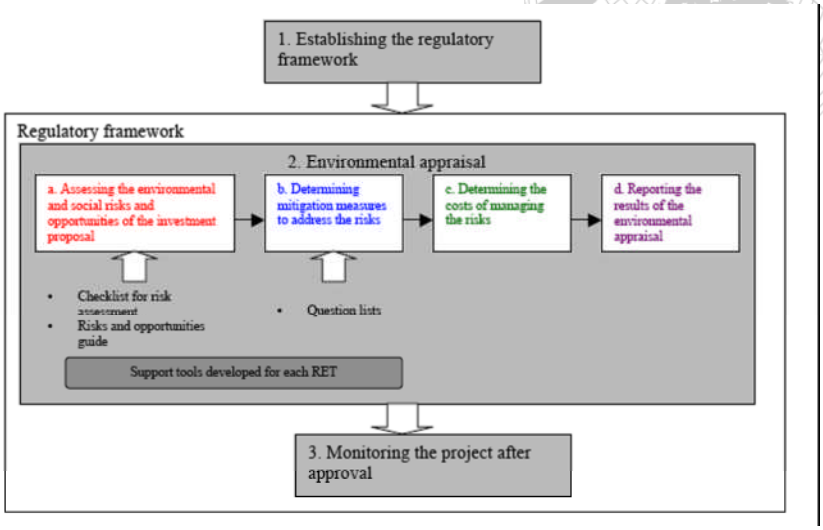
Environmental Due Diligence

Risk assessment of biomass systems



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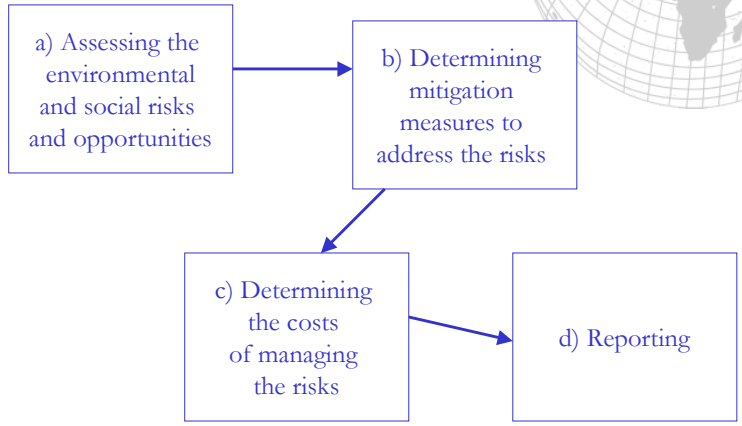
Environmental Due Diligence
Risk assessment of biomass systems based on energy crops



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Environmental Due Diligence
Risk assessment of biomass systems based on energy crops

1. Issues related to effluent emissions, site contamination, and use of hazardous materials
   - Use of pesticides
   - Use of chemical fertilisers
   - Emissions of NO_x, SO_2, CO, particulates, VOCs, greenhouse gases
   - Solid waste generation

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Environmental Due Diligence
Risk assessment of biomass systems based on energy crops

2. Issues related to the protection of biodiversity
   - Land clearing and conversion of forests; habitat fragmentation
   - Introduction of non-native species
   - Use of genetically modified organisms
   - Competitive pressures arising from water use

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Environmental Due Diligence
Risk assessment of biomass systems based on energy crops

3. Issues related to workers' health and safety
   - Exposure to pesticides and other agricultural chemicals
   - Risk of accidents in crop cultivation and harvesting
   - Risk of industrial accidents in processing / conversion stages (fires, explosions, mechanical accidents)

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Environmental Due Diligence
Risk assessment of biomass systems based on energy crops

4. Environmental issues sensitive to public opinion and pressure
   - land use and land use change
   - soil erosion or compaction
   - water depletion
   - loss of biodiversity
   - visual impact of facilities
   - noise
   - traffic

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Biomass certification effort with DaimlerChrysler

FSC - Forest Stewardship Council
PEFC - Programme for the Endorsement of Forest Certification schemes
CSA - Canadian Standards Association's Sustainable Forest Management Standard
SFI - Sustainable Forestry Initiative
RA - Rainforest Alliance
USF (KUL) - Umweltsicherungssystem
UTZ Kapeh - Certification system for fair traded coffee; GAP guidelines
EUREPGAP - Euro-Retailer Produce Working Group
IFOAM - International Federation for Organization Agriculture Movements
Naturland - Naturland
BIO - Bio Siegel
EUGENE - European Green Electricity Network
Green Gold - certification system to trace biomass from sustainable production
RSPO - Roundtable on Sustainable Palm Oil
Fairtrade - certification of fair traded products

Notes:
* USF(KUL) documents were only available in German
** IFOAM Criterion are only available for purchase
*** EUGENE applies to 'eligible sources' for biomass production such as dedicated energy crops or agricultural residues but the label does not provide specific criteria for biomass production (Lewandowski, Faaij, 2004, p.7).

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Summary of indicators for social criteria

No	Categories	FORESTRY				AGRICULTURE								BIOENERGY			TRADE
	Social Criteria	FSC	PEFC	CSA	SFI	RA	SQF	USF (KUL)*	UTZ KAPEH	EUREP GAP	IFOAM**	Naturland	BIO	EUGENE* **	Green Gold	RSPO	Fair Trade
1	Labour conditions	x	x			x			x	x						x	x
2	Protection of human safety & health	x	x			x			x	x						x	x
3	Rights of indigenous people	x	x	x					x							x	
4	No discrimation against gender,race, etc		x			x			x							x	x
5	Elimination of child labour use		x			x										x	x
6	Protection of women and reproductive rights								x							x	x
7	Access to resources ensuring adequate quality of life	x	x		x	x			x	x							x
8	Food and energy supply safety									x					x		
9	Capacity building	x	x	x	x	x			x	x						x	x
10	Combating poverty				x												
11	Democratic participation of multi-stakeholders		x													x	x
12	Land ownership being equitable															x	x
13	Community well-being	x			x	x				x							x
14	Fair trade conditions									x							x
15	Allow employees to unionize	x							x							x	x
16	Promote educational benefits for employees and their families								x								
17	Provide healthcare access for employees								x								

Legend :

X - indicators used in each criteria by the different certification system

new updates as of 22/06/06

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Summary of indicators for economic criteria

No	Categories	FORESTRY				AGRICULTURE								BIOENERGY			TRADE
	Economic Criteria	FSC	PEFC	CSA	SFI	RA	SQF	USF (KUL)*	UTZ KAPEH	EUREP GAP	IFOAM**	Naturland	BIO	EUGENE* **	Green Gold	RSPO	Fair Trade
1	Viability of the business (business minimizes costs to ensure competitiveness and has adequate funding to sustain operations)	x	x												x	x	x
2	Long-term commitments, contracts, management plans	x	x												x	x	
3	Strengthen and diversity of local economy	x		x					x								
4	Reliability of resources (guards against supply disruptions)	x	x							x					x		
5	Sustainable harvesting and yields (agricultural yields should be maintained on an economically viable and stable level)	x	x	x	x				x						x	x	
6	No blocking of other desirable developments	x		x													
7	wage regulations (ie. set minimum wages)															x	

Legend :

X - indicators used in each criteria by the different certification system

new updates as of 22/06/06

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Summary of indicators for ecological criteria

No	Categories	FORESTRY				AGRICULTURE								BIOENERGY			TRADE
	Ecological criteria	FSC	PEFC	CSA	SFI	RA	SOF	USF (KUL)*	UTZ KAPEH	EUREP GAP	IFOAM**	Naturland	BIO	EUGENE* **	Green Gold	RSPO	Fair Trade
1	Protection of the atmosphere		x		x	x			x	x					x		
2	Preservation of existing sensitive ecosystems	x	x	x	x	x			x	x					x	x	x
3	Conservation of biodiversity	x	x	x	x	x			x	x					x		x
4	Conservation and improvement of soil fertility - aviodance of soil erosion	x	x	x	x	x			x	x		x			x	x	x
5	Conservation of ground and surface water	x	x	x	x	x			x	x		x			x	x	x
6	Combating deforestation	x	x	x	x	x			x						x	x	
7	Combating desertification and drought	x				x									x		
8	Improve or preserve landscape	x	x	x	x	x			x	x					x	x	x
9	Conservation of non-renewable resources		x												x		x
10	Waste management and minimisation	x	x			x			x	x		x				x	x
11	Proper use of agrochemicals	x	x		x	x			x	x		x	x		x	x	x
12	Reduce pollution and emissions								x	x					x	x	
13	Prohibit or record genetically modified plants	x	x			x			x	x			x		x		x
14	Pest management control system					x			x						x	x	

Legend :

X - indicators used in each criteria by the different certification system

new updates as of 22/06/06

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Summary of indicators for general criteria

No	Categories	FORESTRY				AGRICULTURE								BIOENERGY			TRADE
	General Criteria	FSC	PEFC	CSA	SFI	RA	SOF	USF (KUL)*	UTZ KAPEH	EUREP GAP	IFOAM**	Naturland	BIO	EUGENE* **	Green Gold	RSPO	Fair Trade
1	Compliance with laws and international agreements		x	x	x	x			x							x	
2	Traceability of products from source	x	x						x	x					x		
3	Aviodance of leakage effects																
4	Strengthening the role of NGOs		x	x		x											
5	Improvement of local conditions	x			x	x			x						x	x	
6	Transparency in practice and process	x	x	x											x	x	x
7	Social and environmental impact assessments undertaken before new projects started	x		x	x	x				x					x	x	x
8	Regular updates and internal inspection	x	x		x	x			x	x					x		x

Legend :

X - indicators used in each criteria by the different certification system

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Final thoughts

- There is a large economic potential for biofuels but some cause for concern about the environmental and social consequences if these are not given sufficient attention.
- Competitive biomass technology combinations are within reach for the world market but expansion needs consistent policies and some market support measures.
- Biofuels have a bright future, but some degree of policy coordination amongst agriculture, trade, climate, energy and development is needed if the potential is to be realized.

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