

LACAF- II: Food Security, NIPE

23 Oct/2013

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Summary – Two parts

- Energy changes
- World final energy outlook
- Energy subsidies
- Unconventional fuels
- Global scenarios
- Biofuels and global land use
- Biofuels
- The Food versus Fuel Debate
- The hidden hunger and food waste
- LACAf- Food Security issues- key questions

Two radical changes with global impacts (IEA data)

- The emergence of shale gas (gas esquisto/gas pizarra)
- Growing energy independence of USA
 - 2017 USA could become world's largest oil producer
 - 2030 USA could become a net oil exporter
 - 2035, 90% middle oil goes to Asia
 - Global implications for the energy market

How shale gas is changing the energy scene

- The growth on shale gas is transforming the energy market (USA)
- Even the largest natural producers (Qatar) are looking for non-energy uses (lubricants, oil-base alternatives (naphtha- the building block for plastics, gasoil, kerosene.....
- Shell new plant in Qatar (\$19bn) to convert natural gas to other products

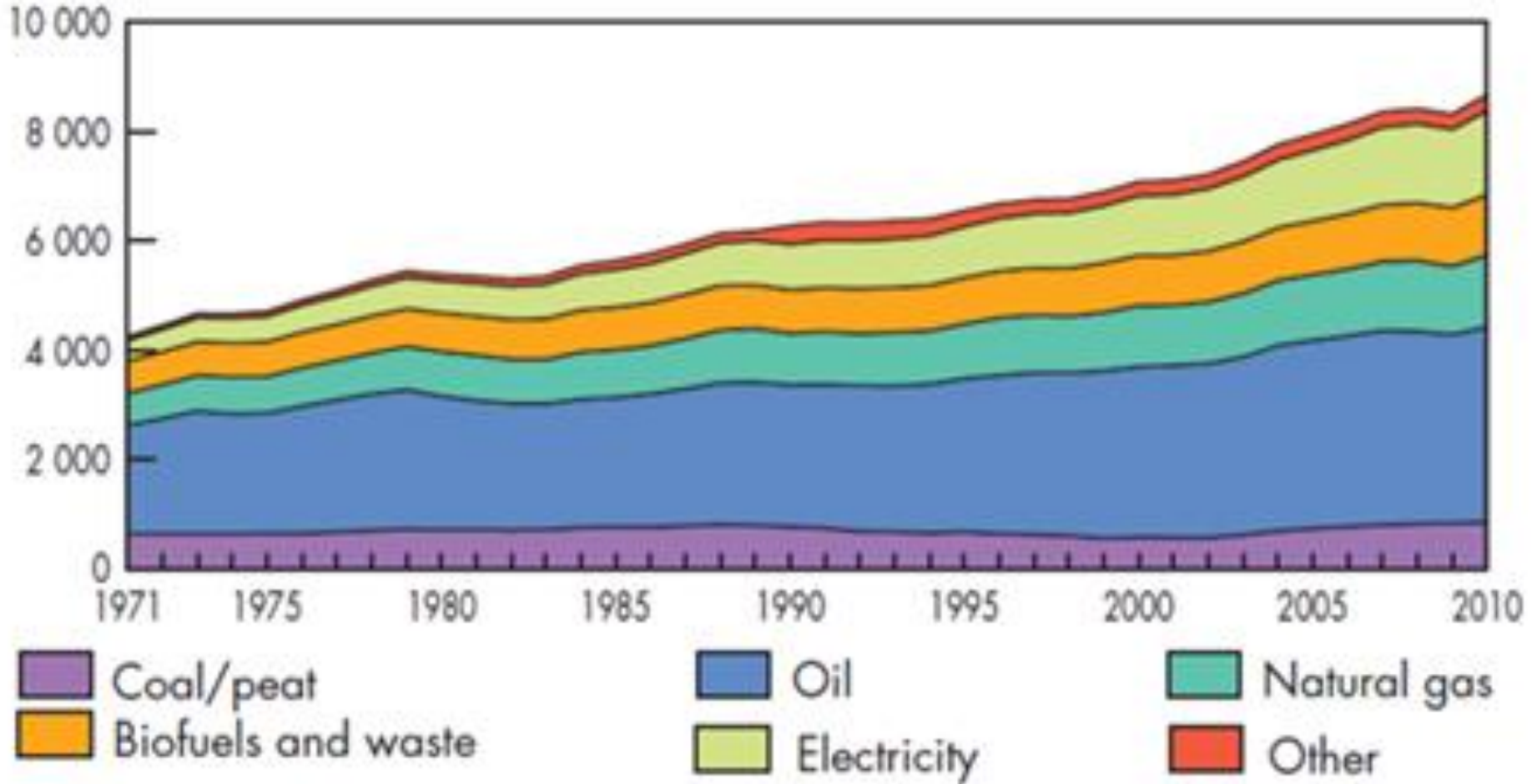
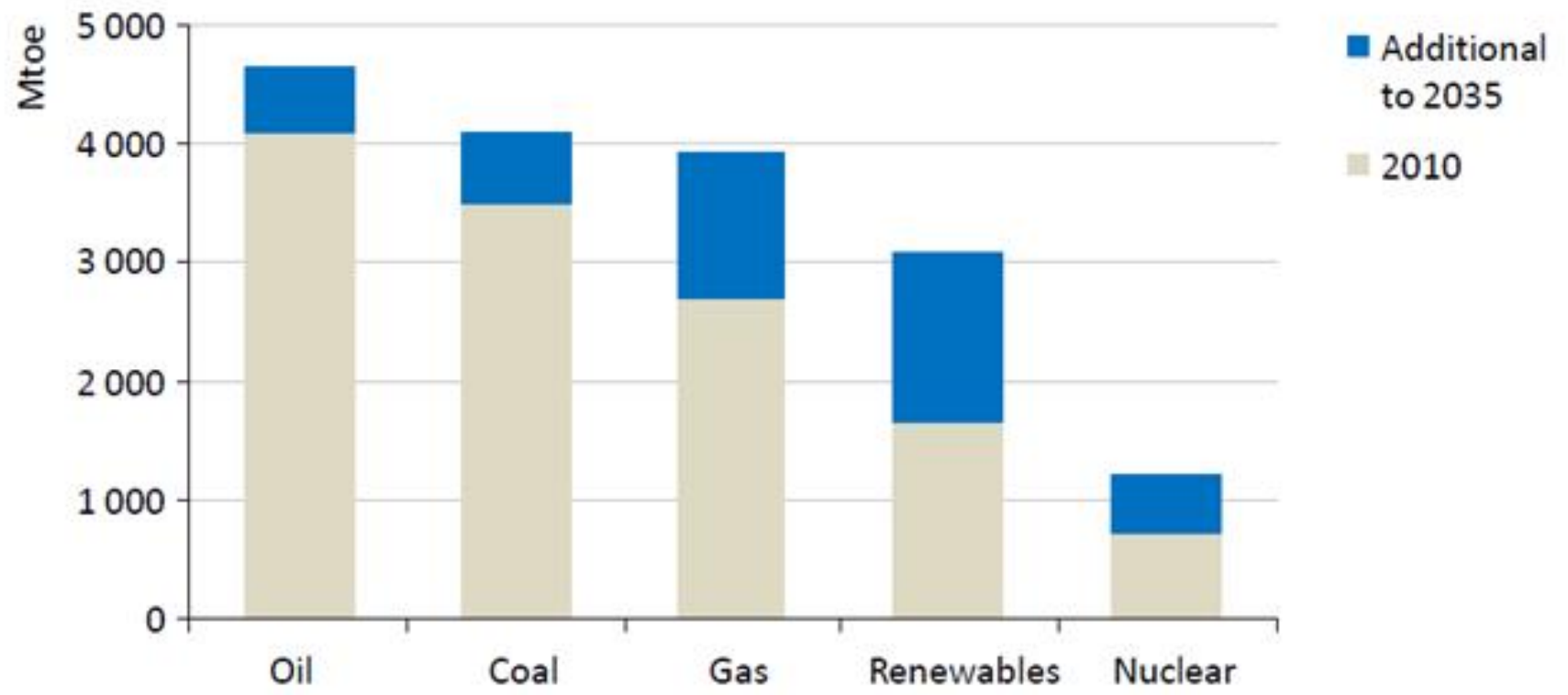


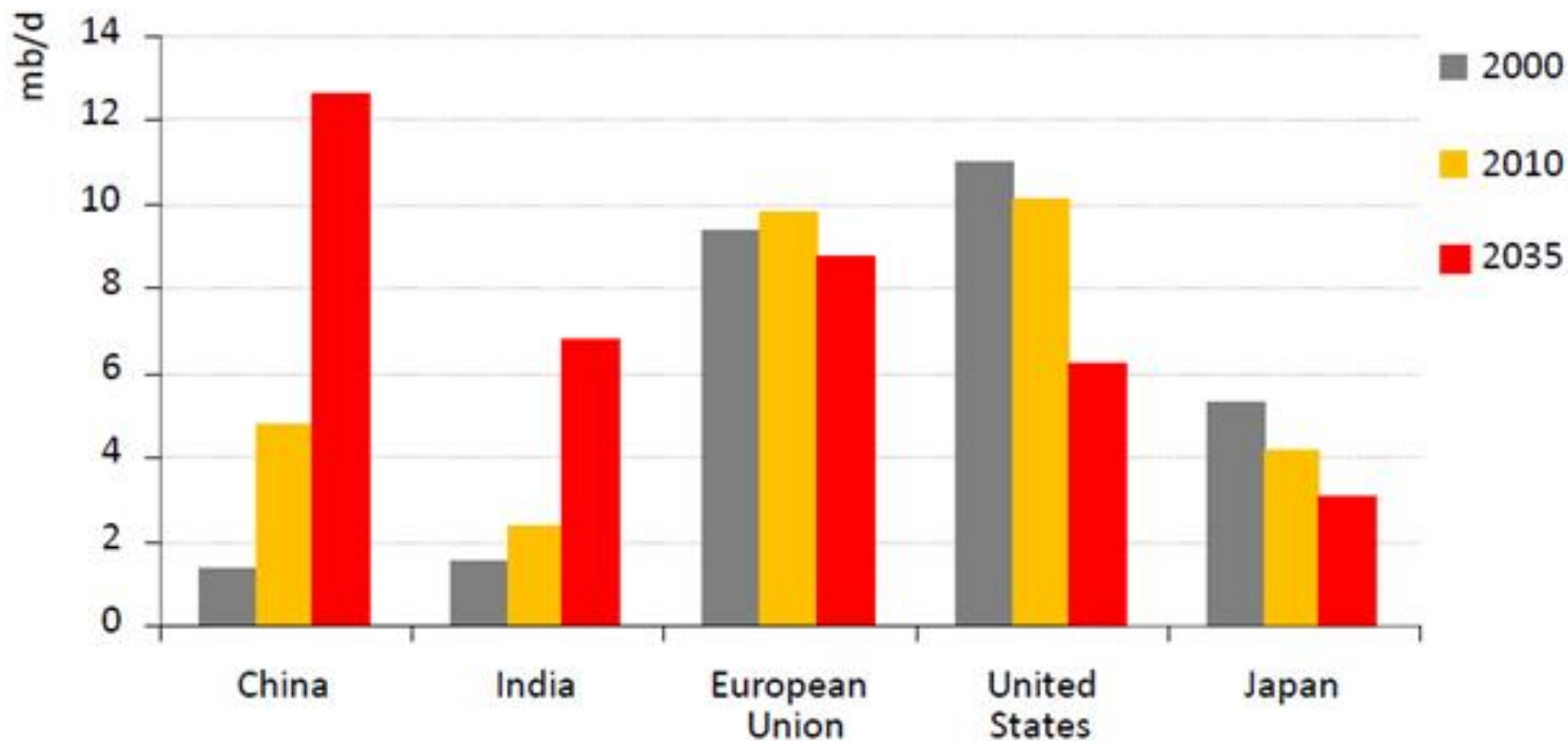
Figure 1. World total final energy consumption from 1971 to 2010 by fuel (Mtoe) (IEA, 2012)

World primary energy demand



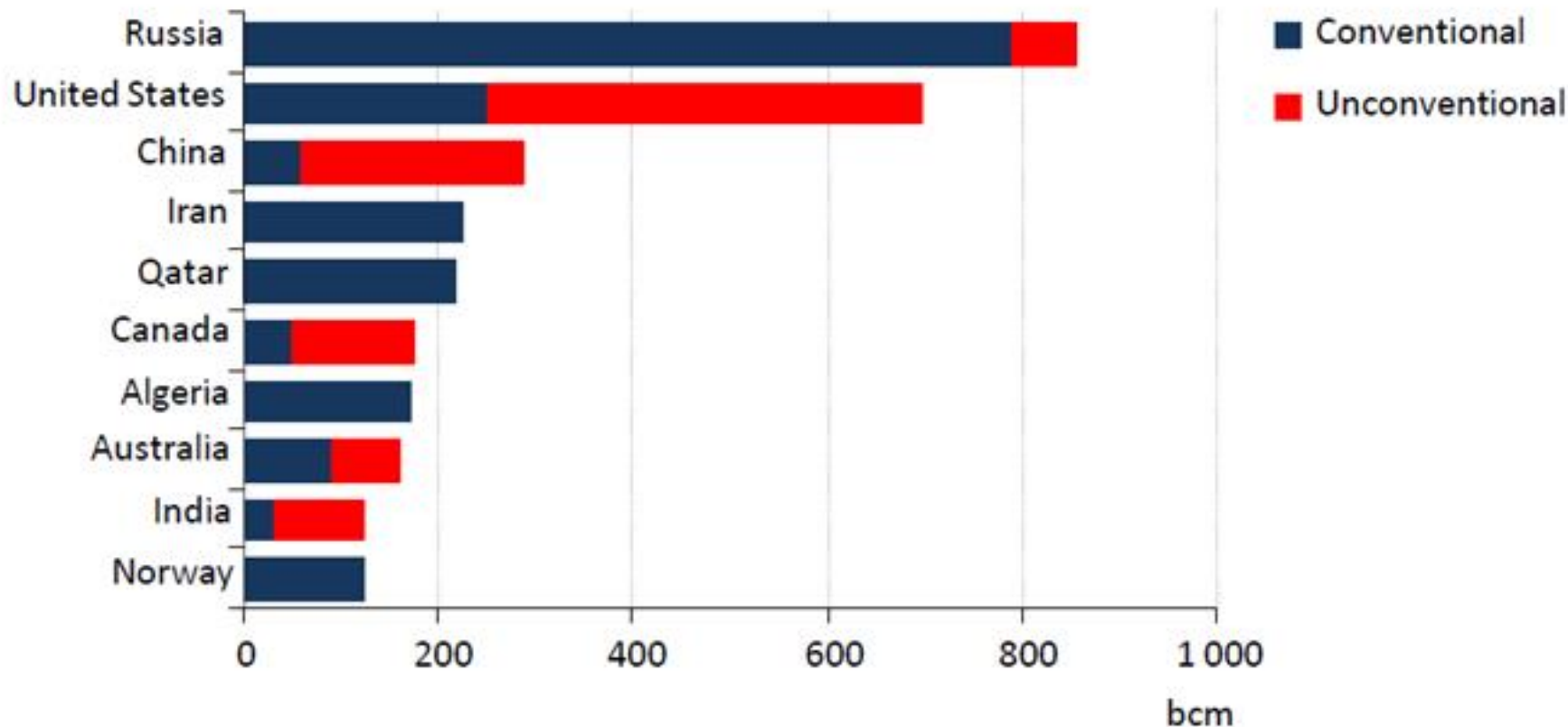
Renewables & natural gas collectively meet almost two-thirds of incremental energy demand in 2010-2035

Net imports of oil



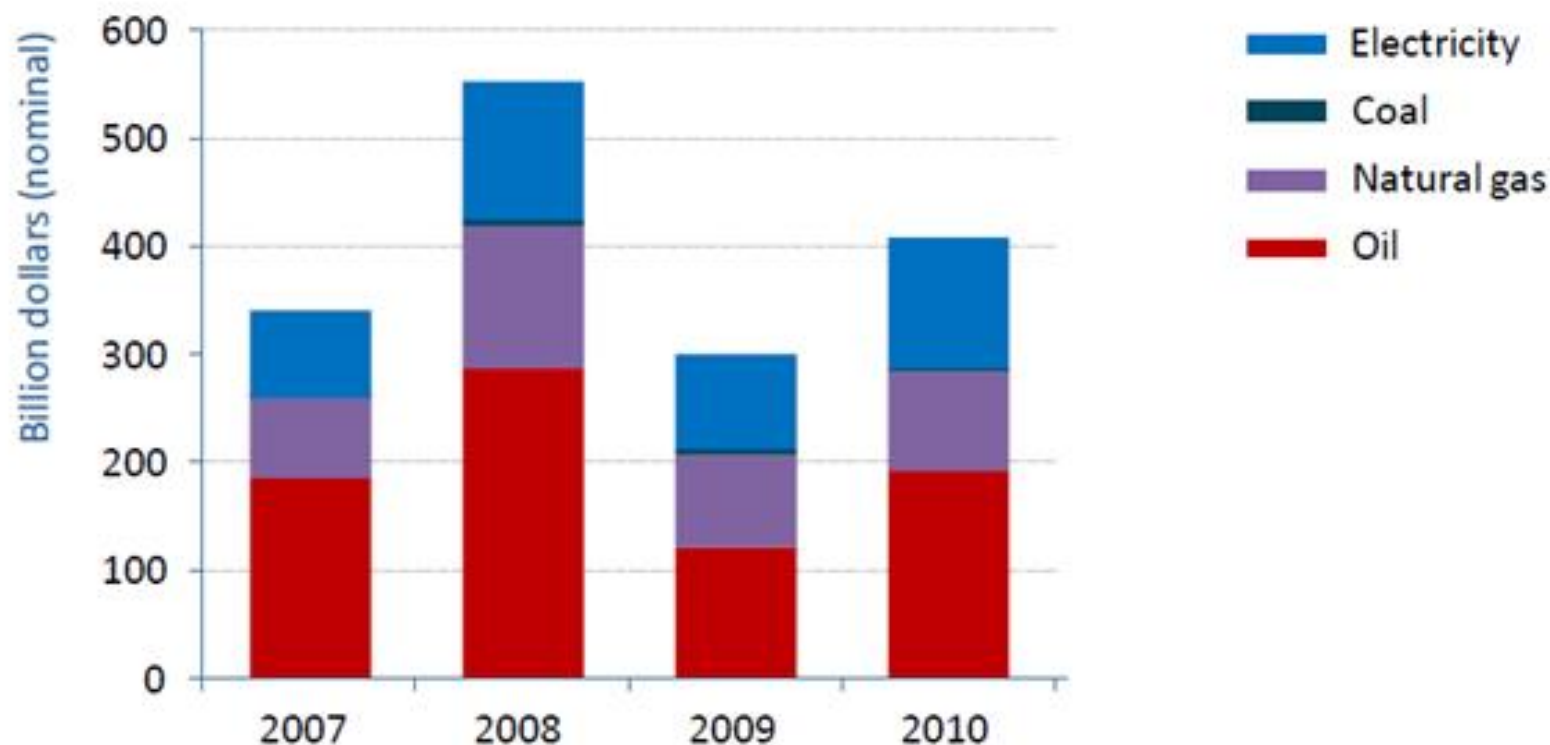
US oil imports drop due to rising domestic output & improved transport efficiency: EU imports overtake those of the US around 2015; China becomes the largest importer around 2020

Largest natural gas producers in 2035



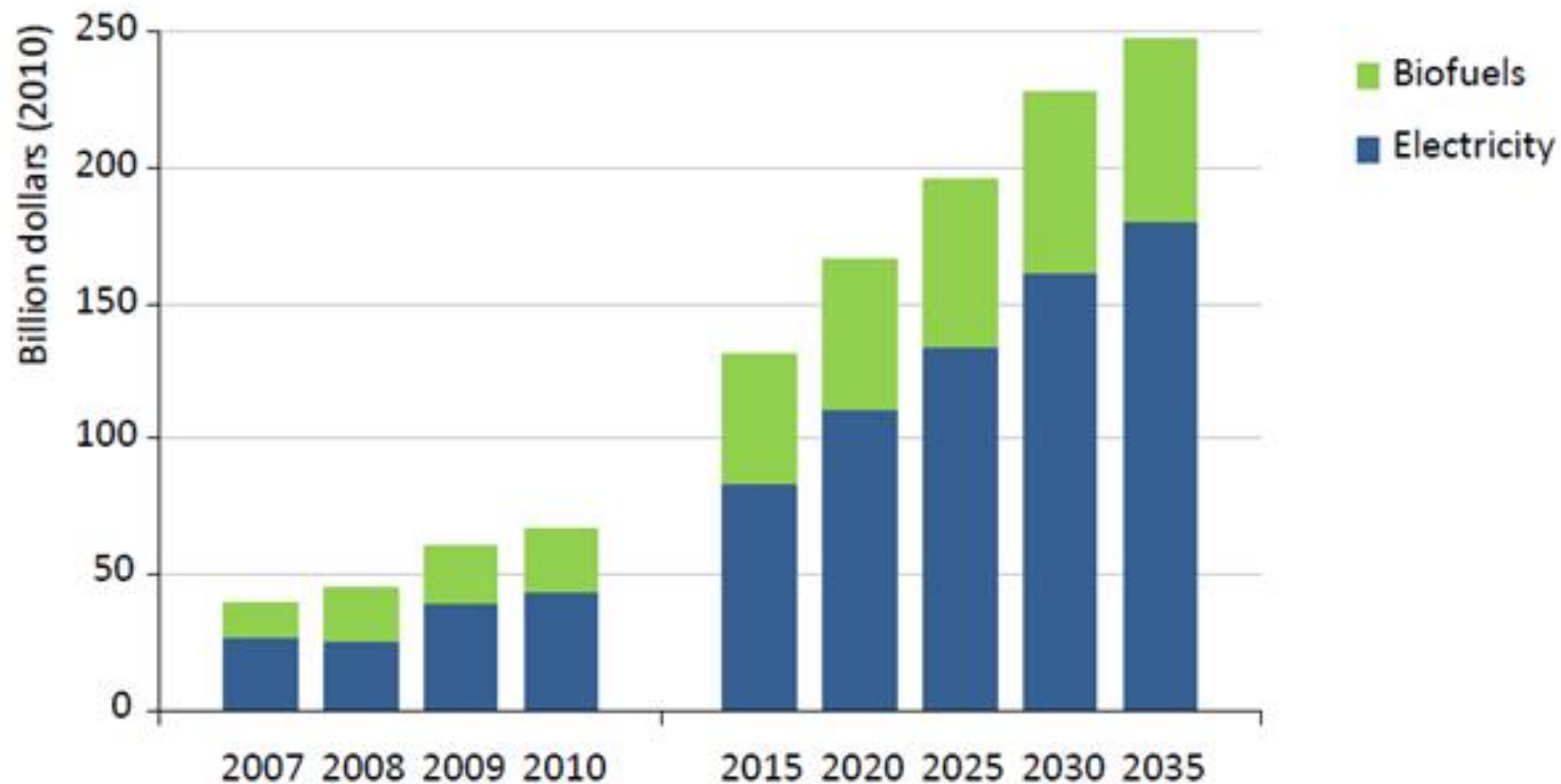
Unconventional natural gas supplies 40% of the 1.7 tcm increase in global supply, but best practices are essential to successfully address environmental challenges

Global economic cost of fossil-fuel
consumption subsidies by fuel



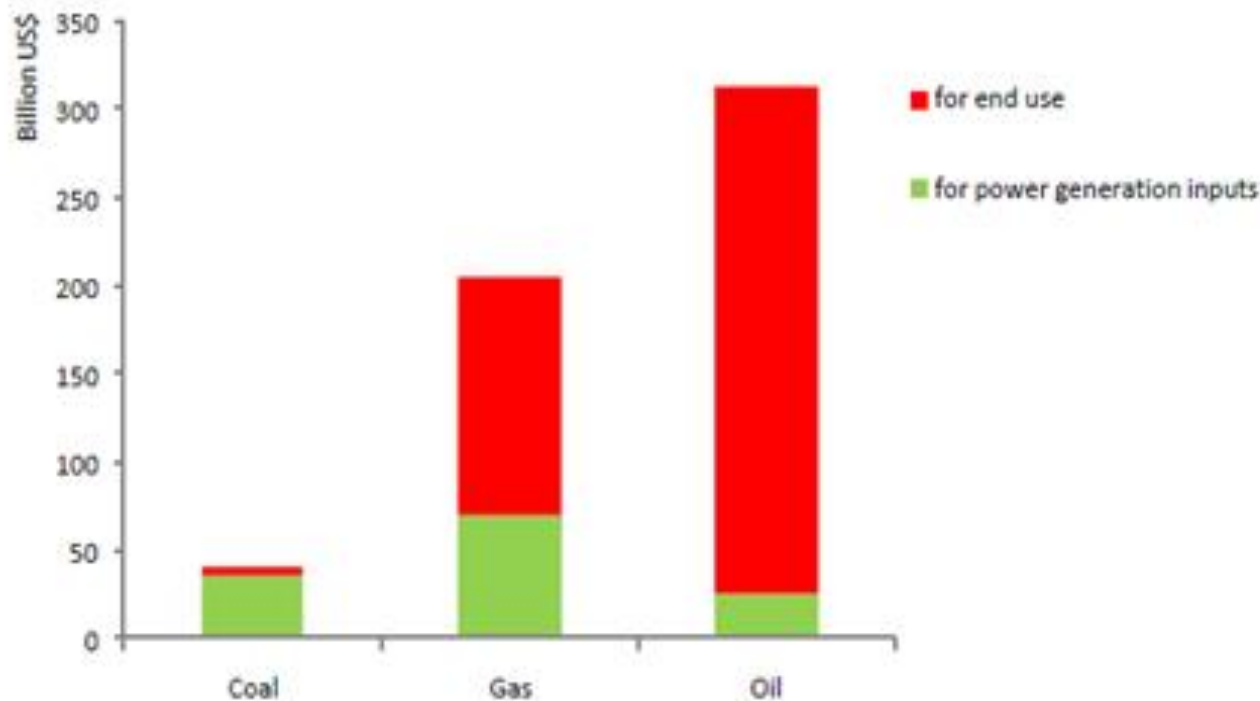
Fossil-fuels subsidies amounted to \$409 billion in 2010 – with negative consequences on energy efficiency, environment and penetration of renewable energy.

The overall value of subsidies to renewables is set to rise



Renewable subsidies of \$66 billion in 2010 (compared with \$409 billion for fossil fuels), need to climb to \$250 billion in 2035 as rising deployment outweighs improved competitiveness.

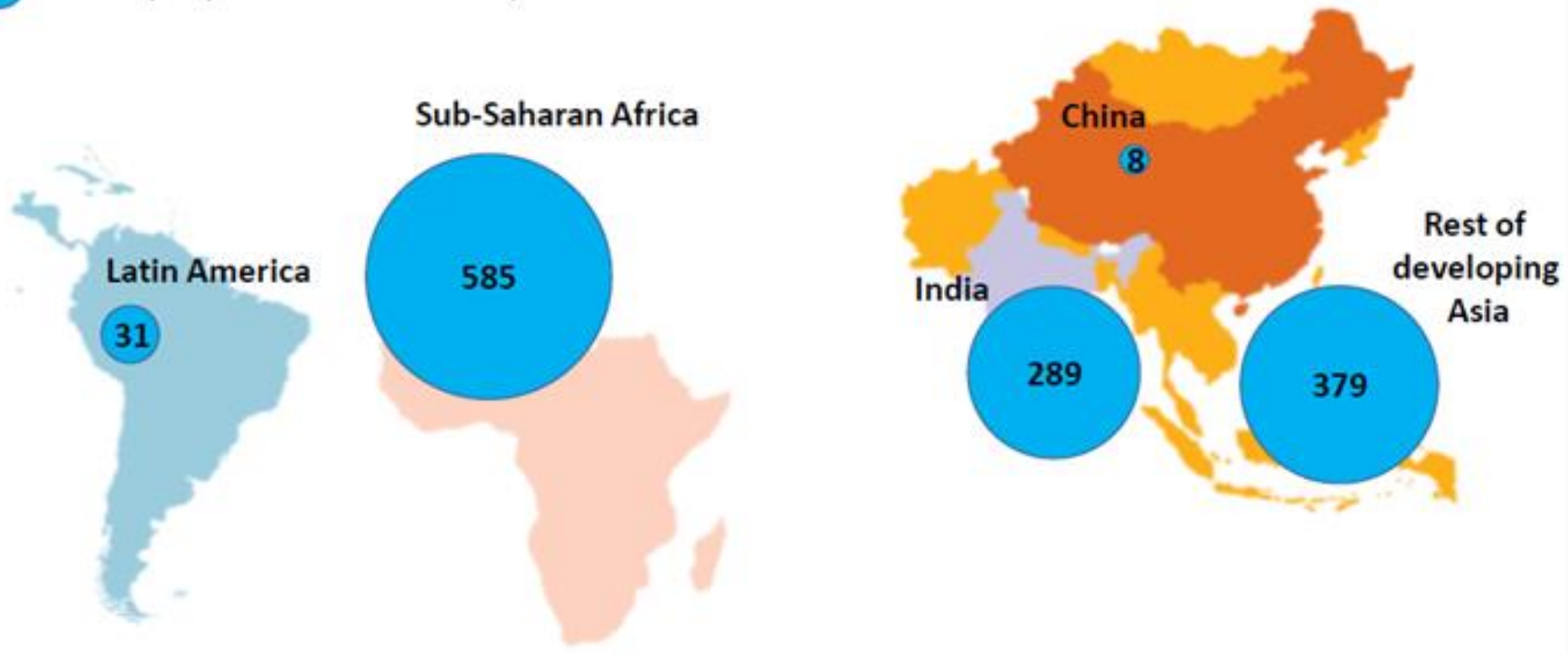
Fossil fuel subsidies by fuel, 2008



In 2008, subsidies for energy consumption by fuel were as follows: oil products at US\$ 312 billion, natural gas at US\$ 204 billion, and coal at US\$ 40 billion

Energy poverty is widespread

● Million people without electricity



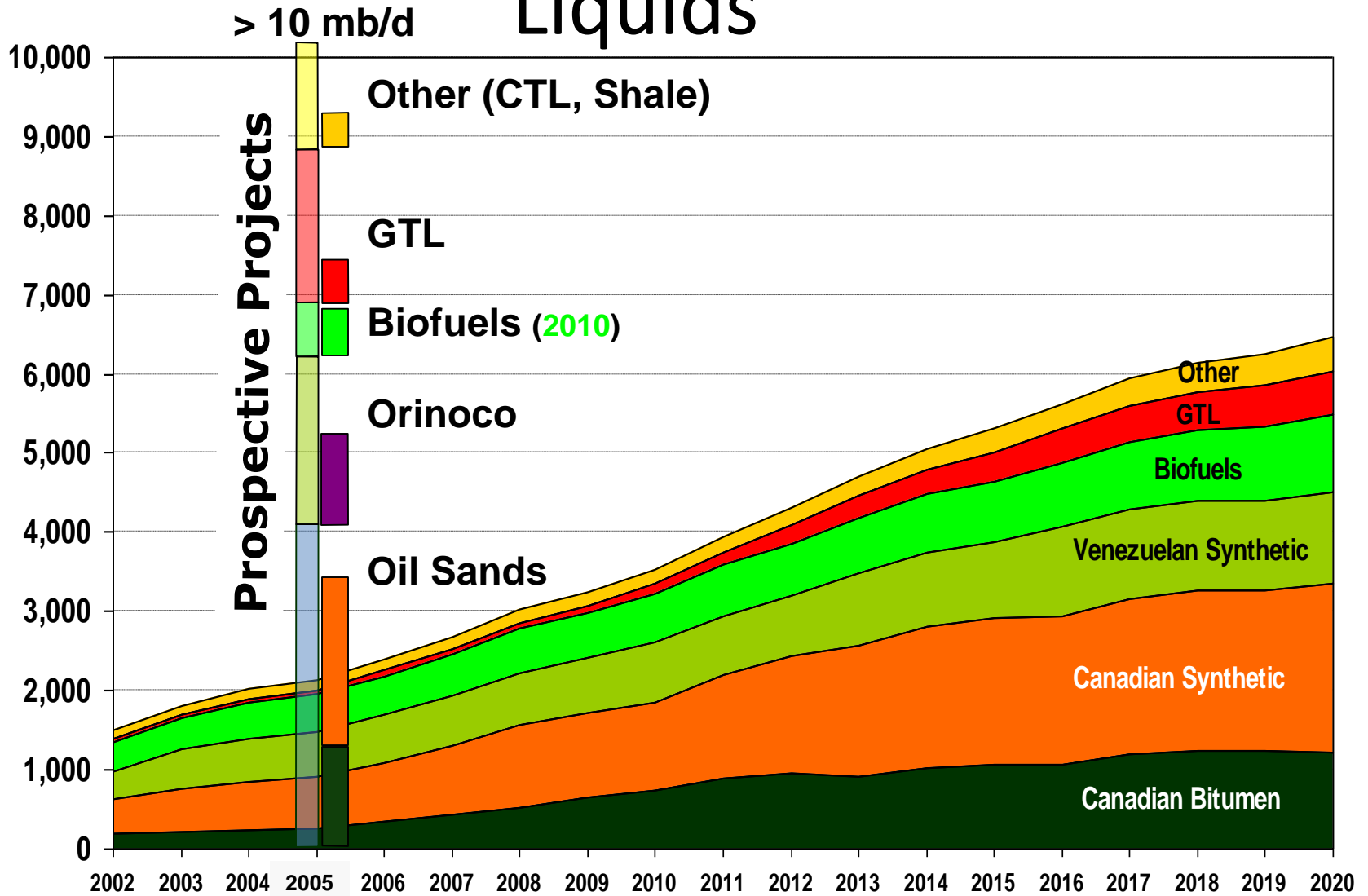
1.3 billion people in the world live without electricity

The Natural Gas Revolution/Shale gas & political implications

Two major technical breakthroughs:

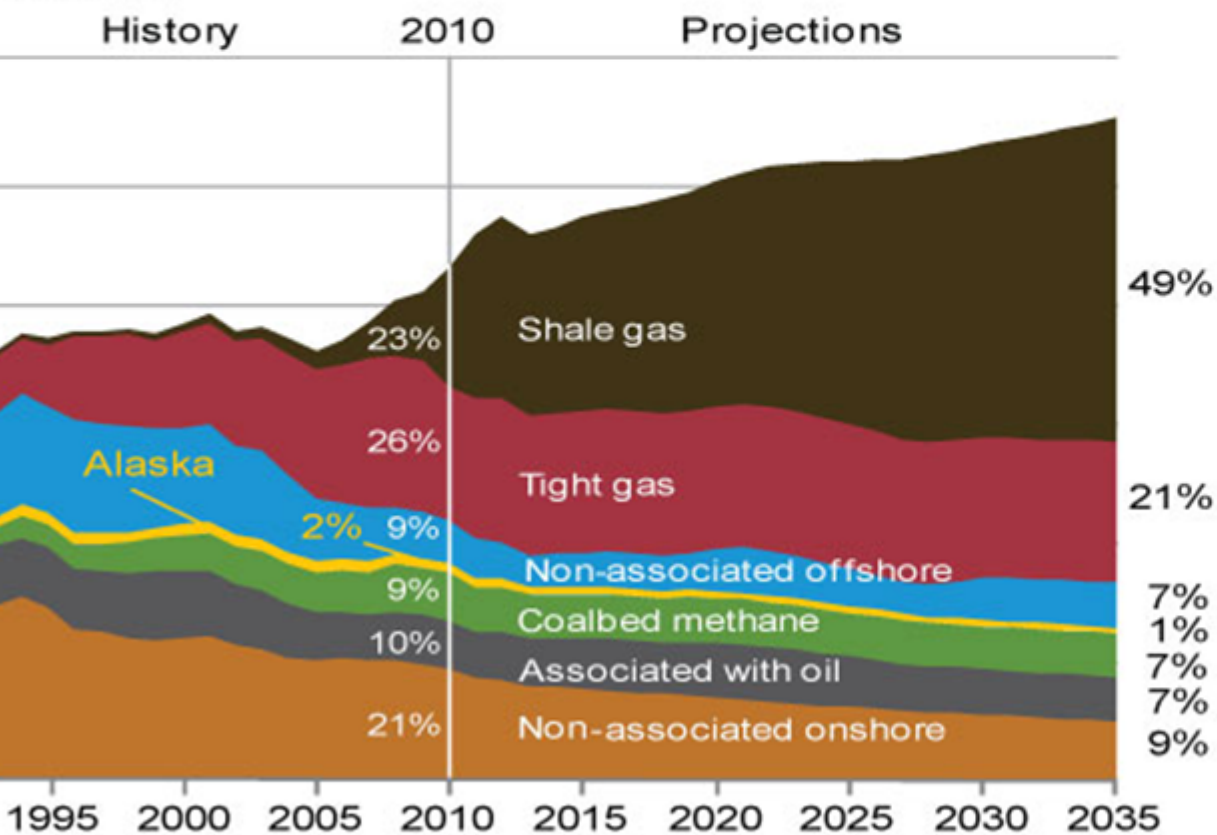
- Hydraulic fracturing (fracking)
 - High pressure water injection + chemicals
- Horizontal drilling
 - Deep earth penetration first vertically & then horizontally
- Shale-gas has made the USA the world's largest producer (more later)

Outlook for Unconventional Liquids



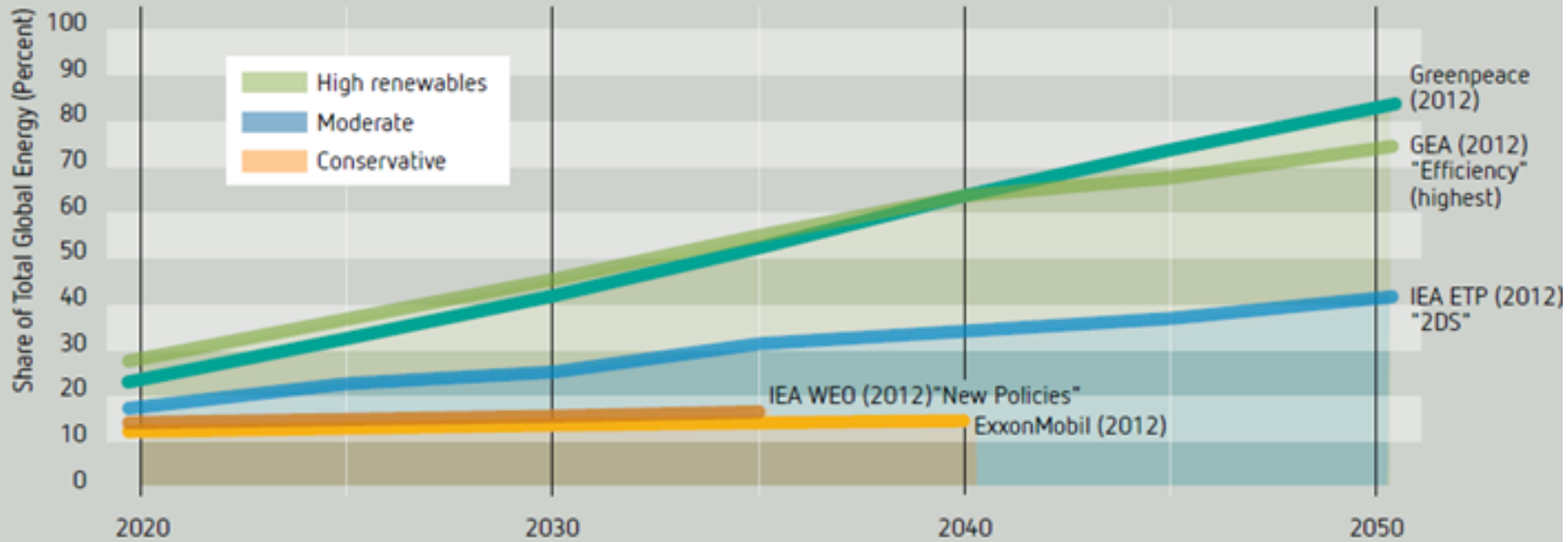
Natural Gas Production, 1990-2035

trillion cubic feet



U.S. Energy Information Administration, AEO2012

Figure 1: Conservative, Moderate, and High-Renewables Scenarios to 2050



Source: See Annex 2 for full scenario names and citations.

RE-Global Scenarios, 2030 – 2040, as %

(www.ren21.net)

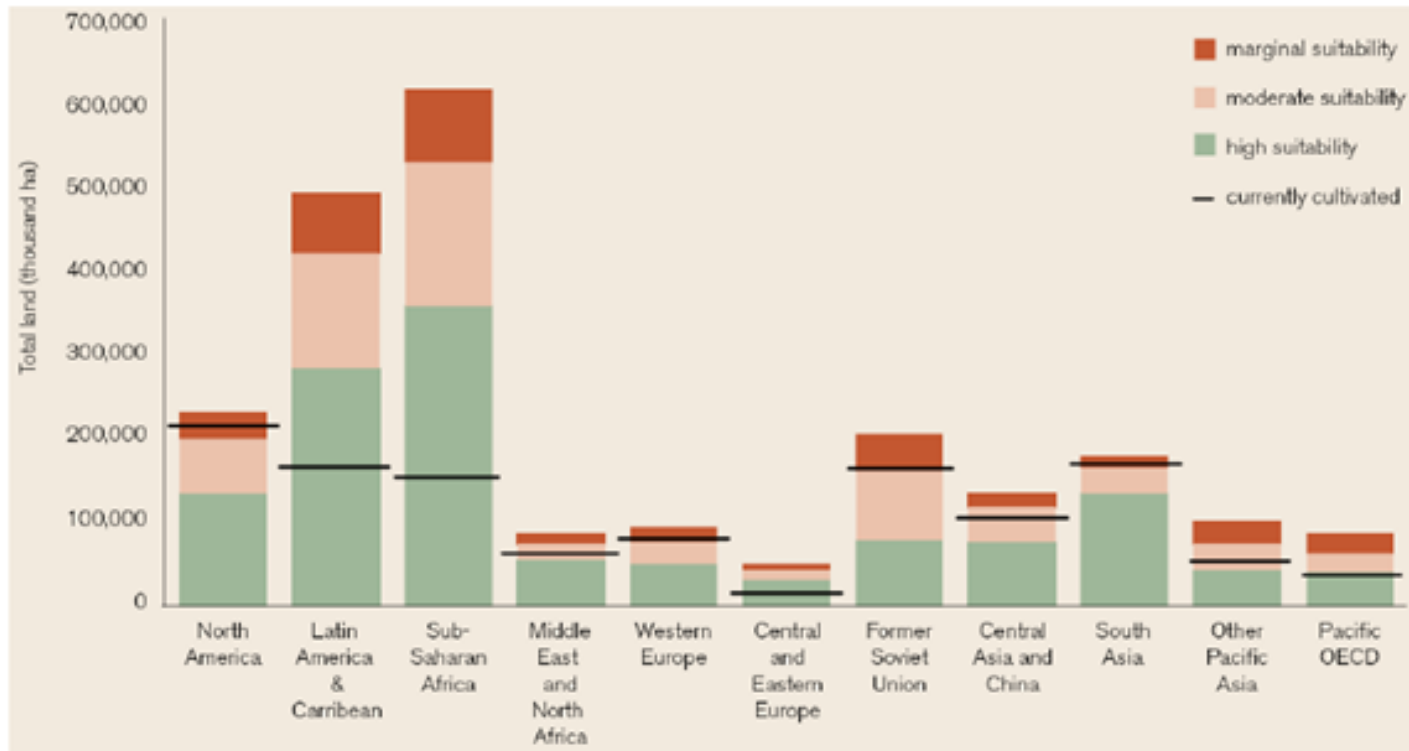
Scenario	By year	Electricity	Heat	Transport
ExxonMobil Outlook for Energy: A View to 2040 (2012)	2040	16	-	-
BP Energy Outlook (2012)	2030	25	-	7
IEA World Energy Outlook -2012 (New Policies)	2035	31	14	6
IEA World Outlook (2012)	2035	48	19	14
Greenpeace – Energy Revolution (2012)	2030	61	51	17

RE-Global Scenarios by 2050, as %

(www.ren21.net)

Scenario	By year	Electricity	Heat	Transport
IEA Energy Tech. Perspectives (2012)	2050	57	-	39
GEA Global Energy Assessment (2012)	2050	62	-	30
IEA Energy Tech. Perspectives, High RE	2050	71	-	-
Greenpeace (2012) Energy Revolution	2050	94	91	72
WWF (2011) Ecofys Energy Scenario	2050	100	85	100

Global Land Use and Availability



- Latin America & Caribbean and Sub-Saharan Africa are the only two regions where substantial amounts of suitable land may still be 'available'.

How much land is available? (FAO & Bioenergy Report, 2011)

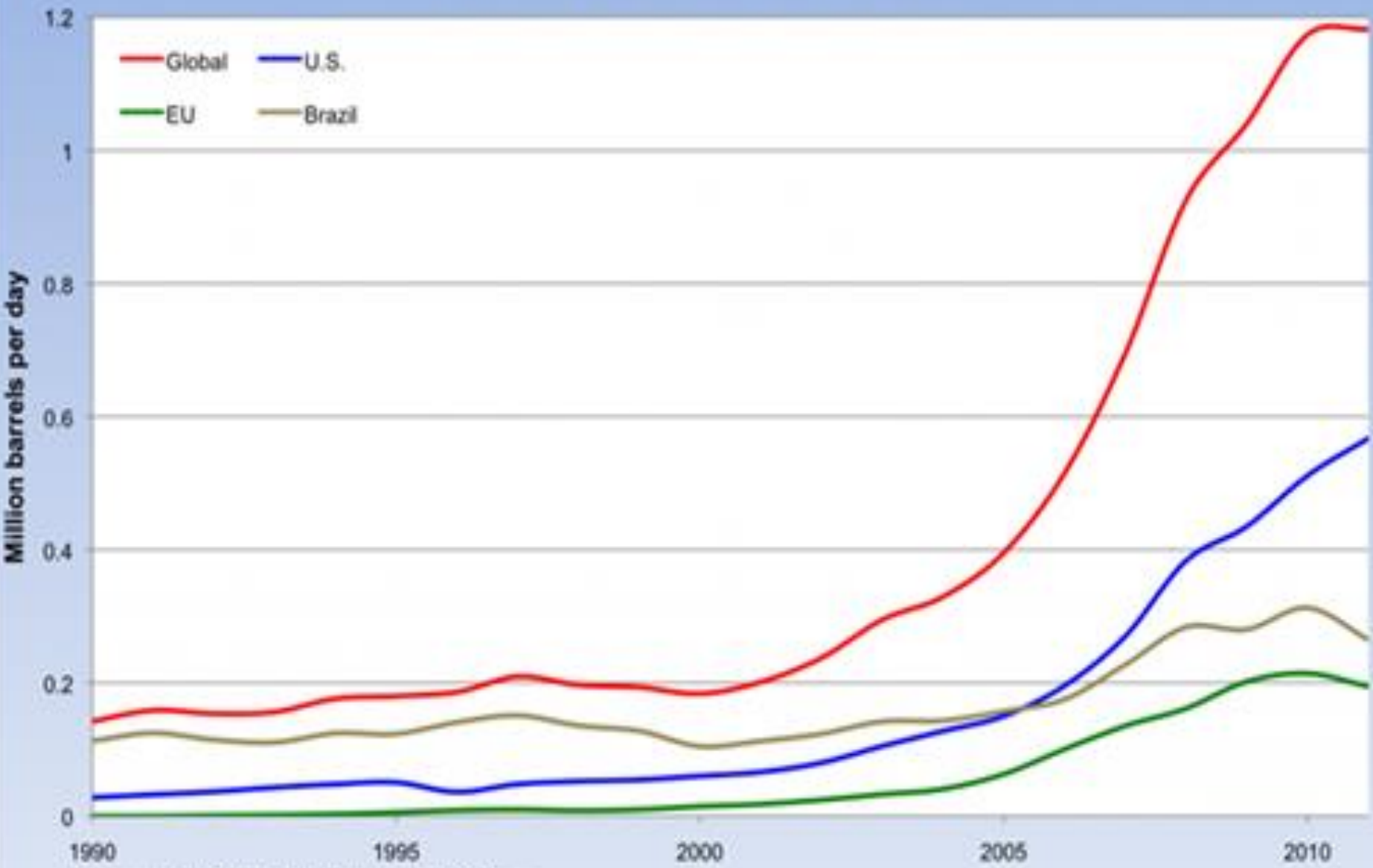
WORLD TOTAL = 13Gha

- **4.2Gha suitable for growing crops of which**
 - **1.55Gha already used + 70Mha by 2050**
- **2.55Gha is suitable land, of which**
 - **1.06Gha are forests, protected areas, etc**
- **Of the remaining 1.5Gha, 500Mha are classified as abandoned land**
- **FAO estimates (surplus land): 700-800Mha**
- **Other, between 100-700Mha and even less**

Land use- what does it means?

- For many people all land is already used in some way or another and hence there is not empty land
- Land availability requires assessment from the large to the small scale- global, regional, local... and all types of use ...
- But many gaps in scientific data

Biofuel Production 1990-2011



Data source: 2012 BP Statistical Review of World Energy

World ethanol fuel production, 2006-2011 in M/I (GRFA, 2013)

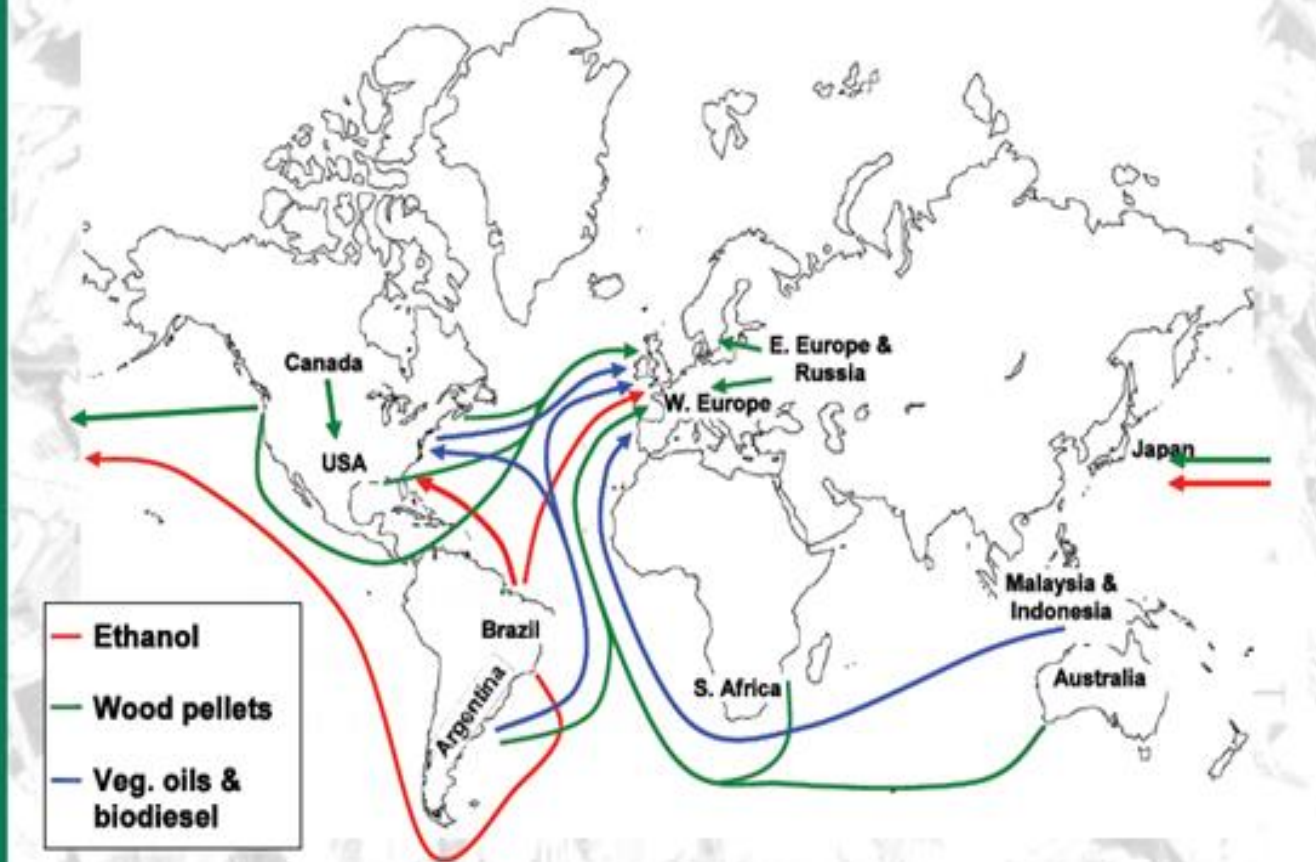
Year	2007	2008	2009	2010	2011	2012
Europe	1882	2814	3683	4615	5467	4973
Africa	49	72	108	165	170	235
N+ S Amer.	45467	60393	66368	77800	79005	75915
Asia/ Pacific	2142	2743	2888	3183	4077	3965
<i>World</i>	<i>49540</i>	<i>66022</i>	<i>73047</i>	<i>85763</i>	<i>88719</i>	<i>85088</i>

Biofuels in Europe

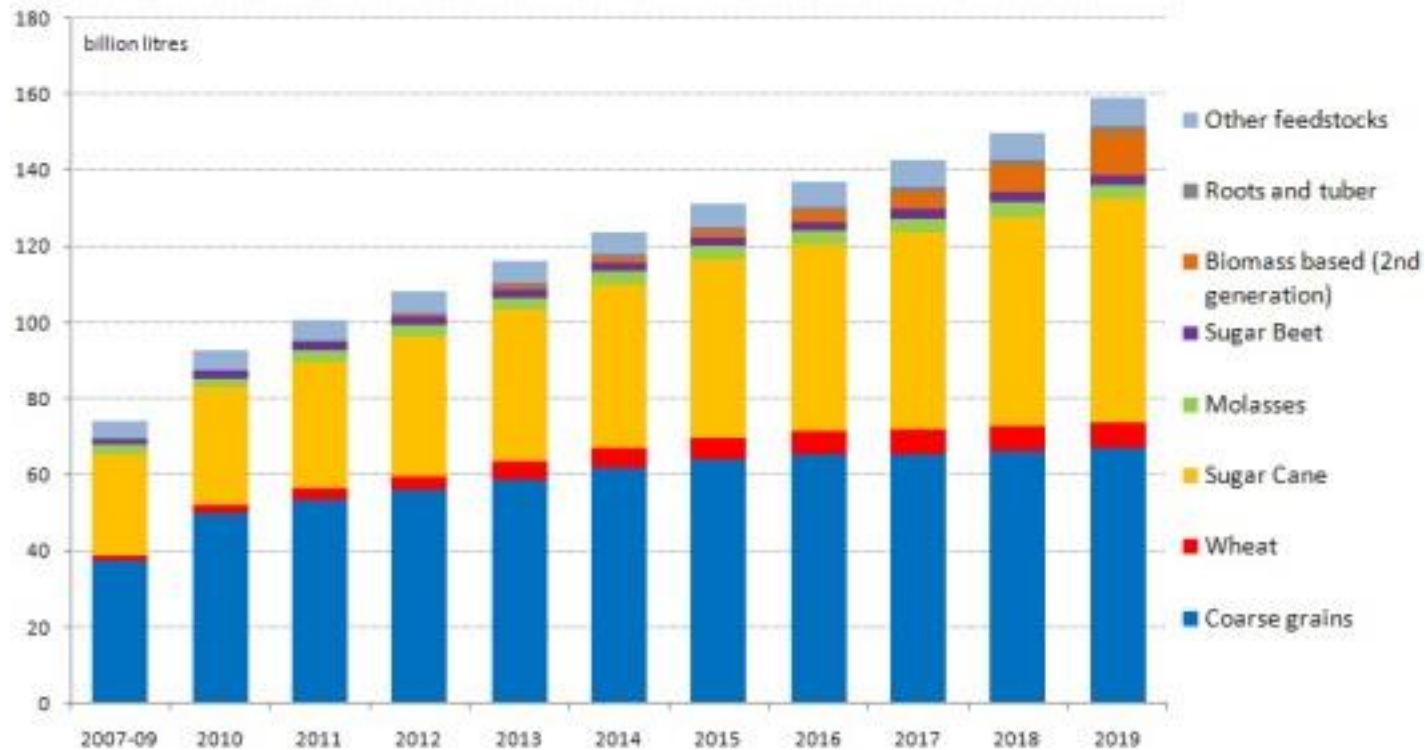
- Biofuel consumption in transport = 14.4 Mtoe (14.0 Mtoe in 2011)
- Increase in biofuel consumption = +2.9% compared to 2011
- Percentage of biofuels in the European transport system = 4.7%

(www.eurobserv-ver.org)

Current main shipping lanes for biomass and biofuels for energy



Global bioethanol production by feedstock, 2007/9 to 2019, OECD/FAO





FvF-Why there is such debate

- ✓ Rooted in the diversity of the feedstocks and potential impacts (positive and negative) in different parts of the world;
- ✓ Diversity of views, and assumptions taken by the different actors on issues related to biofuels, scale, know-how and availability of technology;
- ✓ Attitudes to climate change, environmental objectives, economic development priorities, rural vs. urban poverty and many other factors.
- ✓ Poor understanding the issues involved
- ✓ This new situation requires far more credible answers



The multiple uses of land

- ✓ An important factor is to recognize the multiple uses of land. Experience with biofuels development seems to show the need for a more integrated land use policies to take into account its multiple functions e.g. socio-economic development, policy, food security...
- ✓ NOT to forget the importance of traditional uses of biomass

LAND AND CUMMUNITY INVOLVEMENT

- ✓ It has amply been demonstrated that biofuels to succeed, require the active participation of the local community who is very distrustful of outside involvement. Poor has very little resources are easily manipulated....
- ✓ The only thing were there appear some kind of consensus is that institutional reforms are essential to regulate land investment and to ensure local communities rights



Biofuels and investment

- ✓ It is hugely important for both biofuels and agricultural development and it has been largely demonstrated the benefits in transforming communities.
- ✓ But investment can easily be manipulated to serve certain ends e.g. government policy and investors.
- ✓ Large investment reflects wider social, political and economic interest.



FvF-Key points of the debate

- ✓ The debate is not new and in fact goes back to the 1970s. The nature of the debate has three major components:
 - ✓ i) liquid biofuels (biofuels),
 - ✓ ii) solid biomass (bioenergy) and
 - ✓ iii) adverse climate-driven impacts (the drought in the US in 2012).
- ✓ The debate has a narrow focus based on a handful of feedstocks e.g. maize, cereals and sugarcane.



Key points (emerging concern)

- ✓ The biofuels debate in particular has centred around **FIVE** main areas:
- ✓ i) food versus biofuel production;
- ✓ ii) their positive and negative effects (i.e. GHG, climate change and the broader environment);
- iii) a socio-economic component
- ✓ iv) rapid expansion of solid biomass for electricity and heat generation
- ✓ v) and potential adverse impacts of climate change, driven primarily by the current US drought.



The “hidden hunger”

- ✓ Food vs. nutrition, Amartya Sen (1960):
“what really matters with food is not the overall supply, but individual assess”
- ✓ Of the seven billion people:
 - 1B go without enough calories
 - 1B are undernourished (lack-micro nutrients)
 - 1B are undernourished (eat too much)
 - 3B eat too little, are too unhealthy, or too much
 - (The Economist, 18/2/12 pp 59-60)



... and huge food waste!!

- ✓ it is estimated that 30 to 50% of the global food production rots away uneaten;
- ✓ In some countries as much as 75% of the harvest is lost, particularly fresh vegetables.
- ✓ A recent report by the Natural Resources Defense Council says Americans throw away nearly half their food every year, waste worth roughly \$165 billion annually!
- ✓ US discard 40%; the average American family of four ends up throwing away an equivalent of up to \$2,275 annually in food.



FvF- The terrible food waste!! (Inst. Mech. Engineering (2013))

- ✓ It is estimated that 30–50% (or 1.2–2 billion
- ✓ tonnes) of all food produced on the planet is lost
- ✓ In South East Asian countries, losses of rice can range from 37–80% of the entire production.
- ✓ In India 21Mt of wheat is wasted each year due to inadequate storage and distribution systems.
- ✓ In the UK , 7Mt of food valued at about £10B is thrown away from home s every year.



Is food too cheap for the rich and hence so much waste?

- ✓ Average expenditure in food in the USA
 - 1950 = 26%
 - Mid 1960s = 20%
 - 2000 = 12%

Average expenditure of poor households:
30-70% and higher

Food Security and population trends

- ✓ Some demographers think population may peak c.9bn and then decline to 2-4bn by 2300s.
- ✓ Birth rates:
 - 1950-1955 = 4.95
 - 1970-1975 = 4.45
 - 1990-1995 = 3.04
 - Today down to 2.47
- ✓ Lowest: Singapore, 0.78; Japan, 1.39; China, 1.55; EU, 1.58
- ✓ Highest: Africa, Niger = 7.52



LACAF – Food Security (1)

- ✓ This ‘food security’ sub-project activity of the LACAF-II Task 5/Sub-Task aims to understand the positive and negative impacts of large scale ethanol production and use from sugarcane in Mozambique and South Africa. It will look at the local and regional level and make the pertinent recommendations.



LACAf-2 and Food Security (2)

- ✓ The problem of Food Security is more complex that it seems as there many and differing intertwined factors that have to be taken into consideration. Food Security involves social, ethical and political issues; infrastructure, investment, skills and know how.



And 2A

- ✓ And more fundamentally it is an agronomic issue involving agricultural transformation. Biofuels and food security is currently one the most serious issues affecting the world e.g. energy, food, land use, and socio-economic development.



The nature of biofuels are changing

- ✓ Biofuels are also witnessing major changes, from domestically-driven (Brazil and USA) to increasing globalization led by the EU, with potentially major impacts in agriculture particularly in developing countries



Biofuels – are they good or bad?

- ✓ Biofuels are neutral – they have both positive and negative impacts-local, regional and global impacts. Biofuel policies has been successful in developing an economic market. Increasingly it will be the market the major driver and this means the role of policies will have to change. Biofuel policies need to be integrated with food policies.





LACAF-2 Food security (4)

- ✓ The food security issue and the impacts of biofuels production in developing countries depend on several inter-related aspects, including the previous level of development of agriculture, the social structure, the labor market functioning, the land tenure regime, and the availability of, and access to land.



LACAf-2 Food security (5)

- ✓ Energy is therefore at the core of achieving high agricultural productivity. Energy inputs in agriculture, which represents 30-40 percent of economic costs, are consequently making food production acutely vulnerable to energy price volatility, and cannot be overlooked.



LACAF- 2- Food Security (6)

- Investigate the interrelationships of ethanol production and use from sugarcane and food security
- Investigate complementarities between biofuel production and food security
- Investigate linkages between modern versus traditional and transitional agriculture



LACAF 2- KEY Questions (1)

- **In what ways do bioethanol production systems enhance food security and other social services?** It has been amply demonstrated in Brazil that ethanol expansion had a very positive effect on agricultural production and productivity e.g. through modernization, capitalization and good management practices. Can this be repeated in these two countries?



LACAF 2- Key questions (2)

- How can we improve the communication of new knowledge and successful cases to advance the state of understanding related to sustainable production of bioethanol from sugarcane? This will be more difficult to prove. However in recent years there has been a multitude of schemes aimed to ensure the sustainability of ethanol. Considerable knowledge has been generated in this field.



LACAF -2 Key questions (3)

- To what extent can biofuels be developed to take advantage of existing agricultural practices, production capacity and what fundamental changes may be necessary. In the case of Mozambique with little or not experience in large scale sugarcane and ethanol production, this will be more difficult to predict. Contrary, in South Africa with its long historical experience many valuable lessons can be drawn.



LACAF 2- Key questions (4)

- **Can potential impacts of biofuels be disentangled and separated from all other factors so that they can be analyzed in its component parts?** This is a tricky question and remains a challenge because the intertwined nature of biofuels and food production. Throwing light into this subject is important to gain new understanding.



LACAF 2- Key questions(5)

- **To what extent is land availability a constraint to bioethanol production in Mozambique and South Africa while ensuring local/regional food security?** Though still controversial, a large number of studies show that land is not currently a significant constraint except in some isolated cases. In this case this would apply far more to South Africa where land availability may be more constrained.



LACAF 2- Key questions (6)

- To what extent bioethanol use in transport benefits the rural poor whose priorities is securing fuels for cooking, heating, lighting, etc. Ethanol production has been primarily for transport and only a few example exist where ethanol has been produced as a cooking fuel. This option should be explored further. For example cooking stoves, the use of co-generation of bagasse to generate electricity, etc.



LACAF 2 Key questions (7)

- How can bioethanol be channeled from a policy-driven to a market driven scenario? Food security and biofuels policies are intertwined but priority should be given to food. Hence biofuel production must be complementary to food production.



And 7A

- Up to now the rapid expansion of biofuels have largely been driven by policy (e.g. fiscal incentives, subsidies), if Brazil is excluded. A more market-oriented industry may actually enhance food production since, should prices go up significantly, will make it economically more attractive to the farmers to produce food rather than fuel.



LACAF 2- Key questions (8)

- **Should sugarcane be used to produce primarily ethanol or should be it for other simultaneous uses beyond distillery`s requirements e.g. electricity for rural areas?** Sugarcane can generate multiple products and hence the aim should be to have very efficient distilleries so that ethanol is just one of the products.





In search for new methodological tools

- ✓ Various methodological are being developed that will allow us, over time, to disentangle the many components of the Food Security.
- ✓ EXAMPLE: FAO BEFS methodological toolkit – aimed at investment in bioenergy to enhance agricultural productivity for the benefits of the poor communities
(<http://biofuelsandthepoor.com/>)
- ✓ **Need to fill many scientific data gaps**



For a new development model for Southern Africa

- ✓ There is an on-going debate on what should be the most appropriate developmental model for Southern Africa agricultural development
 - Small, medium, large scale
 - Short, medium and long term development
 - Small, medium, large farms



Biofuels (...)

- ✓ Biofuels are diverse and controversial
- ✓ There are many different of feedstocks from which biofuels can be produced, each one has its own pros and cons
- ✓ Biofuels can only provide a fraction of our energy needs
- ✓ Biofuels are NOT the problem, but part of the problem and part of the solution!
- ✓ There is not a perfect fuel

**The WORLD IS NOT AS YOU WOULD LIKE IT TO BE-
RATHER IT IS REFLECTION OF MANY DIVERSE AND
CONFLICTING INTERESTS AND CANNOT PLEASE
EVERYBODY!!**

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