Global overview of Bioenergy and lessons learnt from the European energy policy

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structure

- Climate change and the global energy system
- Global status of bioenergy
- Bioenergy in Europe and lessons learnt
- Conclusions

Bioenergy and the climate challenge

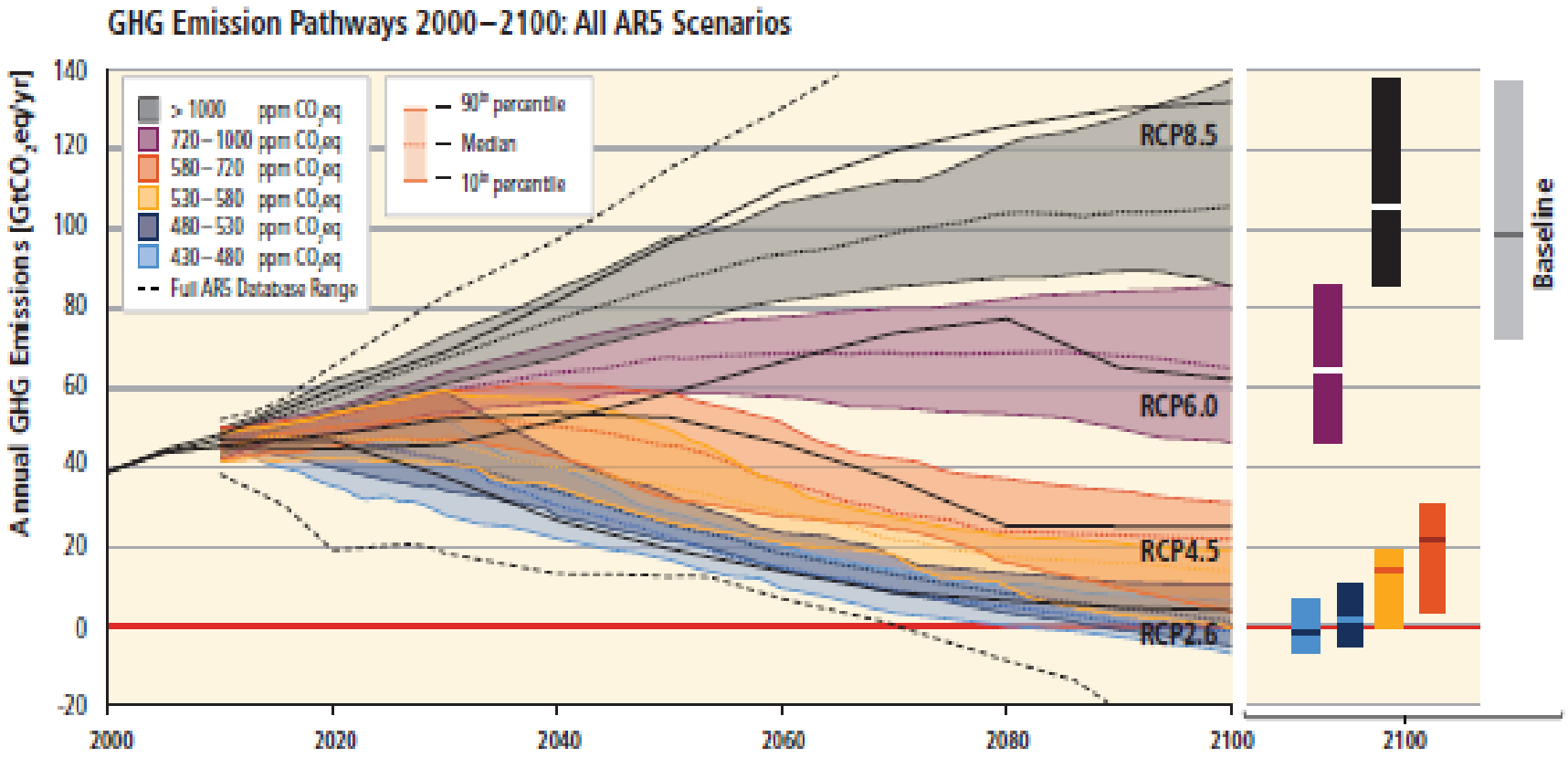
- The message of the IPCC reports is clear: the world is heading to a climate desaster destroying our future economic well being, if we don‘t change the energy system rapidly.

- Fossil fuels are the main cause of climate change!

- Therefore: fossil fuels should remain in the earthcrust in the future, renewable should be the basis of the energy supply.

- Bioenergy is the most important renewable energy

Global green house gas emissions: gray bau; blue climate mitigation



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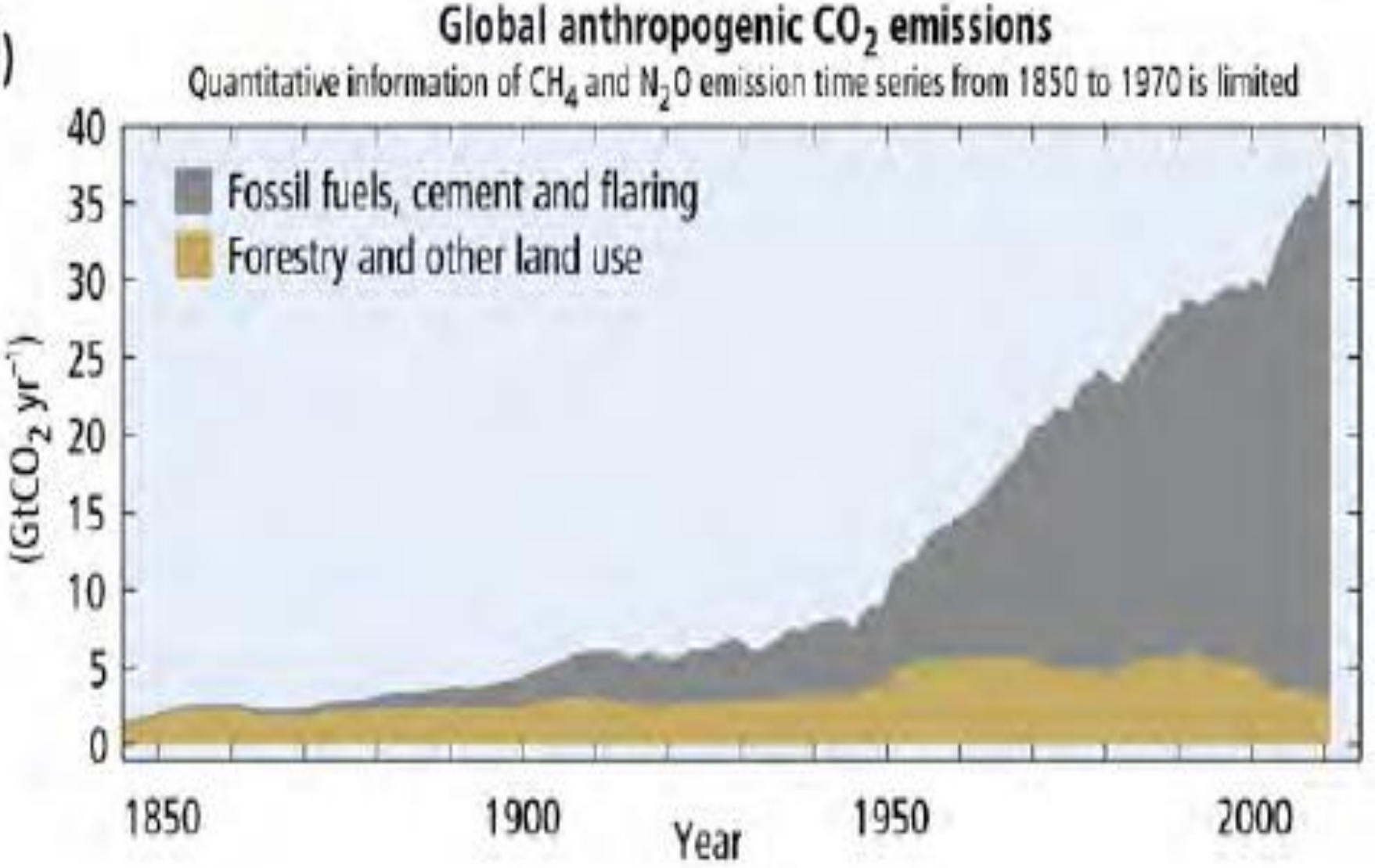
Global anthropogenic CO_2 emissions
Quantitative information of CH_4 and N_2O emission time series from 1850 to 1970 is limited
Fossil fuels, cement and flaring
Forestry and other land use
$(GtCO_2\ yr^{-1})$
40
35
30
25
20
15
10
5
0
1850
1900
1950
2000
Year

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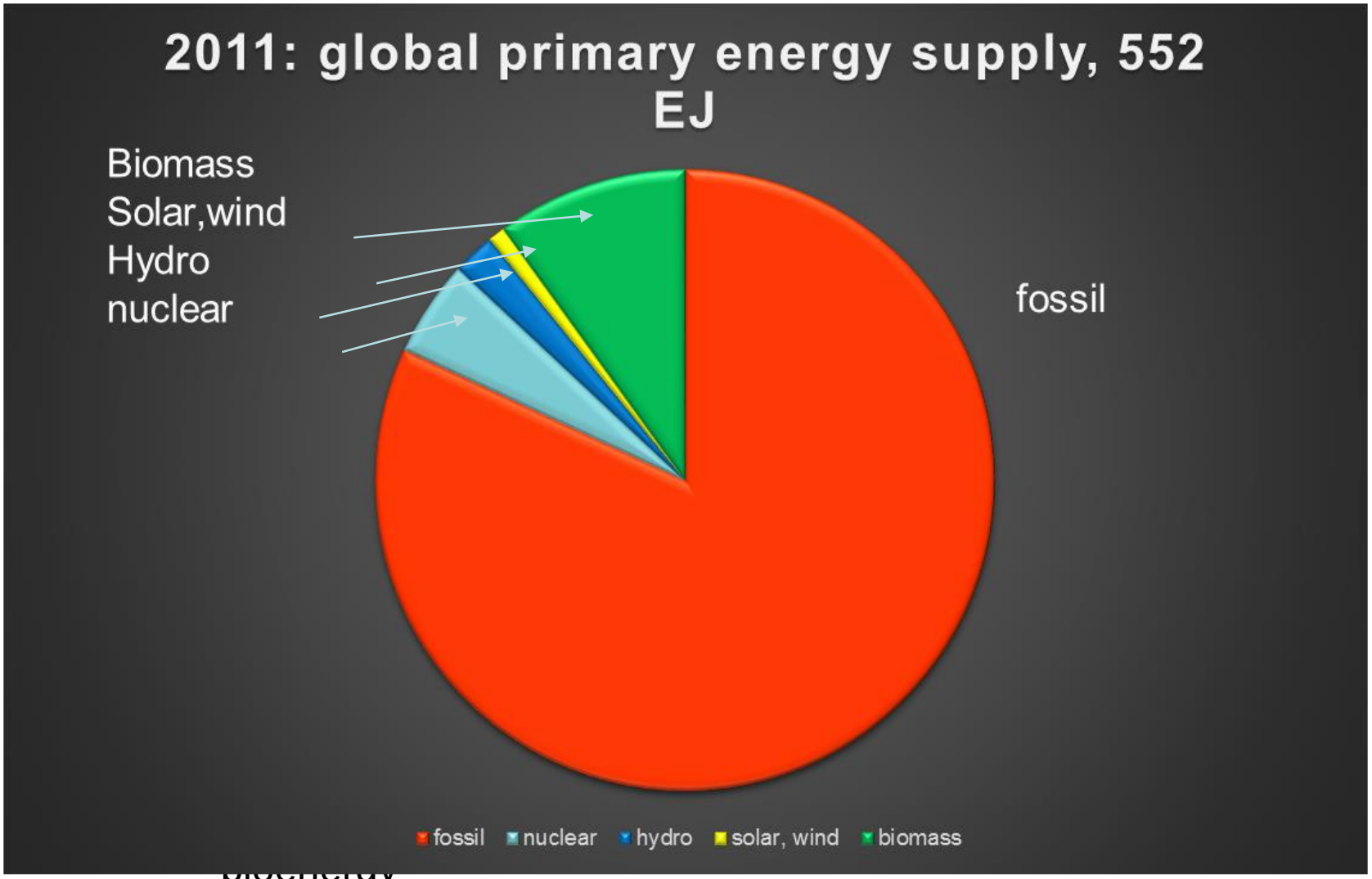

bioenergy

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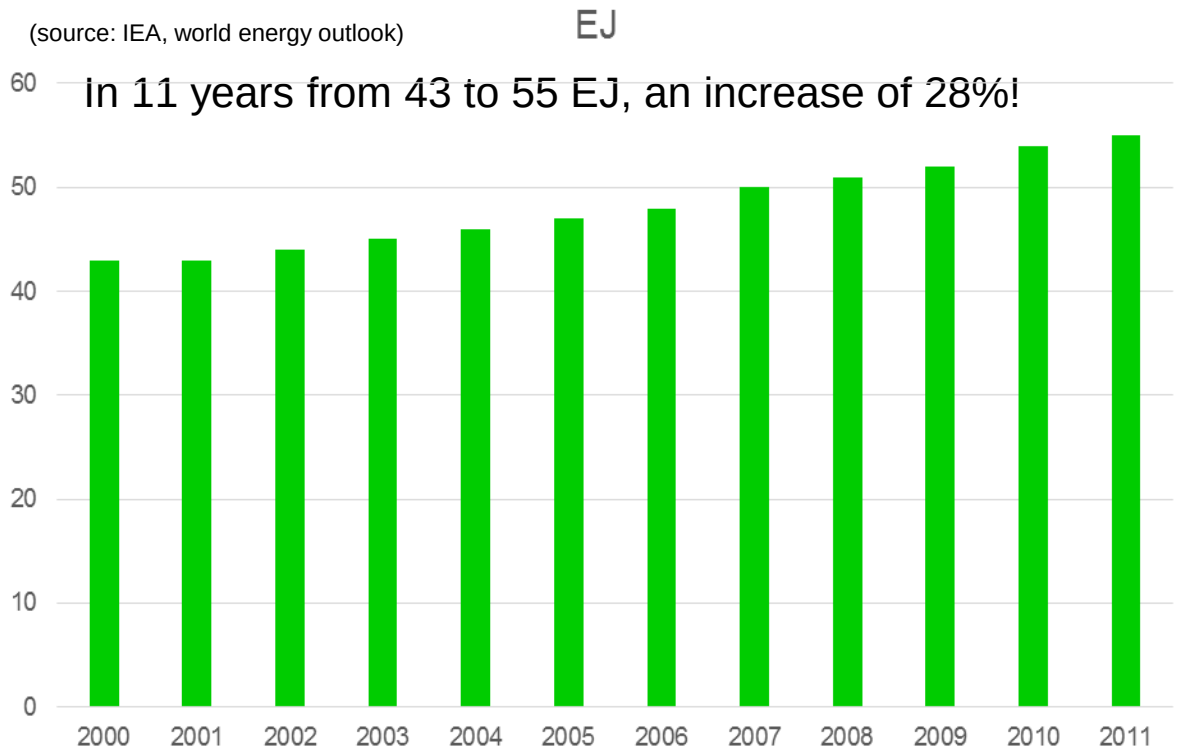
structure

- Climate change and the global energy system
- **Global status of bioenergy**
- Global examples – India, Europe, Americas
- Bioenergy in Europe and lessons learnt
- Conclusions

Bioenergy as primary energy source (EJ)

(source: IEA, world energy outlook)



Growth of Bioenergy almost as fast as the global demand for energy = 28% in 11 years!
Per year 1EJ = 1000 PJ
Total demand for energy grew 11EJ per year!

The supply of biomass

Biomass comes from forests, agriculture and waste streams.

In 2011 the 54.9 EJ originated as follows:

50.1 EJ from forests (91%)

4.7 EJ from agriculture (8%)

0.1 EJ from waste (1%)

Forest: fire wood, wood residues, chips, charcoal, blackliquor, pellets etc.

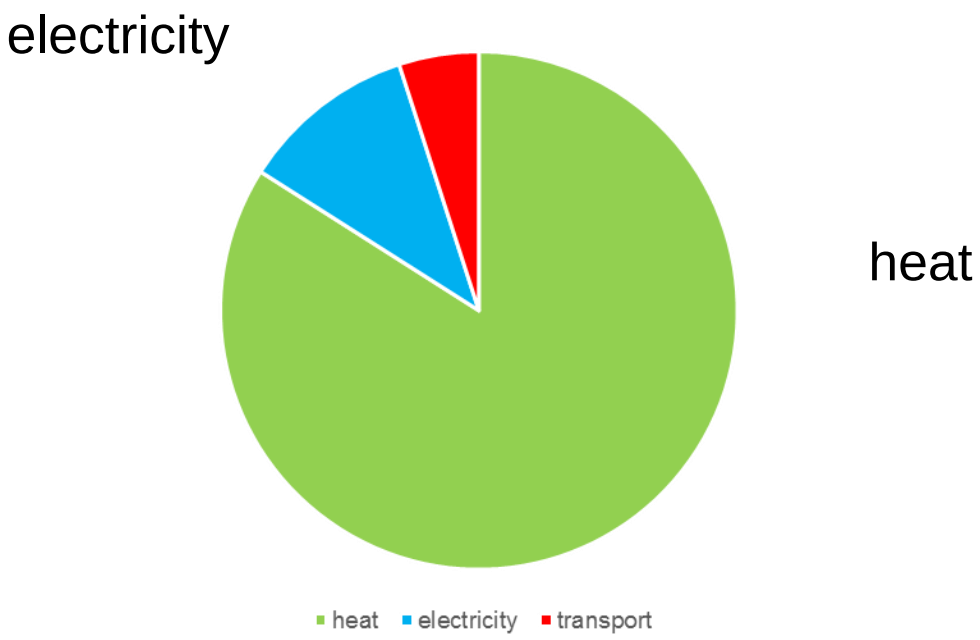
Agriculture: mainly crops for 1G fuels, straw,manure, fruit kernels etc

Modern products play still a modest role:

pellets 0.32 EJ, advanced biofuels 0.1 EJ.

Utilisation of biomass: heat dominates

- Global Utilization of primary biomass, 2011:
  84% heat, 11% electricity, 5% transport fuels



Transport fuels from biomass

Transport fuels

Red line: total production!

Yellow line: ethanol

Blue line: biodiesel.

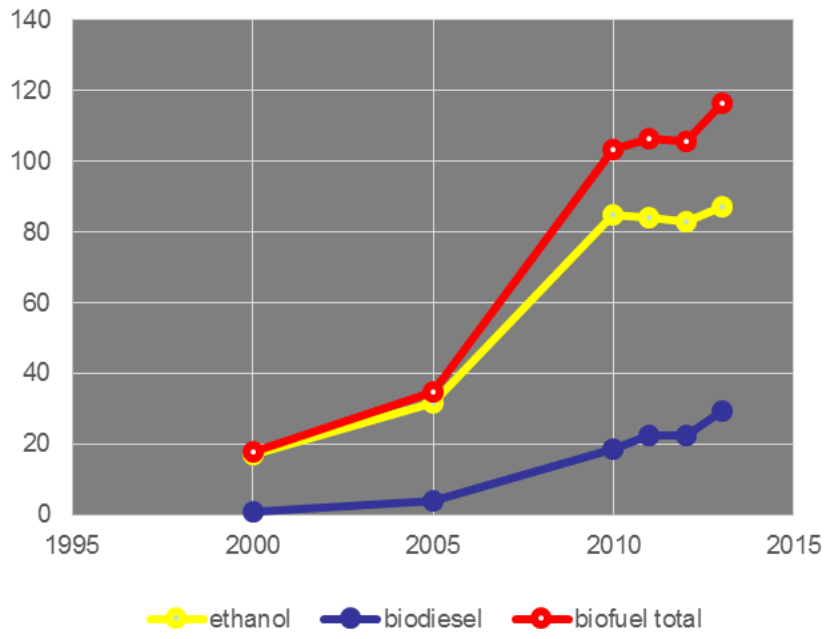
2013: 116 bn litres, 87 bn ethanol, 29 bn biodiesel.

Ethanol: USA, Brazil dominating, Europe declining

Biodiesel: Europe and Argentine leading

1G fuels: biofuels and protein

2G fuels: copmmercial production starts 2013, less than 1 bn litre!



Biomass to heat

Heat is the main market for biomass – today and in the future:
cooking, warm water, residential heating, production processes!

Asia and Africa are the continents where biomass for heat is dominating. India: 70% of the population biomass for cooking!

Most of biomass for heat is still traditional biomass, this will decline with the ongoing urbanisation.

Heat from biomass is in many regions cheaper than fossil energy.
New technologies exist to modernize biomass to heat:
Highly efficient boilers, pellets as feedstock,
district heat as comfortable heat supply in cities
Problems; unsustainable methods, missing understanding and support.

Biomass to electricity

In 2012 the production reached 442 TWh, 101.000MW installed cap.
a strong growth from 170 TWh in 2000.

India	2012:	21 TWh; 6000 MW
EU 28 , 2012		170 TWh, 37 000 MW
China , 2010		´45 TWh, 8 000 MW

Feedstock: solid biomass, by-products of agric., biogas!

Problems: low efficiency, heat losses, missing district heating systems or other heat consumers

Almost no activities in Africa and Oceania!

Biogas

Biogas plays an increasing role within bioenergy.

Global contribution: 1,1EJ, Europa and Asia leading continents. We distinguish

Millions of small plants for cooking in Asia

Landfill gas biogas production starting to grow in different continents

Farm based biogas using manure, energy crops, other by-products

Biogas using waste from the food industry and the communities.

Electricity from biogas in Europe: estimated 35TWh in 2013.

The high investment costs and feed in tariffs will lead to reduced growth in Europe in the next years.

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Bioenergy policy in Europe

Bioenergy policy is a part of the general renewable policy:

- 2009: binding targets for all memberstates, for EU in total 20% RES in 2020, but for each of the 28 states individual targets from 15 -50% share of RES.

- NREAPs: each member state had to present an National Renewable Energy Action Plan with two years intermediate targets to secure the progress

- RES targets also as part of the climate mitigation polic< - also -20% Emissions by 2020 as compared to 1990!

- Instruments:

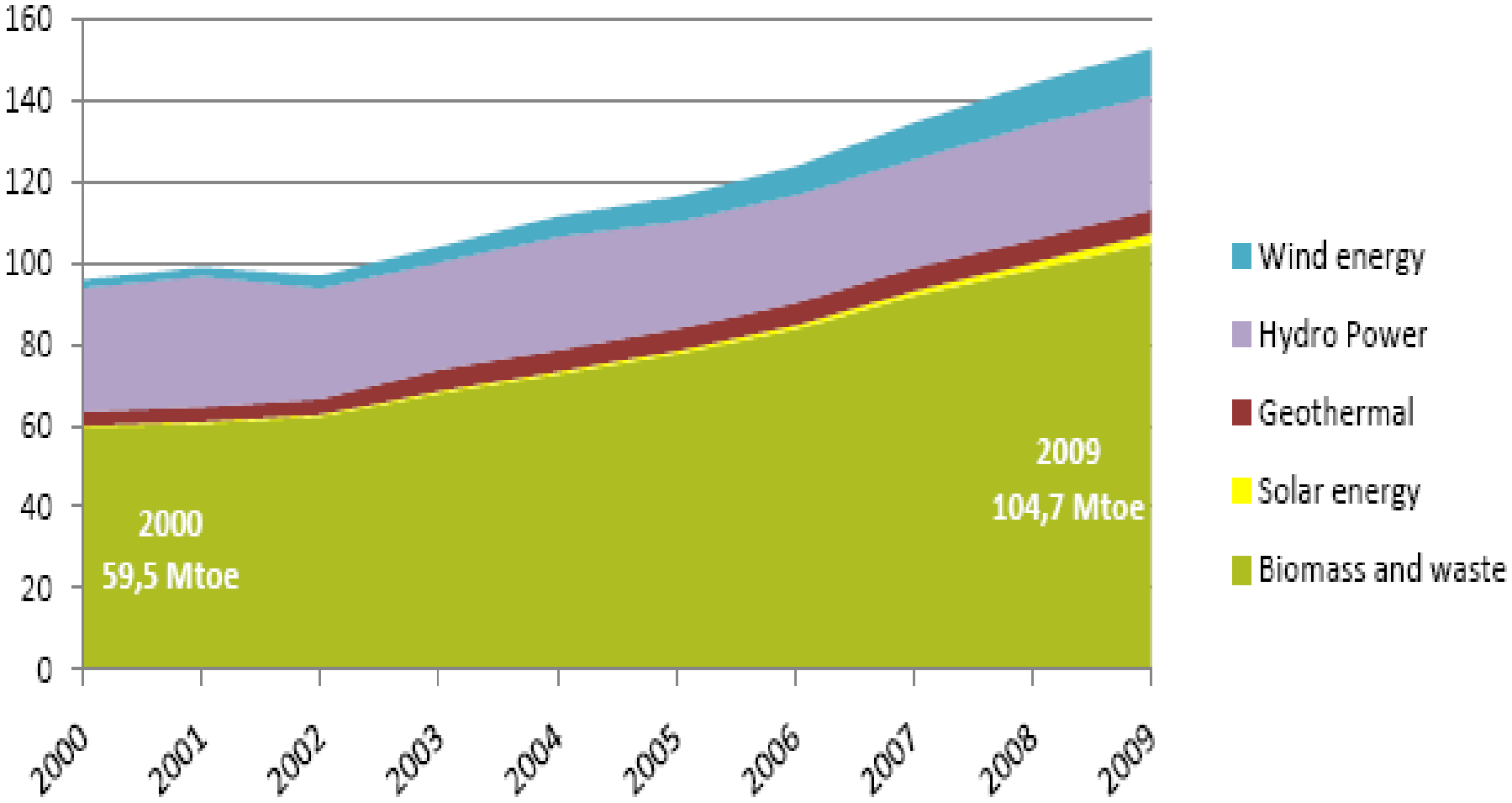
  for electricity: Feed in Tariffs, green certificates,

  for heat: carbon taxes, government grants,

  for biofuels: blending rules for biofuels etc.

EU 27: Development of Renewables 2000 – 2009;

Biomass: two thirds of renewable energy! Fastest growing sector in absolute units! Comprises biomass for heat, electricity, transport and biogas.

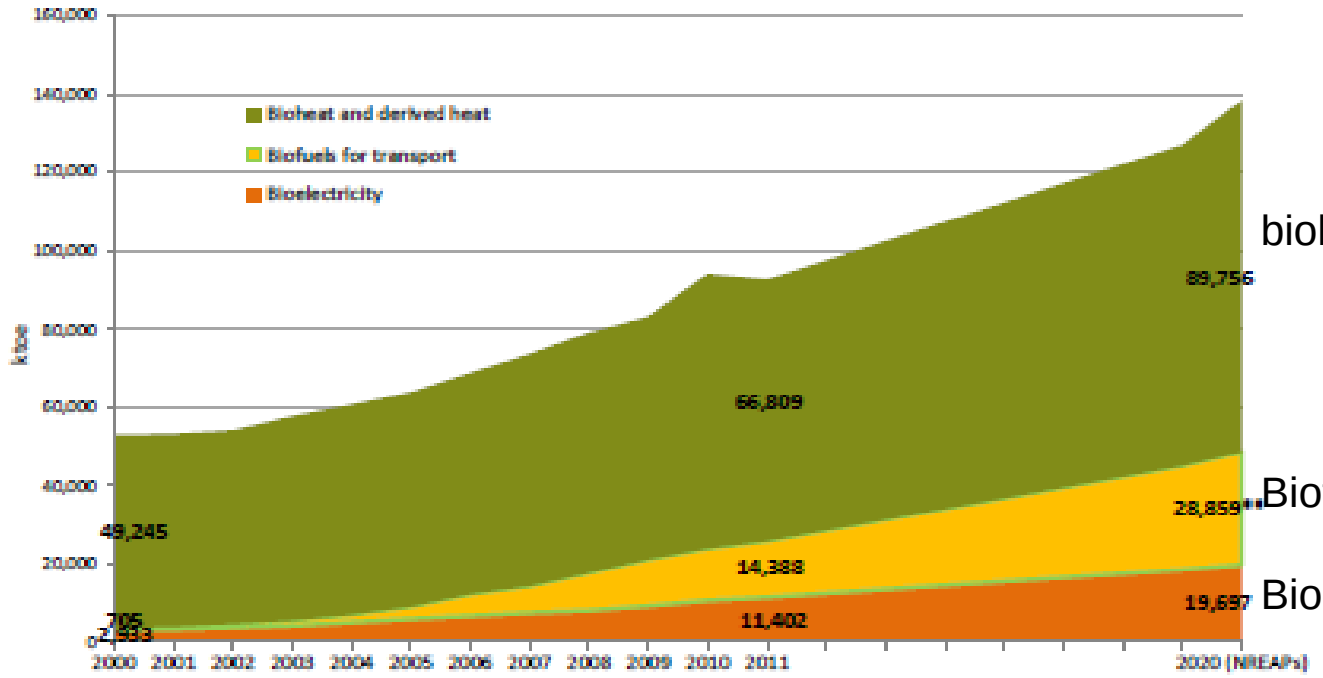


Source: Eurostat

Final energy consumption of bioenergy in Europe 2000 -2020 ktoe

from 55 Mtoe in 2020 to 140 Mtoe in 2020, heat dominating

Figure 2.13 Final energy consumption of bioenergy 2000-2020 in Europe*



bioheat

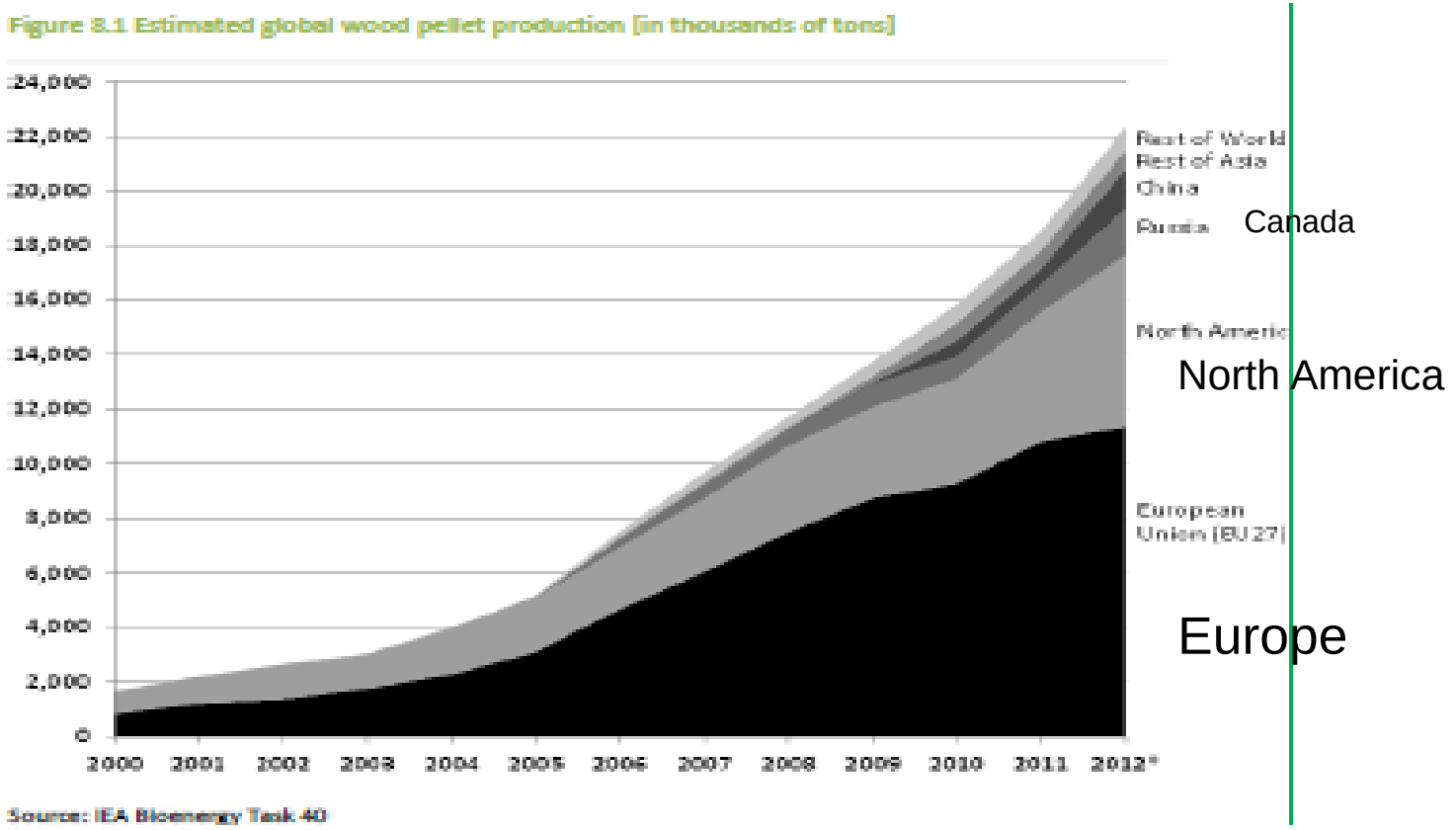
Biofuels

Bio-electricity

* The figures between 2011 and 2020 are only estimations considering a stable growth between2011-2020.
** The rules to calculate the biofuels contribution to the 10% RES target in transport are under revision to take ILUC impact into account. Therefore this biofuels target is very unlikely to be achieved.
Source: Eurostat and NREAPs. AEBIOM calculation

Global estimated wood pellets production

2000: 1,8 Mtone, 2012 22 Mtons



An example: the city of Pecs, Hungary

- 160.000 inhabitants

- Year 2000: heat and electricity from coal and gas
- Year 2014: heat and electrcity from wood and straw

- Two boilers, one wood, one straw, 300MW th, 85 MW el; 180 000 to straw per year

North Atlantic Ocean
North Sea
Baltic Sea
Irish Sea
English Channel
Bay of Biscay
Mediterranean Sea
Adriatic Sea
Tyrrhenian Sea
Ionian Sea
Aegean Sea
Black Sea
Skagerrak
Oland
Bornholm
Gotland
Aberdeen
Edinburgh
Belfast
Newcastle
Isle of Man (U.K.)
Dublin
Liverpool
Cardiff
London
Amsterdam
Hamburg
Rostock
Berlin
Hannover
Elbe
Brussels
Bonn
Frankfurt
Le Havre
Paris
Luxembourg
Stuttgart
Strasbourg
Nantes
Loire
Guernsey (U.K.)
Jersey (U.K.)
Bilbao
Porto
Madrid
Tagus
Lisbon
Barcelona
Valencia
Sevilla
Málaga
Strait of Gibraltar
Gibraltar (U.K.)
Ceuta (SPAIN)
Melilla (SPAIN)
Rabat
Algiers
Tunis
Bordeaux
Geneva
Bern
Lyon
Marseille
Milan
Turin
Genoa
Venice
Florence
Rome
Naples
Palermo
Sicily
Sardinia
Corsica
Balearic Islands
Vienna
Graz
Munich
Prague
Bratislava
Budapest
Cluj-Napoca
Pécs
Ljubljana
Zagreb
Belgrade
Sarajevo
Podgorica
Skopje F.Y.R.O.M.
Tirane
Thessaloniki
Ioánnina
Corfu
Athens
Peloponnisos
Crete
Rhodes
Istanbul
Constanta
Varna
Sofia
Odesa
Chişinău
Kiev
Dnipro
Dniester
Smolensk
Minsk
Vilnius
Kaliningrad
Gdańsk
Poznań
Warsaw
Brest
Wrocław
Kraków
Vistula
L'viv
Riga
Gotland
Göteborg
Skagen
Copenhagen
DENMARK
LATVIA
LITHUANIA
RUSSIA
BELARUS
UKRAINE
POLAND
GERMANY
NETHERLANDS
BELGIUM
LUX.
CZECH REPUBLIC
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MOLDOVA
AUSTRIA
HUNGARY
ROMANIA
SWITZ.
LIECH.
SLOVENIA
CROATIA
BOSNIA AND HERZEGOVINA
Serbia
BULGARIA
MONTENEGRO
ALB.
GREECE
TURKEY
ITALY
SAN MARINO
MONACO
VATICAN CITY
FRANCE
SPAIN
PORTUGAL
ANDORRA
MOROCCO
ALGERIA
TUNISIA
MALTA
IRELAND
KINGDOM
UNITED
Scale 1:19,500,000
Lambert Conformal Conic Projection, standart parallels 40°N and 56°N
0 300 Kilometers
0 300 Nautical Miles
50
40
30
20
10

Pecs: Pannonpower, straw as feedstock

Straw after harvest baled, one bale ca 500kg, storage decentralized

Straw: with trucks to power plant, deloading by crane

Pecs: straw deloading, every 40 moimutes a truck, 18tons

Bales moved to the boiler!

Pécs: woody biomass

Pecs: conclusions

- Pécs, the first green city of Hungary, produces more heat and electricity from biomass than they need: 100% renewable heat and electricity
- They developed a reliable straw logistic based on contracts
- They use 3% of the straw produced in their sourcing area
- There is potential for further development in the future:
  biofuels, integration with other RES!

Lessons learnt in Europe

- Targets 20 20 20: Positive impact
- FiTs: pro and contra, strong push for bioelectricity, partly low efficiency!
- Biogas: interesting, technology expensive, many legal regulations
- Instruments for heat are needed, carbon tax positiv, grants yes often not reliable, budget restraints!
- Competitiveness of biomass: best in the heating sector, reliable policies needed for biofuels, bioelectricity.
- Convincing arguments for bioenergy:
  - regional revenue streams: from the region for the region
  - renewable, carbon neutral, cheaper than fossil for heating
  - improved energy security
  - rural job creation and improved incomes

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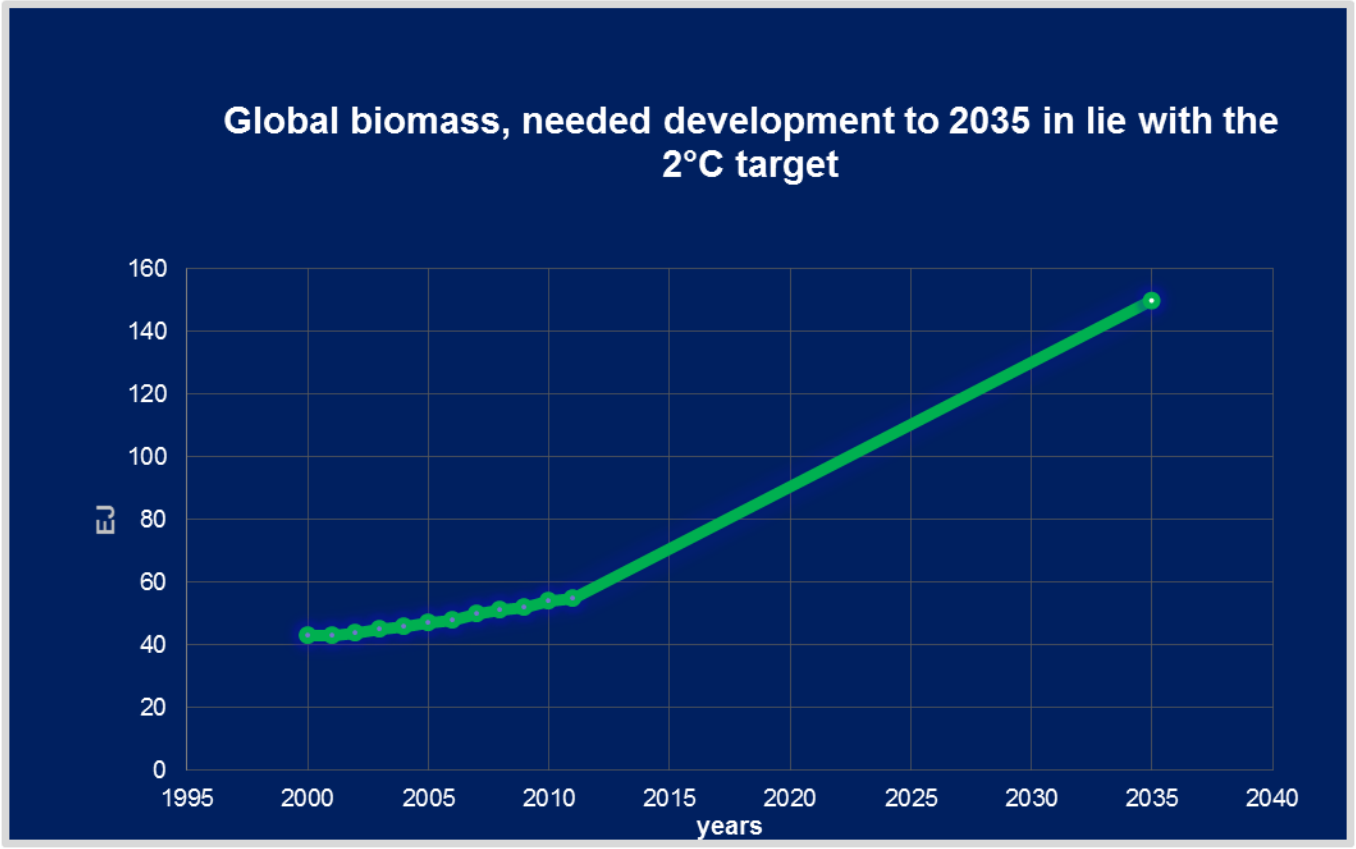
Conclusions

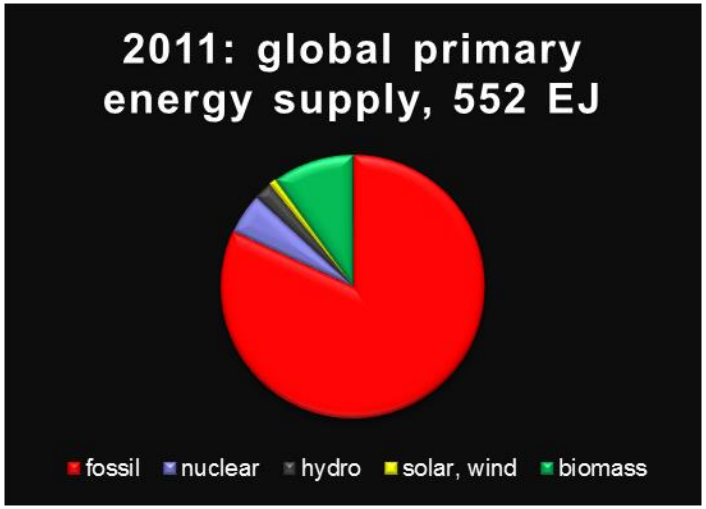
- A successful deployment of bioenergy needs a strong support of government policies on local, regional and federal level: legislation, education and training, financial support and
- Reduction of subsidies and support for fossil fuels
- Climate challenge can only be tackled with a long run vision
  - On bioenergy
  - On all Renewables
  - On the transformation of the energy system

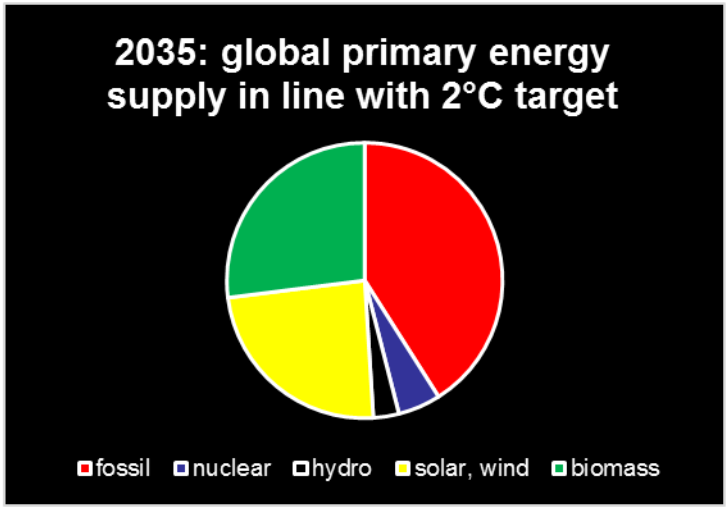
2° C target requires a strong growth of all renewable, biomass should grow until 2035 by more than 90 EJ



in 100% Renew World

The needed change in the composition of the energy supply until 2035 to comply with the mitigation pathway!





Go 100% renewables

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WBA: How we work?

- **Office** in Stockholm, Sweden
- **Our board**: 22 members from 5 continents (Africa 4, Americas 6 , Asia 6, Australia 1, Europe 5)
- **Our members**: companies, associations, indiviudals from all over the world
- **Main issues**: biomass potential, sustainability of biomass, small scale heat with biomass, combined heat and power, future of biofuels, carbon neutrality of biomass, bioenergy statistics
- **Main activities**: fact sheets, projects, position papers, presentations in conferences and workshops, supporting biomass trade with the platform: bioenergy connect (BC)

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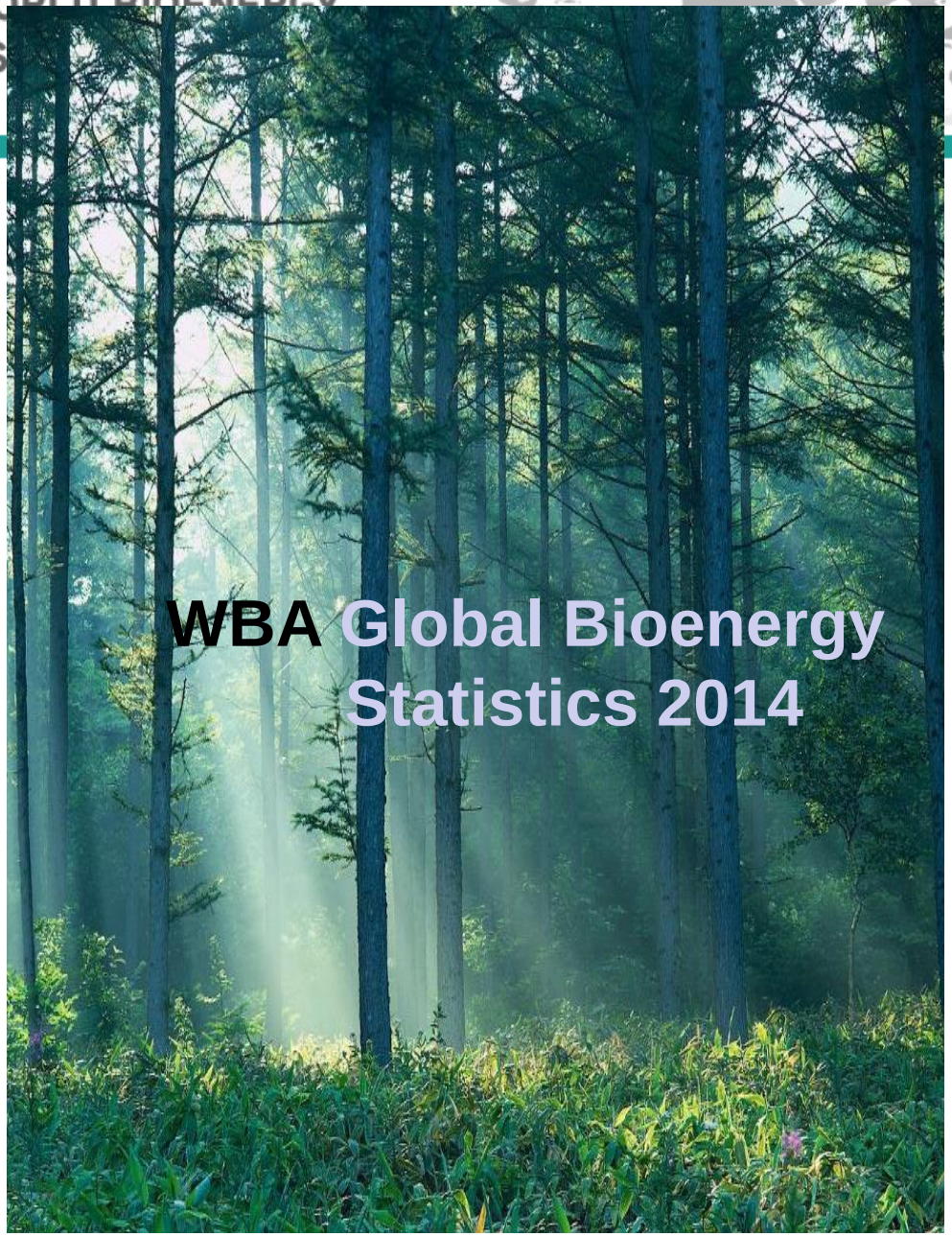

WBA Global Bioenergy Statistics 2014

Thank you for your attention!

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