

Renewables in the Finnish Climate & Energy Strategy 2008

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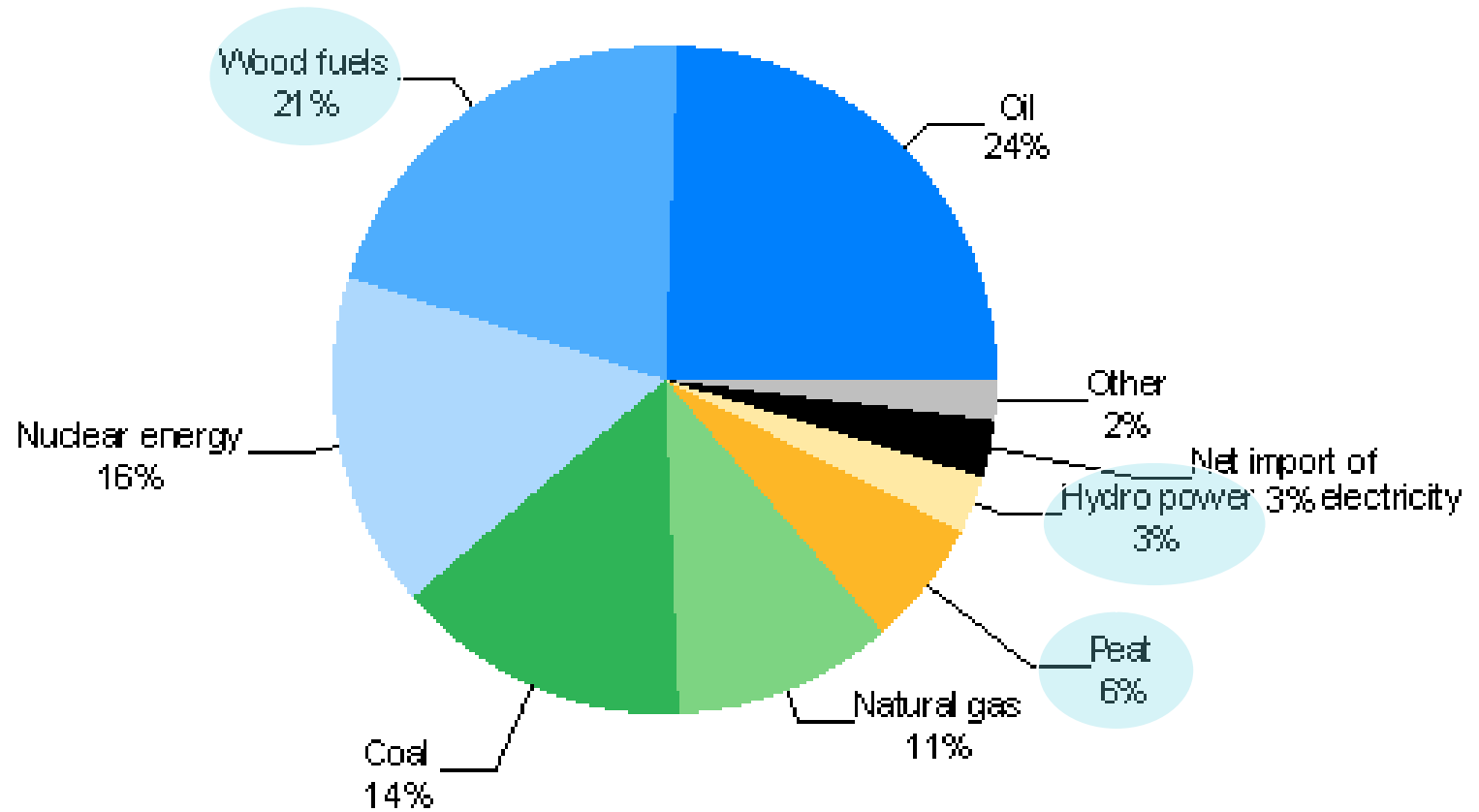
Santa Barbara, November 17th, 2008

Total energy consumption 2006

1 492 000 TJ

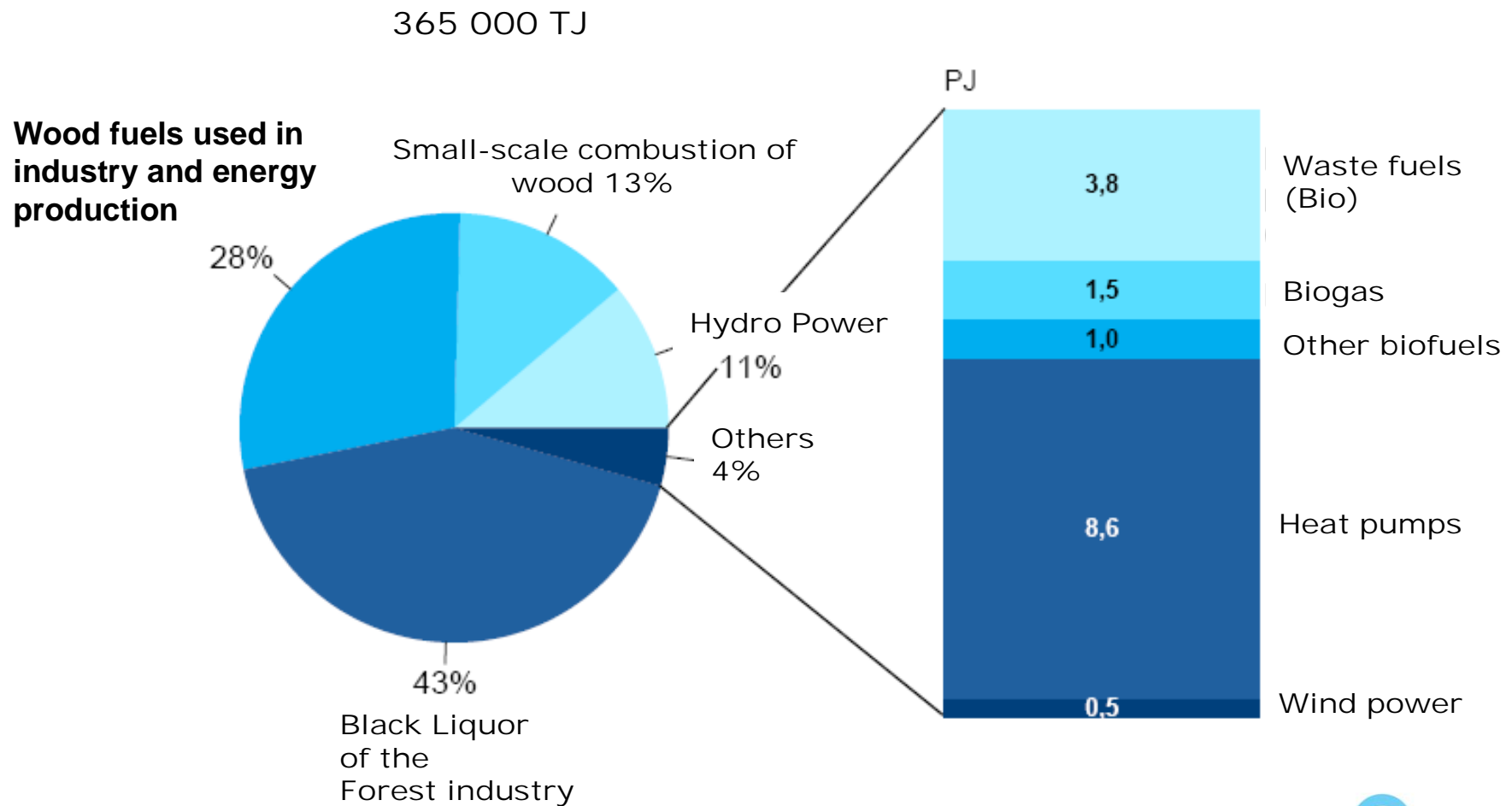
~50%
FOSSIL
ENERGY

1/3
DOMESTIC
ENERGY



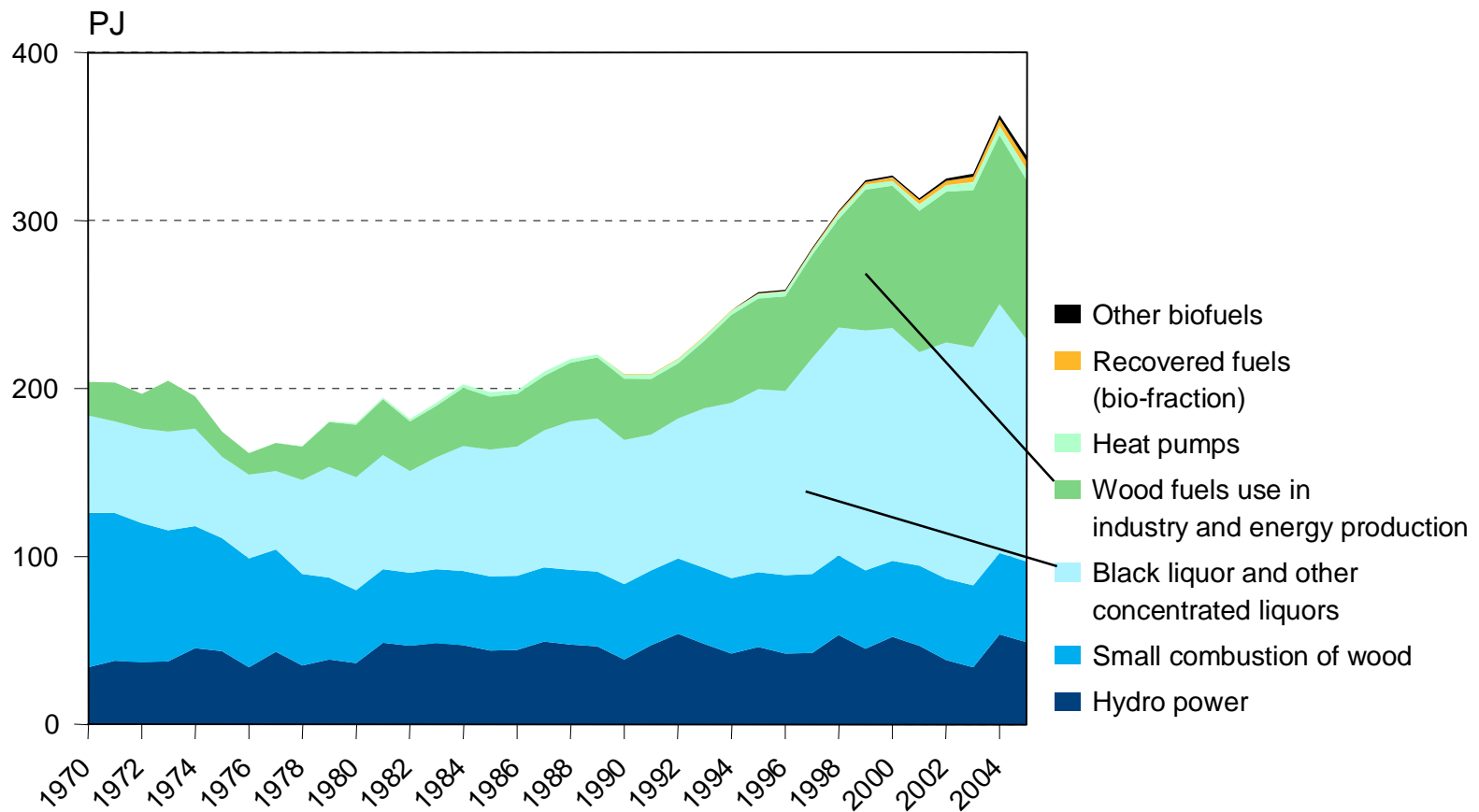
Source: Statistics Finland, Energy Statistics

Renewable energy sources; use in 2006



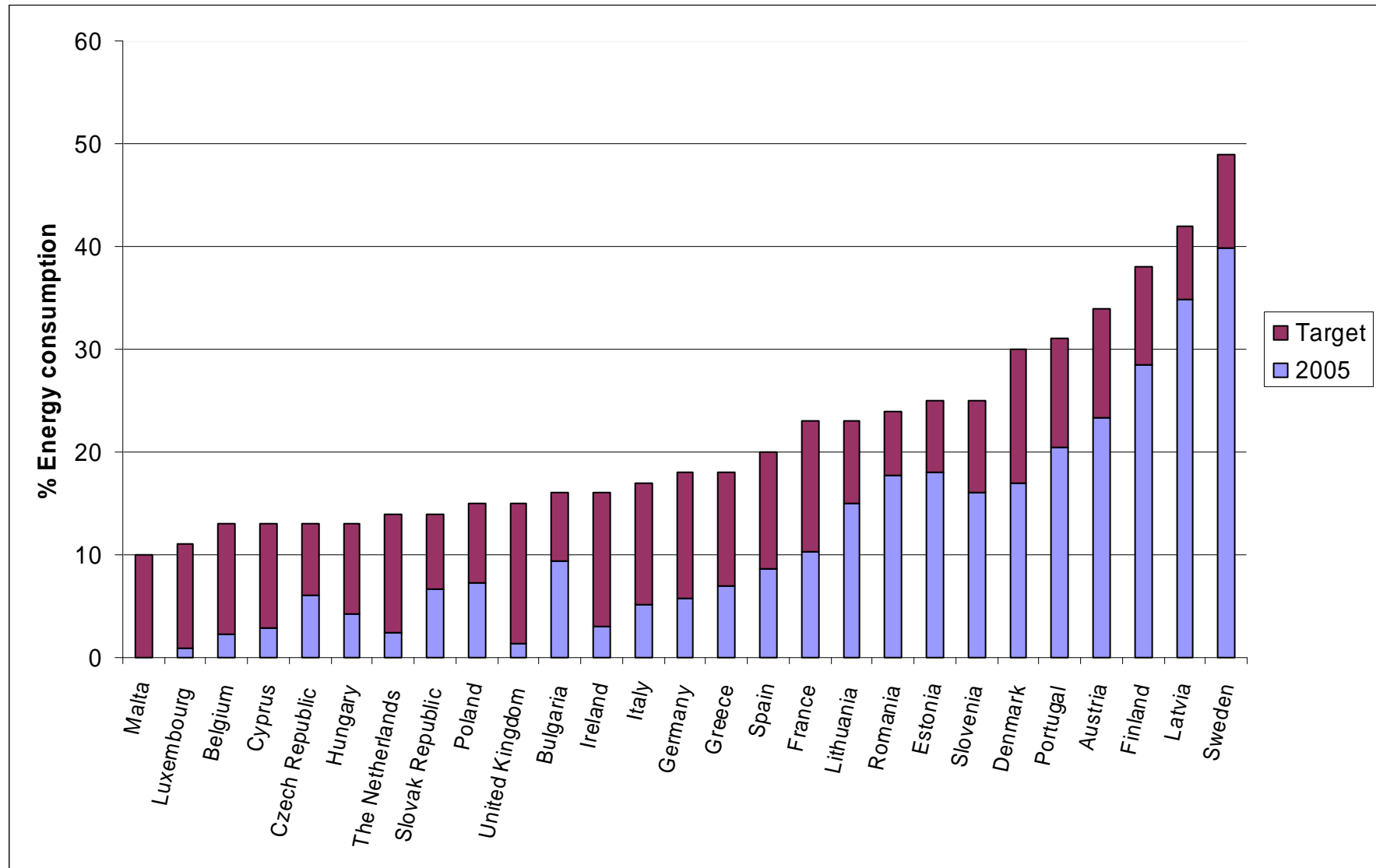
Source: Ministry of Employment and the Economy and Statistics Finland, Energy Statistics

Development of Renewable Energy Sources 1970-2005



Source: Statistics Finland – Yearbook 2006

EU-targets for renewables in 2020



Finnish Climate & Energy Strategy 2008

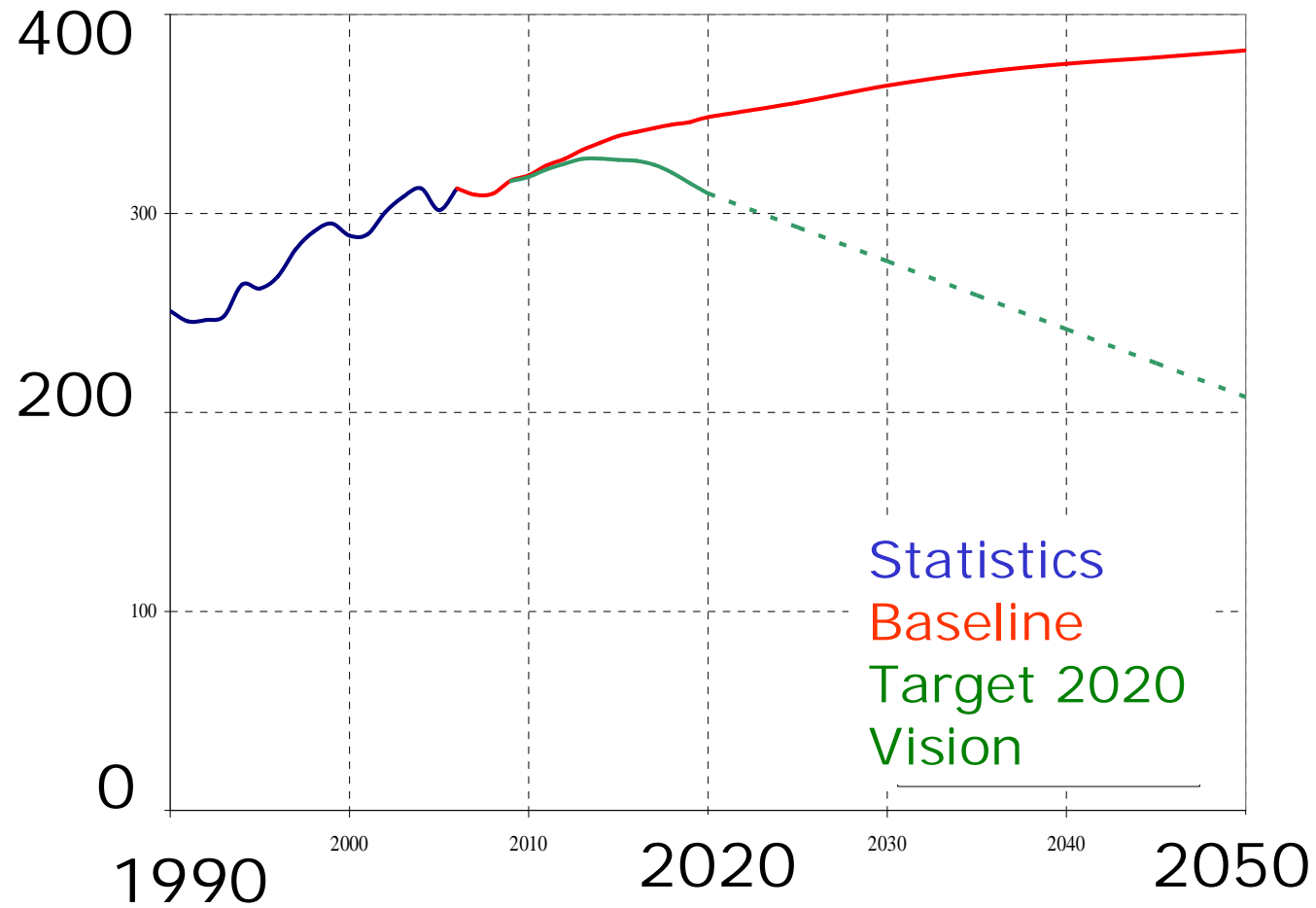
§ Approved by the Government on Nov 6th,
2008

§ Main measures to cut the CO₂ emissions:
increasing energy-efficiency, increasing the
share of renewables, nuclear power

Strategy on the Natural Resources

- § Preparation ongoing
- § An extensive preparatory group representing various stakeholders
- § To be completed in spring 2009

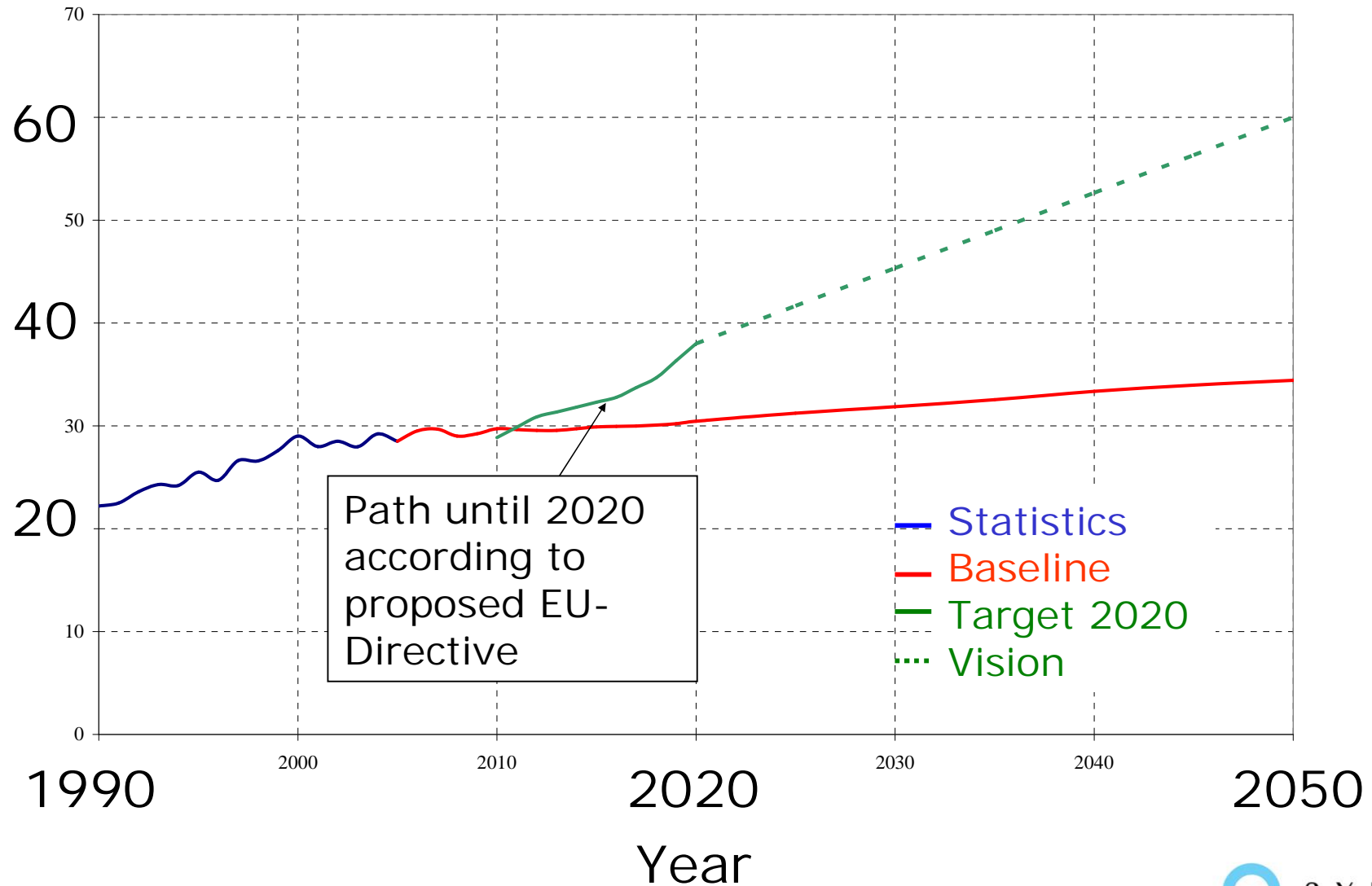
Energy consumption (Twh) in Finland



Source: Ministry of Employment and the Economy, 2008

Share of renewables according to the Finnish Climate & Energy Strategy 2008

% renewables



Source: Ministry of Employment and the Economy, 2008

Instruments to be used for promoting renewables in Finland

- § R&D and demonstration of new technologies
- § Implementation of related EU directives
- § Investment subsidies for changing energy systems
- § Subsidies for changing heating systems of residential buildings
- § Support for energy wood harvesting and chipping
- § Support through energy taxation system
- § Feed-in tariffs and green certificates
- § Information campaigns

Is it possible to increase the use of renewables in a sustainable way?

FORESTS

- § Finland has, based on our forest resources, the highest amount of biomass per inhabitant in Europe.
- § But, we already use our forest resources efficiently, at least partly at the expense of biodiversity and ecosystem services in general
- § Almost half of the forest biomass is utilized for energy production, either directly or indirectly
- § Increasing the energy use of wood can be realized only by utilizing stubs and logging residues
- § What is the best use of forest biomass? There are different criteria
- § Maximizing energy and material efficiency by cascading use of biomass: first, production of various goods, then energy from waste and residues
- § Biorefineries; two projects launched by forest industry

Potential of logging residues

Source: Finnish Forest Research Institute

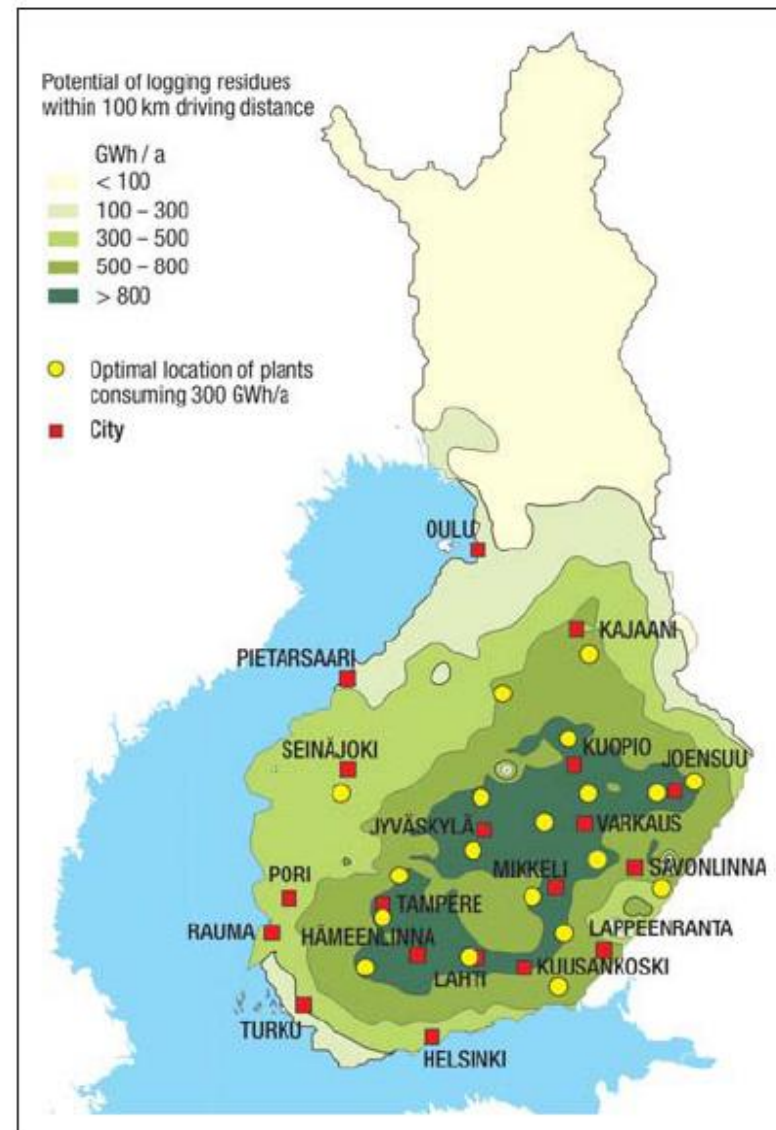


Figure 19. Logging residue potential from final fellings within a 100 km transport distance, and optimal location of power plants with an annual consumption of 300 GWh of forest chips. Small-tree chips and stumpwood chips are not included (73).

AGRICULTURE

§ Reed canary grass (Falaris); 17 200 ha in 2006

§ Ripe seed; only 821 ha

§ Straw

§ Biogas; about 10 plants

§ Cereals: biodiesel, ethanol, heating?

OTHER OPTIONS

Already in production:

§ Bioenergy production from municipal and industrial biowaste

§ Ethanol from waste produced by the food industry (St1)

§ Biodiesel NExBTL (Neste Oil)

In the pipeline:

§ Second/third generation production technologies and cellulose based raw materials

Research on:

§ Algae

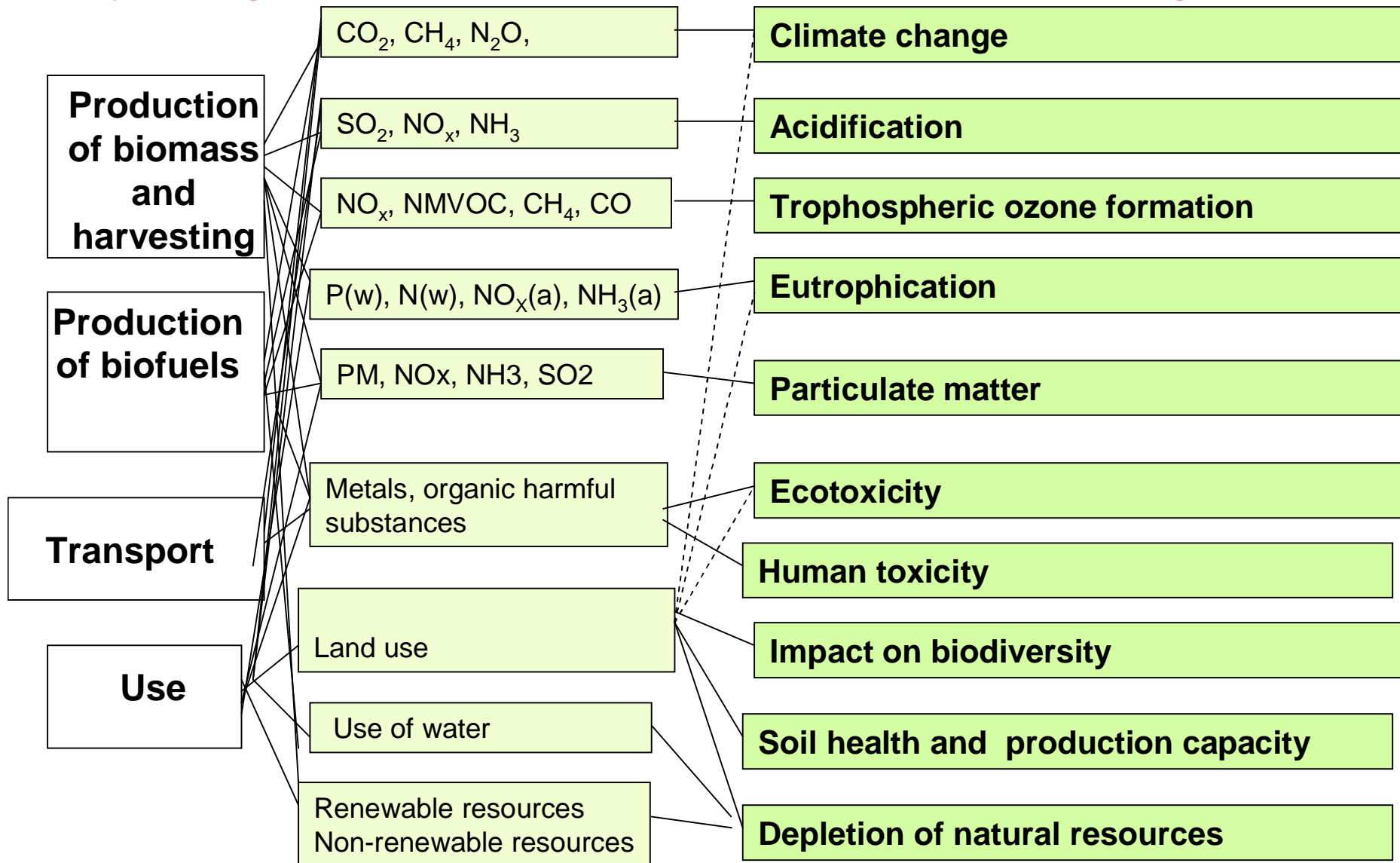
Life cycle approach needed for assessing impacts

Environmental impacts

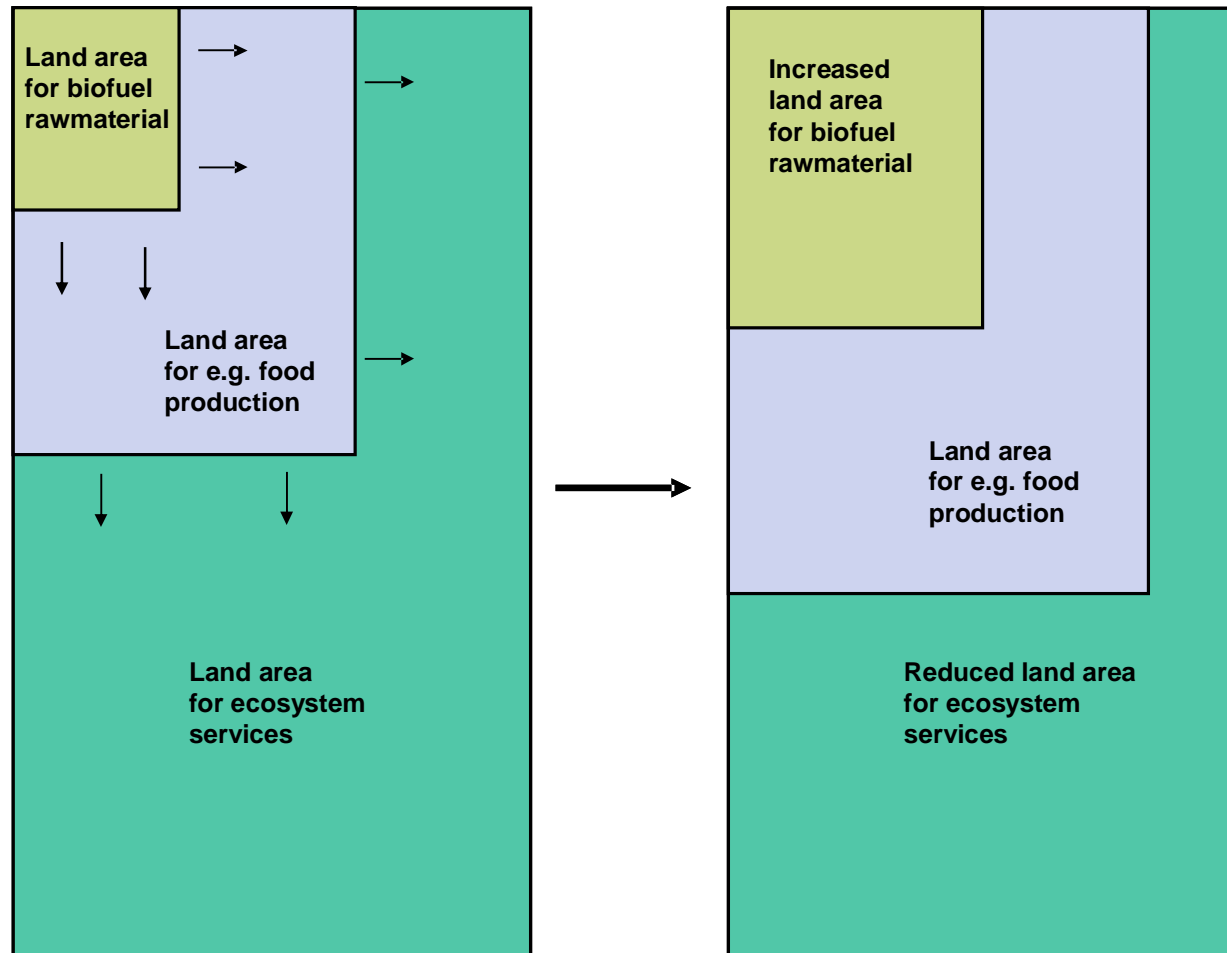
Life cycle stages

Environmental interventions

Impact categories



Competition between different forms of land use



Source: Soimakallio et al. 2008. Assessing the sustainability of biofuels from evolving technologies – A Finnish approach

Environmental impacts of different fuels in relative terms; the biggest GHG reductions are achieved by using biomass for CHP (Antikainen et al. 2007)

	Wood	Natural gas	Peat	Coal (fluidized bed reactor)
Climate change	1	39	46	53
Acidification	1	1	3	11
Tropospheric ozone	1	7	1	5
PM 2.5	3	1	3	12