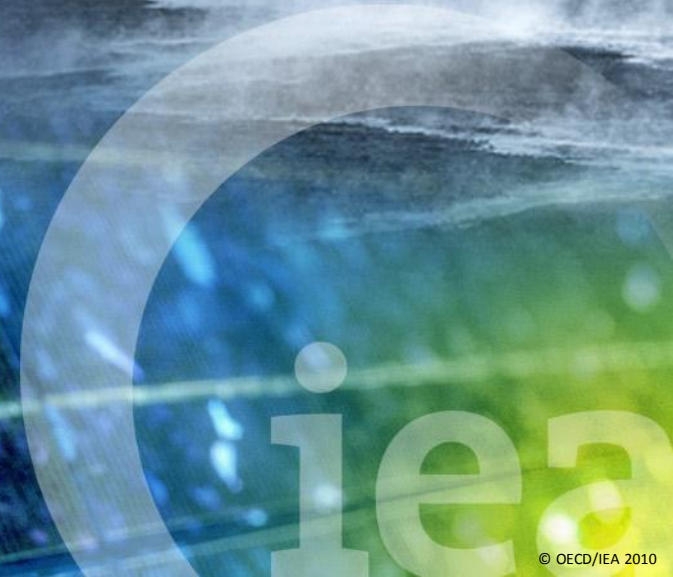




Global outlook for fossil fuels, market development and the role of biofuels

Fuels of the Future
Berlin, 23 January 2012

Anselm Eisentraut
International Energy Agency



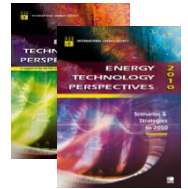
IEA analysis on transport and biofuels

Relevant publications



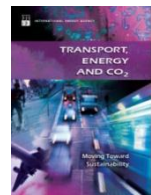
- **World Energy Outlook 2011**

Horizon 2035, all energy sources
Scenarios depicting different developments on the basis of policy actions
Special focus on renewable energy, incl. a chapter on biofuels



- **Energy Technology Perspectives 2010**

Horizon 2050, all energy sources
Scenarios that pay particular attention to the role of technology, especially on the demand side



- **Transport, energy and CO₂ - Moving towards sustainability (2009)**

Horizon 2050, all energy sources relevant to transport
Builds and expands the work done on ETP



- **From 1st- to 2nd-Generation Biofuel Technologies (2009)**

Current state of the art of 2nd-generation biofuel industry

- **Sustainable Production of Second-Generation Biofuels (2010)**

Potential for biofuels from agricultural and forestry residues
Focus on emerging and developing countries

Both publications available at www.iea.org



- **IEA Technology Roadmap – Biofuels for Transport (2011)**

Focus on global biofuel deployment to 2050

www.iea.org/roadmaps

WORLD ENERGY OUTLOOK

2
0
1
1

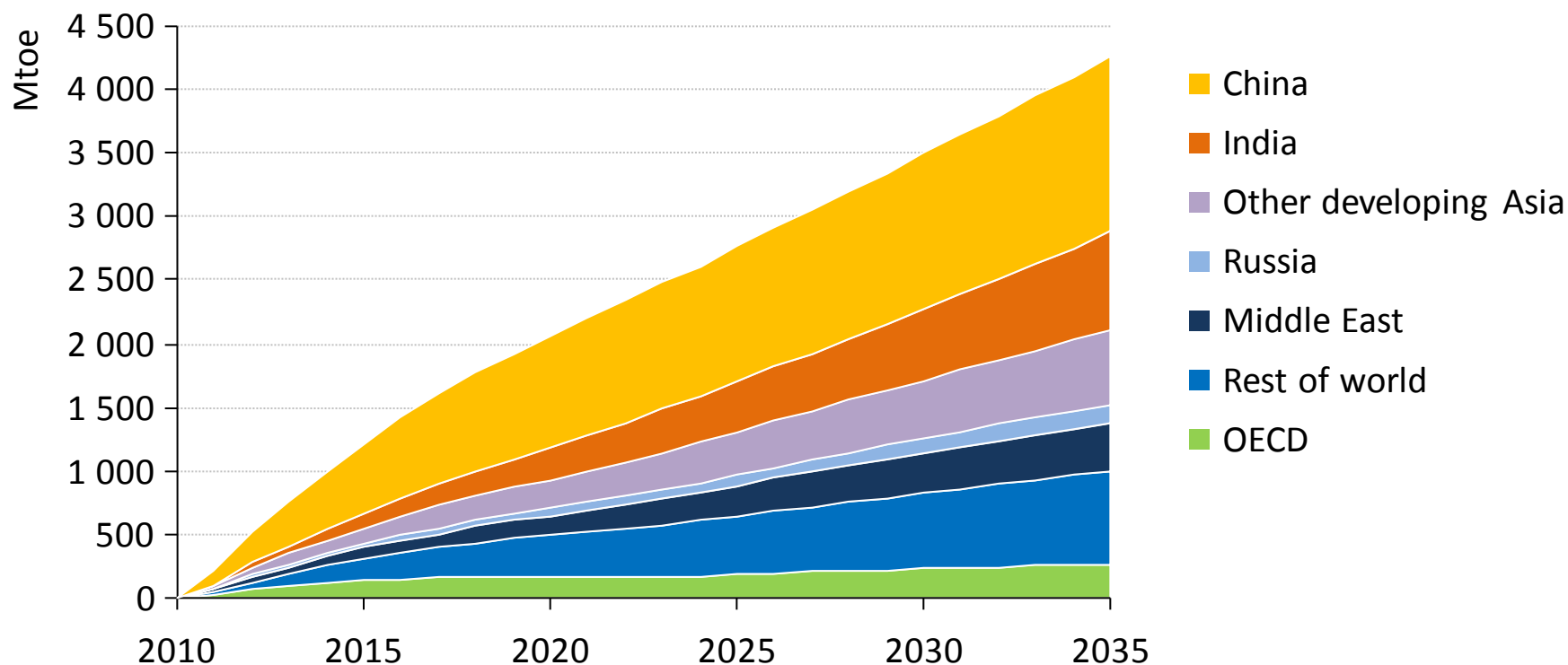
World Energy Outlook 2011

The context: fresh challenges add to already worrying trends

- Economic concerns have diverted attention from energy policy and limited the means of intervention
- Post-Fukushima, nuclear is facing uncertainty
- MENA turmoil raised questions about region's investment plans
- Some key trends are pointing in worrying directions:
 - *CO₂ emissions rebounded to a record high*
 - *energy efficiency of global economy worsened for 2nd straight year*
 - *spending on oil imports is near record highs*

Emerging economies continue to drive global energy demand

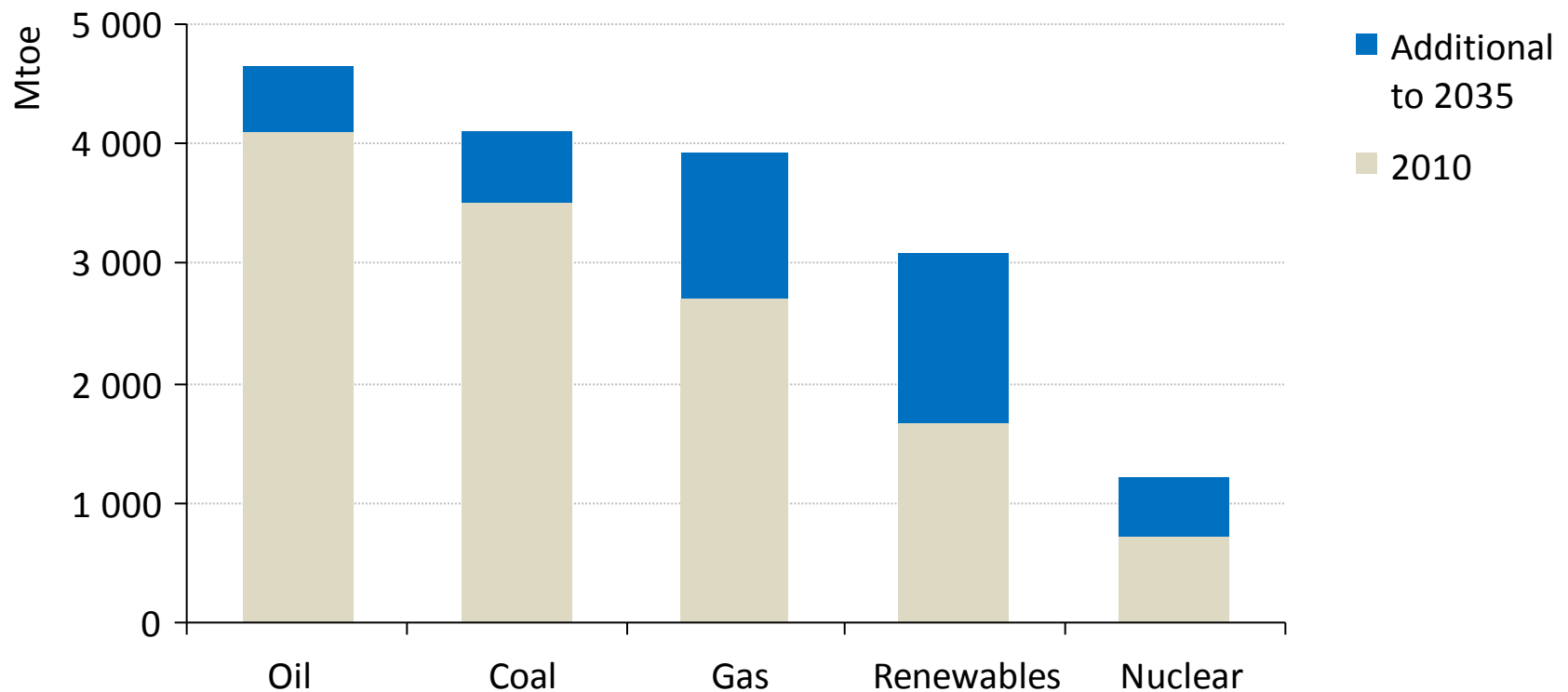
Growth in primary energy demand in the New Policies Scenario



Global energy demand increases by one-third from 2010 to 2035, with China & India accounting for 50% of the growth

Natural gas & renewables become increasingly important

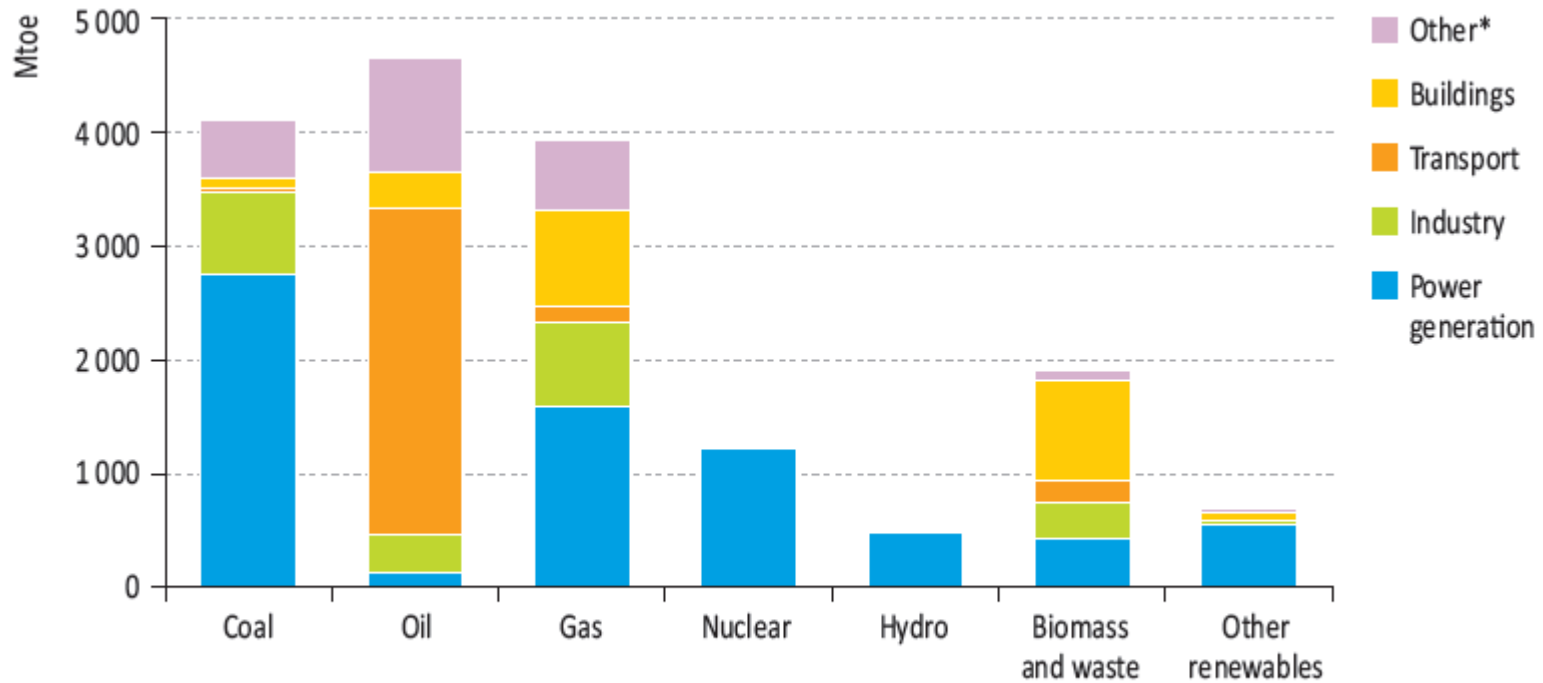
World primary energy demand



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

Energy demand by sector

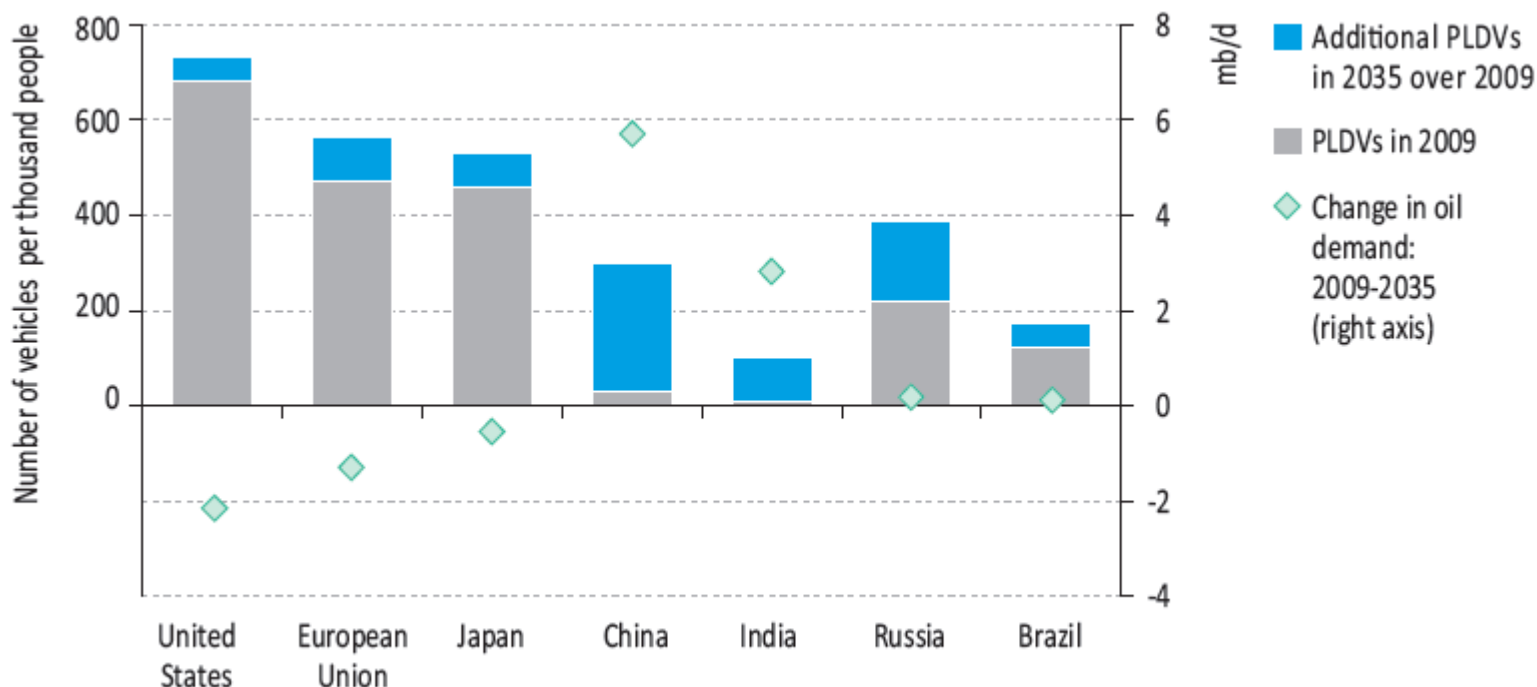
World primary energy demand by fuel and sector in the New Policies Scenario, 2035



*Other includes other energy sector, agriculture and non-energy use.

Demand for fossil fuels is set to grow, but renewables are also growing rapidly

Number of vehicles per 1000 people by region and change in oil demand in road transport



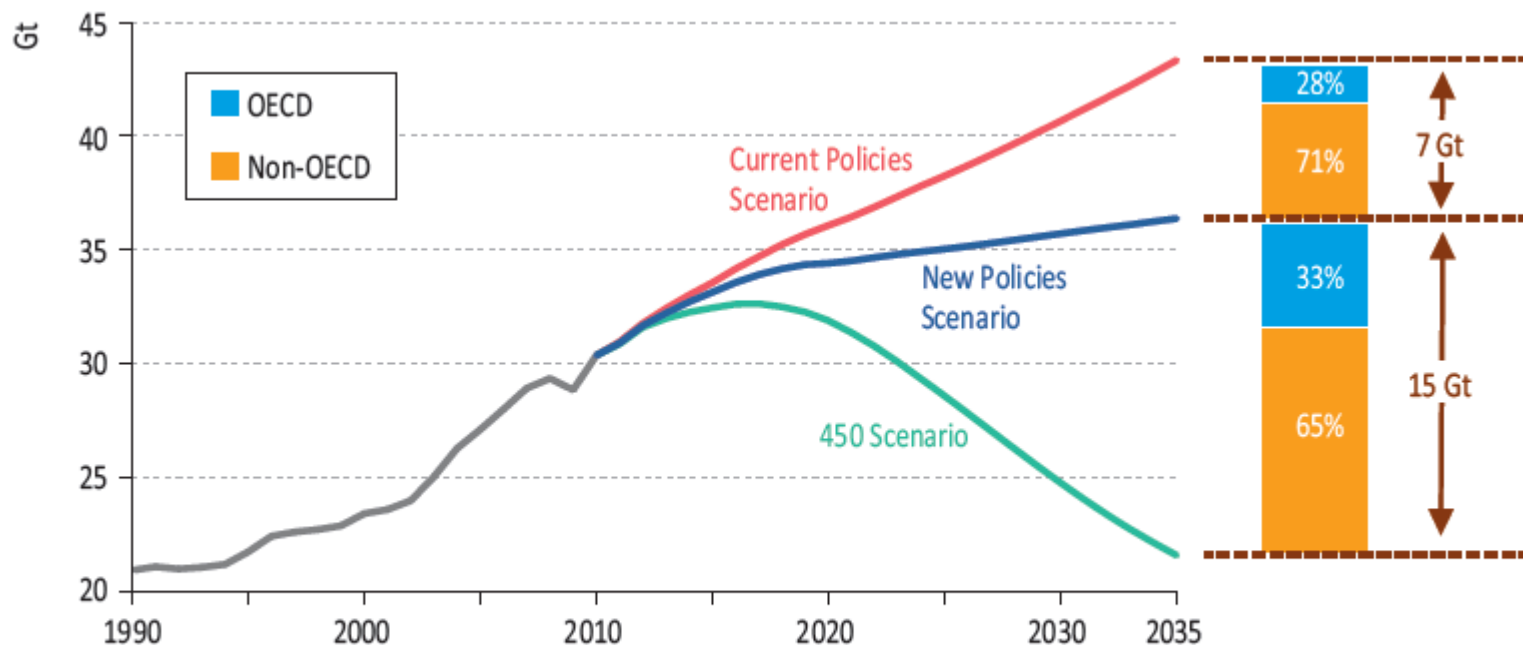
The passenger vehicle fleet doubles to 1.7 billion in 2035

Most cars are sold outside the OECD by 2020

All net growth in oil demand is coming from the transport sector in developing regions

*The door to 2°C is closing,
but will we be “locked-in”?*

World energy-related CO₂ emissions by scenario



Note: There is also some abatement of inter-regional (bunker) emissions which, at less than 2% of the difference between scenarios, is not visible in the 2035 shares.

The New Policies Scenario would lead to a global temperature rise of more than 3.5°C

Without further action, by 2017 all CO₂ emissions permitted in the 450 Scenario will be “locked-in” by existing power plants, factories, buildings, etc.

2010

2015

2020

2025

2030

2035

2040

2045

2050



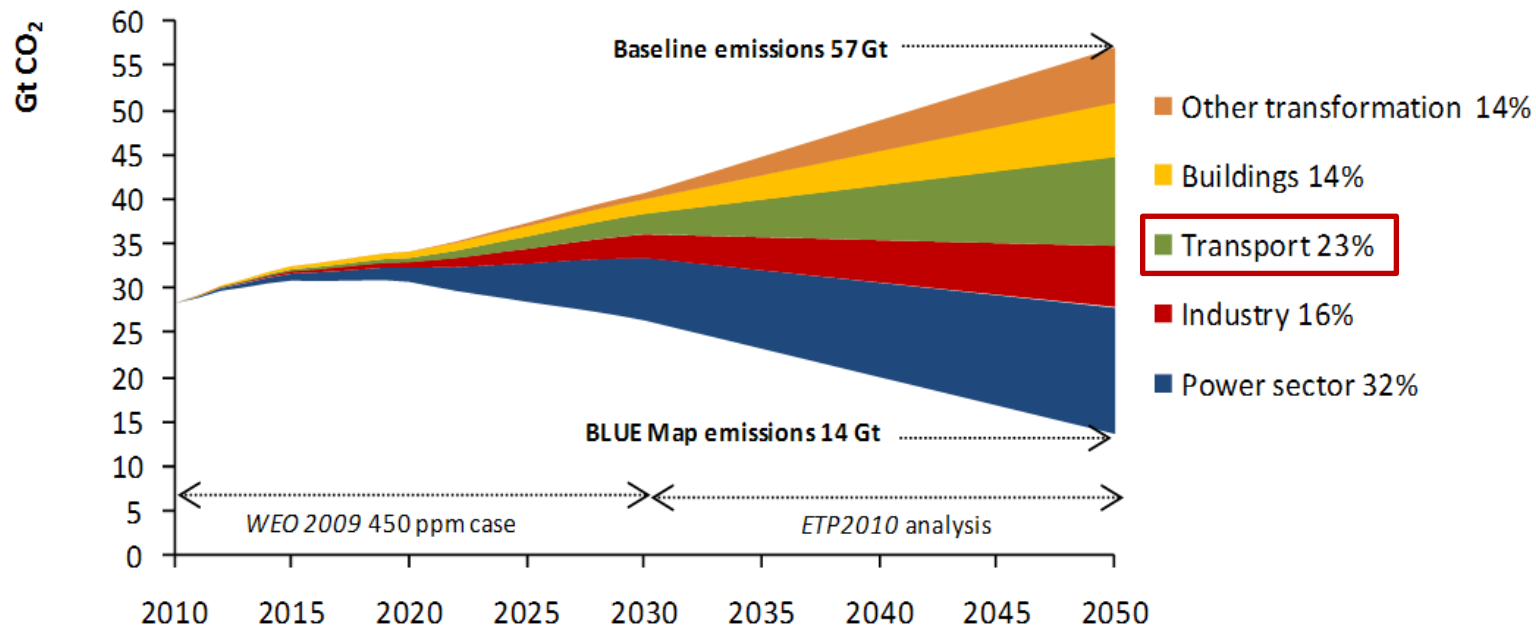
Technology Roadmap

Biofuels for Transport



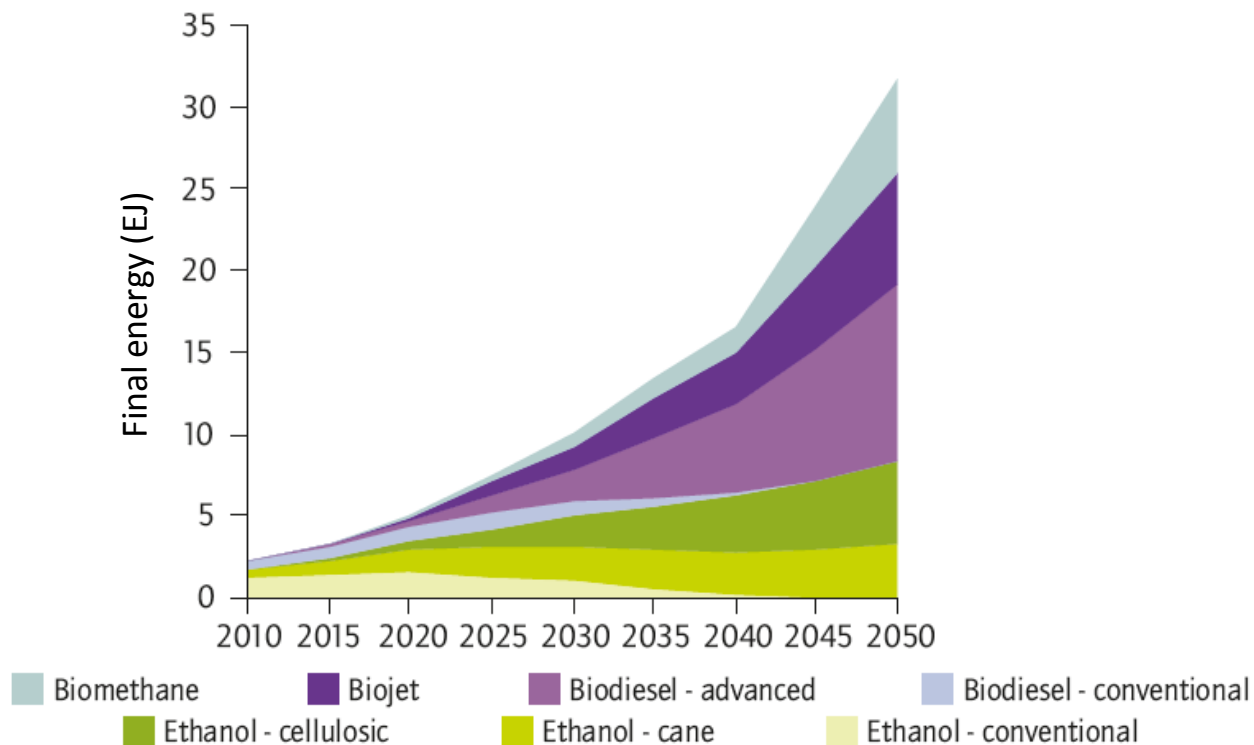
Looking beyond 2035

The BLUE Map Scenario – Towards a low-carbon energy sector

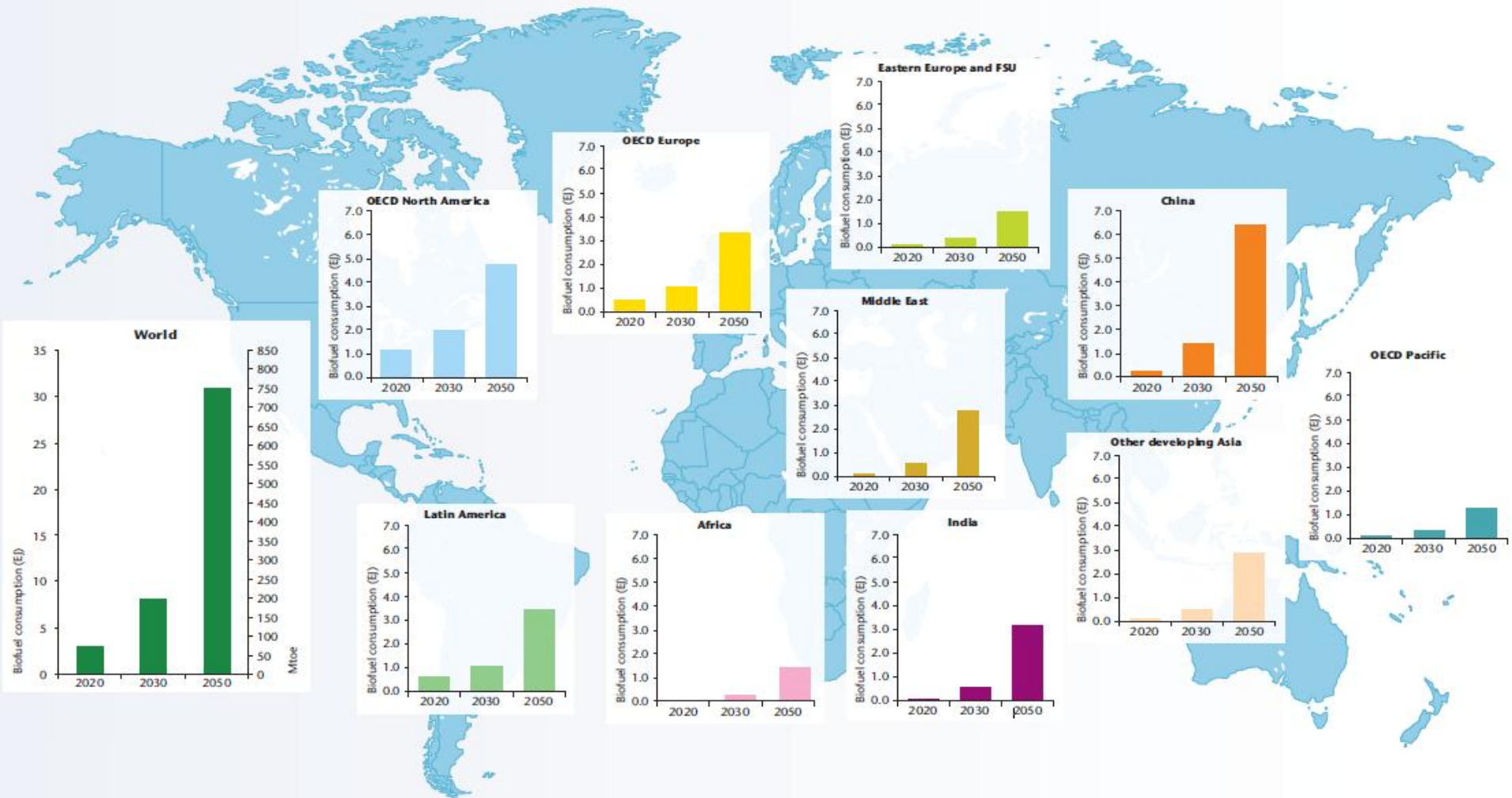


- **Baseline Scenario** – business-as-usual; no adoption of new energy and climate policies
- **BLUE Map Scenario** - energy-related CO₂-emissions halved by 2050 through CO₂-price (up to USD 175/t in 2050) and strong support policies
 - Serves as basis for all IEA Technology Roadmaps
 - 23% of global emission savings occur in the transport sector

IEA Biofuel Roadmap: Vision

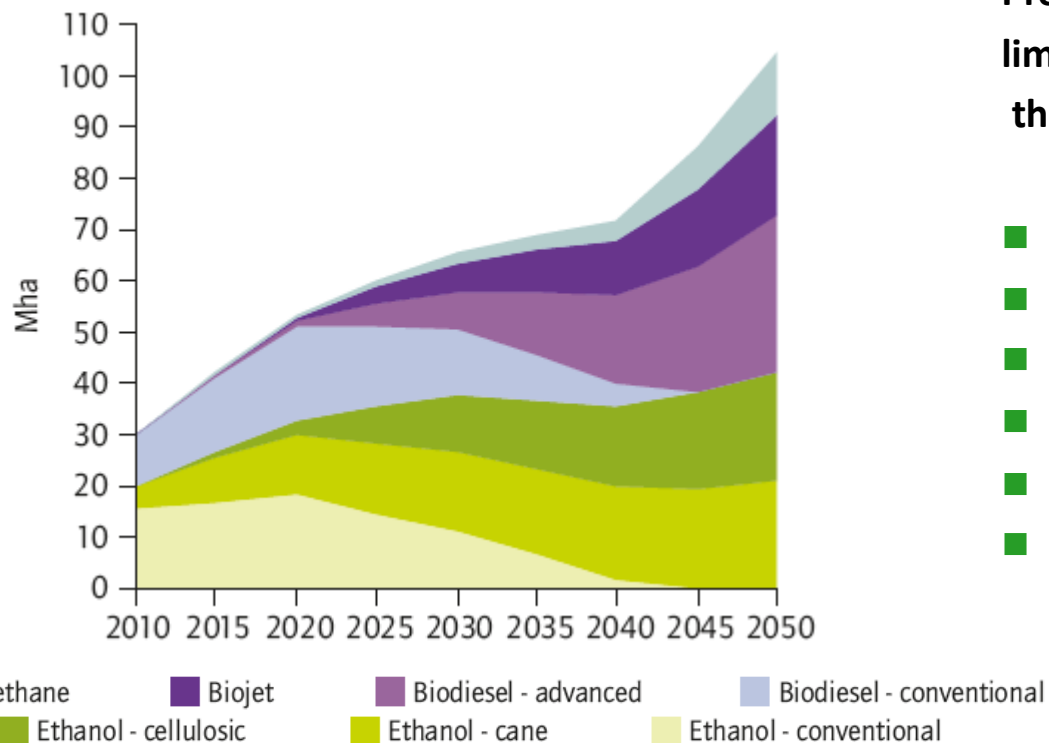


- Global biofuel supply grows from 2.5 EJ today to 32 EJ in 2050
 - Biofuels share in total transport fuel increases from 2% today, to 27% in 2050
 - Diesel/kerosene-type biofuels become particularly important to decarbonise heavy transport modes
- **Large-scale deployment of advanced biofuels will be vital to meet the roadmap targets**



- Biofuel use will increase considerably in all regions
 - Biofuel demand driven mainly by OECD countries until 2020
 - In 2050, non-OECD countries account for 70% of total biofuel consumption
- Trade will be vital to supply biomass and fuels to regions with strong demand

Land Requirements



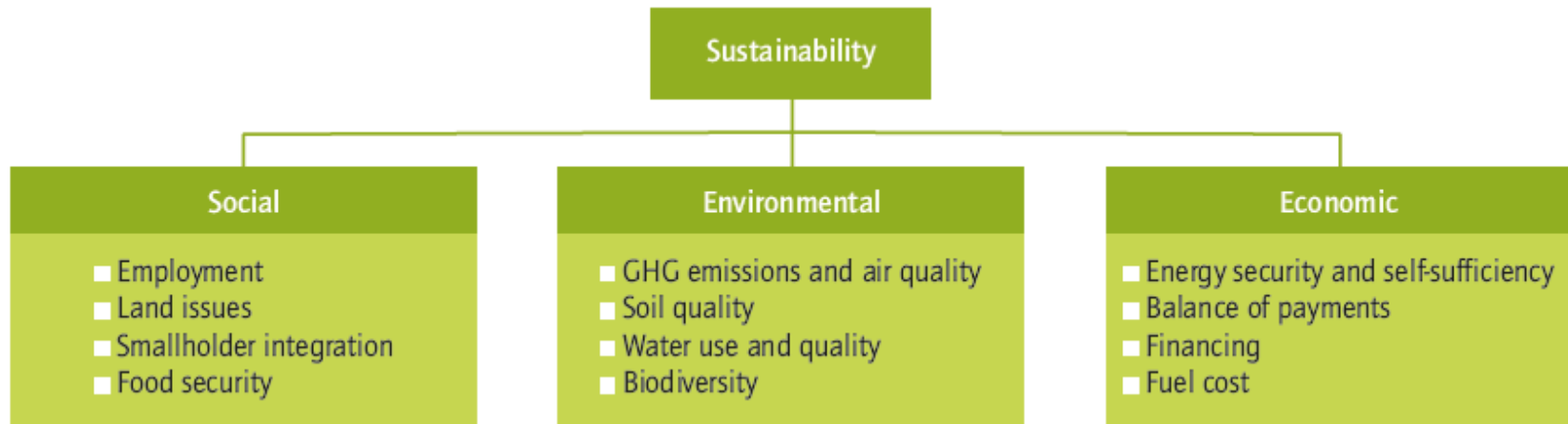
Pressure on agricultural land can be limited and risk of ILUC can be mitigated through:

- Productivity improvements
- Use of residues and wastes
- Use of pasture/ unused land
- Potential for wood biomass
- Biomass cascading & biorefineries
- Land-use zoning and sustainable land-use management schemes

Note: This is gross land demand, excluding land-use reduction potential of co-products

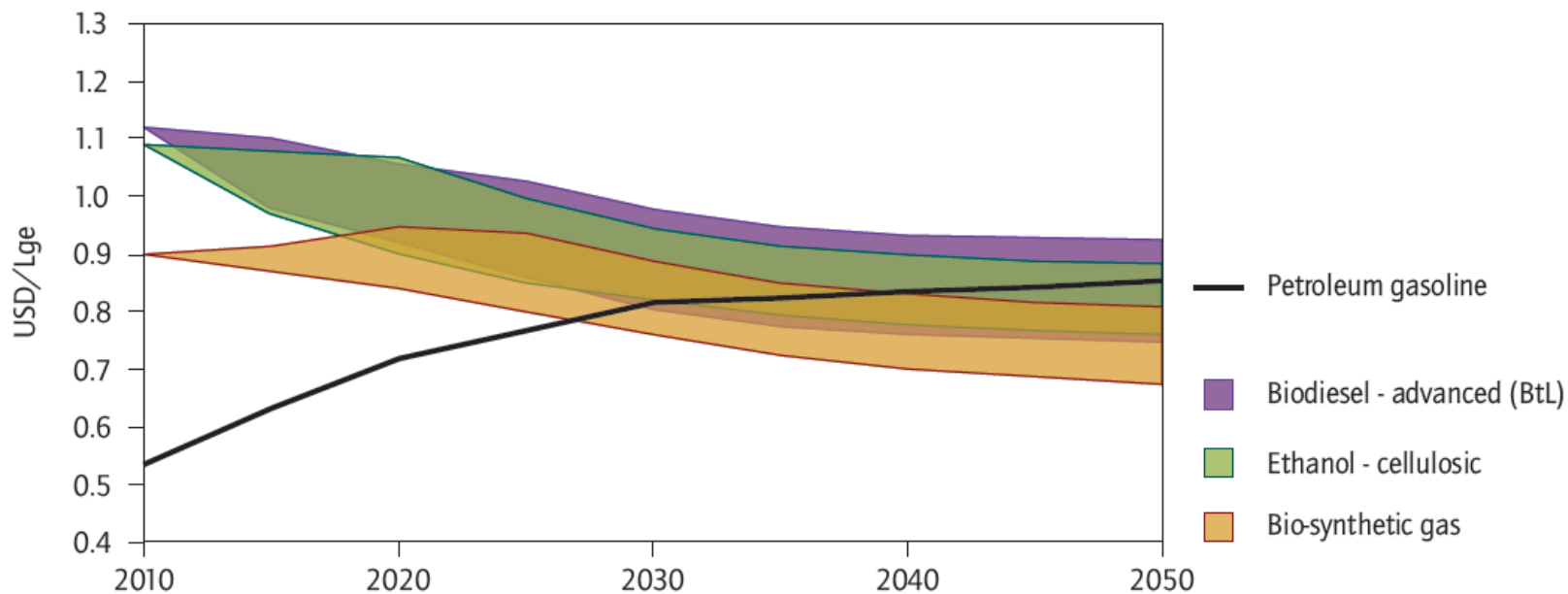
- Land required to produce biofuels increases from **30 Mha** today to **100 Mha** in 2050, in addition to **1 billion tons of residues**
 - Sustainable land expansion will be challenging given increasing demand for food and biomaterial
→ Sound policies needed!

Sustainability of Biofuels



- Sound policies are needed to ensure biofuels are produced sustainably
- Adoption of internationally aligned sustainability certification for biofuels
 - Certification schemes should be based on international sustainability criteria (as developed *e.g.* by the Global Bioenergy Partnership, GBEP)
- However, most sustainability issues are relevant to the whole agricultural/ forestry sector
- In the long-term, a sustainable land-use management for all agricultural and forestry land is needed.

Biofuel Production Costs 2010-50



Production costs shown as untaxed retail price

- Most conventional biofuels still have some potential for cost improvements
- Advanced biofuels reach cost parity around 2030 in an optimistic case

Key policy actions for sustainable biofuel deployment

■ **Stability:**

- Create a long-term policy framework for biofuels.

■ **Innovation and Deployment:**

- Provide sustained funding for advanced biofuels RD&D and commercial deployment.
- Support research efforts on land availability mapping and biomass potential analysis.

■ **Sustainability:**

- Adopt sound, internationally aligned sustainability certification for biofuels.
- Link economic incentives to sustainability performance of biofuels.
- Incentivise use of wastes and residues.

■ **International Collaboration:**

- Engage in international collaboration on capacity building and technology transfer.
- Promote the alignment of biofuel and other related policies (agriculture, forestry, rural development).

Acknowledgements

- Thanks to the roadmap co-authors:
 - Adam Brown, Lew Fulton, Jana Hanova and Jack Saddler

- *IEA Technology Roadmap - Biofuels for Transport*
Available: www.iea.org/roadmaps

- **Forthcoming:**
Energy Technology Perspectives 2012 (June 2012)

- **Contact:**
Anselm.Eisentraut@iea.org

