

World Economic Dynamics (WED) Model: Modeling and forecasting of global economy and total primary energy consumption



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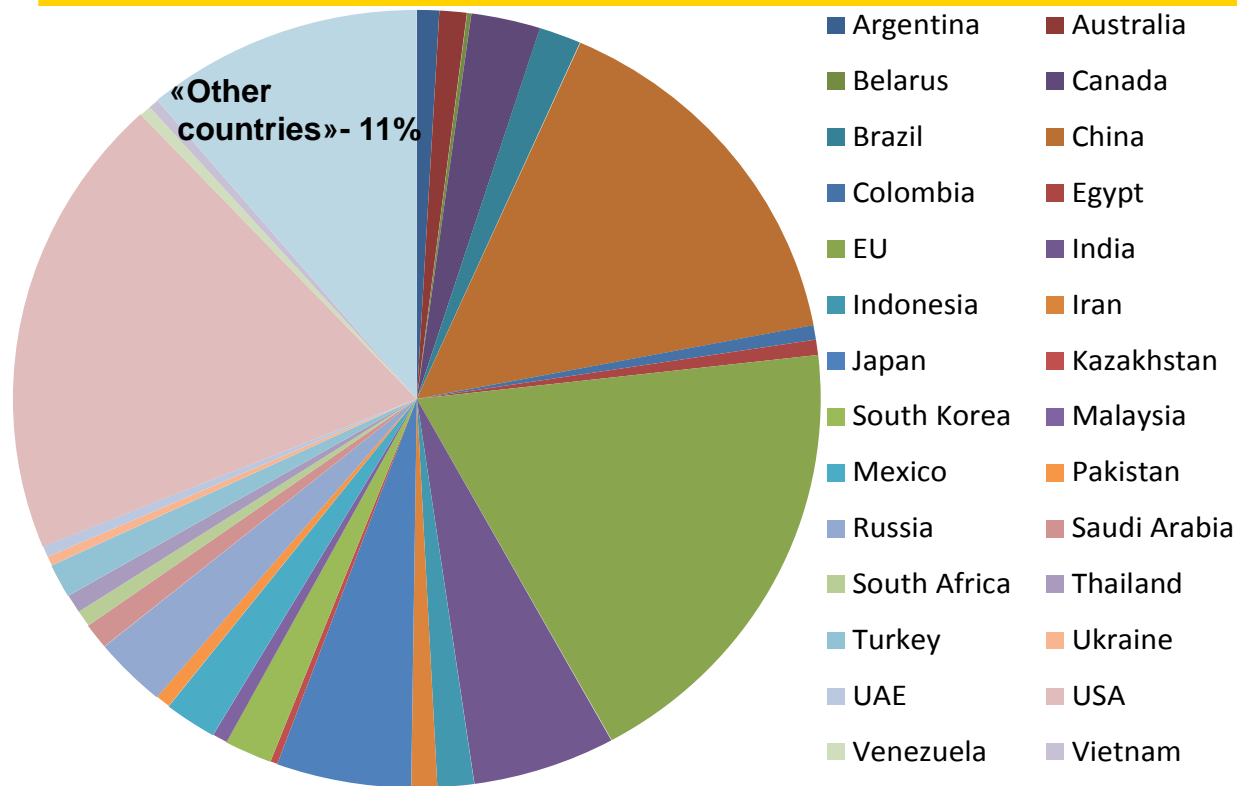


- ▶ General Methodology
- ▶ Economic modeling and forecasting
- ▶ Primary energy modeling and forecasting
- ▶ Electricity output modeling and forecasting
- ▶ Oil consumption modeling and forecasting
- ▶ Gas consumption modeling and forecasting
- ▶ Coal consumption and forecasting

Modeling and forecasting global economy and primary energy consumption: methodology



Share of world GDP PPP by WED countries



- Our analysis takes into account historical data from 1980 to 2013..
- The main sources of information are: The World Bank, International Monetary Fund, International Energy Agency.
- We present global economy and energy projections in the period to 2045.
- Our model and projections include 27 countries, European Union, and aggregate «Other countries» (89% of world GDP and primary energy consumption in 2013).

Modeling and forecasting global economy and primary energy consumption: WED model



Economic module

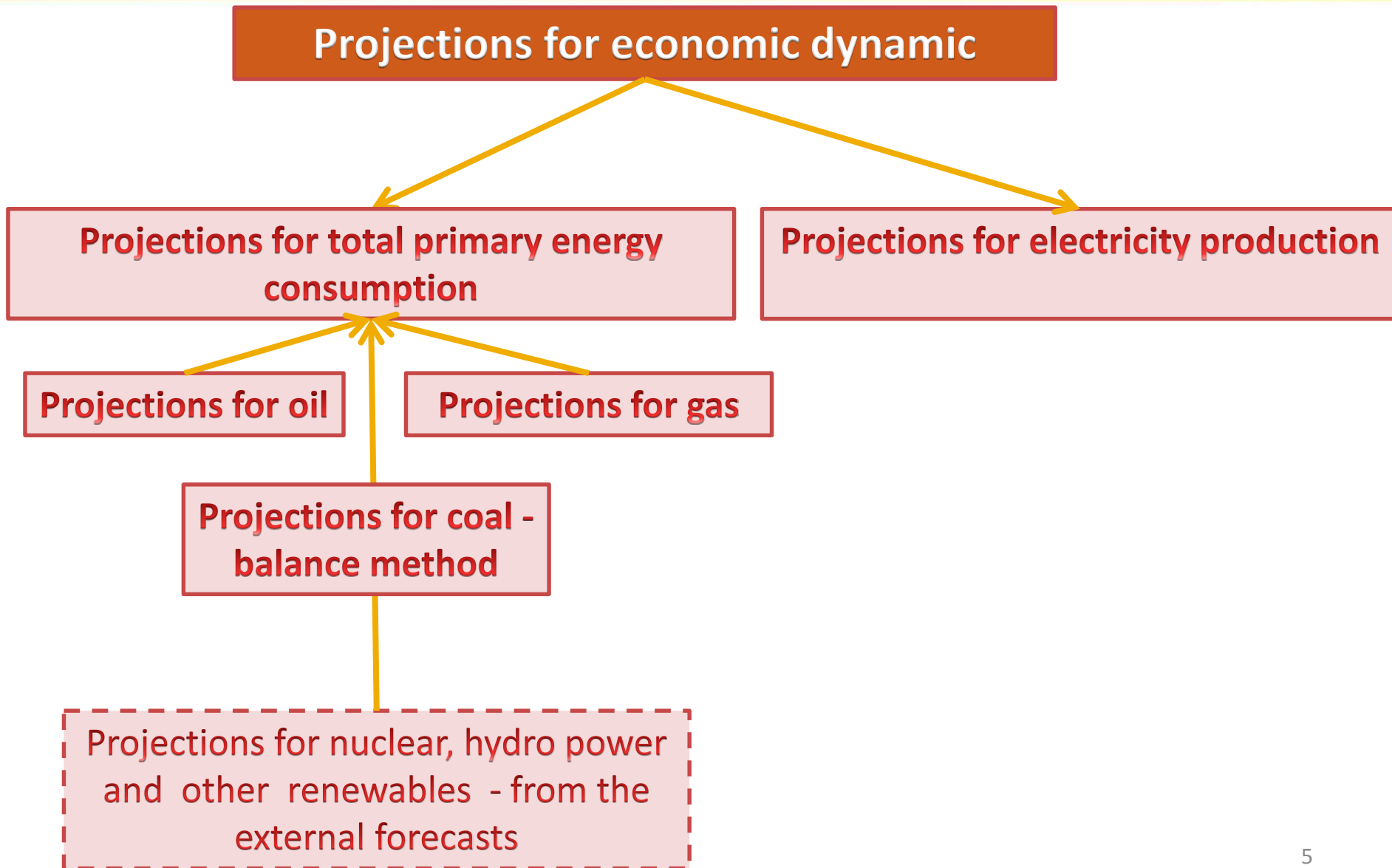
Modeling and forecasting:

- Incremental capital-output ratio
- Gross fixed capital formation (% of GDP)
- GDP, PPP (2005 trillion \$)
- Population (million people)
- GDP per capita (2005 thousand \$)
- GDP per capita growth (annual %)
- GDP growth (annual %)

Energy module

Modeling and forecasting:

- Total primary energy consumption (Mtoe), includes: Oil, Gas, Coal, Nuclear power, Hydro power, Other renewables
- Primary energy consumption per thousand \$ GDP (Mtoe)
- Primary energy consumption per capita (Mtoe)
- Electricity production (TWh)





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$$\text{GDP per capita growth } t = \text{Gross fixed capital formation } t-1 / (\text{Incremental capital-output ratio } t-1 + 1)$$

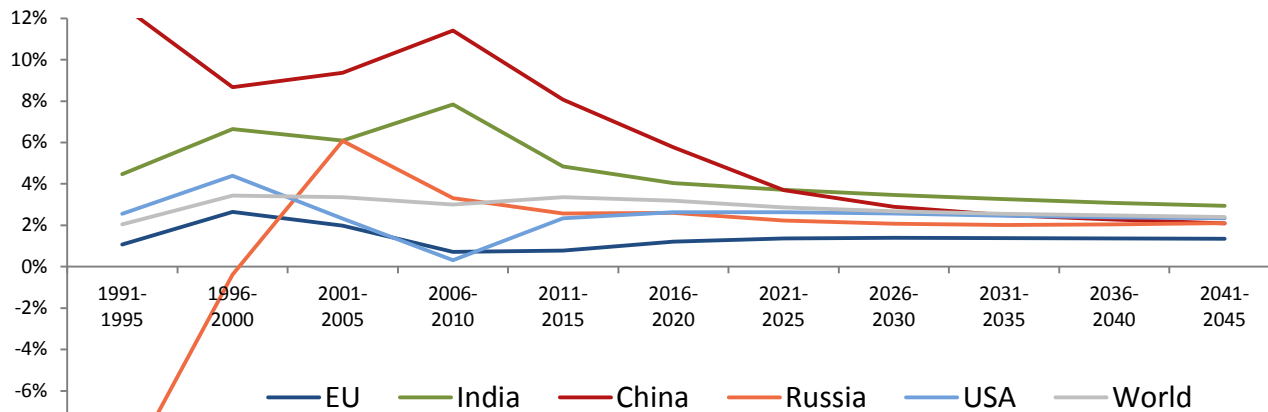
Key assumptions:

- The United States remains the leader in the field of economy and technology. In the long run, the gap between other countries and the United States will be reduced
- Developing countries are trying to achieve the level of developed countries by increasing the Gross fixed capital formation
- Productivity of capital will decline in all countries (in the absence of breakthroughs in science and technology)
- Working-age population in the major developed countries is reduced. Population growth rates in emerging economies are also gradually declining

Economic growth: forecasting

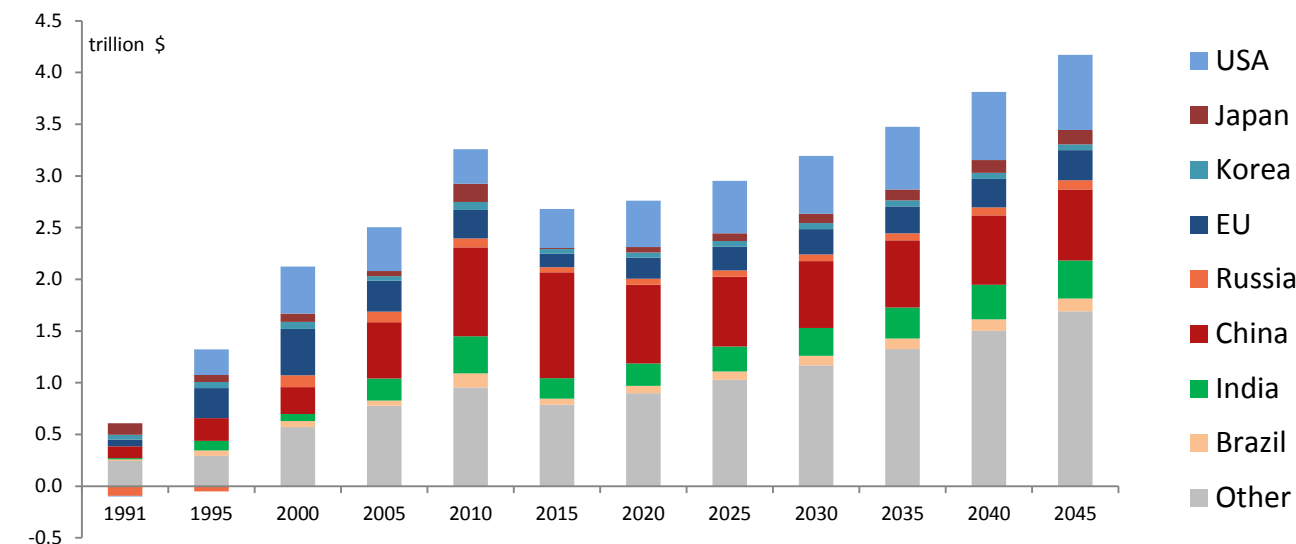


Average annual world GDP PPP growth rate



In our projections developed and emerging economics both will see a decline in their annual GDP PPP growth rate. Economic growth rates, which were before the crisis of 2008, will not be achieved.

Share of world GDP PPP growth by country

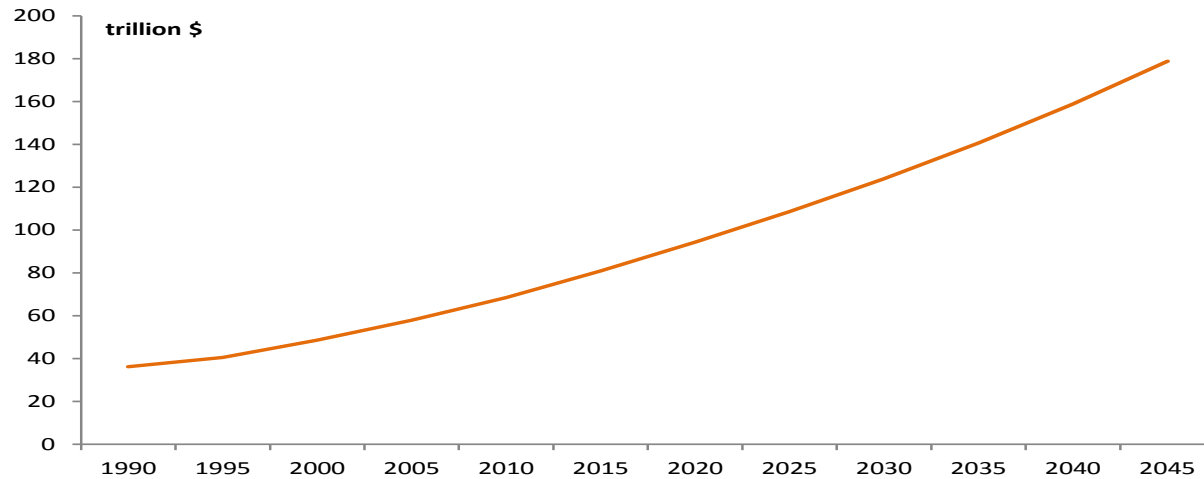


The share of developed economies in global GDP growth will rise. But the main contribution to the global economic dynamics will be made by emerging economies.

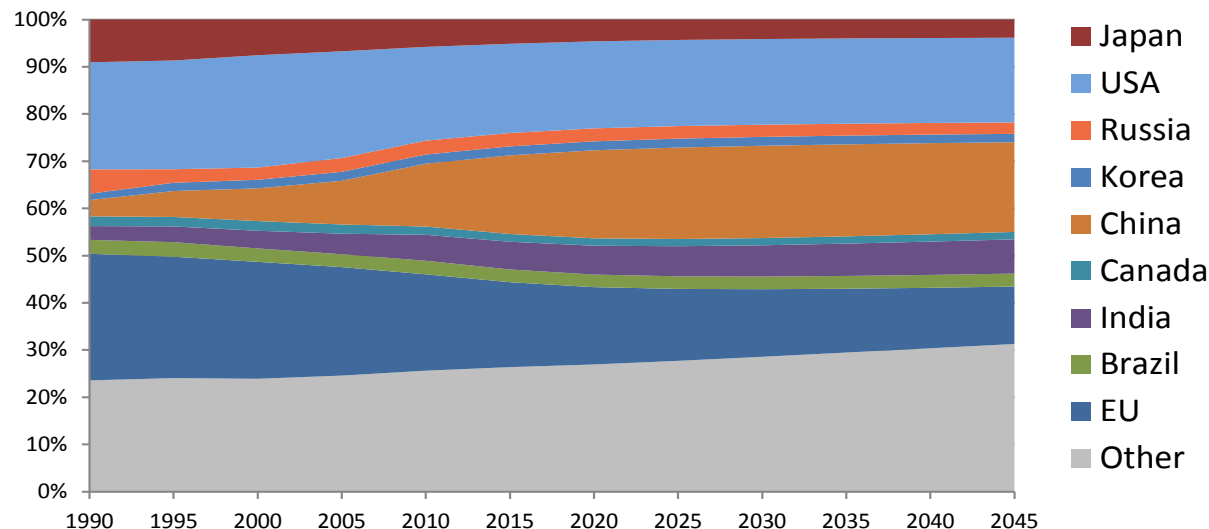
Economic growth: forecasting



World GDP PPP



Share of world GDP PPP by country



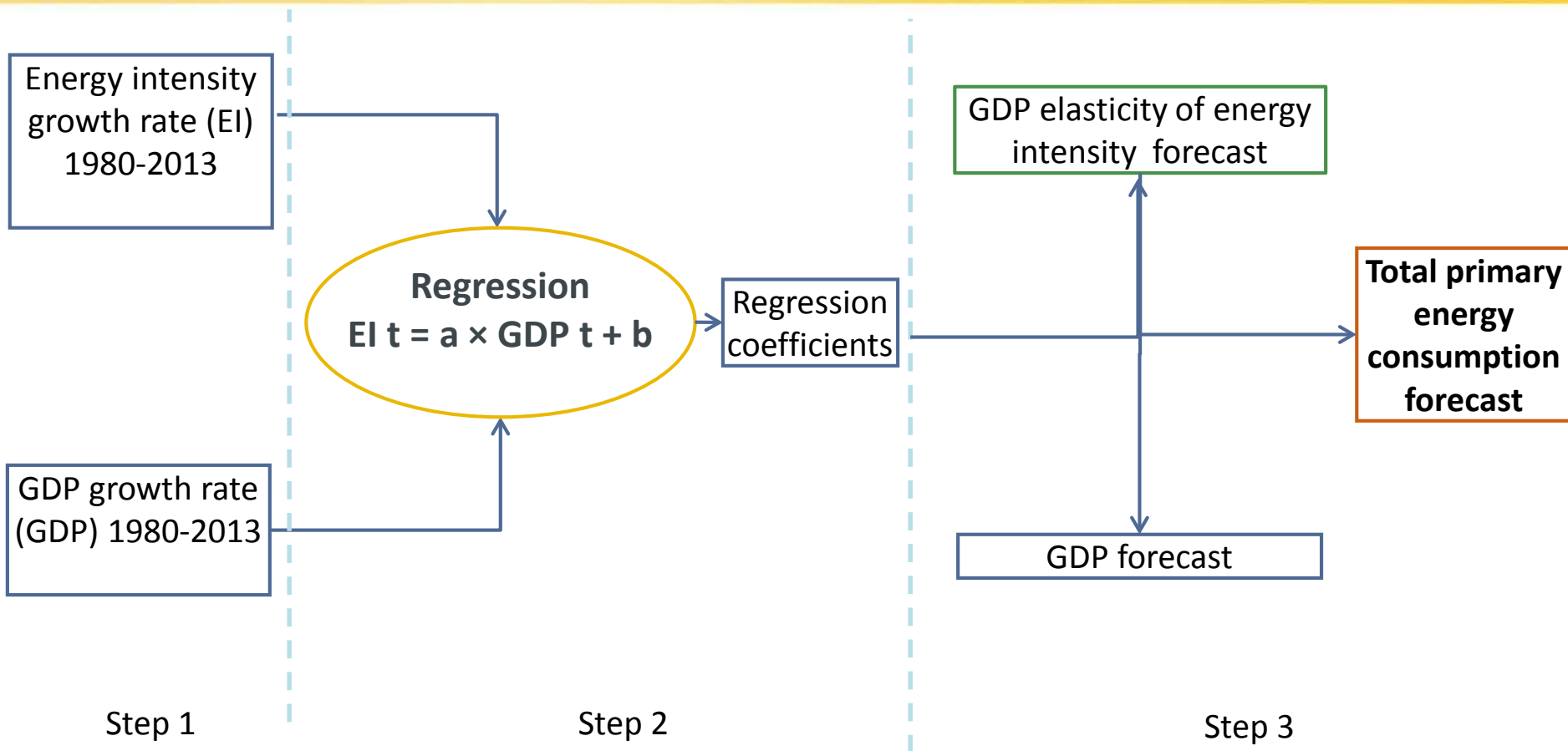
The structure of global GDP will change to 2045

- the share of developed countries (EU, USA, Japan) falls
- the share of emerging economies (India, China) rises
- China become the largest world economy in 2020
- the share of Russia and Brazil not increases



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Total primary energy consumption: modeling

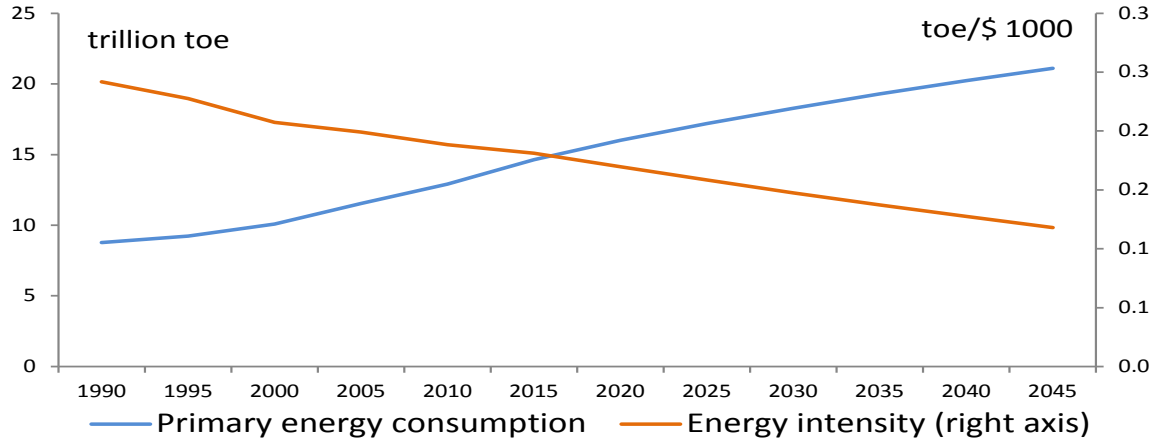


3-step methodology: preparing data, regression, calculation of forecasts

Total primary energy consumption: forecasting



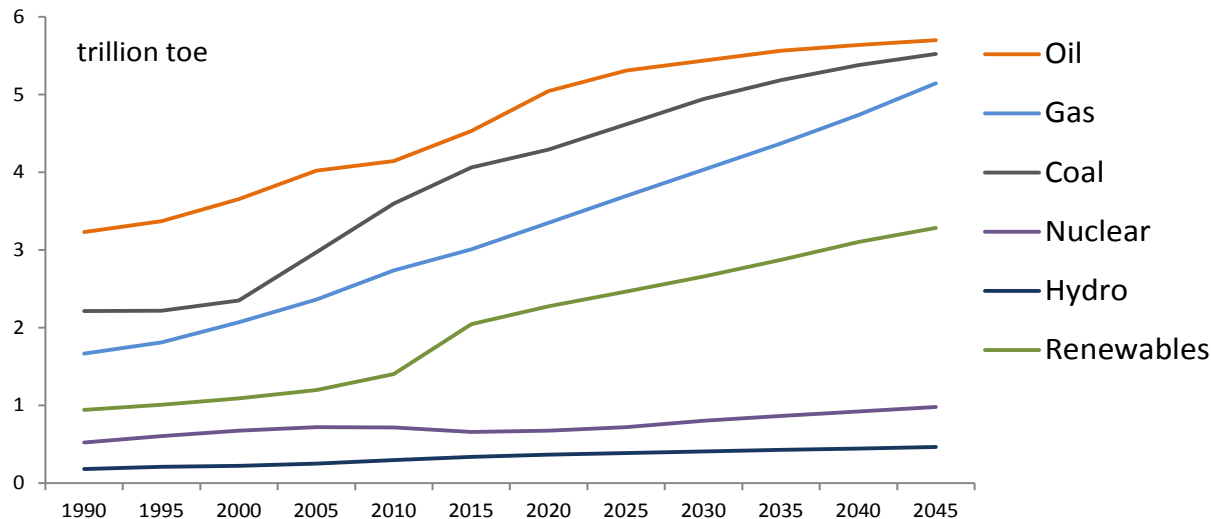
World total primary energy consumption and energy intensity



In our projections global energy demand increases by 50% from 2013 to 2045.

Driven with government policy in support of energy efficiency, improvement in primary energy intensity is expected to continue.

World primary energy consumption by fuel



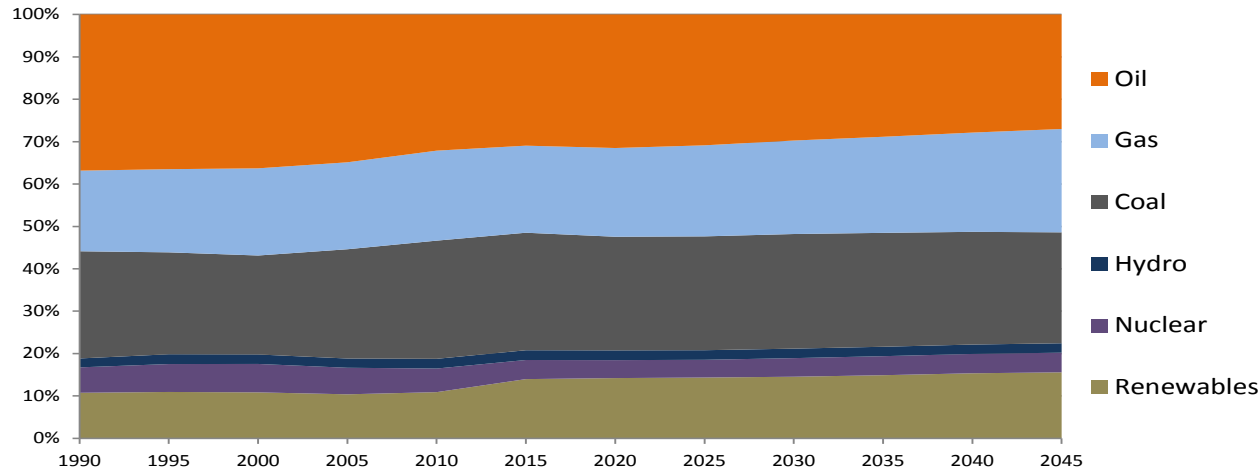
Demand increases for all types of energy (but at a significantly different rates):

- oil 35%;
- gas 78%;
- coal 32%;
- nuclear 55%;
- hydro 45%;
- renewables 67%.

Total primary energy consumption: forecasting



Share of world primary energy consumption by fuel



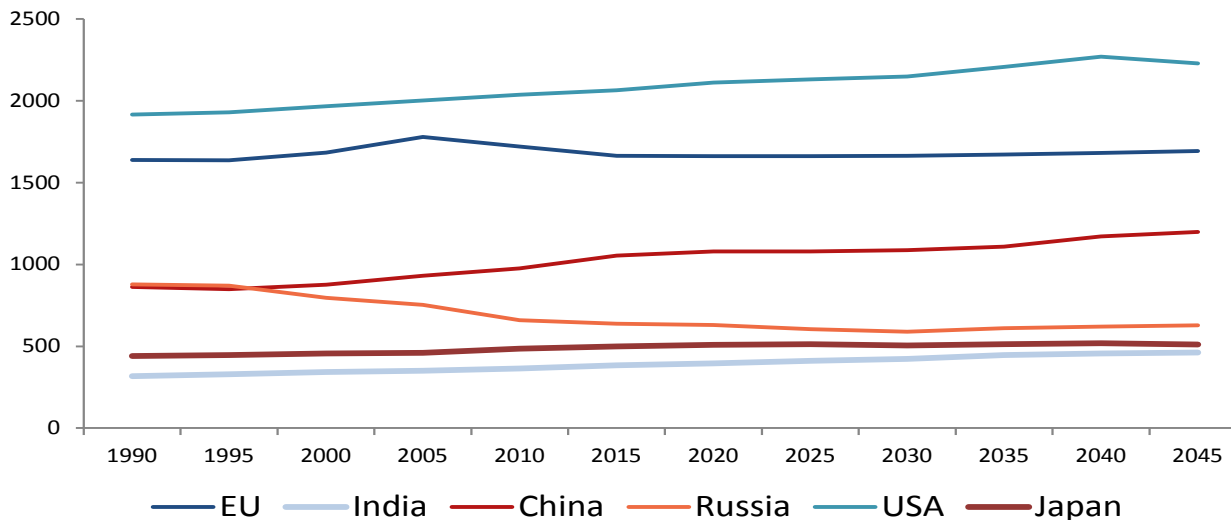
As a result the share of gas, other renewables in global primary energy consumption will rise to 2035.

The share of oil and coal will fall.

The share of nuclear, hydro remaining constant.

Emerging economics (China, India) and USA will be a key drivers of global energy demand growth.

Total primary energy consumption by country





Thank you for your attention!