Norwegian Ministry
of Finance

Projections – Models and Methods

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Methodology

- Macroeconomic model MSG (Multi Sectoral Growth):
  - Projections of GHG and LRTAP
- MSG is a dynamic, integrated economy and emission model. Includes integrated modules for calculating emissions and electricity demand
- Supplemented by micro-information and branch studies
- Projections for non-CO_2 GHG emissions are mainly based on sector- and plant-specific information. Consistent with macroeconomic projections
- Emissions from agriculture (CH_4, N_2O and NH_3) are projected based on population, animal stock and supply level.
- LULUCF – separate modell

Authorities involved

- Ministry of Finance – responsible for the production and publishing of the official emission projections, and the activity data fed into MSG (including energy data)
- The Norwegian Environment Agency – responsible for the projections of non-CO_2 GHG
- Ministry of Oil and Energy – responsible for projections of emissions from the petroleum sector
- Ministry of Agriculture and Food and The Norwegian EA – responsible for projections of emissions from agriculture (CH_4, N_2O and NH_3)
- Statistics Norway's road model
- Norwegian Institute of Bioeconomy Research - LULUCF

Data and the MSG model

- MSG – Multi Sector Growth (model)
- Developed by Statistics Norway – used by the Ministry of Finance for long term projections
- National Account data and Emission Inventory data
- A detailed emission calculation model
  - Consistency between economic and environmental forcasts
  - Consistent with the historical Emission Inventory (and NA)
  - Effective tool for assessing environmental consequences of change in economic activity
- The model puts numbers to how the economy works based on historic observations and contribute to consistency in the projections

Characteristics of the MSG model

- A general equilibrium model
- Growth determined by capital accumulation, labour supply, availability of natural resources and technological change
- All resources fully utilised
- Producer behaviour is characterised by monopolistic competition in the domestic market. Price takers on the world market
- Highly disaggregated
  - 60 commodities
  - 44 industries (33 private and 11 government sectors)
  - 39 consumption goods
- Detailed description of the markets for energy and transport
- Long term projections are sensitive to assumptions on population growth, technological change and the development of prices in international markets

•Heide et al. (2004) and Bye (2008) give more detailed descriptions of the MSG6 model, its empirical fundament, and applications.

Assumptions

- Some of the main determinants of growth has to be given exogenously:
  - Productivity growth
  - Capital accumulation
  - Labour supply
  - Availability of natural resources
  - Technological change

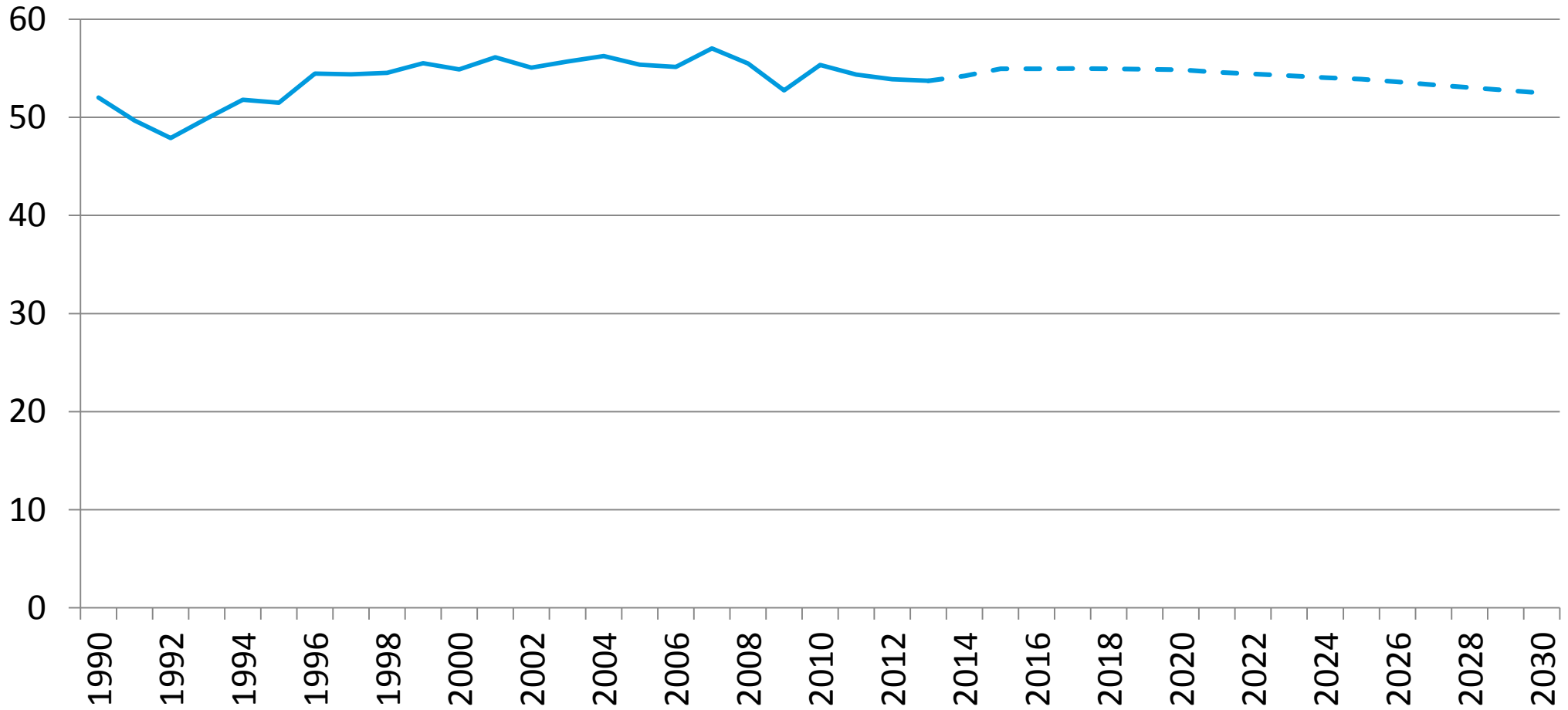
- And some of the economic variables influencing emissions are given exogenously:
  - International economy and petroleum activity (prices, exchange rate etc.)
  - Economic policy guidelines – the fiscal rule
  - Oil and energy prices. Emissions trading prices
  - Electricity consumption by energy-intensive industries

- WEM-scenario: The current design of Norwegian climate policy is retained, including the scope and rates of the CO2 tax.

Assumptions – supply and use of electricity

- Almost all of Norwegian mainland electricity production based on hydropower
- The production of renewables (water and wind power) is exogenously determined
- Marginal long term cost of electricity produced by natural gas (without CCS) determine long term electricity prices in the reference scenario
- Assumptions on electricity demand, particularly from energy intensive industries, are important
- Balance between supply and demand in the projections
- Import meets excess demand – electricity balance

Norwegian emissions of GHG. Historically and projected. Mill. tonnes CO2-eq.



Summing up

- Emissions projections consistent with overall macroeconomic projections
- Combination of a top down and a bottom up approach
- Macro approach to emissions mainly driven by energy use
- Micro approach:
  - non-CO_2 GHG emissions
  - road traffic
  - petroleum sector
  - agriculture
- Micro level and micro information more relevant and available for medium term than long term

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