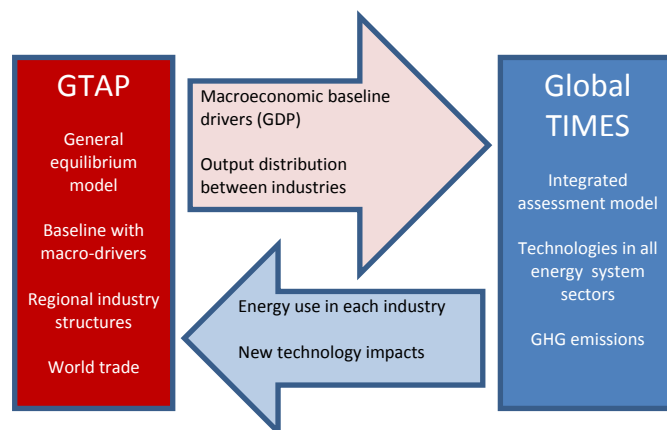


## Global economy scenarios

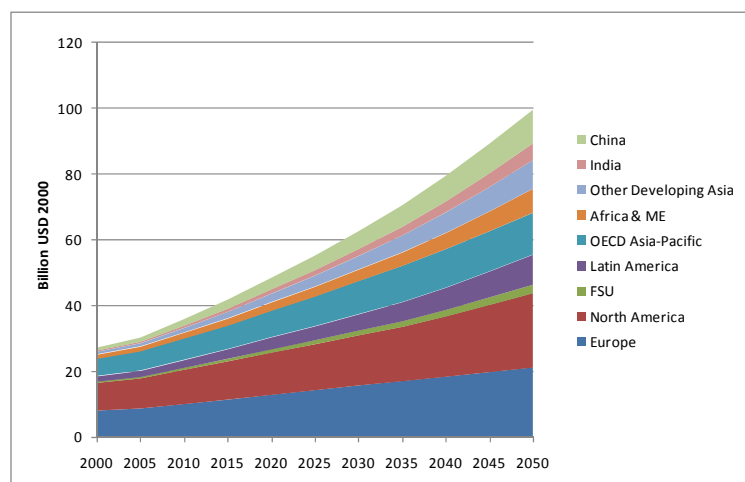
One objective of the NEP project is to develop global economy, energy and emission scenarios to give a wider perspective on the Nordic scenarios for the development of Nordic welfare and energy systems. Below, the macroeconomic baseline results for NEP project's global scenarios are described, produced with the GTAP model. The baseline simulations serve as reference results to policy scenarios and give a projection of the development trends both in local and global levels. This means that in the baseline scenario no climate policy is applied after the Kyoto commitment period. The economy-wide and industry specific output results are also used as inputs in the Global ETSAP/TIAM energy system model based on TIMES modelling system. This model is used to calculate long term global and regional energy and emission scenarios.

In turn, the next steps of NEP project's global scenario work will include using the economy-wide and industry-specific results on energy use and emissions as inputs to GTAP model, as the GTAP model has no inbuilt treatment of energy systems and e.g. technological progress leading to improved energy efficiency and/or increased use of renewables to tackle climate change and enhance energy security. Thus, the results presented in this synthesis report are based on industries relying on present technologies and are only reported until the year 2020 at this stage. At later stages of the project, the GTAP and results may also provide inputs for NEP's Nordic models.



### Macroeconomic development

Starting point for the scenario work is in the growth assumptions for various macro variables that lay the foundations to the economic and other development. These variables are an exogenous input to the simulations. The total economic growth is a product of labour, capital and productivity growths. Long-term projections exist for each of these factors, but they all contain great uncertainties, especially in estimates beyond medium-term horizon of 10–20 years.



For the purposes of NEP project scenarios, we use macro baseline drivers in line with those used in the IEA World Energy Outlook 2008. Particular attention is paid on the data most relevant to the focus region and also on globally significant phenomena. Therefore, improved population data that takes into account intra-European migration has been used, and rapid productivity and skilled labour force growth in developing Asia – and China in particular – is also considered.

*World GDP 2000-2050: Share of developing countries increases*

The projected annual average world population growth in the period 2005–2050 is 0.77% and the total population reaches 9.2 milliard by the end of the projection period. However, alternative population scenarios by United Nations range from 8 to 11 milliard. Due to demographic differences, the labour force growth can be lower or higher than the total population growth in each region, and on global level, an increased share of working age population is observed until 2020, after which it starts to decrease.

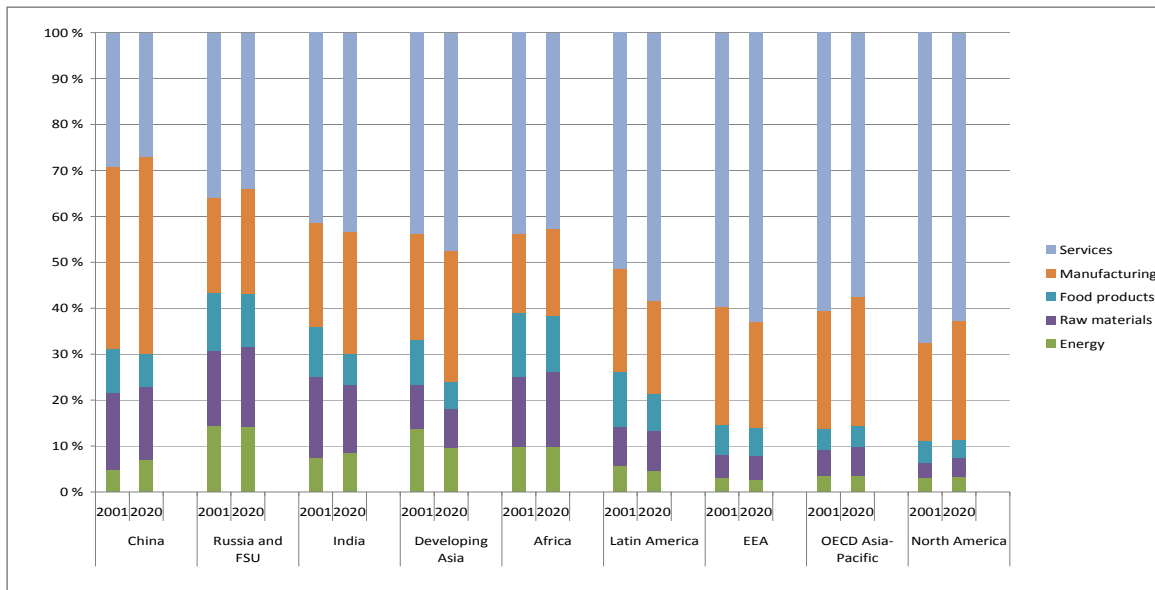
The total factor productivity growth estimates vary between 1% in some Western countries and up to 5% in fastest-growing Asian economies. This results in total annual GDP growth rates of up to 10% in countries like China and India. By the year 2050, the extreme growth figures are projected to come closer to those in developed economies, but the key question for the overall results is how fast this convergence is going to take place.

## Increased demand for energy and food

The growth in macro drivers, and population in particular, triggers some fundamental changes in the world commodity markets. The products that are scarce and difficult to substitute become more expensive relative to other goods. This is particularly true for food and primary energy: whilst their share of the global value of industry output is gradually declining, their prices compared to other goods increase fast.

In rapidly industrialising regions, namely China, energy takes an increasing share of total industry output value until 2020, as illustrated by the figure below. Globally, however, in almost all regions the services and manufacturing with high value added are increasing their share.

The Nordic countries follow the same general pattern, and the share of traditionally energy-intensive industries is declining in favour of services and less energy-intensive production, though the output in all sectors is still growing steadily. In Norway, the increased global demand and subsequently higher prices for energy are reflected in substantial growth of the petroleum sector.



*Output shares of all industries in 2001 and 2020 in different world regions in the assumed baseline scenario*

## World economies grow, emissions grow even more

As all components of economic growth are growing, a positive GDP growth is also observed in all the calculated scenarios. However, on the global level, energy use and thereby CO<sub>2</sub> emissions growth exceeds GDP growth in the baseline scenario. In India, as shown by the figure below, emissions are growing twice as fast as the economy, and similar pattern applies to many other rapidly growing developing regions.

In the developed world, instead, the GDP and emissions growth rates are much closer to one another, and often the simulated GDP growth is even slightly higher. The result is hardly surprising, as more developed industries also tend to be more energy efficient, but it illustrates again the importance of global climate policies. The economic welfare loss from emissions reduction is smaller if sectors with the most polluting type of growth are targeted.

*GDP and CO<sub>2</sub> growth until 2020 without climate policies. The red and blue bars show the percentage growths of the GDP and the CO<sub>2</sub> emissions respectively for each region from 2001 to 2020 level in the hypothetical scenario without any emissions reduction policies. The regions are sorted according to ratio of GDP to CO<sub>2</sub> growth rates from best (Sweden) to worst (India).*

