

The MATISSE Scenarios

A Scenario Task Force worked throughout the MATISSE project on the development of scenarios. The first need was for a baseline scenario to be used in the case studies and model integration studies. We selected the baseline scenario used by the European Environment Agency in the European Environment Outlook of 2005¹.

The baseline scenario was not more than a set of assumptions, so we decided to develop an accompanying narrative. In doing so, however, we found that for crucial assumptions in the baseline scenario, there were two directions in which the story could develop. This led to the development of two scenarios that took these bifurcation points and developed the stories accordingly: ‘Motivated Europe’ and ‘Old and Dense Europe’. These storylines have been quantified and used with a variety of models. A ‘Transition Scenario for Europe’ was also developed, to illustrate how more drastic diversions from current trends may contribute to a more sustainable future.

The Baseline Scenario

The EEA baseline scenario includes existing trends and the effects of policies in place and/or in the process of being implemented by the end of 2001. The EU-25 population remains rather stable peaking in 2020 at around 462 million and declining thereafter (458 million in 2030).

Rising life expectancy combined with declining birth rates and changes in societal and economic conditions lead to a significant decline in average household size and growth in the number of households. The EU benefits from economic and monetary unification and a continued increase in world trade. The assumptions for economic growth reflect the trend of structural change in developed economies away from the primary and secondary sectors. The MATISSE baseline scenario includes the European Emissions Trading Scheme (ETS) and a stronger growth in oil prices than the EEA baseline.

The Bifurcation Points and Two Variants of the Baseline

As noted above, in developing a storyline for the EEA baseline scenario, a number of bifurcation points were identified on a set of key dimensions along which the storyline

OLD AND DENSE EUROPE	Key Dimensions for Development	MOTIVATED EUROPE
No structural influences of government	Institutions	Structural influence of government with respect to policies and subsidies
Lack of educational system while more skilled people are needed	Education - Migration	Investments made in educational system. Fair chances for migrants in the labour market
Pressure on health care sector due to aging population	Health care	Shift to a more caring society
Increasing air pollution through increased car ownership, growing amounts of construction waste, energy demand, and commuting	Pollution	Decreasing air pollution through increased use of public transportation, R&D for technological breakthroughs for cars, improved urban planning, carsharing and car-free cities
City centres are for business, green areas are for living	Infrastructure	City centres become the place for living, working and caring
Slow penetration of renewable energy, no major innovations in modes of transport	Technology	Innovations in sustainable modes of transport including smaller cars and new engine technology
High trade barriers due to failing WTO negotiations; Intensification of land use leads to competition between nature and agriculture	Trade	Successful WTO negotiations lead to abandonment of 20-25% of current agricultural land. Organic farming, low input farming, grazing etc supported
Absolute levels of resource use increase. Increased imports of metals (problem shifting to areas outside of Europe)	Resources - Material flows	Rate of increase of material use stagnates as a result of technological developments, efficiency improvements and more durable products

could follow a different course (see table).

Old and Dense Europe [‘negative’ variant of baseline scenario]: Europe becomes a region of disparities and tensions. There are clear distinctions between rich and poor, Western and Eastern Europe and skilled and low-skilled workers. Some see an increasing growth in pollution due to an increase in per capita car ownership and increased commuting distances. Growing (although stabilizing) populations and individual living continue to intensify demands for water, food, resources, transport and space. There

is a growing disparity between Europe and the 'rest of the world' in terms of resource use per capita, i.e. land, raw materials, energy. Problems are increasingly shifted to regions outside of Europe, by importing resources and exporting wastes. Migration rates exceed birth rates so Europe has become increasingly multi-cultural. Together with the inadequate educational system for low-skilled workers and the absence of cultural integration, this leads to poor skilled and disoriented [young] migrants. There is an unmet need for labour, while at the same time there is increased time pressure on those that do have required skills. One consequence of lower household sizes and independent living is the growing stock of buildings and infrastructure, which have led to a further expansion of settlements and road area at the expense of productive soil. The trend of separating working from living leads to city centres filled with larger business parks but also to uncoordinated land planning outside city centres.

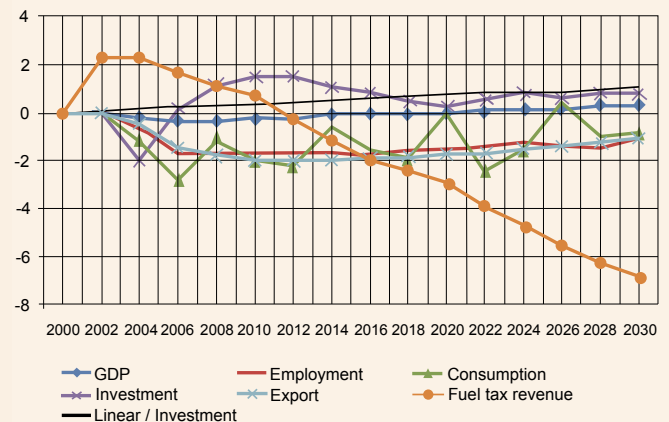
Motivated Europe ['positive' variant of baseline scenario]: In this scenario seeds of change can be identified regarding awareness of sustainability challenges and a shift away from a focus on economic growth within Europe. The transformation of Europe to a more service and knowledge-based economy together with the withdrawal of elderly from the labour market means there is a

growing demand for high-skilled young people. Investments are made in the educational system with a focus on training low-skilled young immigrants as well as their parents. The overall air pollution significantly decreases, in spite of the ever intensifying passenger, freight and air transport. Initially this is achieved through policies that stimulate people to use public transport when commuting. This is supported by subsidies for R&D towards technological breakthroughs for car engines. Also, cities are made more attractive for living and working and policies concerning car-sharing and car-free cities are introduced. Thus, within Europe a culture arises where living, working and caring are integrated, balanced and organised around the city centres. As the barriers for trade from WTO negotiations and related CAP reform become less strict, 20 percent to 25 percent of current agricultural land is freed up for less intensive uses. Organic farming, low-input farming, grazing and free roaming of animals increase.

Various models were used to test the scenario assumptions and to illustrate scenario outcomes, in particular the ASTRA model, the IMAGE model and the E3ME model. Box A gives an example of the results of the Motivated Europe scenario using the ASTRA model.

Box A Economic Impacts of the Motivated Europe Scenario

Assuming that in the Motivated Europe scenario, about 12 million people move into urbanised zones and external costs are internalised for all modes of transport, the ASTRA model shows only a very small change of GDP over the time period 2000-2030 compared with the baseline scenario, higher levels of investment and reduced levels of employment and exports. Not surprisingly, fuel tax revenues decline sharply in the Motivated Europe scenario.

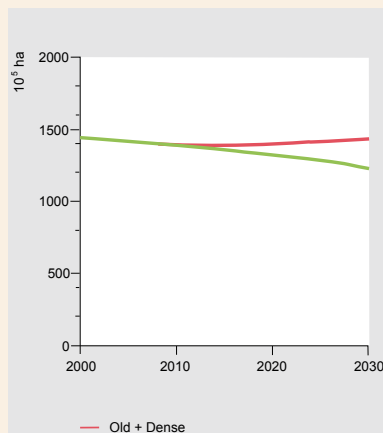


Overview of economic impacts of the Motivated Scenario in EU-27 [% to Baseline]

Box B Impacts on Agricultural Land Use

On the basis of results from the EURURALIS scenarios² it is possible to draw conclusions about agricultural land use in the MATISSE scenario variants. We assume that in Old and Dense Europe market/farm income support remain at current levels and there is no biofuels policy. In contrast, for Motivated Europe we assume that there is a fully liberalised market and trade, farm income is cut to 50% of current levels and the current biofuel directive is implemented.

Agricultural land area in the EU-15 (2000-2030)



In the Old and Dense scenario there is a small decline of agricultural land area in the EU-15 and then a return to the levels of the year 2000. In contrast, in the Motivated Europe scenario there is a continuous decline of agricultural land area, which is 15% below the area in Old and Dense Europe by 2030. The differences between the two scenarios for the EU-10 are much smaller, because they are less sensitive to changes in the Common Agricultural Policy (CAP).

Box B shows results relevant to agricultural land use in the Motivated Europe and Old and Dense Europe scenarios using the IMAGE model.

The MATISSE Transition Scenario

The scenario narratives and quantifications developed in most scenario exercises assume that changes are linear and smooth. The MATISSE project, in contrast, also considered transitions or ‘radical systemic innovations’. The project was interested in how novel and radical solutions emerge (as socio-technical ‘niches’) and become sufficiently powerful to challenge and, ultimately, overthrow a dominant solution (the prevailing ‘regime’ of production and consumption including the associated practices and set of actors) resulting in a transition.

For this purpose, it is necessary to develop ‘transition scenarios’, in which ‘niches’ emerge and challenge the dominant regime. Developments are not assumed to be linear but to take place in a distinct sequence of phases – a pre-development, a take-off, an acceleration and a stabilisation phase (see graph page 9).

In the MATISSE Transition Scenario, by 2030 the dominant practices, rules and assumptions of the European Union have changed dramatically from those that were in place

in 2007. The prices for energy, resources and land more properly reflect the value of ecosystem goods and services. Society measures its progress not in terms of economic wealth but in terms of wellbeing of people and the environment in Europe and worldwide. Paid work is distributed, so that all people who want a job have a job, while work that was previously unpaid (caring for the young, the old and the sick, voluntary work to support environment and society) is paid through a guaranteed basic income for all citizens. Previously low-wage work has to be paid better and has gained prestige.

This results in a more equal distribution of work and income between the genders.

In the **pre-development phase** before 2007, some European countries had begun to experiment with ecological tax reform, but there were barriers to a European-wide introduction. At the same time, however, there was increasing public awareness of the dangers of climate change and a ‘sustainability wave’ began to sweep across Europe. In the **take-off phase** between 2008 and 2012, a coordinated network of actors developed around three concepts: a European ecological tax reform, new measures of progress based on wellbeing and a different ‘work-life-balance’. These concepts became increasingly used in individual countries and developed at the European level. In the **acceleration phase**,



2013-2022, the concepts diffused rapidly and major technological and societal changes resulted. By 2030, Europe is in **the stabilisation phase**, the speed of technological and societal change has decreased and a new dynamic equilibrium is being reached.

Box C shows some results from the E3ME model illustrating this scenario.

¹ http://reports.eea.europa.eu/eea_report_2005_4/en/outlook_web.pdf

² <http://www.eururalis.eu/general6.htm>

Box C Modelling the effects of ecological tax reform, increased R&D and improved material efficiency

Using the E3ME model a series of sequential scenarios have been developed, each of which examined the effect of a particular driver of change. These scenarios involve

- the widespread introduction of a revenue-neutral carbon levy on energy throughout the EU-25 (cost borne by all fuel users; set at 200 Euro per tonne carbon in addition to baseline assumptions of existing ETS);
- levels of business R&D are raised towards national targets (stimulated by the increased cost of energy);
- Manufacturing and construction use 20% less manufactured inputs by 2015 and more modest reductions after 2015 (as a result of increased cost of energy, attention is paid to the effective use of all input costs).

Some results for the EU-25: Impact of the carbon levy

- **Impact on GDP is small** (0.3% in 2020 and 0.7% in 2030), though there is a larger impact in value-added (0.7% and 1%).
- **Revenue recycling has a significant influence on the overall impact.**
- **Impact is greater in EU-10 than EU-15** (2% vs 0.6%).
The GDP impact is negative in some countries, but the scale is small.
- **Impact on employment is positive, but small** (0.5 % higher, 1m in 2020), with greater relative impact in EU-10 than EU-15. **Employment is higher in all broad sectors**, with short-term (to 2015) increases greater in manufacturing, and longer term in financial and business sector.
- **Energy demand is reduced** (10% lower in 2020 and 15% lower in 2030). **Impact is stronger in EU-10 than EU-15. Demand from all sectors falls:** strongest reductions in energy industry's own use, iron & steel, non-ferrous metals, air transport. Power generation mix increases towards renewables. **Greenhouse gas emissions 10% lower in 2020.**
- **Total Material Requirement is lower** (1-1.5 %). **Changes dominated by energy products:** increase in agriculture/fall in coal (direct extraction and imports) and imports of manufactured fuels. **Varied, but small, impact on other commodities** reflecting changes in sector growth profiles.

