European Environment Agency

Sustainability transitions in Europe in the age of demographic and technological change: exploring the implications for fiscal and financial strategies

Summary for policymakers – 24 June 2020

In 2020, EU policy clearly recognises that achieving long-term sustainability will require fundamental transformation of the core socio-economic systems driving environmental problems, such as those meeting society's demand for food, energy and mobility. This understanding comes through forcefully in the new European Green Deal, as well as in the growing body of complementary goals, strategies and tools, including the Energy Union, the New Industrial Strategy for Europe, the just transition mechanism and the proposal for a European Climate Law. In their different ways, these instruments all aim to enable society to meet its material and socio-economic needs while protecting and enhancing the environment in Europe and globally.

As detailed in the European Environment Agency's recent five-yearly assessment, SOER 2020, transforming societal systems represents a major governance challenge, characterised by widespread lock-ins, feedbacks, trade-offs and uncertainties. Achieving sustainability transitions will require that all areas and levels of government work together to enable the emergence and diffusion of new ways of living and working. Fiscal and financial policy tools have a critical role to play in each phase – from enabling experimentation and innovation, and correcting market incentives, to ensuring a fair sharing of the costs and benefits across society. Yet Europe's financial and fiscal systems themselves face significant disruption and change over coming decades, resulting from the transformation of production-consumption systems, and closely intertwined macro-level processes, such as demographic and technological megatrends (Figure 2).

Given the foundational role of the fiscal and financial systems in the functioning and governance of European societies, it is essential to understand how they will be impacted by ongoing social and economic change processes. A forthcoming EEA report, Sustainability transition in Europe in the age of demographic and technological change*, provides an initial response to these knowledge needs. Its main findings are presented in this briefing.*

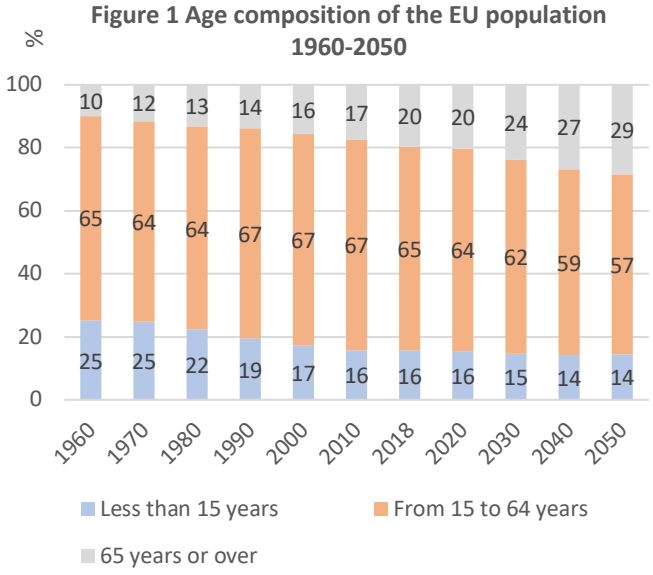
Understanding the implications of an ageing Europe

EU demographic trends are maturing, with population projected to increase until 2040, remain stable to 2050 and then decline. By 2050, the number of people aged 65 or above will have doubled to 29%, relative to 1990 (Figure 1). These trends will lead to a 'demographic deficit', with a growing elderly population reliant on a smaller working age population. This rebalancing may put strain on the social contract between age groups.

Population ageing will have diverse, interrelated effects on sustainability transitions and on the public institutions that seek to navigate societal change.

- Ageing is likely to affect the environment directly through changes in behaviour. For instance, consumption expenditure often drops significantly at retirement. Older populations also alter their consumption patterns, consuming more house and

Figure 1 Age composition of the EU population 1960-2050

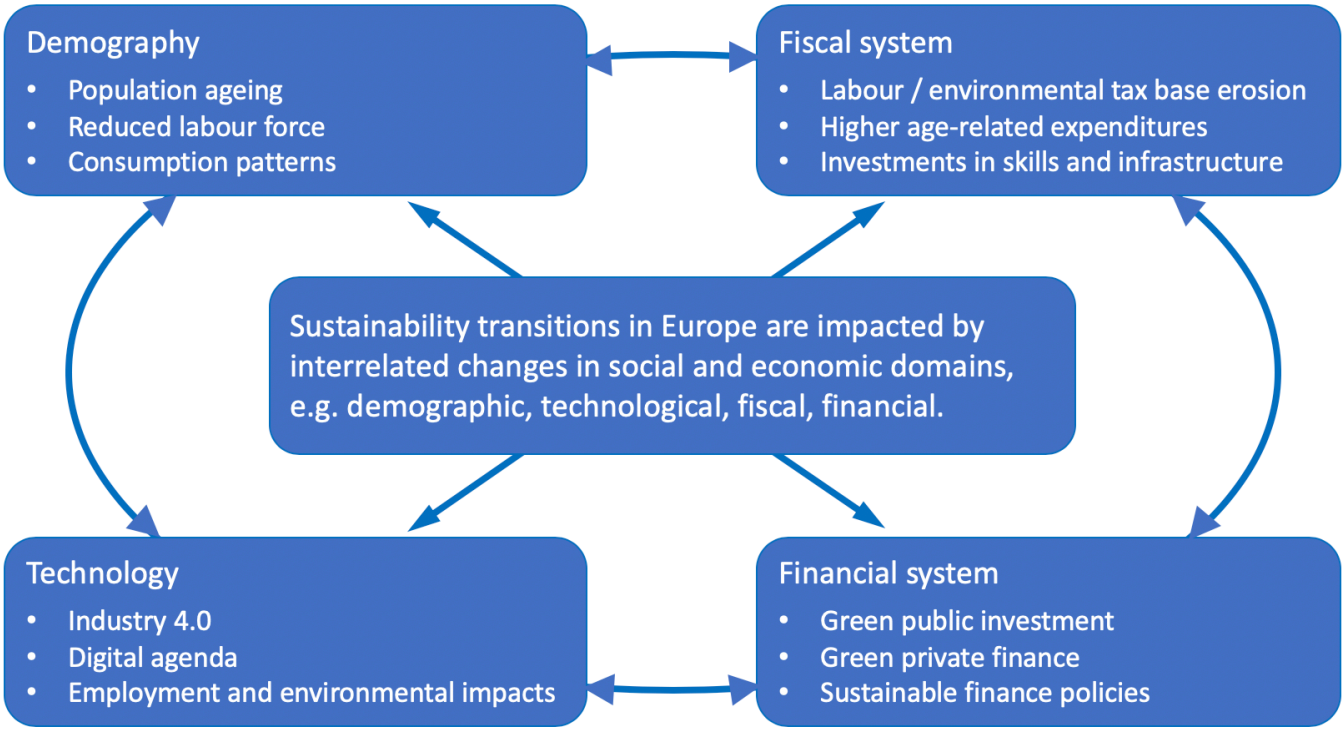


Source: Eurostat

health-related services but less transport services. GHG emissions per capita therefore tend to decline substantially after age 60 and are associated with different bundles of products and services.

- Changes in the EU age composition are projected to lead to a direct reduction in GHG footprints of about 4%. However, population growth is expected to more than offset this reduction, leading to a net increase due to demographic trends.
- Population ageing can also create environmental effects through indirect and systemic channels. At the macroeconomic level, population ageing is considered a key cause of 'secular stagnation', in which a lack of demand in the economy leads to low growth rates over the long term.
- Demographic trends are also likely to impact savings, with increased public pension spending causing a decline in public saving. This may impact growth by reducing investment rates. It also means that younger people will have to save significantly more and postpone retirement to enjoy pension benefits similar to those of today's pensioners
- Population ageing will affect fiscal revenues. The reduction in the working age population from 65% to 57% of the total EU population in the period 2018–2050 may reduce labour tax revenues, including social security contributions, as well as returns from value added tax (VAT).
- Ageing may also shift demand to products and sectors that are subject to different fiscal regimes. For example, a growing elderly population is expected to trigger demand for home automation systems, health care and personal services, which may make extensive use of information and communication technologies (ICTs), artificial intelligence (AI) and robotics.
- Collectively, demographic trends are likely to have significant implications for both fiscal revenues and expenditures, potentially limiting the scope for public investments in sustainability transitions.

Figure 2 Systemic thinking helps identify, assess and prioritise policy interventions



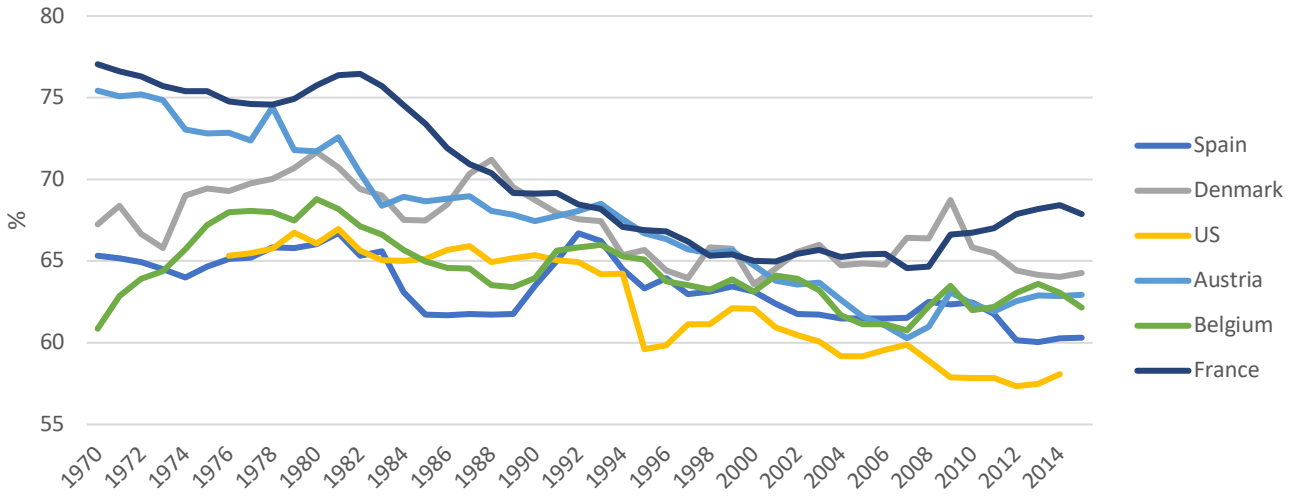
Technology and innovation: enabling or impeding transitions governance?

Sustainability transitions research stresses the crucial role of innovation in triggering systemic change in society's production methods, consumption patterns, lifestyles and cultural norms. A central aspect of transitions governance therefore consists of finding ways to foster experimentation, invention and diffusion of potentially transformative innovations. This is necessarily a hugely uncertain process. It is impossible to know in advance precisely what innovations will emerge, how they will be integrated into lifestyles, and how they will affect sustainable outcomes.

The urgent pace of technological change in recent decades, and the emergence of related innovations in business models, organisational forms and social interaction, therefore present vital opportunities to catalyse transitions but also significant risks and uncertainties. Disruptive technologies such as the Internet of things (IoT), cloud computing and big data, artificial intelligence (AI), blockchain, robotics, biotech and nanotech will affect resource use, greenhouse gas emissions, fiscal systems and other dimensions of sustainability in complex ways.

- Technological innovations offer great potential to reduce resource use and carbon emissions, especially in combination with organisational and social innovations, for example, in the circular economy and the sharing economy.
- The effects of technological innovation can be ambiguous, however, because it is neither guided by nor primarily concerned with sustainability. Some novel technologies, such as blockchain, have significant energy appetites. Others, such as self-driving cars and sharing platforms offer potential resource efficiency improvements but may instead lead to increased environmental pressures if they boost demand (i.e. rebound effects). For example, an analysis in San Francisco concluded that companies such as Uber and Lyft are the biggest contributor to growing traffic congestion.
- Green technology adoption, key for delivering real world effects, has fallen among European firms for greenhouse gas emissions-related technologies, waste management and the circular economy. These trends probably reflect the economic downturn and the prevailing low-investment regime in the EU and are a concern for achieving sustainability transition in Europe.
- Technological innovations can support economic performance in an ageing society by supplying production capacities that have been affected by a shrinking labour force. However, technology-led productivity gains may affect demand for labour. Widespread labour substitution is likely to cause unemployment. If it is biased against older people then it will also exacerbate the public policy problems arising from ageing-related social spending and declining labour tax revenues.
- According to the IMF, new technologies have been the main factor explaining the decline in labour's share of national income (Figure 3). This has increased inequality, as that income has instead gone to the owners of the capital. It has also affected public budgets by shrinking the income tax

Figure 3 Labour's share of national income, (%), 1970 – 2014



Source: KLEMS data

base, since the output of automata, robots, and AI-based devices are taxed as corporate profits.

- In general, ICT innovations raise unprecedented fiscal issues, with significant uncertainties for the tax base of immaterial assets (IT, patents, licenses, etc.) and biased fiscal treatment in favour of capital in the IT-intensive economy.
- Key aspects of the sustainability transition, in particular those of the collaborative economy such as sharing platforms, have ownership, labour, and cost-profit profiles that are not yet fully understood. Collectively, these issues can influence fiscal sustainability and the availability of public resources for investing in sustainability transitions.

Fiscal and financial systems in support of sustainability transitions

Fiscal and financial systems will face major demands and pressures in coming decades. On one hand, the societal transformations that lie ahead, in combination with demographic and technological megatrends, threaten to erode the tax base. On the other hand, public finances will need to play a major role in enabling sustainability transitions through investments in innovation, infrastructure, human capital and ecosystems, yet these needs will compete with expanding demand for spending on areas such as pensions and health.

- In addition to demographic and technology-related pressures, the tax base faces further erosion due to the emergence of novel forms of employment and economic activity, such as the gig economy (i.e. short-term contracting) and the collaborative economy.
- Claims that the tax base can be shifted from labour to environmental taxes should be viewed with caution. Environmental tax revenues amounted to EUR 381 billion in the EU in 2018, corresponding to 2.4% of EU GDP and 6.1% of total revenues from taxes and social contributions.
- Environmental taxes can continue to raise considerable sums in the short and medium term and rates should certainly be increased to support the transition to a low carbon, resource-efficient economy. Yet, there may be limited scope for them to support far-reaching tax shifting programmes. EU-28 environmental tax revenues actually fell during the last two decades, despite the growing calls for environmental tax reform. In part, this is because successes in achieving EU climate and energy targets (e.g. for fuel efficiency) erode the environmental tax base.
- Public spending on the environment in European countries is around 1.5% of total government expenditure and its share has not increased in the last two decades. This is small when compared to social protection and health spending which have increased and are expected to continue rising.
- In a European macroeconomic policy environment steered by fiscal consolidation and balanced public budgets, fiscal sustainability may emerge as a constraint to investment in all public policies. This in turn can reinforce competition among different policy areas for public resources.
- The present trend of public and private investments in the major areas of sustainability transition is far lower than needed. This includes investments to achieve climate and energy targets (e.g. green buildings and transport) but also in socio-economic areas such as broadband and digitalisation, social and affordable housing, education and health. This partly reflects the general weak trend of investments in the EU Member States, especially in capital formation, which fell to a 20-year low in 2013 for the overall EU economy, with a slow recovery afterwards.
- Given the growing pressures on fiscal sustainability, the private sector will be even more crucial for achieving the critical mass of investment required for sustainability transitions. As emphasised in the EU's Action Plan for Sustainable Finance, governments need to redouble efforts to create the right incentive structures and mechanisms to guide private investment. A growing number of institutional investors, including pension funds, insurance companies, foundations, and investment fund, are actively seeking financial products that support sustainability, without compromising returns, liquidity or pricing.
- Within the financial system, there is also mounting awareness and concern that climate change impacts represent significant risks in financing and insuring the real economy. The consequence is a trend towards embodying this risk in financing criteria, with a preference for financing climate-risk 'free' activities.

The need for systemic thinking and analytical approaches

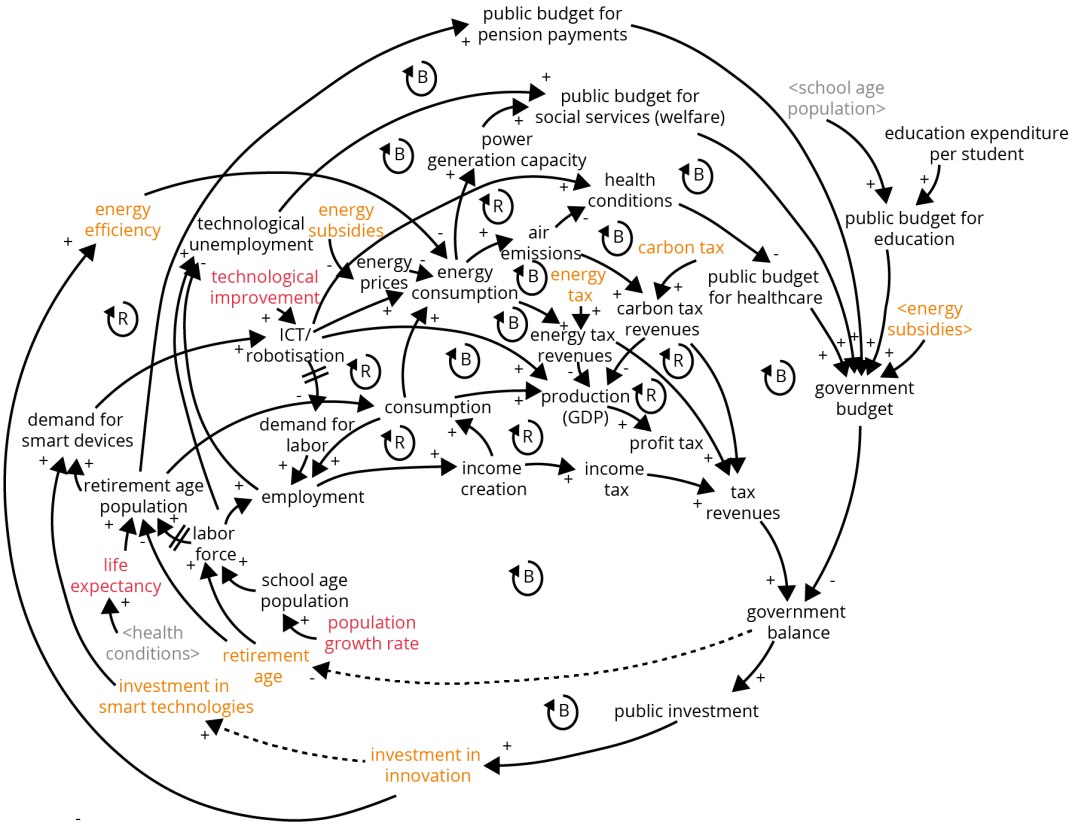
The systemic character of the sustainability challenges facing Europe demands new governance responses. As highlighted in the preceding sections, the complexity of societal systems and their interdependency with other macro-level processes bring into play feedback loops, delays and non-linear effects. Prevailing analytical and policy approaches are inadequate to face these interconnected challenges as they normally address individual issues, leading to unintended outcomes.

Identifying, assessing and prioritising policy interventions to deal with the parallel fiscal, socio-economic and sustainability transition challenges facing Europe requires new thinking. This includes developing and using integrated models that analyse the multiple transition impacts and the potential reinforcing or balancing mechanisms of ageing population, technological change, environmental policies and fiscal sustainability.

The EEA's forthcoming report uses two models: a qualitative system dynamics (causal loop) model and a quantitative computable general equilibrium (CGE) model in a novel approach. These facilitate a combined analysis of ageing population, technological change and environmental policies in order to understand synergistic and non-synergistic linkages and feedback loops (Figure 4).

Overall, this work indicates that mixed modelling methods and multidisciplinary knowledge can inform the formulation of effective policy packages across a range of parallel, systemic, societal challenges. The CGE model provides much needed quantification of the outcomes of macro-trends and policies. This is crucial to prioritise efforts and deliver value for money. The causal loop diagrams model is more comprehensive and allows users to explore dynamics more broadly. In doing so, it provides a basis for creating a shared understanding of the dynamics of the system, and serves as a blueprint for formulating models and scenarios.

Figure 4 Integrated causal loop diagram addressing ageing, technological change and fiscal sustainability



Creating fiscal systems fit for the 21st century

Europe faces momentous changes in coming decades. As the transformation of production-consumption systems proceeds, in the context of rapid innovation, population ageing, changing work relations and shifting resource use patterns, the fiscal and social security systems will have to be reformed to remain viable and support transitions. Existing labour and environmental taxation schemes have not kept up with these developments. The foundations of the taxation system have shifted since the welfare state was established in the last century. The fiscal system must be radically reformed if the state is to continue providing the preconditions for inclusive and sustainable well-being.

Options for new taxation schemes are manifold. In the environment and climate policy field, many (including the European Commission) have called for widespread implementation of **carbon pricing schemes**. In Europe there is still much space to (1) introduce carbon taxes in EU Member States; (2) broaden the tax base, i.e. levy an explicit carbon tax on energy products, such as transport fuels; and (3) implement carbon border adjustments. Each can generate additional budget revenues in the short to medium term, while encouraging corporations and households to invest in cleaner technologies.

Alongside carbon pricing, **distance-based charges** in the transport sector can be set to reflect the pollution costs and congestion implications of different types of vehicles, supporting the transition to zero-emission mobility. They can also compensate for declining revenues from energy taxes as internal combustion engine vehicles are phased out.

Resource taxes directly increase the price of natural resources (minerals, aggregates, water). Higher prices are essential to increase resource efficiency, promote recycling and foster transition to a circular economy.

Beyond environment-related taxes, a variety of other measures have also been proposed that together could help to ensure fiscal sustainability. For example:

- **A robot tax** is promoted by some entrepreneurs and academics and was discussed by the European Parliament in 2017. However, it is heavily criticised as a possible obstacle to further innovation and for hampering the adoption of robots in industry.
- **Digital taxation** (digital service tax) aims to overcome the limitations of existing corporate taxation rules, which struggle to deal with businesses operating in the digital economy, where profits are often shifted from the countries where value is created. Digital taxation schemes are already implemented or proposed in several EU Member States, but others oppose them.
- **Financial transaction tax (FTT)** aims to address financial market instabilities and to generate revenues for the public budget by imposing a levy on financial transactions, such as trade in stocks, shares and bonds. The FTT is high on the political and tax agenda but early estimates of likely revenue have been considerably reduced.

Projected revenues from these new instruments would be quite small in comparison to the current tax take, including social security contributions. Other prominent options include funding pensions out of **consumption and wealth taxes**, to give a broader tax base and a smaller impact on the economy's competitiveness and incentives to substitute capital for labour.

The potential of **consumption taxes**, such as VAT, as budget sources for financing old-age expenditure could be considered in countries with low VAT or sales tax rates. However, European countries today rely heavily on VAT revenues and the OECD has argued that further increases could actually decrease total tax receipts due to disincentives and tax avoidance effects.

Finally, a frequently proposed alternative is **property taxation**, in particular recurrent taxes on immovable property, sometimes known as **land value taxation**. Such taxes are considered to have minimal impacts on economic growth given the immobility of the tax base. There are large differences in the design and scope of property taxation in Europe but for the EU as a whole property tax revenues were similar to environmental taxes in 2018, totalling 2.5% of GDP.

In summary, major transformative forces are reshaping Europe. The picture is complex with countless interactions and feedbacks. When sustainability transitions are considered in the context of other macro-level change processes then environment and climate actions definitely exit the realm of sectoral policies. Economic, financial, fiscal and social policies all have important roles to play. Reforms will be needed across these different policy domains if they are to respond effectively to the challenges of the 21st century.