

European briefings

Resource efficiency



EU-28 domestic material consumption declined by 10% between 2000 and 2012, despite a 16% increase in economic output. Environmental pressures such as waste generation and harmful emissions were also reduced. Policies have contributed to this decoupling but Europe's economic downturn since 2008 also played a role. Achieving sustained reductions in environmental pressures will require coherent policy approaches aimed at fundamentally transforming Europe's systems of production and consumption.

Context

In the context of escalating global environmental pressures, it has become increasingly clear that Europe's prevailing model of economic development — based on steadily growing resource use and pollutant emissions — cannot be sustained in the long term. Already today, Europe's ecological footprint is double its land area and the European Union (EU) is heavily reliant on imports of resources. In 2011, the EU imported almost 60% of its fossil fuel and metal resources.^[1]

At the most basic level, resource efficiency consists of 'doing more with less'. It captures the relationship of society's burden on nature (in terms of resource extraction, pollution emissions, ecosystem pressures) to the returns generated (e.g. gross domestic product (GDP) or sectoral output) (Box 1).

Resource efficiency has a vital role in facilitating economic development within environmental boundaries, but it also offers broader social and economic gains. These include sustaining non-market ecosystem services (such as purifying air and water), securing supplies of critical resources, increasing competitiveness, and stimulating innovation and job creation.

Europe's medium- and long-term strategic planning recognises the fundamental importance of resource efficiency. For example, the EU's 7th Environment Action Programme (7th EAP)^[2] identifies as one of its priority objectives the need to 'turn the Union into a resource-efficient, green, and competitive low-carbon economy.'

Similarly, the EU's Roadmap to a resource-efficient Europe^[3] includes a vision for 2050, wherein 'the EU's economy has grown in a way that respects resource constraints and planetary boundaries, thus contributing to global economic transformation.'

Key trends

While the notion of 'doing more with less' is conceptually very simple, quantifying resource efficiency is more complex in practice. Resources differ hugely: some are non-renewable, some renewable; some are depletable, others are not; some are hugely abundant, some extremely scarce.

The environmental impacts of resource use can also vary greatly depending on the timing and location. For these reasons, producing meaningful estimates of the environmental burden associated with economic activity simply by calculating the ratio of resource use to economic output can be problematic.

The EU's Resource Efficiency Scoreboard,^[4] which is being developed pursuant to the Roadmap to a resource-efficient Europe, therefore offers a diverse mixture of perspectives on resource efficiency trends. It establishes 'resource

productivity' (i.e. the ratio of economic output to material consumption) as its lead indicator, on the basis that materials are the primary link between the economy and the environment.

But it also includes other 'dashboard indicators' on carbon, land and water, as well as 'thematic indicators' on economic and environmental topics.

Box 1: Resource efficiency and decoupling

The resource efficiency challenge is often framed in terms of 'decoupling' economic output from environmental inputs.

Figure 1: Decoupling demystified

Decoupling demystified

Decoupling can take several forms:

- **Relative decoupling** is achieved when an environmental pressure (e.g. resource use or emissions) grows more slowly than the related economic activity (e.g. sectoral gross value added (GVA) or national GDP).
- **Absolute decoupling** is achieved when an environmental pressure remains stable or decreases while economic activity increases.
- **Impact decoupling** is achieved when environmental impacts decline relative to resource use and economic activity.

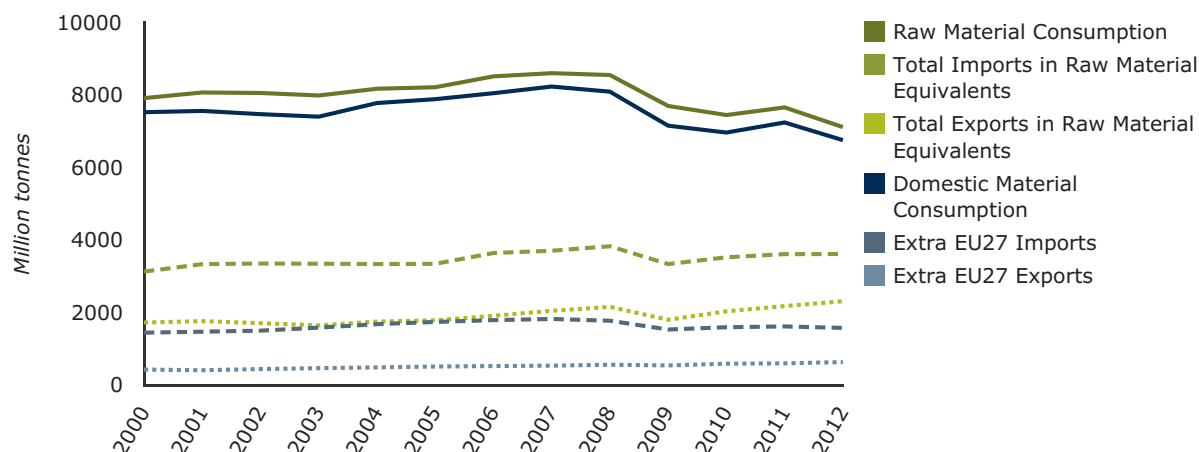
Increases in resource efficiency will always imply some decoupling of economic activity from environmental pressures. But they do not necessarily indicate absolute or impact decoupling.

Material resource productivity

Resource productivity is defined as the ratio of GDP to domestic material consumption (DMC), i.e. the total amount of materials directly used by an economy, including all physical imports and excluding exports.^[5] Eurostat is developing an additional indicator for the EU as a whole, raw material consumption (RMC), which provides a better indication of Europe's resource demands from overseas by including the materials used in producing traded goods and resources. Although the trade flows calculated via this method are much larger, the overall effect on estimates of total EU resource consumption is quite small (an increase of about 5%).

EU-28 resource productivity (GDP/DMC) stood at EUR 1.73/kg in 2012, compared to EUR 1.34/kg in 2000. Despite this improvement, there is little evidence that European resource use has decoupled from economic growth in absolute terms. Although EU-28 total DMC declined between 2000 and 2012, from 7.6 billion tonnes to 6.8 billion tonnes, this was largely due to the economic problems since 2008. Between 2000 and 2007, EU-28 total DMC actually increased by 10%, indicating growing resource use.

Figure 2: EU-27 domestic and raw material consumption



Note: RMC data are only available for the EU-27. For comparability, the DMC data in this figure covers the same countries.

Data sources: a. Eurostat. [Material flow accounts](#)
b. Eurostat. [Material flow accounts in raw material equivalents - modelling estimate](#)

Resource productivity varies significantly across Europe, ranging from EUR 0.2/kg in Bulgaria to EUR 3.6/kg in Switzerland in 2012. There was little evidence of convergence of resource productivity rates between 2000 and 2012. Some of the countries that started with the lowest resource productivity rates recorded negligible improvements or declines during that period. Contrastingly, some of the countries with the highest resource productivity in 2000 recorded the largest percentage increases over the next 12 years. These differences are largely explained by construction sector activity, which dominates resource use in many countries.

Other resource efficiency trends

Turning to the other indicators in the Resource Efficiency Scoreboard, there is evidence that some environmental pressures are decoupling from economic output growth in relative or absolute terms (Box 1). Yet even in cases where pressures are declining, the burden on natural capital often remains excessive, threatening the delivery of the ecosystem services that underpin social and economic development. For example:

- EU-28 greenhouse gas emissions declined by 19% between 1990 and 2012, implying a 38% reduction in emissions per EUR of GDP. Despite these improvements, the EU remains far from the 80–95% reduction by 2050 seen as necessary for developed regions.
- Water use is decreasing for most sectors and in most regions but agricultural water use, in particular in southern Europe, remains a problem.
- Biodiversity faces reduced pressures from acidifying emissions but nitrogen surpluses remain high and landscape fragmentation has increased.
- The waste intensity of manufacturing and service sector economic output has declined since 2004, as has the municipal waste intensity of household spending. However, municipal waste generation has hardly changed in absolute terms.
- Air pollutant emissions have decreased in many parts of Europe but human exposure to harmful air quality remains a challenge, especially in urban environments.

Prospects

Europe's systems of production and consumption continue to impose considerable demands on the environment. Meanwhile, global megatrends such as population growth, urbanisation and the emerging 'consumer middle class' in many developing countries are expected to drive steady growth in global competition for resources in coming decades.

Addressing these challenges will require fundamental changes in Europe's systems of resource use and economic growth. One essential aspect of this change will be a shift away from a linear (take-make-dispose) model of resource consumption, towards a **circular economy** where nothing is wasted.

Waste prevention and management are clearly important in creating a circular economy but factors such as product design and choice of material inputs also have a major influence. EU policy has already driven improvements in recycling of certain waste streams, yet substantial increases are possible and could greatly reduce reliance on virgin resources. **Eco-innovation** also has a crucial role, enabling producers to reduce their resource use or shift to less harmful or scarce substitutes (for example in the transition from fossil fuels to solar or wind power).

There is evidence, however, that isolated resource efficiency improvements are often insufficient to guarantee a decline in environmental pressures because the benefits are offset by increasing consumption and lifestyle changes (a phenomenon known as the '**rebound effect**'). For example, fuel consumption and CO₂ emissions from private cars have increased markedly in the last two decades, despite improved fuel efficiency, because Europeans are driving more.

These realities point to the need for more fundamental adjustments to the systems that meet society's demand for goods and services, addressing production and consumption concurrently. **New business models** that move away from individualised ownership towards service provision and shared consumption of products have an important role here.

Tackling the 'rebound effect' and effecting systemic change in systems of production and consumption will require a smart policy mix, including market-based instruments, regulations, voluntary agreements and labelling approaches. A review of national experience in policy implementation shows that there is no one 'right' combination of policy approaches and instruments. The successful policy mix will be determined by local conditions and will need to address priority concerns first.

SOER 2015 European briefings present the state, recent trends and prospects in 25 key environmental themes. They are part of the EEA's report SOER 2015, addressing the state of, trends in and prospects for the environment in Europe. The EEA's task is to provide timely, targeted, relevant and reliable information on Europe's environment.

For references, see www.eea.europa.eu/soer or scan the QR code.

PDF generated on 27 Feb 2015, 11:10 AM

