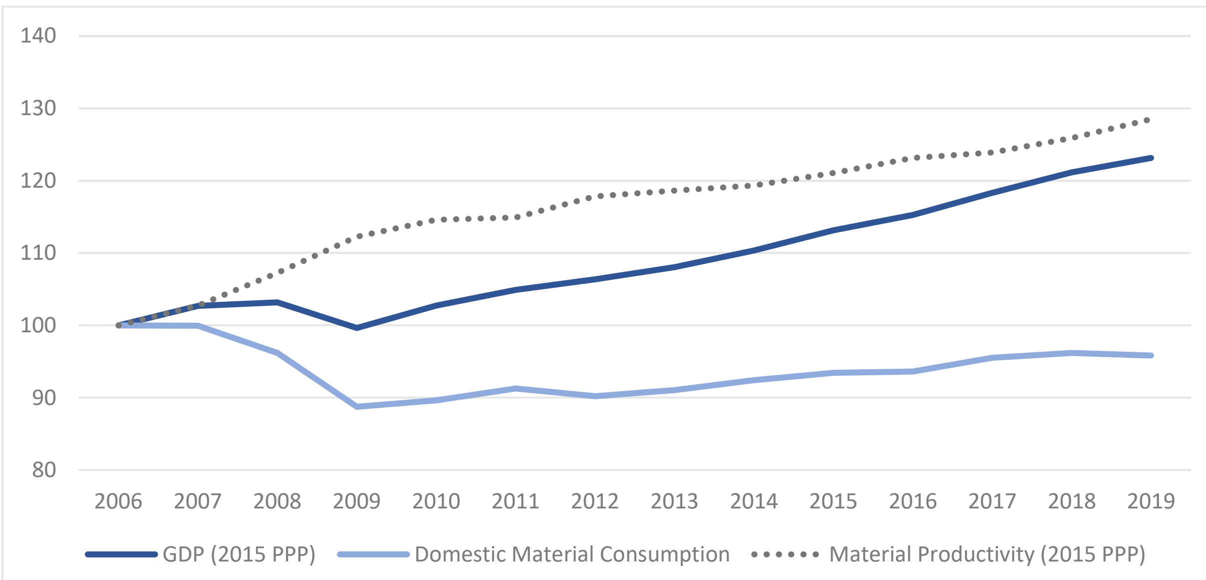
2 Rationale for a circular economy transition in Hungary

This chapter provides insights into global trends in resource use and its environmental implications, and outlines the role of circular economy in addressing them. It also discusses the rationale for transitioning to a circular economy in Hungary. Although Hungary has achieved relative decoupling of economic growth from resource and energy uses as well from waste generation, several challenges remain in the country's resource productivity, circular materials use and waste recycling. Despite structural and technological changes, materials consumption in Hungary is projected to increase significantly to 2050.

2.1. Global resource use and its environmental implications are on the rise

The past decades have witnessed unprecedented growth in the global consumption of raw materials. The effect of lower materials intensity – due to the global shift towards more services and more efficient technologies – has been dampened by the rise in global economic output (see Figure 2.1). Overall, past policies and societal trends have contributed to a relative decoupling, but they have not achieved an absolute reduction in materials use (OECD, 2019[1]).[1] Recent OECD modelling suggests that, in light of a growing world population, improving living standards, structural changes (driven by ageing, globalisation and consumer behaviour), as well as changes in production modes due to new technologies (including servitisation and digitalisation), materials consumption will almost double between 2017 and 2060 in OECD countries (from 89 Gigatonnes [Gt] to 167 Gt) (OECD, 2019[1]).

Figure 2.1. Materials consumption, materials productivity and economic growth in OECD countries



Note: Materials consumption is measured as Domestic Material Consumption (DMC), economic growth is measured in USD (2015 Purchasing Power Parity [PPP]) and material productivity is measured as the ratio of GDP/DMC (USD per kg of domestic materials consumption 2015 PPP).
Source: OECD (2023[2]).

The constant rise in the use of materials has severe environmental impacts, including acidification, eutrophication, intensification of land use, human toxicity and terrestrial ecotoxicity (OECD, 2019[1]). Moreover, every stage of the materials life cycle contributes to the emission of greenhouse gases (GHG) into the atmosphere and is indirectly responsible for two-thirds of global GHG emissions, therefore playing a crucial role in climate change (OECD, 2019[1]; OECD, 2020[3]). In the absence of new policies targeting the life cycle of materials, countries will be at risk of missing the targets of the Paris Climate Agreement, including Nationally Determined Contributions (NDCs) and the “well below” two degrees Celsius objective.

The recent COVID-19 pandemic and its associated restrictions have had severe economic consequences, leading to a significant drop in economic activity. The GHG emissions, as well as emissions of some of the most important air pollutants, fell by around 7% below the pre-COVID baseline level in a single year. The reduction in materials use ranges from 2% for biotic resources to 11% for the use of non-metallic minerals (including construction materials) (Dellink et al., 2021[4]). However, economic growth is expected to recover in the coming years, and the pandemic has not changed the long-term trend towards increasing environmental pressures structurally (OECD, 2020[5]; Dellink et al., 2021[4]) (see Annex Box 2.A.1). More ambitious policy action therefore remains urgent.

2.2. A circular economy can act as a response to these trends

Concerns about the environmental consequences of climate change, acidification, eutrophication, intensified land use, among others, have increased global attention on the continuous rise of materials use. The traditional linear model of resource extraction, product ownership and end-of-life disposal is unlikely to deliver the desired sustainable future. Promoting sustainable materials management has become a major focus of a number of high-profile multilateral and national initiatives and frameworks, including the G7 Alliance on Resource Efficiency (G7, 2015[6]), the G20 Resource Efficiency Dialogue (G20, 2017[7]), and the various partnerships and initiatives launched by the World Economic Forum (World Economic Forum, n.d.[8]).

One of the channels through which decoupling of economic activity from materials use and their environmental impacts can be achieved is in the transition to a more circular economy (Ellen MacArthur Foundation, 2015[9]; OECD, 2019[10]). In contrast to the linear model, a circular economy is regenerative by design and helps to keep resources flowing within rather than through the economy. A circular economy is a model of production and consumption, which eliminates waste and pollution, circulates products and materials (at their highest value), and regenerates nature (by building natural capital) throughout the economy's technical and biological cycles. Products are kept in circulation through reuse, repair, remanufacture and recycling, and nutrients from biodegradable materials are returned to the earth through composting or anaerobic digestion (Ellen MacArthur Foundation, n.d.[11]). More specifically, a circular economy modifies product and material flows through three main mechanisms (McCarthy, Dellink and Bibas, 2018[12]):

- **Closing resource loops** through the substitution of secondary materials and second-hand, repaired or remanufactured products in place of their virgin equivalents.
- **Slowing resource loops** through the emergence of products which remain in the economy for longer, usually due to more durable product design.
- **Narrowing resource flows** through more efficient use of natural resources, materials and products, including the development and dissemination of new production technologies, an increased utilisation of existing assets, and shifts in consumption behaviour.

Achieving real progress in transitioning to a circular economy will require greener modes of production and consumption. There are five business models that support the transition to a more resource efficient and circular economy (OECD, 2019[10]):

- **Circular supply models** replace traditional material inputs derived from virgin resources with bio-based, renewable or recovered materials.
- **Resource recovery models** recycle waste and scrap into secondary raw materials, diverting waste from final disposal while displacing demand for extraction and processing of virgin natural resources.
- **Product life extension models** extend the use period of existing products, slow the flow of constituent materials through the economy, and reduce the rate of resource extraction and waste generation.
- **Sharing models** facilitate the sharing of under-utilised products, and reduce demand for new products.
- **Product service system models** where services rather than products are marketed, improve incentives for green product design and more efficient product use.

2.3. Europe wants to lead the global transition to a circular economy

As a response to global trends, the EU has made the transition to a circular economy one of its policy priorities. The EU established a Resource Efficiency Platform as early as 2012 (European Commission, 2012[13]), and adopted the first Circular Economy Package in 2015 (European Commission, 2015[14]). More recently, the new Circular Economy Action Plan (CEAP) (European Commission, 2020[15]) was adopted in 2020, encompassing bold initiatives along the entire life cycle of products. This action plan has also become one of the main building blocks of the European Green Deal – the new European agenda for sustainable growth (European Commission, 2019[16]). The EU has also revised its waste legislation and developed legislative proposals in several new policy areas, such as plastics, textiles and product policy. For an overview of the key developments in the EU circular economy policy landscape, see Box 2.1.

The circular economy has a key role to play in Europe's recovery from the global pandemic and is one of the ways of "building back better". The EU has established a recovery plan for Europe to help repair the immediate economic and social damage brought about by the pandemic. As much as one-fifth of the funds from the EU's long-term budget and the temporary NextGenerationEU fund will be dedicated to natural resources and environment. To benefit from the EU recovery funds, the EU Member States have developed national Recovery and Resilience Plans (RRPs) to include, among others, measures related to green initiatives and digital recovery (also foreseeing investments and reforms in support of the circular economy) (European Commission, 2020[17]).

Box 2.1. Key circular economy-related policies in the EU

Over the past decade, the European Commission (EC) has launched several flagship policy initiatives.

- The first Circular Economy Package, adopted as early as 2015, contained proposals to amend the EU waste legislation and an EU Circular Economy Action Plan (European Commission, 2015[14]).
- In 2018, the second Circular Economy Package included the EU Strategy for Plastics (European Commission, 2018[18]), a proposal for a Directive on the reduction of the impact of certain plastic products on the environment (European Commission, 2018[19]), a Communication on a monitoring framework for the circular economy (European Commission, 2018[20]) and the *Report on Critical Raw Materials and the Circular Economy* (European Commission, 2018[21]).
- In 2019, the EC presented a non-legislative proposal for Sustainable Products in a Circular Economy (European Commission, 2019[22]) and launched the European Green Deal (European Commission, 2019[16]). One of the main building blocks of the European Green Deal and the European agenda for sustainable growth is the new Circular Economy Action Plan (European Commission, 2020[15]). Adopted in 2020, this document outlines several planned legislative proposals, including widening the Ecodesign Directive, a framework for non-energy-related products and additional sustainability principles, establishing a "right to repair" and revising the Construction Products Regulation. It also foresees revision of the legislation for specific waste streams, such as end-of-life vehicles, packaging and plastic waste, and waste from electrical and electronic equipment (WEEE).

In addition to these policy initiatives, several sector-specific legislations were adopted and revised to implement the policy vision set out in the Circular Economy Action Plan of 2015 and 2020. These elements are discussed in more detail in Annex Box 2.A.2.

2.4. There is a large diversity of national and subnational circular economy strategies

During the past decade, a growing number of EU Member States have embarked on individual paths towards a circular economy. Countries have scaled up local actions, put forward national policy targets, implemented circular economy strategies, and enacted circular economy related laws and regulations. More than 60 circular economy strategies and roadmaps have been developed at national, regional and local levels to stimulate the transition towards a more resource efficient and circular economy (Salvatori, Holstein and Böhme, 2019[23]). Countries with more advanced national circular economy policies include Denmark, Finland, France and the Netherlands, whereas those with more recent strategic frameworks include the Czech Republic, Poland, Slovenia and Sweden. Among the regional and municipal initiatives, most strategies come from countries that already have well-established frameworks at the national level (European Commission, 2019[24]; OECD, 2020[25]). Capitals and large cities throughout Europe (such as Brussels, Glasgow, Helsinki, London and Paris) have been developing circular economy strategies. A number of European cities have signed the European Circular Cities Declaration, including Budapest, which aims to accelerate the transition to a circular economy (ICLEI Europe, 2020[26]).

These strategies aim to further the paradigm shift from a linear to a circular economy as they work within the common framework of the EU's circular economy ambitions (European Commission, 2020[15]; European Commission, 2019[27]). However, there is a rich diversity in the applied approach, ambition and priorities. For instance, different priorities have led to various sectors being targeted to undergo a circular transition. Some countries have also opted for a broad horizontal approach that surpasses individual sectors. These structural choices have, in turn, had an impact on the targets, implementation measures and monitoring instruments for measuring the progress of the transition (see Annex Box 2.A.3). This disparity highlights the need to customize circular economy strategies to the national or local context and priorities.

2.5. Current trends and recent developments in Hungary point to a number of structural, economic and environmental challenges

Hungary has managed to decouple the growing number of environmental pressures from its economic growth. However, the country has so far shown limited efforts to promote the transition towards a circular economy. Several challenges remain related to the country's relatively low performance in waste recycling, circular materials use, resource productivity and eco-innovation. This section discusses Hungary's current socio-economic characteristics and circular economy-related performance.

2.5.1. Slow uptake of circular economy activities

Hungary is a small open economy that has enjoyed relatively fast economic growth. Between 2010 and 2019, Hungary's gross domestic product (GDP) has grown at an average annual rate of 2.8% (OECD, 2020[28]). Almost all sectors have contributed to this growth, including manufacturing, construction and services (Hungarian Central Statistical Office, 2020[29]). This growth has led to record low unemployment and rising wages. However, despite convergence towards the OECD's standard of living, Hungary's GDP per capita is still only three-quarters of the OECD average (OECD, 2020[30]). Moreover, the COVID-19 pandemic has led to disruptions in several sectors, causing considerable economic damage (see Annex Box 2.A.4).

The uptake of circular economy activities in the Hungarian economy has been below par, reflecting, among others, the important gaps in the country's circular economy-related policy landscape (see discussion in chapter 3). Moreover, the slow adoption of circular business models by small and medium-sized enterprises (SME), the shortages in skills critical to the circular economy, and the low levels of eco-innovation have further hampered the transition to a circular economy in the country. These issues are outlined in more detail in the following paragraphs.

First, despite the great importance of **services** and **industry** in the Hungarian economy, circular activities represent only a negligible fraction of these sectors. The "Services" sector[2] currently represents around two-thirds of the economy's gross value added (GVA), with strong growth in the past few years (OECD, 2020[31]). Although circular economy services, such as repairs of computers and other household goods, have also experienced positive growth, they represent a tiny fraction of the economy, constituting less than 1% of its GVA. At the same time, Hungary has a strong industrial sector, with more than one-fifth of GVA attributable to "Manufacturing"[3] (OECD, 2020[31]). The "Repair and installation of machinery" sub-sector is the fastest growing sub-sector (doubling between 2015 and 2019), but with less than 1% of GVA it still represents a small segment of the economy. Nonetheless, this sub-sector illustrates how the servitisation and circularisation of Hungarian manufacturing can be accelerated, by which the manufacture of equipment is accompanied by services related to extending its lifetime.

Second, the Hungarian **construction** and **mining** sectors have been growing exponentially within the past years. "Construction" only represents 6% of GVA, but has strongly expanded – doubling from 2015 to 2019 (OECD, 2020[31]). "Mining and quarrying" represents less than 1% of GVA, but it has almost tripled over the same period. Both sectors are closely related to the extraction of construction materials, have high resource intensity per unit of added value, and generate substantial environmental impacts such that their growth raises challenges in the transition to a circular economy.

Third, although **agriculture** has relatively high importance in Hungary, the uptake of bioeconomy practices lags significantly behind other European countries. The share of "Agriculture"[4] is one of the highest among the OECD countries, accounting for almost 4% of the GVA (OECD, 2018[32]). Despite owning the largest share of agricultural land in the EU (almost 60% of the country's land area), Hungary's biomass only constitutes a small share of the EU's total annual production (less than 5%) (BIOEAST, 2021[33]). The bioeconomy contributes to the circular economy transition in various ways, for instance, by supporting the production of bio-based fertilisers, using organic waste as feed and fodder, and replacing fossil-based production.

Fourth, the overall circular economy **employment** in Hungary is above the EU average, yet shortages in skilled labour might hamper the pace of progress towards the circular transition. Hungary's employment has seen favourable labour market developments in the past decade, with the employment rate increasing to a remarkable high of 70% (OECD, 2020[34]). Of this, the circular economy employed 2%, or about 90 000 people, in 2018 in sectors related to the repair and reuse of a variety of equipment (from motor vehicles to consumer electronics and furniture), the sale of second-hand products, and waste management (Eurostat, 2021[35]). The bioeconomy also constituted an important sector in terms of employment (European Commission, 2020[36]). At the same time, the labour market has been characterised by shortages in skilled labour and a mismatch between skills and employer needs (OECD, 2018[32]). This is particularly critical to the circular economy, for which acquiring new skills (reskilling) and topping-up existing skills (upskilling), especially transferable skills and "green skills", is a prerequisite.

Fifth, **SMEs** remain essential economic actors in the Hungarian economy, with underlying trends of servitisation and digitalisation, offering an, as yet, untapped potential for the uptake of circular business models. SMEs contribute to more than half of the GVA (OECD, 2019[37]) and employ around 70% of the business sector (OECD, 2019[37]). Certain sectors, enabled by servitisation and digitalisation, such as information and communication technologies (ICTs), administration and support services, or transportation and storage, have an above average rate of high growth enterprises (see Annex Figure 2.A.7). At the same time, sectors that have a consistently below average presence of high-growth enterprises include construction, wholesale and retail trade, and accommodation and food (OECD, 2019[37]). For these sectors, finding new synergies for growth by employing circular economy business models, enabled by servitisation and digitalisation, could be an important avenue for expansion, helping them to increase their value added, and making better use of under-utilised assets, reducing costs and entering new markets.

Lastly, Hungary is considered a modest innovator with relatively low levels of **eco-innovation** and generally low expenditure on research and development (R&D). According to the European Innovation Scoreboard (EIS), Hungary ranked 22nd in the EU in 2019 (European Commission, 2020[38]). Hungary has also significantly fallen back on its Eco-Innovation Index since 2015 (Eco-innovation Observatory, 2019[39]); it ranked last but one among the EU Member States in 2019. In addition, Hungary's innovation performance is lagging in terms of intellectual assets. When looking at patents filed under the Patent Cooperation Treaty, the number of patents in Hungary is significantly below the number of patents filed by inventors residing in frontrunner countries (OECD, 2021[40]). Of the total patent count, environmental technologies constitute less than 10%, with the majority representing climate change technologies (especially for buildings, energy generation and transmission, as well as environmental management). Only a small share of the patents is related to waste management, including wastewater management (see Annex Figure 2.A.8). Finally, Hungary's relatively low expenditure on R&D remains an impediment to improved innovative performance. In 2018, Hungary's gross expenditure on R&D stood at 1.5% of GDP, which is less than the EU average (at 2.1% of GDP). The transition to a circular economy inherently requires multidimensional innovation at the product, process, organisation and marketing levels.

Box 2.2. Hungary's Circular Economy Technology Platform

Hungary recently established the Circular Economy Technology Platform (EGOV.HU, 2022[41]) in response to its lag in research, development and innovation (R&D&I) related to the circular economy. The aim of the platform is to accelerate Hungary's transition to a circular economy and to place the country at the forefront of using innovative circular technologies, thereby strengthening its competitiveness, and establishing and strengthening collaborations between private and public stakeholders, professional organisations, academia and civil society (Circular Hungary, 2022[42]).

Established at the University of Pannonia, the platform is a consultation and cooperation forum, which is based on the voluntary professional work of its member organisations (with 135 founding members). The main responsibilities include: establishing an advisory forum; operating working groups; supporting changes in regulatory environment; promoting R&D&I and education and training; and reviewing technical materials (Circular Point, 2022[43]). The objectives of the platform are six-fold: i) accelerating the circular economy transition; ii) mainstreaming systems thinking; iii) creating and connecting local circular value chains; iv) shaping the attitude, and changing the behaviour of businesses and citizens; v) representing the interests of industrial players and research institutes, and providing inputs to policy making; and vi) developing a financing framework (private sector financing and public funding through tenders).

The platform will focus its work on 12 areas covering both horizontal and vertical topics. Altogether, five horizontal working groups will focus on:

- funding for new business models and the circular transition
- inputs for policy
- knowledge transfer and innovation
- awareness raising and behavioural change
- data and measurement.

The vertical working groups will cover the following focus areas:

- critical and secondary raw materials
- circular construction
- circular electronics
- circular agriculture, food industry, and trade
- circular water management
- circular textile industry
- circular settlements.

More information can be obtained from the platform's website: https://circularhungary.hu/.

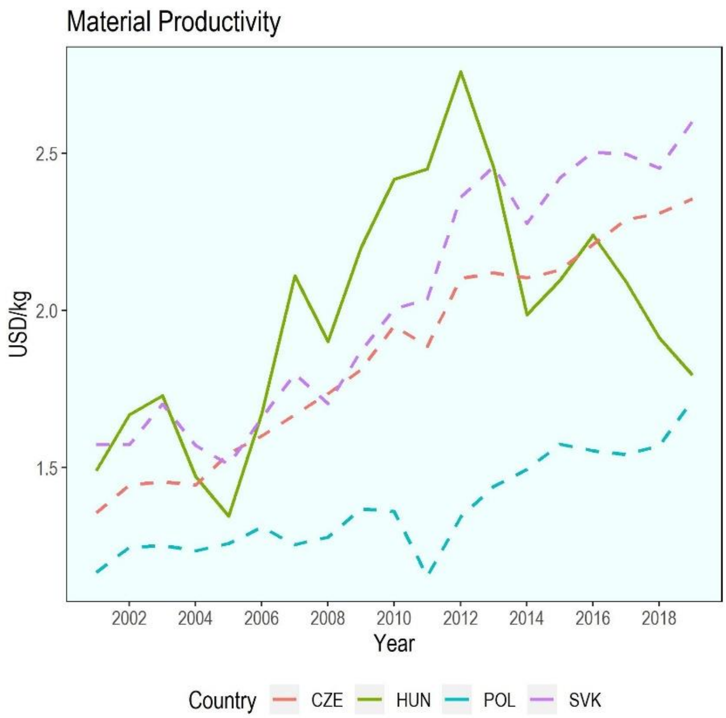
2.5.2. Continuous growth of raw materials use, waste generation and energy consumption

Hungary has achieved relative decoupling of economic growth from resource and energy use, as well as from waste generation (refer to Annex Figure 2.A.9). However, in many aspects, Hungary is an average performer. For instance, the efficiency and the circularity of materials use lag behind its European counterparts. Additionally, its material consumption levels are still increasing while its recycling rates remain low (European Commission, 2019[44]; OECD, 2018[32]). Moreover, Hungary's decrease in domestic energy production has led to a higher dependence on imported fossil fuels with an energy import dependence above the EU average, which continues to rise (Eurostat, 2021[45]).

Hungary's material productivity has been low and has not structurally improved (decreasing again since its peak in 2012, as seen in Figure 2.2), implying that Hungary does not use its materials efficiently to generate economic value.[5] The country's materials productivity stands at USD 1.8 per kg, well below EU levels (at USD 2.9 per kg in 2019). Moreover, Hungary's domestic material consumption (DMC)[6] per capita is above the EU average (at 17.8 tonnes for Hungary and 14.2 tonnes per capita for the EU in 2019) and shows a continuously increasing trend. The significant increases in DMC and decreases in material productivity can be attributed in large part to the consumption of construction minerals (which make up more than half of all materials consumed), followed by biomass for food and feed, and fossil energy carriers (refer to Annex Figure 2.A.10).

At the same time, Hungary's performance in terms of circular material use (CMU) rate[7] has been relatively low. The share of material resources used from recycled products attained only 6.8%, which is far below the EU average (at 11.9% in 2019) (see Annex Figure 2.A.11).

Figure 2.2. Material productivity



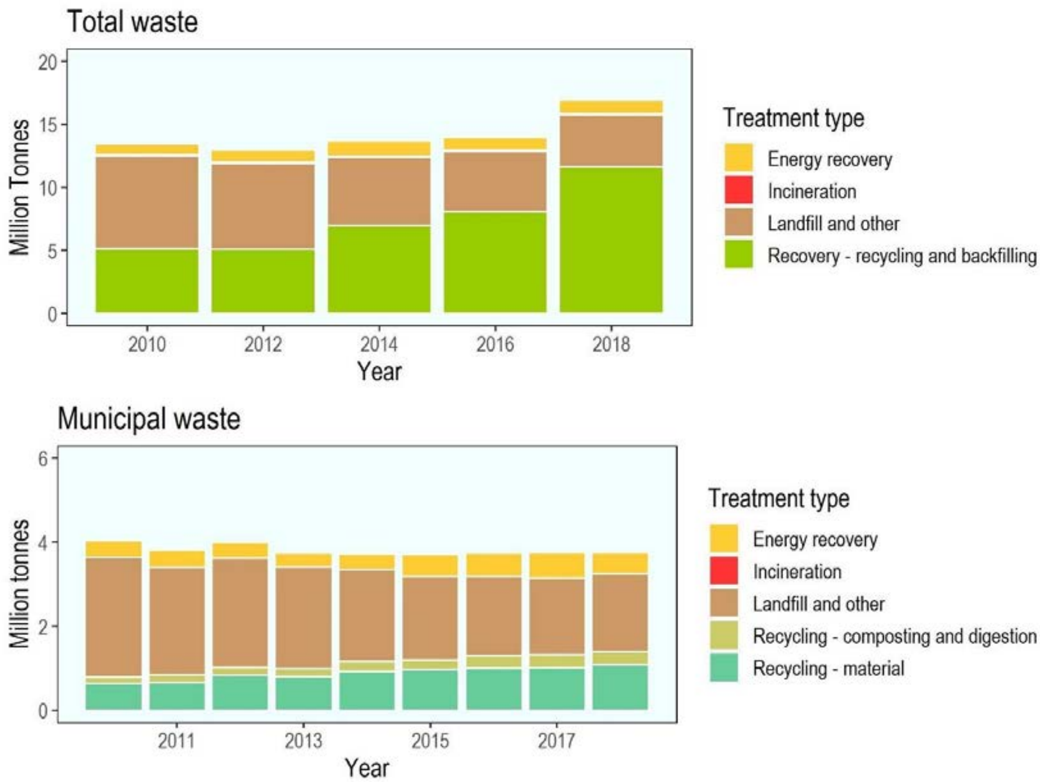
Source: OECD (2020[46]).

Hungary's total waste generation has recently increased with different trends prevailing across individual waste streams. With about one-third of total waste, the construction sector has been dominating waste generation in Hungary (see Annex Figure 2.A.12). Between 2016 and 2018 alone, waste generation in this sector almost doubled. Other significant contributors to waste generation include manufacturing, energy production and households. Agricultural waste, on the other hand, has decreased significantly over the last two decades, becoming a small fraction of total waste. Annex Box 2.A.5 provides more detail on the different waste categories generated by individual sectors.

Waste treatment in Hungary shows disparate trends. On the one hand, the quantity of total landfilled waste has been decreasing, almost halving between 2010 and 2018 (as shown in Figure 2.3). Waste that is recovered (including from recycling and backfilling) has more than doubled since 2010, while energy recovery rates and incineration have remained stable (OECD, 2018[32]). However, on the other hand, municipal waste management performance has been lagging behind despite the stable totals and the low per capita values (381 kg/capita in 2018) compared to the EU average (495 kg/capita) (Eurostat, 2020[47]). Although material recovery rates have been increasing, landfilling still represents about half of municipal waste treatment, which falls short of the ambitious European targets.[8]

Although recycling rates for packaging materials have been relatively high in the last decade, they have continued to decrease. Recycling rates for paper and cardboard packaging reached an historic peak of almost 95% in 2010 but have since decreased to 70% in 2018 (see Annex Figure 2.A.15). Moreover, plastic packaging, glass packaging and miscellaneous packaging rates have been stagnating and have further decreased, thus posing challenges for Hungary to reach EU recycling targets.[9]

Figure 2.3. Total waste and municipal waste, by waste management operations



Source: Eurostat (2021[48]; 2020[47]).

Hungary's total energy supply has been slowly decreasing from its historical peak in 1987, but so has domestic energy production, exposing the country to greater import dependence on fossil fuels. Natural gas and crude oil remain the two most important energy sources in Hungary. In 2019, they each represented about one-third of total energy supply (refer to Annex Figure 2.A.16). However, the majority of natural gas and crude oil consumption is imported from the Russian Federation, leading to an important energy dependency and threatening the security of supply in times of global energy crisis (Eurostat, 2021[45]; IEA, 2022[49]; IEA, 2017[50]). Additionally, while Hungary has one of the highest shares of nuclear energy (slightly less than one-fifth of total energy supply and around half of domestic electricity production in 2019), the share of renewables is among the lowest in the OECD (with only 2% of hydropower, wind and solar power, and 10% of biofuels in 2019). Coal still represents almost one-tenth of the total energy supply, though its role in the energy mix has steadily declined.

Hungary's total energy consumption has been increasing, reaching its highest rate in the past two decades. Although the residential sector accounted for almost one-third of total final consumption, its consumption has been decreasing due to improvements in the energy efficiency of buildings. Other important sectors are "Transport" (due to the country's relatively old car fleet) and "Industry" (which has been growing ever since its recovery from the 2008 financial crisis) (IEA, 2017[50]).

2.6. Macroeconomic projections to 2050 show that Hungary's economy will not become more circular without new policies

Despite the progress made in decoupling environmental pressures from economic activity, macroeconomic projections indicate that in the absence of more stringent policies, Hungary will continue to face a number of challenges in the decades to come. As wealth increases and living standards in Hungary converge towards the EU and OECD averages, demand for resources and materials is projected to increase further. This section presents the projections of macroeconomic indicators for Hungary to 2050, developed using the OECD ENV-Linkages model (Chateau, Dellink and Lanzi, 2014[51]).

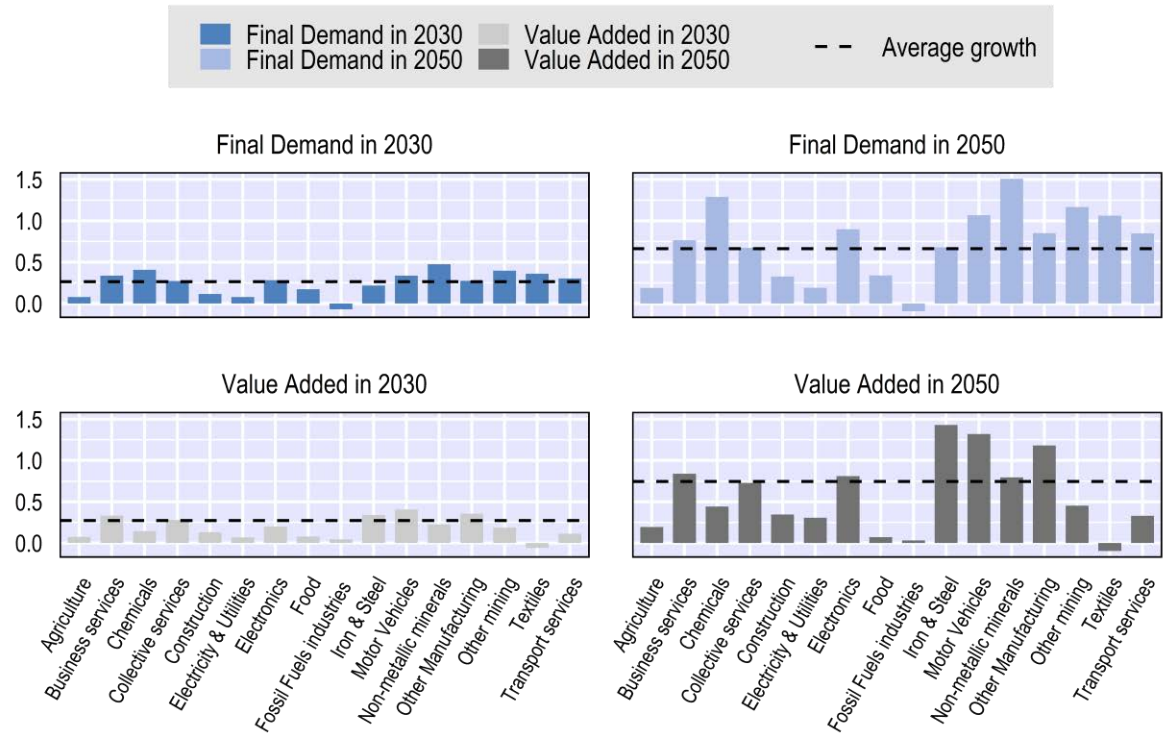
2.6.1. Projected changes in the economic structure

Living standards in Hungary are expected to continue increasing in the next decades. Hungary's economy is projected to grow at an annual rate of 1.9% towards 2050 – a faster growth rate than the EU and OECD averages.[10] Sectors where Hungary holds a comparative advantage (including electronics, motor vehicles, and other manufacturing) are projected to experience fast growth over the next three decades. Moreover, construction is expected to rise following the country's economic progress, while growth in services (including business, collective and transport services) reflects the servitisation of Hungary's economy (see Figure 2.4).

Structural and technological changes are expected to alter the structure of the Hungarian economy. In particular, structural changes towards sectors characterised by low materials intensity (such as services and higher-end manufacturing sectors) will increase resource efficiency, while materials intensive sectors are projected to grow but still remain below the average rate (see Annex Figure 2.A.17). At the same time, technological changes (such as the uptake of technological progress and digitalisation) are projected to further increase resource efficiency in production, shifting the production process away from primary materials towards secondary materials and recyclables (refer to Annex Figure 2.A.18).

Although changes in Hungary's economic structure partially mitigate the increase in materials use, they are not sufficient to offset them. In the absence of new policies, the rise in living standards, along with the underlying structural changes and changes in production modes, are projected to increase the demand for materials by one-third in 2050 compared to 2017 levels (an increase from 119 million tonnes (Mt) to 160 Mt, as shown in Figure 2.5). With an increase in GDP per capita by more than two-thirds, Hungary is projected to experience relative, but not absolute, decoupling of materials consumption from its economic output over the next three decades (see Annex Figure 2.A.19).

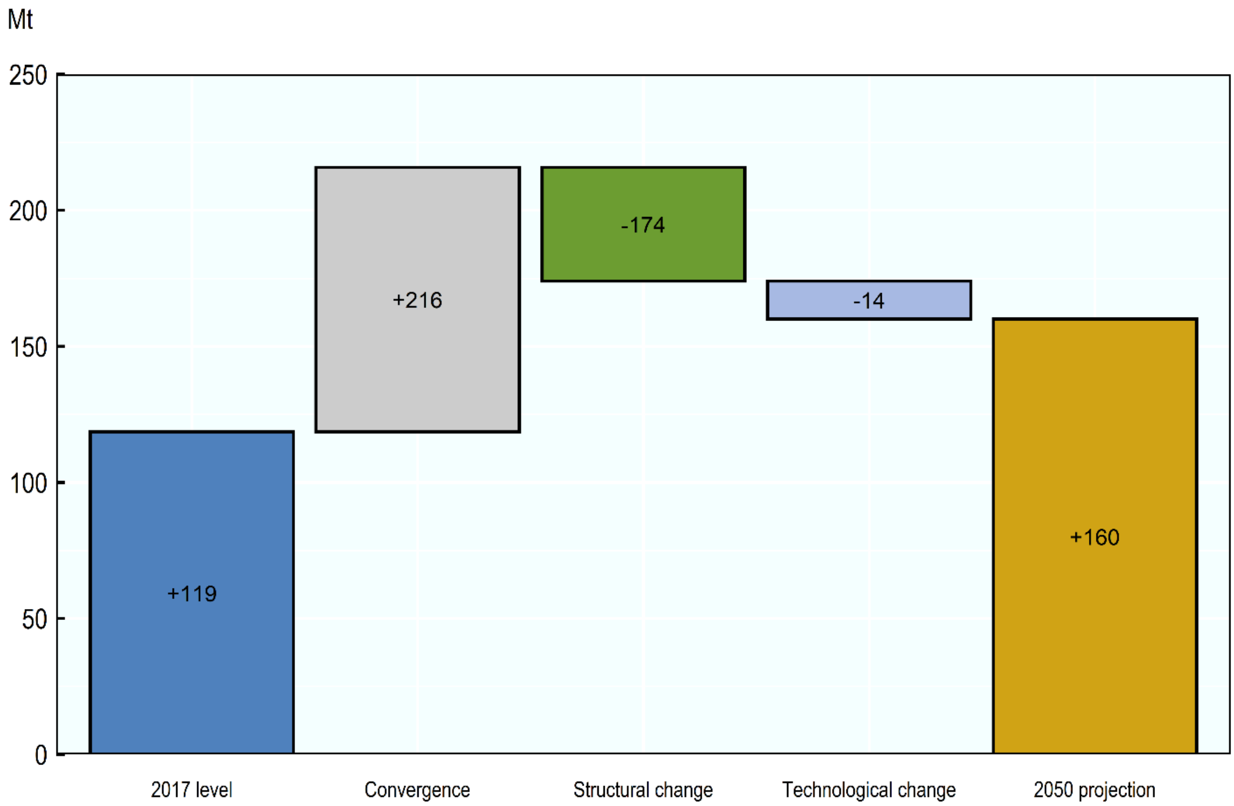
Figure 2.4. Projected changes in sectoral value added and final demand in 2030 and 2050 (relative to 2020)



Note: A change of 1 means a doubling of the quantity.
Source : OECD ENV-Linkages (Chateau, Dellink and Lanzi, 2014[51]).

StatLink https://stat.link/p1exgn

Figure 2.5. Decomposition of the increase of materials use between 2017 and 2050 in Mt



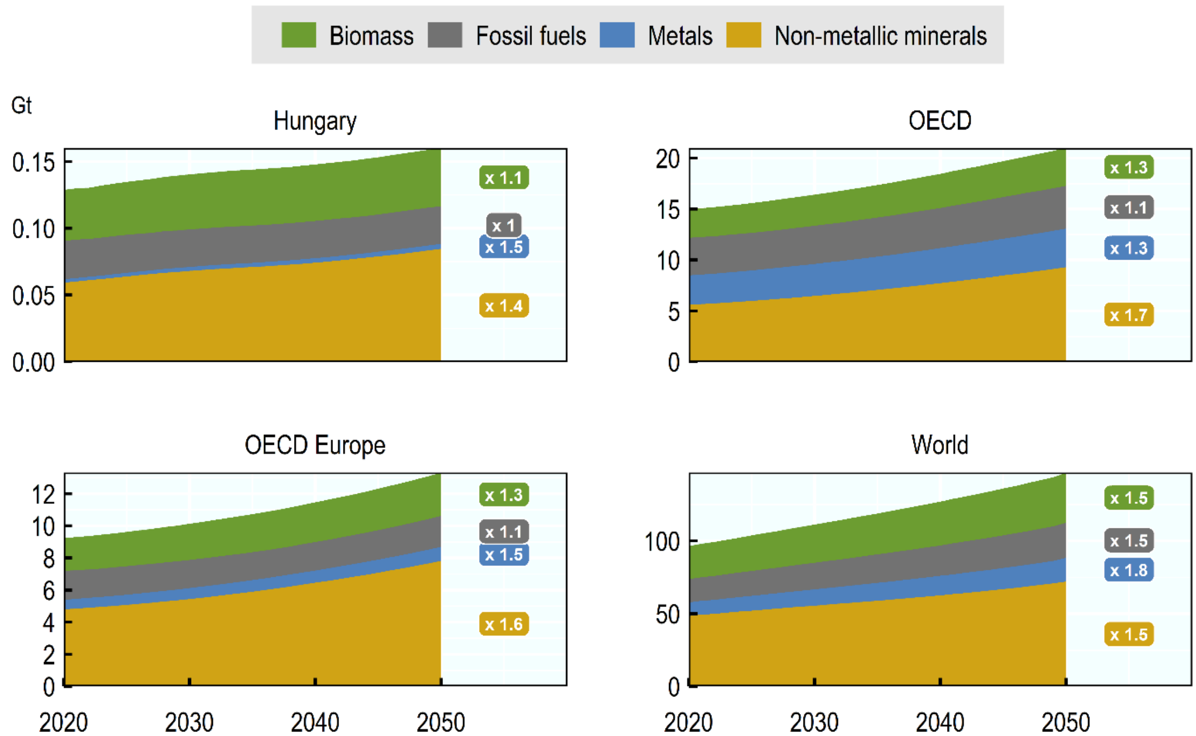
Source: OECD ENV-Linkages (Chateau, Dellink and Lanzi, 2014[51]).

StatLink https://stat.link/arzoh5

2.6.2. Projected increase in materials use and associated environmental impacts

Materials use in Hungary is expected to grow at a slower pace than in other OECD countries, however, growth rates differ across the different materials categories. The overall use of primary materials in the country is expected to increase by 25% (compared to 40% for OECD, as shown in Figure 2.6). Non-metallic minerals constitute the bulk of materials, with demand for construction minerals expected to double by 2050. Biomass is also an important materials category. However, its growth is slower than in the OECD Europe region. The moderate growth of fossil fuels in Hungary reflects a shift towards alternative energy sources. Although metals are the smallest category (when measured by weight), metal extraction and processing are associated with bigger environmental impacts.

Figure 2.6. Projected materials use growth for 2020-2050



Note: Regional averages, except for Hungary. Materials use varies widely across regions, therefore the scale is different across the four charts. The reported material uses include both domestic and imported materials.
Source: OECD ENV-Linkages (Chateau, Dellink and Lanzi, 2014[51]).

StatLink https://stat.link/x6m5wq

The continued increase in materials demand is expected to exert significant pressure on the environment, putting Hungary at risk of missing important environmental goals, and missing opportunities to strengthen the competitiveness and resilience of its economy. More specifically, the increased use of construction minerals (with the largest projected use by 2050), is likely to lead to high acidification and climate warming, placing an extra burden on cumulative energy demand (as total energy use increases along the production chain). Additionally, GHG emissions are expected to increase (mainly driven by emissions associated with construction and chemical sectors), whereas air pollutant emissions are declining across most categories (driven by improvements in energy efficiency in transportation and heating systems, among others) (refer to Annex Figure 2.A.20). Although Hungary is performing better than OECD Europe, and the country is projected to experience a relative decoupling of its GHG emissions from its economic output (as shown in Annex Figure 2.A.21), its progress is still far from Hungary's 2050 carbon neutrality goal.

Additional policies are needed to achieve stronger decoupling of materials use and GHG emissions from economic growth. The NCES could help focus policies on the most materials intensive sectors, in particular, construction,[11] food and agriculture. Given the present and future importance of metals, motor vehicles, electronics, other manufacturing sectors, and chemicals (including plastics), the NCES could also investigate the potential of circular economy opportunities in these sectors.[12] Moreover, horizontal policies directed towards greater technological (and structural) changes can speed up the circular economy transition. The NCES could focus on research and innovation policies, as well as policies directed towards greater use of circular business models (servitisation and digitalisation), shifting the economy away from materials intensive industries towards higher-end manufacturing and services.

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Annex 2.A. Supplementary information

Annex Box 2.A.1. The long-term implications of the COVID-19 pandemic and recovery measures on environmental pressure

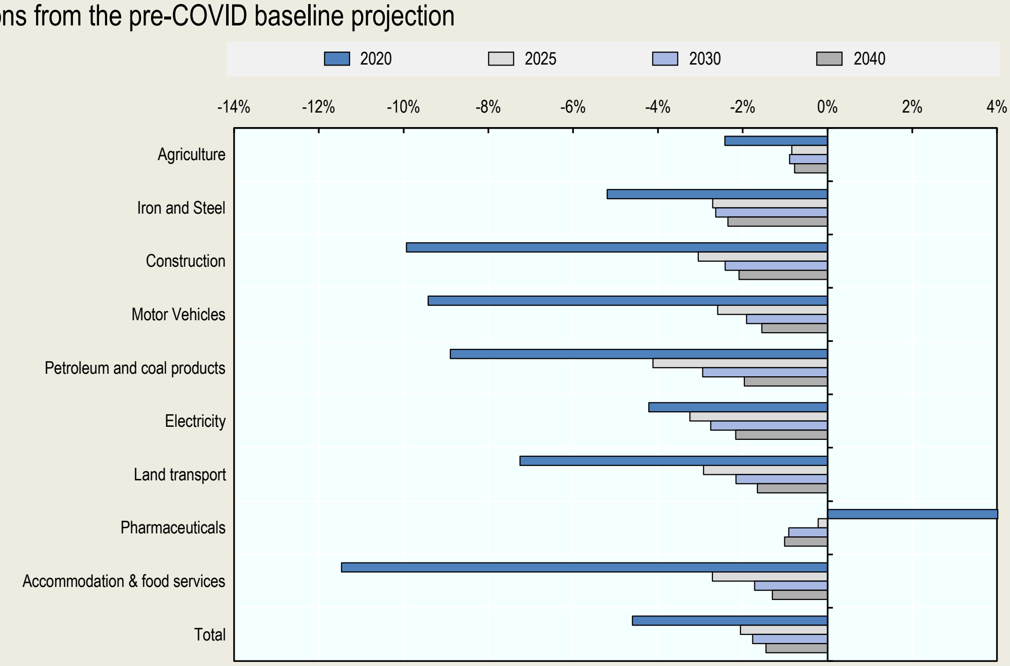
The COVID-19 pandemic and its associated restrictions, not least the lockdowns, have had severe economic consequences, leading to a significant decline in economic activity. Recovery will be a long-term process, and economic activity will likely be affected even after the health crisis is over. The effects of COVID-19 on economic growth will affect the pressure of economic activity on the environment.

The first numerical assessment of the effects of the pandemic on medium and long-term environmental pressure uses the large-scale modelling tool ENV-Linkages (Chateau, Dellink and Lanzi, 2014[51]) to investigate the impact of sectoral and regional shocks to the economy up to 2040.

The modelling analysis shows that there are significant differences in terms of economic impacts across regions, influenced to some extent by the severity of the pandemic in those regions and the strictness and duration of the lockdowns. Differences in the structure of these economies, as well as shifts in international trade patterns, were also observed. Sectoral differences are pronounced. For example, while transport activities and certain services were substantially affected in 2020, pharmaceutical companies are projected to boost production in the short term. After 2020, the low short-term economic growth and fall in investments began to negatively affect all sectors. In the longer term, the burden will shift towards the more capital-intensive industries due to a slower build-up of the capital stock, while services, especially agriculture, will rebound more quickly to pre-COVID baseline levels.

Annex Figure 2.A.1. Effects of the COVID-19 scenario on global output of selected sectors

Deviations from the pre-COVID baseline projection

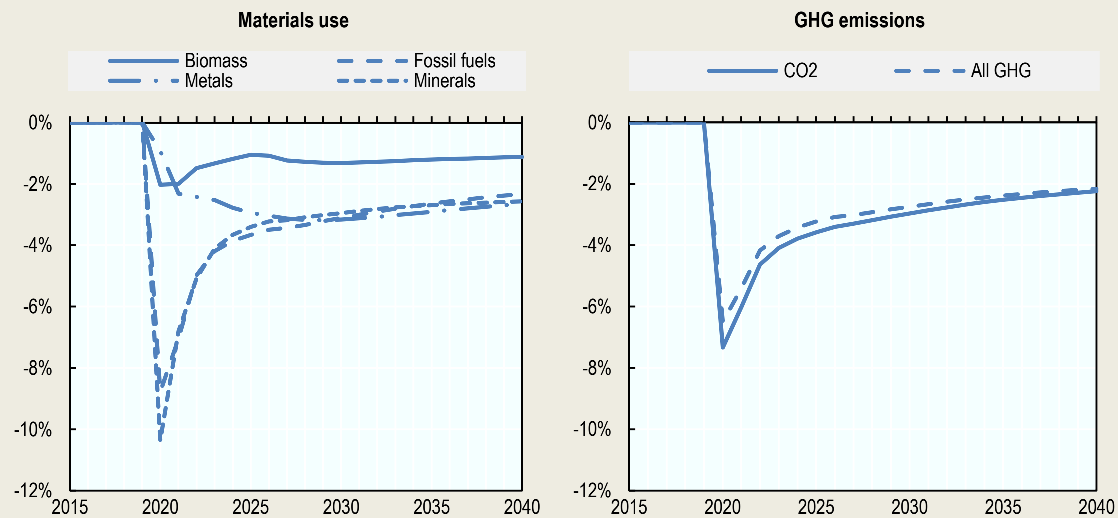


Source: ENV-Linkages model (Chateau, Dellink and Lanzi, 2014[51]).

The short-term easing of the environmental pressures caused by COVID-19 emergency response measures, like lockdowns and social distancing, are significant. Greenhouse gas (GHG) emissions, as well as emissions of some of the most important air pollutants, fell by around 7% below the pre-COVID baseline level in a single year. Other air pollutants, including those more strongly related to agriculture, followed a smaller decline in 2020. The fall in materials use varies with the type of material, for example, biotic resources declined by just 2%, whereas the reduction in the use of non-metallic minerals, including construction materials, is projected to reach 11%.

Annex Figure 2.A.2. Effects of the COVID-19 scenario on global environmental pressures

Deviations from the pre-COVID baseline projection



Source: ENV-Linkages model (Chateau, Dellink and Lanzi, 2014[51]).

GHG emissions were projected to increase again after 2020 as economic activity resumed and vaccines began to be deployed, gradually getting closer to pre-COVID baseline levels. However, there is a long-term (potentially permanent) downward impact on the levels of environmental pressure of 1-3%, depending on the indicator, and roughly 2% for emissions and materials use related to energy use and industry, and less than half of that for land use change, emissions and materials use that are more closely linked to agriculture. Growth rates do recover fully.

Source: Dellink et al. (2021[4]).

Annex Box 2.A.2. European circular economy legislation and related targets

The policy packages introduced by the EC have put forward a range of ambitious targets, as highlighted in Annex Table 2.A.1, as well as binding obligations for the Member States.

Annex Table 2.A.1. Key EU circular economy related targets

Target	Timeframe	Legislation
The preparation of municipal waste for reuse and recycling shall be increased by weight to a minimum of 55% (by 2025), 60% (by 2030) and 65% (by 2035)	By 2025, 2030, 2035	Waste Framework Directive
Separate collection of textiles and hazardous waste generated by households	By 01/01/2025	Waste Framework Directive
Separate collection or recycling at source of bio-waste	By 31/12/2023	Waste Framework Directive
A binding landfill target to reduce landfill to a maximum of 10% of municipal waste.	By 2035	Landfill Directive
Restrictions on landfilling of all waste (or other materials) that is suitable for recycling or energy recovery	From 2030	Landfill Directive
A common EU target for recycling a minimum of 65% by weight of all packaging waste (70% by 2030)	By 31/12/2025 (31/12/2030)	Packaging and Packaging Waste Directive
Minimum recycling targets for specific packaging materials: paper and cardboard to 75% (85% by 2030); ferrous metals to 70% (80% by 2030); aluminium to 50% (60% by 2030); Glass to70% (75% by 2030); plastic to 50% (55% by 2030); wood to 25% (30% by 2030)	By 2025 (By 2030)	Packaging and Packaging Waste Directive
A 77% separate collection target for plastic bottles (90% by 2029)	By 2029	Single-Use Plastics Directive
Incorporate 25% of recycled plastic in the manufacture of PET bottles from 2025 and 30% in all plastic bottles as from 2030	By 2025 By 2030	Single-Use Plastics Directive
At least 55% reduction in GHG emissions (from 1990 levels)	By 2030	Proposal for a European Climate Law
At least 32.5% improvement in energy efficiency (compared to projections of the expected energy use in 2030)	By 2030	Energy Efficiency Directive
At least 32% of total energy needs covered by renewable energy	By 2030	Renewable Energy Directive

Note: Only targets beyond 2020 were included. The table does not include a comprehensive list of sectoral climate and energy targets.

Revised EU waste legislative framework

- Six EU waste directives were amended within the context of the 2015 Circular Economy Package: i) Directive (EU) 2018/851 amending Directive 2008/98/EC on waste; ii) Directive (EU) 2018/850 amending Directive 1999/31/EC on the landfill of waste; iii) Directive (EU) 2018/852 amending Directive 94/62/EC on packaging and packaging waste; iv) Directive (EU) 2018/849 amending Directives 2000/53/EC on end-of-life vehicles (ELV); v) Directive 2006/66/EC on batteries and accumulators and waste batteries and accumulators; and vi) Directive 2012/19/EU on waste electrical and electronic equipment (WEEE).

Revised EU eco-design requirements, sustainable products and product labelling

- The Ecodesign Framework Directive (Directive 2009/125/EC) is implemented through product-specific regulations. In 2019, 10 eco-design implementing regulations were adopted by the European Commission (8 revisions and 2 new product group introductions). These regulations set energy efficiency (EE) and other product design requirements, including aspects on reparability, recyclability and durability.

- The Sustainable Products Initiative (SPI) will revise and widen the scope of the Ecodesign Framework Directive beyond energy-related products so as to make them fit for climate neutral, resource efficient and circular economy objectives. The initiative will also tackle the presence of harmful chemicals in electronics and ICT equipment, textiles, furniture, steel, cement and chemicals. It may also establish product sustainability principles and other ways to regulate sustainability-related aspects in a wide range of products.
- The revised Energy Labelling Regulation (EU) 2017/1369 updates the energy efficiency labelling requirements for products to allow consumers to distinguish between energy efficient products.
- The EU Ecolabel Regulation (EC No 66/2010) sets a voluntary environmental labelling scheme.

EU plastics legislation

- The Single-use Plastics Directive (EU) 2019/904 aims to reduce certain plastic waste streams, such as marine plastic litter. It covers single-use plastic (SUP) items, products made from oxo-degradable plastic and fishing gear-containing plastic.

EU climate and energy legislation

- The EU energy and climate legislation was also revised in 2018. The European Climate Law Regulation (EU) 2021/1119 establishes the framework for achieving climate neutrality. All relevant legislation is expected to be updated with a view to implementing the newly proposed 2030 GHG emissions reduction target and help the EU reach the proposed legally binding target of net zero GHG emissions by 2050.

EU chemicals policies

- One of the most important pieces of legislation in this area is the REACH Regulation (EC) 1907/2006, which aims to protect human health and environment by obliging companies to identify and manage risks related to the chemical substances they produce and sell.

Revised European Fertilising Product Regulation

- The EU Fertilising Products Regulation (EU) 2019/1009 introduces harmonised rules for organic fertilisers manufactured from secondary raw materials, such as agricultural by-products and recovered bio-waste.

Annex Box 2.A.3. Key insights for developing the circular economy strategy in Hungary

From the review of international literature and the analysis of circular economy strategies in Europe, the following lessons can be drawn from the different experiences of countries developing circular economy strategies and roadmaps.

- **A circular economy strategy is a flagship document** that contains the following elements: an inspiring vision and strategic goals, links to critical stakeholders and related policy areas, selected priority areas, quantitative targets and monitoring, as well as a high level implementation plan.
- **A clear vision inspires and makes the ambitions more concrete.** Most countries have presented highly ambitious visions for systemic change that aim to concretise what is meant by a circular transition. Some have opted for an explicit vision statement, while others have been more implicit about the future. Furthermore, the level of ambition of the visions varies, ranging from the most ambitious countries, aiming to become regional or even global leaders in the circular economy, to the less ambitious ones targeting the creation of future-proof sustainable economies and stimulating innovation.
- **The strategy should be tailored to the local context and be embedded in the domestic policy landscape.** Countries reference the links to specific policies and strategies, notably: overarching country development strategies, sectoral strategies, environmental policies and programmes, waste management and raw materials policies and plans, as well as broader enabling policies. Concerning the EU-level regulation, Member States refer to both the circular economy related guidelines (e.g. the EU Circular Economy Action Plan and the EU Circular Economy Package) and the broader environmental regulations (e.g. European waste directives, Industrial Emissions Directive, Ecodesign Directive).
- **Shared ownership across stakeholder groups and government actors is crucial in the process of developing and implementing the roadmap.** The most inclusive strategies incorporate stakeholder consultation, balanced partnerships, inter-ministerial coordination and cross-sectoral cooperation during both development and implementation phases. Stakeholders are involved through public consultations, individual meetings and topical workshops. The strategy development is governed by one or more ministries, and steered by a diverse working group. The implementation is then carried out by stakeholders from priority areas, with a central coordination body typically monitoring the overall implementation.
- **To narrow down the scope and elaborate flagship actions, a selection of priority areas is needed.** Member States tend to select a wide variety of priority areas depending on the local priorities. The priority areas can relate to manufacturing sectors/industries, service sectors, material streams or horizontal tools (see Annex Table 2.A.2). Waste management has a specific role because it can be considered as a service sector but also as a horizontal tool that is essential for every closed materials loop. All strategies include the waste management sector in one way or the other. The approach to select the priorities varies but, typically, economic data, material-related data, stakeholder concerns and political priorities are all taken into account. Typically three to six priority areas are selected.
- **Quantitative targets make the vision more actionable and induce stronger commitments for implementation**. Countries use one or more high level targets as a beacon to focus efforts. In addition to the national level of implementation, countries can also formulate targets for priority sectors or areas. Most quantitative targets build on existing targets from related national and European strategy documents or monitoring frameworks. Their level of ambition varies, ranging from those in compliance with existing targets and obligations to those going beyond

them. In practice, most quantitative targets are related to the environment, more specifically, to resource productivity, reduction in the use of primary raw materials, waste reduction, and recycling. Social and economic quantitative targets are rare and limited to the number of additional jobs to be created or, exceptionally, to circular business models.

- **The strategy needs to be underpinned by an implementation plan that transforms the high-level principles of the strategy into actions.** The implementation plan can be a stand-alone document or it can be integrated in the strategy as a chapter or annex. It should list high-impact actions, allocate responsibilities, develop a timeline, describe the governance structure to coordinate the actions, and foresee a monitoring system for the key indicators. Countries typically put forward a mix of policy instruments including: economic instruments, regulatory instruments and other instruments, for instance, voluntary environmental labelling, voluntary product stewardship or green deal initiatives, education and research, to name a few. The flagship actions, the responsibilities and the timeline around communication can be fully integrated into the implementation plan or can be grouped together in a stand-alone communication plan. Overall, most implementation plans include both cross-sector actions and sector-specific actions, but the sector-specific actions are often more concrete.
- **Local strategies at the municipal, provincial or regional level can support national objectives.** Local authorities have a range of policy instruments that can be used to enhance the transition. These relate to spatial planning, permit requirements for activities and obligations for new construction projects, facilities for material-related start-ups, and waste management. The city-level strategies focus on implementing the national goals by leveraging local authorities. Moreover, they aim to create a dynamic vibe that makes the city a driver for circular economy innovation and an attractive place to live.

Annex Table 2.A.2. Priority areas

Materials	Manufacturing sector	Service sector	Horizontal tools
Biomass and food	Automotive	Circular business models	Digital tools
Building materials	Chemicals	Financial sector	Economic instruments
Glass	Construction	Logistics	Education
Metals	Electronics	Retail	Local authorities
Paper	Packaging	Tourism & hospitality	Public procurement
Plastics	Textiles	Waste management	Research
Other materials, sectors and tools			

Annex Box 2.A.4. Recent trends and economic implications: COVID-19

The COVID-19 pandemic has led to closures in manufacturing and services, and has disrupted international trade, causing considerable economic damage. Hungary swiftly acted on the first wave of the pandemic, but a resurgence of cases was experienced in September 2020. Overall, the economy contracted by 4.8% in 2020, and unemployment increased to 4.1% from its record low of 3.4% in 2019.

The automotive sector, which accounts for nearly one-third of manufacturing output, was hard hit by the double whammy of disrupted international supply chains and a collapse in demand. International supply chains could be particularly difficult to fully restore, leaving the economy with underutilised resources (OECD, 2020[52]). Export volumes decreased by 13.7% and import volumes decreased by 9.7%. In the services sector, tourism and its supporting sectors were particularly affected. The cushioning effect of a fiscal stimulus package (Economy Protection Fund) of 7.9% of GDP provided relief to workers and businesses with wage support and cuts to social security contributions.

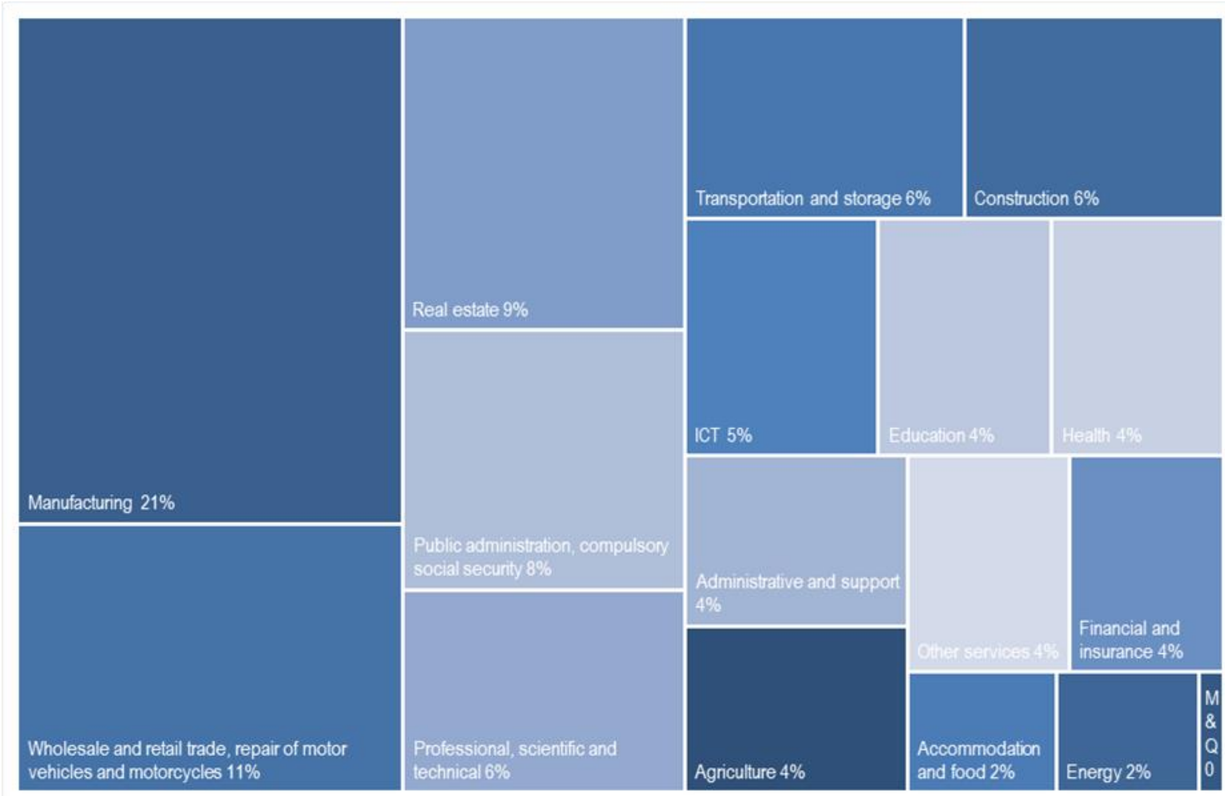
Global economic growth was estimated at 5.6% in 2021. In Hungary, real GDP growth was estimated at 6.9% in 2021 and was projected at 5% for 2022. Downside risks to a robust recovery included prolonged restrictions, subsequent waves and variants of the virus, as well as a slow rollout of vaccines.

The sudden changes in public finances and thus public debt are a global phenomenon in the COVID-19 crisis, and Hungary faces similar pressures. The economic shock has also led to dramatic increases in funding needs across the OECD area. Some of the fiscal interventions were of a short-term nature, while others may need to be medium to longer term. The gross borrowing needs of the OECD member countries increased by 30% compared to pre-COVID estimates in 2020, increasing the OECD countries' debt stock from USD 49.1 trillion to USD 52.7 trillion (OECD, 2020[53]). Due to contraction in economies and an increase in outstanding debt, central government debt-to-GDP ratio may increase to 86.2% (OECD, 2020[53]). Thus, there is a global trend of increasing government debt, with implications for fiscal policy in the short and long term.

Government attention to the more immediate needs to alleviate the economic damage of the COVID-19 pandemic might crowd out some of the initiatives and funds that could otherwise be directed towards the transition to a circular economy. However, there are opportunities to "greening" the recovery by devising appropriate instruments, and by doing no harm, i.e. avoiding environmentally damaging policies, shovel-ready projects or roll-back of existing environmental regulations (Agrawala, Dussaux and Monti, 2020[54]). EU funding, specifically earmarked to tackle environmental issues, could therefore be an important avenue. The NextGenerationEU is one of the largest recovery instruments of the European Union. One of the key constituent parts of this instrument is the Recovery and Resilience Facility (RRF), which makes available loans and grants totalling EUR 673 billion. The RRF aims to green the recovery and allow for a digital transition by requiring that each recovery plan dedicate at least 40% on climate and 20% on digital actions. Hungary has also submitted a Recovery and Resilience Plan (RRP) in 2021, which lays emphasis on green recovery measures, including on the circular economy (Government of Hungary, 2021[55]). The broad circular economy-related measures included in the plan concern regulatory change for a transition to a circular economy, the development of waste management infrastructure (EUR 335 million), and the development of intelligent, innovative and sustainable industry and secondary materials markets (EUR 240 million).[1]

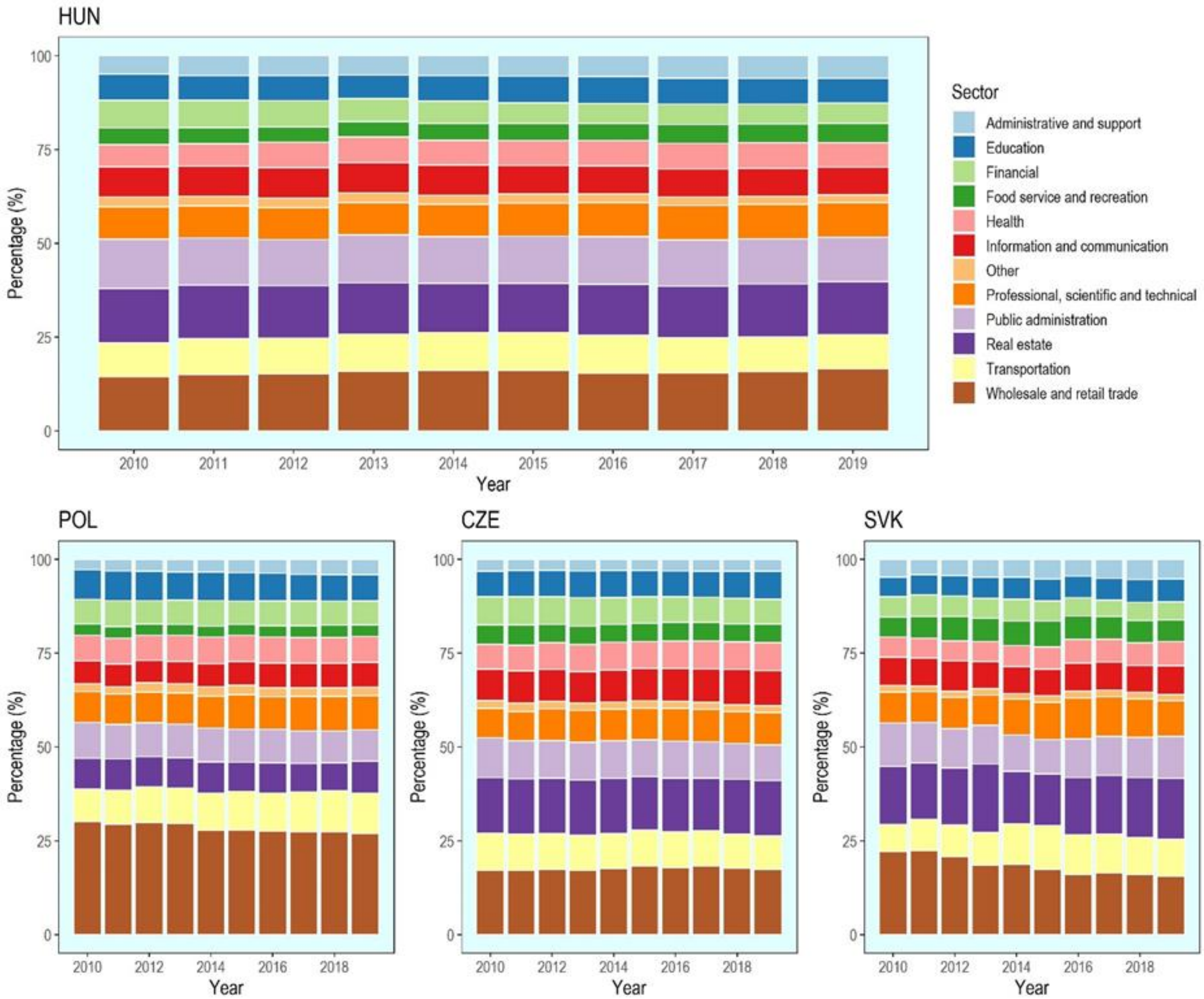
1. Using an average conversion rate of HUF 358 to EUR 1 in 2021 reported by the Hungarian National Bank.

Annex Figure 2.A.3. Gross value added of sectors in Hungary (2019)



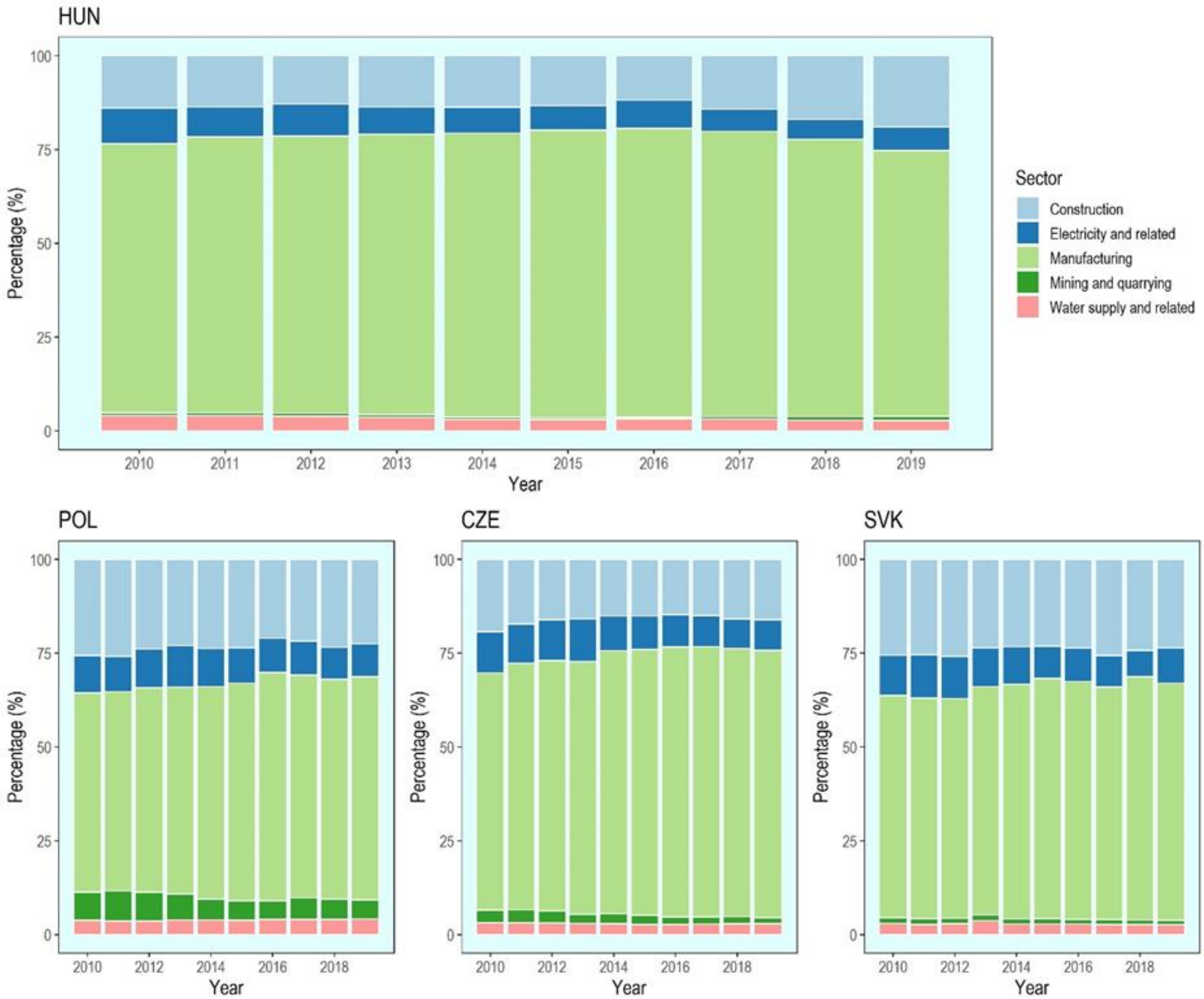
Note: Other services include: Arts, entertainment and recreation, Other service activities, Water and waste management. M&Q refers to Mining and quarrying (0.3%).
Source: Adapted from OECD (2020[31]).

Annex Figure 2.A.4. Services, Gross Value Added, Visegrad 4 (2010-2019)



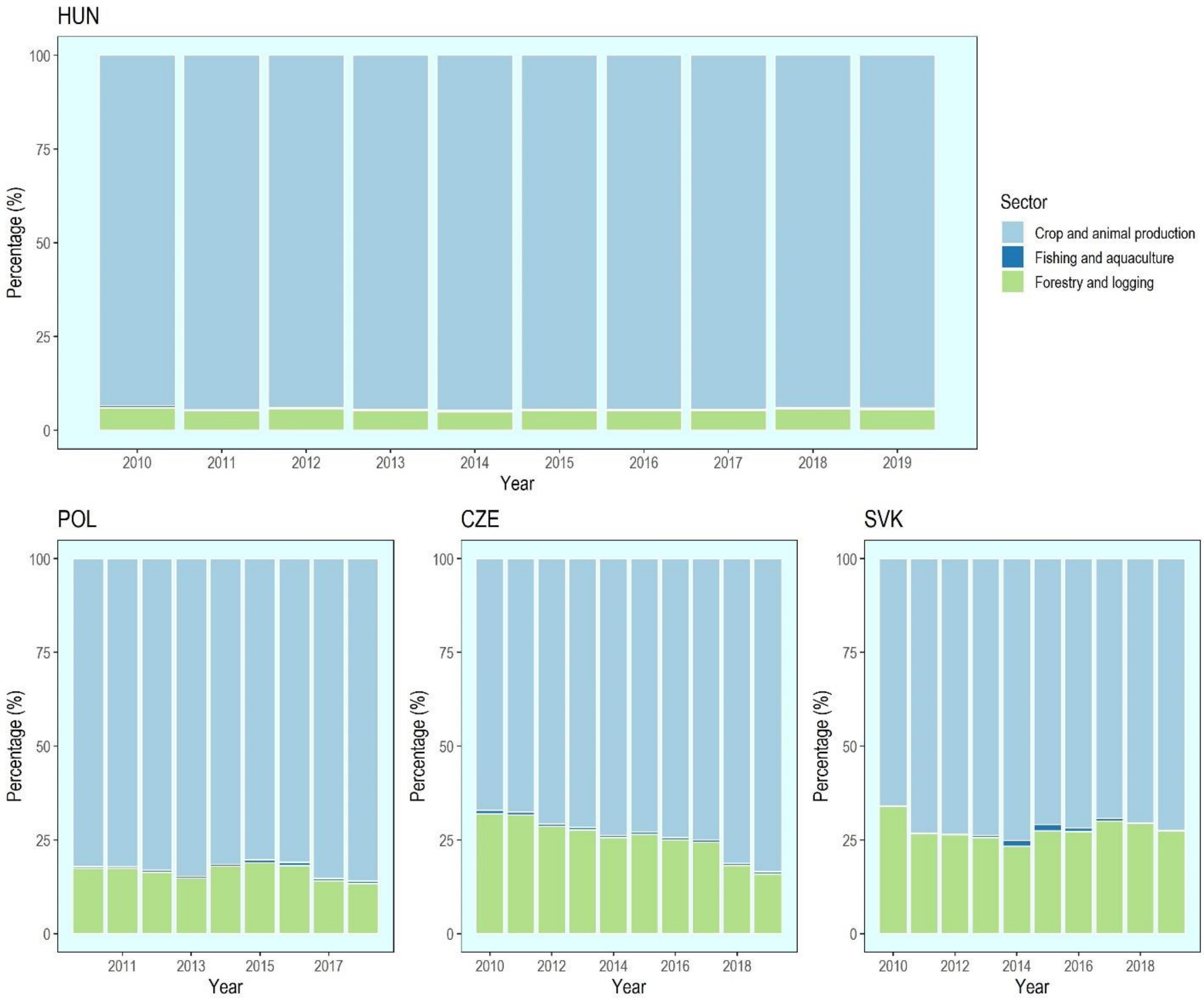
Note: Some of the International Standard Industrial Classification of All Economic Activities (ISIC) rev4 categories were grouped for easier visualization. Food service and recreation refers to ISIC Rev.4 categories "Accommodation and food service activities" and "Arts, entertainment and recreation". Other ISIC Rev.4 categories include "Other service activities", "Activities of households as employers, undifferentiated goods- and services-producing activities of households for own use" and "Activities of extraterritorial organizations and bodies". CZE refers to the Czech Republic, HUN refers to Hungary, POL refers to Poland, SVK refers to the Slovak Republic.
Source: Adapted from OECD (2020[31]).

Annex Figure 2.A.5. Industry, Gross Value Added, Visegrad 4 (2010-2019)



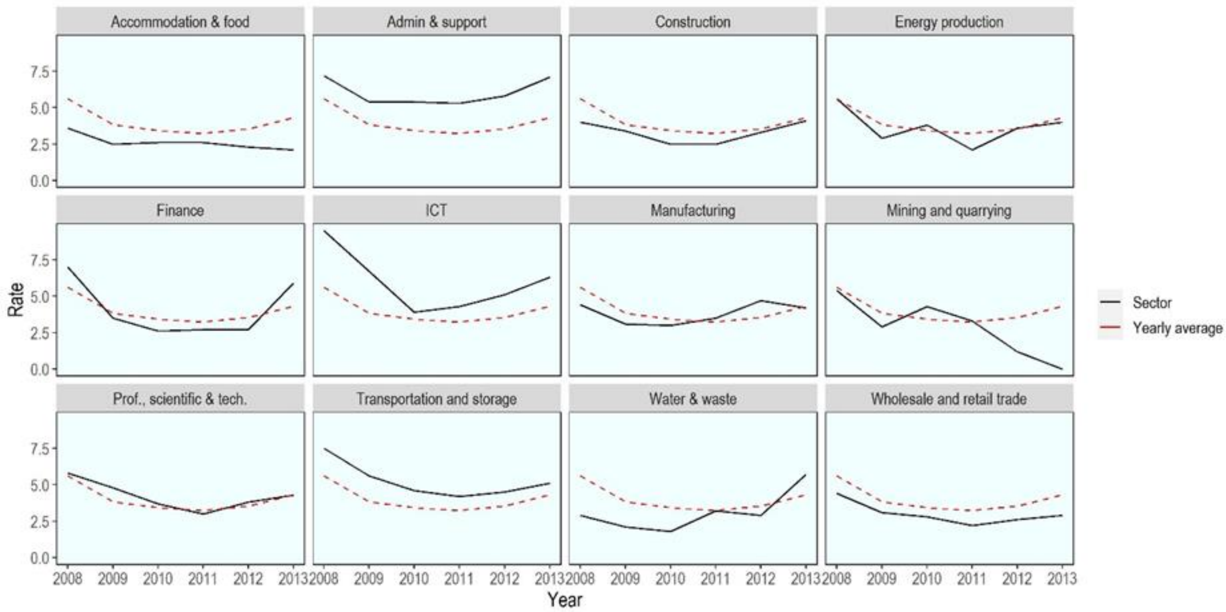
Note: CZE refers to the Czech Republic, HUN refers to Hungary, POL refers to Poland, SVK refers to the Slovak Republic.
Source: OECD (2020[31]).

Annex Figure 2.A.6. Agriculture, Gross Value Added, Visegrad 4 (2010-2019)



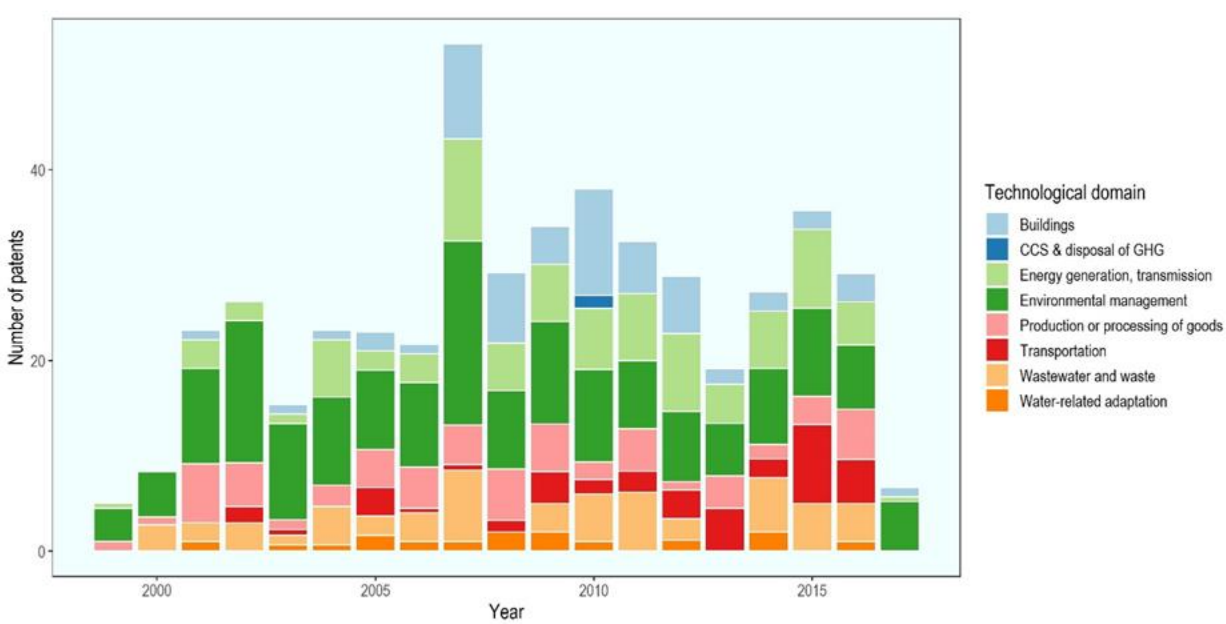
Note: "Crop and animal production" refers to ISIC Rev.4 category "Crop and animal production, hunting and related service activities". CZE refers to the Czech Republic, HUN refers to Hungary, POL refers to Poland, SVK refers to the Slovak Republic.
Source: OECD (2020[31]).

Annex Figure 2.A.7. High-growth enterprises



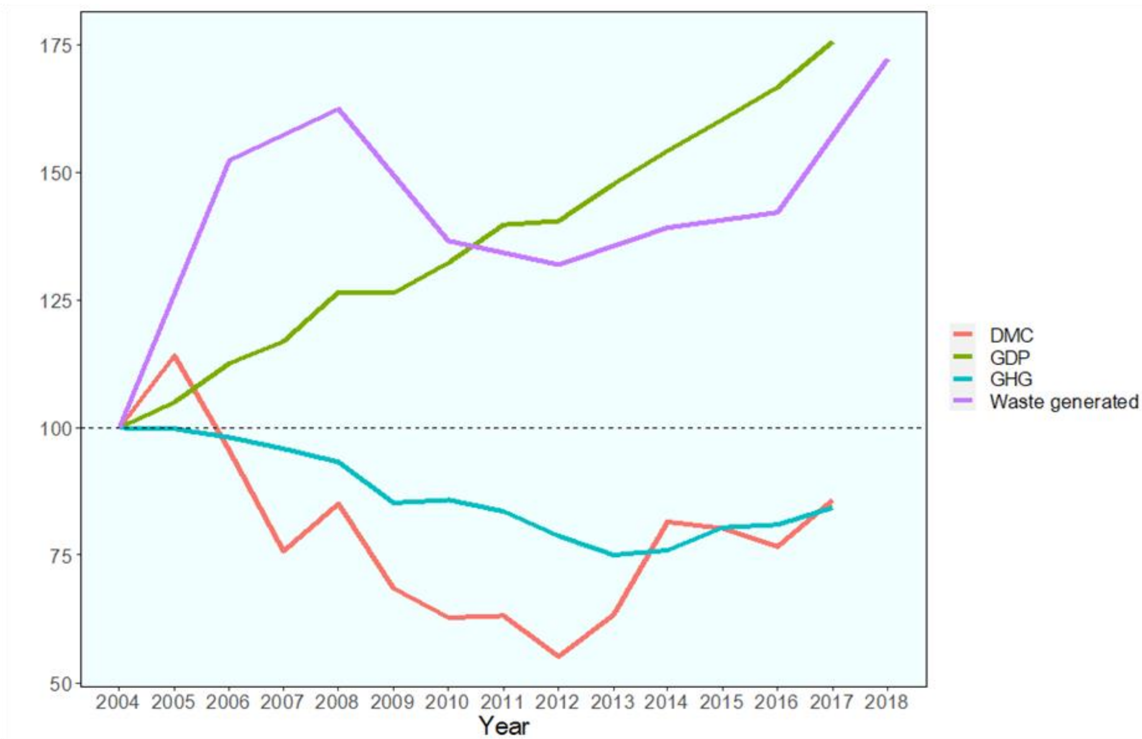
Note: The rate of high-growth enterprises (20% or higher growth based on employment) shows number of high-growth enterprises as a percentage of the population of active enterprises with at least 10 employees. "Yearly average" refers to the average rate of high-growth enterprises across all sectors.
Source: OECD (2021[56]).

Annex Figure 2.A.8. Patents related to environmental technologies



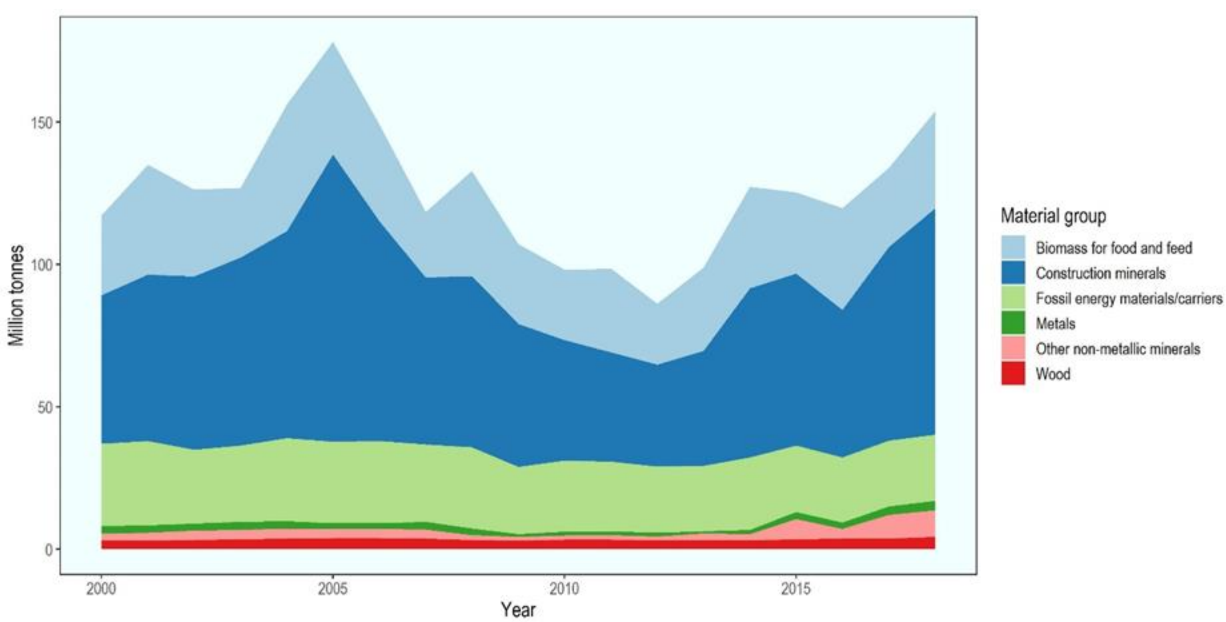
Note: Values refer to data from 1999 to 2017. Data from 2014 and onwards may be incomplete given the time lag between applications of patents submitted and accepted.
Source: OECD (2021[40]).

Annex Figure 2.A.9. Decoupling of material uses, energy uses and waste generation from economic growth



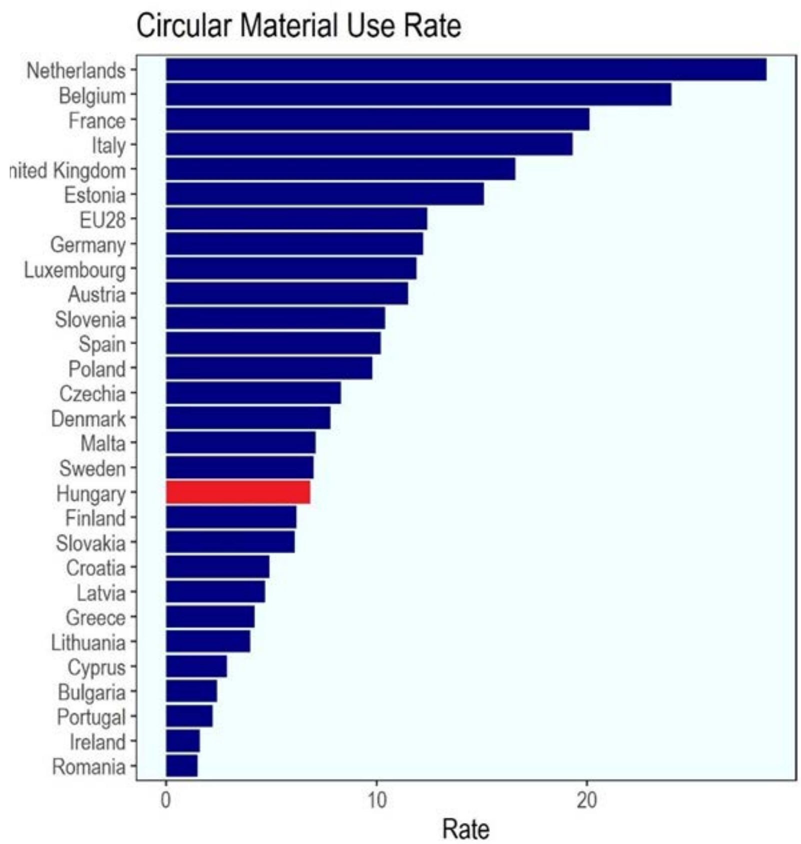
Note: Values for 2004 = 100.
Source: OECD (2020[46]; 2022[57]; 2020[58]) and Eurostat (2021[59]).

Annex Figure 2.A.10. Domestic material consumption



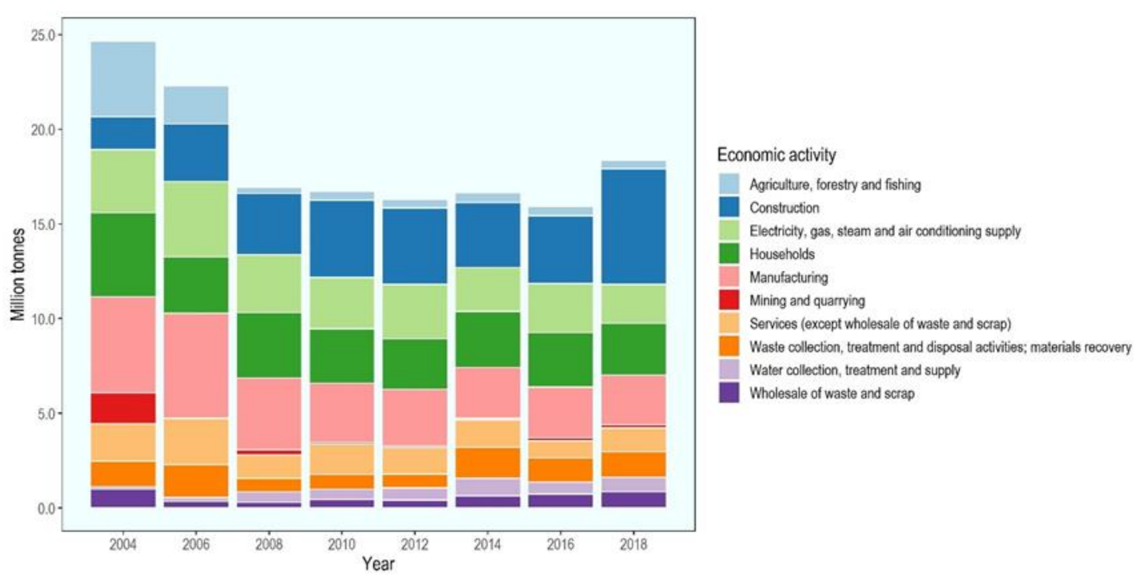
Note: Domestic material consumption (DMC) refers to the amount of materials directly used in an economy, reflecting the apparent consumption of materials.
Source: OECD (2020[46]).

Annex Figure 2.A.11. Circular material use rate



Note: Circular material use (CMU) rate is an indicator of the share of material resources used from recycled and recovered products.
Source: OECD (2020[46]).

Annex Figure 2.A.12. Waste generation by sector

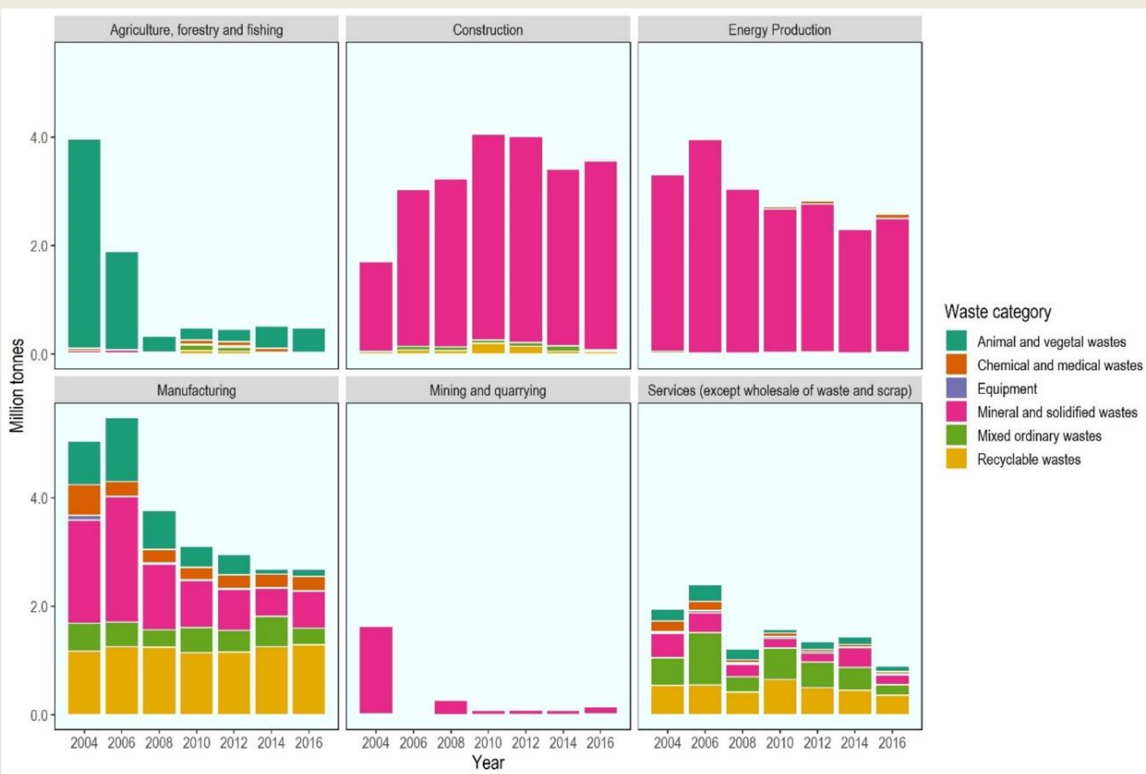


Note: Includes both hazardous and non-hazardous waste. “Water collection, treatment and supply” refers to “Water collection, treatment and supply, sewerage”, and “Remediation activities and other waste management services” in the NACE Rev. 2. classification of economic activities.
Source: Eurostat (2020[60]).

Annex Box 2.A.5. Waste generation by sector and by waste category

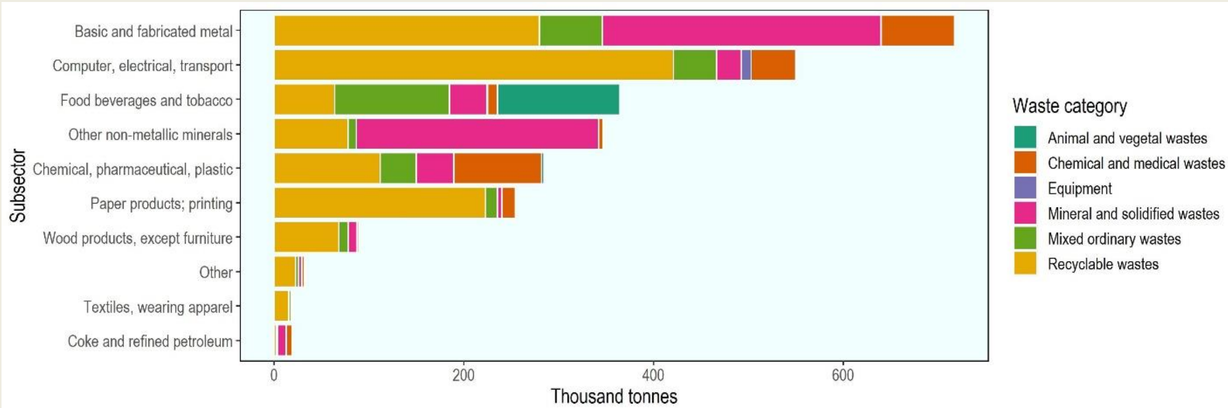
The nature of waste matters. Mineral and solidified wastes dominate the construction, energy and mining sectors. Recyclable wastes, as well as mixed ordinary wastes, are the most important waste categories in “Services”. They represent around 25-40% of Services-related waste. Within “Agriculture”, animal and vegetal wastes are the most significant waste category (as indicated in Annex Figure 2.A.13). Within "Manufacturing”, the composition of waste categories has been changing due to structural changes of the economy. The share of recyclable wastes has doubled, while mineral and solidified waste, as well as animal and vegetal wastes, have decreased in the span of ten years. The manufacturing of basic and fabricated metals, the manufacturing of computer and electrical equipment, and the manufacturing of food and beverages generate above average quantities of waste. Recyclable ferrous metal wastes dominate from the manufacture of transportation vehicles and electric equipment, and the manufacture of basic and fabricated metals (as indicated in Annex Figure 2.A.14).

Annex Figure 2.A.13. Waste generation by sector and by waste category



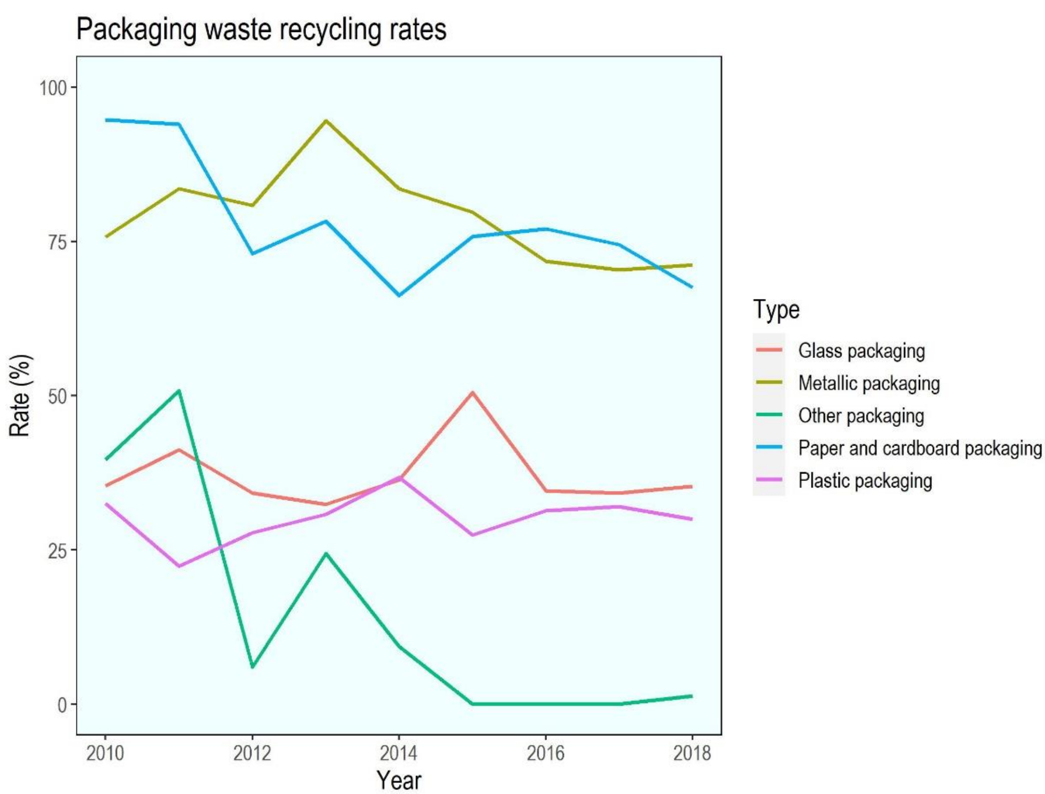
Note: Includes both hazardous and non-hazardous waste. “Water collection, treatment and supply” refers to “Water collection, treatment and supply, sewerage” and “Remediation activities and other waste management services” in the NACE Rev. 2. classification of economic activities.
Source: Eurostat (2020[60]).

Annex Figure 2.A.14. Waste generation by waste category and manufacturing subsectors



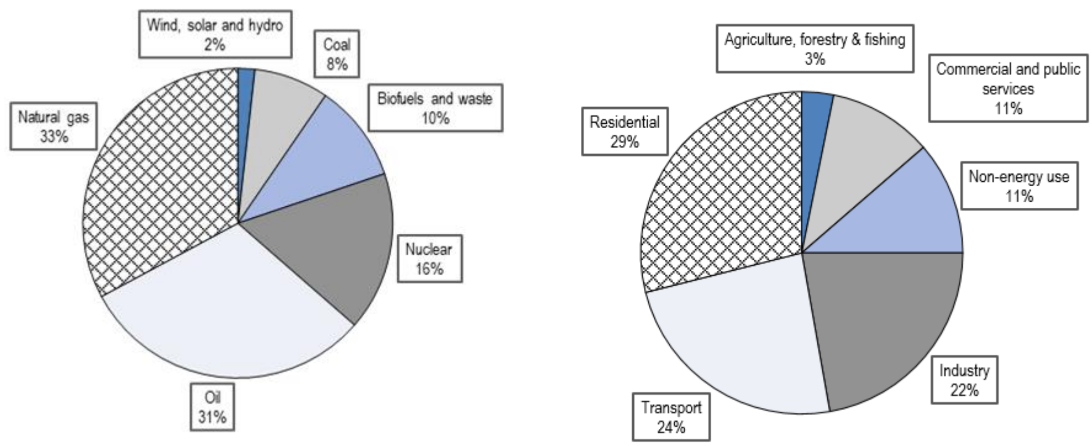
Note: Includes both hazardous and non-hazardous waste. Values refer to 2016 data.
Source: Eurostat (2020[60]).

Annex Figure 2.A.15. Recycling rates of packaging waste



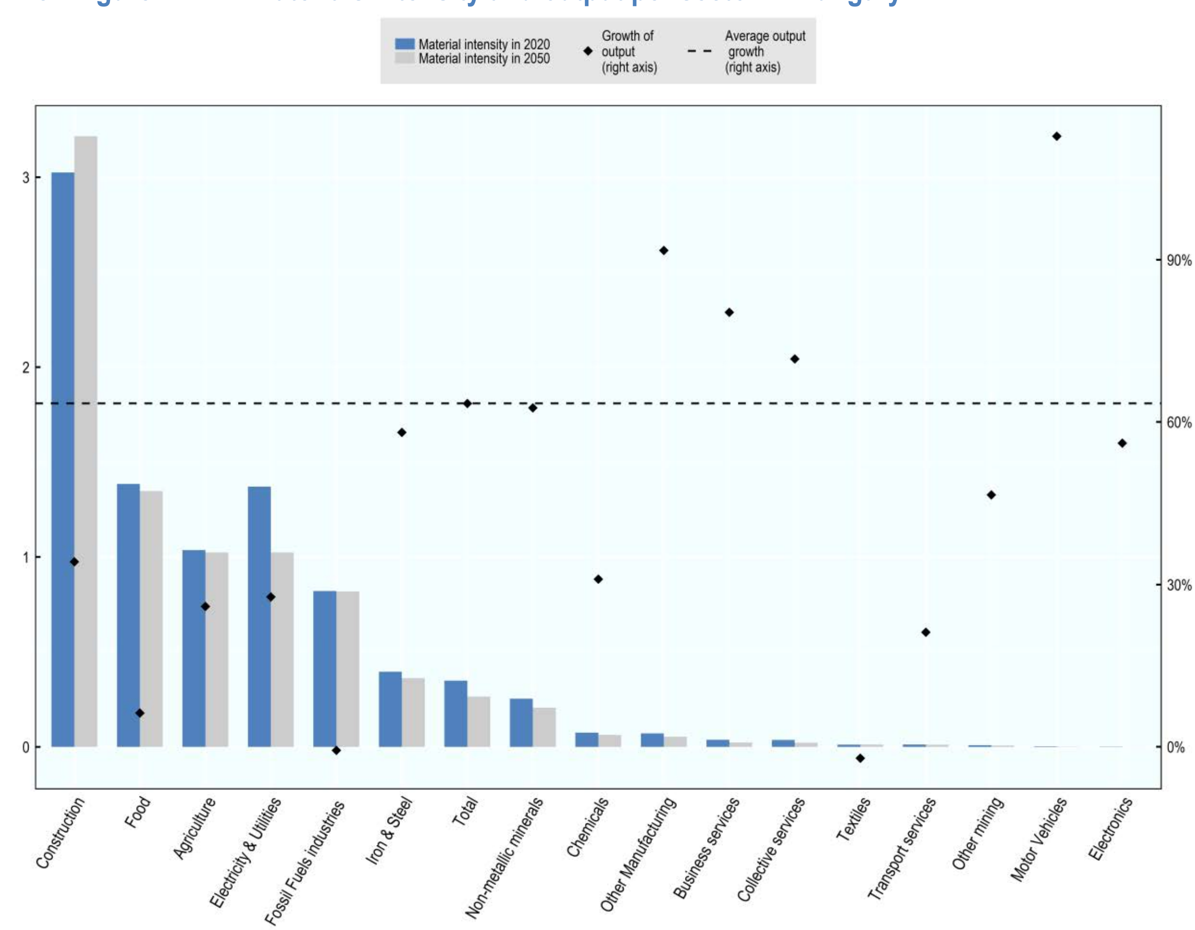
Note: Aluminium packaging and steel packaging rates are omitted due to missing data.
Source: Eurostat (2021[59]).

Annex Figure 2.A.16. Total energy supply by source and total final consumption by sector



Note: Values refer to 2019 data for total energy supply and 2018 data for total final consumption.
Source: IEA (2021[61]).

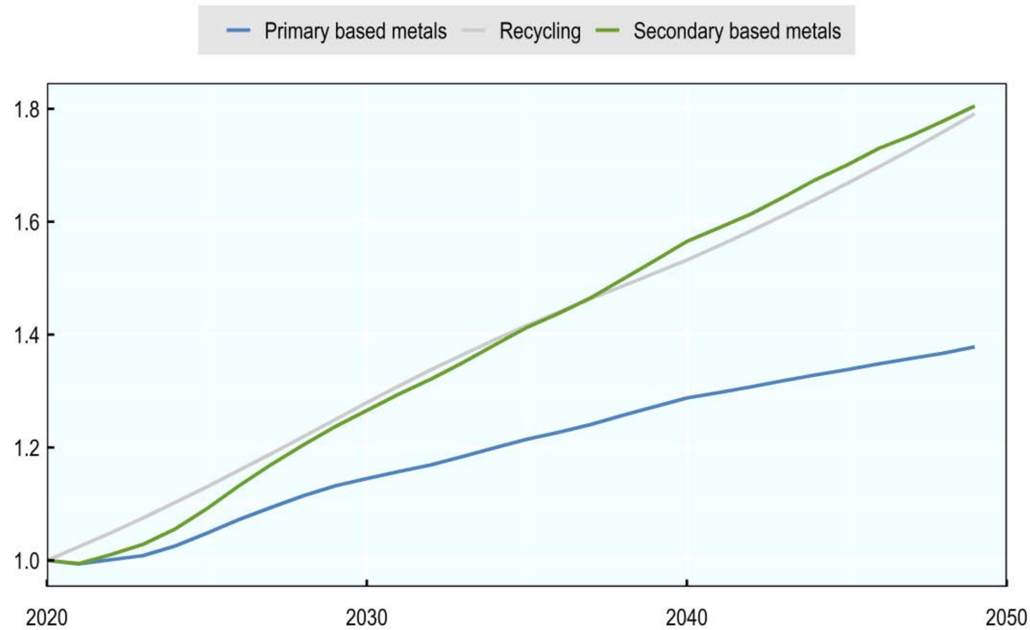
Annex Figure 2.A.17. Materials intensity and output per sector in Hungary



Note: Left axis: Materials intensity (tonnes/USD); Right axis: Gross output growth 2020-2050.
Source: OECD ENV-Linkages (Chateau, Dellink and Lanzi, 2014[51]).

StatLink https://stat.link/g2suz8

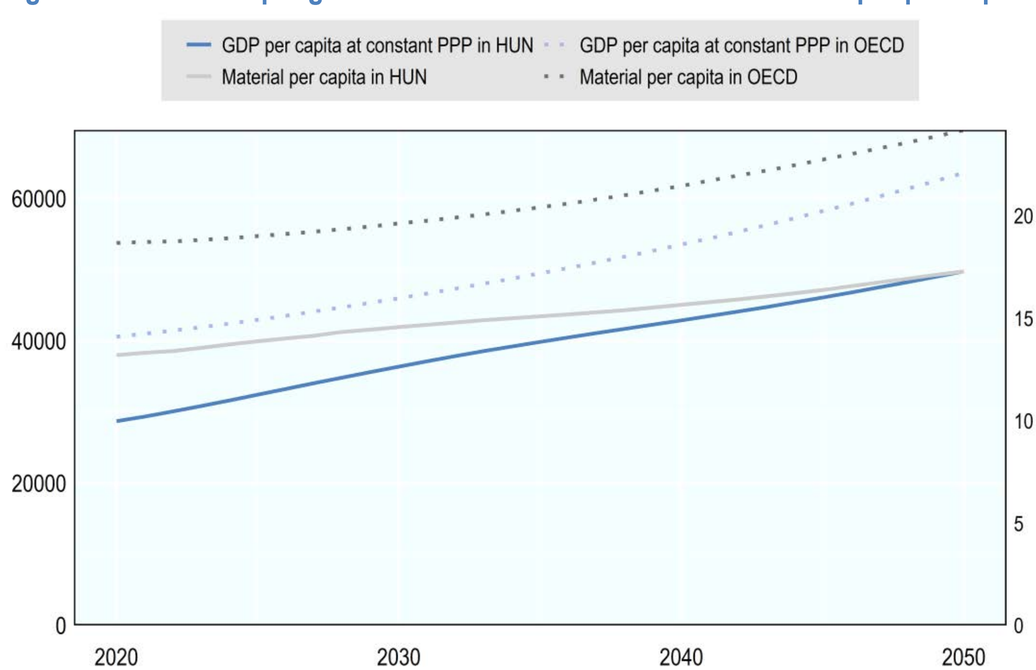
Annex Figure 2.A.18. Evolution of selected materials sectors in Hungary



Note: Index (1=2020).
Source: OECD ENV-Linkages (Chateau, Dellink and Lanzi, 2014[51]).

StatLink https://stat.link/q876bc

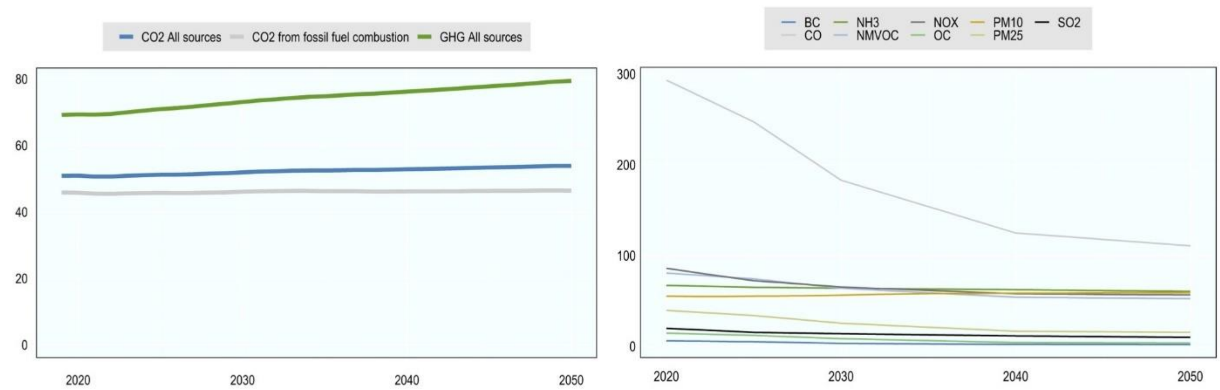
Annex Figure 2.A.19. Decoupling trends: Evolution of materials use and output per capita



Note: Left axis: GDP per capita at constant PPP (USD); Right axis: Materials use per capita (tonne/USD).
Source: OECD ENV-Linkages (Chateau, Dellink and Lanzi, 2014[51]).

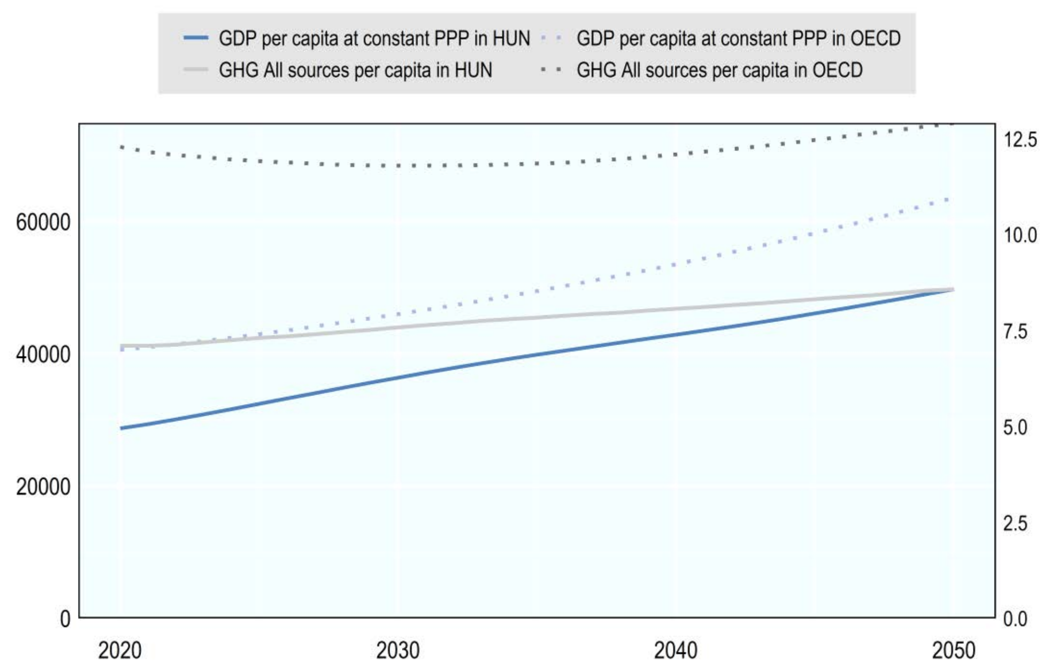
StatLink https://stat.link/dn7kty

Annex Figure 2.A.20. Total GHG emissions and air pollutants per category in Hungary



Note: GHG emissions in million tonnes, and emissions of substances to air in 1 000 tonnes. The categories "CO_2 All sources" and "GHG All sources" do not include CO_2 emissions from "Land Use and Land use Change and Forestry". BC = Black carbon, NH_3 = Ammonia, CO = Carbon monoxide, NMVOC = Non-methane volatile organic compound, OC = Oleoresin capsicum, $PM_{2.5}$ =atmospheric particulate matter (PM) that have a diameter of less than 2.5 micrometres, PM_{10}= atmospheric particulate matter (PM) that have a diameter of less than 10 micrometres, SO_2= Sulphur dioxide, NO_X = Nitrogen oxides.
Source: OECD ENV-Linkages (Chateau, Dellink and Lanzi, 2014[51]).

Annex Figure 2.A.21. Decoupling trends: Evolution of GHG emissions and output per capita



Note: Left axis: GDP per capita at constant PPP (USD); Right axis: GHG emissions per capita (Gt).
Source: OECD ENV-Linkages (Chateau, Dellink and Lanzi, 2014[51]).

StatLink https://stat.link/yrowsm

Notes

[1] Relative decoupling takes place when the value of economic output and the amount of materials are both rising, but with economic output rising faster than materials use. In contrast, with absolute decoupling the value of economic output is growing while the amount of resource inputs used is shrinking.

[2] The dominant sub-sectors include: “Wholesale and retail trade, repair of motor vehicles”, “Transportation and storage”, “Professional, technical and scientific activities” and “Administrative and support service activities” (refer to Annex Figure 2.A.3 and Annex Figure 2.A.4).

[3] The most sizeable sub-sectors include “Manufacturing of transport equipment”, “Computers, electric and electronic products”, “Manufacturing of rubber and plastics”, and “Basic metals” (refer to Annex Figure 2.A.3 and Annex Figure 2.A.5).

[4] Agriculture is dominated by crop and animal husbandry (refer to Annex Figure 2.A.3 and Annex Figure 2.A.6).

[5] Defined as the amount of economic value generated per unit of materials used, or gross domestic product per unit of domestic materials consumption (DMC).

[6] The DMC refers to the amount of materials directly used in an economy, reflecting the apparent consumption of materials.

[7] The CMU rate is an indicator of the share of material resources used from recycled and recovered products.

[8] The efforts required by Hungary to meet post-2020 municipal waste recycling targets are considered even greater (European Commission, 2019[44]).

[9] Hungary failed to meet the overall recycling objective for packaging waste during 2012-2014. This was mainly due to the low recycling rate for glass (OECD, 2018[32]).

[10] This projection does not take into account the economic impacts of the COVID-19 crisis. For a discussion on the implications of the COVID-19 pandemic and recovery measures on environmental pressure refer to Annex Box 2.A.4.

[11] However, policy action for construction materials requires a perspective beyond production, as growth in this sector coincides with advances in economic activity and is driven mainly by housing investments and public infrastructure.

[12] However, owing to global value chains, decisions taken in Hungary may be limited to production issues, while decisions on design and use of materials may be taken elsewhere, and independently of the policy context in Hungary.

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