



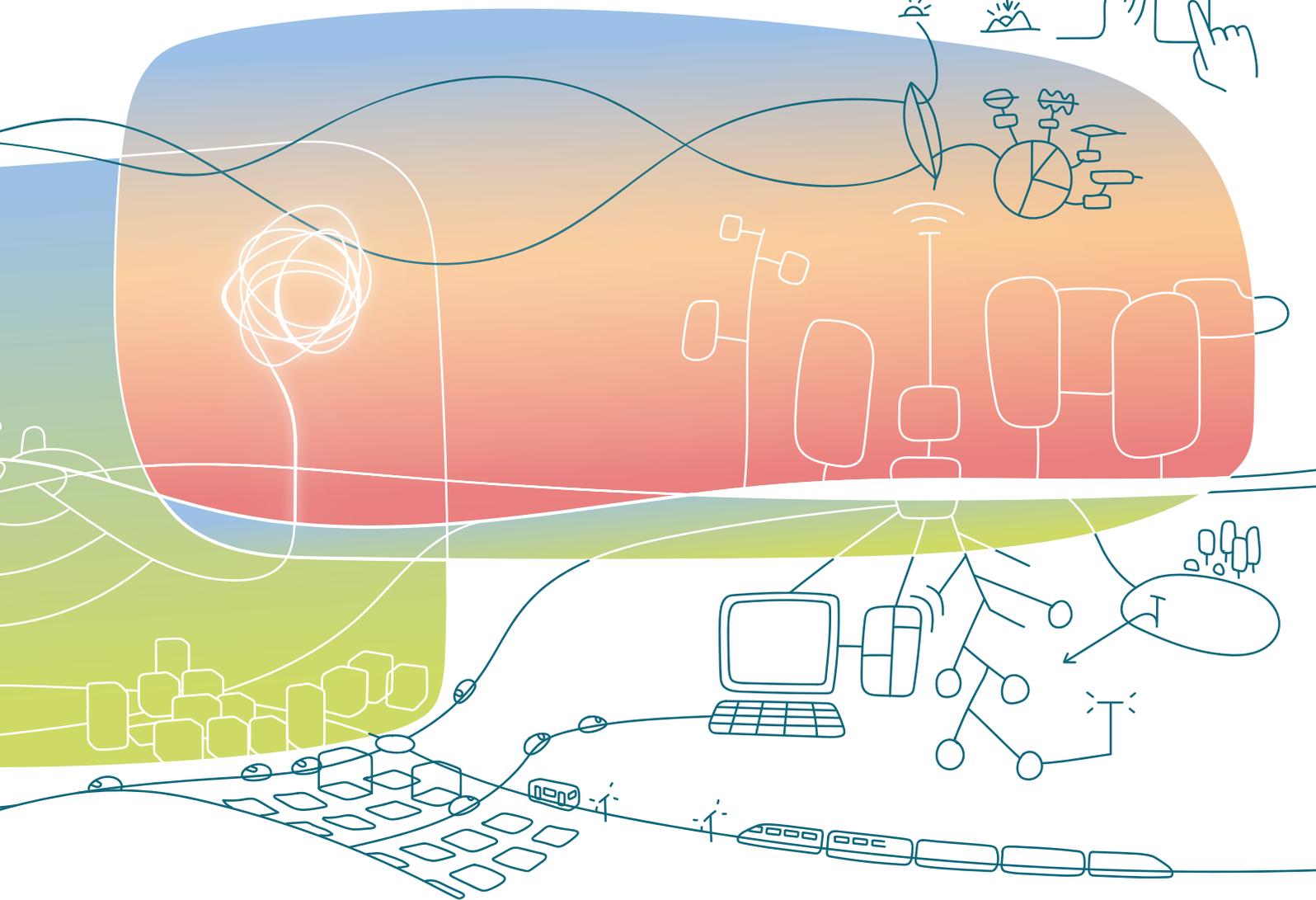
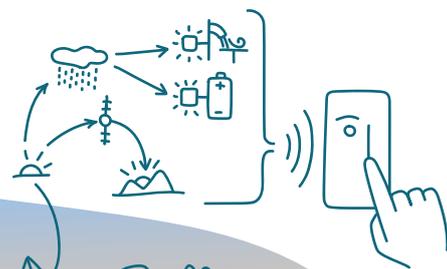
REPORT ON THE STATE OF THE GREEN ECONOMY EXECUTIVE SUMMARY

2021

Focus

Digitalization

for the Green Economy



FONDAZIONE
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REPORT ON THE STATE OF THE GREEN ECONOMY - 2021

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1. Focus: Digitalization for the Green Economy

The thematic focus of the 2021 Report on the State of the Green Economy analyzes the relationship between the green transition and the digital transition: the two pillars of the European Green Deal. Especially in the Italian debate, as compared to the European level, such pillars are presented and discussed as separated, particularly in the National Recovery and Resilience Plan, with little attention to their connections. This Focus section aims to overcome this relevant deficiency. Digitalization is essential to the development of a green economy in all its aspects: **a better and increased employment of digitalization is essential to implement the crucial changes needed for an ecological transition.**

We are well aware that the development of digitalization also implies a significant consumption of both energy and materials. According to the International Telecommunication Union – a UN Agency – the ICT ecosystem consumption, for the entire life cycle, could reach approximately 8% of worldwide electricity demand: an already significant amount that is still increasing. In order to avoid significant climate impacts from such energy consumption, it is essential to focus on measures aimed at increasing energy efficiency and to avoiding wastefulness, as well as to employ electricity from renewable sources. Nonetheless, the same study estimates **a potential reduction in emissions of approximately 12 GtCO₂ by 2030, accounting for 20% of emissions derived from ITC solutions, well above the emissions related to the electricity consumption of the sector**: the development of digitalization is thus a significant element to reach a climate neutral economy.

In 2020, the European Commission monitored the digitalization performances with a composite index considering the connectivity rate, the diffusion of use capacities, the use of Internet, the integrated employment of digital technologies for diverse jobs and the spread rate of digital public services. **Italy ranks below the average and among the bottom ranked countries, above Romania, Greece and Bulgaria.** The Italian delay in digitalization, as compared to the other major European countries, is a gap that needs to be overcome in order to implement the ecological transition, due to the high potentials in the transition to climate neutral energy, in developing circular economy, in sustainable urban mobility, in green cities, and in ecological agriculture.

In the **energy sector**, the digitalization allows to enhance predictive models of nonprogrammable renewable sources, to spread smart connections between supply and demand of energy, also aiming to promote prosumers, energy communities, and smart recharging systems for electric cars. Over the last few years, Italy has been making very significant progresses and has been recovering the huge gap with the other major EU countries. The digital transition allows to accelerate energy transition and Deep Energy Renovation processes towards smart and widespread systems aimed at reducing GHG emissions and to promote integrated designs capable to increase passive energy performances, to promote available energy sources, and to support the adoption of design methods based on “Simulation e Modelling”. The digitalization also contributes to monitor and maximize energy efficiency in plants as well as the shift towards energy-efficient appliances and equipment, to improve lighting systems efficiency, to develop home automation systems to monitor energy

consumption and to digitally interact with users, to adapt electric distribution infrastructures to the increasing electrification of households consumption, to reduce and manage energy demand with monitoring systems and easy-to-use user interfaces.

The implementation of digitalization is essential to **the development of a more circular economy**. The digitalization facilitates **eco-design**, as well as the development of blockchain technology, which allows a more secure data transmission and a more widespread knowledge dissemination, by using exchange platforms or measurement instruments such as Life Cycle Assessment databases. **In the production phase**, the digitalization allows to reduce waste, to increase efficiency in the use of materials, also thanks to continuous and remote systems for measuring output production. Information exchange platforms help in developing industrial symbiosis and, more broadly, the use of digital technologies allows to develop a traceability and mapping of resources, as well as a better planning of material flows, optimizing transport and stockpile management. **In the consumption phase**, the digitalization allows reliable labelling accessible by electronic means, digital products passports identifying proper employment of the product, the development of reuse systems and sharing economy platforms. Finally, **in the waste and recycling phase**, IT solutions can be very useful for proper waste disposal, management, traceability, reuse, and recycle.

The digital revolution can be considered **the third revolution in transport**, after trains and cars. In fact, new technologies allowed the success of innovative mobility services that are able to broaden the offer of transport modalities and to compete on some aspects typical of privately owned cars, such as on-demand use, door-to-door travel, the possibility to choose the most adequate option for each travel (e.g., a car, a scooter, a bike, a kick scooter). This is a revolution that can possibly weaken the primacy of individual mobility, based on cars, vis-à-vis mobility as a service. The development and widespread of digital technology represent a crucial innovation to increase intermodality and multimodality in transport systems, creating and multiplying new solutions able to bridge the gap in preferences between private motorized mobility and shared mobility.

The digitalization is **an essential element of green cities**. Smart grids help in managing energy consumption, smart meters and pipes help in monitoring water quality and to detect leakages, smart sensors improve traffic flow, solid urban waste collection routes, mobile Apps allow citizens to report issues in real time and to directly interact with municipal services, telemedicine improves the performances and reduces costs in the health system, car sharing platforms support a more sustainable mobility, early warning systems can improve readiness, response and recovery after extreme weather events.

The digitalization in the urban area is not limited to information and communication technologies, it also represents an opportunity for social innovation aimed at creating new forms of cooperation among citizens, improving the administrative efficiency and the transparency in choices by municipalities. In this regard, the technological innovation can also support an increase in the possibility for municipalities to involve stakeholders (companies, universities and research centers, associations, and citizens) in policy decisions and planning.

Lastly, the **digitalization in agriculture** is taking a leadership role in national and European policies. The new Common Agricultural Policy (CAP) and the Farm to Fork Strategy give digitalization an important role in order to increase the ecological sustainability of agriculture. Digital technologies can help agricultural entrepreneurs to provide safe, sustainable and quality food, with a proper mix of “doing more with less”, also contributing to a better and environmentally sound land management by optimizing resources management. Agriculture 4.0 represents the combination of

tools and strategies enabling farming companies to use advanced technologies in a synergic and interconnected approach, with the objective to make production more efficient and sustainable. In concrete terms, 4.0 solutions in agriculture include, for example, being able to precisely calculate the water need of each crop with no waste of water; or predicting the development of some plant diseases, or identifying in advance parasites that may attack crops, thus increasing the production efficiency. Despite the wide awareness of advantages, in Italy digitalization in agriculture is still struggling to establish itself. However, encouraging signs can be seen. After a very difficult start, compared to our European competitors, it is growing at a rapid pace in Italy as well.

2. The state of green economy in Italy during the pandemic

A single year of reduction is not enough: the climate crisis is still worsening

The pandemic is the reason for the **9.8% reduction in GHG emissions in 2020 in Italy**, as compared to 2019 (Institute for Environmental Protection and Research - ISPRA). The same reduction was recorded in Europe, on average. The main reduction in such emissions, -16.8%, was recorded in the transport sector, with a -12.6% in electricity generation. GHG emissions derived from industries decreased by about 10%, while those derived from buildings heating decreased by approximately 6%. However, early estimates for 2021 seem to report a substantial rebound in overall emissions: a +6%, in relation to a +5.2% in GDP, the highest increase ever recorded over the last 30 years. Already this year, Italy could nullify over half the 2020 emissions reduction, though remaining below 2019 emissions level. The overall reduction in 2020, as compared to 1990, accounts for 28.8% (19% + 9.8%). Should Italy adopt the new European target of 55% by 2030, emissions in Italy should be cut by 26.2% in the next ten years: the pace of the reduction should significantly increase from the **1% per year recorded on average over the last 30 years to a 2.6% per year over the next decade**. Notwithstanding the cut caused by the pandemic, we still need to accelerate our run.

GREENHOUSE
GAS EMISSIONS

The reduction in emissions caused by the pandemic was not sufficient to halt the increase in atmospheric GHG concentrations, either: the climate crisis worsened. Italy's trend in average temperature increase is more than double the global trend: approximately 1.7 °C, as compared to the early '80, and a +0.7 % world average. **Italy, with the other Mediterranean countries, is one of most vulnerable to the effects of the climate crisis**. In 2020, 1,300 extreme events related to climate change were recorded in Italy.

Worries increase for the ongoing standstill

According to early estimations by GSE (Gestore dei Servizi Energetici), in Italy the 2020 consumption from renewable sources of energy accounted for 21.5 Mtoe (Megatons of oil equivalent), **about 0.4 Mtoe less than the previous year**: 2020 thus confirms the low increase of renewables recorded over the last decade. In 2020, due to the significant reduction in the final energy gross consumption (-13 Mtoe), the final gross consumption covered by renewable sources increased and reached 20% for the first time (18.2% in 2019). Also in 2020, **thermal renewables accounted for 10.1 Mtoe**, little below the 2008 level, covering a little less than 20% of heating demand. **Renewables in transport**, according to early GSE estimations, stand at 1.3 Mtoe in 2020, the same level of 2019, and even lower than the 2012 level. 2020 was an especially important year for Italian **renewable electric sources**, which covered 42% of the national electricity production.

RENEWABLE
ENERGY

In particular, according to Terna, the production of electricity from renewable sources increased by about 1 bln kilowatt hour (1 TWh) as compared to the previous year, due in particular to a significant increase of photovoltaics (+9.6%, +2.2 TWh) and a smaller increase in hydroelectric power (+0.8%, +0.4 TWh), while wind power saw a significant contraction (-7.6%, -1.5 TWh). The remarkable percentage increase is also due to the contraction of electricity demand, decreased by 5.3%, compared to 2019 (-17 TWh). The new European target sets a 40% share of renewables in final consumption by 2030: in Italy, this means doubling it over the next ten years. **It is very clear that Italy, with the current trends in thermal renewables, in transport, and electricity, is far from having the right pace to reach the new target.**

In 2020, according to early estimates, only 800 MW of new renewable electricity plants were installed in Italy, a worrisome trend, especially as compared to European partners: +6.600 MW in Germany, +4.300 MW in Spain, +1.900 MW in France. In order to meet the European 2030 target, Italy should increase new plants by, at least, 6.000 MW per year over the next ten years.

Energy consumption falling substantially

ENERGY SAVING

According to estimates by Mises (Ministry of Economic Development), primary energy consumption decreased by 9.2% in 2020 as compared to the previous year: such fall is in line with the GDP contraction (-8.9%), thus confirming that the reduction in energy consumption was caused by the crisis derived from the pandemic. Oil products, especially those employed in transport, recorded the most significant drop: petrol consumption fell by 21% and diesel by 16%, while jet fuel fell by 60%. The reduction in electricity and gas consumption was moderate, also due to more rigid temperatures in the last trimester of 2020, thus pushing the heating demand. Beside the pandemic, in 2020 the so-called 110% Eco bonus became operational for buildings energy refurbishment. During a parliamentary hearing, ENEA (Italian National Agency for New Technologies, Energy and Sustainable Economic Development) presented some final figures as of June 2021, showing that about 19.000 building renovations were authorized for the 110% tax deduction (little over 50% for single family houses, 38% for independent properties, and the remaining 10% for apartments buildings). In economic terms, this means about 2.5 bln euros authorized for fiscal deduction, 40% related to apartments buildings, 36% to independent properties, 36% to single family houses. The impact of these renovations on energy consumption is still to be estimated.

An updated commitment on climate in cities

GREEN CITY

It is estimated that two thirds of global GHG emissions are produced in cities: **no decarbonization path can overlook their full involvement.** The challenge of climate neutrality is a crucial commitment for the future of cities, as well as an opportunity for an ecological renovation and an improvement in local development and citizens wellbeing. In view of COP26 in Glasgow, in order to promote a new leadership of cities on climate issues and to support a renewal of the Covenant of Mayors according to the 2030 and 2050 targets, on last 8 July the Green City Network presented the **"Chart of Cities towards climate neutrality"**, already joined by over 45 Italian cities of diverse dimensions. The Chart envisages five main areas of climate action, with specific measures and a whole range of instruments: an updated commitment of cities towards the climate transition according to a multisectoral approach, based on high ecological quality; energy efficiency and renewable sources of energy; a more sustainable urban mobility with less cars; circular and decarbonized economy; carbon removals.

Good performances continue in Italy

Italy has a good **resource productivity** (measured by GDP per kg of consumed resources): also in 2020, Italy ranked first among the main European countries, with 3.7 euro/kg, above a France (3,3), Germany (3,0), Spain (2,9) e Poland (0,8). In EU27, resource productivity per euro of GDP increased from 1.8 to 2.2 euros between 2012 and 2020, with a 20% increase, stable over the years. Italy, over the same period, recorded a 30% increase. In 2020, the Domestic Material Consumption (DMC) accounted for 7.4 tons per capita, followed by Spain (8,1), France (10,3), Germany (13,4) e Poland (17,5). In 2019, 14 mln tons (Mt) of urban waste were recycled in Italy, 51% of total urban waste. Compared to the other main European countries, Italy ranked second after Germany. Italy is also above the EU average (48%) of three percentage points. According to Eurostat 2019 data, the Circular Material Use (CMU), which measures the degree of recycled material use as related to total primary material use, accounts for 11.9% at the EU level. As compared to the five major EU countries, Italy ranks second for CMU, above the EU average, with a level of 19.3%, after France (20.1%), but before Germany (12.2%).

CIRCULAR
ECONOMY

Car market has changed: a fall in diesel and petrol and an increase in hybrid and electric

In 2020, the number of new cars sold in Europe decreased by 23.7%, 28% in Italy, with about 530.000 registrations less than 2019, although such reduction seems to be reduced in 2021. At the same time, **the decrease in diesel cars seems to be constant** – from 53% in 2017, to 40% in 2019 and 33% in 2020 – as well as petrol cars, decreased from 44% of total registered cars in 2019 to 38% last year. On the other hand, it is recorder an **increase in alternative fuels cars** – LPG/CNG, electric hybrid (full electric and plug-in) – reaching almost 30% of new registered cars, as compared to 16% the previous year. Such increase is led by **hybrid market penetration**, with 223.000 cars registered in 2020, doubled as compared to the previous year, and exceeding LPG/CNG cars. Also **very important is the performance of electric cars market**: it tripled over a year, from 17.000 units in 2019 to about 60.000 in 2020, with a 4.3% market share. The number of electric cars registered in the early months of this year has already exceeded the total number of 2020, with 68.000 registered cars. Similarly, hybrid cars registrations as of 30 June already reached the 2020 number and is projected to reach 500.000 cars over the entire year. Such estimates project alternative fuel cars to account for over 40% of total new registrations at the end of the year.

TRANSPORT

Good performances in the sector, organic and PDO and PGI products are growing

In the year of the pandemic, the entire agri-food sector (including agriculture, silviculture, fishing, and food) recorded a 1.2% reduction at current prices and a 4% reduction in volumes. The Italian agriculture confirmed, in 2020, its leadership role in the European context: its added value, 31.4 bln euros at current prices, is the highest un EU27, still above France (30.2 bln euros) and Spain (29.3 bln euros). The value of production slightly decreased (56.3 bln euros, compared to 56.5 bln euros in 2019) and our country remains in the third position behind France (75.4 bln euros) and Germany (56.8 bln euros). Organic production continues to increase: as of 31st December 2019, the organic agricultural area accounted for 1,993,236 hectares, increasing by 2% compared to the previous year and by 78.9% compared to 2010. Italy ranks third, after France and Spain, in the total extension of the organic agricultural area. In addition, Italy confirms its leadership in the number of PDO, PGI, and TSG products: 848 in 2020 (312 in the food sector and 536 in the wine sector), above France (692) and Spain (342).

AGRICULTURE

NATURAL
CAPITAL

Continuing alarm signals

The 2021 Fourth Report on the state of the natural capital in Italy shows the results of a study that analyzed 12 ecosystem services (biomass availability from wood, agriculture, and fish, water availability, pollination, flooding risks regulation, erosion protection, hydrological system regulation, water purification through soils, quality of habitats, carbon capture and storage, leisure tourism) and their variation between 2012 and 2018. **Estimates show a reduction in the flow of many of the addressed services, resulting in a reduction of the economic value generated.** Italy is the country with the highest quantity of fresh water collected from surface water or groundwater (9.2 mln m³ in 2018), ranking second in the amount collected per capita (153 m³ per inhabitant, while 20 countries out of 27 collected between 45 and 90 m³ of fresh water for public supplies). In Italy, leakages in water supply networks continue to constantly increase, accounting in 2018 for 42% of the total volume. At the regional level, this varies from 22.1% in Valle d'Aosta to 55.6% in the Abruzzo. In 14 regions, lost water is over 40%, and over 55% in 10 provinces. According to the 2021 Report by ISPRA, **land use is continuing to rapidly transform the national territory. In 2020, artificial surfaces covered an additional 56.7 km², meaning over 15 hectares per day, 2 square meters per second.** Carbon capture and storage is a regulation service supplied by the various land and marine ecosystems thanks to their carbon sequestration capacity. A loss of about 2.9 t of carbon sequestration is estimated in Italy between 2012 and 2020, due to variations in land use and cover.

3. The European and international framework

The European Green Deal

With the **Green Deal**, the policy backbone of the new Commission chaired by Ursula von der Leyen, Europe aims to transform climate and environmental challenges into opportunities in all sectors, thus making the ecological transition more just. The Green Deal aims to zero net emissions, to promote an efficient use of resources, with a shift towards a green and circular economy, and to recover the loss of biodiversity. With the Green Deal, Europe aims to play a leadership role in developing a decarbonized, inclusive, prosperous, and competitive economy.

In March 2018, the Commission adopted the **Action Plan on Financing Sustainable Growth**, defining a taxonomy for ecological sustainability of investments, based on their contribution to at least one of six environmental targets, with no damage to any of the others: climate change mitigation, sustainability and protection of water and marine resources, transition towards a circular economy, prevention and management of pollution and protection and recovery of biodiversity and ecosystems.

On 28 June this year, the Council adopted the Regulation – the so-called European Climate Law – setting in the European legislation **the target of 55% in emissions reduction, as compared to 1990, by 2030 and the target of climate neutrality by 2050**, while also providing that the EU shall set a 2040 mid-term climate target.

On 14 July 2021, the Commission adopted the “**Fit for 55**” package of proposals for the implementation of the Climate Law. the Commission is proposing to gradually phase out the free emissions allowances in aviation, and to include the maritime sector as well. The package also includes a new carbon pricing and trading system for fossil fuels used by road transport and buildings. A part of the income derived from the new carbon pricing system for fossil fuels used

by road transport and buildings will be devoted to face the potential social impact on vulnerable households, on micro-companies and on transport users. The new Regulation proposal on land use, silviculture and agriculture sets an overall target of 310 MtCO₂ carbon sequestration by 2030. Specific goals are proposed for the use of renewable energies in transport, heating and cooling, in buildings and industry. Sustainability criteria on the use of bioenergy are enhanced. The concurrent Directive on energy efficiency, in order to reduce the overall energy consumption, reduce emissions and face energy poverty, sets a more ambitious binding annual target for the reduction of energy consumption, almost double of the current energy saving requirement for Member States. The public sector will be required to refurbish 3% of public buildings each year. The average level of emissions of new cars will be required to decrease, as compared to 2021, by 55% by 2030 and by 100% by 2035: new cars registered from 2035 onwards will be zero-emissions. Finally, **the Commission proposes a new Carbon Border Adjustment Mechanism (CBAM)** to set a carbon price on imports of specific products, in order to avoid a production relocation as a result of the European action on climate.

At the same time as Fit for 55, the European Commission proposed an update to the **Renewable Energy Directive (RED II)**, increasing the share of final consumption to be covered by renewable energies by 2030 from 23% to 40%. With some exceptions, subsidies for electricity production from biomasses will be gradually phased out from 2026 onwards. The Commission also reinforced sustainability criteria for the use of bioenergy, implementing, for forestry biomass, the rules already existing for agricultural biomass. In the industrial sector, the approximate target is a 1.1% yearly increase for renewables, with a 50% binding target for non-biological renewable fuels, other than biomasses, used as raw material or as energy carrier. Products labelling will be required to include the share of renewable energy employed. In buildings consumptions, the new Directive requires to set national targets consistent with the new European target for renewable sources. Self-consumption, local energy storage, and renewable energy communities shall be at the heart of national policies. In the transport sector, the target for GHG reduction is 13% by 2030. Advanced biofuels will have to reach at least 0.2% by 2022, 0.5% by 2025, and 2.2% by 2030, while non-biological renewable fuels will have to reach 2.6%.

The international scenario

Contradictory trends in stimulus measures

According to OECD, in 2020 about 336 bln dollars of environmentally positive stimulus measures were allocated to re-launch the economy after the pandemic: such a remarkable amount seems to support the efforts by a number of Governments to pursue not only economic targets, but also climate and environmental ones. However, OECD also points out that almost the same amount was allocated for measures with negative impacts on the environment, or with both positive and negative impacts. Negative impact measures include, for example, those that directly support fossil fuels. Mixed impact measures can have a positive impact on one environmental dimension, such as the climate, while also having a negative impact on others, such as biodiversity. In conclusion, in OECD Countries, subsidies allocated for potentially environmentally harmful activities almost equal those allocated for green measures.

China remains critical for the climate transition

China is the top emitter of GHG in the world, the first coal consumer, and has per capita emissions well above the European level. Chinese CO₂ emissions curves clearly show a rebound after the pandemic. In the last six months, China planned an increase in electricity production from coal, creating widespread concerns on the deviation from the Paris Agreement path. At the United

Nations General Assembly, on 22 September 2020, Xi Jinping adopted a wait-and-see and inadequate position, rejecting any clear and substantial commitment on emissions reduction by 2030, with a generic commitment to reach the emissions peak and start the reduction by the end of the decade, and announcing a zero target by 2060 without any detailed roadmap.

The big climate crisis is still worsening

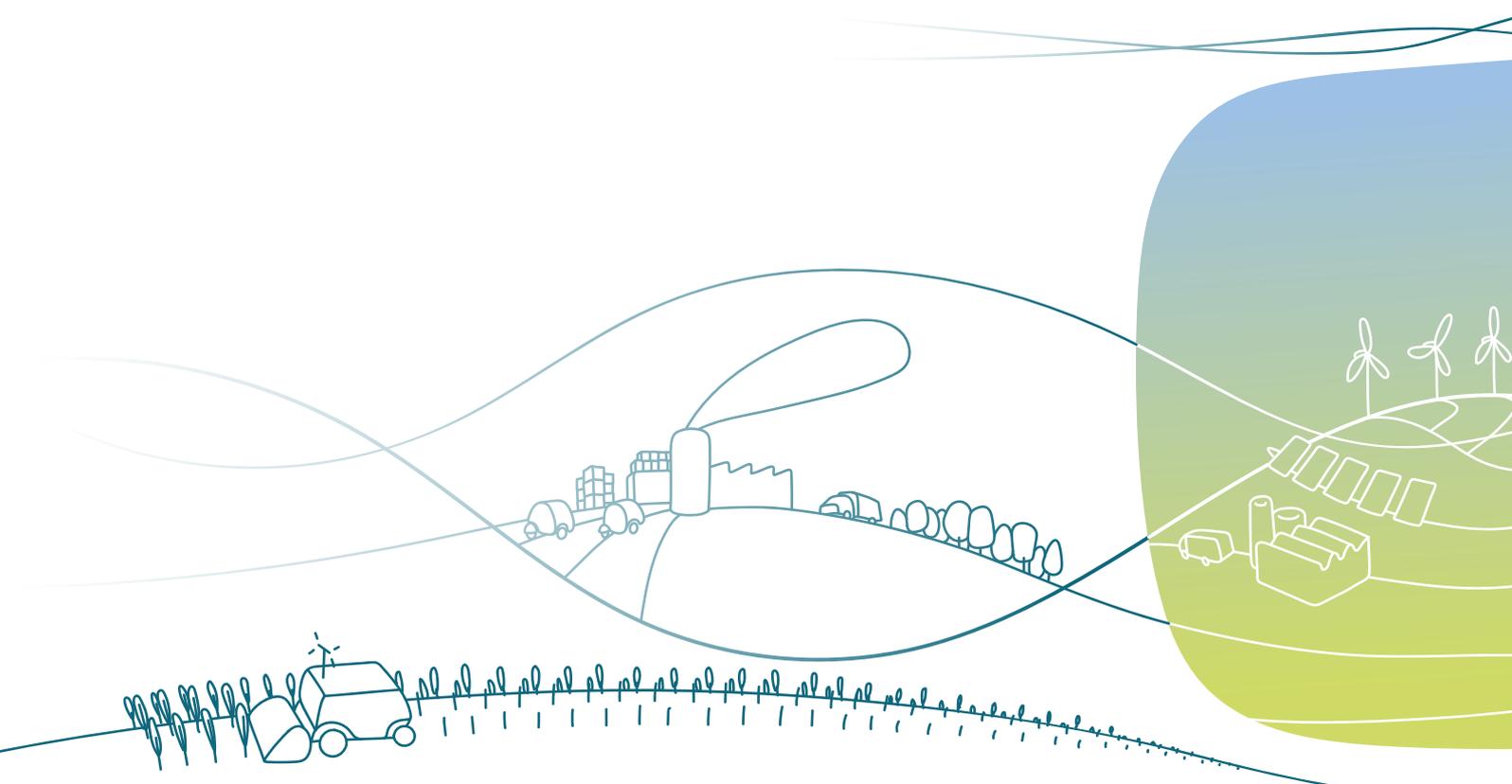
The significant fall in emissions in 2020 was not sufficient to halt the increase in GHG concentration and, thus, to stop global warming. It is not surprising that extreme consequences of the ongoing climate change continued incessantly in 2020. In summer 2021, it is impossible not to mention the severe heatwave that affected Canada, the United States, and Siberia, the unprecedented floods in Germany and China, that caused severe losses. Media attention is very high due to the number of victims and the dimension of such events. Also, the fire events in Australia that tormented the Southern hemisphere summer cannot be forgotten. The heat wave in the Northwest of the United States and Canada is so great to astonish meteorologists. We are about to reach the highest temperature ever recorded on Earth, 56°C, in unpopulated areas. Six years after the Paris Agreement, no signs of a reduction in GHG concentration in the atmosphere can be seen, nor, as a consequence, a reduction in the global mean surface temperature.

Towards Glasgow COP26

The COP, originally scheduled to take place at the end of 2020, was postponed due to the pandemic and will take place in Glasgow, UK, at the end of 2021. COP26 is expected to collect the updated NDCs (nationally determined contributions). The United Kingdom set an updated NDC of at least a 68% reduction by 2030 as compared to 1990, as well as, more recently, a 78% target by 2035; the EU presented an NDC with a 55% target by 2030 as compared to 1990 levels. On 21 April this year, at the Leaders Summit on Climate, the United States announced a 50-52% reduction by 2030, as compared to 2005, and zero emissions by 2050. There is much expectation on the additional targets to be proposed. However, it should be noted that the increase in national and regional commitments is only based on governments voluntary contributions, and that COPs and negotiations do not seem to be enough to boost reduction commitments, if not by requests. At COP26, the United States will be back at the negotiation table, with President Biden intention to make climate action a priority, after bringing the US back in the Paris Agreement, that was abandoned by Donald Trump in 2019.

Changes in the energy system continue

The pandemic, and the resulting economic crisis, impacted on almost all aspects of energy production, distribution and consumption worldwide. Primary energy demand decreased by almost 4% in 2020; oil decreased by 8.6%, coal decreased by 4%. While the pandemic caused a reduction in electricity demand, the increase in energy production from renewable sources substantially contributed to the reduction of emission in this sector. The share of renewable energies in global electricity production increased from 27% in 2019 to 29% in 2020, the highest percentage increase ever recorded. Technologies for renewable energies now dominate the global market for new electricity generation capacity, as the cheapest sources on many markets. The global additional generation capacity from renewable sources in 2020 reached a 260 GW record, over four times the additional capacity from other sources.



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