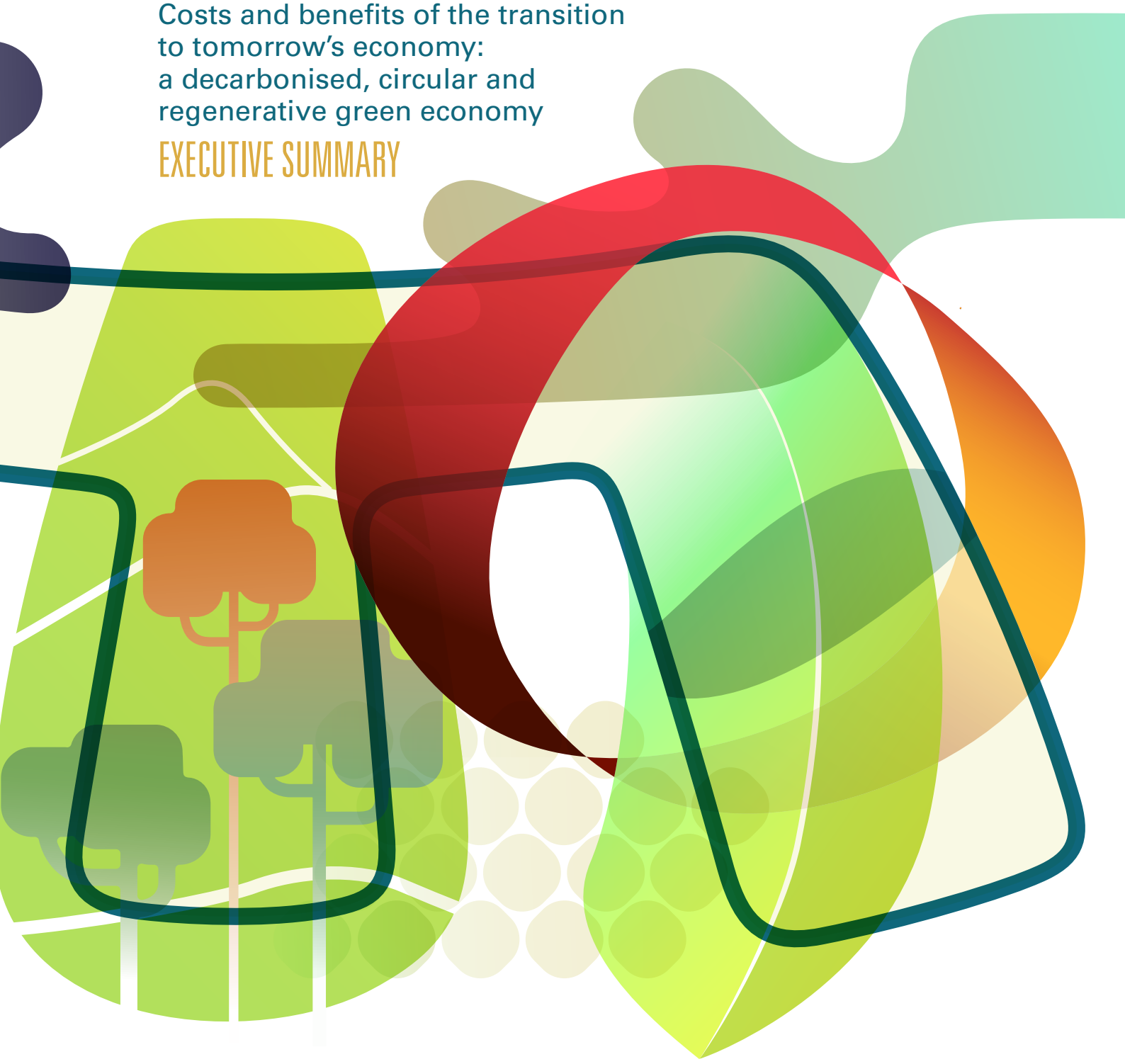
REPORT 2023
ON THE STATE OF THE GREEN ECONOMY

Focus

Costs and benefits of the transition to tomorrow's economy: a decarbonised, circular and regenerative green economy

EXECUTIVE SUMMARY



STATI GENERALI della Green Economy

FONDAZIONE PER LO SVILUPPO SOSTENIBILE
Sustainable Development Foundation

ECOMONDO
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Report on the **state** of the **green economy 2023**

Presentation by **Edo Ronchi**
President of the Sustainable Development Foundation

Focus The transition to tomorrow's economy: a decarbonised, circular and regenerative green economy

A certain "eco-skepticism", widespread in Italy, is fueled by a distorted vision of costs of the ecological transition and a reduction in its benefits. We are now in an unprecedented global climate and ecological crisis that will profoundly impact tomorrow's economy, not in the distant future but within a decade. The ecological transition is unavoidable if we want our economy to have a better tomorrow, not a decidedly worse one. Without an ecological transition, our economy would be severely affected by the disastrous precipitation of the climate and ecological crisis. Given that such a transition cannot happen simultaneously across the world, are the costs economically and socially sustainable for the countries that would implement such a change before others? Would this transition be able to generate economic and social benefits, not only at the end but also during the change, greater than or at least comparable to the costs? Studies and analyses are available from institutional sources and the business world that positively answer both of these questions. With this focus, we will provide a partial overview of them.

Costs and benefits of a decarbonized economy

The **accelerated decarbonization of our economy is challenging, but economically feasible with the benefits outweighing the costs**. There is now ample study and research on the causes of the climate crisis that rational and intellectually honest doubt on the subject is no longer possible. The evidence of the serious impacts in Italy creates a motivated intolerance to denialist positions. The idea that we must wait for China or India to lead decarbonization is crippling and irrational. Is it more likely that the most advanced are the ones to drag others along, or should we expect the opposite? More than just these assessments, the formation of advanced or restrained positions on decarbonization is often motivated by a different assessment of the economic costs and benefits of the transition.

According to a recent study by Confindustria and Rse ("Scenarios and Economic Impact Assessments of 'Fit for 55' Targets for Italy" 2023), **the full implementation of the European decarbonization objectives by 2023 would require additional cumulative investments from 2020, compared to the base scenario without these European measures, of 147 billion euros, an average of 14,7 billion per year**. The most significant increase in investments (58 percent of the major investments) would concern the electrical sector: 59 billion for new machinery (33 for photovoltaic and 26 for wind), plus another 26.8 for the transmission and distribution networks, pumping and storage, green hydrogen and charging infrastructure. In the residential sector, the increase in investment would be 38 billion and in the tertiary sector 28 billion. However, in the transport sector, there would be a reduction of about 13 billion compared to the base scenario: decarbonization would indeed lead to a sharp increase in the penetration of electric cars (to as many as 7.2 million), with a substantial reduction, however, of 3.7 million in the car fleet (from 38.7 million cars on the road in 2019 to 35 million in 2030).

These increased investments by 2030 would generate savings in imported fossil fuel energy of 132 tons in total from 2020, with a reduced expenditure of 29.925 billion euros, as well as a cut in cumulative CO2 emissions of as much as 380 million tons, for a saved cost estimated at 36.1 billion euros. **The total savings of these two items would be about 66 billion€ over the decade**, savings that would continue in subsequent years. These investments also have a multiplier effect on economic activities and on state budget revenues: between Irpef (personal income tax), direct and indirect taxes, social contributions and other current revenues, net of the losses of excise taxes and VAT on fossil fuels, **the cumulative additional revenues for the state would reach a substantial 529.5 billion€ by 2030**. The decarbonization package would also be able to generate new employment: in total, the increase in annual work units (Ula) would be **as much as 11,484,000 over the decade, a potential annual increase of more than 1.1 million Ula**.

In the June 2023 draft of the new Energy and Climate Plan (Pniec), the estimate of additional investments in the period 2023-2030, compared to the Base scenario, is 217 billion €: 70 billion€ more than cited in the Confidustria-Rse scenario. **In the draft of the new Pniec, both the targets and investments in the electricity sector are significantly lower: for renewable electricity generation plants (with 29.6 billion€, compared to 59 in the Confinudstria-Rse plan) and for the grid and storage system (16 billion€ compared to 26.8)**. The largest investment burdens in the new Pniec are concentrated in the transportation sector (vehicles only) and the residential sector. The draft of the new Pniec lacks an estimate of the savings in cumulative emissions and fossil fuel costs by 2030, as well as the increased revenues generated for the state treasury due to increased investments.

The weakness of the new Pniec scenario is also highlighted by comparing it to what is considered an advanced target of electricity production from renewable sources envisaged by the study "The Italian Renewable and Smart Energy Technology Supply Chain Towards 2030" (Enel Foundation, Elettricità Futura and Althesys, 2023). The study analyzes two scenarios: the "Base" scenario with an increase to 102 GW of new renewables by 2030 and "Desire," which is more advanced, with 123 GW. Given that we are at approximately 61 GW in 2023, this would represent an average annual increase of about 5.8 GW in the Base scenario and about 9 GW in Desire. The investments cumulated from 2022 to 2030 amount to 247€ Billion in the Base scenario and 296€ Billion in the more advanced scenario. The economic impacts are positive in both scenarios: in terms of **the production chains (288 billion in the Base scenario and 332 in Desire), with an increase in employment (370,000 per year with Base and 430,000 with Desire).** The **increase in tax revenues** would also be very positive **(13.4 billion with Base and 15.4 with Desire)**. The study also assesses the impacts there would be in a "no action" scenario, with no new initiatives: the billions generated over the period 2022-2030 would only amount to 94.2, with 120,000 jobs created and tax revenues of 4.3 Billion€.

Costs and benefits of a more circular economy

In the "business-as-usual" scenario defined by the Sustainable Development Foundation, the amount of recycled waste increases from 126 Mt in 2021 to 141 Mt in 2030, an increase of about 11.9%, reaching 77% in 2030 (from 70% in 2020). However, waste generation increases by 4% and the amount of waste to be disposed of drops slightly, from 53 Mt in 2020 to 42 Mt in 2030. Domestic material consumption rises from 459 Mt in 2020 to 611 Mt in 2030 (+7.5%). In the most circular scenario, a reduction of 3.5 percentage points per year is targeted for overall material consumption from 2022, a growth in recycling rate of 1.5 points per year from 2021, and a reduction in waste generation of one percentage point from 2021. In the most circular scenario, the total consumption of materials in 2030 would decrease by 14.5 percent compared to 2020, the amount of waste generated would decrease (-17 Mt to 2030), the amount of waste subjected to recycling activities would increase (+18 percent to 2030) bringing the recycling rate in 2030 to 89.8 percent. The comparison shows that in 2030 compared to 2020 **the more circular scenario would significantly reduce Italy's dependence on foreign sourcing with a reduction of 40 Mt and savings of 82.5 billion euros** (compared to an increase in imports of 80.4 Mt, for higher costs of about 166 billion €). **Total waste generation would also decrease by 17 Mt, while in the Bau scenario it would grow by nearly 8 Mt**. Increased recycling rates, even with declining waste generation, would not only maintain but also lead to a significant increase in recycled quantities (+20 Mt) with an **increase in employment in the sector of more than 46,000 units**. Activities related to prevention (reuse, repair and sharing) would also increase in size, leading to a 10% reduction in waste generation, with an expected increase in employment in these sectors of more than 50,000 units. Overall, **the more circular scenario would result in an additional supply of nearly 97,000 new jobs in the recycling, reuse, repair and rental sectors.**

Costs and benefits of a regenerative economy

There are also **economic reasons to support the transition to a regenerative economy with a net-zero impact, balanced with the regenerative capacity of natural capital.** The "IV Report on the State of Natural Capital" of 2021 reports the results of a study that analyzed 12 ecosystem services and the economic costs of their deterioration that occurred between 2012

and 2018. 72 million cubic meters less of recharged water resources in aquifers, resulting in an economic loss of €14 million; 166,000 fewer metric tons of agricultural biomass, resulting in an economic loss of about €36 million; increased soil erosion (from 11.63 to 11.69 t/ha) caused a loss of about €17 million; land cover changes reduced the regulating capacity of hydrological regimes, with estimated losses of up to €3.8 billion; and the disappearance of natural vegetation caused a decline of about 2.5 million metric tons of stored carbon, for a reduction in economic benefits of between €491 and €614 million.

The impact assessment accompanying the "nature restoration law" contains detailed estimates of the costs and benefits for restoring different types of ecosystems for different European countries, including Italy. The ratio of benefits to costs is decidedly positive, with particularly high values for aquatic environments. Compared to the European average, Italy is expected to incur lower costs for ecosystem restoration both in relation to GDP and per capita, as it has a relatively lower share of ecosystems in poor condition. **Italy would benefit about 2.4 billion euros from ecosystem restoration, incurring intervention costs for restoration and protection of 261 million.**

The strategic issues of the green economy in Italy

EMISSIONS AND THE CLIMATE CRISIS

According to Ispra's preliminary estimates, in 2022 Italy's greenhouse gas emissions remained largely unchanged compared to the 2021 levels (+0.1 percent). From a decarbonization perspective, the trend is confirmed to be completely insufficient. The stable trend in 2022 emissions can be attributed, on one hand, to the growth recorded in transport and energy production (+5.5% and +9.6% in 2021, respectively) and on the other hand, to the sharp decline in emissions related to heating (-11.3%) and industry (-5.9%). By 2022, all major European countries would be virtually back to pre-pandemic emission levels. Italy had a particularly significant rebound in 2021 (+10%, double the European average), while in 2022 growth was virtually zero, unlike the other large European countries whose emissions increased from less than 3% to nearly 7% in Spain. From 1990 to 2022, Italy's greenhouse gas emissions were reduced by almost 20%, below the European average of 25%, less than France (-22%) and Germany (-36%), although better than Poland (-12%) and Spain (+6%). In terms of intensity and per capita values, Italy maintains better performance than the European average, although this advantage is gradually narrowing. In 2022, for the EU27, the average carbon intensity was 264 tons of CO_2 equivalent per million euros of GDP, while Italy was around 240. Furthermore, Italy generated 7.1 tons of CO_2 equivalent per inhabitant in 2022, better than the European average of 8.1. According to the latest Ispra update, 2022 was the hottest year in the series starting in 1961. Italy is located in the center of the Mediterranean basin, which is classified as a "climate change hotspot," i.e., an area where temperature increases are occurring faster than the global average and the effects of global warming are manifesting themselves with greater intensity. The year 2022 was the driest year in sixty years, marked by a long period of drought, along with an increase in short and very intense rainfall that created damage and flooding.

RENEWABLES

In 2022, the simultaneous decline in renewables and energy consumption kept the share of renewables in Italy stable at 19 percent, confirming an inadequate trend to reach the new 2030 European target of 42.5 percent as established in the updated Renewables Directive. Thermal use stood at 10.5 Metric tons of oil equivalent (Mtoe), down from 2021, but remaining stable stable around the levels of the last decade. In transportation, renewables reached nearly 1.6 Mtoe in 2022, showing a slight increase from 2021. Biodiesel alone still accounts for 90 percent of all biofuels, but the growth trend of biomethane is still confirmed in 2022: 0.19 Mtoe or about 210

million cubic meters (+26 percent compared to 2021). In 2022, renewables covered only 35 percent of national electricity production, one of the lowest values in the past 10 years. The main cause was the collapse of hydroelectric generation due to drought. The only renewable source that grew was photovoltaics (+12% compared to 2021), while wind, geothermal, and bioenergy all contracted slightly (about -2%). Overall generation from renewables in 2022 stopped at 101 TWh, 13% less than 2021. In 2022, 3 GW of new renewable energy facilities were installed, three times the average of recent years, primarily due to photovoltaics (+2.4 GW) and wind power (+0.5 GW). Meanwhile France installed 5 GW, Poland 6 GW, Spain 9 GW and Germany 11 GW. In the first half of 2023 there are improvements in: generation from renewables grew by 4% and covered 35% of national electricity demand. Hydroelectric power is showing a decent recovery (+18%), photovoltaic generation has also increased (+4%), while wind power is decreasing (-3%).

ENERGY SAVINGS

In 2022, final energy consumption was reduced by 3.5 percent from the previous year, reaching 109.3 Mtoe. The sector that reduced consumption the most in 2022 was the buildings sector (residential, commercial, and services). It consumed 45.4 Mtoe, 8 percent less than in 2021, due to both energy-saving efforts and a particularly mild winter. In 2022, the industry consumed 23.8 Mtoe, a 7% decrease; agriculture 2.9 Mtoe, remaining stable compared to the previous year; while transportation used 36.7 Mtoe, a 5% increase compared to 2021. Since 1990, buildings have increased consumption by 32%, transportation by +12%, agriculture has about the same energy consumption levels as 30 years ago, while industry has reduced them by as much as 30%. The surge in prices and the need to reduce gas imports from Russia following the invasion of Ukraine produced significant changes in the source mix in 2022 with a significant increase (+30%) in domestic coal consumption, from 5.5 to 7.4 Mtoe, a cut in gas (-10%) from 62.4 to 56.1 Mtoe, and a reduction in petroleum products (-5%), from 53.5 to 50.3 Mtoe. Renewable sources also experienced an unprecedented decline (-7%), from 30 to 27.5 Mtoe in 2022, mainly due to the collapse of hydropower.

CIRCULAR ECONOMY

In 2022, for every kilogram of resources consumed, Italy generated 3.3 euros of GDP, much better than the average in Europe (2.1). The recycling rate of all waste in 2020 in Italy was 72 percent, compared to a European average of 58 percent. According to the most recent Ispra data, which refer to 2021, the recycling rate for municipal waste dropped by 0.3 percentage points to 48.1 percent, while recycling of special waste is about 72.1 percent. Italy also has a good rate of using materials from recycling, at 18.4 percent in 2021, compared with 11.7 percent in the EU. Regarding this specific indicator, Italy is confirmed to be in fourth place in the comparison with all 27 EU countries, behind only the Netherlands (33.8%), Belgium (20.5%) and France (19.8%). The growth of the Italian figure peaked in 2020 (20.6 percent), and then began a gradual descent in the following two years. Overall (2012-2021), Italy saw an increase of 4.5 percentage points, while France grew by 2.9 and Germany by 1.5. Spain and Poland, on the other hand, saw an overall decrease of 1.8 and 1.5 percentage points, respectively.

NATURAL CAPITAL

Data from the Biodiversity Information System for Europe (Bise) of 2023 shows us that overall Italy protects 21.4 percent of its territory and 6.9 percent of its sea, both values lower than the EU average. As far as protected areas on land are concerned, we rank 19th in the EU27, while for marine protected areas, only four member countries protect a smaller area than ours. In contrast, Italy has the most relevant biodiversity values: we are second, behind Spain, in the number of species of community interest and first in the number of habitats. Monitoring results on the conservation status of species and habitats protected by the Habitats Directive have revealed unfavorable conservation for 54 percent of terrestrial and inland flora, 53 percent of terrestrial and inland fauna, and 89 percent of terrestrial and inland habitats. The most significant threats

to biodiversity conservation are intensive forms of agriculture and the growth of settlements and infrastructure. An insidious pressure factor is represented by wildfires. In the period from 2006-2022, Italy is the European country with the highest number of fires (an average of 275.9 per year) second only to Spain in terms of areas burned each year (more than 50,000 hectares).

WATER RESOURCES

Italy, due to land conformation and geographical location, is a country naturally exposed to recurring water crises brought about either by excessive rainfall or its prolonged absence. We are in a new phase of "permanent climatic abnormality." Measures taken in the past to contain floods and their associated risks, as well as to mitigate the impacts of drought, no longer appear to maintain the same level of effectiveness in the new climatic framework of increasingly intense and increasingly frequent and prolonged phenomena. We urgently need to update and integrate the overall knowledge framework, which is currently quite deficient, with reference to water resource availability and actual uses, expected frequency and intensity of weather phenomena and related responses of the hydrographic system. We urgently need to update and integrate the overall knowledge framework, which is currently quite deficient, with reference to the availability of water resources and their actual uses, expected frequency and intensity of meteorological phenomena and the related responses of the hydrographic system. The high financial requirement for soil defense is not so much a matter of availability but rather the reduced spending capacity of local authorities, in particular. The planning of interventions and, above all, of funding streams must be brought to unity. The commitment to sustainable agriculture that promotes savings and the rational and optimized use of the water resource must be strengthened. To reduce the risk of heavy rainfall generating floods, nature-based solutions should be emphasized, encouraging the expansion of rivers within their riverbeds, floodplains, wetlands and natural flood retention areas.

AGRIBUSINESS

In 2020 there were 1,133,023 active farms in Italy, a reduction of 30.1 percent compared to 2010. The utilized agricultural area (Sau) has also decreased by 2.6 percent over the past decade, far greater than the European average reduction of 0.97 percent. The average size of Italian farms (11.1 ha) remains small, lower than the European average (17.3 ha) and far below that of Germany (55.8 ha) and France (69.6 ha). The production volume of the agriculture, forestry and fishing sector in 2022 decreased by 1.5 percent. Value added in the sector also declined by 1.8 percent, compared with an increase in the overall value added to the national economy of 3.9 percent. As a result, the share of agri-food in the total national economy decreased from 4 percent in 2021 to 3.8 percent in 2022. The main causes of the agricultural production difficulties in Italy in 2022 are related, on the one hand to the instability of international markets for agricultural raw materials and energy products, accentuated by the Russian-Ukrainian conflict that has led to a sharp price increase, and on the other hand to weather patterns, characterized by low rainfall and very high temperatures in the summer months, which has affected the quantity of crops and the quality of production. At the end of 2022, the organic area in Italy is 2,349,880 ha, 18.7 percent of the total Sau, an increase of 7.5 percent over 2021. In the last three years the average increase has been 5.6 percent. Maintaining these rates will make it possible to meet the European target of 25 percent by 2030. In 2022, the value of the domestic market for organic products reached 3.66 billion euros, an increase of 0.5 percent over 2021, which had experienced a decrease. The organic market is growing less than the agri-food sector as a whole (+6.4 percent), and the share of sales in Italian agri-food expenditure stands at 3.6 percent, with a slight decline (-0.3 percent) compared to 2021.

MOBILITY

In 2022, 1,316,000 cars were registered, 10% less than in 2021. Vehicle registrations have increased only for LPG (+10%) and hybrid (+6%) cars. Meanwhile, registrations for methane (-66%), diesel (-20%) and gasoline (-16%) cars decreased, as well as for electric cars (-15%). Average specific

emissions of new registrations in 2022 fell to 118.8 gCO_2 /k m in 2022, or -0.8% compared to 2021. In 2022, the Italian motorization rate increased to 683 cars per 1,000 inhabitants, passing the 40 million mark, with 390,000 more vehicles than in 2021. Gasoline and diesel still account for about 86 percent of the total, just one percentage point less than in 2021. The number of cars registered from January to June 2023 was about 843,000, compared with 687,000 in the first half of 2022, a percentage increase of +22.8 percent. The total number of full-electric cars registered as of June 30, 2023, was 32,000, 7,900 more than in the same period in 2022. These values are still very low, even in relation to what is happening in other European countries where the Bev market share is steadily increasing. The low penetration of the electric car in the market in Italy can be linked to the reduced access to incentives. The maximum amount that can be financed for a full electric car in 2023, with a list price not exceeding 35,000 euros, is 5,000 euros by scrapping one's own vehicle and 7,500 euros for people with Isee less than 30,000 euros, lower contributions than in 2021 when it was 8,000 euros for all those who scrapped a car, with no Isee limits. It is interesting to note the "Social Leasing" project launched in France, which aims to enable 900,000 less affluent families to drive a Bev by paying a fee of between 70 and 200 euros per month, depending on the size of the vehicle, between 2024 and 2030.

The European and international framework

In 2022, prolonged drought in East Africa, record-breaking rainfall in Pakistan, and exceptional heat waves in North America, China, and Europe affected tens of millions of people, caused food insecurity, increased mass migration, and caused billions of dollars in damage. The concentration of CO_2 measured at Mauna Loa in Hawaii continues to rise, reaching 424 ppm and the Earth's average surface temperature, an index of global warming, reached the sixth hottest year in the series in 2022, 1.06°C higher than the pre-industrial average 1880-1900. The World Meteorological Organization and Copernicus record Europe warming faster than other regions and about twice as fast as the global average. High-impact weather and climate events in 2022 claimed more than 16,000 lives in Europe, much of it attributed to heat waves. It was the hottest summer on record.

The emissions of the world's top five emitters in 2022 were 23.3 Gt CO_2, accounting for 65% of total emissions. China increased its emissions by 1.2% in 2020 and 6% in 2021 and decreased them by 1.5% in 2022. In 2022, U.S. emissions grew by 3.2 percent, Europe's by +0.5 percent and India's still rapidly, by +7 percent. Russia, the fifth largest emitter, increased its emissions every year from 2019 to 2021, but decreased them by 1.8 percent in 2022.

In 2020, due to the pandemic, global energy consumption decreased by 4.7 percent. However, the consumption of renewable energy, including traditional biomass, continued to grow by 2.6 percent year-on-year reaching 19.1 percent of the total. Renewable electricity use in global consumption rose from 26.3 percent in 2019 to 28.2 percent in 2020. Renewable sources account for 24% of energy used for heating, up 1% in 2020, while the transportation sector continues to have low penetration, only 4% of final energy consumption in 2020. According to the Iea, $2.8 trillion is expected to be invested globally in energy in 2023, **more than $1.7 trillion of which will go to clean technologies.**

UNITED STATES

The Inflation Reduction Act (IRA), enacted into law in the U.S. on Aug. 16, 2022, allocates $500 billion for reducing carbon emissions, promoting clean energy, reducing health care costs, with investments and tax incentives for U.S. businesses. Many of IRAs tax incentives also contain in-country production or procurement obligations. The intentions of the American "Green Deal" plan

are explicit in terms of countering Chinese competition in the energy and ecological transition sectors and to boost American industry and economy, with important effects on competitiveness with European ones in the same sectors.

EUROPEAN UNION

Since the publication of the Green Deal at the end of 2019 to address climate change, the greatest challenge of our time, and turn it into an opportunity to build a new economic model, the EU has made an unprecedented effort to gain an advanced global position in the climate and ecological transition. With the NextGenerationEU Plan, presented on 27 May 2020, it has deployed 750 billion euros, some in loans and some in grants, to support Europe's recovery from the pandemic, financing reform and investment programs with two clear and priority objectives: climate and ecological transition and digital transition. With the "Fit for 55" package, presented in mid-2021, the Commission set out the roadmap for decarbonizing the European economy. The package contains 13 legislative proposals on energy and climate that aim to put the EU on track to meet the target of reducing greenhouse gas emissions by 55 percent by 2030 as set out in Regulation (EU) 2021/1119 of the European Parliament and of the Council of June 30, 2021, establishing the framework for achieving climate neutrality (European Climate Act). With RePowerEu, launched in May 2022 as a European response to the Russian invasion of Ukraine to eliminate dependence on Russian gas imports, the EU has, among other things, strengthened measures to save energy and increase production from renewable sources.

The **Green Deal Industrial Plan**, presented by the European Commission on 1 February 2023, promotes four pillars: a coherent and simplified regulatory framework, faster access to finance, the enhancement of skills, and developing the Green Deal with an advanced, competitive and open economy. With the **Net Zero Industry Act**, the Commission's proposed regulation presented on March 16, 2023, is proposed to produce at least 40 percent of the annual need for climate-neutral technologies in the EU by 2030. To this end, eight technologies are declared strategic: solar photovoltaic and thermal, onshore wind and offshore renewable sources, batteries and storage, heat pumps and geothermal, electrolyzers and fuel cells, biogas and biomethane, carbon capture and storage, and electrical grid technologies. Member countries will be required to provide a single point of contact for all administrative and authorizing procedures related to zero-emission projects and may establish regulatory "**sandboxes**" that enable the development, testing and validation of innovative zero-emission technologies in a controlled real-world environment.

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