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HOW MUCH INVESTMENT IS NEEDED FOR THE DECARBONISATION OF THE ITALIAN ECONOMY?

A propaedeutic analysis for the revision of the National Energy and Climate Plan

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Executive summary

1. ***The trajectory of Italy's greenhouse gas (GHG) emissions is currently out of line with European targets (down 55% compared with 1990), and the Italian government's ambition has so far appeared insufficient to close the gap. This situation calls for an extraordinary and extremely focused effort in order to correct emissions over the next seven years.***

The National Energy and Climate Plan (NECP, in Italian PNIEC), which is the central policy document of Italy's energy and climate strategy, must be updated by the Italian government by June 2023. At present, the Italian government's ambitions can only be inferred indirectly from the official documents available to date. Since the NECP is still under revision, the 2023 Economy and Finance Document (*Documento Economia e Finanze – DEF*) only reports the trend with current policies in force, in the absence of corrective measures. That trajectory brings total emissions in 2030 to 349.7 MTCO2e (314.9 MTCO2e including removals).

According to ECCO's calculations, **in order to meet European targets by 2030, Italy needs to cut emissions to 189 MTCO2e from 2019 levels. Thus, compared with the NECP (2019) –which envisaged an emission cut of 94.3 MTCO2e compared with 2019 levels by 2030 – the order of magnitude of the new emission targets has doubled.** The Italian government's ambition with respect to emissions therefore needs to be rapidly recalibrated in order to realign with European targets. The estimates of the investment effort required also require recalibration.

2. ***Estimates of the total investment that Italy needs in order to align with the new European Fit-for-55 targets range between an average of EUR 122 and EUR 134 billion per year. The additional investments needed are therefore EUR 30-42 billion per year higher than estimated in the NECP (2019), and 2-3 times higher than the amount allocated in the NRRP (in Italian PNRR) (2021) for the green transition in the 2021-26 five-year period (an average of EUR 14.4 billion per year).***

Quantification of the investments needed for the green transition is a complex operation, as it has to take into account highly differentiated production processes and some technologies that are still under development. Furthermore, estimates also restrict the scope of the investments to those necessary for the energy transition, and do not include investments for adaptation to climate change, nor those for repairing the physical damage related to climate change, or potential economic and financial losses of a transitional nature (e.g. stranded

assets). In addition, estimates only focus on investments in capital assets (Capex) and do not extend to the operational expenditure (Opex) involved in the transition. **Therefore, however large, the size of the estimated investments is in any case an underestimate of the overall cost of the climate change challenge.**

Moreover, sizing investment needs is a necessarily adaptive process that has to be updated as new elements of the effort required are explored, and the application of new technological solutions becomes more clearly defined. In 2018, the European Commission estimated the additional investment needs related to the Green Deal for the whole Union to be approximately EUR 260 billion per year on average. **In 2023, by aggregating the impacts of subsequent legislative and regulatory innovations (Fit-for-55, RepowerEU and the Green Deal Industrial Plan or GDIP), the estimate has doubled (520bn) and is likely to increase further.**

From a methodological point of view, the investment review mirrored the division into sectors of the NECP, which comprises four main macro-sectors: thermal in civil construction (divided into residential and commercial), industry, transport, and the electricity sector (divided into power generation and the distribution network). The same division into sectors was adopted by the main estimation processes examined (RSE 2021, Confindustria 2023, and Enel Foundation-Studio Ambrosetti 2022).

All the analyses lead to the same conclusion, that the size of the investments required (average per year normalised over the 2020-30 ten-year period) is significant and falls between EUR 105.6 bn (ENEL-Ambrosetti) and EUR 116.3 bn (Confindustria). ECCO's assessments are higher than those indicated (**an average of EUR 121.1-132.8 bn per year**), partly to take into account the developments in European regulations since the reports were drawn up (in particular REPowerEU and the GDIP), and partly on the basis of specific policy assumptions. In 2019, the NECP estimated an annual average investment of EUR 92 bn per year. The additional investment effort with respect to the NECP (2019) is therefore EUR 20-25 bn per year, according to RSE and Confindustria (1.2%-1.4% of GDP), and EUR 14 bn per year according to Enel Foundation-Ambrosetti (0.8% of GDP). However, according to ECCO's analysis, it is likely that these estimates are all approximated by default and should plausibly amount to at least 1.7%-2.4% of GDP (an additional EUR 30-42 bn annually).

3. **The size of the effort needed to bring Italy's emissions into line with the Fit-for-55 European targets means it is crucial to develop an appropriate financial strategy to complement the updating of energy and climate plans.**

i. Achieving the green transition requires a huge effort to refocus a large part of public and private investments. Since the annual total of gross fixed capital formation in Italy is about EUR 400 billion, **at least 25%-30% of the country's total investments must be redirected to the energy and ecological transition over the next decade. The efforts for the green transition can thus be neither residual nor supplementary. Rather, it must be the backbone of public investments and of policies to incentivise and orient private investments within the framework of an organised, strategic plan. This plan must be outlined in the next update of the NECP and must be central to the reallocation of NRRP resources.** However, such a huge effort opens up extraordinary opportunities for growth and employment, especially insofar as green investments are associated, with particularly high-income multipliers.

ii. The second element concerns the impact on public finances. **The public sector plays a decisive role, mainly through direct investments in enabling infrastructure, supporting innovation, and through the structuring of fiscal and financial incentives that channel private investments in the desired direction (through crowding-in).** These interventions necessarily bring about increases in public expenditure or reductions in revenue and are thus linked to the issue of the overall sustainability of public finances. For example, the European Commission estimates that, as far as industrial strategy is concerned, 17-20% of the total estimated resources for the GDIP at European level (EUR 13.1 billion per year) will be borne by public finances. If the same proportion were applied to the entire amount of investment needs estimated by ECCO (EUR 130 billion per year), the burden on public resources would be around EUR 20-25 billion per year (1.2%-1.4% of GDP). **An accurate assessment of the public instruments that need to be activated is therefore needed to optimise the cost and benefit ratio of each, not only to regulate their impact on public finances, but also to maximise their effectiveness in activating private finance and reducing emissions.**

The goal of optimising the final impact of public incentives and maximising the mobilisation of private finance (credit and investment) must also be supported by an ad-hoc financial strategy. This should be consistent with the objectives and the legislative and regulatory instruments that the European Union is developing as part of the Green Deal in order to guide investment finance (Taxonomy, CSRD, CSDD, SFDR, etc.).

However, a decisive (though not well explored) component of the EU financial strategy is that aimed at activating private credit (which ECCO has already

dealt with extensively on other occasions, to which we refer)[1]. **These channels (which leverage the EIB and the National Promotional Banks or NPBs) have already been partly activated in Italy to cope with the liquidity crisis of companies due to the pandemic in 2020-21.** They could thus be redesigned to facilitate the provision of bank credit that is conditional on the realisation of the energy and climate transition through the involvement of Italian NPBs (CDP, SACE, and Invitalia-MCC)[2].

iii. Closely connected to the issue of public finance sustainability are, lastly, the reforms of the **Stability and Growth Pact** currently under discussion in Europe and the Commission's proposal for establishing a **European Sovereignty Fund** (which ECCO has already discussed and to which we refer)[3]. The reform drafts of the former in fact envisage the preliminary negotiation between individual governments and the European Commission of specific multiannual adjustment paths (4-7 years) for each country, and the application of stricter and more rigorous discipline throughout. However, when requested by the Italian government, they excluded the possibility of separating green investments from the calculation of the budget balances to be reduced (golden rule). This approach places responsibility on national governments for reconciling the investment effort for the ecological transition with the (necessarily restrictive) stabilisation trajectories of public finances. Together with the simultaneous relaxation of European constraints on state aid, this leads to inevitable imbalances in the fiscal capacity of different EU countries due to the different starting levels of their public debt. This different fiscal capacity, combined with more restrictive constraints for the more indebted countries, compromises (or at least strongly weakens) their ability to independently implement the ecological transition. In this context, it is therefore crucial for Italy:

- **to systematically connect public investments with the European objectives of the Green Deal, aligning them with the NRRP and the NECP.** According to the Commission's proposal for reforming the Stability

[1] Cf. ECCO, *"Il ruolo delle Banche del Clima nella strategia del Green Deal europeo"* (November 2021), https://eccoclimate.org/wp-content/uploads/2021/12/Il-ruolo-delle-banche-del-clima_Rapporto.pdf

[2] Cf. ECCO, *"Cassa Depositi e Prestiti: National Promotional Bank del Clima?"* (January 2022), https://eccoclimate.org/wp-content/uploads/2022/01/CDP_20220110.pdf ; ECCO, *"SACE: Export Credit Agency del Clima?"* (January 2022), https://eccoclimate.org/wp-content/uploads/2022/01/SACE_20220110.pdf ; ECCO, *"Invitalia-MCC: Regional Development Financial Institutions italiane del clima?"* (January 2022), https://eccoclimate.org/wp-content/uploads/2022/01/INVITALIA_20220110.pdf

[3] Cf. ECCO, *"A Macroeconomic Governance Framework for the Climate Transition"* (March 2023), https://eccoclimate.org/wp-content/uploads/2023/03/Una-governance-macroeconomica-per-il-clima-en-GB.pdf

and Growth Pact, public debt stabilisation trajectories must be compatible with the pursuit of the EU's strategic targets, especially climate and social objectives. In this approach, the operational quantity subject to planning and monitoring in the new Pact is net expenditure (nationally financed net primary expenditure), the calculation of which excludes all expenditure financed by EU fund interest expenditure, and cyclical unemployment benefits.

- If the new Stability and Growth Pact retains the approach described above, the issue of transition investment financing shifts entirely to the dossier of the establishment the EU Climate and Energy Security Fund[4]. **Achieving the establishment of the Climate and Energy Security Fund at European level (expressly aimed at encouraging decarbonisation and resilience of economies and endowed with adequate resources)** would indeed remain the only option, as national public spending is tied to the progressive reduction of debt. In turn, the Government would have very strong negotiating arguments for the need for the Fund if the investment expenditure planned by Italy (set out in the NECP) was strictly correlated to achievement of the climate objectives dictated and shared by the EU, and strictly consistent with the project goals that the EU already finances through the NRRP.

[4] It is expected to be discussed during the review of the EU Multiannual Financial Framework (MMF), scheduled for summer 2023.

Part I

Decarbonisation and necessary investments

1. Global and European investment estimates from the perspective of net-zero

1.1 Global investment estimates

The estimates accepted by the IPCC in 2018 compared those from global IAM models[5] with those that could be deduced from nationally determined contributions (NDCs) based on policies from 2016 for the 2016-2050 period. The examination of the six main IAM models showed the need for supply-side investment (resource extraction, power generation, fuel conversion, distribution and storage systems) of USD 1.5-3.5 trillion/year and demand-side investment in energy efficiency of USD 640-910 billion/year[6], i.e. overall average annual investment of USD 2.1-4.4 trillion/year (at constant prices). These figures were then compared with an order of magnitude of the cumulative investments projected in 2016 by the NDCs at unchanged policies of three to fourteen times lower (USD 1,500-1,700 billion/year)[7].

The most recent projections confirm the same orders of magnitude. Indeed, the latest UNEP report estimates that, in order to achieve climate neutrality by 2050, global investment would have to be approximately USD 4-6 trillion/year, 20%-30% of new financing flows (i.e. 1.5%-2% of the total financial assets in circulation)[8]. A similar calculation was carried out in 2021 by the IEA (International Energy

[5] Integrated Assessment Models, i.e. models that include economic and climate components and are generally utilised by international organisations and governments to assess the economic impacts of climate change.

[6] The key element in explaining the differences between the assessments in the models examined was mainly the energy consumption projections, in turn related to investments in energy efficiency. The total amount of investment by 2050 could be at least 10% lower with the introduction of strict energy saving policies, although it is unclear to what extent lower supply-side investments would be compensated by higher demand-side investments. Cf. McCollum D. et al, "Energy Investment Needs for Fulfilling the Paris Agreement and Achieving the Sustainable Development Goals", Nature Energy 3 (2018) pp. 589-599.

[7] IPCC (2028) quote p. 154

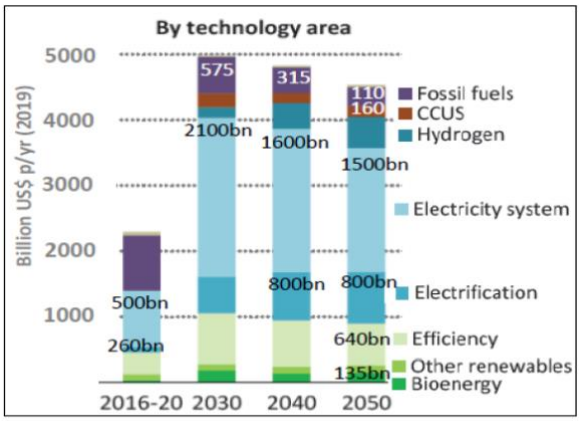
[8] UNEP (2022), UNEP, *"The Closing Window. Emission Gap Report 2022"* (October 28, 2022), https://www.unep.org/resources/emissions-gap-report-2022 pp. XXVI and 65-67. In 2021, the IPCC also assessed that, at constant prices, mitigation investments should be at least three to six times higher than today, i.e. about USD 1.8-3.4 trillion/year: 0.5-1.7 tn in energy efficiency; 0.8-1.5 tn in electricity; 1-1.1 tn in transport and 0.1-0.3 tn in agriculture, forestry and land use. In Europe, the order of magnitude was estimated at USD 0.4-0.8 tn/year. Cf. IPCC, *"Investment and Finance in Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change"*, Intergovernmental Panel on Climate Change (Geneva 2022), https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_Chapter_15.pdf

Agency)[9]. The IEA estimates that the global investment required to achieve net zero emissions (NZE) by mid-century must increase from an annual average of USD 2 trillion[10] over the last five years to double or even triple in the next five years **(USD 5-6 trillion), rising from 2.5% of global GDP to 4.5%-5% by 2030** (and then fall back to 2.5% between 2030 and 2050).

[9] IEA, *"Net-Zero by 2050. A Roadmap for the Global Energy Sector"* (July 2021), https://www.iea.org/reports/net-zero-by-2050

[10] However, Climate Policy Initiative assesses that actual global investments related to decarbonisation goals of economies in 2019-20 were much lower (570bn USD/year). Cf. Climate Policy Initiative, 'Global Landscape of Climate Finance 2021'.

Figure 1.1 – Global annual investment consistent with NZE by 2050



Fonte: IEA, «*Net-Zero by 2050: A Roadmap for the Global Energy Sector*» *(July 2021) p. 81*

However, a study by the International Institute of Sustainable Development (IISD)[11] estimates that, at global level, the projected investment in renewable energy (wind and solar[12]) by 2030 is at least USD 450 bn per year less than what is needed to keep global warming within 1.5°C. According to the IPCC and the IEA, achieving that target would require an annual increase in global installed capacity of renewable energies by 2030 that is 4-5 times higher than current levels. However, the capacity projection under current policies is only able to cover just over half of that requirement[13].

1.2 Investment estimates by the European Union

The financial architecture of the European Green Deal was underpinned by the European Commission's original estimates that achieving the climate targets set out in the Strategic Plan[14] would require additional investments of around **EUR 260 bn per year by 2030**[15] (thus no less than **EUR 2,600-2,700 bn** over the

[11] International Institute of Sustainable Development (IISD), *"Navigating Energy Transition. Mapping the Road to 1,5°"* (October 2022), https://www.iisd.org/publications/report/navigating-energy-transitions

[12] The IPCC report limits the assessment to wind and solar, as these are the technologies with the greatest mitigation potential and the lowest cost per tonne of CO2. Cf. IPCC AR6 (2022), 'Sixth Assessment Report: Working Group III. Mitigation and Climate Change', https://www.ipcc.ch/report/ar6/wg3/

[13] In the 1.5° scenario, installed capacity is expected to reach over 1010 GW in 2030: 350 GW of solar and 660 GW of wind. By contrast, the additional capacity in 2030 under the plans currently in place is only 535 GW (135 GW of solar and 400 GW of wind). IISD (2022) quote p.22

[14] Cf. European Commission, *"A Clean Planet for All-A European Strategic Long Term Vision for a Prosperous, Modern, Competitive and Climate Neutral Economy"* and *"In-Depth Analysis in Support the Commission Communication"*, COM 2018 773 (28/11/2018)

[15] This assessment has been presented by the European Commission as very conservative, as it does not take into account investments needed for climate adaptation or mitigation of the adverse effects of other challenges (e.g.

decade). Those original estimates were later revised upwards by the European Commission, and the current assessment of the order of magnitude of European investment requirements for the energy and climate transition is almost five times higher. Over the 2021-23 period, the European Union's most recent initiatives (Fit-for-55, REPowerEU, and the Green Deal Industrial Plan) have indeed significantly expanded the Commission's assessments of the investment requirements for the transition.

Fit-for-55. Within the scope of multiple amendments to existing legislation[16], the Fit-for-55 package of July 2021 also includes for interventions aimed at significant increases in energy efficiency[17] and the share of final energy consumption provided by renewable sources[18].

However, the set of measures provided for by the Fit-for-55 package entails an estimated total investment of more than EUR 12,400 billion over the 2021-30 ten-year period. Of this, EUR 1,484 billion is for the expansion of production capacity and reinforcement of the electricity distribution network, EUR 3,393 billion for the

biodiversity protection). It also excludes assessments of public investments needed to minimise the social costs of the energy transition as well as the costs of inaction. Cf. COM 2019 640 Final (11/12/2019) p.15

[16] The Fit-for-55 package presented by the European Commission on 14 July 2021 contains amendment proposals for eight existing legislative acts and five new initiatives that include: (a) strengthening the ETS and extending it to new sectors (transport and buildings); (b) increasing energy efficiency and renewable energy use targets; (c) increased penetration of low-emission vehicles and the roll-out of recharging and refuelling infrastructures for alternative fuels (e.g. hydrogen); (d) measures to discourage production relocation (carbon leakage); (e) fiscal policies aligned with the Green Deal; (f) measures to preserve natural carbon sinks (LULUCF). Cf. European Commission, 'Fit-for-55: Delivering the EU 2030 Climate Target on the Way to Climate Neutrality', COM/2021/550 final (July 14, 2021)

[17] The proposal amends existing legislation and revises previous energy efficiency targets (-32.5% primary energy) with a further 9% reduction in energy consumption at European level by 2030. Compared with the previous scenario, the revision implies savings of 36% in final energy consumption and 39% in primary energy consumption. For Member States, compared with the 2017-19 average, the energy saving obligations increase from 0.8% per year (for the period 2021-2030) to 1.5% per year in the period (2024-2030). For Italy, this implies a new target for final energy consumption by 2030 of 94 Mtoe, instead of the 103.8 Mtoe envisaged by the 2019 NECP.

[18] At European level, the target of final energy consumption from renewable sources by 2030 is raised from 32% to 40%. For Italy, the new minimum target is raised from 30% to 36% RES in total final energy consumption. The general targets are correlated with specific sectoral targets: the 2030 target of power from RES as a percentage of electricity consumption (18.2% in 2019) rises from 55%, as set out in the NECP, to 62.2%; the target of thermal systems from RES on heating and cooling consumption (in 2019 at 19.7%) rises from 34% to 40% and that of RES in transport (9% in 2019) rises from 22% to 38%. However, energy efficiency makes a significant contribution to the achievement of these target shares, which reduces the denominator of the ratios.

efficiency and electrification of the energy end-consuming sectors (industry, housing, and services), and EUR 7,540 billion for transport[19] **[Table 1.1]**

REPowerEU. In the second half of 2022[20], following the Russian invasion of Ukraine and the ensuing energy crisis, the EU approved a new package of measures called REPowerEU, which partly modifies and reinforces some of the objectives of the Fit-for-55 and at the same time supplements its budget. The immediate goal of the REPowerEU is to strengthen the EU's energy autonomy by reducing its high reliance on Russian gas imports and, at the same time, to accelerate the transition to renewable energies[21]. Since it has been explicitly stated that the REPowerEU's medium-term objectives and initiatives will be included in the National Recovery and Resilience Plans, the former represents the new basis on which the revision of both the Italian NRRP and the NECP must be built. In the medium term, the REPowerEU provides for:

- An increase in energy savings from 9% to 13%[22] compared with the 2030 Fit-for-55 targets (with particular focus on the transport and residential heating sectors).
- A further increase, from 40% to 45%, in the target share of renewable energies in final energy consumption by 2030[23].

[19] Cf. European Commission, *Renewable Energy Directive. Impact Assessment Report*, SWD (2021) 621 final (14/7/2021), https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021SC0621&from=EN. Original data, expressed in 2015 Euros, have been re-evaluated in 2022 Euros using a deflator (1.1588) and normalised over 10 years.

[20] The REPowerEU initiative had a long and troubled political gestation during 2022, which began on 18 May with the Commission's proposals, amended by the European Council on 4 October and by the European Parliament on 10 November. The trialogues were finally concluded on 14 December 2022 and resulted in approval of the Regulation (first reading) on 14 February 2023.

[21] The REPowerEU plan includes both short- and medium- to long-term measures. In the short term, it is mainly focused on replacing gas supplies from Russia, to be achieved (a) through energy savings (-13 bn m³ of imported gas); (b) through increasing strategic gas stocks (to at least 80%-90% by November 2022); (c) through new strategic partnerships with other gas-producing countries; (d) through the acceleration of renewable energy projects (-50 bn m³ of imported gas); (e) through the increase of biomethane production (-17 bn m³ of imported gas); (f) through the start of EU hydrogen development projects by mid-2023. Cf. European Commission, "RepowerEU Plan" COM (2022) 230 final (18/5/2022)

[22] Further increased to 11,7% after the Trilogue.

[23] The new target raises renewable energy capacity (RES) from 1067 GW under Fit-for-55 to 1236 GW by 2030 and aims to double the amount of grid-connected solar photovoltaic energy by the same deadline (from 300 GW today to 600 GW), saving around 9 bn m³ of gas by 2027.

– An acceleration of industrial decarbonisation plans[24].

In addition to revision of the medium-term targets for energy efficiency and transition to renewables, the REPowerEU includes:

– New regulations and recommendations to speed up authorisation processes for the installation of renewable energy production and distribution plants and infrastructures.
– Initiatives to ensure industry access to critical raw materials for the digital and electricity transition (e.g. rare earths, lithium, cobalt, etc.)
– Initiatives to accelerate the production of energy from hydrogen.
– New national plans in the framework of the RRF (NextGenerationEU Recovery and Resilience Facility), modified to support additional investments in Europe of around EUR 300 bn.

The Commission's assessment is that the total of the medium-term targets recalculated in REPowerEU would entail EUR 298 bn of additional investment compared with Fit-for-55 over the RRF implementation period (EUR 210 bn over 5 years), plus a further EUR 90 bn over the subsequent three-year period (2027-30). Investment would be fully covered in the first period by RRF loans allocated but not requested by most EU countries (EUR 225 bn) and other smaller sources[25].

Green Deal Net Zero Industrial Plan (GDIP). Following approval of the Inflation Reduction Act (IRA) programme in the United States, which allocated USD 370 billion in subsidies for ecological transition technologies with incentives aimed at encouraging the localisation of production in the United States[26], the issue of combining acceleration of the ecological transition with limitation of EU dependence on the importing of strategic technologies and raw materials, as well as the need to protect the competitiveness of domestic production chains

[24] The RepowerEU provides for upfront investments of EUR 3 bn for industrial decarbonisation (from the Innovation Fund) with the aim of saving around 35 bn m³ of imported gas by 2030 (of which 22 bn m³ concentrated in the most energy-intensive sectors (non-metallic minerals; cement, glass, and ceramics; chemicals; refining of oil derivatives) and 30% of steel production powered by green hydrogen.

[25] Potential sources of funding for the additional investment required by the RepowerEU include: cohesion policy funds, the European Agricultural Fund for Rural Development and the Innovation Fund. In line with the overall financial strategy of the Green Deal, EIB funding and the mobilisation of private finance are also mentioned. The possibility of public expenditure contributions from national taxation on specific objectives of RepowerEU is also envisaged (but not quantified). Cf. European Commission, 'Implementing the RepowerEU Action Plan' SWD (2022) 230 final (18/5/2022). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=SWD%3A2022%3A230%3AFIN

[26] Cf. D.Kleimann, N.Poitiers, A.Sapir, S.Tagliapietra, N.Véron, R.Veugeleres, J.Zettelmeyer, "*How Europe Should Answer the US Inflation Reduction Act*", Bruegel, Issue n.4/23 (February 2023)

with respect to non-European ones, has become a top priority also in Europe. In February 2023, the European Commission launched the Green Deal Industrial Plan (GDIP)[27], followed in March by its two main regulatory pillars: the Net-Zero Industry Act (NZIA)[28] and the Critical Raw Materials Act (CRMA)[29]. The NZIA has the goal of defining the strategic lines of European industrial policy with specific reference to the domestic production of strategic technologies for decarbonisation of the economy (net zero)[30]. The CRMA, on the other hand, sets out a coordinated set of actions to ensure that EU countries have secure and diversified access to critical raw materials for the ecological transition.
At a technical level, the European Commission estimates that the investments required for the implementation of the NZIA amount to approximately EUR 92 billion in the period 2023-30[31]. However, as the Commission has explicitly admitted, this is a minimum estimate of the amount of investment actually required, since it only refers to part of the strategic technologies indicated by the NZIA[32], and does not consider the upstream and downstream components of the relevant production chains (raw materials and semi-finished goods)[33]. Therefore,

[27] Communication of the European Commission, *A Green Deal Industrial Plan for the Net-Zero Age*, COM (2023) 62 final 1/2/2023

[28] Regulation of the European Parliament and of the Council, *Net Zero Industry Act*, COM (2023) 161 final, 16/3/2023, https://ec.europa.eu/commission/presscorner/detail/en/ip_23_1665

[29] European Commission, *European Critical Raw Material Act*, https://single-market-economy.ec.europa.eu/publications/european-critical-raw-materials-act_en

[30] The NZIA Regulation provides for: (a) a simplified regulatory and authorisation framework to increase European production capacity in key climate neutral technologies; (b) privileged access to tax and financial breaks; (c) capacity-building programmes; (d) cooperation initiatives and business partnerships at the international level. The 'net-zero strategic technologies' are: (1) Solar photovoltaic and thermal; (2) Onshore and offshore wind; (3) Batteries and storage; (4) Heat pumps and geothermal energy; (5) Electrolysers and fuel cells; (6) Sustainable biogas and biomethane; (7) Carbon Capture and Storage (CCS); (8) Grid. Cf. European Commission, Net-Zero Industry Act, COM (2023) 161 final, Annex (16/3/2023)

[31] Cumulative investments for the period 2023-30 range from a minimum of EUR 52 bn, in the scenario in which European market shares in strategic net-zero technologies remain unchanged in the international context, to a maximum of 119 bn, in the scenario of complete independence in European imports and a substantial increase in European market share internationally.

[32] The assessment excludes solar thermal, wave and tidal energy production technologies, storage without batteries, geothermal technologies, fuel cells for hydrogen energy production, biogas and biomethane production, and grid technologies.

[33] There are also quantification uncertainties about the adoption of some technologies. In the case of batteries, for example, the estimates are much lower than those of industry: industry projections of a battery deployment of up to 1000 GWh of storage capacity would in fact involve investments 60% higher than those estimated by the Commission.

the size of the investments required could easily be well above the EUR 92 billion estimated by the Commission.

In general, the estimated investment needs for implementation of the Fit-for-55 package, RepowerEU, and the GDIP require additional annual investments of approximately EUR 520 bn at European level in the 2021-30 period (compared with the 2011-20 average), which is 3.6 percentage points of the 2021 EU GDP **[Table 1.1]**. The European Commission's new estimate brings the cumulative total of investments needed over the decade to EUR 5200 bn, essentially twice those originally estimated by the Commission for the Green Deal in 2018.

Table 1.1

European Union - GDIP-NZIA - Targets and Investments in the Energy System by 2030

Annual averages	Historical 2011-2020	Ff55 2021-2030	RepowerEU 2021-2030	NZIA 2023-30	Ff55+RepEU+NZIA 2023-30
	€ bn (2022)	€ bn (2022)	€ bn (2022)	€ bn (2022)	€ bn (2022)
SUPPLY SIDE	**55**	**148,4**	**20,1**		**168,5**
- Power Grid & storage	15	55,4	3,9		59,3
- Power plants (incl.boilers and new fuels)	40	93,0	16,2		109,2
DEMAND SIDE	**160**	**339,3**	**9,7**	**13,1**	**362,1**
- Industrial sector	12	34,0	4,1	13,1	51,2
- Residential	102	202,3	5,6		207,9
- Tertiary	46	103,0			103,0
TOTAL ENERGY SYSTEM	**215**	**487,7**	**29,8**	**13,1**	**530,7**
- Transport	549	754,0			754,0
TOTAL ENERGY SYSTEM+TRANSPORT	**764**	**1241,7**	**29,8**	**13,1**	**1284,7**
of which: additional investments		**477,7**			**520,7**

Source: CE NZIA SWD (2023) 68 final Annex 1 p.43

2. Italy's emissions reduction goal for 2030

Italy is required to set out its greenhouse gas (GHG) reduction targets and methods within the framework of EU climate governance[34]. The two main instruments required for the medium- and long-term planning of decarbonisation pathways by Member States are the National Energy and Climate Plan (NECP), which focuses on energy policies for a 10-year period[35], and the Long-Term Strategy (LTS), which analyses long-term decarbonisation pathways (to 2050), especially in relation to the technological options available[36].

The core 2030 GHG reduction targets in the 2019 NECP, built upon the EU target of a 40% reduction by 2030 compared with 1990 levels, have however been overtaken by the redefinition of the 2020 European targets, which aim for a 55% reduction by 2030 (again compared with 1990 levels). Partial revisions on the basis of this redefinition of the emissions scenarios in the current NECP can be found in the 2021 Economic and Financial Document (DEF)[37], down 42% compared with 1990, and in the 2022 Ecological Transition Plan (*Piano per la transizione ecologica – PTE*)[38], down 51% compared with 1990. However, in both cases, and unlike the NECP, these projections are not related to quantitative assessments of the sectoral impacts of the planned policy measures. Since the purpose of this paper is to calculate the amount of investment needed to adapt to the new European targets, reference will be made exclusively to the NECP.

2.1 The original objectives of the 2019 NECP

The last version of the NECP version was published at the end of 2019. It defined a broad range of measures that aimed to achieve the goals that were set by the EU in compliance with the 2015 Paris Agreement. These goals included

[34] EU, Regulation (EU) 2018/1999 of the European Parliament and of the Council (11/12/2018), https://eur-lex.europa.eu/legal-content/IT/TXT/PDF/?uri=CELEX:32018R1999&from=EN

[35] National Energy and Climate Plan (NECP) (December 2019), https://www.mise.gov.it/images/stories/documenti/PNIEC_finale_17012020.pdf

[36] MITE, Italian Long-Term Strategy for greenhouse gas emissions reduction (January 2021), https://www.mite.gov.it/sites/default/files/lts_gennaio_2021.pdf

[37] MEF, *'Relazione del Ministro della Transizione Ecologica sullo stato di attuazione degli impegni per la riduzione delle emissioni di gas ad effetto serra'*, Annex of the 2021 Economic and Financial Document (DEF) (April 2021)

[38] The Ecological transition plan (PTE) is the linking document between the LTS (2021), the drafts of the NRRP (2021) and the guidelines of the European Fit-for-55 package (July 2021). Cf. Ministry of the Environment and Energy Security (MITE); 'Piano per la transizione ecologica' (March-April 2022), https://www.mite.gov.it/pagina/piano-la-transizione-ecologica

greenhouse gas (GHG) reductions[39] for the EU of **40% compared with 1990 levels** by 2030. This overall EU goal implied the following national and sectoral targets for Italy:

- **for ETS sectors, a target of -43% compared with 2005[40]**.
- **for non-ETS sectors**, a national target (established with the Effort Sharing Regulation and based on the relative GDP per capita of Member States) of -33% compared with 2005.

While the ETS targets are the subject of initiatives decided at European level, efforts to meet the targets for the non-ETS sectors are delegated to national policies, harmonised under the EU Effort Sharing Regulation (ESR)[41]. These affect, for example, interventions on transport (such as reducing private transport needs, promoting public transport, and phasing out fossil-fuel based transport), buildings (support schemes for the modernisation of buildings, heating/cooling systems based on electricity and/or based on renewable energies), agriculture

[39] According to the Kyoto Protocol, there are six greenhouse gases on which the common reduction commitment should focus: (1) carbon dioxide (CO2); (2) methane (CH4); (3) nitrous oxide (N2O); (4) hydrofluorocarbons (HFCs); (5) perfluorocarbons (PFCs); (6) sulphur hexafluoride (SF6). To these the ESR Regulation added (7) nitrogen trifluoride (NF3). Cf. https://ec.europa.eu/clima/policies/strategies/progress/kyoto_1_en. From 2021, emissions and removals from land use and forestry will instead be regulated by the *Land Use Land Use Change and Forestry (LULUCF) Regulation* [2018]. Cf. https://ec.europa.eu/clima/news/regulation-land-use-land-use-change-and-forestry-2030-climate-and-energy-framework-adopted_en and https://ec.europa.eu/clima/policies/forests/lulucf_en

[40] With Directive 2003/87/EC (Emissions Trading System Directive), later amended by Directive 2009/29/EC, the EU established an Emissions Trading System (EU ETS) for the industrial sector, based on a cap-and-trade system that sets a cap on allowable emissions and the trading of allowances between system participants. Directive 2018/410/EU establishes the rules for the functioning of the EU-wide emissions allocation/trading system (EU-ETS or European Union Emissions Trading System) for the period 2021-2030. The sectors included in the Directive are listed in a new carbon leakage list (i.e. those exposed to a high risk of carbon leakage): the energy sector, energy-intensive industries, and aviation. The ETS is the European Union's emissions trading system for the industrial and thermoelectric sectors. The ETS mechanism provides for the setting of emissions caps for installations or carriers included in the system. These caps are progressively reduced over time and in line with European decarbonisation targets. Installations (or carriers) that exceed their allocated caps can buy allowances at auction to cover the exceedance, those with emissions below their allocated cap can sell them. In this way, the ETS forms a market price for GHG emissions. The EU influences the GHG price through the allocation of free allowances on the basis of sector benchmarks based on the best emissions performance of installations in the EU. Should the sum of allocations exceed the cap, a linear reduction factor that is equal for all sectors is applied.

[41] REGULATION (EU) 2018/842 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 30 May 2018, setting binding annual targets for Member States (for the periods 2013-2021 and 2021-2030) for emissions from sectors not covered by the EU Emissions Trading System (EU-ETS), e.g. transport, buildings, agriculture and waste. Unlike the sectors covered by the EU-ETS, which are regulated at EU level, it is up to the Member States to adopt national measures and policies to limit emissions from non-ETS sectors.

(climate- and environment-friendly practices, conversion of livestock manure into biogas, etc.), waste and non-CO2 gases[42].

2.2 Revision of the EU 2030 targets and the potential impact on Italy

Between late 2019 and mid-2020, the EU redefined its decarbonisation targets as part of implementation of the European Green Deal[43], the package of measures presented in July 2021 and known as Fit-for-55[44]. With the aim of achieving climate neutrality (i.e. net-zero emissions) by 2050, the new binding EU target for 2030 has been raised from -40% to **-55% net compared with 1990 levels.** In line with the new European target, for Italy total emissions in 2030 should now fall to **233.4 MTCO2e** compared with the target of 328 MTCO2e in the previous version of the NECP. Thus, **compared with the pre-pandemic 2019 levels (418 MTCOe), the Italian effort to reduce emissions by 2030 has essentially doubled [Table 2.2].**

From the legislative and regulatory point of view, part of the effort is not a direct responsibility of the Italian government as the ETS sectors are subject to European regulations. As seen above, the ETS mainly includes the power sector and energy-intensive industries, intra-EEA flights and maritime transport (which includes parts of international routes). However, responsibility for European regulation by no means implies that the investment and financing burdens are borne by the EU. Compliance with European regulations in the ETS sectors has to be achieved through investments made almost exclusively at national level. **The division between ETS and non-ETS sectors is therefore not relevant for**

[42] In the 2019-2030 projection, the most significant contributions to emission reductions in the NECP (2019) were concentrated on **electricity generation** (-34.8 MTCO2e), the **buildings and commercial sector** (-28.5 MTCO2e) and **transport** (-23.5 MtCO2e). On the other hand, contributions from other sectors appeared much smaller, such as emissions from energy consumption in agriculture (-1 MTCO2e); those from **industrial processes** (-4.9 MTCO2e) and from **waste** treatment (-5.2 MTCO2e). Emissions from **farming** appeared to increase compared with 2019 (+1.5 MTCO2e), evidently following the population growth trend that was assumed in the foreword to the 2019 NECP **[Table 2.2 column *a*]**.

[43] European Parliament (November 2019) https://www.europarl.europa.eu/news/en/press-room/20191121IPR67110/the-european-parliament-declares-climate-emergency; European Commission (December 2019), COM/2019/640, https://eur-lex.europa.eu/legal-content/IT/TXT/?qid=1576150542719&uri=COM%3A2019%3A640%3AFIN

[44] Cf. European Commission,*'Fit-for-55: Delivering the EU 2030 Climate Target on the Way to Climate Neutrality'*, COM/2021/550 final (July 14, 2021) https://www.consilium.europa.eu/en/policies/green-deal/fit-for-55-the-eu-plan-for-a-green-transition/#:~:text=The%20European%20climate20law%20makes,EU%20climate%20neutral%20by%202050.

quantification of the total investment needs, or for the composition of their financing. On the other hand, energy efficiency and decarbonisation policies governing the buildings sector (housing and commercial), road and rail transport, agriculture (both for energy consumption and for crops and livestock) and waste disposal/recycling are entirely the responsibility of national policy.

Table 2.1

NATIONAL GHG EMISSIONS AND EUROPEAN TARGETS V. NECP (DEF update 2021)

GHG emissions (Mt CO2 eq)					*DEF (*) 2021* Estimates	*PNIEC 2019* Original targets	*DEF (***) 2021* WAM targets	*UE -55% (**) 2020* New targets
	1990	2005	2015	2019	2020	2030	2030	2030
NATIONAL EMISSIONS (a+b+c)	**518,7**	**589**	**440,4**	**422,3**	**379,4**	**328**	**303,3**	**233,4**
(a) ETS sectors		250,4	156,2	140,9	124,4	109	95,7	73,0
(b) ESD/ESR sectors		343,8	280,9	278,9	254,1	216	205,2	156,6
(c) National flights not subject to ETS		3	2	2	2	2	2	3,8
(d) ESD/ESR TARGETS (*)		**363**	**304,2**	**293,4**	**291**	**218**	**207,6**	**160,4**

Source: tables 5 p.47 and 71 p.269 NECP ; (*) Updated DEF 2021 annex 1 Ecological Transaition p.19 and p.29

(**) Our scenario estimates -55%; (***) Reference scenario DEF 2021 Annex 1 p. 29 (historical) and Tables III.1 p.28

As mentioned above, the NECP has not yet been officially updated to align with the new European targets. However, on the basis of European climate governance, the Plan will have to be updated by the Italian government by June 2023. Following the Commission's assessment, the Plan will then have to be sent in its final form to the EU by June 2024.

Since no modelling tools are available to take into account the different adjustment costs for individual sectors (and thus to distribute emission cuts also according to their relative cost-effectiveness), the new sectoral emission targets can be approximated by maintaining the same proportions as the old target, assuming that the -189MTCO2e of the new reduction is distributed in the same proportion as the -94 MTCO2e of the previous target[45]. Even at sectoral level, the impact of the revision of the emission targets determines such a broad agenda

[45] The assumption in the assessed breakdown of Table 2.2 is that each sector participates in meeting the new target (233.4 MTCO2e) in proportion to its percentage weight in total 2030 emissions (implicit in the NECP estimates). This assumption is equivalent to linearly extrapolating the trajectories of the sectors originally assumed by the NECP and thus emphasising their different intensity.

of interventions that it represents an extraordinary and impressive transformative effort for the Italian economy[46].

A significant component of the emission reduction targets in the old NECP (2019) came from energy efficiency. In the view of a general objective of reducing energy consumption by **32.5%** by 2030 compared with the trend forecast[47] set at the time by the European Union[48], the NECP envisaged for Italy a reduction in primary energy consumption of **43%** (to 125 Mtoe against 158 Mtoe EU) and in final energy of **39.7%** (to 103.8 Mtoe against 124 Mtoe EU)[49].

With the Fit-for-55 package, the previous efficiency targets are also revised by the Union, with a further EU-wide reduction in energy consumption of 11.7% by 2030. Compared with the previous scenario, the revision implies savings of 38% in final energy consumption and 40.5% in primary energy consumption. For member countries, the energy savings obligations compared with the 2017-19 average increase from 0.8% per year (for the period 2021-2030) to 1.5% per year in the period 2024-2030. For Italy, the Fit-for-55 implies a new final energy consumption target in 2030 of 94 Mtoe instead of that of 103.8 Mtoe, envisaged by the 2019 NECP. The REPowerEU further increased the ambition of energy savings compared with the Fit-for-55 targets to 2030, with a particular focus on the transport and residential thermal sectors.
With such a wide revision of the sectoral decarbonisation and energy efficiency targets compared with the 2019 NECP, it is reasonable to assume that the scale of Italy's decarbonisation ambitions and the related investment effort should also be updated correspondingly.

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[46] Compared with the NECP targets (2019), the contribution of the energy industry (electricity production and distribution) should increase from -34.7 to -51.1 MTCO2e); that of industry should be even more than eight times higher (from -2 to -15.8 MTCO2e); that of Transport (from -24.3 to -47.9 MTCO2e) and Housing/Commercial (from -28 to -43.3 MTCO2e) should double and increase by one and a half times, respectively. [Tab.2.2 col. d]. These emission estimates are very simplified and do not tend to take into account sectoral reduction costs, based on the technologies adopted (elements that require appropriate modelling projections). However, the estimates made are useful to quantify orders of magnitude of the investments needed and to develop a methodology for comparing what will be the official estimates.

[47] The trend forecasts in the NECP are based on the reference forecasts published in 2007 by the EU Directorate for Energy and Transportation and produced with the PRIMES model. Cf. EU, 'Energy and Transport: Trends to 2030' (update 2007), henceforth PRIMES (2007). The same projections were subsequently updated in 2016. Cf. EU, 'EU Reference Scenario: Energy, Transport and GHG Emissions Trends to 2050' (2016) henceforth PRIMES (2016). The NECP base scenarios are obtained by applying the EU projected percentage changes to the most recent historical data.

[48] Directive 2012/27/EU (par.1 and Art.3 par.5) sets a target for each Member State in terms of primary or final energy consumption to be achieved between 2020 and 2030.

[49] NECP (2019) pp.65-75

Table 2.2

GHG EMISSION PROJECTIONS BY SECTOR (Update DEF 2021)

	Historical data (*)				GHG targets					
					(a) NECP - 40%	*NECP*	*(c.1) DEF 2021*	*(b.2) DEF 2023*	*(c.2) RSE Fit55*	*(d) EU - 55% (**)*
	1990	2005(*)	2019 (*)	2021(*)	Targets 2030	WEM targets 2030	WAM targets 2030	WEM targets (*****) 2030	WAM targets 2030	Targets 2030
	MtCO2	MtCO2	MtCO2	MtCO2	MtCO2	MtCO2	MtCO2	MtCO2	MtCO2	MtCO2
TOTAL FROM ENERGY USES	**425,3**	**488,3**	**336,4**	**333**	**256,0**	**285,9**	**236,7**	**269,4**	**202,1**	**182,2**
Energy industries	137,6	159,9	91,7	86	57,0	77,5	52,7	59,3	45,0	40,6
Industry	92,3	92,3	50	54	48,0	49,0	44,4	40,3	37,9	34,2
Transport	102,2	128,4	106,3	103	82,0	100,0	75,8	92,4	64,8	58,4
Residential and commercial	78,9	95,8	81	83	53,0	58,3	49,0	70,3	41,9	37,7
Agriculture energy consumption	14,3	11,9	7,4	6,0	7,0	7,8	6,5	7,0	5,5	5,0
Other	0	0	0	0	8,0	8,9	7,4		6,3	5,7
TOTAL FROM OTHER SOURCES	**93,4**	**105,9**	**85,9**	**85**	**72,0**	**80,4**	**66,6**	**80,3**	**56,9**	**51,2**
Industrial processes/Fluorinated gas	40,4	47,2	34	32	29,0	32,4	26,8	32,9	22,9	20,6
Agriculture Crops and livestock	35,7	34,6	32,2	33	31,0	34,6	28,7	31,6	24,5	22,1
Waste	17,3	24,1	19,7	20	13,0	14,5	12,0	15,9	10,3	9,3
TOTAL (**)	**518,7**	**594,2**	**422,3**	**418**	**328,0**	**366,3**	**303,3**	**349,7**	**259,0**	**233,4**
of which: ETS (***)	173,1	250,4	140,9	132	112,0	123,0	95,7	103,7	73,0	70,0
of which: ESD/ESR (***)	342,6	343,8	278,9	284,0	216,0	240,8	205,2	246,0	184,0	163,4
LULUCF absorptions		-35,6	-41,8	-27,0				-34,9		

Source: tables 5 p.47 and 71 p.269 NECP ; (*) Updated NECP 2023 ExSumm Table 7 and Table 86 p.388; (*) DEF 2023 Annex 1 Ecological Transition p.27

(**) Our estimates scenario -55%; (***) Reference scenario DEF 2021 Annex 1 Table III.1 p.28

(****) WEM=estimated trend with existing measures (estimated sectoral division); WAM= trend with additional planned measures (estimated sectoral division)

(*****) WEM under current policies including NRRP measures

3. Investment estimates in Italy in the net zero to 2030 outlook

3.1 The investments envisaged by the 2019 NECP

The NECP 2019 assessed an average annual inertial investment volume of EUR 92 bn (cumulatively EUR 1195 bn between 2017 and 2030). In addition to the efficiency/reconversion of energy production and distribution (district heating, power generation and grid), average annual investments estimated in the NECP for the 2017-2020 period were concentrated on the transport (EUR 58.4 bn), civil construction, i.e. thermal residential/tertiary (EUR 20.8 bn) and energy (EUR 10.1 bn) sectors. Total investments for industry (EUR 2.5 bn) were relatively modest **[Table 3.1]**[50].

The volume of new average annual investment quantified by the 2019 NECP now appears to have been largely underestimated considering both the new European decarbonisation targets and the revised EU-level investment needs estimated by the European Commission **[Table 1.1]**[51].

3.2 The state of the art

At the end of 2021, RSE updated its estimates of the investments needed by Italy to adapt its energy and industrial policies to the new European decarbonisation

[50] In brief, the measures envisaged in the NECP of December 2019 were as follows: in the **residential sector** (private and commercial), the focus was on energy efficiency measures in existing buildings through the dissemination of new technologies (heat pumps, etc.); in the **transport sector**, interventions were focused on the gradual replacement of the vehicle fleet with reduced energy consumption/low CO2 emission vehicles (estimated at 6 million vehicles by 2030); the reduction in emissions from **industrial processes** essentially in the production of cement, lime and steel and fluorinated gases; in **waste** management, emission reductions were in the total quantities produced, with a lower share of biodegradable substances sent to landfill, and percentages of methane recovered from landfill gas (which in turn were linked to the separate collection target of 60% by 2030); in **agriculture**, emissions were attributed to multiple factors (the number and type of livestock, changes in cultivated areas and the type of crops, extension of the use of nitrogen-containing fertilisers, etc.), which have been stable over the last few years), factors that were found to be stable over time and little affected by changes in fertiliser types or biogas production; finally, in the **energy** sector, the NECP projected a 30% share of renewable energy in gross final energy consumption by 2030, broadly in line with the previous EU target (32%).

[51] As seen above, by aggregating the impacts of subsequent normative and regulatory innovations (Fit-for-55, RepowerEU and GDIP), the updated assessment of European investments appears to be double the original one (annual average of EUR 520 bn instead of EUR 260 bn) and represents 3.6% of EU GDP in 2021.

targets, indicating an average annual investment volume of EUR 113 bn (cumulatively EUR 1,128 bn over the 2020-30 decade)[52].

A similar exercise was subsequently replicated by RSE in conjunction with Confindustria in March 2023[53], based on the new post-energy crisis scenario and with some revisions in policy assumptions. However, the scenario developed by Confindustria assumes a reduction in emissions by 2030 that is below the EU target (-50% compared with 1990 levels). The investments assumed by Confindustria (2023) are higher than those of RSE (2021), totalling an annual average of EUR 116 bn (cumulatively EUR 1163 bn over the 2020-30 decade).

Finally, in a summer 2022 report on Italy and Spain, Enel Foundation-Studio Ambrosetti[54] estimate that, by 2050, Italy alone will have to cumulatively invest over EUR 3350 bn to achieve climate neutrality and that, of this, EUR 1056 bn must by 2030[55]. The Enel Foundation-Studio Ambrosetti's average annual estimates to 2030 are also higher than EUR 105 bn.

The results of the first two estimates (by RSE and Confindustria) are particularly indicative, as they were developed applying the same methodology as that adopted for developing the NECP[56], and will therefore be used as the main comparison here.

It is important to note that all the analyses examined point out that the volume of the investments required (annual average normalised over the 2020-30 ten-year period) is significant, ranging from an average annual amount of EUR 105.6 bn (ENEL-Ambrosetti) to EUR 116.3 bn according to Confindustria (compared with

[52] Cf. RSE, *'Studi a supporto della governance del sistema energetico nazionale'* (December 2021).

[53] Confindustria, *'Scenari e valutazioni di impatto economico degli obiettivi Fit-for-55 per l'Italia'* (March 2023)

[54] Enel Foundation-Studio Ambrosetti, 'Net-Zero E-economy 2050. Decarbonisation Roadmaps for Europe: Focus on Italy and Spain' (August 2022), https://www.enelfoundation.org/topics/articles/2022/09/net-zero-e-conomy-2050. The simulations were carried out by Enel Foundation-Ambrosetti on the basis of the PRIMES model, the same used by the European Commission to project energy and emission scenarios to 2050 for all member countries.

[55] Enel-Ambrosetti's report also estimates that, paradoxically, lowering ambition compared with NZE to 2050 and postponing certain initiatives and investments leads to higher, not lower, overall burdens (EUR 3899 bn cumulative vs. EUR 3351 bn) by 2050.

[56] Like the NECP, both reports are based on the methodology adopted by RSE with different scenario projections and policy assumptions. The projections of the main macroeconomic drivers are based on those of the European Commission (Primes EUref): 2019 NECP on those of 2016; and RSE (2021) and Confindustria on those of 2020 updated to take into account the most recent economic developments. The energy scenarios were developed on the basis of the TIMES-RSE model. Cf. RSE, AA.VV. 'Studies Supporting the Governance of National Electricity and Energy Systems', RSE, RDS Reports nos. 18001055 and 18007604 (2018).

EUR 91.8 Bn in the 2019 NECP[57]). However, these ratios were drawn up before implementation of the REPowerEU plan, and do not incorporate its new energy efficiency and renewable energy targets, nor do they take into account the industrial policy guidelines of the subsequent Green Deal Industrial Plan (GDIP).

ECCO's assessments[58] are higher than those indicated (**EUR 121.1 – EUR 132.8 bn annual average**), partly to take into account European regulatory developments since the reports were drawn up (in particular the REPowerEU and the GDIP), and partly on the basis of its own autonomous policy assumptions. **[Table 3.1]**

The main differences between the assessment of ECCO and those of RSE (2021) and Confindustria (2023) are concentrated in the transport, civil construction, and industry sectors, while in the energy sector the overall assessment is essentially aligned.

In the energy sector, the volume of total investment estimated by ECCO (an annual average of EUR 17.5 bn) is in fact slightly higher than that estimated by RSE (EUR 14.9 bn) and Confindustria (EUR 15.3 bn). However, compared with the latter two estimates, the electricity production component implies a more significant financial effort (EUR 14.5 bn vs. EUR 9.9-EUR 10.2) than that of grid infrastructure (EUR 3 bn vs. EUR 4.7-EUR 5.3). The quantification adopted by ECCO is based on the Fit-for-55 scenario that was projected by Terna[59], which forecasts a 65% share of renewables in overall electricity demand by 2030 (i.e. 75% of national electricity production alone). In order to reach these targets, the scenario hypothesises the development of renewables at a capacity increase of 80 GW compared with installed capacity as of August 2022, in line with the gap estimated by RSE for 2019 and about double the NECP (2019) forecast of 38.9 GW. Investments in renewables in the power generation sector (estimated on the basis of the mix assumed by Terna and evaluated based on IEA-NEA costs[60]), including storage, are higher than those of RSE and Confindustria, which instead include them among grid infrastructures (annual average of EUR 14.8 bn vs. EUR

[57] The figure normalises over 10 years (2020-30) the EUR 1195 bn that in the NECP was projected over 13 years (2013-30).

[58] Here, ECCO did not develop its own model-based simulations but conducted a critical examination of the hypotheses in the RSE (2021) and Confindustria (2023) projections.

[59] Cf. Terna, *Documento di descrizione degli scenari* (2022), https://download.terna.it/terna/Documento_Descrizione_Scenari_2022_8da74044f6ee28d.pdf

[60] The assessments are from the NEA-IEA source and refer to overnight Capex and consider entire storage capacity will be fulfilled by electrochemical storage as well as by separating out investments in small-scale distributed generation. Cf. Projected Costs of Generating Electricity - 2020 Edition, https://www.oecd-nea.org/upload/docs/application/pdf/2020-12/egc-2020_2020-12-09_18-26-46_781.pdf

10.2). With respect to the quantification of investment in the electricity distribution grid, ECCO's estimates include the most recent extension and renewal plans designed by Terna[61], but do not take into account elements (such as hydrogen production and transport, biorefineries) that RSE and Confindustria instead include among grid investments (under 'system' investments).

In the transport sector, the differences are mainly attributable to the number of electrified cars expected to be in circulation by 2030 (11.2 m vs. 9.5 m), which in turn are linked to the assumptions regarding the share of biofuels in the energy mix. Two different hypotheses have been formulated with respect to this aspect. One is essentially aligned with the minimum limit of biofuels envisaged by the RED III Directive (+100% by 2029), which leads to a forecast of the number of vehicles in circulation (and hence of necessary investments) that is essentially in line with those of RSE and Confindustria. The second hypothesis on the other hand projects a much lower contribution of biofuels (+20% on 2019) and leads to a forecast of a higher number of electric vehicles in circulation (+1.2-1.5 bn vehicles) compared with the reference scenarios. The higher amount of electric vehicles in turn translates into a higher investment requirement (EUR 75 bn on average per year, instead of EUR 67 bn).

In the civil construction sector, ECCO's projections are mainly based on the assumption of an increasing rate of deep renovation (nZEB) of existing buildings over time, resulting in strong energy savings. RSE (2021) does not formulate explicit hypotheses with regard to the extension and depth of building renovations. Instead, RSE hypothesizes a high substitution of traditional forms of heating systems with heat pumps, a factor that changes the energy mix over time, reducing the sector's dependence on fossil fuels for energy consumption. The scenario developed by Confindustria (2023) is calibrated on lower overall emission reduction targets (-50% instead of -55%) and, for the civil construction sector, also incorporates hypotheses of lower energy efficiency (-3.9 Mtoe against 4.7-4.8 Mtoe).

The industry assessments should instead be considered separately. ECCO's methodological approach focused on the analysis of adoptable technologies for the decarbonisation of the main energy-intensive sectors (steel, chemical, non-metallic minerals, and paper) on which sector-specific assessments are available at microeconomic level[62]. This route does not allow a direct comparison with the results of modelling simulations and, due to the partial nature of the sample,

[61] Cf. Terna, *Piano di sviluppo della rete 2023* (2023), https://www.terna.it/it/sistema-elettrico/rete/piano-sviluppo-rete.

[62] These sectors are responsible for 71% of the GHG emissions of the entire industry.

provides much lower assessments of average annual investments[63]. The analysis should in fact be extended to sectors that are less significant from the point of view of emissions, but that are relevant in the context of the recomposition of production chains. Extending the analysis in this direction is, however, beyond the scope of this work and is one of the main areas for future investigation. In order to have an initial and approximate reference, the bottom-up results for the industrial sectors examined have been re-proportioned based on their specific weight within the whole industry[64]. In this case, the overall industry investment assumes dimensioning that is comparable and even higher than that of the modelling estimates (EUR 3.3 – EUR 4.1 bn per year on average versus EUR 2.5 bn). Despite the roughness of the procedure, this order of magnitude appears acceptable (and perhaps still approximated by default) because the modelling simulations probably tend to underestimate industry-wide investment[65]. The estimation of a single aggregate production function for the entire industry is in fact methodologically not suitable to capturing the specificities of the different sectors that make up the industry or identifying the needs for technological change due to decarbonisation[66]. Furthermore, estimates for industry in the reports examined do not include some components that are important in the future necessary process of production upgrading. Indeed, neither the

[63] Annual average of between EUR 580 m and EUR 720 m.

[64] In 2019, the gross fixed capital formation (GFCF) of the surveyed sectors accounted for 17.4 per cent of total industry investment.

[65] Following publication of the Fit for 55 package, which raises the new European decarbonisation targets from -40% to -55% compared with 1990, greenhouse gas emission reduction targets of the Italian industrial sector also need to be revised. Reproportioned to the new European target, the cut in industrial emissions can be estimated at 15.7 MTCO2e (from 49.9 MTCO2e in 2019 to 34.2 MTCO2e) and that of 'Industrial processes' to 13.3 MTCO2e (from 33.9 MTCO2e to 20.6 MTCO2e). An eightfold higher decarbonisation target could reasonably be assumed to be matched by a significantly larger investment effort on the part of industry as a whole than the EUR 2.5 bn/year originally envisaged by the NECP (2019) for the next decade. Despite the higher target for emission cuts, currently available assessments of the investment needed by industry in the new Fit-for-55 scenario (RSE and Confindustria) do not, however, appear to be significantly different from those in the NECP (annual average of EUR 2.5 bn versus EUR 2.7 bn in the NECP). Even those of the Enel Foundation-Ambrosetti are less than half (EUR 1.1 bn).

[66] Neo-classical aggregate production functions (e.g. Cobb-Douglas and CES) assume that production technologies are continuously replaceable, and adjust for input prices. Technological discontinuities may appear as possible changes in elasticities of substitution, but such potential structural changes cannot be incorporated into the estimation of production function parameters (necessarily based on econometric evidence adduced from past trends). Cf. R.Klump, P.McAdam, A.Willman, 'The Normalised CES Producton Function. Theory and Empirics', ECB WP no.1294 (Feb 2011); M.K.Heun, J.Santos, P.E.Brockway, R.Pruim, T.Domingos, 'From Theory to Econometrics to Energy Policy: Cautionary Tales for Policymaking Using Aggregate Production Functions', MDPI, Energies 10, 2030 (2017). With specific reference to the simulations by RSE (2021) and Confindustria (2023), as the energy price projections in the two years diverge, the modest differences in the substitution of fossil sources by renewables could possibly be explained by very low historical elasticities of substitution.

reconversion of refining plants to biofuels/biomethane (which RSE and Confindustria do not reclassify in the industrial sector, but which they register among system investments), nor the Italian share of the effort to support the strategic industrial sectors indicated by the Commission within the GDIP (Net-Zero Industrial Act)[67] are considered in the calculation. Quantification of the investments required in these two areas (especially the second) still seems difficult and uncertain because it largely concerns innovative technology and infrastructure, which are the backbone of the new European industrial strategy, but their impact at national level depends on the determination of the policies of individual countries to fit into the ongoing process of change and to manage it proactively. In the absence of specific and detailed analyses, only circumstantial elements – still very approximate – can be used, for now, as a benchmark for these aspects. According to the projections of RSE and Confindustria, including the first aspect (biorefineries/biomethane) within the boundaries of industry would add an average EUR 350-450 m per year to investments in the sector. Whereas, based on the range of assessments of the European Commission of NZIA-related investments (EUR 13-21 m average per year), Italy's share of investments in strategic sectors could be an additional EUR 1.6 m to 2.6 m per year. If these two components are also taken into account, the assessment of average annual investments in the industrial sector would increase to at least **EUR 5.3-7.2 bn** per year (i.e. 2-3 times higher than that assessed by RSE-Confindustria and 5-6 times higher than that assessed by ENEL Foundation-Ambrosetti). The broader assessment of investments for the industrial reconversion would increase the overall total of new investments needed by an average of EUR 2-3 bn per year. These additional elements have been counted by ECCO only in the calculation of the maximum total investment needed (annual average of EUR 134 bn).

In general, the difference between the updated total investment needs and those originally envisaged by the NECP represents the additional investments for Italy under the new European regulatory framework (Fit-for-55+RepowerEU+GDIP). The additional investment effort compared with the NECP (2019) is EUR 20-25 billion per year (1.2%-1.4% of GDP[68]) according to the assessments of RSE and Confindustria, and EUR 14 billion per year (0.8% of GDP) according to that of Enel Foundation-Ambrosetti. However, based on our

[67] The European Commission assesses that the GDIP requires investments of at least an additional EUR 92 bn (annual average of around EUR 13 bn) over the 2023-30 period. By readjusting these figures by the share of Italian GDP of EU GDP, the volume of additional GDIP-related investments for Italy would amount to more than a cumulative EUR 11 bn (annual average of EUR 1.6 bn). Communication of the European Commission, A Green Deal Industrial Plan for the Net-Zero Age, COM (2023) 62 final 1/2/2023; Regulation of the European Parliament and of the Council, Net Zero Industry Act, COM (2023) 161 final, 16/3/2023, https://ec.europa.eu/commission/presscorner/detail/en/ip_23_1665.

[68] The reference is the nominal GDP of 2021

analysis, it is likely that these assessments are all approximate by default, and that they should plausibly be at least 1.7%-2.4% of GDP (EUR 30-42 bn per year)[69].

Table 3.1 – Meta-comparison of average annual investment assessments for the 2020-30 period

AVERAGE ANNUAL INVESTMENT 2020-30 (€ bn)	ECCO (2023)		RSE 2021 (1)	Confindustria 2023 (2)	ENEL F.-Ambrosetti 2022 (3)	NECP 2019 (4)	NRRP (2021) (5)
	ECCO -55% annual average 2020-30 min (a)	ECCO -55% annual average 2020-30 max (b)	Ff55 annual average 2020-30	NZE scenario annual average 2020-30	NZE scenario annual average 2020-30	Scenario -40% annual average 2017-30	Green quota annual average 2021-26
	€ bn	€ bn	€ bn	€ bn	€ bn	€ bn	€ bn
TOTALE	**122,0**	**133,7**	**112,8**	**116,3**	**105,6**	**91,8**	**14,4**
Building (*)	34,2	34,2	28,1	31,4	23,6	20,8	3,6
Industry (**)	3,3	7,2	2,4	2,6	1,1	2,5	2,7
Transport	66,9	74,8	67,4	67,0	65,2	58,4	5,9
Energy	17,5	17,5	14,9	15,3	15,7	10,1	2,2
- Electricity sector	14,5	14,5	10,2	9,9	10,5	6,5	1,4
- Networks and systems	3,0	3,0	4,7	5,3	5,2	3,5	0,8

(1) RSE, Studies to support governance of the national energy system (Dec 2021)

(2) Confindustria, Scenarios and valuations of the economic impact of the Fit-for-55 targets for Italy (March 2023)

(3) Enel Foundation-Ambrosetti, "Net Zero E-economy 2050" (Aug 2022)

(4) NECP (2019) table 78 p.287 NECP

(5) NRRP+FC: tot. green tag =72.7 bn

3.3 Revision of the NECP and the NRRP

The limitations of the NRRP

The NRRP (National Recovery and Resilience Plan)[70] is the plan adopted by the government to activate the European Recovery and Resilience Facility (RRF), which comprises EUR 122.6 bn in loans and EUR 68.9 bn in grants. This is in addition to the EUR 191.5 bn of the RRF, the ReactEU programme[71] (EUR 13 bn) and the Complementary Fund (EUR 30 bn), provided by the Italian government

[69] As a percentage of the GDP, however, all assessments for Italy appear to be much lower than those of the European Commission, which quantifies the additional investment needed at European level at 3.6 percent of EU GDP (annual average of EUR 521 bn).

[70] Cf. Piano Nazionale di Ripresa e Resilienza # Next Generation Italia. *'Italia Domani'* (April 2021)

[71] The NextGeneration EU (NGEU) package comprises seven different programmes, the largest of which is the Recovery and Resilience Fund (RRF), consisting of EUR 650 bn (of which EUR 312 bn in grants and EUR 360 bn in loans). ReactEU is one of the NGEU programmes (EUR 47.5 bn in total) aimed at addressing the negative economic impacts of the Covid-19 pandemic and expendable within the 2021-23 three-year period (unlike RRF resources, which are to be implemented by 2026).

and financed by the public budget (spring 2021). Altogether, this amounts to EUR 235 bn to be allocated by 2023 and deployed by 2026. Compared with the plans of other European countries, Italy's plan is not only financially more substantial, but also includes both loans and subsidies. Many European countries have preferred to access only non-reimbursable subsidies, rather than taking on more onerous loans[72]. At least with respect to those linked to the RRF (EUR 191 bn), allocation of the Plan's resources appears to be formally consistent with European requirements. Indeed, 40.8% of financial resources are allocated to 'green transition' (against 37% required by the EU), while 26.9% are earmarked for the 'digital transition' (against the 20% required by Europe)[73]. The Italian government's range of action is thus much broader than that of the European programmes. However, in the NRRP there are almost never any explicit indications concerning the final impact of each project, thus preventing any judgements being made as to the overall appropriateness of the planned interventions. Under closer scrutiny[74], the Italy's NRRP shows a scarce strategic focus on climate policies that are actually transformative. An analysis by ECCO, conducted in collaboration with the think tanks E3G and Wuppertal in May 2021, shows that only 16% of the NRRP projects (13% if one also considers the Supplementary Fund) can be classified as unquestionably green[75].

In general, Italy's NRRP does not appear to be very much aligned with the other documents regarding energy and climate that the Italian government has sent to the EU, such as the NECP (2019) and the Long-Term Strategy on the Reduction of Greenhouse Gas Emissions (2021)[76]. In the 2021 NRRP there is no sign of aggregate assessments on energy savings or value chains. Yet aligning the NRRP with the overall targets of the European Green Deal is of strategic importance for Italy today.

Today, the opportunity for a critical revision of the measures in the NRRP is possible thanks to REPowerEU, which allows the addition of new regulations and

[72] For example, the funds that France (EUR 49 bn), Germany (EUR 26 bn) and Spain (EUR 70 bn) included in their national plans refer only to RRF allocations. Spain and Portugal have also only activated non-reimbursable components (grants). Cf. Darvas, Tagliapietra (2021). For detailed analyses: Wuppertal Institute, E3G, 'Green Recovery Tracker Report' https://www.greenrecoverytracker.org/country-reports-overview.

[73] Many projects transversally impact more than one mission. The allocation between the 'Green revolution and ecological transition' (M2) and 'Digitalisation' (M1) missions of the individual NRRP projects is detailed in the table annexed to the NRRP: https://www.governo.it/sites/governo.it/files/PNRR_RiformeInvestimentiMissioni.pdf.

[74] For example, considering only those measures that are consistent with the DNSH (Do No Significant Harm) principle, i.e. consistent with the constraint of having no collateral impacts on any aspect of environmental sustainability.

[75] Cf. Green Recovery Tracker, https://www.greenrecoverytracker.org/country-reports/italy

[76] Cf. ECCO, *'Un PNRR per l'Energia. Un'occasione da non sprecare'* (February 2023), https://eccoclimate.org/wp-content/uploads/2023/02/Pnrr-per-lenergia_17febbraio2023.pdf

funds to improve energy efficiency, and to the precise industrial policy guidelines outlined in the Green Deal Industrial Plan (GDIP). The revision of the NRRP could also be carried out simultaneously with the update of the NECP, which focuses on the new European decarbonisation targets and has to be finalised by June 2023[77]. This is the right context for a better intertwining of Italy's investment plans and European decarbonisation and industrial policy targets.

The opportunity to link the NRRP and the NECP

Ahead of the upcoming deadline for the preparation of NECP drafts, which must be updated based on the goals of Fit for 55 and take into account the changed conditions brought by the Covid-19 pandemic and the energy crisis, the European Commission has prepared a Communication on the guidance to Member States for the update of the 2021-2030 national energy and climate plans (2022/C 495/02).

The guidelines for the update of the national energy and climate plans remind that the NECPs are "the central strategic planning tool under the Governance Regulation and that provide short, medium and long-term **investment predictability**, especially in uncertain times, and are **crucial for mobilising the massive investment needed to achieve the collective ambition of climate neutrality and for having a fair and just transition**, while preserving energy security and affordability".

With regard to the aspects dealt with in this paper, the guidelines state that when updating the Plans, it is necessary:

1. To ensure **consistency with other planning instruments** and to reflect measures, investments and financing and planning instruments established from the submission of the first NECPs in 2019.
2. To provide a detailed financing plan, with a comprehensive and coherent overview of the public and private investments needed to achieve their energy and climate objectives, targets and contributions **at the level of each policy and measure or group of policies and measures**, including **information on the planned investment and related financing from both public (national and EU level) and private sources**.

[77] The December 2019 NECP is still designed on the previous target of a 40 percent emissions reduction compared with 1990 and needs to be adjusted to the 55 percent reduction envisaged by the European Climate Law (2021), which is to be implemented through the Fit-for-55 package (2021).

Regarding the first point, Member States will, therefore, have to fully take into account:

- The energy and climate investments and reforms included in and based on the National Recovery and Resilience Plans (NRRPs) for the achievement of their updated 2030 targets, objectives, and commitments.
- The transition process outlined in the territorial just transition plans, explaining the synergies between the 2030 climate and energy targets and the transition away from fossil fuels, and how the achievement of national targets will specifically mitigate socio-economic impacts at regional level.
- The Social Climate Fund: updated NECPs should include the basic analysis required for the development of social climate plans, explaining how they intend to use the resources of the Social Climate Fund to achieve the relevant objectives, targets, and contributions.
- The Common Agricultural Policy (CAP), with synergies between CAP strategic plans and NECPs.
- Cohesion policies: Member States are also invited to reflect on synergies with existing planning documents drawn up within the framework of the EU cohesion policy for 2021-2027.

With respect to the necessary consistency with the NRRP and its update (in order to include the new REPowerEU chapter), in an earlier briefing, ECCO[78] called for more details on measures in terms of aggregated assessments of energy savings, value chains, and the contribution of each measure to emissions reduction.

In terms of methodology, the realignment between NRRP and NECP would require:

- Re-mapping of the projects in the NRRP based on the strategic priorities of the NECP
  (but also of the National Plan for Adaptation to Climate Change (PNACC)).
- Verification of the carbon footprint of each of the projects.
- Verification of immediate energy security needs, which must take into account both gas demand forecasts and alternative solutions.
- Indication of the effectiveness of the policies and measures to be implemented.
- Identification of the economic sectors that are most exposed to technological change and the territorial areas at risk.

[78] Cf. ECCO, *The National Energy and Climate Plan (NECP): What prospects for the review?*, (March 2023), https://eccoclimate.org/the-necp-what-prospects-for-the-review

NRRP, NECP and public finance

Updating the NECP and refocusing the NRRP has a direct influence on the future evolution of public finance and on the budget policies that are actually pursued by the Italian Government. The main channels of impact are essentially two: (a) the so-called 'penalties' linked to the failure to meet greenhouse gas reduction targets and, above all, (b) the fiscal manoeuvre margins governed by the new Stability and Growth Pact (currently under discussion in the EU).

(a) Indeed, according to the analyses conducted by ISPRA and published last April[79], despite the fact that the adoption of measures that already in 2021 were financed through the NRRP, Italy's emissions are higher than the allocations for the country under the Effort Sharing Regulation (ESR), and non-compliance with the effort sharing targets leads to impacts on public finances that could become significant. In the event that a Member State fails to meet its allocated emission limits, penalties are assigned with the need for further efforts, including economic and financial efforts, to close any gaps[80]. **In other words, the decarbonisation targets assigned to each country cannot be waived and any deviations require more severe (and predictably costly) cumulative adjustments in subsequent years.**
It is therefore necessary to carefully assess the public instruments to be activated, in order to optimise the benefit-cost ratio for each planned measure, not only to govern their impact on public finances, but also to maximise their effectiveness in terms of activating private finance. In this sense, therefore, the Commission's request for guidelines assumes not only a methodological but also a political relevance: for each measure, a detailed analysis will be needed on the effectiveness of public spending both in terms of its direct impact and function as a driver for enabling private investment (especially for a country with a high public debt like Italy)[81].

(b) Closely connected to the issue of the future viability of Italian public finance are the reforms, currently under discussion at the European level, of the

[79] ISPRA, *'Le emissioni di gas serra in Italia: obiettivi di riduzione e scenari emissivi',* Report n.384/2023 (April 2023)

[80] The penalties that apply to the Member State are: a) an amount, in tonnes of CO2 equivalent, that is equal to the excess of greenhouse gas emissions multiplied by a factor of 1.08, is added to the Member State's greenhouse gas emissions for the following year; b) the Member State is temporarily prohibited from transferring any part of its annual emission allocation to another Member State until it complies with its obligations.

[81] Particularly significant on this point is the assessment provided by ISPRA in the eighth national communication on emissions, published on 30 December 2022. Regarding the civil construction sector, the assessment was negative for the Superbonus 110% project. The upgrading of cinemas, theatres, museums, schools, and buildings pertaining to the Ministry of Justice had an effect that was quantifiable in a reduction of about 1% of the sector's emissions, compared with what they would have been without these interventions.

Stability and Growth Pact and the Commission's proposal to set up a European Sovereignty Fund[82]. Indeed, the reform drafts of the former envisage the preliminary negotiation between individual governments and the European Commission of multiannual adjustment paths (4-7 years) specific to each country, and more rigid and rigorous discipline along the way. However, they exclude the possibility of separating green investments from the calculation of the budget balances to be reduced (golden rule)[83]. This approach places the responsibility on national governments for reconciling the investment effort for the ecological transition with the (necessarily restrictive) stabilisation trajectories of public finances. Coupled with the simultaneous relaxation of European constraints on state aid (TCTF[84]), this leads to inevitable asymmetries in the fiscal capacities of different EU countries due to the different starting levels of their public debt. In turn, the different fiscal capacity, combined with more restrictive constraints for more indebted countries, compromises (or in any case strongly weakens) their ability to independently implement the ecological transition.

In this context, it is decisive for Italy to systematically connect public investments to the European objectives of the Green Deal, aligning the NRRP and the NECP with them. According to the Commission's proposal for reforming the Stability and Growth Pact, stabilisation trajectories of public debt must be compatible with the pursuit of the EU's strategic goals, primarily climate and social targets[85]. In accordance with this approach, the operational quantity subject to planning and monitoring is, in the new Pact, net expenditure (nationally financed net primary expenditure), from

[82] Cf. ECCO, *'A macroeconomic governance framework for the climate transition'* (March 2023), https://eccoclimate.org/wp-content/uploads/2023/03/Una-governance-macroeconomica-per-il-clima-en-GB.pdf

[83] Cf. European Commission, *'Proposal for Regulation on the Effective Coordination of Economic Policies and Multilateral Budgetary Surveillance and Repealing Council Regulation EC n. 1466/97'* COM(2023) 240 final (26/4/2023),

https://economy-finance.ec.europa.eu/publications/new-economic-governance-rules-fit-future_en

[84] Cf. European Commission, Temporary Crisis and Transition Framework, https://ec.europa.eu/commission/presscorner/detail/en/ip_23_1563

[85] "(…) *the economic governance framework of the Union should be adapted to help address the medium and long-term challenges facing the Union including a fair digital and green transition, including the Climate Law, ensuring energy security, open strategic autonomy, addressing demographic change, strengthening social and economic resilience and implementing the strategic compass for security and defence, all of which requires reforms and sustained high levels of investment in the years to come.*" Point 4, p.12 COM (2023) 240 26/4/2023.

the calculation of which all expenditure financed by EU funds is excluded[86], in addition to interest expenditure and cyclical unemployment benefits. If the new Stability and Growth Pact maintains the approach described above, the issue of financing transition investments will come under the umbrella of the establishment of a European Sovereignty Fund for climate (EU Climate and Energy Security Fund)[87]. The establishment of a European Sovereignty Fund for climate, expressly aimed at the decarbonisation of economies and the ecological transition and endowed with adequate resources, would indeed be the only viable option (since national public spending is tied to the progressive reduction of debt). In turn, if the investment expenditure necessary for Italy (articulated in the NECP) were strictly correlated to the achievement of the climate objectives defined and shared by the EU and were strictly consistent with the project goals that the Union already finances through the NRRP, the government would have very strong negotiation leverage regarding the need for a Fund.

[86] Cf. art. 2.2, art. 12.b, Annex II.a e Annex VI, COM (2023) 240 26/4/2023.

[87] The discussion on this issue is expected during the revision of the EU Multiannual Financial Framework (MFF), scheduled for summer 2023.

THE ITALIAN CLIMATE CHANGE THINK TANK

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