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THE EUROPEAN RECOVERY PLAN

AS A BREAKTHROUGH FOR GREEN INNOVATION?

COMPARING 14 NATIONAL RECOVERY AND RESILIENCE PLANS

#EUGREENDEAL
#BUILDING EUROPE
#RECOVERYPLAN
#INNOVATION
#CLIMATECHANGE

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1 ■ CHALLENGES AND OPPORTUNITIES FOR AN INNOVATIVE GREEN RECOVERY

1.1 ■ The importance of green innovation for climate neutrality

The EU and its Member States have set themselves the objective to reduce their CO2 emissions by 55% (by 2030 in comparison to the level of 1990) and be carbon-neutral by 2050. To achieve these climate ambitions, they will not only have to massively invest in already existing technologies but also develop and implement innovative technologies, especially to decarbonise the industrial and transport sectors. The size and speed of investment in green innovation will be a deciding factor for the success of the green transition.

1.2 ■ The European recovery plan as an opportunity for green innovation

In response to the Covid-19 crisis, the EU and its Member States have set up a European recovery plan (called NextGenerationEU) based on common EU debt. Through its central instrument, the recovery and resilience facility (RRF), the European recovery plan finances national recovery and resilience plans (NRRPs) through both grants and loans. To receive European funding, a number of criteria are attached to these national investment and reform plans, including the obligation that they spend at least 37% of the overall plan on the green transition. The RRF regulation provides a methodology for climate tracking, detailing to which extent specific types of investment are supporting this objective. While giving a 100% green coefficient (rather than 40%) to many investments financing particularly innovative technologies, it remains up to each individual country, to decide which types of green investment to include in their NRRPs. While all of the 22 NRRPs that have been approved so far by the European Commission and the Council of the EU fulfil the 37% green investment objective, reaching close to 40% taken altogether, we know less to which extent Member States use the European recovery plan to finance innovative green technologies and in which types of green innovation they invest.

1.3 ■ An analysis of 14 national recovery and resilience plans

This policy paper thus analyses the green innovation dimension of a representative selection of the currently approved NRRPs, studying 14 plans. These cover different European countries, Member States of various population size, and contain national variation regarding the absolute and relative size (in relation to national GDP) of RRF funding. The analysis includes four Western-European countries (DE, FR, BE, AT), three Southern-European countries (IT, ES, PT), four Eastern-European countries (RO, CZ, HR, LV) and three Northern-European countries (DK, FI, IE). The 14 NRRPs under analysis cover about 80% (€401bn) of the overall expected RRF spending, which will be roughly €500bn when all NRRPs will be approved.

1.4 ■ Dimensions of green innovation under analysis

To study green innovation, this paper focuses on a number of technologies deemed as particularly relevant to achieve climate neutrality in 2050 beyond status quo green technologies, focusing on the areas of industrial production, energy production and storage, fuels and recharging, and carbon capture. This includes technologies that enable, for example, the production of green hydrogen, e-fuels, low- or even zero-carbon steel and cement, energy storage, or provide methods to capture, use and store CO2 emissions (either through direct air capture or in hard-to-abate sectors). The paper also includes investments in infrastructure that are an important precondition for a successful green transition (e.g. in recharging and refuelling infrastructure) as well as investments in broader research on the green transition in both university and enterprise settings.

1.5 ■ Challenges for the study of green innovation in NRRPs

Before delving into the data on green innovation a few points of caution and potential caveats are in order for an adequate interpretation of the presented numbers. First, this paper adopts a specific definition of what constitutes green innovation. Studies that conceptualise green innovation differently might arrive at considerably higher or lower numbers. It should be noted that relative rather than absolute numbers should be taken into account for interpreting the efforts towards green innovation made in the different NRRPs. Second, even if we have tried to apply our definition of green innovation as coherently as possible to all NRRPs included in this study, there might be some divergences in how specific measures were counted. This is due to the fact, that the various NRRPs are organized in very different manners, sometimes mixing different types of measures in individual investments, rendering the extraction of exact and comparable numbers a challenging task. Some measures contain, at the same time, several green innovation dimensions, investments in green innovation and more traditional green spending or even entail spending on other investment priorities. Using the Staff Working Documents of the European Commission on the individual NRRPs, we have tried to achieve as much granularity as possible, but nevertheless had to make assumptions in some cases on which share of a particular spending envelope would go to green innovation. Specific spending envelopes were generally attributed to the green innovation dimension we considered to be predominant inside it. Third, while this analysis gives an insight in the extent to which Member States have made use of the European recovery plan to finance green innovation, it is important to be aware that some countries might already run ambitious green innovation spending programmes through their national budgets or other EU funding. Without adding up all national and EU-financed spending on green innovation, one has to be careful in extrapolating the (lack of) ambition of specific countries in their NRRPs to their overall policies.

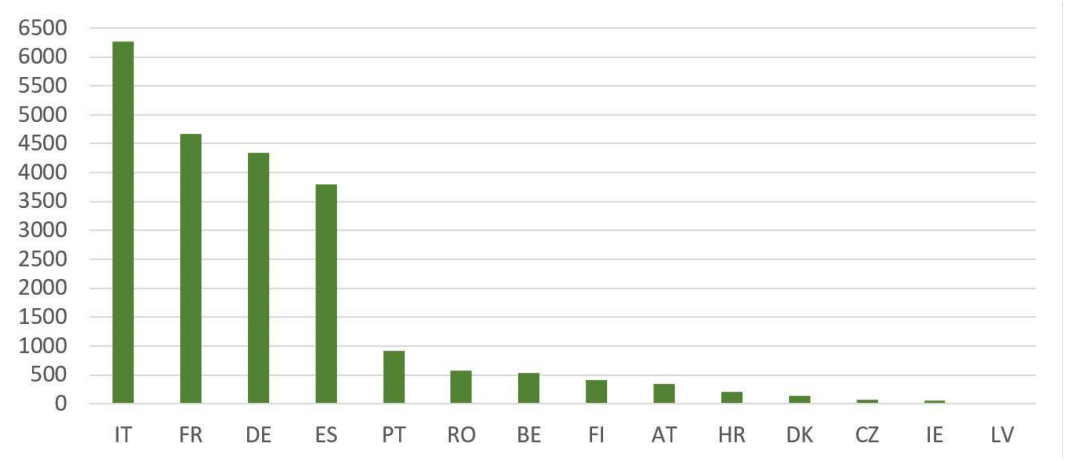
2 ■ OVERALL SPENDING ON GREEN INNOVATION IN NRRPS

Among the 14 NRRPs studied in this policy paper, there are important differences in green innovation spending, both in absolute and relative terms, in relationship to the size of NRRPs and national GDP.

2.1 ■ Green innovation spending in absolute numbers

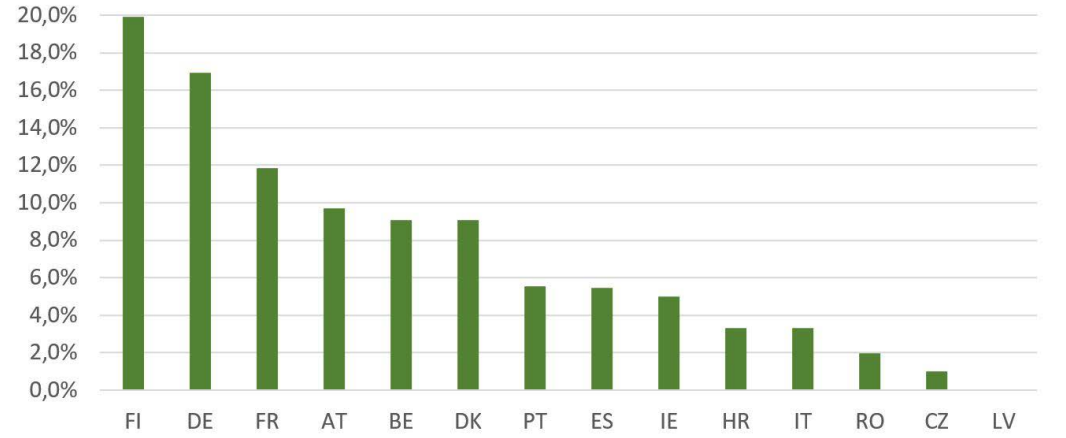
Figure 1 shows the absolute numbers of green innovation spending in NRRPs in million euros. The Italian, French, German and Spanish plan allocate the highest amounts of funding to green innovation, ranging from €6.3bn (IT) to €3.8bn (ES). With a large gap, the other NRRPs follow, all spending less than €1bn on green innovation as defined in this paper. Latvia is the only country that does not spend any money on innovative green technologies.

Figure 1 ▪ Green innovation spending in NRRPs (absolute values in million euros)



Sources: European Commission (2021), Own Analysis

Figure 2 ▪ Green innovation spending as a share of overall NRRP spending



Sources: European Commission (2021), Own Analysis

2.2 ▪ Green innovation spending as a share of NRRPs

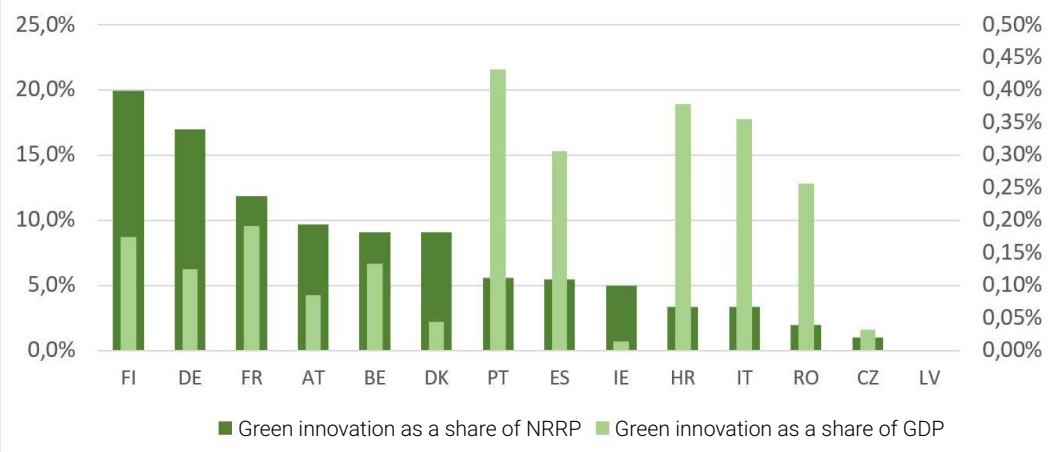
When looking at the relative size of green innovation spending in each NRRP (Figure 2), the picture changes quite substantially. In comparison, Finland and Germany spend the largest shares of the money allocated to them through the European recovery plan on green innovation, with 19.9% and 16.9% respectively. Also France, Austria, Belgium and Denmark use a significant share of their NRRPs for such spending, ranging from 11.8% to 9.1%. Especially the NRRPs of Romania, Czechia and Latvia have very small shares of green innovation spending between 2% and 0%. These data on green innovation spending relative to the size of NRRPs should, however, be taken with a grain of salt. The overall spending envelopes of NRRPs differ very strongly between Member States, as countries that were hit harder by the Covid-19 crisis and that have a lower GDP per capita received substantially more grants from the European recovery plan. In addition, 3 of the 14 NRRPs (IT, PT, RO)

included in this analysis also make use of the loan component of the RRF. Having a high green innovation spending share would be unrealistic for countries having received comparatively large European funding, as there are some limits to the absorption capacity of investments.

2.3 ■ Green innovation spending as a share of national GDP

To account for these issues, Figure 3 shows both green innovation spending as a share of NRRPs and of national GDP. We find that it is Portugal, Croatia, Italy, Spain and Romania that invest most in green innovation in relation to their GDP. In contrast, Denmark, Czechia, Ireland and Latvia spend the least. Thus, even when controlling for the variation in the size of NRRPs, we see that stark differences in green innovation spending remain.

Figure 3 ■ Green innovation spending as a share of NRRPs and national GDP



Sources: Eurostat (2021), European Commission (2021), Own Analysis

Note: GDP data is taken from 2019 to exclude the volatile data linked to the Covid-19 crisis.

3 ■ THE DISTRIBUTION OF GREEN INNOVATION SPENDING IN NRRPS

Beyond the overall spending on green innovation in NRRPs, it is also important to analyse which dimensions of green innovation they include and how much money they receive. Table 1 provides an overview of green innovation spending in different sectors, including hydrogen and green fuels, innovative measures in the industrial sector (e.g. demonstration projects for green steel or cement), recharging infrastructure, energy storage (including batteries), carbon capture, use and storage, and general research on green innovation (including R&D&I). The following sub-sections draw on this data, discussing well-covered and less consistently funded green innovation dimensions.

Table 1 ■ Green innovation spending in NRRPs by sector

MS	HYDROGEN & GREEN FUELS	GENERAL RESEARCH	RECHARGING INFRASTRUC-TURE	INDUSTRIAL SECTORS	ENERGY STORAGE	CO_2 CAPTURE, USE & STORAGE
AT	€125m		€37.9m	€100m	€76.5m	
BE	€387.2m	€26.4m	€61.7m	€50m		€10m
CZ		€7.9m	€64.6m			
DE	€2547m	€50.4m	€742m	€999.3m		
DK	€94m	€15m				€27m
ES	€1555m	€725m	€834m		€684m	
FI	€212.7m	€192m	€20m			
FR	€2625m	€1555.2m	€187.5m	€300m		
HR	€131.9m		€32.3m			€45.9m
IE		€50m				
IT	€2594m	€1693m	€781m	€700m	€500m	
LV						
PT	€185m	€454m	€7m	€238m	€39m	
RO	€115m		€177.5m		€280m	
Sum	€10572m	€4769m	€2945m	€2387m	€1580m	€82.9m

Sources: European Commission (2021), Own Analysis

More detailed data available upon request: eisl@delorsinstitute.eu

3.1 ■ Well-covered green innovation dimensions

Our analysis finds that some dimensions of green innovation are covered in a large majority of plans, such as renewable hydrogen, recharging infrastructure and general research on green innovation.

3.1.1 ■ Hydrogen and green fuels

Spending on hydrogen and green fuels is included in 11 out of the 14 NRRPs under analysis. Only Czechia, Ireland and Latvia do not dedicate any funding from the European recovery plan to renewable hydrogen. Importantly, 6 of the 11 Member States allocating money to hydrogen and related green fuels actually use more than half their green innovation spending on it (BE, DE, DK, FI, FR, HR). Also in absolute numbers, spending on hydrogen is significant, reaching more than €2.5bn in Germany, France and Italy, and more than €1.5bn in Spain. Across all NRRPs under analysis, more than €10.5bn are dedicated to this green innovation dimension. Green hydrogen in NRRPs also has a strong European dimension, as a considerable number of measures are to be undertaken in the framework of the planned Important Project of Common European Interest (IPCEI) on hydrogen, which should be approved in 2022.

3.1.2 ■ Recharging infrastructure

Investments in recharging infrastructure are equally covered by 11 of the 14 NRRPs, missing only in the NRRPs of Denmark, Ireland and Latvia. Particularly Spain, Italy, Germany (spending more than €700m each) as well as France and Romania (allocating more than €150m each) invest strongly in the construction of public and private recharging infrastructure. It is, however, important to acknowledge that also Portugal invests €360m in the construction of recharging stations in the framework of its NRRP, but uses national resources to finance it. Czechia uses the vast majority of its green innovation spending on recharging infrastructure, while spending relative to other green innovation dimensions is considerably more limited in the remaining NRRPs, typically ranging from 10% to 20% of the overall green innovation envelope. Overall, almost €3bn are allocated towards the construction of recharging stations across the 14 NRRPs under analysis.

3.1.3 ■ General research on green innovation

Constituting a rather diverse category, broader research on green innovation is also funded through 10 of the 14 studied NRRPs. It includes funding in both academic and enterprise contexts. It was difficult to further disentangle these measures, because many research funding programmes implemented through NRRPs cover a broad range of different research areas dealing with the green transition. Particularly Italy (€1.69bn) and France (€1.56bn) as well as Spain (€725m) and Portugal (€454m) spend considerable amounts of money on green innovation research. In relative terms, Portugal, Finland and Ireland have dedicated large parts of their green innovation spending on general research. Taken together, more than €4.7bn of NRRP funding are mobilised to invest in general research on green innovation, constituting the second-most important green innovation spending category after hydrogen.

3.2 ■ Less consistently funded green innovation dimensions

Green innovation dimensions that are less systematically financed through NRRPs are innovative measures in industrial sectors, energy storage, off-shore projects and carbon capture, use and storage technologies.

3.2.1 ■ Green innovation in industrial sectors with hard-to-abate emissions

Six NRRPs financially support the transition of industrial sectors with hard-to-abate emissions, including Germany, Italy, France, Portugal, Austria and Belgium. When including Germany's €550m programme on Carbon Contracts for Difference (CCfDs), the overall spending envelope for this green innovation dimension consists of more than €2.3bn.

3.2.2 ■ Energy storage

With an overall spending of roughly €1.6bn, measures towards green innovation in energy storage, including production and deployment of batteries, are financed through the NRRPs of Spain, Italy, Romania, Austria and Portugal. Especially Southern-European countries seem to invest in this dimension of green innovation.

3.2.3 ■ Carbon capture, use and storage

Financing for carbon capture, use and storage solutions is part of the Belgian, Danish and Croatian NRRPs. RRF funding for these technologies is very limited in comparison to other green innovation spending, reaching less than €100m across the different plans. It should, however, be mentioned that in some NRRPs, spending envelopes on hydrogen also include measures related to carbon capture, use and storage. While we thus might underestimate actual spending on this green innovation dimension, the general picture would not change significantly.

4 ■ DIVERGENT GREEN INNOVATION AMBITIONS IN QUANTITY AND QUALITY

The analysis of overall green innovation spending and its distribution across different measures in NRRPs highlights stark differences in the ambition of national policy-makers to use the European recovery plan as an instrument to accelerate green innovation spending, as well as their priorities towards specific technologies and instruments. In principle, the 14 NRRPs under analysis present by and large, maybe with the exception of Latvia and Czechia, a clear effort by Member States to incorporate green innovation into their EU-backed recoveries. The data shows that the three Southern-European Member States included in this study (IT, ES, PT) strongly invest in green innovation, helped by the large European funding allocated to them. Also Romania and Croatia spend quite a large share in comparison to their national GDP on green innovation through their NRRPs. This seems equally related to the generous European support for their relatively vulnerable economies. In contrast, the wealthy Member States Ireland and Denmark have dedicated comparatively little money from the European recovery plan to green innovation. While especially some advanced countries in Europe might already use their national budgets to fund green innovation, this can only be a part of the explanation, as Finland, for example, nevertheless uses almost a fifth of its NRRP to support green innovation technologies and instruments.

Interestingly, none of the 14 NRRPs under analysis covered all six of the green innovation dimensions on which we based this policy paper. The plans that have the most diverse funding strategy for green innovation are those of Belgium, Italy, and Portugal (covering five dimensions) as well as Spain, France, Germany and Austria (covering four dimensions). On the other end of the spectrum, Latvia, Ireland and Czechia only fund 0, 1 and 2 green innovation dimensions respectively. Beyond that, as the analysis above has shown, there is a strong concentration of green innovation spending on hydrogen. More than 47% of all green innovation spending in the 14 studied NRRPs focuses on hydrogen and green fuel technologies. We view this concentration on and limitation of funding to specific green innovation technologies and instruments as a risk. While the efforts to set up a well-functioning renewable hydrogen value chain are laudable, governments should support green innovation technologies and instruments more broadly, especially those that are still in early stages of the innovation cycle and therefore are still decades from wide commercial market adoption. Innovation comes with uncertainty, and a portfolio approach for green innovation seems to be crucial to meet the challenge of Europe's net-zero objectives, tackling decarbonisation from several angles.

5 ■ POLICY SUGGESTIONS FOR THE WAY FORWARD

5.1 ■ A portfolio approach to green innovation across funding sources

As a vast majority of NRRPs has been approved already, a green innovation portfolio approach for the next years should be developed primarily through the creation of a coherent interplay between NRRPs, other EU funding and national funding. In this regard, a reform of the fiscal rules of the Stability and Growth Pact, allowing for more national green investment, and/or another European investment programme based on common debt would also be helpful to ensure a broad and ambitious financing of green innovation. Budgetary constraints on investments that are crucial to achieve the EU's climate neutrality objective should be lifted as much as possible to allow national budgets to complement the European recovery plan.

5.2 ■ Opportunities to maximise green innovation spending inside approved NRRPs

But even inside the already approved NRRPs there are still opportunities to shape their implementation towards a maximisation of green innovation spending. First, Member States should prioritise green innovation projects inside pre-defined spending envelopes. Many of the spending envelopes included in NRRPs that (can at least partially) finance green innovation are rather broad and vague and depend on proposals by enterprises that have concrete investment projects in mind. This means that, depending on the number and type of proposals made, more or less money could go to green innovation in practice. To maximise green innovation spending, governments should thus, on the one hand, incite companies to focus on green innovation projects and, on the other hand, also design selection processes in a manner that prioritises such projects. Second, Member States should top-up specific green innovation funds with national spending if necessary. Should the demand for funding from specific spending envelopes go beyond their size, governments should consider to support eligible green innovation projects through a top-up based on national spending. Making it clear to private actors that the state would jump in if necessary would also help companies to propose bold and innovative projects.

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