

Analytical note¹

Green innovation in national Recovery and Resilience Plans (RRPs)

1) Introduction and methodological note

This analytical note serves as a background document to the joint letter on green innovation in national RRP signed by various organisations that study energy and climate policies. While the analysis is based on 9 national RRP, the discussed findings refer to seven plans (DE, FR, IT, ES, PL, BE, AT) as not all of these plans are already fully publicly available. The reviewed plans total €236.7 billion of EU recovery grants, or 70 percent of the total share of grants disbursed under the Recovery and Resilience Facility. The objective of the analysis was to identify the presence of various key dimensions of green innovation in the plans. The selected dimensions include: overall spending, energy production and storage, fuels and recharging, materials, carbon capture, and regulation. For each of these dimensions, a spreadsheet defined more specific keywords such as green hydrogen, (carbon) contracts for difference, carbon-neutral/low-carbon steel, direct air capture, etc. Using the word search functions, the different investigators identified these key words in the available documents and extracted relevant information in a common spreadsheet.

It is important to note that the analysis focused on particularly innovative technologies and public policies, which are considered vital to achieve climate neutrality by 2050. This includes technologies in early stages of development or deployment and public policies which have not yet been applied on a large scale basis. The reported numbers in this document are thus considerably smaller than normally mentioned regarding green or climate spending in national RRP. There are some important caveats to the analysis and the reported numbers, which should be taken into consideration:

- 1) Spending envelopes which we would, in principle, consider as contributing to green innovation not necessarily only finance such projects. We could thus overestimate actual green innovation spending.
- 2) Some spending envelopes that are primarily geared towards more ‘traditional’ forms of green spending could at least partially be used to finance green innovation measures. There is thus also a potential risk of underestimating actual green innovation efforts in national RRP.
- 3) It is important to mention that this analysis of plans cannot evaluate the overall green innovation efforts of European and national actors, as it cannot give an integrated account of green innovation spending across the RRP, other EU funds and spending from national budgets. We could thus, in a comparative manner, over- or underestimate overall green innovation efforts of different countries depending on how they fund green innovation.

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2) Main findings

2.1) Well-covered green innovation dimensions

Our analysis finds that some dimensions of green innovation are well covered in the studied national RRFs, being a part of investment/reform projects across a majority of countries. Among these green innovation elements are in particular hydrogen and recharging infrastructure. Hydrogen has also a strong European dimension as many investment projects are to be undertaken in the framework of the IPCEI on hydrogen, building up cross-national value chains for the production, storage and use of hydrogen.

Hydrogen

The following table contains country-specific RRF spending on hydrogen. Hydrogen is one of the most clearly delineated green innovation elements in the plans. There are nevertheless risks for an over- or underestimation of actual hydrogen spending as some countries have broader spending envelopes that can potentially also fund innovative hydrogen projects which are not included in this table (e.g. Austria) while some included H2-dedicated spending envelopes might also fund expenses beyond green innovation around hydrogen (e.g. Belgium). Not included are also broader incentives such as contracts for difference, which could, however, be targeted at subsidising H2 (Germany, e.g., plans to spend €550mil on contracts for difference).

	DE	FR	IT	ES	PL	BE	AT
H2 spending	€2.75bn	€2.43bn	€3.14bn	€1.56bn	€0.80bn	€0.39bn	€0.13bn

The seven countries mentioned here plan overall expenditures for hydrogen of roughly €11.2bn euros through RRF funding. Some countries, such as Germany, however also dedicate significant national spending to hydrogen. The German plan mentions more than €3.5bn related to hydrogen and decarbonisation coming from national funding. An important caveat here which should be noted is that while many plans make reference to 'green hydrogen' it is not always clear whether H2 funding would exclusively go towards green hydrogen or could also be used to finance blue hydrogen projects.

Recharging infrastructure

National RRFs also contain funding for recharging infrastructure across the board. The same caveats for the over- or underestimation of spending as for hydrogen also apply here. In some plans, recharging infrastructure is part of spending envelopes also financing the purchase of electric vehicles (e.g. Austria) while some spending envelopes that could partly finance recharging infrastructure are dominantly targeted at other objectives.

	DE	FR	IT	ES	PL	BE	AT
Recharging infrastructure	€700mil	€0mil	€740mil	No exact data	€0mil	€61.5mil	€37.4mil

Overall, the seven countries aim at spending about €1.54bn on recharging infrastructure. It is important to note that some countries subsidise the construction of recharging infrastructure already through national spending such as France. For the Spanish plan, detailed information on specific spending envelopes was missing.

2.2) Interesting country-specific green innovation initiatives

Beyond common and broad green innovation projects, the national RRP of individual countries also contain specific green innovation initiatives, often in coherence with domestic industrial structures and priorities. Here we want to highlight five initiatives that also have the nature of pilot/demonstration projects, being particularly innovative.

- **Carbon contracts for difference (DE)**

The German RRP provides funding for a pilot programme on Carbon Contracts for Difference (CCfD) amounting to 550 million euros. These contracts are supposed to go beyond subsidies for investment and cover additional process costs that innovative technologies might possess in comparison to traditional and more CO₂-intensive production methods.

- **Sustainable aviation fuels (FR)**

The French RRP provides funding for the development of sustainable aviation fuels in its broader support plan for the aeronautical sector, a key industrial sector in the French economy. Funding amounts to up to 1.37 billion euros for R&D support in the aeronautical sector, which could be at least partially used for sustainable aviation fuels.

- **Support of start-ups and VCs towards ecological transition (IT)**

The Italian RRP provides funding for the support of start-ups and VCs that work towards ecological transition amounting to €250 million euros.

- **Carbon capture, storage and use (BE)**

The Belgian RRP provides funding for emerging energy technologies, discussing the opportunities for the capture, storage and use of CO₂. It is, however, difficult to identify the exact spending planned on these measures as most of them are integrated in spending on the development of the hydrogen sector and its transport network.

- **Demonstration projects (AT)**

The Austrian RRP provides funding for eco-innovative measures with a particular focus on demonstration projects amounting to 100 million euros. The plan points out the potential to subsidise larger investment projects than previously possible via national funds, focusing on particularly innovative projects such as 'carbon-free steel'. Such efforts seem to be in line with recent attempts of the large Austrian steel company VOEST to reduce emissions through green innovation.

2.3) Absent green innovation dimensions

While some of the key dimensions of green innovation are addressed in all or many of the analysed national RRP, some other dimensions are largely missing. Based on the utilised key words, we could not identify any plan mentioning green public procurement. In addition, no major investment projects for long-duration energy storage are proposed in the studied national RRP other than in the Spanish plan, which, however, does not define spending on this issue well enough.

2.4) Overall green innovation spending

It is very difficult to compare the individual RRFs in a coherent manner and spending envelopes are organized very differently across countries, rendering the extraction of exact numbers a challenging task. In addition, one has to be aware that some countries might finance green innovation spending already through their national budgets. Without adding up national and EU-financed spending on green innovation, one has to be careful in evaluating the ambitions of specific countries in their RRFs. Focusing on the spending envelopes we identified in relation to the green innovation dimensions on which we based this analysis, we tentatively can show the – most likely incomplete – following numbers (see also the last two pages of this document). Green innovation spending for some countries, such as Italy and Spain, however, might be underestimated here.

	DE	FR	IT	ES	PL	BE	AT
GI spending	€4.56bn	€4.30bn	€4.13bn	€2.93bn	€0.8bn	€0.54bn	€0.31bn

Across these seven countries, this makes for green innovation spending amounting to €17.63bn. Here, spending on research and pilot projects towards the green transition are included in the data.

3) Green innovation spending by national RRF

Germany (DE)

- IPCEI Hydrogen (€1.5bn RRF)
- Pilot programme Carbon Contracts for Difference (€550 mil RRF)
- Subsidy program for decarbonisation of industry (€449.3 mil RRF)
- Lead projects in R&I in the context of the national hydrogen strategy (€700 mil RRF)
- Project-related research on climate protection (€60 mil RRF)
- Subsidies for industry for hydrogen/fuel cells application in transport (€545.9 mil RRF)
- Subsidies for the construction of recharging/refueling infrastructure (€700 mil RRF)
- Municipal real-world laboratories of energy transition (€57 mil RRF)

France (FR)

- Develop the hydrogen sector (€1.93bn RRF)
- Support plan for the aeronautical sector (€1.67bn RRF)
 - o Support for R&D in the sector (1.37bn RRF)
- Innovate in the ecological transition (€1.7bn RRF)
 - o Hydrogen (€500 mil RRF)
 - o Decarbonisation of industry (€300 mil RRF)
 - o Biosourced products, industrial biotechnologies & sustainable fuels (€200 mil RRF)

Italy (IT)

- Energy transition and sustainable mobility (€23.78bn RRF)
 - o Hydrogen for hard-to-abate sectors (€2bn RRF)
 - o Experimentation of hydrogen in road transport (€230 mil RRF)

- Experimentation of hydrogen in rail transport (€300 mil RRF)
- Research and development of hydrogen (€160 mil RRF)
- Development of recharging infrastructure (€740 mil RRF)
- Leadership Hydrogen research and development (€450 mil RRF)
- Support of start-ups and VCs towards ecological transition (€250 mil RRF)

Spain (ES)

- Incentives plan for the installation of public and private recharging points and buying of electric vehicles (C1.I2) → exact data difficult to extract
- Development of innovative renewables energies, integrated into buildings and production processes (including pilot projects and initiatives) (C7.I1) → exact data difficult to extract
- Electricity infrastructure, promotion of smart grids and deployment of flexibility and storage (€1.37bn RRF)
 - Deployment of energy storage (C8.I1)
- Renewable hydrogen roadmap and sectoral integration (€1.56bn RRF)
 - Renewable hydrogen (C9.I1)

Poland (PL)

- Hydrogen (€800 mil RRF)

Belgium (BE)

- Renolab: Renovation laboratory (€13.4 mil RRF)
- Emerging energy technologies
 - Transport network for H2 and CO2 (€95 mil RRF)
 - Industrial value chain for transformation towards H2 (€292.2 mil RRF)
 - Develop low-emissions industry (€50 mil RRF)
 - Research platform on energy transition (€26.5 mil RRF)
- Recharging infrastructure (€61.5 mil RRF)

Austria (AT)

- Climate-friendly mobility (€848.6 mil RRF)
 - Subsidies for emission-free buses and infrastructure (€256 mil RRF)
 - Subsidies for emission free commercial vehicles and infrastructure (€50 mil RRF) → €37.4mil approximately for infrastructure
- Transformation towards climate neutrality (€100 mil RRF)
- Digitalisation and greening of companies (€605 mil RRF)
- Strategic innovation (€250 mil RRF)
 - IPCEI hydrogen (€125 mil RRF)
- Resilience (€104.2 mil RRF)
 - Resilient municipalities (€50 mil RRF)