

REVIEW SUMMARY

SOLAR MANUFACTURING IN THE NATIONAL RECOVERY AND RESILIENCE PLANS

An analysis compiled by the European Solar Manufacturing Council (ESMC)



The European Solar Manufacturing Council (ESMC) is the organization representing the interests of the European PV manufacturing industry. The ESMC represents key industrial companies, organizations and research centers active in the PV sector rooted in Europe. ESMC aims at promoting and supporting the PV manufacturing industry and its value chain at the European level, speaking with one voice.

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SUMMARY

The Recovery and Resilience Facility makes €723.8 billion available to support measures undertaken by European Union (EU) Member States as a response to the coronavirus pandemic. To benefit from the support of the RRF, EU Member States must submit Recovery and Resilience plans (RRPs), with the reforms and investments to be implemented by the end of 2026. The European Solar Manufacturing Council (ESMC) has evaluated the endorsed plans with respect to PV manufacturing to identify and summarize the opportunities for European PV industry actors to receive support.

In ESMCs RRP evaluation effort, a total of €477 million have been identified as direct support for PV manufacturing. They consist of both loans and grants to establish or strengthen the PV value chain in Italy, Romania, and Croatia.

Italy undoubtedly holds the largest direct RRP support for solar PV manufacturing, with €400 million dedicated to help reach the national target of 2 GW annual manufacturing capacity by December 2025.

In **Romania** €50 million are allocated to develop 200 MW of solar PV production capacity.

Croatia dedicated €26.5 million to the development of environmentally friendly production processes in mid-cap and large entities – this is clear potential this support to be directed to the PV manufacturing amongst other renewable technology efforts.

An additional €11 167 million are identified in indirect support measures for solar PV. Indirect support can either include direct support for PV deployment, or measures that could benefit the PV industry, for example by R&D&I investments or Important Projects of Common European Interest (IPCEI). Accordingly, the remaining 7 Member States (Austria, Denmark, France, Germany, Greece, Portugal and Spain) are planning to invest in the PV manufacturing sector indirectly.

Austria plans to expand its PV generation capacities, improve coupling of PV and electrolysers, and integrate PV into industrial processes.

Denmark have dedicated efforts for the green share and ensure a long-term growth potential by investing in new green technologies as well as with incentives to boost R&D in companies.

In **France**, the renewable energy development is notably supported outside the RRP by the green bonds and the Energy Regulatory Commission (ERC) tender system, but support for innovative businesses and R&D&I activities could potentially be directed to the strategic value chain of photovoltaics through the IPCEI or other potential mechanisms.

In **Germany** the funding aims to support the use of hydrogen produced with energy from renewable sources and to increase the level of industrial innovation. Social and technological innovations are being emphasized and the projects should demonstrate how they can strengthen the German climate resilience.

Greece is highlighted as a Member State with extensive indirect support for PV manufacturing, including dedicated financing of manufacturing, infrastructure and clear actions on research and innovations, with the target to increase the penetration on international markets and to reduce the industry's impact on the environment and climate change.

Portugal aims at increasing the competitiveness and economic resilience of the economy through R&D&I, diversification, and specialization of production industry. Renewable energy production and storage systems (solar energy) is included as investments in Business Reception Areas.

In **Spain**, special attention is given for harnessing and strengthening Spain's position on both domestic and export markets and to consolidation the industrial value chain in the field of renewables and support for development and innovation in renewable generation technologies.

ESMC draws these key conclusions from the Member States RRFs:

- The Member States support for the PV industry varies extensively – Italy, Romania and Croatia are the leaders, showing dedicated support for PV manufacturing, while 16 EU Member States are not considering any meaningful support, neither for the PV Industry nor for PV deployment.
- €11 167 million of potential of indirect support in 10 Member States should be further investigated, as they constitute potential investments to support PV manufacturing via R&D&I, IPCEI or small and medium enterprises support instruments. As the Member States are just starting to frame the more detailed support instruments for the RRFs, now is the right moment for the European PV industry to check the potential financing options in the 10 concerned Member States included in this review.
- There are two important factors, that will be critical for the European PV manufacturing industry to benefit from the financing of RRFs. *Firstly*, effective, and dedicated investments of already foreseen support for the PV manufacturing industry during 2022 and 2023 (as 70% of the grants shall be committed by the end of 2022 and remaining 30% shall be fully committed by the end of 2023). *Secondly*, additional financial support should be planned in line with the best financing examples including, but not limiting to, the review of the RRFs – foreseen to be completed by the European Commission by the end of July 2022.
- The financial support already envisaged in RRFs is only a small part of the potential systemic and integrated European support for the PV manufacturing industry in Europe. Other instruments (solar PV strategic positioning, appropriate legislative framework, IPCEI) are equally important and should be addressed without any delay, to send the right signals and assurance for the PV manufacturing industry to meet the European PV demand from the local PV production.

The RRF could have been a well-timed and impactful system to accelerate the re-establishment of the European PV manufacturing industry. While it is clarified that the investments in the plans aren't necessarily the Member States' only efforts to support the green transition, ESMC considers the lack of the Member States commitment to PV industry in most RRFs as a missed opportunity. Especially since the last years have shown how the prevailing pandemic, from which the RRF is aimed to help Member States recover, has contributed to disruptions in the supply chain of solar PV.

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ABBREVIATIONS

| | |
|---------------|--|
| CCS | Carbon Capture and Storage |
| EU | European union |
| GHG | Greenhouse Gas |
| GDP | Gross Domestic Product |
| IPCEI | Important project of common European interest* |
| PV | Photovoltaic |
| R&D | Research and Development |
| R&D&I | Research, Development, and Innovation |
| RES | Renewable Energy Sources |
| RRP | Recovery and Resilience Plan |
| RRF | Recovery and Resilience Facility |
| Single market | The EU as one territory without any internal borders |
| SME | Small and medium enterprises – EU definition |

*ESMC one pager about IPCEI [1]

INTRODUCTION

The Recovery and Resilience Facility (RRF) makes €723.8 billion in loans (€385.8 billion) and grants (€338 billion) available to support reforms and investments undertaken by European Union (EU) Member States.

The aim is to mitigate the economic and social impact of the COVID-19 pandemic and make European economies and societies more sustainable, resilient, and better prepared for the challenges and opportunities of the twin transition. ESMC sees the Recovery and Resilience Facility (RRF) as the timely instrument to push the European Green Deal objectives forward. The minimum 37% expenditure target for Climate investments and reforms outlined by the European Commission clearly reflects the priorities of the support package.

ESMC has previously addressed stakeholders and politicians at EU level to take into consideration the strategically important European Photovoltaic (PV) manufacturing industry by concrete and targeted policy and financial measures in both the RRF guidance documents and in the Recovery and Resilience Plans (RRPs) prepared by the Member States ([Policy Statement – appeal to RRF commitment](#)) [2].

Evaluation of the Recovery and Resilience Plans

To benefit from the support of the RRF, EU Member States must submit RRFs, which are then assessed and thereafter endorsed by the European Commission. Each plan sets out the reforms and investments to be implemented by the end of 2026 [3].

The intention of this report is to alert European PV industry actors on possible opportunities for funding through the RRF. In the process to summarize the support for PV Manufacturing in the EU Member States' RRFs, all submitted drafts, and thereafter the final reports, have been examined. Based on a general assessment, they have been categorized into different levels of interest with respect to their support for PV manufacturing or deployment. The review of the endorsed RRFs of the supporting Member States was focused on summarizing the direct or possible indirect support PV manufacturing that manufacturers or industry organizations could benefit from.

In this context, direct support for PV manufacturing includes reforms or investments targeting the establishment, or strengthening, of a domestic PV value chain. This can either be in direct wording, or with references in line with *Strategic value chains for the green transition* or *Renewable energy technologies*. However, even though imprecise wording has also been sought for, most of the summarized direct support consist of exclusively targeted PV industry investments. Most measures with indirect wording have been classified as indirect support because of the need for more details. Indirect support can either include extensive support for PV deployment or measures that could be interpreted as support for ESMC Member companies and organizations, for example investments targeting Research Development Innovation (R&D&I) or recovery support for both Small and Medium Enterprises (SME).

This work has been carried out in autumn 2021, and while the work proceeded, several RRFs were endorsed by the European Commission. At the time of writing, all Member States except Netherlands had submitted their plans. However the Member States considered for this analysis are Austria, Croatia, Denmark, France, Germany, Greece, Italy, Portugal, Romania and Spain [3]. The other Member States – Belgium, Bulgaria, Cyprus, Czechia, Estonia, Finland,

Hungary, Ireland, Latvia, Lithuania, Luxembourg, Malta, Poland, Slovakia, Slovenia and Sweden – didn't foresee the meaningful support mechanisms for the PV manufacturing and its deployment in their respective RRP.

General reflection

As mentioned in the introduction, the EU declared that 37% of each Member States' expenditure had to be exclusively allocated for the green transition for the plans to be endorsed. Inside that share, PV manufacturing could have potentially gotten support. Additionally, a central statute is that all spending becomes subject to the "*do no significant harm*" – principle defined in the taxonomy regulation [4], which excludes close to all possibilities to target investments to fossil fuels.

Despite that solar PV is often forecasted to be one of the, if not the single most important power source, to reach the goals of renewable energy shares set in the Paris agreement, central efforts aimed at the PV industry are absent in most plans. As will be further presented in the section on indirect support, there are admittedly support for PV deployment, often through energy efficiency measures in the built environment. What is missing, on the other hand, is a holistic approach through investments focused on strengthening the interregional supply of solar cells and panels to meet the rapidly growing market demand.

It is clarified that the investments in the plans aren't necessarily the Member States' only efforts to support the green transition, but rather that they constitute a complement, strengthening the national climate goals and laws. Nevertheless, the Recovery and Resilience Facility could have been a well-timed and impactful system to accelerate the re-establishment of the European manufacturing industry. Therefore, ESMC consider the lack of the Member States commitment to PV industry in most RRP as a missed opportunity. Especially since the last years have shown how the prevailing pandemic, from which the RRF is aimed to help Member States recover, has contributed to disruptions in the supply chain of solar PV.

Direct support for PV manufacturing

The identified direct support is summarized in Table 1. Italy undoubtedly holds the largest direct RRP support for solar PV manufacturing, with €400 million dedicated to help reach the national target of 2 GW annual manufacturing capacity by December 2025. As the order of magnitude of Italy's investments suggests, Italy's plan is the most comprehensive. The investment aims at developing high-efficiency solar panels and reduce the dependence on foreign producers. At the time of writing, ESMC Member company Midsummer AB have benefited from this investment support and have been granted both loans and grants from the RRF to establish 50 MW of thin film manufacturing in Bari, Italy [5]. ESMC sees this as an encouraging example of how the economic and social recovery from the covid-19 pandemic can strengthen the European strategic PV value chain as well as the energy security of the Union.

Also, in the Romanian RRP, an investment aimed directly at the solar PV value chain is included. €50 million are allocated to develop 200 MW of solar PV production capacity. Manufacturing, assembly, and recycling are mentioned in the investment description as activities eligible for support. ESMC want to encourage manufacturers, technology companies and others with an interest to the Romanian Manufacturing opportunity to investigate this

investment further, as the available funds are considered substantial in relation to the targeted manufacturing capacity.

Lastly, Croatia is a good example of direct support expressed in a way where PV manufacturing could be fitted in, amongst other renewable technology efforts. € 26.5 million is dedicated to the development of environmentally friendly production processes in mid-cap and large entities.

Table 1. A summary of the identified direct support for PV manufacturing in the National Recovery and Resilience Plans, expressed in €M.

| Member State | Direct support [€M] | Internal ref [page] |
|--------------|---------------------|---------------------|
| Croatia | 27 | 10 |
| Italy | 400 | 27 |
| Romania | 50 | 33 |

Indirect support for PV manufacturing

As mentioned, indirect support for PV manufacturing can mean either one of two things in this context, 1) direct support to PV deployment or 2) investments or reforms formulated in a way that it could benefit PV manufacturing companies, for example depending on the future specifications of the investments. The total support is summarised in Table 2.

All evaluated plans hold investments where the European upstream sector could receive support. Primarily, ESMC wants to encourage research organisations to investigate the indirect measures in their respective countries’ RRP. These measures often include R&D&I investment support, not seldom in consortiums with industry partners where ESMC working groups, either internal or chaired by ESMC, could help identify possible collaboration partners for these projects.

Greece is highlighted as a Member State with extensive indirect support for PV manufacturing. Measures exclusively targeted to the PV sector are included as PV deployment in existing or new industrial parks, loans for PV manufacturing as well as a new strategy for lifelong skilling, an effort to contribute to green skills and jobs, and to the green economy. The available funds for loans to activities related to solar PV are quite significant, €1 189 million, but the plan does not offer an exhaustive description of the activities that can be covered within these loans, why any interested companies or organisations are encouraged to investigate that specific opportunity further.

Especially interesting for ESMC is the expressed support to, or funding of, innovative industrial IPCEIs projects. This is highlighted in the Italian RRP, for example. With the initiated collaborative process to create an IPCEI for solar PV, this investment will likely become relevant for the European PV manufacturing industry. The Portuguese, but before all the Spanish plan, also opens opportunities to support cross-border projects in new IPCEIs. Additionally, several plans support the creation of a Hydrogen IPCEI, with related projects of PV deployment, so that they also qualify as indirect support measures.

Other examples of indirect measures are industry-university collaborative PhD programs and support to innovative start-ups in Italy and an investment to establishing and consolidating the industrial value chain in the field of renewables in Spain. The latter is specified as support for development and innovation in renewable generation technologies

or the integration of said generation in end uses. A formulation of development of innovative renewable energies integrated into buildings and production processes forms a link to solar PV.

Lastly, there are several connections to the Just Transition Fund (JTF) in the RRP, which are considered as indirect support for PV. With the central focus of the JTF to transform fossil-dependent regions into *Renewable Energy-hubs*, creating green job and re-skilling among the local population, ESMC sees great potential for solar PV to contribute to the transition in these identified European regions.

Table 2. A summary of the identified direct support for PV manufacturing in the National Recovery and Resilience Plans, expressed in €M.

| Member State | Possible indirect support [€M] | Internal ref [page] |
|---------------------|---------------------------------------|----------------------------|
| Austria | 378 | 7 |
| Croatia | 362 | 10 |
| Denmark | 305 | 14 |
| France | 325 | 17 |
| Germany | 500 | 20 |
| Greece | 1 620 | 23 |
| Italy | 4 180 | 27 |
| Portugal | 490 | 30 |
| Romania | 560 | 33 |
| Spain | 2 447 | 36 |

RRP SUMMARIES

In the following chapter, the evaluated RRP are presented. The evaluated Member States are Austria, Croatia, Denmark, France, Germany, Greece, Italy, Portugal, Romania, and Spain.

The main source of information about the national investments, reforms, and goals are the Members States' respective RRP, most often written in the country's native language. Complementing the RRP, the European Commission staff Working document with the accompanied analysis of the recovery and resilience plan often provides more detailed information of the investments connected to the green and digital transition, and so is the Annex to the Proposal for a Council Implementing Decision on the approval of the assessment of the recovery and resilience plan. All these documents are accessible on the European Commission's webpage [3].

THE AUSTRIAN RECOVERY AND RESILIENCE PLAN

General

The total volume of measures in the Austrian RRP amounts to EUR 4.5 billion, of which two thirds are new investments that were not included in the previous Austrian budget planning [6]. One-third of the measures in the RRP were included in the 2021 federal budget or in the current federal financial framework law until 2024 [7].

Climate protection and digitization is a central focus in the plan, which includes a 46% share for climate protection purposes and a 41% share for digitalization measures [6]. The plan is built on 4 components, where each component is in turn divided into 4 sub-components. Component 1 ("Sustainable Recovery") is directly, and sub-components 2-D, 3-D, 4-B and 4-D are indirectly related to climate protection measures [7].

Central value chain efforts

The Austrian RRP does not mention explicit measures for the support of PV manufacturing, but there are several horizontal programs dedicated for PV deployment, from which PV manufacturing also can benefit, see investments below.

The RRP also includes general references [7, p.20] ("sustainable build-up", "knowledge-based build-up", "digital build-up, etc.) to all of the seven framed European *flagship initiatives*. Via sub-component 3-D ("Strategic innovation"), a total of €250 million are to be invested into the two Important Project of Common European Interest (IPCEI); *Microelectronics* and *Hydrogen*.

Further potential for the PV manufacturing could also be found in:

- Renewable Energy Expansion Act (EAG)
- Ecological investments in enterprises
- An Eco-social tax reform is included in component 4.D.5 [7, p.597] in the RRP, that will be designed to reduce annual CO₂ emissions by at least 2.6 million tons by 2030 [8, p.52].
- A green finance agenda (4.D.6) is introduced in line with the EU Sustainable Finance Action Plan. It is an approach to steer cash flows into sustainable areas, especially in the reconstruction phase of the economy after the Covid pandemic [7, p.576].

Relevant components and investments for PV manufacturing

1.D. Transformation towards climate neutrality

| | |
|-----------------------|--------|
| Total budget for 1.D: | 100 M€ |
| Budget for no 1.D.2: | 100 M€ |

One of the key energy and climate policy goals of the Austrian government is to convert the electricity supply to 100% renewable energy sources by 2030. The Renewable Energy Expansion Act (EAG) provides the necessary legal and organizational framework.

Goals or opportunities, in selection to PV manufacturing:

- Generation capacity for PV ~ 11 TWh by 2030, envisaging 1,100 MW/ year via PV systems
- Up to €50 million for financing electrolysis plants -> Improve coupling of PV to electrolysers
- Improve integration of PV into industrial processes

Investment 1.D.2:

The new subsidy regime provides a subsidy by means of a market premium as an instrument of operational support, as well as an investment subsidy scheme (p.147). Investment for 1.D.2 Decarbonisation of industry could trigger (integrated and/or coupled) PV projects [9, p.24].

2.D. Digitalisation and ecological transformation of businesses

| | |
|---------------------------|----------|
| Total budget for 2.D: | 605 M€ |
| Budget for 2.D.3: | 503.5 M€ |
| Budget for 2.D.3 (solar): | 153 M€ |

Goals or opportunities, in selection to PV manufacturing:

- Improve integration of PV into infrastructure and industrial processes.

Investment 2.D.3:

Energy efficiency and the use of renewable energies in companies should help to reduce energy consumption and investments in building renovation. Companies are therefore given an incentive investment subsidy to encourage them to invest in ecological measures. Investment 2.D.3 *Green investments in companies* shall trigger pull-forward effects of corporate investment and trigger multiplier effects [7, p.267]. A specific budget of €153 million within 2.D.3 is dedicated for installations of photovoltaic systems, electricity storage and thermal solar systems.

3.D. Strategic innovation

| | |
|-----------------------|--------|
| Total budget for 3.D: | 250 M€ |
| Budget for 3.D.2: | 125 M€ |

The IPCEI Hydrogen is intended to support integrated projects along the entire hydrogen value chain that contribute to the achievement of the national and European energy and climate goals and the development of a renewable hydrogen economy to a significant extent.

Goals or opportunities, in selection to PV manufacturing:

- Improve coupling of PV to electrolysers.
- Green hydrogen demands huge capacities of renewable electricity, i.e. wind and PV.

The contribution of hydrogen is to be focused on those sectors that are difficult to decarbonize and do not have alternative decarbonization paths - for example, through electrification, and should therefore be allocated primarily to energy-intensive industry, freight transport and public and municipal transport [7, p.392].

Investment 3.D.2:
IPCEI Hydrogen.

Process to access the funds

The RRP includes an implementation process, with an auditing and control system led by the national Court of Auditors, payment processing, monitoring of progress in relation to the milestones and target values, reporting, as well as dissemination and communication.

The Austrian government has set up a dedicated [web site](#) for dissemination of all available information on the objectives and news related to RRP.

THE CROATIAN RECOVERY AND RESILIENCE PLAN

General

Since the Croatian economy is heavily reliant on the tourism sector, it took a hard hit from the COVID-19 pandemic, and Croatia was the most negatively affected economy among all Central and Eastern European countries [10].

In the context of the green transition, Croatia is one of the EU Member States with the lowest GHG emissions per capita. Between 1990 and 2019, Croatia's total GHG emissions fell by 22%, slightly less than the EU total, while the gross domestic product (GDP) per capita increased by 22%. However, Croatia suffers from poor air quality because of concentrated emissions in certain areas as well as a heavily fossil dependent transport sector [10].

In the Croatian RRP, 40% of the budget is allocated to the green transition, which exceeds the 37% required by the European Commission [11]. The plan is built on 5 central priorities and 1 initiative, being i) economy, (ii) public administration, judiciary and state, (iii) education, science and research, (iv) labour market and social security, (v) health care - and the initiative for renovating buildings. Altogether, it amounts to 222 separate measures, divided into 76 reforms and 146 investments. In total, the plan reaches an amount of almost €6.4 billion in grants. The plan itself is extensive, with 1 266 pages [12].

The largest component in the energy transition section is energy efficiency and post-earthquake reconstruction of buildings - EUR 789 million, followed by EUR 728 million for sustainable mobility, EUR 658 million for low-carbon energy transition and EUR 542 million for green transition and energy efficiency in the business sector [12].

Central value chain and energy efforts

The plan does not contain *specific* measures to increase the deployment of wind or solar energy. However, it aims to provide a stable legislative framework for potential investors, by introducing a premium system for the support of investments in renewables, outlining a long-term investment plan and mapping of potential RES locations, considering the potential impact on Natura2000 protected sites [10, p.53].

It also presents central objectives in the economy component to improve the national electrical grid and energy system to meet the demand for renewable electricity in line with their National Energy and Climate Plan. This means that by 2030, the system must be ready to receive at least 2 500 MW of additional renewable energy capacity. To achieve this, it is necessary to strengthen the transmission capacity in south - north direction, to strengthen and digitize the existing infrastructure and to provide storage capacities for renewable energy [12, p.180].

Finally, there is a focus on reforming the transportation sector with help of biofuels and green hydrogen. The reform shall ensure a sufficient supply of renewable hydrogen and biofuels, to primarily the domestic transport sector, which also includes a need for adequate infrastructure. Therefore, by the end of 2021, it is planned to draft a strategic document that will demonstrate the potential and objectives for providing infrastructure for renewable hydrogen production and infrastructure for the use of renewable hydrogen in transport [12, p.206]. The heating sector is also a focus in the plan, along with the residential sector transformation, which is planned to be tackled through the principle "energy efficiency first".

Goals and statements with respect to PV manufacturing

- Reduce the emissions in the EU Emissions Trading System sectors with 43% by year 2030 compared to 2005 levels [10, p.12].
- 80% emission reductions by 2050, compared to the 1990 levels [10, p.12].
- The plan includes a dedicated initiative for the energy-efficiency renovation of buildings (Initiative - Renovation of buildings), in the context of post-earthquake reconstruction. In addition, the plan includes investments for construction and reconstruction of energy-efficient buildings in various sectors, including education, judiciary and social infrastructure [12, p.1098].

Relevant components and investments for PV manufacturing

C.1.1. Enhancing competitiveness and green transition of the economy

The Green and Digital Economy component C1.1 includes investments and several regulatory and administrative changes. Substantial resources within the economy component are devoted to increase businesses' access to capital, to boost their competitiveness, increase their productivity, adapt their business processes to the green and digital transition and, specifically, to increase their investments in green technology [10, p.31].

Goals or opportunities, in selection to PV manufacturing:

- to encourage a higher level of investment in R&D&I, green and digital technologies.
- To increase expenditures of the business sector for research, development, and innovation.

C1.1.1. R4. Enhancing competitiveness and green transition of the economy

| | |
|------------------------------|----------|
| Total budget for C1.1: | 738.7 M€ |
| Budget for C1.1.1. R4-I1.a: | 99.5 M€ |
| Budget for C1.1.1. R4-I1.b: | 152.6 M€ |
| Budget for C1.1.1. R4-I2.a: | 27.9 M€ |
| Guarantee fund C1.1.1 R4-I3: | 79 M€ |
| Budget for C1.1.1. R4-I3.a: | 26.5 M€ |

The financial instruments shall be used for investments in new, up-to-date and advanced technologies (machinery and equipment), in the expansion and strengthening of business capacity (expansion of manufacturing and service facilities and capacities), with a preference for projects in renewable energy, energy efficiency, circular economy, environmental protection, digitalisation of production, procurement and sales processes [12, p.93].

Investment C1.1.1. R4-I1.a and C1.1.1. R4-I1.b:

These investments are dedicated to support businesses for the transition to an energy and resource-efficient economy and are dedicated for the SMEs and large enterprises separately. Most of the investments will be dedicated for the PV deployment while enhancing the share of renewables in Croatia, consequently its potential for the PV manufacturing is rather low [12, p.93] & [10, p.73].

Investment C1.1.1. R4-I2.a:

This investment encompasses the financial instruments for micro, small and medium-sized enterprises – green part. The total budget of this investment (€27.9 million) could potentially be used for PV manufacturing. However, it is dedicated to micro, small and medium-

sized enterprises to reduce their climate footprint [10, p.73]. Further benefits of these investments will depend on the concrete planning documents and the conditions for the applications.

An ‘umbrella’ guarantee fund is introduced in C1.1.1 R4-I3: Financial instrument for mid-cap and large enterprises to investments at strengthening competitiveness and resilience.¹ This instrument is aimed at issuing individual or portfolio guarantees for investment loans and working capital loans in the fields of green and digital transition with a planned allocation of €79 million [13, p.8].

Investment C1.1.1. R4-I3.a:

This investment aims to support environmentally friendly production processes in mid-cap and large entities – green part. A minimum of €10.6 million of the €26.5 million shall go to reducing greenhouse gases. While all the other financial support in Croatia is mostly dedicated for the PV deployment, this particular measure has one of the biggest potentials for the support of PV manufacturing [12, p.123].

C1.1.2. Boosting innovation and digitising the economy

| | |
|---------------------------------|-----------------|
| Total budget for C1.1.2: | 127.8 M€ |
|---------------------------------|-----------------|

The economy of the Republic of Croatia is today characterised by a too low level of investment in the R&D&I of advanced technologies to meet the set goals of the country. Therefore, special emphasis in the RRP is placed on supporting the introduction of technologies necessary for the digital and green transition of the economy, the acquisition of new skills and the mastering of new tools for human resources.

To improve the position of the Croatian economy on the European value chain, by boosting innovation and digitisation in the private sector, a more R&D friendly environment is desired. A reform is included in the RRP, with the objective to increase the number of enterprises investing and the size of investments in R&D. The reform shall consist of an analysis of the existing R&D tax incentive scheme and amending and complementing the legal framework for R&D tax incentives to encourage the private sector to increase the intensity of its R&D investment, increase the number of beneficiaries of R&D tax incentives, simplify the procedures and reduce the administrative burdens, while improving transparency and accessibility. Amendments to the State Aid Act on Research and Development Projects

¹ Council Implementing Decision on the approval of the assessment of the recovery and resilience plan for Croatia, <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52021PC0401&from=EN>.

shall be based on an analysis of appropriateness and effectiveness of the current tax relief system [12, p.146].

C1.2. Energy transition for a sustainable economy

| | |
|---------------------------|----------|
| Total budget for C1.2.: | 565.5 M€ |
| Budget for C1.2. R1-I3.c: | 3.1 M€ |

The decarbonization of the Croatian energy sector is primarily related to establishing modern and digitally managed infrastructure for electricity and heat, further investments in renewable energy sources (especially in the energy and transport sectors), development of new technologies, development infrastructure for the production and use of renewable hydrogen, improvement and strengthening of the district heating system as well as the implementation of energy efficiency measures, especially in industry [12, p.179].

The Economy component of the plan, and specifically sub-component 1.2 on the energy transition, includes investments which should help reduce greenhouse gas emissions and alleviate the negative consequences of the green transition in the Sisak–Moslavina region, one of the two regions eligible for the Just Transition Fund in Croatia [10, p.24]. Solar energy has a separate sub-investment under Use of hydrogen and new technologies.

Goals or opportunities, in selection to PV manufacturing:

- The component is formulated in line with the NECP of 2021 by 2030, which contains three key national targets: reducing CO₂ emissions, increasing the share of Renewable Energy Sources (RES) in immediate consumption and increase energy efficiency [12, p.179].

Investment C1.2. R1-I3.c

Use of hydrogen and new technologies – Solar [12, p.198].

Process to access the funds

The Croatian Government have established a dedicated [website](#) for the Recovery and Resilience Plan, which includes a function of sending newsletters to interested stakeholders. Information campaigns on the Government's social networks, which includes Facebook platforms, Twitter, Instagram and Youtube, are also mentioned [12, p.1208].

THE DANISH RECOVERY AND RESILIENCE PLAN

General

With the main goal of accelerating the green transition, supporting digitalisation, and increasing the resilience of the healthcare system, the Danish plan will be financed by €1 551 billion [14]. It is structured on 7 components, which in turn consists of a total of 39 measures. With its allocation of 59% of the funds to green transition measures, the plan exceeds the 37% limit with a large margin. Even though the economic consequences from COVID-19 have been less severe in Denmark compared to many other European Union (EU) Member States, the export market is one of the sectors facing the largest decline in activity in Denmark. Since around 60% of the Danish export goes to countries in the Single Market, they share a large interest in the Recovery of the European economy [15].

In the medium to long term, the Danish RRP is expected to stimulate and speed up the green transition. Denmark's RRP has a strong Research and Development (R&D) focus, with more than 17% of the total spending earmarked for (green) R&D projects [16].

Central value chain efforts

There are no explicit mentionings in the plan on strengthening the national energy technology value chains. However, an exception is made for Carbon Capture and Storage (CCS), since it is highlighted that the whole value chains, as well as early implementation, must be established in Denmark and Europe for the technology to reach its full potential [16, p.104].

In September 2020, the Danish government published a new national green research and innovation strategy *"Green solutions of the future – Strategy for investments in green research, technology, and innovation"* [16, p.199]. With the Strategy as direction, an inter-sectorial program with the intent to establish public-private collaboration, integrating and building solutions for the green transition is established in component 7, financed by €94 million from the RRF fund. The innovation program will allow actors from all parts of the economic landscape to apply for funding for research, demonstration, and development projects. The partnerships will be open to both established and new players specializing in the green transition, thus creating opportunities for SMEs and future companies [16, p.200]. To receive funding from the program, private and public institutions must join to form a partnership.

In the section on SDG 17 - *"Partnerships for the Goals"*, the Danish plan highlights the topic of possible large greenhouse gas (GHG) emissions as an effect of global supply chains, and the geographical distribution of said emissions. To solve this situation of inequality between production and consumption nations, Denmark expresses the goal to support companies in transitioning their global product and supply chains to limit their impact on the climate, while still creating the best terms for poor small farmers and factory workers in production countries. The government will also promote climate partnerships with the business sector internationally, as a model for how public and private actors can find joint solutions [16, p.337].

Goals and statements with respect to PV manufacturing

- A GHG emissions reduction target of 70% by 2030 relative to the 1990 [16, p.325].
- Climate neutrality by 2050 [16, p.325].

Relevant components and investments for PV manufacturing

C7. Investing in Green Research and Development

| | |
|-----------------------|--------|
| Total budget for C7: | 168 M€ |
| Budget for no C7.1.1: | 15 M€ |
| Budget for no C7.2: | 94 M€ |

The component focuses on research projects connected to four missions, namely 1) carbon capture and storage or use of CO₂, 2) green fuels for transport and industry, 3) climate- and environmentally friendly agriculture and food production and 4) reuse and reduction of plastic waste through circular economy [16, p.198].

Goals or opportunities, in selection to PV manufacturing:

- Create long-term growth potential by investing in new green technologies.
- Investing in energy efficient solutions as well as finding cost-effective technologies to reduce greenhouse gas emissions will support stimulus within multiple sectors, including the transport, industry, agricultural and food sector.

Investment no C7.1.1:

Incentives to boost R&D in companies – green share [15, p.62].

Investment no C7.2:

Research in green solutions [15, p.62].

C4. Green Tax Reform

| | |
|----------------------|--------|
| Total budget for C4: | 429 M€ |
| Budget for C4.1.1: | 163 M€ |
| Budget for C4.2.1: | 33 M€ |

With the first phase of the Green Tax Reform, energy tax rates on fossil fuel use are increased for industries to ensure a greenhouse gas reduction by 0.5 Mt in 2025. The second phase is to introduce a uniform carbon tax.

The Recovery and Resilience Facility funding ensures financing for the first phase and a just transition for affected companies [16, p. 113].

Goals or opportunities, in selection to PV manufacturing:

- Frontloading investments in the green and digital transition: The Green Tax Reform will create an investment window for companies. This will provide a basis for green and digital growth in the future, while avoiding carbon leakage.

Investment no C4.1.1:

This investment is named "*Investment window – green share*". The funds are aimed at boosting the companies' growth potential and job creation, while encouraging companies to invest in new hardware and technology that can reduce emissions in the longer run. The

investment window will not include machinery running on fossil fuels, to ensure a green transition of industry [17, p26]. This investment potential should be checked and approached to maximize its benefits for the PV manufacturing.

Investment no C4.2.1:

Investment "*Accelerated depreciation – green share*" with €33 million budget could be also of the benefit for the PV deployment which potential should be evaluated and explored further. However, its potential is rather limited as the measure will be dedicated to the companies' investments in fixed assets and even with the rise of the limit to DKK 30 000, its investment deployment potential will be low [17, p26].

Process to access the funds

A substantial share of the Danish RRP is disbursed via pools that will be open to applicants that meet the set criteria. During the calls and tenders for these pools, it will be clearly marked that part of, or the entire funding, comes from the RRF. This ensures that communication of the spending of Recovery and Resilience funds is clear through the preparation part and the implementation part of the RRP.

Neither the plan, nor the Danish government's webpage, offer yet any concrete information or direct reference on where to find the information regarding disbursements of the fund [16, p.128].

THE FRENCH RECOVERY AND RESILIENCE PLAN

General

Amongst the EU Member States, France was one of the most severely affected, with a 9.2% government deficit in 2020, amounting to 3.3% of their national GDP. According to the Commission's Spring 2021 forecast, the real GDP of France declined by 8,1% in 2020 and is expected to decline by 2,9% cumulatively in 2020 and 2021 [18, p.13].

The French €39.4 billion in grants plan reaches the set target for allocations to climate objectives with a large margin, with 46% of the investments supporting the green transition. These funds will be used in a renovation programme to increase energy efficiency in the built environment, to create a value chain for green hydrogen, to modernise the railway network and to reform the national legislation to contribute to the greenhouse gas emissions reduction target for 2030 [19].

The six components in which the plan is structured around are: 1. Buildings renovation, 2. Ecology and biodiversity, 3. Infrastructure and green mobility, 4. Green energies and technologies, 5. Financing of businesses and 6. Technological sovereignty and resilience, 7. Digitalisation of State, territories, enterprises, Culture, 8. Job protection, youth, disability, vocational training, 9. Research, Health and Dependence, Territorial cohesion [18].

Goals and statements with respect to PV manufacturing

- A 33% share of energy from renewable sources in gross final consumption by 2030 [20, p.13] (latest available data shows 17.2% in 2019 [18, p.17]).

Central value chain and energy efforts

No direct support to deployment of, or establishment of a value chain for, renewable energy production can be found in the French RRP. In terms of central value chain efforts, France is expected to participate in the planned Important Projects of Common European interest (IPCEI) to promote and development a value chain for hydrogen technology. All measures in the plan, and in the IPCEI, targets decarbonised hydrogen, which will be produced with nuclear energy.

Support for establishing PV parks is mentioned in relation to renewable hydrogen production in Component 6 [18, p. 364], but otherwise the support for PV is low. In the Component 1 of buildings renovation, solar PV is mentioned amongst other energy technologies to be installed in the renovation wave [18, p.78].

In the plan, it is also stated that the RRP investments do not constitute all of France's green policies and investments and note that renewable energy development is notably supported outside the Recovery and Resilience facility by green bonds (*OAT vertes*) [18, p.17].

Relevant components and investments for PV manufacturing

C4. Green energies and technologies

| | |
|---------------------------|----------|
| Total budget C4: | 5.3 bn€* |
| Budget for C4.I1.-part 5: | 100 M€ |

*7.2 bn€, of which 5.3 bn € is financed by the RRF.

Component 4 contains investment to improve the governance of the broad Investment Program of the future (*Programme d'investissements d'avenir*) (PIA). The investments are paired with a reform [18, p.254].

While much focus is on Green Hydrogen, the broad objective is to reach the set targets for the reduction of greenhouse gas emissions. Another aim is to strengthen the competitiveness of the French green industry [18, p.285]. The investment in component four is divided into seven sub-investments, all under the fourth PIA.

Investment C4.I1-part 5. Innovate for the green transition (PIA4), Sustainable cities and innovative buildings (decarbonisation part).

In order to reduce urban contribution to the detriment of agricultural land and natural spaces, and to make cities more resource efficient, resilient, inclusive and productive, this strategy shall support innovative and replicable territorial demonstrators, with a focus in particular on the definition of tools and methods to promote the large-scale deployment of energy renovation of buildings; structuring the wood and geo-sourced materials sector with a view to carbon neutrality; and the digital transition of cities and artificial intelligence [18, p.288] & [20, p.89].

C6. Technological sovereignty and resilience

| | |
|-------------------------------|----------|
| Total budget C6: | 3.2 bn€* |
| Budget for C6.I3, green part: | 225 M€ |

*5.2 bn€, of which 3.2 bn € is financed by the RRF.

As in Component 4, there are measures in Component 6 to incorporate the targets in the PIA4. Additionally, the R&D expenditures of 2.2% of total GDP in France are below the EU target of 3% set by the Lisbon Strategy. As the name entails, the component aims at strengthening the French Technological sovereignty and resilience by R&D&I, with a focus on strategic technologies [18, p.325].

Investment C6.I3 Supporting innovative businesses (PIA4) (climate-related part).

The objective of this measure is to finance R&D investment for innovative companies. It targets innovative enterprises that, individually or through collaborative programmes, need access to finance to cover the risk inherent to their R&D projects. Two targeted support

investments within the program are: *1. Innovation competitions for start-ups and SMEs* and *2. Support for structured R&D projects* [18, p.359] & [20, p.90].

Accordingly, the Component 6 with its concentrated attention to R&D&I potentially could accommodate the financial support to the strategic value chain of photovoltaics through the IPCEI or other potential mechanism – this potential should be further elaborated in nearest future.

Process to access the funds

The French government has a [website](#) for the progress and status of the French RRP on their web site for the Ministry of the Economy, Finance and Recovery. The website allows the users to filter through the measures to see how you can benefit from them as a private individual, a company, local authority, or an administration. Additionally, a monthly update of the data and progress is mentioned in the RRP communication plan, allowing visibility of the plan and its measures [18, p.726].

THE GERMAN RECOVERY AND RESILIENCE PLAN

General

Germany seeks to address the challenges and responses related to the COVID-19 crisis with help of €25.6 billion in grants. The RRP is composed out of 10 components (see Table 1) grouped in six thematic focus areas, being: 1. Climate action and energy transition, 2. Digitalisation of the economy and infrastructure, 3. Digitalisation of education, 4. Strengthening social inclusion, 5. Strengthening a pandemic-resilient health system, 6. Modern public administration and reducing barriers to investment [21].

At least 42% of the financial contribution is expected to go to measures supporting the green transition, through three main objectives: 1) a hydrogen leap, 2) support for electric cars and 3) energy efficiency in residential buildings [22].

Table 3. The separate components in the German RRP and their respective expected cost [21, p. 24].

| | Component | Cost [€ million] |
|-----|--|------------------|
| 1.1 | Decarbonization using renewable hydrogen in particular | 3 259.3 |
| 1.2 | Climate-friendly mobility | 5 427.9 |
| 1.3 | Climate-friendly renovation and construction | 2 577.0 |
| 2.1 | Data as the raw material of the future | 2 766.0 |
| 2.2 | Digitalisation of the economy | 3 136.5 |
| 3.1 | Digitalisation of education | 1 435.0 |
| 4.1 | Strengthening social inclusion | 1 259.3 |
| 5.1 | Strengthen a pandemic-resilient healthcare system | 4 563.9 |
| 6.1 | Modern public administration | 3 475.0 |
| 6.2 | Reducing barriers to investment | 50.0 |

Central value chain and energy efforts

The development of the internal EU market for hydrogen is becoming increasingly important for the German government. Germany hopes to develop transnational projects where Germany can adopt a coordinating role. The plan connects German R&D&I in hydrogen to deployment of renewable energy, especially in high wind yield locations around the North Sea and in southern Europe, with great potential for photovoltaics [23, p.95]. This is planned to be realized through an IPCEI for Hydrogen, which Germany is taking active part in (See investment 1.1.1 Hydrogen projects within the framework of IPCEIs, [23, p.96]). The plan entails that Germany plans to actively participate in the IPCEIs on microprocessors and semiconductor technologies (See investment 2.1.2. IPCEI microelectronics and communication technologies, [24, p. 405]), as well as on the proposed cloud IPCEI (See investment 2.1.3. IPCEI Next Generation Cloud Infrastructure and Services, [24, p. 408]).

Even though significant resources are allocated towards investments in R&D in Germany, there is a challenge of private investments being increasingly concentrated to large companies [21, p.9]. SMEs invest relatively little in R&D&I, while still making up a large part of the economic output in Germany (p.87). An investment program directly targeting SME was therefore introduced, (*Zentrales Innovationsprogramm Mittelstand*), which gives support to companies to increase their innovation capacity and competitiveness [21, p.9].

Goals/statements in the plan, in selection to PV manufacturing

- A 38% non-EU-ETS greenhouse gas (GHG) emission reduction compared to 2005, by 2030 [21, p.11].
- 49-51% GHG reduction in the industrial sector by 2030 compared to 1990 [23, p.55].
- The exit from coal is planned to be completed by 2038 (at the latest) [21, p.11].
- Net climate neutrality by 2050 (or by 2045 to which the target is expected to be advanced) [21, p.11].
- A target objective in the plan is building renovation. RRF funding is available for energy-efficient buildings (see investment 1.3.2 Municipal living labs for the energy transition [25, p.261] and 1.3.3 Building renovation: federal funding for energy-efficient buildings [25, p. 284].
- Strengthening international competitiveness in the key area of green hydrogen [23, p.96].
- Develop a European value chain in the field of green hydrogen [23, p.96].

Although the plan connects German R&D&I in hydrogen to deployment of renewable energy with great potential for photovoltaics, the potential support measures are exclusively dedicated to hydrogen without special support measures or programs for PV deployment or PV manufacturing.

Relevant components and investments for PV manufacturing

C.1.1. Decarbonisation using renewable hydrogen in particular

| | |
|----------------------------|------------------|
| Total budget C1.1: | 5259.3 M€ |
| Budget for C.1.1.2: | 449.3 M€ |
| Budget for C.1.1.4: | 50.4* M€ |

* Germany indicated that their expected cost may include VAT. In this table, the cost is shown excluding the full amount of potential VAT for this measure (assuming that the maximum VAT rate of 19% fully applies).

Component C.1.1 of Germany's RRP addresses the challenge of reducing greenhouse gas (GHG) emissions, with a focus on industry. The objectives of the component are to support the use of hydrogen produced with energy from renewable sources and to increase the level of industrial innovation [23, p.55].

Investment C.1.1.2:

Funding programme for decarbonisation in industry.

The aim of the decarbonization in industry funding programme is to reduce or remove process related GHG that, according to the current state of technology, are difficult or impossible to avoid. Support shall be given to research and development, testing (experimental or pilot plants) as well as investments in industrial scale installations, applications, and/or implementations. The support will be granted in the form of a partial investment grant. Any granted projects must also consider the possible shift of GHG emissions to other areas or sectors and ensure that the process leads to an overall reduction in emissions [23, p.75].

Investment C.1.1.4 - Project-related climate protection research:

Like other measures from this component, the aim of this measure is to contribute to the general goal of decarbonizing the economy in line with the 2050 targets, but with a stronger focus on SMEs and basic industries.

Collaborative projects will be supported in the three areas: (i) climate protection in the industry, (ii) SME innovation and (iii) climate resilience. The funding aims at social and technological innovations that lead to a more sustainable urban development. The projects should demonstrate which Innovations can strengthen climate resilience in Germany. The target groups of this investment are companies in the basic industry, SMEs, research institutions, universities, and municipalities [23, p.98].

The implementation of the investment shall be completed by 31 December 2025. All are expected to be approved in 2021 [26, p.4].

Process to access the funds

The German Government have established a dedicated [website](#) for the Recovery and Resilience Plan. The BMF website ([bundesfinanzministerium.de](https://www.bundesfinanzministerium.de)) provides information on the RRP and the separate components. Apart from the website and intergovernmental information channels, the communication plan also includes social channels such as Twitter for information dissemination.

THE GREEK RECOVERY AND RESILIENCE PLAN

General

As many nations with large tourism sectors, the Greek economy was severely affected by the Covid-19 pandemic. The recent recovery from a decade long financial crisis added to the vulnerability of the financial system [27]. The Greek national Recovery and Resilience Plan amounts to €30.5 billion, of which €17.8 billion are grants and €12.7 billion are loans [28]. The four pillars of the plan are 1. Green transition, 2. Digital transition, 3. Employment, skills and social cohesion, 4. Private investment and economic and institutional transformation, comprising in a total of 175 measures, of which 67 are reforms and 108 are investments [27]. The loans will be used in a RRF loan facility, see relevant components and investments for PV manufacturing – investment 16980 below. This loan facility is one of the most promising for the PV manufacturing with €1 190 million dedicated while other financial support instruments are dedicated to PV deployment, for example, investment 16634 to deploy solar energy in existing or new industrial parks.

The key measures to Greece's green transition will be financing electricity infrastructure (grid and storage), increasing the level of energy efficiency in residential buildings and provide charging points, electrical vehicles as well as pedestrian pathways to create a more environmentally sustainable transportation sector. Transport is responsible for 21% of the national greenhouse gas emissions and accounts for the largest share in the final consumption of energy (41%) – the reason why many measures concern the transportation sector (working document, p.46). A total of 37.5% of the plan's allocation for reforms and investments supports climate objectives [28].

Central value chain efforts

Several investments in the plan, especially related to pillar 1. *Green transition* can be linked to PV deployment. Apart from the investments listed below, a special sub-investment in Climate related economic transformation on the Agricultural Sector - Renewable energy - (solar) with €35 million financing (ID: 16626) [29, p.203] is included, as well as the measure to gradually transform 11 Greek cities into 'smart cities' with €73 million financing (16854) [29, p.90] and Energy renovation of residential buildings with €1 253 million financing (16872) [29, p.164]. There is also an amendment of the legal framework for the attraction of strategic, or emblematic, investment, where offshore photovoltaic parks are mentioned as an example of such projects (ID: 16593) [30, p.189].

Regarding central value chain objectives, the plan has a direct investment that targets electrical mobility, identified as a strategic value chain. The supply-side of e-mobility is supported in Produc-E Green (ID: 16831) by providing funding for development of more than 10 sites with R&D departments for innovative products or services. Recycling of electric car batteries through re-use of raw materials like lithium and cobalt or the designing of electric vehicles and regular or high-power charge points are mentioned as examples [30, p.25]. Additionally, in the same measure (ID:16831), the development of the first CO₂ storage facility in Greece is included. The carbon capture and storage facility will be designed to provide long term storage for CO₂. The capacity of the carbon capture and storage facility will initially have a CO₂ injection rate of 1 million tonnes/year and provide capacity for, at least, 25 years [30, p.25].

Goals and statements with respect to PV manufacturing

- As a result of the measures in the RRP, an additional 6.5 GW of renewable energy production capacity is expected by 2025. This equals 74% of the set target by 2030 [27, p. 69].

Relevant components and investments for PV manufacturing

3.2. Education, vocational education and training, and skills

| | |
|--|---------|
| Total budget no 16913: | 1040 M€ |
| Budget 16913b Green skills, jobs, economy: | 350 M€ |

Reform 16913 in component 3.2: education, vocational education and training, and skills is a New Strategy for Lifelong Skilling: Modernising and Upgrading Greece's Upskilling and Reskilling System [29, p.179].

The reform is accompanied by an investment in *horizontal upskilling programmes* targeting various population groups and aimed at providing a) baseline and medium-level digital skills, **b) green skills** and c) financial literacy skills [30, p.94].

The implementation of the reform and investment shall be completed by 31 December 2025.

Investment no 16913b Green skills, jobs, economy

A New Strategy for Lifelong Skilling: Modernising and Upgrading Greece's Upskilling and Reskilling System, contributing to green skills and jobs and the green economy [30, p.94] & [27, p.99].

4.6. Modernise and improve resilience of key economic sectors

| | |
|------------------------|-------|
| Total budget no 16634: | 49 M€ |
| Budget for no 16634d: | 5 M€ |
| Budget for no 16721: | 75 M€ |

This component aims at improving the competitiveness of the country's main economic sectors, being tourism, culture, **manufacturing**, agriculture, and infrastructure. In addition, research and innovation actions are promoted in a step to increase the ability to penetrate international markets, to economically transform the respective sectors. A key element of the investment in this component is the introduction of digital technologies. The proposed investments shall, through innovation and new environmentally friendly product processing methods, reduce the industry's impact on the environment and climate change. All while promoting research and innovation [29, p.122].

16634. New industrial parks

In an effort to upgrade and develop the Greek industrial landscape, an investment for financial assistance for a) the establishment of new, next-generation industrial parks, b) expansion of the existing ones, with a view to increasing their readiness for transition to 5G and ultra-high bandwidth network infrastructure and use of renewable energy sources, smart energy management and energy saving interventions, and circular economy infrastructure, and c) the transformation of areas with high industrial concentration to green and digitalized industrial parks is established.

Investment no 16634 New Industrial Parks Renewable energy (solar):

There is a dedicated part of the measure to deploy solar energy in existing or new industrial parks. The launch of calls for the proposals is planned in Q1 2022 [30, p.185].

16721. Acceleration of smart manufacturing

Another investment under component 4.6 is one of Acceleration of smart manufacturing, which includes financial support for SME's in the industrial sector.

The funding is to be used for relevant investments in modern processing systems and artificial intelligence. The aim is to improve the productivity and competitiveness of the manufacturing sector.

A launch of all competitive calls for proposals for the manufacturing sector in investments will be held, regarding digitalisation of production lines, automation and interconnection of supply chains, designing and production of smart products and services, implementation of smart manufacturing technologies in ultrahigh speed/ 5G network mechanical, laboratory & manufacturing equipment, quality control equipment, ICT & software equipment, software licenses, cloud licenses, implementation services for the new IT infrastructure and S/W, IT Security services, product design, intellectual property, patent and certification costs [31].

Up to 50% co-financing is foreseen [29, p.202]. The measure shall also support industrial schemes and clusters of enterprises in important industrial value chains that promotes Greece's transition to *Industry 4.0* [30, p.186].

The implementation of the investment shall be completed by 31 December 2025.

4.7. Improve competitiveness and promote private investments and exports

| |
|---|
| Total budget RRF loan: 12 700 M€ |
| Budget for no 16980b: 1 190 M€ |

Greece has established a *RRF loan facility*, which holds all loan funding from the European Commission. The intention is to utilize the facility to promote and finance additional reforms and significant investments, and thus counteract the exceptionally low level of investment that has characterized the Greek economy in the last decade.

In 2019, investments reached 10.1% of GDP in Greece, which can be compared to the European average of 21.4%. The borrowing costs in Greece are also high, which the loan facility aims to neutralize [29, p.134].

The loans will be directed to investments that fall into five categories: a) digital transformation, b) green

transition, c) extroversion, d) development of economies of scale through partnerships, acquisitions and mergers, e) R&D&I.

Goals or challenges, in selection to PV manufacturing:

- The immediate use of loans of the National Plan for private financing investment, is expected to significantly enhance productive growth, the creation of new jobs and the economic and social cohesion of Greece.

Investment for no 16980b RRP Loan Facility- Renewable energy (solar).

This is one of the most promising financing instruments through loans for the PV manufacturing in Greece as this has a clear dedication to solar, it is oriented to improve competitiveness and promote private investments and exports with the general requirement for all these investments that 38.5% of the financing should be dedicated to climate target. The implementation of the investment shall be completed by 30 June 2026 [30, p.226] & [27, p.105].

Process to access the funds

A [dedicated website](#) for the RRP and the related projects is established and works as a single-entry point for all interested parties who wish to get information, and a destination hub for all communication materials. A support e-mail address is also set up under the ministry of finance, rrfasupport@minfin.gr. Through the website, the calls for projects, a list of reform and investment projects, monitoring/update of the implementation of the RRP, achievements and results and communication materials are listed.

THE ITALIAN RECOVERY AND RESILIENCE PLAN

General

Of all EU Member States, Italy has the highest share of allocated RRF funds [32]. The Italian RRP includes €191,5 billion of investments and reforms, consisting of €68.9 billion in grants and €122.6 billion in loans [33]. The plan is divided into six *missions*, which are in turn divided into a total of 16 separate components. Although mission 2 covers investments on green transition policies and green energy investments, solar PV is also extensively included in mission 1, 3 and 4 [34]. The RRP fulfils the criteria of the fund's green target, with 37.5% of the funds being allocated to the green transition [33].

The objective of the Italian RRP is not only to invest in infrastructure, digital transition and green energy projects, but also to simplify the access to the funds, changing the existing national and regional regulations, to attract more national and international investors ([eg. art. 57, c. 6, d.l. 16 July 2020, n. 76](#)).

Italy has confirmed extensive investments (€1.1 billion) to Agro-voltaic – PV panels on areas used in addition for agriculture, with a capacity of 1.04 GW for an estimated capacity of at least 1 300 GWh annually, see investment M2C2.1 *incrementare la quota di energia prodotta da fonti di energia rinnovabile* [34, p.128].

Central value chain efforts

Italy is planning to launch an extensive program with port authorities for the renewable energy and energy efficiency measures with €124 million support dedicated for solar photovoltaic installations (investment M3C2-I1.1-154b) [32, p.101]. However, the main positive difference of the Italian RRP comparing it with the RRFs of the other EU Member States is clearly dedicated and strategically targeted financing for the PV manufacturing. According to the Italian RRP, it is important to promote the national chain (both industrial as well as research and development) in the principal sectors of the electrical transition: in a market that today is dominated by Chinese and Asian producers (70% of the solar panel production), for Italy and Europe there is the unique opportunity to develop an industry able to compete at a global level [34, p.137]. These €1 billion investment for renewables and batteries envisages two projects. The first one is dedicated to technological competencies necessary to put into operation new productive plants. The second concentrates on production plants for flexible and highly efficient solar panels, see investments below.

Goals and statements with respect to PV manufacturing

- Italy wants to develop an industrial and technological leadership to decrease the dependency on other nations concerning production and storage of green energies [34, p.137].
- The decarbonization of all sectors, investing in green energy, is in agreement with the European Flagship projects as *Power Up* and *Refuel and recharge* [32, p.40].
- The Italian RRP include extensive support for solar PV deployment, for example through projects focused around Agri-Solar, Green Islands, Promotion of innovative plants (off-shore) and Energy efficiency measures in buildings.

Relevant components and investments for PV manufacturing

M2C2-I5.1. Renewables and batteries

| | |
|---------------------------|-----------|
| Total budget for M2: | 59 470 M€ |
| Budget for M2C2.I5.1.110: | 400 M€ |

Component M2C2 envisages investments in renewables, hydrogen and the mobility ecosystem, including significant investments in production value-chains of the key sectors of the ecological transition aiming at developing industrial and knowledge excellence in these fast-growth industries. Example of such manufacturing value-chains mentioned in the RRP are photovoltaics, batteries for the transport sector and for the electricity sector, buses supply chain and hydrogen [34, p.125].

Goals or opportunities, in selection to PV manufacturing:

- Development of highly efficient solar panels production capacities from the current 200 MW annually to at least 2 GW annually is planned by December 2025 [35, p.248].
- To implement this target by June 2022 the Ministerial Decree will define the amount of resources available, access requirement of the beneficiaries, the conditions of admissibility for programs and projects including the admissible expenses.

Investment M2C2-I5.1-110:

€400 million budget allocated explicitly directed PV technology manufacturing [35, p.248]. The target is to increase the Italian production of renewable energy and reduce dependence on foreign producers, strengthen the solar panels and battery value chains and develop a national leadership in R&D, innovations and patents [34, p.137].

M4C2-I2.1. IPCEI

| | |
|-----------------------|-----------|
| Total budget for M4: | 30 880 M€ |
| Budget for M4C2.I2.1: | 1 500 M€ |

Component M4C2 in Italy's plan includes several cross-border initiatives (investment M4C2.I2.1). One of them being supporting IPCEIs [34, p.189]. Those resources are meant to increase the IPCEI fund, and to finance new European projects that promote collaboration between the public and private investment landscape [34, p.193].

Goals or opportunities, in selection to PV manufacturing:

- If the initiative of creating a PV manufacturing IPCEI is successful, Italy

could fund its part though this Component

Investment M4C2.I2.1:

In the plan, support is expressed in the form of participation and the funding of approved and potential IPCEIs. Although new or existing projects will be selected concerning specific innovative industrial sectors in the cloud, raw materials, health and cybersecurity sectors, the €600 million potential for the green IPCEI is envisaged in the investments M4C2-I2.1-189b [32, p.102] & [35, p.373].

Identification of the criteria for allocation of funds are planned for until June 2022, to be followed by the publication of the list of the parties participating in IPCEI funds by June 2023.

M4C2-I2.2. Horizon Europe

| | |
|------------------------------|------------------|
| Total budget for M4: | 30 880 M€ |
| Budget for M4C2.I2.2: | 200 M€ |

The M4C2 component's, and investment M4C2.I2.2's in particular, goal is to sustain the level of research and the development of the Horizon Europe program. The component is directed to private and public business and research centres [34, p.193].

M4C2-I3. Innovation and research

| | |
|-----------------------------|------------------|
| Total budget for M4: | 25 400 M€ |
| Budget for M4C2.I3: | 2 480 M€ |

M4C2 are financing initiatives to merge or transfer the scientific knowledge of the academic world with or to the industrial world, with regards to green and digital research (M4C2.I3.1). The plan is to create Ph.D. programs inside, and with the help of private industries, and to incentive the hiring of young researchers in the industries (M4C2.I3.2). The components also contain a section for investments in the creation of new start-ups [34, p.194].

Process to access the funds

All information regarding plan, the status of each mission and any updates can be found on the [website](#). User friendly information and investments search tool is provided including annual budget allocations in each of the investments. Published on the same webpage is also a complementary plan with funds allocated directly from the Italian government that follow the same objectives as their RRP. If the project investment amounts to €150 000 or less, the State can allocate the needed fund directly. For larger project, a tender is necessary.

THE PORTUGUESE RECOVERY AND RESILIENCE PLAN

General

Portugal has requested €16.6 billion to finance the measures in their National Recovery and Resilience Plan, split between €13.9 billion in grants and €2.7 billion in loans [36]. Portugal's long-term challenges relate mainly to social and educational needs, institutional resilience, and investments in R&D. Improving the business environment and the sustainability of the Portuguese public finance is another central focus. Besides the challenges of the twin transition, Portugal experiences high unemployment, especially amongst the youth [37].

The plan is structured in 20 components, where 38% of the plan's economical allocations support climate objectives and 22% are aimed at digital objectives. The key measures for the green deal are energy efficiency in residential buildings, financing of private projects of hydrogen and renewable gases, and protection of vulnerable forest areas [36].

The components in the plan are; 1. National Health Service, 2. Housing, 3. Social responses, 4. Culture, 5. Capitalization and innovation business, 6. Qualifications and competences, 7. Infrastructures, 8. Forests, 9. Water Management, 10. Sea, 11. Industry decarbonization, 12. Sustainable Bioeconomy, 13. Energy efficiency in buildings, 14. Hydrogen and Renewables, 15. Sustainable mobility, 16. Companies 4.0, 17. Quality and sustainability of public finances, 18. Economic justice and the environment of Business, 19. Public Administration - Digitization, interoperability and cybersecurity and 20. Digital school [37].

Central value chain efforts

In Component 14. Hydrogen and Renewables, strategies and reforms for the energy transition and decarbonisation of industry and transport are included. An emphasis is put on the production of green hydrogen and other renewable gases. The Portuguese government express support and interest to take part in the IPCEI for hydrogen if it will be established, and even in an absence of an IPCEI, Portugal will support the foreseen projects of renewable hydrogen [38, p.161]. This may have an importance for deployment on solar PV in Portugal and could constitute an opportunity for synergistic collaborations with a domestic PV manufacturing industry.

Goals and statements with respect to PV manufacturing

- Portugal aims to contribute to the EU's 2030 target for renewable energy by reaching 47% of renewable energy in energy consumption [38, p.290].
- Carbon neutrality by 2050, which will have to be achieved by an emission reduction of more than 85% compared to 2005 and a carbon sequestration capacity of 13 million tonnes [38, p.151].

Relevant components and investments for PV manufacturing

C5. Investment and Innovation

| | |
|-----------------------------------|----------|
| Total budget C5: | 2 914 M€ |
| Budget for RE-C05-i01.02_green: | 372 M€ |
| Budget for RE-C05-i02-Green part: | 82 M€ |

The component aims at increasing the competitiveness and economic resilience of the Portuguese economy through R&D&I, diversification, and specialization of production industry. It seeks to reignite companies in the above-mentioned fields that have experienced a regression caused by the pandemic [38, p.106].

Goals or challenges, in selection to PV manufacturing:

- Reverse the above-average de-industrialization in Portugal, where the weight of GDP of the manufacturing industry declines from 18.1% of in 1995 to 13.5% in 2019, compared to the 16.5% European average for the same year.

Investment RE-C05-i01.02:

The objective of investment RE-C05-i01.02 is to mobilise and strengthen Portugal's scientific and technological capabilities via the deployment of research and innovation agendas based on business-academia consortia. The investment is specialised in a number of Green Agendas (focusing on the green transition) [38, p.111].

Investment RE-C05-i02:

The sub-investment C05-i02 includes a new financing model of the Technology Interface System Centres and Collaborative Laboratories (CoLAB) to improve business and academia linkages, to ensure an efficient technology transfer and the translation of research results into innovation. This will be targeted to private non-profit associations or firms that aim to create *qualified employment*, either directly or indirectly.

This will be based on the structure of 1/3 core funding, 1/3 competitive funding and 1/3 market funding [38, p.112].

Due to the comparatively large amount (€372 million), dedication to green agendas and target to the Alliances for business innovation this financing could be further explored as one of the potential support measures for the potential IPCEI projects in the PV area.

C7. Infrastructure

| | |
|---|--------|
| Total budget C7: | 690 M€ |
| Investment for RE-C07-i01 – Solar energy: | 36 M€ |

The objective of the investment is to modernise Portugal's so-called business reception areas, which are areas of land developed as a site for offices, factories, and other businesses. The funding will cover improvements of these business parks, in ways that promote or enable renewable energy production and storage systems, pilot projects to improve energy

stability, installations of electric and hydrogen charging stations, enhanced 5G coverage and active fire prevention measures.

These measures towards environmental sustainability and digitalisation shall be carried out in 10 business reception areas, chosen through a public tender. The implementation of the investment is expected to be completed by 31 December 2025. This is an investment in line with Portugal's 2030 national infrastructure plan (PNI 2030) [38, p.123].

Investment RE-C07-i01:

Business Reception Areas — Renewable energy production and storage systems (solar energy) [37, p.103]. This is one of the most important areas dedicated for solar energy, more specific and detailed conditions should be explored within the Government conditions and frameworks for the RRF [39, p.80].

Process to access the funds

The dissemination of all available information on the objectives and news related to the Recovery and Resilience Facility is done through the RRP-specific government [web page](#). There is a possibility to sign up for a newsletter and receive updates on the distributions of the funds and the progress of the reforms.

There is also an available [tool](#) that can be used to find open applications, sorted by components and with references to the different governmental funds from where the funds are disbursed.

THE ROMANIAN RECOVERY AND RESILIENCE PLAN

General

Romania's Recovery and Resilience Plan (RRP) will be financed by €14.2 billion in grants and €14.9 billion in loans [40]. The plan includes 15 components, being 1) Water management, 2) Forests and Biodiversity protection, 3) Waste management, 4) Sustainable transport, 5) Renovation Wave, 6) Energy, 7) Digital transformation, 8) Tax and pension reforms, 9) Business support, research, development, and innovation, 10) Local fund, 11) Tourism and culture, 12) Health, 13) Social reform, 14) Good governance and 15) Education [41].

In line with the set targets for the RRF, Romania has made substantial allocations to the green and digital transition, namely 41% to the green deal targets and 21% to the digital objectives (fact sheet p.1). The Romanian Government has targeted structural transformations of the economic system. For example, full digitalisation of the tax administration and a gradual phase out of excessive tax incentives are two central reforms. In terms of the energy transition, the phase out of coal is one main property, considering that the energy sector is the largest source (66%) of GHG emissions in Romania [41, p.57].

Central value chain and energy efforts

Romania plans to actively engage in cross-border projects through the planned IPCEI on microelectronics, specifically on Low Power Processors and Semiconductor Chips (C9.1.4). Romania scores below average on the gross domestic expenditures on R&D, with 0.6% in 2018 compared to the EU average of 2.2%. The country is also lagging in patent applications. Targeted reforms and funding incentives supporting academia-business cooperation, innovative start-ups and technological catch-up among SMEs are included in the plan to support green and digital transition as well as enable a sustainable economic growth [41, p.23].

Another challenge that Romania faces is the high rates of carbon intensity and energy poverty, as well as the difficulties of reaching their set energy and climate targets for 2030 (working document p.14). Therefore, the green transition targets in the plan are focused on energy efficiency in buildings (€2.7 billion), railway modernisation (€3.9 billion), urban mobility (€1.8 billion), environmental protection (€1.1 billion) and clean energy production (€855 million) [40]. Both deployment and manufacturing processes of renewable energy technologies are mentioned in relation to the targets on clean energy production.

Goals and statements with respect to PV manufacturing

- An ambition to close 3 780 MW of the total of the current 4 590 MW of coal/lignite fired electricity production capacity by 2025, reform in C.9 [41, p.57].
- Implementation of C.6 is expected to result in 3 000 MW of additional electricity generation capacity from renewables by 2026. Special focus is put on solar PV and wind [42, p.160].
- The sub-investment on the value chain of PV cells and panels (manufacturing, assembly, and recycling) shall achieve a total yearly capacity of at least 200 MW of photovoltaic cells and panels by 31 December 2025 [42, p.161].

Relevant components and investments for PV manufacturing

C6. Energy

| | |
|--------------------|----------|
| Total budget C6: | 1 219 M€ |
| Budget for C6.I.1: | 460 M€ |
| Budget for C6.I.4: | 50 M€ |

In the RRP, and especially in Component 6, the reforms and investments are expected to significantly decarbonise the energy sector and unlock the potential for renewables deployment.

Direct support to batteries, PV and electricity storage is included to support the flexibility of the electricity grid to cater for increased renewable electricity production [41, p.32].

Goals or challenges, in selection to PV manufacturing:

- As a result of the actions in component 6 in the RRP, an additional capacity of at least 3 000 MW of renewable energy (wind and solar) shall be put into operation and connected to the grid by 30 June 2026 [41, p.57].
- The sub-investment in the value chain of PV cells and panels (manufacturing, assembly, and recycling) shall achieve a total yearly capacity of at least 200 MW of photovoltaic cells and panels by 31 December 2025. Signature of the contracts for these investments is foreseen in Q3 2022 [42, p.161].

Investment no C6.I.1:

New capacities for electricity generation from renewable sources. Contracts for Difference and Power Purchase Agreements are foreseen as the main support mechanism for these investments [41, p.85].

Investment no C6.I.4:

For the value chain of photovoltaic cells and panels (manufacturing, assembly, and recycling) of a total yearly capacity of at least 200 MW of photovoltaic cells are given exclusively €50 million (Annex to the Proposal for a Council Implementing Decision, p.160). The financial support measures should be further investigated as the amount of the support foreseen exclusively to the PV manufacturing is rather extensive

compared to the production capacity planned to be achieved during the next 4 years annually [42, p.161].

C9. Business Support, research, development and innovation

| | |
|--------------------|----------|
| Total budget C9: | 1 164 M€ |
| Budget for C9.I.2: | 100 M€ |

This component includes a set of reforms and investments to strengthen the business environment in Romania, including the research, development and innovation sector.

Regarding both design and implementation of the R&D&I reforms and investments, The Horizon Policy Support Facility is used [41, p.29]. To reach the Renewable Energy Targets, a special focus is put to investments in the energy efficiency and renewable energy field. The objective of this sub-investment is to provide equity support for SMEs, mid-caps, including start-ups, companies in early and advanced growth stages, and infrastructure projects focused on renewable energy, and energy efficiency.

Investment C9.I.2 provides financial investments for the private sector [42, p.294].

C9.I.2.2 - Climate Action Portfolio Guarantee

The objective of this sub-investment is to deliver finance and investments to SMEs and individuals through working capital, credit lines, investment loans, or leasing, aimed at investments and finance for energy efficiency improvements in enterprises and the residential and buildings sector. The instrument shall address Romania's current challenges in supporting investments in the energy efficiency and renewable energy sectors [42, p.288].

C9.I.2.3 - Recovery Venture Capital Fund (for SMEs and mid-caps)

The objective of this sub-investment is to provide equity support for SMEs, mid-caps, including start-ups, companies in early and advanced growth stages, and infrastructure projects focused on renewable energy, and energy efficiency [42, p.289].

Process to access the funds

The Romanian Government have established a [website](#) for the Recovery and Resilience Plan and its progress. On the website, the process of creating the RRP can be followed by listening to the public debate forums that were held on different topics in the beginning of 2021. There is also a dedicated area with news regarding the RRF and an opportunity to subscribe for notifications.

THE SPANISH RECOVERY AND RESILIENCE PLAN

General

In the Spanish RRP, 40% of the budget is allocated to the green transition, which exceeds the 37% required by the European Commission [43]. The plan is built on 10 levers, which are in turn divided into 30 separate components, of which 4 (C7-C10) are directly related to a fair and inclusive energy transition. All together they reach an amount of €69 528 million [44].

The general aim of the Spanish RRP is to reinforce public investment and to mobilize private investment to reorient the production model, and issue the appropriate signals to promote decarbonisation, energy efficiency, the deployment of renewable energies - including the Renewable Hydrogen Roadmap, the electrification of the economy, the development of energy storage, nature-based solutions, and the improvement of the resilience of all economic sectors [45].

The RRP includes projects of all of the seven framed European *flagship initiatives*, where one is named *POWER UP* – Development of innovative renewable energies, integrated into buildings and production processes – acceleration of the implementation of renewables [45, p.36]. This, with the goal to reach a 100% renewable energy system in 2050, supported by the principles of maximum efficiency, electrification, and integration of renewables. Spain's plan includes €6.1 billion to invest in clean technologies and accelerate the development and use of renewables [44, p.36].

Central value chain efforts & PERTE

The plan has central efforts regarding developing value chains for batteries and green hydrogen [45, p.138]. Given the essential nature of public-private collaboration, the regulatory framework of public-private collaboration instruments has been adapted with the creation of a new collaboration figure: *los Proyectos Estratégicos para la Recuperación y Transformación Económica* (PERTEs). These are projects of a strategic nature with great driving force for economic growth, employment, and competitiveness of the Spanish economy, with a high component of public-private collaboration. The PERTEs will have to be strategic projects that will play a role in the twin transition (green & digital) across the whole value chain. This mechanism aims at promoting and coordinating priority projects, that can be particularly complex or where there is a clear market failure, significant externalities or insufficient initiative or investment capacity from the private sector [45, p.115].

Six possible strategic projects for economic recovery and transformation have been preliminarily identified to promote structural reform processes of the entire value chain in the areas of (i) **the green and connected automotive industry**, (ii) **energy generation through green hydrogen**, (iii) the aerospace industry, (iv) sustainable and efficient agriculture, (v) the use of Spanish in the field of artificial intelligence, (vi) or the development of a leading national health system [45, p.115].

Goals and statements with respect to PV manufacturing

- A 100% renewable electricity supply by 2050 [44, p.77].
- Actively participate in IPCEI – projects to position Spain in the front of the strategic and technological development [45, p.27]. Here, the plan mentions existing IPCEIs but the interpretation of ESMC is that this could be used to promote participation in a possible upcoming the PV manufacturing IPCEI.
- The Plan pays special attention to cross-border projects, particularly with Portugal, France and Italy, to enhance the scale of projects of special interest (IPCEI), explore synergies from the integration of value chains, and strengthen the internal market [45, p.138].
- Develop a climate in which SME can grow and increase productivity. Technology start-ups are explicitly mentioned [45, p.27].

Relevant components and investments for PV manufacturing

C7. Deployment and integration of renewable energies

| | |
|----------------------|----------|
| Total budget for C7: | 3 165 M€ |
| Budget for no C7.I1: | 2 365 M€ |

In the introduction to lever policy III on a fair and inclusive energy transition, the plan mentions harnessing the Spanish value chains, strengthening its position on both domestic and export markets. Also, creating strategic leader positions in global sectors is also mentioned under the energy transition introduction section [45, p.26].

Goals or opportunities, in selection to PV manufacturing:

- the establishment and consolidation of the industrial value chain in the field of renewables,
- support for development and innovation in renewable generation technologies or the integration of said generation in end uses [45, p.150].

Investment no C7.I1:

Development of innovative renewable energies integrated into buildings and production processes [46, p.72].

C10. Just Transition Strategy

| | |
|-----------------------|--|
| Total budget for C10: | 300 M€ |
| Budget for no C10.I1: | Many different sub-investments, see here for breakdown on budget |

The objective of this component is to minimize the economic and social impact of the transition to a green and low-carbon economy, which will imply the cessation of activities such as coal mining, coal-fired power plants and nuclear power plants as agreed [45, p.153].

Goals or opportunities, in selection to PV manufacturing:

- No goal set in the plan, see JTF documentation

Investment no C10.I1:

Investments in Just Transition. EU consists of a set of actions aimed at reducing the impact of the Covid pandemic crisis, vulnerability to emergencies and contributing to social and territorial cohesion in very specific areas marked by the energy transition. The investment included in Component 10 of the Recovery Transformation and Resilience Plan seeks an immediate effect to:

- create employment and activity in the short term,
- to promote change *levers* with actions that had not been carried out until now and that will allow preparing those of the Just Transition Fund by scaling up those with the greatest impact,
- stimulate and promote the economic development of these areas in their necessary process of change at a time of special difficulty motivated by the pandemic [46, p.87] & [45, p.153].

C12. Industrial policy Spain 2030

Total budget for C12: 3 782 M€
Investment for no C12.I2: Many different sub-investments, see [here](#) for breakdown on budget

The manufacturing industry (excluding the energy sector) represents 12.3% of the GVA of the Spanish economy, a lower percentage than neighbouring countries. This represents an element of vulnerability. 83% of total Spanish exports are attributed to industry and it boasts the highest employment stability ratios and higher wages compared to the rest of the economic sectors [45, p.155].

Goals or opportunities, in selection to PV manufacturing:

- Improving efficiency in water, waste, energy and waste management. Renewable resources, emissions and energies within the framework of the circular economy [45, p.155].

Investment no C12.I2:

The program (*Programa de impulso de la competitividad y sostenibilidad industrial*) to promote industrial competitiveness and sustainability in transformation of strategic value chains. This investment is mainly intended to promote the transformation of the strategic value chains of industrial sectors which have a large driving effect on the economy, encompassing all parties that operate in these value chains — from the smallest emerging companies to the largest companies, from the academic world to research staff and from service providers to providers. Given the structure of industrial companies in Spain, an important component of support for SMEs is foreseen. This program will mainly support projects that are considered strategic for the industrial transition, favouring the transformation of sectors such

as the automotive and electric vehicles, the agri-food, health, aeronautical and naval sectors [45, p.155] & [46, p.105].

C17. Institutional reform and capacity building of the national science, technology, and innovation system

| | |
|-----------------------|----------|
| Total budget for C17: | 3 456 M€ |
| Budget for no C17.I7: | 82 M€ |

The short-term objective of the component is to boost the economic and social recovery. In the medium term, the Spanish government want to increase and accelerate investment in R&D&I in a sustainable way and in strategic areas and make Science, Technology and Innovation making a key instrument to address the great challenges, such as the ecological and just transition, digitization, and the demographic challenge [45, p.160].

Goals or challenges, in selection to PV manufacturing:

- No obvious goals

Investment no C17.I7:

Environment, climate change and energy. Research projects will be carried out focused on sustainable plastics, on the impact of climate change on water reserves, RES, integration of high-tech components in the energy cycle and identification of favourable areas for the environmentally sustainable exploitation of mineral raw materials critical to the energy transition [46, p.161] & [45, p.160].

Process to access the funds

The communication plan includes information on the (financial) participation opportunities offered to potential beneficiaries of the RRP, as well as the requirements, the allocation, and the management of the funds.

The Spanish government has set [up a dedicated](#) web site for dissemination of all available information on the objectives and news related to RRP. The page will work as an information channel for further activity and actions like announces of tenders, grants and aid open to companies, organizations and citizens. In the plan, one can read that the web site will work as a tool for promoting the European Recovery funds, strategic projects and their results (p. 220-221). There is also a specific [page](#) where SMEs can find information and status on the different projects.

In addition, dedicated events will be organised focused on communicating the general elements of the plan and the specific components. Specific actions will also target media focusing on communication of opportunities and the development and impact of measures, increasing public awareness. C11 (Public administration) provides further details regarding this communication strategy [45, p.219].

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