Linking the 'Recovery and Resilience Plan' and Smart Specialisation.
The Spanish Case

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Abstract

This study aims to analyse the alignment of investments in the Spanish 'Recovery and Resilience Plan' with the Smart Specialisation Strategies priorities (2021-2027) of the country and its regions to identify opportunities for potential synergies and complementary between funding instruments. The structure and methodology follows Marques Santos (2021) approach that has been applied in the Portuguese case study. This methodology uses the information available in the Plan and its annexes and establishes the steps for carrying out a detailed analysis to identify and to classify the investments and actions able to enhance Research and Development and Innovation (R&I) and regional innovation ecosystems. The analysis indicates that up to €20.5 Billion of the Spanish Plan (29% of available funding for 2021-2023) could potentially support directly and indirectly the Smart Specialisation processes in Spain. Similarly to the Portuguese case, the effect of the identified contributions will greatly depend on the final beneficiaries, project selected, absorption capacity, and governance model.

Keywords: Covid-19 crisis; Innovation; Government Policy; Spain.

JEL Classification: E32; O31; G38

Executive Summary

This work analyses the alignment of investments in the Spanish 'Recovery and Resilience Plan' (RRP) with the priorities set by Smart Specialisation Strategies (S3) for 2021-2027[1] in order to identify opportunities for potential synergies and complementarities between funding instruments. This study follows the approach and methodology set up by Marques Santos (2021) for the Portuguese case study.

Spain is the country that has been more severely affected by the Covid-19 pandemic with a real GDP drop of 10.8% in 2020, compared to the EU-27 average of 5.9% (Eurostat). In 2020, the Recovery and Resilience Facility was launched with a total allocation of €723.8 Billion within the Next Generation EU to facilitate the recovery of Europe. This programme includes €69 Billion allocations to Spain for 2021-2023. In order to request these funds Spain submitted its RRP on 30 April 2021. The Spanish RRP aims to "consolidate the recovery and minimise the risk of a delayed negative impact on the production structure, investments and jobs from the shock suffered in 2020" and, in a medium- and long-term, to transform the production towards a more sustainable growth (Gobierno de España 2021: 21-22). S3 were launched within the Cohesion policy of the European Commission for the 2014-2020 programming period and articulate the current programming period of 2021-2027. This innovation policy has similar long- term objectives of socio-economic transformation. If initiatives (investments and reforms) included in the Plan can improve the national and regional Research and Innovation (R&I) ecosystems in areas of activities prioritised in the smart specialisation approach, through its bottom-up processes involving industry, science, policymaking and civil society, they could support the implementation of Smart Specialisation. On the other hand, the S3 prioritisation exercises could help to better achieve the goals of the Plan and enhance the socio-economic effects of the R&I initiatives included in the Plan. To study the alignments and priorities is especially important in the Spanish case as the Covid-19 pandemic hit Spain when its R&I system was still recovering from the financial crisis of 2008, making synergies and a possible enhanced impact more relevant.

After matching and classifying R&I actions and investments of the Spanish RRP with Smart Specialisation priorities for 2021-2027, we estimate that up to €20.5 Billion of the Spanish Plan (29%) could potentially support directly and indirectly the Smart Specialisation processes in Spain. Direct support initiatives account for €11,017 Million, including investments in the Plan that can financially support R&I projects (from research to market commercialisation) that are aligned with S3 priorities areas. Indirect support actions account for €9,446 Million and include initiatives that could improve innovation eco-systems by acting in some barriers to innovation activities, excluding direct support. These figures only represent initiatives that have allocated some budget (investments). In addition, other 12 identified initiatives (reforms) importantly support Smart Specialisation indirectly by removing innovation barriers. For example, reform C17.R1

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[1] At the time of writing this paper, one region (Canary Islands) was revising their S3 exercises for the 2021-2027 period. Their S3 priorities refer to the 2014-2020 exercise.

'Reform of the Law of Science, Technology and Innovation' or reform C13.R1 'Improvement of regulation and of business environment'.

	POTENTIAL SUPPORT OF THE PLAN TO THE ACHIEVEMENT OF SMART SPECIALISATION GOALS 29% of available funding for 2021-23	
	DIRECT €11,017 Million	INDIRECT €9,446 Million
GOAL	Access to finance for innovative projects	Improvement of regional innovation eco-system (excluding access to finance)
ACTIONS	- Providing financial support to R&D and Innovation investments in areas aligned with Smart Specialisation priorities - Promoting R&D projects in partnership	- Supporting up-skilling and re-skilling labour force qualification for the twin transitions - Improving/adapting regional assets and infrastructures to twin transitions - Supporting internationalization
POTENTIAL EFFECT	- Reduction of R&D costs - Improving access to finance for innovation activities - Enhancing collaboration and partnership - Fostering knowledge transfer	- Matching demand and supply of labour force - Reducing the lack of qualified human resources - Support to find customers
(Marques Santos, 2021)		
COMPONENTS IN THE PLAN	C1 Sustainable mobility (urban) C3 Agri-food and fisheries C12 Industrial policy C15 Digital connectivity C17 Science, technology, and innovation C22 Care economy, equality, and inclusion	C1 Sustainable mobility (urban) C2 Renovation C7 Renewables C8 Electric infrastructure C9 Hydrogen C11 Public administration C13 Support to SMEs C14 Tourism C15 Digital connectivity C17 Science, technology, and innovation C18 Reform of health system C20 Vocational training

Source: Own elaboration based on Table 3 and Marques Santos (2021)

1. Introduction

Spain is the EU country that has been most affected by the Covid-19 pandemic with a real Gross Domestic Product (GDP) drop of 10.8% in 2020, compared to the EU27 average of 5.9% (Figure 1). Together with Italy, Malta, Greece, Croatia and France, Spain has suffered a very negative impact in terms of the GDP percentage change between 2019 and 2020 (around 8% or higher - Eurostat).

Figure 1. GDP (% real change), 2000-2020
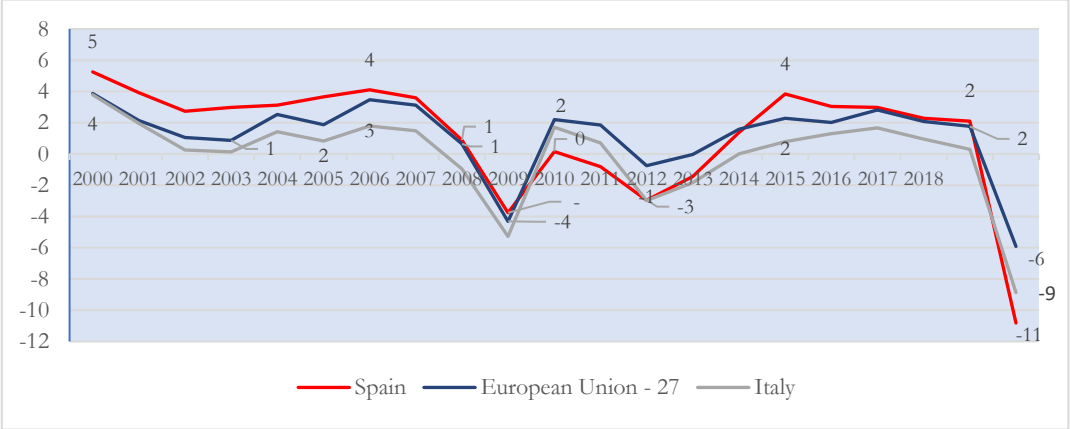
Source: Own elaboration based on Eurostat data [mama_10_gdp]. Item: GDP at market prices. Unit: Contribution to GDP growth, percentage point change on previous period.

The impact of the Covid-19 pandemic has been different across Spanish regions (Figure 2), with the Balearic Islands showing a GDP drop of 20% in 2020, Canary Islands and Catalonia following with GDP declines of 12.5% and 11.7%, respectively, on the same year. All Spanish regions showed negative GDP percentage drops in 2020 higher than 5% except Extremadura with a 4.6% GDP drop (Figure 2).

Figure 2. Interannual GDP growth rates across Spanish regions, 2020
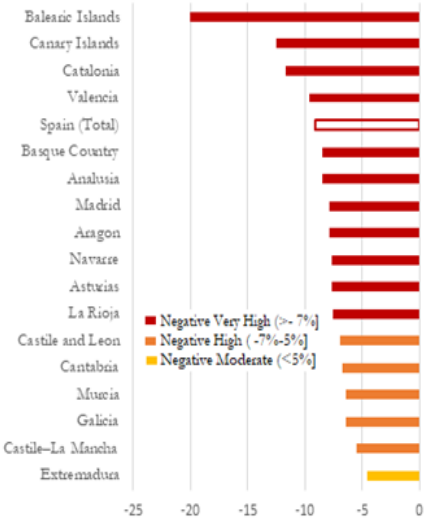
Source: Own elaboration based on Airef estimations. At the time of writing this paper, INE GDP data across regions was not available.

The Recovery and Resilience Facility launched in 2020 with a total allocation of €723.8 Billion within the Next Generation EU aims to facilitate the recovery of Europe. A total of €69 Billion corresponds to the Spanish allocation for 2021-2023, envisaging €140 Billion in public investments until 2026. In order to request these funds Spain submitted its RRP on 30 April 2021. This plan also has the medium-long term goal of transforming the economic fabric towards a more sustainable growth model (Gobierno de España 2021).

The Covid-19 crisis hit Spain in a moment when the Spanish Research and Innovation (R&I) system was still recovering from the financial crisis of 2008. Spanish Gross Domestic Expenditures on Research and Development (GERD) by GDP was 1.25% in 2019, which is below the 2010 level of 1.4% (INE-ICONO).[2] This combination of crises makes it more important to analyse the alignment of investment in the Spanish RRP with the priorities set by Smart Specialisation Strategies for the 2021-2027 programming period and to find opportunities for potential synergies and complementarities. Initiatives (investments and reforms) included in the Spanish RRP Plan could directly and indirectly have a positive impact on S3 processes by providing funding for R&I projects or by improving R&I national and regional ecosystems. S3 processes at national and regional level might also help to achieve the goals of the Plan and boost socio-economic effects of the R&I initiatives included in the Plan.[3] S3 were launched within the Cohesion policy of the European Commission for the 2014-2020 programming period and renewed for the current 2021-2027 programming period. S3 is an innovation policy that could be considered a new approach to governance and an experimental innovation policy due to its 'place-based' approach to regional development and to the involvement of a wide range of stakeholders in the process (Foray and Goenaga, 2013; Marinelli and Periañez Forte, 2017). New policy frameworks and methodologies could reshape S3 intro 'transformative Smart Specialisation' (Pontikakis, et al., 2020; Marques Santos et al., 2021; Marinelli, et al., 2021). Exploited synergies and complementarities between R&I policy actions might increase the long-term multiplier effect of R&I initiatives included in the Spanish RRP.

This report has four sections. Section 2 presents the methodology. Section 3 includes: a review of the obstacles to innovation activities and business operations (3.1); a revision of the priorities of the Smart Specialisation process in the country; (3.2) a review of the Spanish RRP (3.3); and the results of the matching process (3.4). Finally, Section 4 concludes.

2. Methodological approach

This study uses datasets and other secondary sources to describe the main R&I trends in Spain and its regions and to provide some figures on the different challenges and impacts of the Covid-19 pandemic at

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[2] See de No et al. (2018) for more details on the impact of the 2008 crisis on R&D investments in Spain and Europe (Veugelers, 2016).
[3] For example, if actions focus on specialisation areas that have been identified through the EDP process.

European and National level. Information on Smart Specialisation priorities relies on the [Eye@RIS3](4) database, [Red IDI](#) and S3 policy documents. S3-platform information was used for gathering S3 priorities for the 2014-2020 period. This information has been updated for the 2021-2027 period with the information provided by Spanish S3 policy documents: National S3 strategy and regional S3 Strategies (17 regions 'CA'). This combined information covers the two programming periods influenced by the S3 process: 2014-2020 and 2021-2027. At the time of writing this paper, 15 regions have advanced their priorities. S3 priorities refer to the 2014-2020 exercise for the remaining region: Canary Islands. Information on RRP relies on: the public version of the RRP as adopted by the Member States, including detailed information by components; EC Staff Working Document and EC Council Implementation Decision of the plan and related annexes.

The mapping and matching of the S3 innovation priorities with the R&I action on the RRP follows Marques Santos (2021: 15-18) methodology (see Box 1).

Box 1. Steps Followed in The Matching Process

- **Step 1. Mapping S3 innovation priorities** for 2021-2027 period, to understand which regions can potentially benefit from the actions of the Plan.

- **Step 2**. **Mapping** the different **components of the Plan by six thematic pillars** as listed in the Article 3 of Regulation (EU) 2021/241, to pre-screen component with investments in R&D and Innovation.

- **Step 3**. **Identifying components/investments** in the Plan that may be explicitly **associated with Smart Specialisation**, using text analysis.

- **Step 4**. **Classifying** actions in the Plan, directly and indirectly, related to **R&D and Innovation investments**.
  - **Direct linkage**: refers to investments in the Plan that can financially support any phase of innovative projects (from R&D to market commercialisation) that are aligned with Smart Specialisation priority areas.
  - **Indirect linkage**: refers to investments (*) in the plan that may affect the regional innovation ecosystem by acting in some known barriers, obstacles or challenges to innovation activities or business operation.

- **Step 5**. **Categorisation of R&D and Innovation actions** in the Plan by thematic areas. If no information is available, the action is considered with a potential benefit for all the innovation priorities of the strategies.

- **Step 6**. **Regionalisation of investments**, measuring the intensity of potential contribution for each region. See Table 4 in the Appendix. If no information is available (% of RRP investment attributed at NUTS 2 level), investments are categorized with potential benefit for all the regions or sectoral concentration of the territory.

- **Step 7**. Using information from steps 1,5 and 6, we **categorised the links** between the action in the Plan and S3 goals into three categories (strong, medium, and weak). See Table 5.

  - **Strong link** (●●●): means that the actions in the Plan may potentially benefit the region(s) because investment is channelled to the territory to support directly or indirectly the implementation of Smart Specialisation; furthermore, areas of actions of the Plan are also

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> aligned with innovation priorities of Smart Specialisation. When applicable, a strong link also means that the intensity of investment in the region is above the average.
>
> o **Medium link** (●●): refers to a situation when the investment intensity in a region is relatively close to the average and/or the area of action of the Plan is also aligned with the innovation(s) priority(ies) of Smart Specialisation. Final beneficiaries are not only actors of the regional innovation ecosystem, but actions are related to the mitigation of main known barriers to innovation activities.
>
> o **Weak link** (●): refers to a situation where planned investment intensity is below the average or non-existent in the territory, but the region can also benefit from it, even if not implemented in the territory. Areas of action of the Plan are also aligned with the innovation priorities of Smart Specialisation. The benefit of the action in the Plan is not only targeted for actors of the regional innovation ecosystem and/or priority areas of Smart Specialisation.
>
> Marques Santos (2021: 15-18)
> (*) In the Spanish case, initiatives consider investments and reforms.

The identification of R&I actions and initiatives in the Plan was done following a multi-step process: 1. Searching for 'R&D' related concepts and actions in the Plan; 2. Searching for 'innovation-related'[5] concepts in the Plan; 3. Search for R&I related Country Specific Recommendations (e.g. CSR2019 2.5); 4. Search for 'R&I' initiatives and actions in the detailed information of each component. Finally, all identified initiatives and actions were reviewed to see if they could be included in the analysis.[6]

3. Case study of Spain

3.1 Obstacles to innovation activities and business operation in Spain

During the pandemic problems to business operations for both Spanish and European (EU-27) firms were related to 'other' issues, which includes Covid-19 issues (Figure 3). Finding customers and the costs of production or labour followed in importance for both Spanish and European firms but were felt with greater intensity by Spanish firms (Figure 3). The availability of skilled staff or experienced managers was felt differently by European and Spanish firms, considering the rank of the degree of importance. While European firms rated this problem on a similar average degree of importance to that of cost related issues, around 6, Spanish firms rated it with an average near 5.5, being just above the rate of access to finance (Figure 3). Before the pandemic, the main obstacles to innovative activities in Spain were related to different priorities within the enterprise and high R&D and innovation costs (Figure 4). These two obstacles were reported with greater intensity by innovative firms. Difficulties in obtaining public grants or subsidies was the third main obstacle for innovative companies, while high competition and uncertain market demand was third for non-innovative companies (Figure 4).

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[5] A separate search of 'R&D' related concepts (e.g. 'I+D', 'investigación', 'ciencia') and 'innovation-related' concepts was done due to the widely spread use of 'innovation' in the Plan. The second search was carried out combining 'innovation' with concepts, such as, 'empresas', 'tecnología', 'I+D+i'. Smart Specialisation Initiatives were search in the plan and each component looking for 'especializacion', 'inteligente', 'estrategia', 'RIS3', 'S3'.

[6] Detailed information on actions found across searchers could be provided by contacting the author.

Figure 3. Problems to business operations, Spain April- September 2020
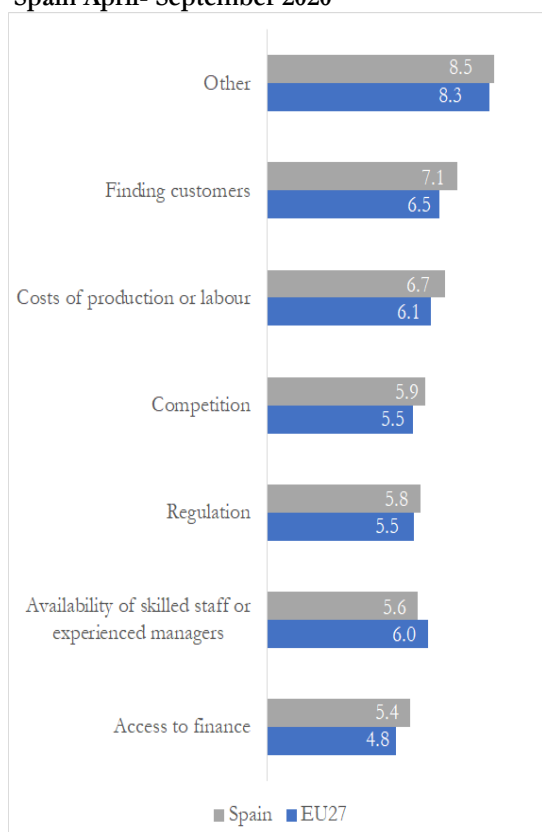
Figure 4. Hampering factors for innovation activities, Spain 2018
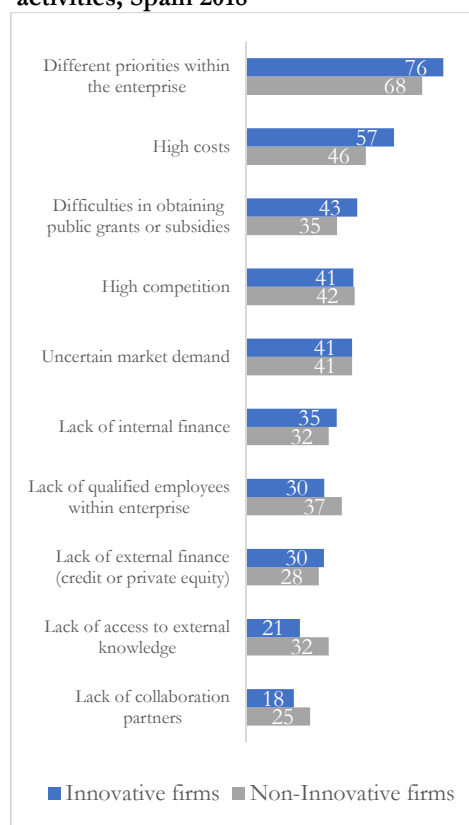
Source: Own elaboration based on Survey on the Access to Finance of Enterprises (Figure 3) and Community Innovation Survey (Figure 4). Note: Figure 3 refers to the average level of importance of the obstacles on a scale of 1-10, where 1 means it is not at all important and 10 means it is extremely important. Figure 4 includes the percentage of firms that have indicated the level of importance of hampering factors as high or medium [Eurostat: inn_cis11_ham]

Figure 5 and Figure 6 show the distribution of the two most hampering factors to innovation activities (for both innovative and non-innovative) across Spanish regions: different priorities within the enterprise (Figure 5), and high costs (Figure 6). Around 50% of firms in North-Western regions of the country considered internal prioritisation a highly important factor, while a lower percentage of firms felt the same in the rest of the country. Considering the high cost as a hampering factor for innovation (Figure 6), firms located in the Southern regions felt more intensively the high cost of R&D and innovation as a hampering factor of innovation activities. The different emphasis of the most hampering factors across Spanish regions might influence the relevance of direct (R&I investments) and indirect (other actions) R&I actions included the RRP plan.

Figure 5. Innovation activities 2017-2019. Percentage of firms that attribute a high level of importance to the factor "Different priorities within the enterprise"
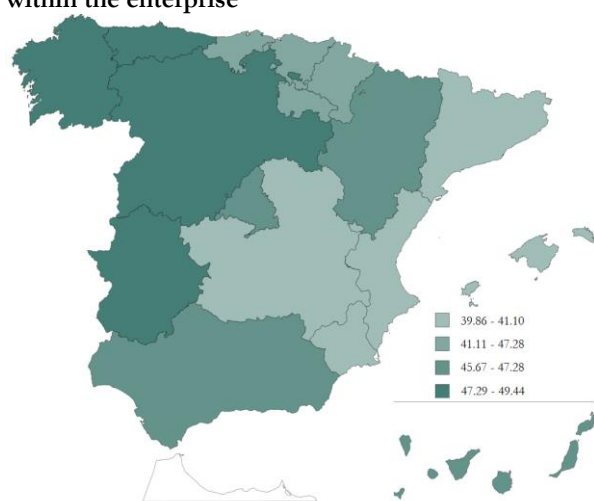
Figure 6. Innovation activities 2017-2019. Percentage of firms that attribute a high level of importance to the factor "High costs"

39.86 - 41.10
41.11 - 47.28
45.67 - 47.28
47.29 - 49.44

22.99 - 24.53
24.54 - 27.27
27.28 - 29.37
29.38 - 38.63
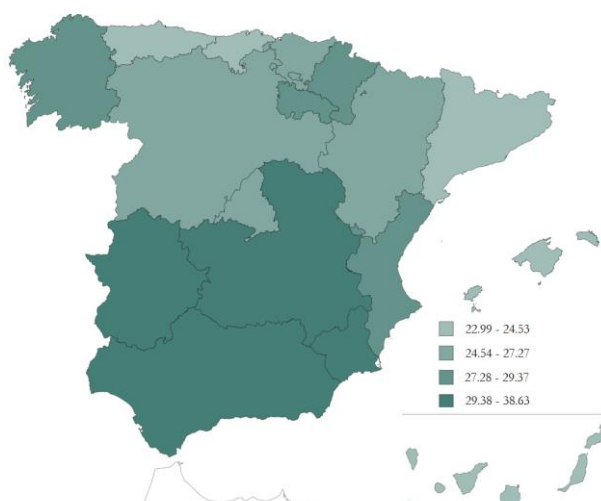
Source: Spanish Statistical National Institute (INE) Business innovation survey.

3.2 Smart Specialisation Strategies in Spain: Revision and Challenges

The Smart Specialisation process in Spain follows the multi-level structure of the country. There is a Smart Specialisation Strategy (RIS3) at state level ('RIS3-estatal') and 17 regional smart specialization strategies. At national level, the Spanish Strategy for Science, Technology and Innovation 2013-2020 (EECTI) was considered the Smart Specialisation Strategy of Spain (RIS3) for the previous programming period 2014-2020 (Operational Programme Pluriregional -POPE 2014-2020: 14). The new EECTI 2021-27 was approved on 8 September 2020. It is designed to become the S3 at national level ('S3-estatal') [7]. In addition, the EECTI provides support to the regional S3 developed by the regional governments ('Comunidades Autónomas' -CA). This "interaction is coordinated through the CPCTI [8] and the Network of Public Policies for R&I (Red IDI) and it is led by the Directorate General of European Funds of the Ministry of Treasury and Public Function (MINHA) and the Directorate General of Research Planning of the Ministry of Science and Innovation (MCIN) and integrates the entities involved in the R&I policies at State (AGE) and regional governments that manage the European Funds" (EECTI 2021-2027: 17). For the programming period 2021-2027 most regions have revised their priorities and the remaining ones are under the revision process. Figure 7 displays the S3 Innovation Priorities of the 17 Spanish regions. Following new European trends, new priorities are expected to include actions towards a greener, digital and inclusive economy, but showing some continuity with previous S3 prioritisation exercise. Some of these new trends include conceptual, methodological and policy frameworks that could help to reshape Smart Specialisation policies

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[7] In the previous programming period, the acronym 'RIS3' was used extensively. Currently, the acronym 'S3' is becoming predominant. In this text, we will restrict the term RIS3 to documents that include the acronym.
[8] Council of Science, Technology and Innovation (CPCTI) ("Consejo de Política Científica, Tecnológica y de Innovación")

(Foray and Goenaga, 2013) into 'transformative Smart Specialisation Strategies' (Pontikakis, et al., 2020; Marques Santos et al., 2021; Marinelli, et al., 2021). These changes could also help to increase the medium- and long-term multiplier effect of R&I initiatives included in the Spanish RRP, "raising the economy's sustainable growth potential (Gobierno de España, 2021: 22).

Figure 7. S3 Innovation priorities, Spain (2021-2027) (*)

Analusia	Aragon	Asturias
Transport and logistics Advanced Transport Systems and advance manufacturing Natural resources management Tourism innovation Health and well-being systems Healthy and safe food Promotion of Renewable Energies Digital Economy	Mobility Agri-food Logistics Ecological transition Wellness and health Leisure and culture	Agrifood Energy Green, smart and resilient industry Data economy Active and healthy aging Heritage and biodiversity

Balearic Islands	Basque Country	Canary Islands (*)
R&D (marine science..) Ecological transition Digital transformation Modernization of tourism Design Export products (textile..)	Smart Industry Clean Energies Personalised Health Healthy food Eco Innovation Sustainable Cities Creative Euskadi	Tourism and quality of life Renewable energy Logistics and connectivity Green growth and sustainability Astronomy and astrophysics instrumentation Marine Science Biotechnology and biomedicine related to biodiversity and tropical diseases Digital Economy

Cantabria	Castile and Leon	Castile–La Mancha
Agrifood Biotechnology Satellite and radio frequency communications Marine Engineering Automotive machinery and components Chemistry Metallic transformation Tourism	Quality of life (agri, health, silver economy, habitat, tourism) Carbon-neutral and fully circular (sustainability primary sector, bioeconomy, renewable energy, transport) Smart manufacturing and cybersecurity (advanced technology, Agri livestock 4.0, Forest Sector 4.0, Mining 4.0, Advanced Manufacturing, cybersecurity)	Food industry Tourism, culture and natural heritage Industry in transition and ancillary services Aeronautical Health and quality of life Logistics and smart mobility Transversal areas: digital transformation Sustainability and circular economy Talent and entrepreneurship internationalization

Catalonia	Madrid	Extremadura
Shared agendas: A sustainable, fair, equitable and healthy food system. An energy and resource system that is neutral in emissions and respectful of the environment A sustainable mobility and logistics system A universal, sustainable and resilient social-health system A reflective, anticipatory, inclusive and responsive education and knowledge generation system	Human and social processes Communications and digital transformation Enabling Advanced Technologies ecological transition global health Biotechnology and agri-food	Agro-food Ecologic transition Health and Wellbeing Cultural industries and Tourism Digital Transformation

Figure 7. S3 Innovation priorities, Spain (2021-2027) - (continuation)

Galicia	La Rioja	Navarre
Scientific and technological solution for sustainability Digitization for the new industrial and social model Galicia Living lab	Smart territory Competitive territory Sustainable territory	Electric and connected mobility Healthy and sustainable food Green energy industry Personalised medicine Sustainable tourism Audiovisual industry

Murcia	Valencia
Agri-food (water, environment and logistics) Driving activities (marine and maritime, energy, chemical) Quality of life (Tourism, Habitat, Health, Footwear and Fashion)	Towards a circular and low carbon economy Integrate data in the era of the digital economy Innovative Valencian Community due to its origin and destination Innovation for people

Source: Own elaboration based on information provided by Red IDI and regional sources (i.e Extremadura S3 website).
Information for 2014-2020 S3 priorities comes from Eye@RIS3 database and Red IDI.
Note: (*): S3 priorities refer to the 2014-2020 exercise as, at the time of writing this report, their S3 priorities for the 2021-2027 period were not published.

3.3 Spanish Recovery Resilience Plan

Spain submitted its RRP Plan on 30 April 2021. The Spanish RRP includes 30 components (Table 1), with 212 measures (110 investments and 102 reforms), that represent an amount of €69,528 million for 2021-2023, fully consisting of grants. These components are associated with four cross-cutting pillars (Green transition; Digital transformation; Social and territorial cohesion; and Gender equality) (or 'structural dimensions') and 10 'lever policies' ([9]) or policy areas (i. Urban and rural agenda, fight against depopulation and agricultural development; ii. Resilient infrastructures and ecosystems; iii. A fair and inclusive energy transition; iv. An administration for the 21st century; v. Industry and SME modernisation and digitalisation; vi. Promotion of science and innovation and strengthening of the National Health System; vii. Education and knowledge, lifelong learning and capacity building; viii. The new care economy and employment policies; ix. Promotion of the culture and sports industry; and, x. Tax system modernisation); and the six thematic pillars referred to in Article 3 of Regulation (EU) 2021/241 (Green transition; Digital

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([9]) "Lever policies" is the term stated in the Plan (see Executive Summary in English).

transformation; Smart, sustainable and inclusive growth; Social and territorial cohesion; Health, and economic, social and institutional resilience; and Policies for the next generation, children and the youth).

Table 1. Components of the Spanish RRP by policy areas

Component	Mill. €	%
i. Urban and rural agenda, fight against depopulation and agricultural development	**14,407**	**20.7%**
C1 Action Plan for sustainable, safe and connected mobility in urban and metropolitan areas	6,536	9.4%
C2 Housing rehabilitation and urban renewal plan	6,820	9.8%
C3 Green and digital transformation of agri-food and fisheries industries	1,051	1.5%
ii. Resilient infrastructures and ecosystems	**10,400**	**15%**
C4 Ecosystems biodiversity conservation and restoration	1,642	2.4%
C5 Coastal area and water resources preservation	2,091	3.0%
C6 Sustainable, safe and connected mobility	6,667	9.6%
iii. A fair and inclusive energy transition	**6,385**	**9.2%**
C7 Renewable energies implementation and integration	3,165	4.6%
C8 Electrical infrastructures, promotion of smart networks and deployment of flexibility and storage	1,365	2.0%
C9 Renewable hydrogen roadmap and sectoral integration	1,555	2.2%
C10 Fair transition strategy	300	0.4%
iv. An administration for the 21st century	**4,239**	**6.1%**
C11 Modernisation of public Administration	4,239	6.1%
v. Industry and SME modernisation and digitalisation	**16,075**	**23.1%**
C12 Industrial Policy Spain 2030	3,782	5.4%
C13 Fostering SME growth	4,894	7.0%
C14 Modernisation and competitiveness of the tourism sector	3,400	4.9%
C15 Digital connectivity, cybersecurity, 5G deployment	3,999	5.8%
vi. Promotion of science and innovation and strengthening of the National Health System	**5,025**	**7.2%**
C16 National Strategy for Artificial Intelligence	500	0.7%
C17 Institutional reform and capacity building of the national science, technology and innovation system	3,456	5.0%
C18 Renewal and expansion of National Health System capacities	1,069	1.5%
vii. Education and knowledge, lifelong learning and capacity building	**7,317**	**10.5%**
C19 National Plan for Digital skills	3,593	5.2%
C20 Strategic plan for Vocational Training	2,076	3.0%
C21 Modernisation and digitalisation of the education system, including early education from 0 to 3 years	1,648	2.4%
viii. The new care economy and employment policies	**4,855**	**7.0%**
C22 Emergency plan for the care economy and reinforcement of inclusion policies	2,492	3.6%
C23 New public policies for a dynamic, resilient and inclusive labour market	2,363	3.4%
ix. Promotion of the culture and sports industry	**825**	**1.2%**
C24 Valorisation of the cultural industry	325	0.5%
C25 Spain audio-visual hub	200	0.3%
C26 Sports sector promotion plan	300	0.4%
x. Tax system modernisation	**n.a.**	**n.a.**
C27 Measures to prevent and fight against tax fraud	n.a.	n.a.
C28 Tax reform for the 21st century	n.a.	n.a.
C29 Improving the effectiveness of public spending	n.a.	n.a.
C30 Long-term sustainability of the public pension system within the framework of the Toledo Pact	n.a.	n.a.
Total	**69,528** [*]	**100%**

Source: Adapted from Spanish RRP - Gobierno de España (2021: 118)

(*) "This amount is marginally in excess of the plan's total allocation of EUR 69 512 589 611". Commission analysis of Plan - SWD(2021) 147 final (2021: 25). (n.a.) Non-available. Reforms don't have budget assigned in the RRP.

The ex-ante impact evaluation of the Spanish RRP, conducted by the Member State, foresees a positive impact of 0.4 perceptual points (p.p.) on GDP growth (p. 226). "The execution of the actions envisaged in the plan could represent an annual increase of 2 p.p. of the GDP, recovering the pre-COVID growth path at the end of the RRP execution period" (Gobierno de España, 2021: 227). The evaluation impact remarks the multiplier effect of digital actions and R&D investments. In terms of employment, the plan envisages over 800,000 new employments over the implementation period (p. 227). The actions and investments of the Spanish RRP are envisaged to break the declining trend on public investments and R&D investments that emerged after the financial crisis (p. 229-231). The positive impact of the Spanish plan is ratified by Commission services simulations. These simulations indicate that the plan could increase the GDP of Spain by between 1,8 and 2,5% by 2024 ([10]) (EC Council Implementing Decision of the Spanish Plan - Com(2021)322 final: 7).

The plan indicates potential complementarities with other strategic actions at European level (e.g. European Green Deal, European Digital Strategy) and funding instruments, such as the Multiannual Financial Framework (MFF) (e.g. European Social Fund -ESF and European Regional Development Fund -ERDF) and the EU's centralised programmes (e.g. Horizon Europe, Digital Europe, Connecting Europe Facility-CEF) (Gobierno de España 2020: 179)

On 16 June 2021, the European Commission provided a positive assessment of the Spanish Plan (SWD(2021) 147 final). On 13 July 2021, it was formally approved by the European Council. This allowed Spain to sign the grants agreement and start receiving the funds for the implementation of the Spanish Plan. The Commission analysis of the Spanish Plan (SWD(2021) 147 final) indicates that: i. "The plan pursues the general objective of the Facility to promote the Union's economic, social and territorial cohesion and is balanced in its response to the six policy pillars referred to in Article 3 of the Regulation" ([11]) (p. 3). Table 2 reports the Spanish -Member State (MS) - and Commission analysis on the contribution of each component of the Spanish Plan to the pillars of the Recovery and Resilience Facility Regulation.

([10]) These simulations consider the overall impact of NextGenerationEU (NGEU), including funding for ReactEU, Horizon Europe, InvestEU, Just Transition Fund (JTF), Rural Development and RescEU. Recovery and Resilience Facility (RRF) represents 90% of the NGEU funds (European Commission [Accessed on 31/08/2021]. The simulations do not include the positive impact of structural reforms that could be substantial.

([11]) Regulation (EU) 2021/241 of the European Parliament and of the Council of 12 February 2021 establishing the Recovery and Resilience Facility.

Table 2. Components of the Spanish Recovery and Resilience Plan by pillars

Component (shortened names)	Amount €Million	Green transition MS	Green transition EC	Digital transformation MS	Digital transformation EC	Smart, sustainable and inclusive growth MS	Smart, sustainable and inclusive growth EC	Social and territorial cohesion MS	Social and territorial cohesion EC	Health, and economic, social and institutional resilience MS	Health, and economic, social and institutional resilience EC	Policies for the next generation, children and the youth MS	Policies for the next generation, children and the youth EC
C1 Sustainable mobility (urban)	6,536	●	■	●	□	●	□	●	□				
C2 Renovation	6,820	●	■			●	■	●	■				□
C3 Agri-food and fisheries	1,051	●	■	●	□	●		●	□				
C4 Ecosystems and biodiversity	1,642	●	■	●	□	●			□	●	■		
C5 Coast and water resources	2,091	●	■		□	●			□	●	■		
C6 Sustainable mobility (long-distance)	6,667	●	■	●	□	●	□	●	□				
C7 Renewables	3,165	●	■			●	□		□				
C8 Electric infrastructure	1,365	●	■	●	■	●	□						
C9 Hydrogen	1,555	●	■			●	□						
C10 Just transition	300	●	■	●		●	□	●	■	●		●	
C11 Public administration	4,239	●	□	●	■	●	■	●	□	●	■		
C12 Industrial policy	3,782	●	■	●	■	●	■			●	■		
C13 Support to SMEs	4,894			●	■	●	■	●	□	●	■		
C14 Tourism	3,400	●	□	●	■	●	■	●	■	●			
C15 Digital connectivity	3,999	●		●	■	●	■	●	■	●		●	
C16 Artificial Intelligence	500			●	■	●	■			●		●	
C17 Science, technology and innovation	3,456	●	□	●		●	■			●		●	□
C18 Reform of health system	1,069			●	□	●		●		●	■		□
C19 Digital skills	3,593			●	■	●	□	●		●		●	■
C20 Vocational training	2,076	●	□	●	□	●	□	●	□	●		●	■
C21 Education	1,648			●	□	●		●	□	●		●	■
C22 Care economy, equality and inclusion	2,492			●	■	●		●	■	●	■		□
C23 Labour market	2,363	●	□	●	□	●		●	■	●		●	□
C24 Cultural industry	325			●	□	●	■	●				●	
C25 Audiovisual	200			●	□	●	■	●					
C26 Sports	300	●	□	●	□	●		●			□		
C27 Prevention of tax fraud	n.a.					●		●		●	■		
C28 Tax system	n.a.		■			●		●		●	■		
C29 Effective public spending	n.a.					●		●		●	■		
C30 Pension system reform	n.a.					●		●	■			●	

Source: Own elaboration based on the Spanish RRP - Gobierno de España (2021: 81) – and Commission analysis of Plan - SWD(2021) 147 final (2021: 35).

Note: MS corresponds to the Member State Classification - ● component contribute to the EU pillar, EC corresponds to the European Commission classification - ■ component significantly contribute to the pillar (with colour codes), □ component partially contributes to the pillar.

i. A total of 18 out of 30 components of the Spanish plan are aimed at green transition (Table 2), supporting climate change objectives for an amount that represent 40% of the plan's total allocation.

ii. A total of 21 out of 30 components of the Plan address the digital transformation (Table 2), which represent 28% of the plan's total allocation.

iii. The RRP of Spain is expected to contribute to addressing a significant subset of challenges identified in the relevant country-specific recommendations addressed to Spain in the context of the European Semester regarding: i) Fiscal sustainability; (ii) Labour market (e.g. Employment protection and framework for contracts and incentives to work and create jobs and unemployment benefits) ; (iii) Education (e.g. Access to digital learning and reduce early school leaving and improve educational outcomes, taking into account regional disparities); (iv) Social policies (e.g. improve support to families and improve adequacy and coverage of minimum income schemes); (v) Research and innovation (e.g. Enhance the effectiveness of policies on research and innovation); (vi) Investment (e.g. focus investment on fostering innovation and green and digital transition); and (vii) Public administration and business climate (e.g. improve coordination across levels of government and enhance measures to provide liquidity to SMEs and self-employment).

3.4 RRP as a potential instrument to support Smart Specialisation

After matching the R&I related initiatives of the Spanish RRP and the Smart Specialisation innovation priorities for 2021-2027 up to €20,462 million (Table 3) – 29% of the 2021-23 total subsidies were identified as potential ([12]) contribution to the implementation of the Smart Specialisation Strategies of Spanish regions.

Although Smart Specialisation Strategies are only explicitly mentioned as a framework for action in one component (C17- Science, Technology, and Innovation), the analysis carried out in all the initiatives (investments and reforms) in the Plan identified actions in 15 components with potential direct and indirect linkages with the Smart Specialisation processes in the country. Direct linkages represent €11,017 million, including actions that financially support R&D and innovation investment in any part of the innovation chain (from development to market). Indirect actions account for €9,446 million and include initiatives that could positively affect smart specialisation processes as they aim at improving regulation, infrastructures, or skills.

Across components, C12 'Industrial policy' represents the highest share of the total potential investments to support Smart Specialisation (25%), followed by C13 'Support to SMEs' (24%) and C17 'Science, Technology, and Innovation' (17%). Other important initiatives are included in C1 'Sustainable mobility (urban)' (10%), C9 'Hydrogen' (8%) and C15 'Digital connectivity' (7%). These figures show the transversal character of R&I initiatives across policy areas and the importance of coordination across policy levels,

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([12]) It will depend on the final selection of projects and the governance model adopted. For example, with different degrees of regionalisation or stakeholders involvement.

layers and policy areas (Flanagan et al., 2011; Magro and Wilson, 2013) for a successful implementation of R&I and S3 initiatives (Marinelli, et al., 2020).

Previous figures take into account the initiatives that have allocated some budget (investments). In addition, the analysis found other 12 initiatives (reforms) that could importantly support Smart Specialisation indirectly, by improving R&I systems through non-financial instruments and by removing other barriers to innovation (Table 3). For example, reform C17.R1 'Reform of the Law of Science, Technology and Innovation' or reform C13.R1 'Improvement of regulation and of business environment'.

Initiatives (investments and actions) included in the plan might help to achieve S3 goals by acting in some barriers to innovation in the country. These actions include providing financial support for R&D projects and other innovation activities (C1; C3; C12; C15; C17; C18; C22), which is the most common direct intervention across components (Table 3). Indirect initiatives frequently envisaged across components include the improvement of regulatory frameworks (C1; C2; C7; C8; C9; C13; C14; C17; C18). Other actions aim at: supporting innovation and business creation (C8; C9; C11; C14; C15); developing infrastructures (C3; C9; C12; C17); providing skills (C13; C14; C15; C20); and fostering knowledge transfer and network creation (C9; C13; C17). Actions targeting the improvement of the R&D system and coordination are specific of the C17 component. Gender oriented actions include, for example, specific funding for female entrepreneurship (C13) (Table 3).

Selection processes of R&D funding appears to follow a competitive process in general terms as all the funding included in the R&I Plans (ie. Spanish Spate Plan of Scientific and Technical Research and Innovation -PEICTI- 2017-2020 and PEICTI 2021-2023) are distributed on a competitive basis. For example, call on "Public-private strategic research projects" (cod. BDNS 556877 or SA.63028 (2021/X) INV). This selection process could help to ensure a diversified participation. However, this exercise has not included a systematic review of the calls launched within Spanish RRP across components.

Table 3. Matching actions of the Spanish RRP and Smart Specialisation innovation priorities

Component	#	Description	Amount € Million	Type of link	Contribution to smart specialisation	Innovation area-related	linkage with Smart Specialisation
C1 Sustainable mobility (urban)	1	Plan for electric mobility, including innovation projects, related to experimental and industrial developments linked to electric mobility	2000	Direct	- Providing financial support to R&D and innovation activities on health	Sustainable mobility	●●● All regions
C3 Agri-food and fisheries	2	Plan to promote sustainability, research, innovation, and digitization of the fishing sector (I). Modernization of Network	10	Direct	- Providing funding for infrastructures and studies and technology acquisition	sustainable fishing and marine studies	● Andalusia, Murcia
C3 Agri-food and fisheries	3	Plan to promote sustainability, research, innovation, and digitization of the fishing sector (II): Promotion of fisheries research and aquaculture and training support	10	Direct	- Providing funding for R&I and infrastructures	sustainable fishing and marine studies	●●● Andalusia and Mediterranean regions ● Other coastal regions
C3 Agri-food and fisheries	4	Plan to promote sustainability, research, innovation and digitization of the fishing sector (III). Promotion of technological development and innovation in the fishing and aquaculture sector, to promote the blue economy	11	Direct	- Providing funding for R&D projects and technology development	Blue economy	●●● Galicia, Andalusia, Cantabria, Valencia, Basque Country ● Other regions
C3 Agri-food and fisheries	5	Plan to promote sustainability, research, innovation and digitization of the fishing sector (VI). Support to the financing of the Fishing Sector	10	Direct	- Providing funding for innovation	Blue economy	●●● Galicia, Andalusia, Cantabria, Valencia, Basque Country ● Other regions
C12 Industrial policy	6	Funding for the promotion of disruptive digital spaces in different sectors	400	Direct	- Providing financial support to R&D and innovation activities on health - Supporting technology development	ICT	●●● All regions
C12 Industrial policy	7	Initiatives to promote industrial transitions	4797	Direct	- To fund R&I projects - To provide infrastructures	All innovation areas	●●● All regions
C15 Digital connectivity	8	Deployment of cross-border digital infrastructures, including R&I projects (quantic communication)	125	Direct	- R&I projects on quantum communication	ICT	●●● All regions
C17 Science, technology, and innovation	9	Complementary Plans with CCAA. Collaboration between the Autonomous Communities and the General State Administration in R&I actions, aligning priorities and establishing synergies in strategic areas.	299	Direct	Improving national-regional coordination on S3 priorities	All innovation areas (Quantum Communication, Energy and Green Hydrogen, Agri-food, Biodiversity,	●●● All regions

						Astrophysics and High Energy Physics, Marine Sciences, Advanced Materials, Health Biotechnology)	
C17 Science, technology, and innovation	10	Funding for strengthening the infrastructure and research equipment	445	Direct	Providing financial support to R&I infrastructure and equipment	All innovation areas	●● All regions ●●● Canary Islands
C17 Science, technology, and innovation	11	Funding for R&I projects, encouraging public-private collaboration, and strategic lines	1167	Direct	- Providing financial support to R&D activities - Improving innovation network - Supporting knowledge transfer	All innovation areas	●●● All regions
C17 Science, technology, and innovation	12	Funding for improving research careers and its relationship with the public sector	294	Direct	- Providing financial support to R&D activities - Supporting knowledge transfer	All innovation areas	●●● All regions
C17 Science, technology, and innovation	13	Funding for technology transfer projects. Promoting excellence in SMEs (European stamp) and investments in strategic technologies	402	Direct	- Providing financial support to R&D and innovation activities - Supporting innovation in SMEs and knowledge transfer	All innovation areas	●●● All regions
C17 Science, technology, and innovation	14	Funding for flagship initiative on R&I for personal health	527	Direct	- Providing financial support to R&D and innovation activities on health - Supporting technology development on health	Health related	●●● All regions
C17 Science, technology, and innovation	15	Funding for research projects on Environment, climate change and energy, focusing on sustainable plastics, on the impact of change climate in water reserves, renewable energies, integration of high-tech components in the energy cycle and identification of areas favourable for the sustainable environmental exploitation of mineral raw materials critical for the energy transition	82	Direct	- Providing financial support to R&D and innovation activities on health - Supporting technology development	Energy transition and environment (Green economy)	●●● All region ●●● Extremadura (+)
C17 Science, technology, and innovation	16	Funding for R&I projects on sustainable automobile	40	Direct	- Providing financial support to R&D and innovation activities transport (automobile) - Supporting technology development	Transport (automobile)	● Asturias; Balearic Islands; Canary Islands; Castile–La Mancha, Extremadura; La Rioja; Murcia

							●●● Rest of the regions
C17 Science, technology, and innovation	17	Funding for R&D and technology development linked to the future low- and zero-emission aircraft whose R&D activities are covered by the Aeronautical Technological Plan	200	Direct	- Providing financial support to R&D and innovation activities on aerospace - Supporting technology development	Aerospace and sustainability	●●● Madrid, Castile–La Mancha; Andalusia, Basque Country, Catalonia ●●Rest of the regions
C22 Care economy, equality and inclusion	18	Spain Accessible Country Plan, including R&I projects (8)	198	Direct/Indirect	- To facilitate/fund R&I projects	All innovation areas	● All regions
SUBTOTAL (DIRECT LINKAGE)			**11,017**				
C1 Sustainable mobility (urban)	19	Law on sustainable mobility and Financing of Transport that will regulate activities related to transport and mobility, including fostering innovation and digitization (regulatory Sandbox)	-	Indirect	Promoting innovation in mobility (Regulatory Sandbox)	Mobility transport	●● All regions
C2 Renovation	20	Action plan for the implementation of the long-term strategy for Rehabilitation Energy in the Building in Spain (ERESEE)	-	Indirect	- To facilitate policy and regulatory framework	Construction	●● All regions
C7 Renewables	21	Roadmap for innovation and technology development in renewable energies (offshore wind energy and biogas, including legal framework and technology development)	-	Indirect	Creating favourable climate and legal framework	Renewable energy	●● All regions
C8 Electric infrastructure	22	Regulatory sandboxes that contribute to facilitating research and innovation in the electric sector	-	Indirect	- Regulatory sandbox	Energy	●● All regions
C8 Electric infrastructure	23	Storage strategy energy and adaptation of regulatory framework for deployment of energy storage, including development of new business models	-	Indirect	- To facilitate regulatory frameworks - To promote new business models in the sector	Energy	●● All regions
C8 Electric infrastructure	24	New business models in the energy transition (e.g. Regulatory sandboxes, demand aggregators and start-up creation)	156	Indirect	- To facilitate regulatory frameworks - To promote new business models and start-up in the sector	Energy	●● All regions
C9 Hydrogen	25	Roadmap for hydrogen, which includes an analysis of the current situation and the barriers facing the development of renewable hydrogen in Spain, including measures in different areas (regulations, incentives, and R&I)	-	Indirect	- To facilitate policy and regulatory frameworks - To promote R&I in the sector	Energy (hydrogen)	●● All regions
C9 Hydrogen	26	Renewable hydrogen 4 lines: a) Support measures for SMEs and technology centres (R&I infrastructures), b) Sectoral integration that spatially concentrates large-scale production, transformation, and consumption, c) Development of pioneering projects on renewal hydrogen,	1,555	Indirect/Direct	- To provide R&I infrastructure - Network facilitation and project development	Energy (hydrogen)	●● All regions

		d) Development and integration of the value chain (network creation and project development)					
C11 Public administration	27	Initiatives to improve Public Administration through ICT and innovation	960	Indirect	- To promote and facilitate innovation	ICT	●● All regions
C13 Support to SMEs	28	Regulatory changes aiming to improve business environment	-	Indirect	- Improving regulatory framework to business environment	All innovation areas	●● All regions
C13 Support to SMEs	29	The Strategy includes a set of instruments to support innovative entrepreneurship, including a Law for Start-ups to create a favourable framework for the constitution and growth of highly innovative emerging companies and a fund public-private NEXT-TECH to scale start-ups in disruptive technologies	-	Indirect	- Improving regulatory framework to business environment	All innovation areas	●● All regions
C13 Support to SMEs	30	Set of measures aimed at enhancing the entrepreneurial ecosystem in four main areas: entrepreneurial skills, tools to facilitate the creation and transfer of companies and business management in early stages, communication, and lines of financial support for the entrepreneurial activity of SMEs.	329	Indirect/Direct	- Improving skills and tools - Supporting networks for entrepreneurships tools - Funding for female entrepreneurship	All innovation areas	●● All regions
C13 Support to SMEs	31	Growth. Promotion of the growth of SMEs through: (i) program skill for the growth of SMEs, (ii) Support program for industrial entrepreneurship, (iii) Strengthen guarantee system, providing support in the form of guarantees.	514	Indirect/Direct	- Improving skills and tools - Facilitating guarantees	All innovation areas	●● All regions
C13 Support to SMEs	32	It includes programs for SMEs to facilitate the adoption of digital solutions and digital transformation; support digitalization projects in the value chain of the different industrial sectors (clusters recognized as Agrupaciones Innovative Business Companies) and support for Digital Innovation Hubs	3556	Indirect	- Improving digital solutions and skills - Facilitating networks	All innovation areas	●● All regions
C13 Support to SMEs	33	It includes three actions: a Technological fund programme; a funding program for markets and commercial areas; Support for the Centre for Research and Quality Control.	318	Indirect	- Technology acquisition - Infrastructures	All innovation areas	●● All regions
C13 Support to SMEs	34	It includes several initiatives to support the internationalisation of Spanish firms	202	Indirect	- Support services for internationalisation	All innovation areas	●● All regions
C14 Tourism	35	Royal Decree by which the State Financial Fund for Tourist Competitiveness (FOCIT) for innovation projects in sustainable tourism	-	Indirect	- Regulatory framework	Sustainable tourism	●● All regions
C14 Tourism	36	Support for resilience strategies tourism for extra-peninsular territories (Balearic Islands, Canary Islands and Ceuta and Melilla), in order to support the innovation, adaptation to climate change and promoting diversification and seasonal adjustment	220	Indirect	- Skills development and facilities	Sustainable tourism	●● Balearic Islands, Canary Islands, Ceuta and Melilla
C14 Tourism	37	Digitalization IA in the tourism sector, including new governance models, innovation, and technology development and acquisition	337	Indirect	- To facilitate technology acquisition - To promote digital transformation and new value chains	Sustainable tourism	●● All regions

	#	Description	Amount	Linkage	Objective	Innovation area	Regions
C15 Digital connectivity	38	Funding for 5G deployment of (i) infrastructure; (ii) mobile networks; (iii) projects; and (iv) development of R&I ecosystems in 5G and 6G	230	Indirect	Development of R&I ecosystems in 5G and 6G	ICT digital communication	●● All regions
C15 Digital connectivity	39	Reinforcement of connectivity in reference centres for socioeconomic growth (eg. industrial areas, research centres, hospitals..) and transformative project development of sectoral digitization	480	Indirect/direct	- To facilitate connectivity - To promote project development (Transformative actions)	All innovation areas	●● All regions
C15 Digital connectivity	40	Cybersecurity: (Skills)Strengthening the capacities of citizens, SMEs and professionals; and Boosting the sector's ecosystem	524	Indirect	- To provide skills on cybersecurity - To improve research and business ecosystem on cybersecurity	ICT	●● All regions
C17 Science, technology, and innovation	41	Reform of the Law of Science Technology and Innovation improving: 1) governance and coordination; 2. Research careers; and knowledge and technology transference.	-	Indirect	Improving governance and coordination and knowledge and technology transference	All innovation areas	●● All regions
C17 Science, technology, and innovation	42	EECTI 2021-2027 sets the strategic framework of the Spanish R&I systems. SECTI is the R&I monitoring system	13	Indirect	- Providing strategic framework - Improving coordination and monitorization	All innovation areas	●● All regions
C17 Science, technology, and innovation	43	Reorganization of Public Research Bodies (OPIs) to improve structure and functioning.	-	Indirect	Improving functioning of public research centres	All innovation areas	●● All regions
C18 Reform of health system	44	Promotion and regulatory adaptation to improve R&I in health sector.	2	Indirect	Facilitating regulation on Health sector (new medicines)	Health related	●● All regions
C18 Reform of health system	45	Strengthening of Primary and Community Care. Line k) Promote research and innovation in Primary Care	-	Indirect	- To promote research and innovation in Primary Care	Health	●● All regions
C20 Vocational training	46	Innovation and internationalization of Vocational Training, including development of innovation and knowledge transfer projects through associations between companies, Vocational Training centers and any other training and innovation institution in the territories	50	Indirect	- Skills development and knowledge transfer through vocational training	All innovation areas	●● All regions
		SUBTOTAL (INDIRECT LINKAGE)	**9,446**				
			20,462				

Source: Own elaboration based on information in the Spanish RRP

Note: # refers to the sequential number. For some components, the values in the column 'amount' do not include the total of the component because only investment/actions related to Smart Specialisation were included. For more details about the reasoning on the intensity of the linkage see Table 5 in the Appendix

Legend: ●●● strong link, ●● medium link, and ● weak link.

4. Conclusion

This study has analysed the initiatives (investments and actions) of the Spanish RRP that could potentially support directly and indirectly the achievements of the S3 goals, by acting in some barriers to innovation activities in Spain:

- Providing financial support to R&D, technology development and other innovation activities (C1; C3; C12; C15; C17; C18; C22)
- Improving governance and coordination (C17)
- Fostering knowledge transfer and network creation (C9; C13; C17)
- Developing infrastructures (C3; C9; C12; C17)
- Improving regulatory frameworks (C1; C2; C7; C8; C9; C13; ; C17; C18)
- Supporting innovation and business creation (C8; C9; C11; C14; C15)
- Providing skills (C13; C14; C15; C20)

Following Marques Santos (2021) methodology for matching and classifying R&I related initiatives (investments and reforms) of the Spanish RRP with S3 priorities for 2021-2027, we found that up to €20.5 Billion of the Spanish Plan could potentially support directly and indirectly the S3 processes in Spain. Direct support actions account for €11,017 Million and include investments in the Plan that can financially support R&I projects along the innovation chain (from development to market) that are aligned with S3 priorities areas. Indirect support initiatives account for €9,446 Million and include investments that could improve innovation eco-systems by acting in some barriers to innovation activities with the exception of direct R&I support. In addition, we found other 12 identified initiatives (reforms) that importantly support Smart Specialisation indirectly by removing innovation barriers. These correspond to initiatives that do not have budget allocation. For example, reform C17.R1 'Reform of the Law of Science, Technology and Innovation' or reform C13.R1 'Improvement of regulation and of business environment'.

Matched action cover 15 components of the 30 components of the Spanish RRP. Across components, C12 'Industrial policy' represents the high share of the total potential investments to support Smart Specialisation (25%), followed by C13 'Support to SMEs' (24%) and C17 'Science, Technology, and Innovation' (17%). Other important initiatives are included in C1 'Sustainable mobility (urban)' (10%), C9 'Hydrogen' (8%) and C15 'Digital connectivity' (7%). These figures show the transversal character of R&I initiatives across policy areas and the importance of coordination across policy levels, layers and policy areas (Flanagan et al., 2011; Magro and Wilson, 2013) for a successful implementation of R&I and S3 initiatives (Marinelli, et al., 2019 and 2021). In addition, the transformative framework of S3 (e.g. Marinelli, et al., 2021; Pontikakis, 2020) could help to enhance synergies between RRP and S3.

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Acronyms

MAPA - Ministry of Agriculture, Fisheries and Food - Ministerio de Agricultura, Pesca y Alimentación

MCIN – Ministry of Science and Innovation - Ministerio de Ciencia e Innovación

MINCOTUR- Ministry of Industry, Commerce and Tourism- Ministerio de Industria, Comercio y Turismo

MINECO - Ministry of Economic Affairs and Digital Transformation

- Ministerio de Asuntos Económicos y Transformación Digital

MINHA – Ministry of Treasury and Public Administration - Ministerio de Hacienda y Función Pública

MITECO – Ministry for the Ecological Transition and the Demographic Challenge - Ministerio para la Transición Ecológica y el Reto Demográfico

MITMA- Ministry of Transport, Mobility and Urban Agenda Ministerio de Transportes, Movilidad y Agenda Urbana

SEDIA – State Secretary of Digitalisation and Artificial Intelligence SEDIA - Secretaría de Estado de Digitalización e Inteligencia artificial

Appendix

Table 4. Justification under the regionalisation of selected investments

Comp	#	Investment code, name, and amount	Amount € Million	Justification for the regionalisation of investment
C7	21	C7.R4 - Framework for innovation and technology development for renewable energies	-	Entities involved in the implementation: MITECO in collaboration with CA
C15	38	C15.I6 - Deployment of 5G. Networks, technology change and innovation.	230	Entities involved in the implementation: MINECO
C17	41	C17.R1 Reform of the Law of Science, Technology and Innovation	-	Entity involved in the implementation: MCIN
C17	42	C17.R2 Spanish Strategy for Science, Technology and Innovation 2021-2027 (EECTI) and Information System on Science, Technology and Innovation (SICTI) development	13	Entity involved in the implementation: MCIN. Beneficiaries: national and regional coordination R&I actors
C17	43	C17.R3 Reorganization of Public Research Bodies (OPIs)	-	Entity involved in the implementation: MCIN. Beneficiaries national research centres (OPIS).
C17	9	C17.I1 R&I collaboration plans Regions and Central Administration (AGE)	299	Implementation through bilateral and multilateral national -regional agreements
C17	10	C17.I2 Strengthening the capacities, infrastructures, and equipment of R&I system	445	Entity involved in the implementation: MCIN. Beneficiaries public and private R&I actors involved in research infrastructures
C17	11	C17.I3 New R&I projects (public-private, intersectoral, etc.)	1,167	Entity involved in the implementation: MCIN.
C17	12	C17.I4 New scientific career	294	Entity involved in the implementation: MCIN.
C17	13	C17.I5 Knowledge transfer	402	Entity involved in the implementation: MCIN (CDTI).
C17	14	C17.I6 R&I and health	527	Entity involved in the implementation: MCIN (Health Instituto Carlos III).
C17	15	C17.I7 Environment, climate change and energy	82	10% of the budget is devoted to a project allocated in Extremadura Entities involved in the coordination and execution (AGE and Extremadura CA).
C17	16	C17.I8 R&I and sustainable mobility (PTAS)	40	Firms in all regions could benefit, but regions with automobile factories might have greater absorption capacity MCIN coordinated by the AGE
C17	17	C17.I9 Aerospace sector	200	Entities involved in the implementation: MCIN, coordination AGE
C18	44	C18.I5 Plan for the Rationalization of the consumption of pharmaceutical products (R&I development in the sector)	2	Entities involved in the execution: Ministry of Health
C1	19	C1.R2 Law for Sustainable Mobility and Transportation Financing	-	Entities involved in the execution: MITMA
C1	1	C1.I2 Incentive plan green hydrogen and electric mobility	2,000	Entities involved in the execution: MITMA and Regions (CA)
C3	2	C3.I6 Plan to promote sustainability, research, innovation and digitization of the fishing sector (I)	10	Specific actions for Murcia and Cadiz (Andalusia) Entities involved in the implementation: Ministry of Agriculture, Fisheries and Food (MAPA) (fishery DG)
C3	3	C3.I7 Plan to promote sustainability, research, innovation and digitization of the fishing sector (II)	10	Specific actions for Andalusia and Mediterranean regions Entities involved in the implementation: Ministry of Agriculture, Fisheries and Food (MAPA) (fishery DG)
C3	4	C3.I8 Plan to promote sustainability, research, innovation and digitization of the fishing sector (III)	11	Entities involved in the implementation: Ministry of Agriculture, Fisheries and Food (MAPA) (fishery DG)
C3	5	C3.I11 Plan to promote sustainability, research, innovation and digitization of the fishing sector (VI)	10	Entities involved in the implementation: Ministry of Agriculture, Fisheries and Food (MAPA) (fishery DG)

C8	22	C8.R4 Sandboxes for sectorial research and innovation	-	Entities involved in the implementation: MITECO
C12	6	C12.I1 Sector data spaces	400	Entities involved in the implementation: MINECO in collaboration with other Ministries
C13	28	C13.R1 Improvement of regulation and of business environment	-	Entities involved in the implementation: MINECO in collaboration with the Ministry of Justice
C13	29	C13.R2 Strategy for an Entrepreneurial Nation	-	Entities involved in the implementation: MINECO in collaboration with other Ministries
C13	30	C13.I1 Entrepreneurial ecosystem	329	Entities involved in the implementation: Ministry of Industry, Commerce and Tourism, MINECO, Alto Comisionado para España Nación Emprendedora,ENISA, EOI, AEAT, ICEx
C13	31	C13.I2 SME growth	514	Entities involved in the implementation; AGE, MINECO, MITECO, ICO, CERSA, EOI
C13	32	C13.I3 Digitalisation and innovation	3,556	Entities involved in the implementation: MINECO, EPE, Red.es., MINCOTUR
C13	33	C13.I4 Support for trade	318	Entities involved in the implementation: MINECO, Red.es., Local entities (markets)
C13	34	C13.I5 Internationalisation	202	Entities involved in the implementation: MINCOTUR, ICEX, COFIDES, Cámara de Comercio de España
C14	35	C14.R1 Royal Decree for the development of State Financial Fund for Tourist Competitiveness (FOCIT)	-	Entities involved in the implementation: MINCOTUR, in collaboration with MITECO and Ministry of Treasury
C14	36	C14.I3 Tourism resilience strategies for extrapeninsular territories (Balearic Islands, Canary Islands and Ceuta and Melilla)	220	Entities responsible for the execution: regions and cities (Ceuta and Melilla)
C20	46	C20.I3 Innovation and internationalization of Vocational Training	50	Ministry of Education and Vocational Training in collaboration with regions
C9	25	C9.R1. Hydrogen roadmap	-	Entities involved in the implementation: MITECO in collaboration with regions (CA) and local entities
C9	26	C9.I1 Renewable hydrogen	1,555	Entities involved in the implementation: MITECO (SC Energy), MINCOTUR (L1 and 4), MCIN (L1, 2, 3), Ministry of Education and Vocational Training; Regions (CA) L1
C2	20	C2.R02 Rehabilitation Energy in the Building in Spain (ERESEE)	-	Entities involved in the implementation: MITECO (CDTI) in collaboration with regions (CA) and local entities
C8	23	C8.R2 Strategy for energy storage	-	Entities involved in the implementation: MITECO
C8	24	C8.I3 New business models in the energy transition	156	Entities involved in the implementation: MITECO and regions CA
C11	27	C11.I1 Modernization of the General Administration of State (AGE)	960	State Secretary of Digitalisation and Artificial Intelligence (SEDIA)
C12	7	C12.I2 Program to Promote Industrial Competitiveness and Sustainability	4,797	Entities involved in the implementation: MINCOTUR, in collaboration with the regions (CA)
C14	37	C14.I2 Digitalization IA in the tourism sector	337	Entities involved in the implementation: MINCOTUR, in collaboration with the regions (CA)
C15	39	C15.I2 Reinforcement of connectivity and sectoral digitization projects	480	Entities involved in the implementation: MINECO, in collaboration with other administration
C15	8	C15.I5 Deployment of cross-border digital infrastructures	125	Entities involved in the implementation: MINECO with aid CEF 2 of EU
C15	40	C15.I7 Cybersecurity	524	Entities involved in the implementation: MINECO execution INCIBE Spanish Institute of Cybersecurity
C18	45	C18.R1 Strengthening of Primary and Community Care	-	Entities involved in the implementation: Health in collaboration with the regions (CA)
C22	18	C22.I3 Plan for accessibility	198	Entities involved in the implementation: Ministry of Social Rights and Agenda 2030 in collaboration with CDTI and National Centre of Cognitive Accessibility. No information on the location of the centre or allocation system of R&I projects
Total			**20,462**	

Source: Own elaboration based on information in the Spanish RRP.

Table 5. Reasoning behind the typology of link between actions in the RRP and the Smart Specialisation goals

Comp.	#	Is regional information available?	Is there an alignment with S3 innovation priority?	Typology of linkage
C7	21	No. Potential location of investments in all the regions.	Renewable energy is an innovation priority for "all regions".	MEDIUM - All regions
C15	38	No. Potential location of investments in all the regions. .	ICT and digital are innovation priority for "all regions". All regions might benefit. Not only actors of the regional innovation system	MEDIUM for all regions
C17	41	No. Potential location of benefits all regions.	It may potentially benefit all the innovation priorities of the regions, but include generic measures	MEDIUM for all regions
C17	42	No. Potential location of benefits all regions.	It can potentially benefit all the innovation priorities of the regions. Final beneficiaries are not only actors of the regional innovation ecosystem, but actions are related to the mitigation of barriers to R&I activities	MEDIUM for all regions
C17	43	No. Final beneficiaries are OPIs that are distributed across the regions but are central state dependent.	It can potentially benefit all the innovation priorities of the regions. Final beneficiaries are not only actors of the regional innovation ecosystem, but actions are related to the mitigation of barriers to R&I activities	MEDIUM for all regions
C17	9	All regions could engage in national-regional partnerships	Yes. It aims at improving national-regional alignment on S3 priorities	STRONG for all regions
C17	10	No. Potential benefits all regions. Regions with large infrastructures (e.g. Canarias) could specially benefit.	It might potentially benefit all innovation areas (R&I infrastructures include areas, such as, Life sciences, Energy, Engineering, Materials, ICT, Astronomy). Canary Island includes a large infrastructure and S3 priority area on Astronomy)	MEDIUM - All regions. STRONG - Canarias
C17	11	No. Potential benefits all regions.	It might potentially benefit all innovation areas	STRONG for all regions
C17	12	No. Potential benefits all regions.	It can potentially benefit all the innovation priorities of the regions.	STRONG for all regions
C17	13	No. Potential benefits all regions.	It can potentially benefit all the innovation priorities of the regions.	STRONG for all regions
C17	14	No. Potential location of investments in all the regions.	Renewable energy is an innovation priority for "all regions".	STRONG for all regions
C17	15	Yes. Entities in all regions could apply but one project is allocated to Extremadura (10% of total budget)	Energy and sustainability are considered priority areas for all regions	STRONG for all regions + Extremadura
C17	16	No. Call for applications will be open for entities in all the regions. Based on information on the beneficiaries, regions with automobile factories might have greater absorption capacity	Actions are targeted towards sustainability and mobile sector. Ten regions have automobile factories	STRONG - Andalusia; Aragon; Basque Country; Cantabria; Castile and Leon; Catalonia; Madrid; Galicia; Navarre; Valencia WEAK - Asturias; Balearic Islands; Canary Islands Castile–La Mancha; Extremadura; La Rioja; Murcia

C17	17	No. Madrid and Castile-La Mancha have aeronautics as specialization area. Andalusia, Madrid Basque Country, Catalonia have firms concentrated in the sector (aeronautics)	Actions are targeted to investments in aerospace and sustainability. Two regions have this specialisation area explicitly mentioned	STRONG Madrid, Castile–La Mancha; Andalusia, Basque Country, Catalonia MEDIUM -Rest of the regions
C18	44	No. Entities in all regions could apply.	Heath is an important priority for all the regions	WEAK - All regions
C1	19	No. All regions might benefit.	Mobility sustainability and transport are priorities for all the regions	MEDIUM - All the regions
C1	1	No. All regions	Sustainable mobility and transport is a widespread priority	STRONG - All regions
C3	2	Some measures will be placed in Murcia and Andalusia, but there is not information about the regional distribution of funding	Actions target fishery and marine sciences. Marine Sciences is a priority for Murcia. Natural resources management and safe food for Andalusia could be considered aligned.	WEAK - Andalusia and Murcia
C3	3	Some measures will be place Andalusia and the Mediterranean regions, but there is not information about the regional distribution of funding	Actions target fishery and marine sciences. Marine Sciences is a priority for Murcia. Natural resources management and safe food for Andalusia could be considered aligned.	STRONG - Andalusia and Mediterranean regions; WEAK other coastal regions
C3	4	No. Call for applications will be open for entities in all the regions. Based on information on the beneficiaries, regions with fishery and aquiculture sectors might have greater absorption capacity	Regions with fishery and aquiculture sectors might have greater absorption capacity (cnae 102) Galicia, Andalusia, Cantabria, Valencia, Basque Country	STRONG Galicia, Andalusia, Cantabria, Valencia, Basque Country; WEAK - other regions
C3	5	No. Call for applications will be open for entities in all the regions. Based on information on the beneficiaries, regions with fishery and aquiculture sectors might have greater absorption capacity	Regions with fishery and aquiculture sectors might have greater absorption capacity (cnae 102) Galicia, Andalusia, Cantabria, Valencia, Basque Country	STRONG Galicia, Andalusia, Cantabria, Valencia, Basque Country; WEAK - other regions
C8	22	No. Call for applications will be open energy companies in any region.	Sustainable energy is a priority in all the regions	MEDIUM- All regions
C12	6	No. Call for applications will be open to entities in any region.	Related to transversal innovation priorities	STRONG-All the regions
C13	28	No. Entities in all regions could benefit	Related to transversal innovation priorities	MEDIUM - All regions
C13	29	No. Entities in all regions could benefit	Related to transversal innovation priorities	MEDIUM - All regions
C13	30	No. Entities in all regions could benefit	Related to transversal innovation priorities	MEDIUM - All regions
C13	31	No. Entities in all regions could benefit	Related to transversal innovation priorities	MEDIUM - All regions
C13	32	No. Entities in all regions could benefit	Related to transversal innovation priorities	MEDIUM - All regions
C13	33	No. Entities in all regions could benefit	Related to transversal innovation priorities	MEDIUM - All regions
C13	34	No. Entities in all regions could benefit	Related to transversal innovation priorities	MEDIUM - All regions
C14	35	No. Entities in all regions could benefit	Related to transversal innovation priorities	MEDIUM - All regions
C14	36	Yes. Canary Islands (45%); Balearic Island (45%); Ceuta and Melilla (5% each)	Related to transversal innovation priorities	MEDIUM - All regions

C20	46	No. Entities in all regions could benefit	Related to transversal innovation priorities	MEDIUM - All regions
C9	25	No. Entities in all regions could benefit	Actions targeted to investments in energy (hydrogen). Sustainable and energy is a priority for all regions.	MEDIUM - All regions
C9	26	No. Entities in all regions could benefit	Actions targeted to investments in energy (hydrogen). Sustainable and energy is a priority for all regions.	MEDIUM - All regions
C2	20	No. Entities in all regions could benefit	Actions targeted to investments in sustainable rebuilding. All regions might benefit.	MEDIUM - All regions
C8	23	No. Entities in all regions could benefit	Actions targeted to investments in energy. Sustainable and energy is a priority for all regions.	MEDIUM - All regions
C8	24	No. Entities in all regions could benefit	Actions targeted to investments in energy. Sustainable and energy is a priority for all regions.	MEDIUM - All regions
C11	27	No. Entities in all regions could benefit	Actions related to ICT and digitalisation that is a priority for all regions.	MEDIUM - All regions
C12	7	No. Entities in all regions could benefit	Related to transversal innovation priorities	STRONG-All regions
C14	37	No. Entities in all regions could benefit	Related to transversal innovation priorities	MEDIUM - All regions
C15	39	No. Entities in all regions could benefit	Related to transversal innovation and small specialisation priorities	MEDIUM - All regions
C15	8	No. Entities in all regions could benefit	ICT and digitalisation could be considered a cross regional priority	MEDIUM - All regions
C15	40	No. Entities in all regions could benefit	Related to transversal innovation and small specialisation priorities	MEDIUM - All regions
C18	45	No. Entities in all regions could benefit	Health related priorities is included across regions	MEDIUM - All regions
C22	18	No. Entities in all regions could benefit	Transversal priority area across regions.	WEAK - All regions

Source: Own elaboration based on information in Figure 7 and Table 4.

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