STUDY

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Addressing the challenges of the digital transition in national Recovery and Resilience Plans

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Addressing the challenges of the digital transition in national Recovery and Resilience Plans

Abstract

This paper analyses the digital pillar of the national RRPs to identify the key initiatives, examine the distribution of resources, assess the current state of implementation and define the main challenges in reaching the overall objectives.

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LIST OF ABBREVIATIONS

4G	Fourth-Generation Wireless
5G	Fifth-Generation Wireless
6G	Sixth-Generation Wireless
AI	Artificial Intelligence
API	Application Programming Interface
bn	Billion
CRM	Customer Relationship Management
DEP	Digital Europe Programme
DESI	Digital Economy and Society Index
DIH	Digital Innovation Hub
eID	Electronic Identification
Edtech	Education Technology
EP	European Parliament
EU	European Union
FTTP	Fiber to the Premises
GBPS	Gigabits per second
GDP	Gross Domestic Product
HPC	High Performance Computing
ITVS	Information Technologies for public administration
ICT	Information and Communication Technologies
IT	Information Technology
m	Million
MB	Megabit
MBPS	Megabit per second

MFA	Multi-Factor Autenthication
MSs	Member States
NGA	Next Generation Access
NLP	Neuro-linguistic programming
NRRP	National Recovery and Resilience Plan
PA	Public Administration
PFTHD	Le plan France Très Haut Débit
PhD	Doctor of Philosophy
RRF	Recovery and Resilience Facility
RRP	Recovery and Resilience Plan
R&D	Research and Development
R&I	Research and Innovation
SOC	Security Operations Centre
SMEs	Small and medium-sized enterprises
STEM	Science, Technology, Engineering, Mathematics
TEN-T	Trans-European Transport Network
VHCN	Very High-Capacity Network

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EXECUTIVE SUMMARY

Background

The paper investigates how digital challenges have been addressed in the national Recovery and Resilience Plans (RRPs) issued by Member States (MSs). To do so, reforms and investments across 5 different areas have been analysed, namely, **connectivity, digitalisation of the public administration (PA), artificial intelligence (AI) and Industry 4.0, digital skills and cybersecurity**. The distribution of resources across these areas and the state of implementation were also analysed by referring to milestones and targets, in order to understand the current state of the art of the digital pillar of the Recovery and Resilience Facility (RRF) and bring to light possible challenges.

Key findings

MSs devote an average of 26% of their RRF expenditures to digital objectives, planning reforms and investments in all the 5 areas defined. National RRF plans describe the set of measures foreseen and the relevant funding. However, the structuring of this information in the RRF plans differs from country to country and makes the comparison difficult. Countries vary to the extent in which they specify their expenditure on (macro/micro) area, measures, reforms and/or investment. In addition, countries do not follow the exact same classification of areas. Therefore, expenditure pertaining to one area could also include another. As far as key deliverables are concerned, as of October 2022, only 10 countries had achieved the relevant milestones and targets regarding approved payment requests as published in the Recovery and Resilience Scoreboard. However, the analysis of the indicators defined by each country is on average challenging and dispersive, scattered around different sources or in national languages only.

Policy recommendations

A first policy recommendation is to harmonise the provision of information regarding the RRF to simplify accessibility for all stakeholders and to improve the verification of the implementation status of the measures both at national and European level.

As far as the measures are concerned, many MSs have designed actions to digitalise public administrations, but the efficient functioning of these new systems also requires citizens trusting the new tools introduced.

While the inadequacy of digital skills is becoming increasingly significant, basic training is now often included in educational programmes, in schools and in training, however, specialist digital skills related to emerging technologies are often lacking. The introduction of more initiatives could be useful here. As well, more structured reforms are needed to ensure women's participation, especially in STEM (Science, Technology, Engineering, Mathematics). Training in cybersecurity is also lacking in most RRPs, both in education, labour and PAs, jeopardising the security of their IT systems. In addition, more reforms are required for other vulnerable groups experiencing gaps in opportunities and safe access to the digital world, especially for the elderly. Finally, a stronger interoperability of data systems would be beneficial, as well as cross-country initiatives, especially regarding research & development (R&D) on emerging technologies.

1. INTRODUCTION

The RRF is an unprecedented EU recovery instrument to mitigate the economic and social damage of the coronavirus pandemic by providing EU MSs with €723.8 bn (in current prices) in grants and loans that will be used to implement reforms and investments.

Reforms and investments by MSs need to be in line with the EU's priorities and address the challenges identified in country-specific recommendations under the European Semester framework of economic and social policy coordination. In particular, the regulation of the RRF **requires reserving 20% of the total expenditure to the digital transition. This target has actually been exceeded, with an average expenditure of 26% of the total**, with peaks in Austria and Germany (53% and 50%, respectively[1]).

However, comparing national plans is a challenging task. Although the objectives and the general structure are similar, each MS developed its own plan based on variables specific to the country, in order to better address internal issues, and proceeded to structure the RRP following their own classification. Thus, comparison is not always straightforward.

Comprehensive, reliable and updated information on the RRF implementation is available online on the Recovery and Resilience Scoreboard - a tool displaying data on plans, the milestones and targets achieved, the grants and loan disbursed, a breakdown of the pillars and the relative expenditures. As stated in the website, the Recovery and Resilience Scoreboard contains two types of information - data collected by the Commission on the RRF implementation in monitoring the implementation of the plans, and data collected by the MSs on the common indicators. It shows milestones (i.e., qualitative implementation steps) and targets (quantitative) that have been deemed as satisfactorily met by the European Commission and have received a positive assessment, as a first step to disburse the funds. Milestones and targets that are not present in the Scoreboard can, in any case, be implemented or already completed. To date[2], data on milestones and targets achieved are available from only 10 MSs (Croatia, Cyprus, France, Greece, Italy, Latvia, Portugal, Romania, Slovakia, Spain).

The Scoreboard is a useful tool to compare key data from the 27 countries in a standardised way. However, and despite the Commission making guidelines available on how to structure and present the RRPs, comparing the RRF plans and expenditures in detail is a challenging task, since each MS presented its RRP with its own structure for information, objectives, measures and costs. Therefore, the availability of information varies greatly amongst countries.

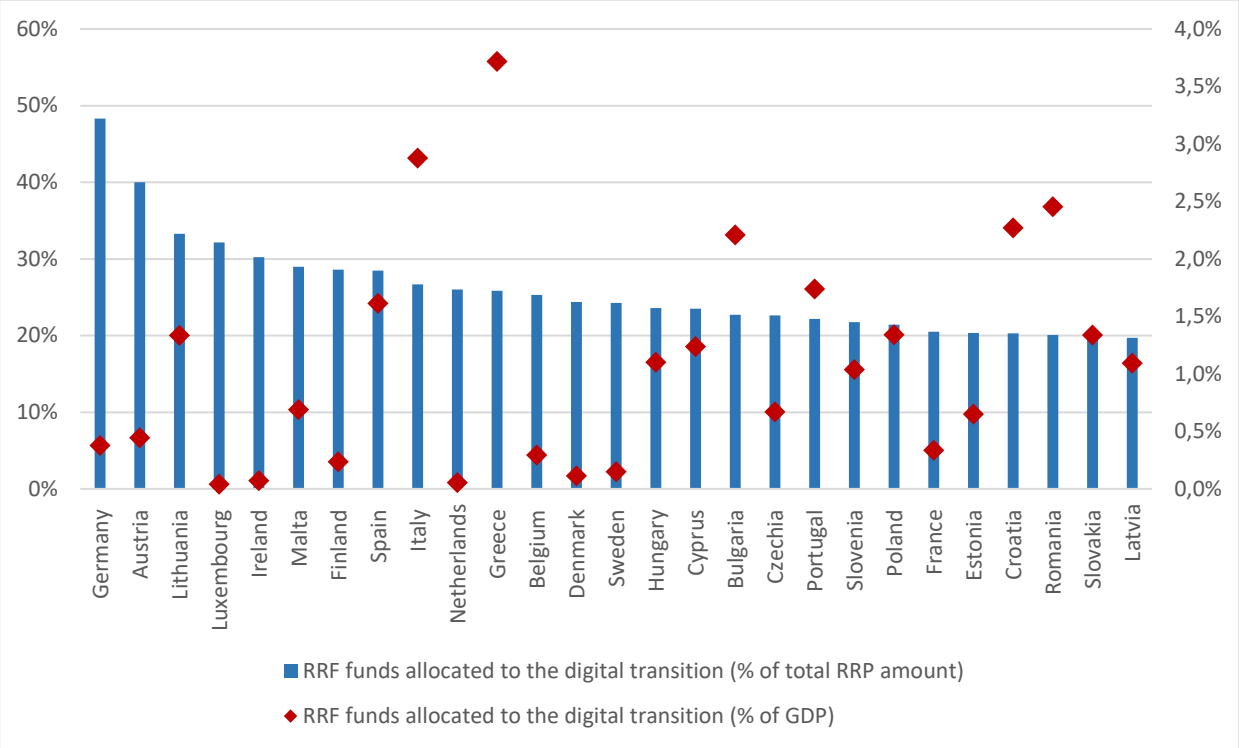
According to the Annual Report on the RRF, which is based on the pillar reporting methodology, a total of almost **€130 bn in expenditure is allocated to the digital transformation pillar**, of which more than a third is for the digitalisation of public services (36%, €47 bn), followed by measures supporting the digitalisation of businesses (20%, €26 bn) and human capital (20%, €26 bn).

The highest expenditure in the digital pillar in absolute terms is from Italy and Spain (€27 bn and €18 bn, respectively). Amongst the countries devoting the highest percentages of their GDP to the RRF digital pillar, we find those countries that are lagging behind in the DESI (Romania, Bulgaria, Greece, Portugal, Croatia), thus, they are making a strong effort to close the gap.

[1] Source: Recovery and Resilience Scoreboard. The exact percentage, however, varies across different sources (national RRPs, Scoreboard, Commission Staff Working Documents, news articles, etc.). This may depend on different components being considered, as well as the methodology used (e.g., digital tagging).

[2] Up to 10th December 2022.

Table 1: RRF funds allocated to the digital transition as a % of the total RRF amount and in relation to GDP.



Source: I-Com elaboration on data provided on Italiadomani web portal for Italy, IOBE elaboration for Greece, IPP-Lisbon elaboration for Portugal, Elcano Royal Institute elaboration for Spain[3]. For the other Member States calculations are based on Bruegel's dataset https://www.bruegel.org/publications/datasets/european-union-countries-recovery-and-resilience-plans.

To better understand the measures foreseen by each country and their intended impacts, we have analysed reforms and investments of national RRPs by clustering them into the following **5 main areas**:

- to foster the development of **connectivity**, enhancing fixed infrastructures and establishing 5G coverage;
- to improve **digital public services**, implementing cloud solutions and integrating technologies in public administrations, health, justice;
- to enhance **artificial intelligence and Industry 4.0**, improving the digital intensity of SMEs, supporting R&I and adopting favourable regulations;
- to support **digital skills**, reforming education and supporting labour upskilling and reskilling;
- to ensure **cybersecurity**, improving infrastructures in connectivity, developing skills and awareness.

For each area, the main reforms and investments have been analysed, highlighting the focus points in the reforms and investments planned by the countries and some best practices. For explanatory

[3] The elaborations are included in the PromethEUs Joint Paper "DRIVING DIGITALISATION IN SOUTHERN EUROPE. The role of national Recovery and Resilience Plans and the current EU Policy Agenda", June 2022, available at https://www.prometheusnetwork.eu/wp-content/uploads/2022/07/PromethEUs_RRF_Digital_Joint-Paper_Final-Draft.pdf.

purposes, we have also analysed and classified the countries' expenditures into these five areas, following national classifications used in their RRPs.

However, by looking in more detail at the national RRPs, there are different classifications of expenditures. **Countries vary to the extent in which they specify their expenditure at the level of (macro/micro) area, measures, reforms and/or investment.** In addition, countries do not follow the exact same classification of areas. Therefore, expenditure pertaining to one area could also include another. National and EU sources provide slightly varying data, which could depend on different ways of presenting the data, and the different variable or tagging methods considered. However, this is not always evident.

From the following table (Table 2), it is clear that the strongest efforts concern the digitalisation of PAs and the economy (digitalisation of SMEs and support for innovation). The development of digital skills in education, labour and PAs is also foreseen as a key component in most countries, with the third largest expenditure in total. Finally, we can see that not many countries include specific measures addressing cybersecurity. However, this does not mean that there is a lack of investments and reforms here, but rather that cybersecurity measures are dispersed amongst different components. For a breakdown of the components considered for each area and country and to understand the methodology used, see Annex I and II.

Table 2: Expenditures on the 5 areas of the digital pillar as indicated by MSs in their RRPs (€ m)

	Connectivity	Digital public services	AI and industry 4.0	Digital skills	Cybersecurity
Austria	891	160	Not specified	171	Not specified
Belgium	95	585	142	655	79
Bulgaria	272	547	42	319	30,7
Croatia	182	583	257	242	2
Cyprus	53	176	19	34	Not specified
Czechia	227	446	476	370	Not specified
Denmark	13	2	367	Not specified	Not specified
Estonia	Not specified	122	86	Not specified	Not included
Finland	135	405	156	277	30
France	540	2,676	1,574	1,783	336
Germany	Not specified	6,604	5,348	1,525	Not specified

Greece	522	2,019	3,405	1,149	5
Hungary	Not specified	45	Not specified	689	Not specified
Ireland	19	124	106	64	Not specified
Italy	6,710	11,728	18,871	5,993	623
Latvia	17	108	153	106	Not specified
Lithuania	114	4,213	61	536	Not specified
Luxembourg	Not specified	14	10	6	Not specified
Malta	Not specified	50	31	Not specified	Not specified
Netherlands	Not specified	331	639	233	Not specified
Poland	121	671	845	1,537	193
Portugal	26	1,526	54	1,225	Not specified
Romania	100	2,099	1,004	1,237	63
Slovakia	615	297	162	236	Not specified
Slovenia	Not specified	342	68	60	Not specified
Spain	3,999	3,265	5,633	4,156	Not specified
Sweden	488	21	Not specified	165	Not specified

Note: The definition «Not specified» indicates countries that foresee measures addressing that area but do not specify the exact amount at the component level (e.g., because they use a different classification, or because they assign the amount to a more general objective and it is therefore impossible to individuate the allocation to each measure). The definition «Not included» means that the national plan does not include specific measures addressing that area.

For a breakdown of the costs and the components considered for the calculation of each amount, see Annex I.

Source: I-Com's elaboration on the national RRPs.

2. CONNECTIVITY (FIXED AND MOBILE)

2.1. High speed broadband networks

To ensure the provision of digital services for all citizens and to maintain its prosperity, the European Union requires a digital connectivity infrastructure that is highly performing, secure, sustainable, and which can leverage the latest optical fibre technologies in fixed networks.
The study on household behaviour and upcoming digital use shows that both residential and business consumers will increasingly demand gigabit connections to satisfy their needs, such as use of enhanced video standards, cloud services, applications based on virtual and augmented reality, AI applications, automated driving, logistics and manufacturing processes. For some of these applications users will produce and share the same amount of data as they consume. Thus, they will require an underlying connectivity infrastructure that is able to support a reliable increased balance of upload and download speeds and low latency. We can consider the provision of gigabit connectivity services as a fundamental factor for the economic attractiveness of MSs.

Fixed Very High-Capacity Networks (VHCN) reached 70% of EU homes in 2021, signalling an increase of 60% on the previous year. This was mainly due to FTTP deployments.
According to the DESI 2022 report on digital infrastructures, broadband coverage of rural areas is an issue. 8.5% of households is not actually covered by any fixed network, and 32.5% excluded from services of NGA technology.

One of the targets of the Digital Decade related to broadband connectivity for 2030 is gigabit coverage for every household.

The present analysis shows some of the measures that were adopted by MSs to address these issues. It is possible to distinguish between 'one-shot' investments in digital infrastructure and measures that will support high speed broadband networks also in the long run.

While drawing up measures to foster the development of fixed connectivity, some MSs have focused on enhancing the living environment through the deployment of high-capacity broadband networks, allowing end-users to benefit from ultra-fast internet access. Particular importance has been given to the **need to increase fixed broadband coverage in rural areas**, which, as previously mentioned, is recognised as an issue in the DESI 2022 document for digital infrastructures. An example of a country pursuing this type of strategy is **Denmark**. The reforms and investments of the Danish Plan will be supported by €1.5 bn in grants, and it plans to invest 25% (€382 m) of its RRP in measures related to the digital policy area. In the area of connectivity, Denmark's RRP presents the **Broadband pool**, a demand-oriented (applicant-based) funding scheme that provides grants for broadband projects in rural areas with poor coverage where there is no prospect that the market itself will provide fast broadband. The pool has existed since 2016. It is a prerequisite that the funded broadband projects roll out broadband technologies within the VHCN category, and are thus in line with the 2025 Gigabit society targets (at least 100 Mbps upgradeable to 1 Gbps speed).

The definition of a funding scheme to support broadband projects stands out as an original measure amongst those typically designed by MSs to foster connectivity. Differently from 'one-shot' measures that foresee single investments in digital infrastructure, a pool guarantees the availability of funds devoted to an issue, encouraging the continuity of intervention and the possibility to meet future changes.

In line with the measure introduced by Denmark, **Finland**'s RRP aims at improving the availability of high-speed connections in areas where they would not be built under market conditions. According to the 2022 edition of the DESI for Finland, there exists a marked divide related to fixed network coverage.

The provision of VHCN is not evenly distributed across the country because of the lack of economic incentives to roll out in sparsely populated areas. The goal is to support broadband connections that provide at least 100 Mbps. The plan will invest €50 m in the rollout of VHCN, which is expected to support those white spot areas. Considering the country's weaknesses, this seems a relatively small amount given that Finland's RRP assigns €574.3 m to the digital transition, which represents 27.5% of total RRP funds. The stimulus funds would complement the national broadband support programme, to which €5 m have been assigned from the national budget. Finland has also introduced a measure for the recruitment of a coordinator for the national Broadband Competence Office project to boost high-speed broadband and coordinate support investments inter alia to define the coordination of both national and EU broadband funding. This kind of measure is very important to achieve an effective allocation of funds and provides for an original alternative to standard investments for the development of digital infrastructure.

Providing digital connectivity to disadvantaged areas is also a concern for the **French** RRP. At the beginning, the goal of the **France Très Haut Débit (PFTHD) plan** was to enable access for all to speeds of over 30 Mbps by 2022. The huge rollout of NGA networks throughout the country, particularly in fibre optics, will allow for ensuring that all citizens, including those living in rural areas, will have the best standard in digital connectivity at home and at work, with speeds over 100 Mbps, and generally in excess of 1 Gbps.

The government wants to send a strong signal to all players in the sector and to foster the accelerated deployment of networks by investing a further €240 m in the PFTHD. The total estimated cost of the measure (for the public part) amounts to €570 m, including €240 m for France Relance.

As well, the RRPs of **Italy** and **Cyprus** provide for the coverage of digital connectivity to disadvantaged areas. In particular, Italy's plan includes a project to supply at least 1 Gbps in download and 200 Mbps in upload connectivity in Next-Generation Access (NGA) market failure areas. Where the Cypriot plan is concerned, the objective of eliminating divides and allowing for an inclusive digital transformation will be achieved by providing fibre coverage for 100% of the population living in organised communities.

Another country that emphasises the need to extend fixed broadband coverage in disadvantaged areas in its RRP is **Estonia**. According to the 2022 edition of the DESI, Estonia performs well and scores above the EU average in all indicators, except for connectivity where it ranks 26th. In the Estonian plan, €208 m are estimated to be allocated to digital objectives (21.5% of the plan's total budget) and €24.29 m from the Recovery and Resilience Facility will be invested in VHCN in rural areas. In particular, the plan introduces the investment 'Construction of very high-capacity broadband networks'.

With their measures, France and Italy directly address the EU weakness identified by the DESI 2022 report for digital infrastructures according to which, as for broadband coverage of rural areas, 32.5% of households is excluded from services of NGA technology.

2.2. Mobile connectivity and 5G technologies

To guarantee the availability of digital services for all citizens, the European Union also requires a digital connectivity infrastructure which can connect innovative wireless systems such as 5G, 6G and Wi-Fi. The targets of the Digital Decade related to broadband connectivity for 2030 are gigabit coverage for every household and 5G in all populated areas.

Focusing on mobile technologies, while 4G coverage of populated areas reaches 99.8%, 5G commercial services were launched in all MSs at least in a part of the country by October 2022. 5G coverage

increased significantly from 14% in 2020 to 66% in 2021 of populated areas. 4G is extensively available also in rural areas (99.6%).

The policy analysis first investigated measures that focus on **infrastructures for 5G coverage along corridors,** and then moved to mobile connectivity measures centred on the modernisation and digitalisation of industries, institutions and the government.

5G is an essential new generation network technology that supports innovation and the digital transformation. 5G ensures virtually universal, ultra-high bandwidth, and low latency "connectivity" to individual users as well as to connected objects. It will support a variety of applications and sectors including professional uses. Some examples include connected automated mobility, eHealth, energy management and possible safety applications.

In order to foster the development of connectivity, some countries have opted for the definition of measures that imply the establishment of **infrastructures for 5G coverage along corridors**.

An example of a country adopting this kind of strategy is **Latvia**, which includes in its RRP the investment 'Construction of passive infrastructure in the ViaBaltica corridor for 5G coverage'. The investment is directly targeted at the development, set out in Latvia's sustainable development strategy, of transport infrastructure planning, which emphasises that "Transport corridors of international significance, including the TEN-T network, will ensure links between development centres of international significance in Latvia and neighbouring countries".

Czechia's plan focuses on a similar objective. Reforms and investments in Czechia's RRP will be supported by €7 bn in grants. Investments related to the area of connectivity include building high-capacity connectivity, covering 5G corridors and promoting the development of 5G, supporting the development of 5G mobile infrastructure in rural investment-intensive white areas and scientific research activities related to the development of 5G networks and services. The reforms foreseen by Czechia's RRP include improving the environment for the deployment of electronic communication networks and supporting the development of the 5G ecosystem. The total resources allocated to these reforms and investments amount to €227 m[4]. The investments are in line with the weaknesses of the country, with the coverage of the fixed VHCN still below the EU average, according to the DESI 2022 edition.

5G corridors are included also in **Belgium**'s plan, whose goal is to establish universal and affordable access to connectivity in all urban and rural areas. One of the projects of **Italy**'s RRP in the field of connectivity is **Italia 5G**, which fosters investments to boost the deployment of 5G mobile infrastructure in 'market failure areas', 5G corridors and 5G-ready extra-urban roads. **Bulgaria**'s plan envisions the main road network to be covered by secure broadband mobile connectivity, which will ensure high-speed coverage for the main roads included in the TEN-T network - Trakia, Hemus, Struma highways -, as well as the connections with Romania and Turkey.

The measures mentioned above appear to be well designed in supporting the 5G Action Plan for Europe, which calls for actions to ensure uninterrupted 5G coverage in all cities and along all major transport routes in all MSs by 2025. The aim is for the EU to be able use advanced 5G connectivity as a strategic advantage to drive digital transformation, particularly in vertical sectors, and to support key societal objectives. 5G infrastructure is expected to be a key enabler for the development of connected

[4] The total value may have been subject to fluctuations due to the exchange rate between the Czech koruna and the euro.

and automated mobility, providing a wide range of digital services for vehicles, paving the way for fully autonomous driving.

5G deployment can result in important gains in economic competitiveness. With their measures in the area of connectivity, some countries have focused on the modernisation and digitalisation of industries, institutions and the government. Indeed, RRPs often stress the need to ensure access to 5G technologies of digitally intensive enterprises and institutions.

Lithuania and Spain have centred their connectivity related measures on these kinds of objectives.

Lithuania's RRP, which allocates €73 m to boost the rollout of VHCN, presents the investment **Step towards 5G**. The measure aims at ensuring coverage and penetration of high-bandwidth electronic communications networks that meet the needs of digitally intensive businesses and is designed to accommodate the steady roll-out of 5G networks. The investment will enable 5,000 digitally intensive enterprises/institutions to access gigabit broadband, encourage businesses and public institutions to deploy and adapt transport innovations (autonomous transport, unmanned aerial vehicles, 5G) and implement at least 7 practical innovative applications in transport.

In **Spain**, the RRP presents a lever policy[5] where it is possible to identify funds assigned to digital connectivity, cybersecurity[6] and 5G deployment that will receive €4 bn, 5.8% of total EU funds. With regards to 5G, Spain has planned to allocate €770 m of public funding to the deployment of 5G access network infrastructure and transmission network reinforcements, including €150 m to create passive mobile infrastructure in rural areas without 4G coverage.

Ireland's RRP includes the investment **Using 5G technologies to Drive a Greener More Innovative Ireland**[7] which foresees the use of 5G technology by the government to enhance connectivity and service provision. This implies the construction of a low latency platform with a high-speed backbone using edge computing nodes to enable a faster response. This platform will interconnect with the local access technologies of the carriers, including stand-alone 5G as it becomes available nationwide, and will be connected to government and commercial data centres as well as cloud providers. This will enable the processing of data at the right location, whether it is at an edge computing node, a regional computing node, or in the cloud.

These measures can successfully contribute to the spreading of 5G, fostering the development of technologies relying on mobile fast connectivity and supporting disadvantaged areas.

2.3. Connected schools

The pandemic has clearly shown how the need for connectivity in the school environment has become more important than ever and will necessarily grow in the future. For this reason, it is essential to monitor and bridge the digital divide caused by a growing inequality in access and quality of connection among schools.

Here, it is worth noting how several countries have introduced in their RRPs measures focusing on **school connectivity**.

[5] In Spain, the RRP presents Lever Policy 5 on "Modernisation and digitalisation of industries, SMEs, tourism and the building-up of an entrepreneur nation". The latter is the lever policy receiving the highest percentage of investment, with a budget of €16.1 bn, (amounting to 23.1% of total of investments).

[6] The resources allocated to cybersecurity are included within the perimeter of digital connectivity but the exact amount allocated is not specified.

[7] This investment is assigned €19 m and is part of Priority Component 2, 'Accelerating and Expanding Digital Reforms and Transformation', which will be supported by €291 m.

Amongst the five projects in the field of connectivity in the **Italian** plan, one is called **Connected Schools**, and includes measures to provide access to the Internet for all school locations nationwide with symmetrical speeds of at least 1 Gbps. This project targets about 35,000 school buildings.

Belgium's RRP component related to fibre optics, 5G and new technologies not only includes investments to achieve the coverage of white areas by the development of very high-speed fibre optic networks but also introduces an investment to improve internal (via Wi-Fi) and external (via fibre optic) connectivity of schools. This project specifically aims to amplify the internal connectivity of 1,500 schools in order to implement the digital education strategy.

A programme to provide digital infrastructure and funding to schools is included also in the **Ireland**'s RRP. One of the projects that belong to the programme entails the provision of High-Speed Broadband Connectivity to up to 1,100 primary schools through the Schools Broadband Programme. This will guarantee that all 3,240 primary schools in Ireland will have parity of services with high-speed connectivity ensured through the National Broadband Plan implementation, commercial provision, and this NRRP project, within the Schools Broadband Programme.

In its RRP, **Slovenia** has introduced a measure in the field of digital skills which is also related to the connectivity of schools. This investment aims at ensuring a stable, resilient long-distance and fibre connection of the research and education backbone network to at least 40 existing long-distance and fibre connections of the publicly owned research and education network, and guarantees a minimum of 100 Gbps download speeds on these connections.

2.4. Milestones, targets and related indicators[8]

In **Belgium,** reforms to enable 5G rollout were being put in place[9]. The 5G auction at federal level was expected by the first half of 2022.

In **Latvia,** two milestones have already been achieved in the area of connectivity, contributing to the digital transition. On the one hand, a common model for the development of the last mile broadband connection (to ensure end-user's access to very high-capacity broadband network in regions and rural areas), has been adopted, based on an analysis of the potential market for VHCNs. On the other hand, the technical requirements for connected and automated driving have been approved. The latter milestone will allow for the development of a route for connected and automated driving alongside the Latvian section of the Via Baltica corridor, a railway connecting Estonia, Latvia and Lithuania to Poland and Czechia.

In the meantime, **Spain** has published in the official journal the legal act on 5G, the "Roadmap 5G: Spectrum management and assignment, deployment burden reduction, Cybersecurity Act 5G and Support to Local Authorities".

Moving to the **Italian** RRP, in the area of connectivity, all activities necessary to start the implementation of the ultrabroadband connectivity projects were completed. All tenders were awarded between April and June and contracts were signed between June and September.

For its investment 'Large-scale deployment of digital infrastructure', **Bulgaria** introduces result indicators in terms of transport corridors with continuous 5G connectivity, settlements with high-speed connectivity with the possibility for 5G, the number of towers on transport corridors for 5G and the number of base stations using alternative energy sources. Values to be achieved within a certain year

[8] For more detailed information about the connectivity indicators, see the Annex V, tab. V1.
[9] As of 23 May 2022.

on these dimensions are complemented by impact indicators regarding increased average data transfer rate, Internet users and households covered with high-speed Internet access. Overall, there are many different conditions that must be satisfied and will determine a well-defined system to measure progress which takes into account to what extent Internet coverage has expanded and the quality of Internet access.

Instead, **Estonia** in its investment 'Construction of very high-capacity broadband networks' only introduces a target in terms of number of addresses, which could be complemented by some other type of indicator in order to capture progress more effectively.

For its measure to improve the quality and availability of telecommunications networks, **Finland** introduces two targets - at least 10,000 potential new subscribers will be within reach of high-speed (100/100 Mbit/s) broadband by Q2 2024, and at least 25,000 potential new subscribers within reach of high-speed (100/100 Mbit/s) broadband by Q2 2026. The establishment of an intermediate target can be useful in spotting timely deviations from the desired outcome.

Czechia defines a milestone for its measure for building high-capacity connections which involves awarding all grant decisions for connecting address points with the very high-capacity network (VHCN) by the Ministry of Industry and Trade. In this case, the qualitative indicator is given by the notification of the award. The country also defines a target for the same measure which involves the completion of address points connected with the VHCN. The goal is to complete 23,000 of them. Supporting quantitative indicators with qualitative indicators as Czechia does with this measure allows for achieving a better progress assessment. In fact, the effectiveness of this measure does not only depend on the quantity produced but also on the successful awarding of grant decisions for connecting address points with the VHCN.

As highlighted in table 3, some indicators of these countries seem in line with a common indicator from the list provided by the EU Commission. They especially recall indicator number 5 involving additional dwellings with Internet access provided via VHCN. However, the EU Commission indicator refers to the:

"Total number of households with access to very high-capacity networks as defined in BEREC's guidelines on very high-capacity networks (BoR (20) 165 (6)) that, prior to the support provided by measures under the scheme, only had access to slower connections or no Internet access at all."

Instead, the country indicators analysed often only refer to the percentage of Internet users or to the number of addresses which seems to also include units which already had an advantage before the establishment of the measure. Estonia's indicators provide for an example of this.

Italy presents several indicators for its measures related to connectivity which recall the EU Commission common indicator number 5. For example, its measure for fast Internet connections (Ultra-broadband and 5G) is associated to an indicator which involves extending 1 Gbps connectivity to at least 8.5 million additional dwellings through fibre FTTH/B, FWA or 5G by June 2026. In this case, the Italian indicator complies with the definition provided by the common indicator.

3. DATA/CLOUD STRATEGY AND DIGITALISATION OF THE PUBLIC ADMINISTRATIONS

3.1. Digital transformation of the public administrations

The PA digitalisation has become a key issue for governments. Providing citizens with more effective and accessible public services is now a priority that ensures accessibility to all citizens, efficiency (also time-wise) and reduction in administrative burdens, modernisation of and support to the digital transition. It can also improve transparency and openness and meet citizens' new demands.

The **Digital Decade** objective is to make 100% of the key services completely accessible online for all citizens, with 80% of them using digital identities. The aim is to make all services digital by default, thus improving efficiency, productivity and security.

The RRPs include measures to **improve e-government solutions** to make processes more user-friendly, citizen-centred and interoperable, in order to **simplify the adoption** of these services by citizens and businesses alike. The Annual Report on RRF calculates that a total of €47 billion is dedicated to this task by Member States.

First of all, the **regulation of eID solutions is envisaged in most RRPs**, in order to create a unique identity that will be instrumental in increasing the interoperability of digital public platforms and complying with the "once only" principle – a measure intended to reduce the administrative burden for citizens and companies.

In addition, a **more efficient data collection and management**, with the integration of data analytics and AI, will simplify these processes and support data-driven decision making. **Investments in digital public services are useful to integrate advanced technologies and improve the cybersecurity of the systems used by the public administrations**. For this reason, most countries intend to create governmental **cloud solutions**.

The main points involved in PA digitalisation are the simplification of procedures, to ensure **services more accessible to the public**, the effective **management of data**, also by providing a **unique access point**, the strengthening of cybersecurity measures in governmental infrastructures, and the **interoperability** of data for information exchange. These measures all require a **central data warehouse and the modernisation of digital infrastructures**, **central registers and a state cloud**.

All countries envisage measures for the development and upgrade of cloud-based infrastructures. For instance, the **Italian** plan proposes the development of a national cloud-based hybrid infrastructure and the migration of public IT systems to a cloud. In addition, the Italian RRP includes a reform on **cloud first and interoperability** that will ease cloud adoption, streamline the data-exchange between PAs, and enhance the adoption of digital services. An investment will be devolved to the creation of a National Digital Data Platform. The Italian measures on PA will be instrumental in improving the quality, efficiency, usability and accessibility of digital public services; supporting the adoption of key enabling platforms and apps (such as PagoPA) by PAs; supporting a wider adoption by PAs of the digital solution for eID (SPID), the electronic national identification document and the national registry of identifying data; creating digital services access points in areas of the country that, due to their geographical location, are at risk of suffering from a lack of connectivity; and supporting PAs in the gradual adoption of the platform for digital notices.

Another best practice can be found in **Germany**'s plan, strongly focused on data, which is making data widely accessible and processable in real time. The **federal data structure** will create a fully

interoperable, highly secure, fully energy-efficient and privacy-compliant infrastructure that will foster investment in digital capabilities and the spread of advanced technologies.

Malta is also implementing tools for **cloud security monitoring**, data classification, and privileged account management as part of the government digital backbone investment.

Denmark will address the bridging of the **digital divide** by modernising digital infrastructure, digital public services and public administrations. These measures will address the interoperability between central, regional and local administrations, the acceleration of administrative processes, and the improvement of the digital interaction between administrations, citizens and businesses. The modernisation of the national digital infrastructure in Denmark will also support the development and implementation of cross-border and interoperable digital services, e.g., eID gateway and Single Digital Gateway.

Greece plans to acquire a **Central Cloud Computing Infrastructure and Services**, and envisions the upgrade of cloud-computing infrastructures and services for the National Infrastructures for Research and Technology. Resources are allocated to the development of web services, the establishment of more e-Registries, the development of Customer Relationship Management systems (CRM), a new system for public procurement, a central document management system, and the modernisation of public administrations according to the "one-stop shop" principle.

In the RRP of **Latvia**, data and services are centralised in **competence centres**. This will allow for automating and streamlining the delivery, installation, release management, testing, operation and performance monitoring processes through automated management platforms. At the same time, this reform will simultaneously ensure **cross-border accessibility of public administration services**, while providing for a primarily digital delivery of services, ensuring that they are received in the most personalised, single user experience-based manner, and paving the way for the implementation of the "one-stop shop" principle.

The reform aims to ensure the availability and sharing of public and private sector data and services by laying the foundations for the development of a data and platform economy and interoperability with European data spaces and by ensuring data sharing within the EU.

One main **cloud advantage** is the possibility to **improve the citizen's experience in interacting with PAs**. Collecting data in governmental clouds is expected to **reduce processing times** and simplify interaction with public authorities for citizens. If we look at the **Cyprus** cloud first migration strategy, its ultimate goal is to create a high-quality experience for the user by accessing touch-points where they may interact with PAs. This will contribute to the enhanced perception of reliability, security and resilience, creating trust in the system and in technologies, making citizens more willing to access digital public services and aware of their possibilities.

Another best practice is to be found in **Estonia**'s RRP with the **Bureaucrat Programme**, a national virtual assistant platform and ecosystem. In other words, it is a conversational chatbot, a voice-operated AI-based virtual assistant connected to direct public services that enables users to consume all public services without any specialised knowledge, using any of the most common communication methods or channels and devices, including increasingly across borders.

Similarly, **Croatia** is investing in creating a **mobile platform** where citizens can access public services in a one-stop shop where they can find all services and refer to a single unified helpdesk.

The plan of **Lithuania** is to consolidate the state's information resources in their entirety, so that the IT infrastructure, services and processes of public institutions are managed in a centralised, efficient and

secure way. It aims to do so with a **Customer Oriented Services reform**, with a user-orientation of public management redesigning the operational processes so that, wherever possible, the services are delivered using automated tools and digital data.

Moreover, another advantage of clouds and data warehouse is related to the **collection of large data volumes** that can be processed and analysed – mostly by AI technologies – to improve the decision-making process. **Hungary**'s plan includes measures to integrate public services with AI technologies and automation processes to support efficiency and ensure quality. This will be instrumental in data-driven decision-making and legislative process to improve efficiency and effectiveness.

Estonia plans to establish and develop a **centre of excellence for data management** and key data to reuse data held and collected in the public sector for better decisions in policy making and service improvement, including the provision of holistic and predictive services. In fact, for the deployment of AI applications, etc., high quality data is needed. Furthermore, a greater simplification and efficiency of public services is not only an advantage to citizens, but also to businesses. Estonia focuses on entrepreneurs by ensuring reliable information and access to public digital services for entrepreneurs is centralised in a single, technologically powerful and user-friendly online environment, so that it is easy and convenient for the entrepreneur to interact with the public sector.

Measures from **Latvia** for the modernisation of government and digital transformation of services also focus on the business environment, by investing in services and delivery processes for the effective implementation of the digital transformation of the economy, using innovative technologies and approaches. These include AI and machine learning solutions, as well as introducing a data-driven forecasting and decision-making approach in service and process management and ensuring the full implementation of the "once-only" principle.

A comprehensive effort to increase the **digital skills of public servants** is underpinning these measures, becoming a priority for all countries[10]. A best practice is **Latvia**'s investment in ensuring the competences and capacities for the digital transformation of national and local governments, by strengthening the digital capacities of PAs towards the goal of a digitally literate and advanced PA at national and local level. This includes both direct training activities for 62,900 PA employees and the development of self-learning and broad access online learning approaches for PAs, as well as the wider public, on topical issues such as cybersecurity, public services and their usability. The investment will be in line with the priority defined in the European flagship initiative "Reskill and upskill" to ensure the necessary digital transformation skills and competences for PA staff.

This goes hand in hand with strengthening **cybersecurity**, which, in addition to the concern for system architecture, also translates into an awareness issue. Public servants need, more than anyone, digital upskilling and reskilling in order to gain awareness of the risks of cyber-attacks, given the sensitive data that they handle. **Specific training on cybersecurity is lacking in most RRPs**, jeopardising the security of IT systems. This is especially true for civil servants handling sensitive and important data and being more subject to cyber-attacks.

Moreover, the **efficient functioning of digitalised PA systems also requires citizens to trust the new tools** introduced. Thus, increasing citizen awareness of what their countries are doing to embrace the digital transition is fundamental to making digital services actually beneficial. This is especially true of older people, who usually have more difficulty in accessing new technologies, especially when isolated. More specific measures should be targeted at increasing citizen awareness and understanding

[10] Further measures addressing the development of digital skills will be described into more detail in section 6.

of new technologies, not only with contact points and hubs, but also with systematic initiatives for helping them develop a digital-oriented mindset.

3.2. Healthcare

Public services are also going digital in the field of health, which is gradually implementing **e-health** solutions. The Digital Decade has set objectives for healthcare systems to ensure that, by 2030, 100% of citizens will have access to medical records. This will be done by providing a legislative framework for e-health that will regulate aspects such as telemedicine services, interoperability of databases, and a wiser use of all health data for research and regulation. In this field too, investments are aimed at integrating digital technologies as well as security. In this respect, telemedicine has the potential to include patients in remote areas, reducing costs and ensuring simple and efficient access to healthcare for a wider range of citizens.

Many countries include measures aimed at the digital transformation of their national healthcare systems, in order to make them more accessible and effective. Most MSs support the implementation and upgrade of **national registries** to simplify the exchange of information between stakeholders. The **storage and management of health data** also has the important advantage of being useful for both policy-making and research purposes**.** Moreover, investments in some countries include the integration of the health system with AI and other digital technologies.

This requires a set of reforms that provide for **a solid legal basis for the digitalisation of the healthcare sector**, which needs particular care given the sensitive information and procedures that it entails. The **creation of ICT systems and platforms**, the **interoperability of systems** and an effective digital **training** are among the main concerns.

In **Italy**'s plan, there are several measures connected to the area of cloud and data focused on the Italian Health System and, more specifically, on strengthening the technological infrastructure of hospitals and health facilities for the collection, processing, analysis and simulation of data. Investments aim to support the completion and interoperability across regional systems of the electronic health record (EHR) and data usage for health risk monitoring. Thus, it will be easier for both citizens and the healthcare system to retrieve important data. These investments will be complemented with measures to boost the use of telemedicine solutions and the digital upgrade of hospitals and diagnostic equipment.

Telemedicine is also a solution envisaged by several countries, because it reduces distances and grants (or simplifies) access to healthcare of people in remote areas or from vulnerable groups. **Finland** is planning to invest in digital solutions in healthcare to speed up care needs assessments and referrals, by enhancing remote diagnosis and treatment of diseases and supportive preventive services. It will support the development of services aimed at both citizens (diagnoses, prevention, digital health and so on) and professionals (management systems, data analysis, customer segmentation). In addition, telemedicine will significantly improve health assistance for people living in remote areas and risking social isolation.

In **France** one-stop shops are foreseen for digital health services, integrating existing services with new solutions, and also ensuring software interoperability (with a special focus on integrating public and private data). Moreover, long-term care facilities will be equipped with digital infrastructures.

The use of digital technologies will be promoted in **Slovenia** to communicate with patients, introduce quality monitoring of real-time data, improve planning of patient management, as well as of hospital facilities and services.

Belgium's plan underlines that health data will be crucial in improving the policy-making process as well as research, because it ensures a high volume of processable data that can be used, provided it complies with adequate security and privacy standards.

In this sector, as well, the possibility of the elderly to access digital services should be highlighted. The **demographic structure** of the EU population and the high percentage of people over 65, expected to increase markedly over the next years, is often overlooked. Since the EU population is ageing, in order to achieve a successful transition to a digitalised society, it would be useful to **design specific measures targeting older people to support the adoption of new digitalised systems**, especially regarding health services.

3.3. Justice

E-justice is another field considered in most RRPs. Digitalising the justice system is crucial to improving the efficiency and quality of justice. Even in this case, cross-border cooperation and interoperability are guiding principles, together with the simplification and standardisation of procedures.

Investments and reforms in the justice system are crucial to **improving judicial quality and efficiency.** The digitalisation of the national justice systems targets court modernisation – using digital tools for communication – but also **cross-border cooperation** between national authorities and **interoperability**, the management of electronic data and digital registries, the access to court proceedings, the creation of electronic platforms, and digital training.

Bulgaria envisages a comprehensive reform of the e-justice legal framework, by upgrading its court **unified information system** and making e-services accessible to citizens and legal entities. The objective of the project is to further develop the **single portal for e-justice** in order to improve main activities, such as making certification statements in electronic form, performing procedural actions in electronic form, and serving of notices and summons. The digitalisation of key court proceedings in the system of administrative justice is another area for investment.

Portugal is focused on promoting the adoption of a **"digital by default" principle** in internal procedures and interacting with stakeholders. This will enhance the data management system and ensure interoperability with other internal actors and within the national system.

In the same way, the plan of **Greece**, aimed at all branches of the judiciary system, increases the IT capabilities of justice data and foresees ensuring the interoperability of IT systems.

Czechia's plan includes the analysis of the use of data and a mapping of the needs of digitalisation in the justice sector, implementing a data warehouse and supporting remote access.

3.4. Milestones, targets and related indicators[11]

As far as public administration is concerned, **Italy** has achieved several milestones with the entry into force of reforms on PA digitalisation and Cloud First and Interoperability. Other indicators that measure the progress of the digitalisation of PAs regard the acquisition of ICT materials, the implementation of acts for the simplification of critical procedures, and the creation of a National Strategic Centre. By 2024, Italy aims at enabling 4,000 local PAs regarding the cloud, and a further 8,000 by 2026. By the end of 2022, the National Digital Data Platform is expected to be functioning and two targets are expected to be reached in the upcoming years in relation to a specific set of interfaces for API (Application

[11] For more detailed information about the PA digitalisation indicators, see the Annex V, tab. V2.

Programming Interface) published and integrated into the platform. 21 one-stop shops for digital services are expected to be working by 2023, and their quality and usability will be measured to ensure an improvement to 40% by 2024 and to 80% by 2026, with a 55% improvement in their accessibility. Indicators are also set for the number of digital services offered on PagoPA and the IO app by PAs and the number of eID platforms. The digital upskilling of civil servants is measured through the enrolments in training initiatives and, subsequently, the completion of these activities.

Further indicators also relate to the legislative process related to the digitalisation of the justice system, also with the digitalisation of files and procedures. Moreover, Italy achieved a milestone in digital health services by approving a plan on the digital update of hospital technological equipment and a measure on "home as the first place of care and telemedicine".

In May 2022, **Portugal** accomplished a target concerning digital PAs with the entry into force of the legal framework for the Digital Transformation of Public Administrations.

In **Belgium**, a goal related to the area of PA digitization was achieved in April 2021. A new platform (CRM) facilitating the interaction between the administration and citizens/businesses and between administrations is now operational in the Brussels Region. The platform will be available for the development of specific CRM projects within the same region. The objective is to deploy by the end of 2024 16 projects distributed between regional and/or local administrations (Parking.Brussels, Hub.Brussels, Bruxelles Économie et Emploi).

Belgium's RRP also includes a project to digitize healthcare in an accessible and secure manner. In January 2022, the law establishing the Health Data Authority, which defines, among other issues, its role and tasks, entered into force. In April 2022, the requirements, design and solutions for the various eHealth sub-projects were defined.

Cyprus is adopting measures to enhance open data and transparency. The Cyprus National Action plan for Public Sector Information (PSI) re-use focuses on the continuous development of the national PSI Portal, a designated area to showcase open data re-use. A new law reinforcing the principles of transparency and accountability in the public sector is included in the Recovery and Resilience Plan and entered into force at the end of 2020. The digitalisation of various PAs is also measured by the achievement of the milestone of a repository system for audit and control.

In July 2022, **Slovakia** has achieved a milestone on the digitalisation of public administrations with the reform concerning the standardisation of technical and procedural cybersecurity solutions (ITVS – Information technologies for public administration).

By the end of 2022, **Malta** aims to deploy at least € 2,500,000 for contractual obligations relating to measures in relation to the modern digital workplace and solutions to improve the front-end customer experience. For the uptake of online services, Malta plans to increase from the current 63% to 71% by 2025, based on the DESI indicator of individuals who used the Internet, in the last 12 months, for interaction with public authorities, expressed as percentage of Internet users. Using the DESI indicator to assess the progress of a measure is useful to see its direct impact and keep it in line with European objectives.

Malta also foresees indicators on e-health and e-justice. The former is expressed as contracts signed for the digitalisation of services, while the latter is measured with the creation of a digital registry on corruption cases, the expenditure for the digitalisation of law courts and the launch and availability to users of IT tools and systems.

Estonia's measure for the creation and development of a centre of excellence for data governance and open data is correlated to indicators establishing the structure, the number of projects completed and published datasets. For the development of proactive digital public services for individuals, an increasing number of operational services is expected to be met by 2025. As for the national virtual assistant platform and ecosystem, the number of public digital services accessible through the virtual assistant is expected to gradually increase by 2026. The reconfiguration of basic digital services and a safe transition to cloud infrastructure is assessed by the number of systems migrated to the cloud, the number of critical systems and the tests performed.

Most indicators in this field provide us with information on the status in the legislative process of adopting new frameworks and reforms for the digitalisation of the PA. Valuable indicators also relate to the number of digital public services activated and operational and the number of users they can reach, as well as the number or percentage of users who actually resort to them. Other useful indicators that can be developed could describe the time, money and effort saved either by public servants or citizens by using digital instead of non-digital services.

4. ARTIFICIAL INTELLIGENCE AND INDUSTRY 4.0

4.1. Digital transformation of businesses

As we are living through the so-called "**fourth industrial revolution**", with its exponential technological innovation disrupting economies and businesses, keeping up to speed with the rapidity of global changes is a key challenge for the competitiveness of our economy. New technologies, such as AI, blockchain, Big Data, cloud computing, quantum computers, Internet of Things and many more, can lead to enabling opportunities for businesses and citizens at large. However, for society to fully take advantage of these opportunities, an empowered and digitalised business environment, a regulatory framework that mitigates potential risks, and a continuous dialogue between science and innovation and the economy need to be in place.

Digital transformation is a priority for EU businesses. The Digital Decade objective for 2030 concerning **technological uptake** is for at least 75% of companies to be using the cloud, AI or Big Data, and ensuring that more than 90% of SMEs have at least a basic level of digital intensity. Supporting innovative start-ups is also a key priority to reach the goal of doubling the number of EU unicorns.

The DESI dimensions "Integration of digital technologies" monitors several indicators directly relevant to this goal. First, it observes the level of basic **digital intensity in SMEs**, which, in 2022, is on average 55%. Additionally, it monitors the adoption of advanced technologies by enterprises, combining data on electronic information sharing (38%), social media (29%), Big Data (14%), cloud (34%), AI (8%) and other technologies, resulting in starkly different percentages between large companies and SMEs.

SMEs represent 99% of all businesses in the EU and account for more than half of value added, but often have difficulties in complying with costs and face barriers, especially related to digitalisation (digital upskilling, adoption of technologies, administrative burdens, etc.). The RRF will boost SMEs transition towards a more digital economy addressing all these issues.

Reforms and investments targeting the digital transformation of businesses, and particularly SMEs, are a priority area and are addressed – to a different extent – in all RRPs. From investments directly supporting the digitalisation of SMEs, to projects enhancing R&I or measures in the digitalisation of PAs that have a positive impact on businesses, several initiatives are in place to benefit European enterprises.

Investments supporting digitalisation assist companies in accessing the financial or human resources to adopt digital technologies and take full advantage of them, in order to accelerate their digitalisation. A good practice in this sense is **Portugal**'s plan to create 25 digital commerce accelerators and a system of financial incentives that will upscale their business models. Thanks to a comprehensive investment package (€450 m), Portugal will support the transformation of the business models of SMEs and their digitalisation through a coaching programme and a voucher system for start-ups aimed at supporting them to develop digital- and green-based business models. Moreover, there will be vouchers for incubators and accelerators, the creation of a national test bed network for SMEs to test new products and services and accelerate their digital transformation. The target is to establish 30 test bed infrastructures and to test at least 3,600 pilot projects.

Other measures are aimed at simplifying company access to finance, for instance by providing direct financing through financial tools or improving the framework for private investments. This will be done either by measures providing financial conditions and consulting for SMEs – such as **Croatia**'s favourable financing instruments or **Cyprus**'s National Promotional Agency for tailor-made consulting – or via dedicated investments for SMEs to participate in digital projects, such as in **Slovakia**.

Investments and reforms simplifying administrative costs will also largely benefit companies, and most importantly SMEs, by lightening the heavy bureaucratic burdens that may hamper their success[12]. Several MSs have established **one-stop shop mechanisms** that support citizens and businesses and facilitate their interactions with PAs. The digitalisation of business registers is also a key measure in this regard. For instance, **Germany**, with the **Online Access Act**, is creating a single infrastructure for data management where citizens and companies will be able to submit their information applying the "once-only principle". **Greece**'s plan is also focused on measures to simplify the complexity, cost and duration of procedures such as accessing credit, registering property, and obtaining permits. The aim is to reduce the administrative and regulatory burden on businesses through a series of interventions that simplify procedures such as getting credit, obtaining an electricity connection, registering property, and getting a construction permit. For registering property for instance, the reform provides for an online platform enabling purchasers to complete all requirements for transferring property online. The reform also involves training public sector staff involved in such processes.

Extensive measures are dedicated to the **integration of advanced technologies in production processes**, which is supported by different means, such as loans or grants. **Italy**, for instance, supports companies for the purchase of tangible (machinery) and intangible (software) goods, with the **Transition 4.0 programme**, which provides tax credit for firms investing in Industry 4.0. **Austria** and **Denmark** have made significant efforts in supporting SMEs to adopt digital technologies, while **Bulgaria** has focused on smart industry with vouchers and financial help to build in SMEs the necessary human, scientific and institutional capacity.

Reskilling and upskilling initiatives to improve human resource capability are key instruments to enhance the SME environment, as well as connectivity (both topics are covered in sections 3 and 6).

4.2. Research and innovation

To ensure its position as a global leader, the EU is increasing its competitiveness through **support to R&I**. Useful data can also be retrieved from the European Innovation Scoreboard, which reports a steady increase in the last few years in the R&I performance of MSs, but with less developed regions still lagging behind. Support for R&I is an economic opportunity that is essential for the digital transition and is addressed in the RRF with the endorsement of research in technology and innovation, cross-border cooperation, and private-public partnerships.

R&I are among the most powerful tools underpinning the EU's competitiveness and sustainable economic growth, as well as its position in comparison to other global actors. Country-specific recommendations invite MSs to increase investments in their innovation ecosystem, and RRPs contain measures addressing this issue from research to technological uptake.

By **boosting cooperation in R&I among all MSs**, the EU's capacity to deliver innovation can be strengthened. Especially for emerging technological fields, **cross-border cooperation** is a priority area that allows for attracting and retaining the best talent, while also facilitating strategic connections and knowledge transfer.

All the RRPs include measures on R&I. Reforms are mostly directed at **improving the research system**, by **enhancing the role of research institutes** and **improving research careers**, **reducing the administrative obstacles** hampering funding for R&I, **strengthening the collaboration between public and private funds,** as well as the **transformation of scientific output into business applications**. For instance, **Cyprus** proposes a reform with a National Strategy for R&I that would map

[12] Further measures regarding the digitalisation of Public Administrations are discussed in the relative chapter.

the ecosystem, monitor its impact and match innovation to business needs. **Croatia** and **Portugal** have increased investments in R&D by encouraging the involvement of enterprises through tax reductions and fewer administrative burdens. Croatia is planning to first make an analysis of the existing R&D tax incentive scheme and then amend and complement the legal framework to encourage investments, increase the number of beneficiaries, simplify the procedures and make them more transparent and accessible. Portugal is also revising the legal framework related to public R&I investments, with the aim of facilitating public-private R&I partnership, by simplifying the access to funding instruments and establishing a multi-annual framework.

Spain is updating its Science, Technology and Innovation Law, with the purpose of improving the governance and coordination of the sector, making scientific careers more attractive and improving technology transfer and practical applications.

On the other hand, measures include **targeted investments in the areas related to advanced technologies** and the facilitation of **public-private R&I cooperation**. **Denmark**, for instance, will provide funding to both the public and private sector by establishing four public-private partnerships that unite different actors with the common goal of reducing emissions. Similarly, **France** will strengthen the link between research laboratories and private businesses.

Other initiatives **foster entrepreneurship** and, in particular, the start-up environment related to innovative technologies. **Spain**'s plan includes a Law on Startups that aims to create a positive environment for the creation and growth of innovative startups, also supported by a public-private fund specifically for scaling up disruptive technologies. **Croatia** includes measures supporting innovation in start-ups at the market entry phase. **Lithuania** will expand the Innovation Promotion Fund for the development of a start-up ecosystem that boosts acceleration services, providing services to a growing number of start-ups. **Portugal** envisages a voucher system for start-ups, enhancing the role of incubators and accelerators. **Finland** has also a strong focus on start-ups and SMEs innovation capacity and funds packages for companies to support sustainable growth and digitalisation, especially in applied research related to 6G, AI, quantum computing and cybersecurity.

Horizontal investments are dedicated to strengthening the role of innovation clusters and hubs, as centres of excellence where research on specific subjects can be carried out by the best talents and in a more focused manner. Several countries, such as **Slovakia** and **Spain**, focus on their participation in the network of Digital Innovation Hubs. For this purpose, **Greece** is setting up clusters of research excellence, expanding the attractiveness of innovative research for foreign academics and reinforcing the link between academia and companies through industrial PhDs. The aim is to boost scientific research and technological development by financing specific industrial or experimental projects that help address major social challenges and have a great potential for disruption and impact. **Spain** will support digital innovation hubs to enhance the adoption of digital solutions, and more specifically, it aims to attract national and international talents in the AI field (SpAIn Talent Hub) and create a network of excellence in AI to retain talent.

Multi-country projects have a similar objective. For example, **Austria** and the **Netherlands** are at the forefront of scientific and technological innovation in quantum technology, and the latter is planning on taking the lead at the European level in order to strengthen MS cooperation and promote a knowledge exchange. For this reason, it has established a national Quantum Delta NL ecosystem focused on research and innovation to create the first quantum computer. The Netherlands is also at the forefront of enabling **AI applications**, with an investment in public-private partnership (Dutch AI Coalition) and the National Growth Fund, which will make the country a testing ground for the creation of responsible AI applications. Other countries guiding multi-country projects are **Germany**, which is,

instead, focused on Big Data for the improvement of the use, sharing and management of data, and **France** in cloud technologies and microelectronics.

More cross-country initiatives on emerging technologies can be established in order to take advantage of a country's leadership **in specific technologies**.

Moreover, targeted actions for the employment of AI are hard to find in RRPs, especially since it is a field where international collaboration is pivotal if Europe intends to compete with the US and China. Here, the **AI European Strategy** does not seem to have greatly benefited from the RRF. The approach to AI in the RRPs is more generally related to digital transformation in the business sector or PAs, and should therefore be more systematic, in tune with the EU coordinated plan.

4.3. Regulatory initiatives

Finally, this all requires a **regulatory approach** that avoids internal market fragmentation, improves technology transfer and safeguards the ethical application of the new technologies.

Some countries have taken steps to **regulate** the enabling potential – as well as the risks – of the **digital transformation and AI**, to ensure a positive impact on economy and society. AI can be a valuable tool to **reduce discrimination, boost the green transition and eliminate geographical disparities**, as long as it is in line with fundamental ethical and social principles.

In its National Strategy for Artificial Intelligence, **Spain** intends to develop a normative framework that regulates the application of AI in several fields, ensuring a secure and reliable technology, while **Belgium** has a centre for research and innovation in AI that focuses on societal issues. In **Estonia**'s RRP, there is a focus on high quality data, key for a correct deployment of AI applications.

Several countries foresee regulatory **sandboxes to test new technologies in supervised environments**, such as in the case of **Spain**, **Czechia** (in particular, on R&I in services) and **Cyprus** (focused on FinTech startups and other innovative companies).

4.4. Milestones, targets and related indicators[13]

Portugal has reached a few significant targets related to the digitalisation of businesses and innovation. Where the creation of a catalyst for the digital transition of enterprises is concerned, in May 2022, Portugal created 16 Digital Innovation Hubs. Moreover, a reform for promoting R&D and innovative investment in enterprises was made with the update of the guidelines for the strategy for technological and business innovation for Portugal 2030.

In December 2021, **Spain** had approved the **Digitalisation of SMEs Plan for 2021-2025**. In addition, it published in the Official Journal two main documents: the National Strategy for Artificial Intelligence and the Digital Rights Charter. The National Digital Competences Plan was also approved by the Spanish Council of Ministers in 2021.

In April 2022, **Italy** achieved an important milestone with the entry into force of legal acts to make **Transition 4.0 tax credits available** to potential beneficiaries, and establishing a Scientific Committee. The number of enterprises taking advantage of these tax credits will be used to assess the progress of this measure over the years. For innovation and research, Italy reached the milestones related to the awarding of contracts for strengthening research structures and supporting the creation of "national R&D leaders" on some Key Enabling Technologies, for establishing and strengthening

[13] For more detailed information about the artificial intelligence and Industry 4.0 indicators, see the Annex V, tab. V3.

"innovation ecosystems for sustainability", building territorial leaders of R&D, and for a fund for the construction of an integrated system of research and innovation infrastructures.

One of the projects presented in **Belgium**'s RRP involves the development of the **AI for the Common Good Institute** to address societal challenges. In April 2022, four pilot projects of the AI for the Common Good Institute were completed and provided support services (such as training, proof-of-concept development of software solutions) to for-profit, non-profit, or public organizations in areas such as AI education, healthcare, and employment in the Brussels Region.

Malta has published a Smart Specialisation Strategy, which aims at, inter alia, investing in research infrastructure and promoting inter-agency collaboration in support of enterprises. Moreover, it plans to support 50 enterprises by 2024 in R&D activities through inter-agency account management between the Malta Enterprise and Malta Council for Science and Technology (MCST). In 2022, Malta published a call for applications for business to receive grant support for digitalisation, including wholesale and retail, tourism (including culture) and manufacturing sectors. By 2026, 360 undertakings should receive support for digitalisation, with grant agreements for €15 m being concluded, and at least 90% of the budget being paid out to beneficiaries following the completion of their digitalisation projects.

Finland's set of indicators is monitoring 6G, AI and quantum computing development facilities assessing the number of projects selected and implemented, and the measure on accelerating the data economy and digitalisation through shared platforms and services. For R&D, after the launch of the application for investments in RDI infrastructures supporting sustainable growth and digitalisation, the number and percentage of projects completed in various fields will be assessed.

Estonia is planning to monitor the digital transformation of enterprises through the call for proposals and subsequent awarding of grants for the support of their digitalisation.

In general, these indicators keep track of published calls for proposals for the digitalisation of enterprises and the number of enterprises benefiting from these funds and projects, in accordance with the European Commission's common indicators.

5. DIGITAL SKILLS

5.1 Basic digital skills in education

Digital transformation changes every aspect of life and work. New technologies and innovation permeate different aspects of our lives as citizens, while also urging organisations and companies to develop new business models. People are at the centre of this transformation. To take advantage of the opportunities offered by the digital transformation, as well as to be aware of its risks, citizens and workers must acquire an adequate level of digital skills.

Basic digital skills are now essential, first of all, to become empowered and aware citizens and consumers who can **access digital products and services, retrieve online resources and information, critically identifying frauds and risks**. As public services are increasingly offered online – to enhance their efficiency and simplifying procedures – interaction with PAs is becoming more and more digital**. Therefore, guaranteeing that all citizens have the means and the skills to access public services becomes a priority**. At the same time, digital skills in the workforce are at the foundation of a resilient and sustainable growth, increasing the competitiveness of the EU economy. Business models are constantly evolving and call for new roles and new skills, entailing **workers in all fields reskill and upskill their competences**.

The development of digital skills is one of the main areas of the Digital Transformation pillar. According to the RRF Annual Report, 20% of the digital expenditure is dedicated to human capital, amounting to a total of €26 bn[14]. **All countries include measures to increase digital skills in the general population, in the workforce or in education through reforms and investments targeting different groups** (education systems from school to university, the unemployed, employees, vulnerable groups).

The ambition of Europe's **Digital Compass** is that, by 2030, at least **80%** of all adults should have basic digital skills. The 2022 DESI finds that, on average, 54% of European individuals (16-74 years old) have at least **basic digital skills** and 26% have above basic digital skills. Differences between MSs are blatant, with Finland and Netherlands being the best performers with 79% of the population with at least basic digital skills, while Italy, Poland, Bulgaria and Romania are the lowest ranking countries, with results of even below 30%.

As digital competences are amongst the eight key competences for lifelong learning[15], developing them from the youngest age – and keeping them updated throughout life – is a priority for all MSs. Increasing basic digital skills starts with the digitalisation of education, with plans to integrate the use of technologies into the education ecosystem. Actions addressing the digitalisation of education can be found in all countries' RRPs, with efforts mainly aimed at **updating school programmes, training teachers and furnishing digital equipment.**

Comprehensive reforms of the educational system are envisaged by all MSs to expand quality education, improve skills (including digital skills) and strengthen inclusion at all levels.

[14] Report from the Commission to the European Parliament and the Council on the implementation of the Recovery and Resilience Facility, published on 1.3.2022.

[15] European Commission, Directorate-General for Education, Youth, Sport and Culture, *Key competences for lifelong learning*, Publications Office, 2019, https://data.europa.eu/doi/10.2766/569540

Few MSs envision incorporating digital skills in the school curricula, such as **Cyprus** and **Croatia**'s plan to create a **curriculum on digital transition**, which helps create awareness on digital transformation from a very young age.

Another good practice is to insert digital skills in the school curricula by updating them to **meet the needs of the labour market**. For instance, **Portugal** provides school orientation to better match labour market demand, and **France** foresees the creation of a **structural partnership** between educational and research institutions and businesses, to facilitate the continuous exchange between schools and the labour market. This will allow students to develop valuable skills that can be more easily applicable in the world of work and, in the long term, help reduce the skills mismatch.

To increase the level of digital maturity in schools, **countries plan to invest in the digital infrastructure of educational institutions furnishing classrooms with technological infrastructure**. **France**'s plan is exemplary here, as it invests significant funds in the digitalisation of education by promoting the use of digital technologies. As inequalities in education widened due to the pandemic, and students from lower socio-economic conditions had difficulties in accessing remote learning, providing them with the necessary equipment is a key measure to facilitate inclusion and equal access to digital skills. **Croatia's e-School project** also should be mentioned as a good practice, as it plans to invest in the digital infrastructure of higher education institutions with modern teaching digital infrastructures and support online learning. Although there are new digital learning and teaching tools, Croatia is confronted with insufficient resources and an imbalance in equipment in its higher education institutions, affecting the quality of higher education. Therefore, the plan includes investments in digital teaching infrastructure and digital teaching tools (e.g., a digital register of diplomas for the development of a graduate tracking system to aid their integration into the labour market).

These measures need to be reinforced with further remedies related to the qualification and the adequate training of teachers to support digital skills development. **Cyprus** will ensure digital equipment for 700 classrooms while providing students with the necessary hardware, and aims at training 3,375 teachers, which accounts for 32% of all teachers in primary and secondary schools, in order to ensure that the use of digital equipment is underpinned by the necessary digital skills from teachers.

Educational material provided in schools should also **integrate digital learning principles and online technologies for pedagogical purposes**. Targeted investments for the adaptation of digital learning are present in **Lithuania's plan** which includes a measure called **EdTech project** supporting the transformation of digital education by funding digital solutions and content for classrooms, in order to provide online learning material that allows for the continuous practising of digital skills. Following digital learning principles in school has the double advantage of integrating new technologies to improve education and helping students become accustomed to digital methods.

5.2 Developing advanced digital skills

Experts in ICT fields are key to enhancing the adoption of the fastest growing digital technologies and underpinning EU economic growth. Europe's **Digital Compass** aims at having **20 m employed ICT** specialists in the EU with an equal number of men and **women**. However, percentages are still far from the Digital Compass target - **ICT specialists now number 9 m**, **representing approximately 4.5% of total employment.** The highest absolute number is reported in Germany, France and Italy, which collectively account for 40% of the total ICT workforce in the EU. The highest percentages of specialists

can be found in Sweden and Finland, with 8% and 7.4% respectively of total employees. A significant gap between men and women still exists.

In their RRPs, MSs have not only focused on the development of basic digital skills but also made efforts to advance the digital skills of students of all levels in cross-cutting technologies. This will contribute to **expanding the number of people with above basic digital skills**, by **increasing awareness** of the functioning of digital technologies, but also to **increase the number of ICT specialists and experts**.

At university level, courses and **PhDs in STEM fields are encouraged by most MSs**.

Germany includes in its RRF an innovative **focus on data policy**, which is also relevant in this case. Its aim is to increase data literacy for students, also at university level (with new PhD programmes in Data Science), in workers and the PA, in order to help raise awareness of the functioning, the risks and the benefits of data.

Italy's **RRP** also includes measures for advanced digital skills, **expanding the academic offer in digital technologies and supporting PhD programmes**, which will add to the strong existing research community in AI and quantum computers. This will also boost research, innovation and competitiveness in this field.

One important strategy is that of **Latvia** , which focuses on **increasing the number of specialists** with advanced digital skills by developing approximately 20 training modules in advanced digital skills for advanced technologies such as quantum, high performance computing, and language technologies. The training modules will be included in higher education programmes (Bachelor, Masters, and Doctorate), as well as educational programmes for professionals in enterprises. The investment will support 3,000 participants in the developed modules. This will help increase awareness of advanced technologies and expand the number of people involved in this field from a younger age.

It should be noted that as technologies evolve fast, the inadequacy of **digital skills** becomes increasingly significant. While basic training in digital skills is often included in educational programmes, schools and training, specialist digital skills in emerging technologies are rare and at risk of rapidly becoming obsolete if not properly and continuously updated. AI algorithms, blockchain, NLP and other tools are gradually becoming more pervasive in our lives, therefore, people need to update their skills fast, as well as understanding the opportunities and risks. This is also pivotal to fully take advantage of new technologies and new business models and boost the EU economic potential.

Specific measures targeting the understanding of advanced technologies are not often mentioned by MSs and, if so, in most cases they are related to a higher degree of specialisation (STEM degrees). These competences are horizontal and at least a basic knowledge of what they are should be favoured in all subjects.

5.3 Digital skills in the labour market

Digital skills strategies in the labour market attempt to **narrow the gap between workers' skills and the evolving need of the market**, with an eye to the development of **critical skills for the unemployed**. Several RRF plans include measures to increase the digital skills level in the general population and in the workforce, by providing opportunities for targeted groups such as the employed, the unemployed or SMEs in the form of online training courses or voucher systems.

Supporting the development of digital skills is a **key measure to tackle unemployment**. For instance, **Portugal** has a high level of youth unemployment and plans on addressing this with a special focus on lifelong learning and labour market participation. Furthermore, vocational training will be modernised, with a focus on digital literacy and competences. **Italy**'s RRP similarly supports the tertiary vocational

training system and provides further assistance for the unemployed and workers in transition in acquiring digital skills, while **Luxembourg** has launched a Digital Skills Programme foreseeing 30,000 short-time workers to be eligible for e-learning courses focusing on digital skills.

Measures to expand the digital skills of the employed often include **support to businesses in offering training.** As digital skills vary across fields, roles, personal levels of competency, a wide range of training courses covering different needs is required. There may not be a one-measure-fits-all solution. A best practice is **Portugal**'s **Digital Academy**, a platform for digital competences that aims at training 800,000 employees through RRF funding, by evaluating their digital skills level and, consequently, offering them a tailored training path for the development of the digital skills they need for their profiles and roles. **Croatia**'s plan includes investments to **foster lifelong learning and upskilling of workers**, matching them to the needs of the economy. This will be achieved through a system of **vouchers**, with a focus on vulnerable groups, and with the development of e-services that facilitate inclusion.

More specific and **advanced skills related to ICT are also addressed in many RRPs**. **Malta** has started implementing measures supporting advanced digital skills and the digitalisation of enterprises aimed at increasing the pool of ICT professionals, and especially related to the AI field. **Estonia**, although its population has good digital skills, suffers from marked ICT vacancies to be filled and focuses on increasing ICT knowledge of ICT managers and experts.

One of the largest measures is the establishment of the **Spanish National Digital Competences Plan**, that will act as a roadmap to identify the challenges and implement the necessary actions to ensure that all Spanish citizens will have the opportunity to develop digital skills. It will focus on digital skills for education and training, upskilling and reskilling for work, and promotion of ICT specialists. Spain also foresees a **Strategic Plan for Professional Training** with investments in reskilling, upskilling, and the digital transformation of professional training.

However, more structured reforms are needed to ensure **women's participation,** especially in STEM, in order to reach a full gender balance, as per the Digital Decade objectives. Few countries have specifically planned initiatives to achieve this, notwithstanding the gender imbalance in STEM being still quite significant across the EU. More actions should be planned to encourage female participation from an early age.

5.4 Ensuring equality in digital skills

Targeted measures aim at **supporting vulnerable groups with limited access to the education, work, or digital services, by increasing their employability**, making more equipment available or through career guidance programmes. Countries have focused on groups in lower socio-economic conditions, but also in bridging the gap between men and women graduates. A best practice in this field is **Spain**'s specific plan for digital transformation for citizenship that emphasises the role of women and girls.

One of the main efforts in the above was made by **Romania**, which has one of the highest percentages of population at risk of poverty and social exclusion in the EU, with disadvantaged groups such as undeclared workers, self-employed in agriculture, Roma, people with disabilities, the elderly and homeless. 2022 DESI results show that only 28% of the population has at least basic digital skills, placing the country as one of the bottom performers, while 9% of individuals have above-basic digital skills. In order to tackle this, the Romanian RRP plans a measure enhancing basic digital skills of citizens belonging to disadvantaged groups by reconverting 105 libraries into hubs for the development of

digital skills and planning funds for the upgrade of the IT equipment of over 1,000 libraries. The aim of this measure is to develop basic skills of at least 100,000 citizens from vulnerable groups.

A similar concern is addressed in **France**'s RRP, which results in an unprecedented effort for the digital inclusion of all citizens to ensure equal access to online public services, and in **Belgium**'s plan, which includes a measure to support the digital inclusion of vulnerable groups. The measure **E-inclusion for Belgium** aims at tackling the inequality in the access to digital technologies, services and the development of digital skills. For instance, a platform will be established to help prison inmates develop digital skills and facilitate their job placement. This will enable them access digital technologies and therefore new opportunities, promoting equality.

Another best practice in addressing the digital divide is envisaged in **Italy**'s plan, with the so-called **digital civil services**, whereby volunteers will train people in digital skills and strengthen the network of digital facilitation centres. This has the joint aim of improving digital skills in the population to narrow the digital divide and to support the digital inclusion of individuals by providing physical access points.

Apart from these, it is hard to find in the national plans initiatives to **balance the gap in digital opportunities faced by specific vulnerable groups and ensure equal access**. Groups from lower socio-economic conditions, immigrant origins, persons with disabilities, have more difficulties not only in accessing basic services, but also in developing digital skills, enabling digital business opportunities and so on, but specific actions to tackle this misbalance are not properly addressed by MSs. Given the particular situations of these groups, more structural reforms and investments should be developed to address their difficulties. Another group that is missing in most plans is that of the elderly, who often lack digital skills and may risk social isolation and difficulty in accessing digital services.

5.5 Milestones, targets and related indicators[16]

By looking at publicly accessible data on milestones and targets related to this area, the kind of indicators mainly used to assess the progress of the RRPs can be individuated. These mostly relate to the adoption or entry into force of decrees, the awarding of contracts of projects or publications in official journals. Milestones in this area mainly give us information on the legal and regulatory state of the art.

Italy, with its €11,252 m budget, **allocates the highest expenditure to digital skills**, targeting the general population, PAs, education and the labour market. For digital skills in education, an indicator is related to the adoption of the **School 4.0 plan** to transform classrooms into innovative learning environments and the reform of the tertiary vocational training system, while the effectiveness of initiatives to the general population are measured through the number of citizens involved and participating. As for R&D, indicators relate to the awarding of contracts for projects concerning national R&D leaders on key enabling technologies, strengthening of the **system of research and technology transfer centres**, covering fields such as advanced simulation and Big Data, quantum computing, Industry 4.0, and AI.

Spain also achieved some milestones related to digital skills, including investments in the digital transformation of education, the equipment of schools with digital infrastructures and the approval of the National Digital Competences Plan.

[16] For more detailed information about the digital skills indicators, see the Annex V, tab. V4.

With regards to **France**, so far, 16,000 places in higher education have been created, achieving the target **Plan for youth: higher education of post-baccalaureate students**. This provides important information on the actual entity and impact of the measure. France reached another milestone aimed at supporting teaching, research, development and innovation ecosystems, with the launch of **three projects** - "ExcellencES", "Diversification of the resources of higher education and research institutions", and "Transformation of school education by promoting innovation and new forms of organisation and management". Another milestone is the signing of an agreement to increase resources for "France Compétences", with no specification – at the indicator level in the Scoreboard – of its entity.

Portugal has already received its first disbursement with targets and milestones achieved, related to digital transition in education, with the signature of contracts for the purchase of individual computers for pupils and teachers.

In July 2022, **Slovakia** received a first disbursement from the European Commission after approving a landmark reform concerning research, development and innovation. The approval of reforms in the governance of universities, concentration of excellent educational and research capabilities, and of the organisation and funding of research institutions, in particular the Slovak Academy of Science, were among the milestones and targets contributing to this result. In May 2022, Slovakia also issued a national strategic document for the digitalisation of education and is expected to prepare a new strategy to improve the digital skills of all population groups.

Malta is measuring its progress by assessing the launch of a scholarship scheme for students to become ICT professionals and the support – measured against the objective of 1,000 individuals – to mitigate the digital divide by 2023 with a pilot scheme.

Finland is using as indicators targets and milestones related to the upskilling and continuous learning reform and digitalisation programme, by defining a target for the service prototypes completed and available to users and the percentage of courses that have gone "digital".

Estonia's skills reform for the digital transformation of businesses, after its entry into force in 2022, is expected to see the enrolment of 500 participants by 2023 and 2,000 training activities completed by 2026. The number of new upskilling and retraining modules will also be monitored, with a review of qualification standards for ICT specialists.

In general, these indicators are useful to keep track of the legislative process contributing to the launch of the envisioned projects. As for the implementation, available indicators describe the number of activities offered and the users enrolled or completing said activities. These indicators are valuable and can be useful to keep track of the concrete impact of these training initiatives (e.g., whether procedures in enterprises somehow benefitted from the new skills developed by the employees or how more advanced digital skills are helping individuals in finding better jobs).

6. CYBERSECURITY

6.1 Public administrations

The public sector is responsible for a large volume of sensitive information, making it highly exposed to the actions of cyber criminals. Government agencies' data is highly sought after by hackers as its systems hold large quantities of information from citizens and other organisations connected through various platforms. Moreover, the public sector's information systems and technology are quickly evolving and also the quantity of resources and services provided virtually is rising. This evolution generates a demand for innovation and a call for safe cloud database storage. While this storage is becoming increasingly complex, governments must work hard to support technology to keep up and at the same time cover the gaps.

The public sector mainly obtains funds from taxpayers, and government agencies can suffer from constrained budgets if IT department allocations are poor. This means reduced software updating, as well as for security, resulting in numerous organisations relying on old technology. A cyberattack which targets the public sector compromises state services and results in high financial costs for publicly financed agencies.

The EU has defined a **Cybersecurity Strategy** to strengthen Europe's ability to face cyberattacks. The goal of this strategy is to reinforce collective cybersecurity and reaction to cyberattacks, laying the foundations for a stable and secure global Internet where the rule of law, human rights and democratic values are safeguarded. The areas of intervention of the strategy are 'resilience, technical sovereignty and leadership', 'operational capacity to prevent, deter and respond' and 'cooperation to advance global and open cyberspace'.

Cybersecurity is also a key area in the Digital Europe programme which aims to reinforce cybersecurity coordination among EU MSs, and to finance the ability of EU countries to withstand cyberattacks.

Many countries have defined in their RRPs **measures to foster the development of cybersecurity for PAs**. This is planned to be achieved in several ways.

Some countries have focused on enhancing cybersecurity for **specific administrative apparatus** by operating on their information and communication infrastructure. For example, **Bulgaria**'s RRP pillar 'Fair Bulgaria' introduces an investment for the transformation of the existing information and communication infrastructure in the **Prosecutor's Office** of the Republic of Bulgaria into a new fault-tolerant, reserved, productive and protected type. The goals of the project are to develop high resilience, protection and redundancy of internal electronic exchange of documents between units in the Prosecutor's Office, technical implementation of policies for protection of personal and sensitive data in its electronic files and electronic identification of users of electronic systems in the Prosecutor's Office, and the level of direct communication with operational bodies and inspectors in the ministries. The total planned resource is €14,7 m.

Another example is given by **Cyprus**, whose plan introduces an investment aiming at the digitalisation in various central government ministries and services. The projects that will be promoted through this investment include **Digitalisation in the Ministry of Foreign Affairs – SKYTALE**. One of the divisions of this project is 'Crypto' and its objective is to **preserve classified information** from being stolen or manipulated from attackers or non-need to know persons by further developing existing systems allowing controls and cryptographic tools. Division A envisages improving equipment and controls for secure and immediate transmission of classified data and voice and achieving authentication,

confidentiality and integrity of the documents, improving monitor controls and threat intelligence to safeguard government networks from cyberattacks and applying protective measures and procedures and accelerating the deployment process in order to safeguard the implementation of the projects. Division B, 'Cyber Defence', envisages ensuring all controls are in place to safeguard government equipment and networks and providing a secure digital environment for the Ministry of Foreign Affairs staff, securing means of communication for unclassified but sensitive data and building a knowledge database using the services of a professional consultant.

Given the high exposure of the public sector to cyberattacks due to its control over large volumes of sensitive information, investing in improving the cybersecurity of specific administrative apparatus could be considered as a best practice. Indeed, the high level of risk requires a targeted intervention. Focusing on specific areas of the public administration allows for concentrating efforts and obtaining better results in terms of security.

Among the countries that define measures to support cybersecurity centred on **enhancing the infrastructure of public administrations** are Malta, Poland and Lithuania.

In its RRP, **Malta** includes an investment to implement a state-of-the-art **Security Operations Centre** and invest in tools and other **infrastructure for cybersecurity** as part of the government's digital backbone improvement. The investment in the tools will be complemented by digital training provided to public officers and awareness campaigns, notably on cybersecurity.

Poland includes in its RRP transformative reforms and investments to strengthen the state's cybersecurity capacity. The country aims at achieving increased security in cyberspace, securing data processing infrastructure and digitalisation of the infrastructure of services responsible for security. Poland has defined a reform to increase the cybersecurity of information systems and strengthen the data processing infrastructure and an investment of €193 m to introduce **CyberPL** and infrastructure for data processing and delivery of digital services.

In its RRP, **Lithuania** introduces the reform **Transforming the management of public information technology**. The aim of the reform is to consolidate the state's information resources in their entirety, so that the IT infrastructure, services and processes of public institutions are managed centrally, efficiently and securely.

In general, investing in the infrastructure of PAs could have important positive effects on the level of cybersecurity given the limited resources that are usually available for the public sector and which hamper the passage to new, more secure technologies.

Other countries address the theme of **cybersecurity within the area of connectivity**. For example, among the pillars of **Bulgaria**'s RRP, the **Connected Bulgaria Plan** includes several policy areas. The digital connectivity policy area will lead to an enhanced data transmission environment, as well as digital connectivity and high protection of public institutions, administrations and consumers. This will enable adequate implementation of the measures foreseen by the Cohesion Policy to increase the pace of digitalisation of the public sector and guarantee a high level of cybersecurity.

Greece's plan, in the component "Enhancing connectivity for citizens, businesses and the state", promotes the digitalisation of the public sector but also refers to cybersecurity measures. The **adoption of a cybersecurity strategy** is a priority of the Greek plan. Within the same framework, Greece aims to increase the reliability and security of public sector systems and their data, ultimately leading to a faster digitalisation of public services.

Another strategy adopted by some countries for the development of cybersecurity involves the **creation of new operating structures**.

While designing measures addressing the issue of cybersecurity, **Estonia** has focused on the option of creating a **single centre** managing the provision of major basic IT services and on the establishment of a centrally provided security testing for the state. **Estonia**'s RRP introduces the reform **Re-engineering the basic services of the digital state and secure migration to the cloud infrastructure**. An objective of this measure involves the provision of major basic IT services - server infrastructure and computer workstations - being managed by a single centre of excellence in the country. As a result, basic services will be streamlined and modernised. The quality of basic IT services in the digital economy will be higher - satisfaction with these services will increase, information security will be enhanced, that is, there will be fewer incidents (despite growing threats). The measure also implies that the state has the capability to perform its own security testing of digital solutions, as a centrally provided or shared service. Therefore, the hope is that digital public services will have a higher resilience to cyber threats and fewer incidents, including service disruptions and safe deployment of cloud infrastructure.

Similarly, **Italy** is another country that has opted for the creation of a new operating structure. Cybersecurity plays an important role in its digital transition. The Italian RRP has the objective of strengthening cybersecurity with an allocated budget of €623 m and intends to do so by investing in technology tools and operating structures such as a 'national hyper Security Operations Centre (SOC)' and the creation of a new national cybersecurity agency. More specifically, the Italian RRP aims to reinforce the cybersecurity protection of PA bodies and companies of national interest, enforce the evaluation system of electronic equipment and applications used by those bodies, as well as operationalise the new National Agency for Cybersecurity. The establishment and operability of the new National Cybersecurity Agency is planned to be completed by December 2022.

The creation of new operating structures such as those mentioned above generates increased quality in basic IT services and enhanced information security. This in turn allows for addressing the issue of a quick evolution of the public sector's information systems and technology and of an increase in resources and services provided virtually which lead to a demand for innovation and a call for safe cloud database storage.

As mentioned in the sections on digital skills, further provisions to foster cybersecurity for PAs include measures to ensure adequate **digital skills**. This is a strategy implemented by Latvia. When cyberattacks occur, they may become notorious thanks to media coverage and inspire "copycat" criminals. To guarantee an adequate level of protection from these attacks, education regarding the main cyber threats to which the public sector is exposed is of the utmost importance.

6.2 Enterprises

The pandemic has greatly encouraged the shift to the digital world. As well as new opportunities, the move to a more digital world has also introduced new threats in the form of cyberattacks. Cyberattacks can lead to the stealing of data, spying on users, taking control of computers and so on. In order to achieve a successful digitalisation of society, European businesses must be able to exploit new technologies without being subject to these risks.

According to estimates, ransomware attacks cost the world roughly €20 bn in 2021 and the global annual cost of cybercrime was €5.5 trillion in the same year[17].

[17] Enisa (European Union Agency for Cybersecurity) and European Commission, 2022.

Companies are increasingly exploiting different technologies and cyberattacks are one of the most challenging problems for both large and small-scale enterprises. For this reason, countries need to define measures that strengthen the cybersecurity of firms.

While developing measures in the field of cybersecurity, some countries have focused on **ensuring that businesses have sufficient and high-quality skills for the digital switchover**, which is the basis for business competitiveness, sustainability and growth.

Estonia recognises that the growing role of new technologies has led to a significant increase in the need for cybersecurity **expertise**. Cyber-attacks on businesses have increased[18]. The need has also been amplified by the increased demand for secure digital services resulting from Covid-19 and the need and opportunity to export Estonian digital services. This requires the availability of sufficient ICT and cyber experts and the growing cyber capabilities of digital services companies in international competition. A recent international survey[19] showed that 44% of IT and technology managers consider maintaining IT security of systems and safeguarding corporate information as their strategic priority for 2021. An elite continuing education programme in cybersecurity and its synergy with higher education (micro-skills) will both support the cybersecurity of Estonian companies and create a new quality level for an important export article in the field of education.

Finland has also focused on the development of skills in the field of cybersecurity with an investment in **cybersecurity training activities**. Indeed, active training activities are essential to support the prevention, management and resolution of cyber-attacks. Cybersecurity exercises are an instrument that allow organisations to carry out training and develop their own activities without compromising their own production environments. Technical cybersecurity exercises are useful for the development of skills of technical staff, the operational processes and the effectiveness of incident management.

Instead of focusing on the development of digital skills in enterprises, another option to target the development of cybersecurity is to **foster the use of advanced technologies**. This is an example of the strategy adopted by **Greece**. The **uptake of advanced technologies by businesses, such as cybersecurity systems**, is the main objective of Component 2.3 of the Greek RRP which focuses on the digital upgrade of the private business sector. Similarly, **Malta** plans to include cybersecurity as one of the candidate technology areas which are to be supported when rolling out measures to intensify the digitalisation of the private sector (see below).

The development of cybersecurity can also be achieved through **centralising support services for the digital transition of firms under more accessible conditions**, focusing this process on cybersecurity. An example of this measure is provided by **Portugal** within the investment **Catalysing the Digital Transition of Enterprises**, requiring €100 m. Within the 'Digital Innovation Hubs' investment programme, support services for the digital transition of firms should be centralised under more accessible conditions. This process is focused on three disruptive technologies - AI, HPC and cybersecurity. The programme aims to expand and develop a national DIH network, improving the investment forecast by complementing the network that is already being developed within the framework of the Digital Europe Programme (DEP) to add 126 more hubs. Another programme of the investment is **Certification Seals for Cybersecurity, Privacy, Usability and Sustainability**. It foresees investment in four new certification platforms involving cybersecurity, privacy, usability and

[18] Republic of Estonia Information System Authority (RIA), Trends and Observations, 2020.
[19] 'How will COVID-19 shape demand for cyber-security skills in 2021?', Robert Half, 8th December 2020.
https://www.roberthalf.co.uk/blog/hiring-and-management-advice/how-will-covid-19-shape-demand-cyber-security-skills-2021

sustainability, as well as a promotion campaign and training of conformity assessment bodies and technical assessment laboratories, and the award of seals.

Due to the magnitude of the problem, in an increasingly digital world, relying only on the development of cybersecurity skills in enterprises is probably not enough to respond to the issue of cyberattacks. Training the staff of an enterprise on the risks of cybersecurity certainly ensures an increased ability to prevent attacks and to intervene effectively in emergency cases, but this type of measure should also be supported by investment in advanced technologies.

6.3 Citizens

Cyberattacks also target citizens, taking the form of hostile efforts to access or damage a computer or network system. Cyberattacks can cause loss of wealth or the theft of personal, financial and medical information and they can harm reputation and security.

In general, **teaching basic skills to all people and to develop these skills is the most cost-effective way to increase cybersecurity in a society**. Indeed, some countries have targeted the development of cybersecurity skills for citizens in their RRPs.

Finland has introduced in its RRP the investment **Civilian cybersecurity skills - Training and development of European countries' Action Plan**. The objective of this project is, first of all, to compare how European countries have already implemented cybersecurity education for their citizens and, secondly, to create a common European model and platform for teaching and developing cybersecurity skills that can be exploited equally throughout EU MSs. The study has three phases. First, understanding to what extent and how European countries currently teach basic cybersecurity skills to their citizens is fundamental. It is also important to take national specificities into account when summarising the current situation and content needs. This phase of the research will be qualitative, based on contacts and research. The second phase will define common content and requirements for the platform to be implemented. These are both qualitative and technical solutions. The third phase will provide a platform for basic cybersecurity education to which all Europeans will have access. The implementation will use game features and the possibility to update the platform's teaching formats to meet changing requirements. The aim is that this solution will significantly enhance cybersecurity skills and awareness for all Europeans. The research project will be carried out by Finland's key cybersecurity research universities and their consortia.

With investment 'Digital literacy for citizens, including youth', **Latvia** plans to ensure the acquisition of general computer skills for broad groups of society, including social risk groups, seniors, and people with low educational attainment, which have been identified as the most important groups with low digital literacy. This investment will contribute to raising the public awareness of the basic principles of **secure digital activities** and the **fundamentals of cybersecurity**. Other than improving digital skills, the content of the training activities will also include elements of digital security.

When it comes to protecting citizens, raising awareness of the risks arising from an inappropriate use of technology is a good strategy. However, this kind of measure should also be supported by the broader adoption of software or other technologies that guarantee increased security.

6.4 Milestones, targets and related indicators[20]

In July 2022, **Slovakia** achieved a milestone in the digitalisation of PAs with the reform on the standardisation of technical and procedural cybersecurity solutions (ITVS – Information technologies for public administrations).

Among the **Italian** RRP targets and milestones met as of October 2022, we can find the Cybersecurity Agency being established and now fully operational.

The **French** RRP presents the measure 'Innovating for the resilience of our economic models'. In the context of this measure, which focuses specifically on the development of key digital and health markets at the national level, several strategies have already been launched. France has achieved one of its targets by validating a number of strategies. The disbursement date associated to this target was 4 March 2022. Among the strategies already validated in the framework of the RRP, there is the cybersecurity investment strategy. By exploiting the strong research and growth potential of the French industry, the cybersecurity investment strategy aims to accelerate innovation to bring France to the global forefront, to master key technologies in critical applications (such as industry, health and mobility) and to disseminate cybersecurity within companies and society.

Czechia introduced a measure related to cybersecurity where it establishes a milestone involving the modernisation of the Security Information and Event Management System of the police of Czechia, and extension of its use for cybersecurity protection of a further five information systems, to be selected based on a risk and feasibility study. This is associated to a qualitative indicator related to the adoption of a fully functional and upgraded Security Information and Event Management system and of an additional five information services selected on the basis of a risk and feasibility study. The same measure also entails a target related to the completion of projects leading to an increase in the number of information systems whose cybersecurity has been strengthened in line with Act No. 181/2014 Coll., on cybersecurity. If both the target and milestone are achieved, there will be substantial gains in terms of cybersecurity for Czechia.

Finland's cybersecurity research investments are associated to a milestone that implies a training platform and content available in multiple languages. In this case, the indicator entails specifications for cyber knowledge and skills required and for how they are to be taught, and a digital platform created on this basis in the first phase of the project. Moreover, there are shared training content requirements for the platform and the indicator states that 'the platform is widely available to educational institutions in the Member States in August 2024.' Some targets that allow for achieving the reach of this platform would help to better assess its progress.

In its RRP, **Bulgaria** presents a measure for the transformation of the existing information and communication infrastructure (ICI) in the Prosecutor's Office of the Republic of Bulgaria into a new type - fault-tolerant, reserved, productive and protected. The country associates this measure to a very long list of result indicators. For example, an established and functioning unified secure communication system for secure data exchange is required (1 piece) by December 31, 2023. Moreover, built security systems (6 pieces) are demanded by December 31, 2023. 12 more indicators of this kind are presented, determining an adequate level of accuracy when it comes to assess the performance of such a complex measure. The country often provides for indicators that recall the EU Commission indicator number 10, which is related to the number of participants in an education or training course. As table 7 shows,

[20] For more detailed information about the cybersecurity indicators, see the Annex V, tab. V5.

Bulgaria's measure mentioned above is associated to many indicators on the number of trained employees in different areas.

Malta introduces a measure to support cybersecurity and associates it to a milestone implying improved level in a NIST cybersecurity framework. The qualitative indicator involves the NIST level assessed as level 4 in an internal report as validated by an external body. In particular, the milestone foresees an internal assessment showing that MITA infrastructure attains an overall level 4 in NIST. The report must be precise and exhaustive, clearly indicating how the level is achieved on each measure prescribed by the framework. An external body will validate the report. This external control increases the reliability of the milestone allowing for a more accurate assessment of the performance of the measure concerned.

Estonia presents in its plan a reform for restructuring the basic services of the digital state and a secure transition to cloud infrastructure. One of the targets set for this measure is that by the end of 2024, 16 comprehensive security tests of public sector information systems will have been carried out by the security testing team to be set up at the Information System Authority.

Italy presents various indicators for its investment 1.5 on cybersecurity. For instance, they require the establishment of the new Agency for National Cybersecurity (by Q4 2022), the initial deployment of national cybersecurity services (by Q4 2022), the launch of the cybersecurity screening and certification laboratory network (by Q4 2022) and the activation of a central audit unit for PSNC and NIS security measures (by Q4 2022). These all seem valuable signals for the successful implementation of cybersecurity measures.

7. POLICY RECOMMENDATIONS

The digital pillar of the RRF is an essential instrument to ensure the EU's recovery and resilience. Reforms and investments aimed at integrating digital technologies in our society and economy are crucial to increase EU economic potential, ensure the respect of rights and unleash new opportunities. The exceeding of the 20% rule for the expenditure on digital objectives by all Member States demonstrates **a strong interest in taking full advantage of the possibilities of the digital transformation** by countries performing to different degrees in digitalisation.

To fully implement this goal, countries have envisaged plans improving connectivity, digital public services, cybersecurity, digital skills, AI and Industry 4.0. Initiatives in these areas are present in most plans and discussed in this paper. In light of this, some key points can be highlighted:

- The **analysis of RRPs and their status of implementation can be difficult,** both for citizens and relevant stakeholders. Most information can be found on the websites of PA entities of the countries. However, timelines and information on the state of implementation of the plans are not available for all Member States, and it is unclear whether that depends on countries not taking relevant steps towards the accomplishment of the goals associated to the RRP measures, or if the missing data has just not been published yet. Even when this kind of information is available, it is quite dispersed. Moreover, all RRPs use their own classification and structure and display the information, goals, figures and fields of interventions differently. This makes a comparison of the countries more cumbersome while a more standardised approach could simplify the operation.
- The **Scoreboard** provides a useful overview, reporting all the milestones and targets recognised by the Commission as being satisfactorily fulfilled. However, the RRP implementation monitoring system could be enhanced by designing a tool that allows for keeping track of the accomplishment of steps envisaged by reforms and investments, even at a prior stage than the official recognition of milestones and targets. A tool **ensuring publicly available information on the course of action of EU countries** would also allow citizens to become more involved in the adoption of the RRF and more aware of the new possibilities provided by the measures in the area of the digital transformation.
- Information on **milestones and targets and the related qualitative and quantitative indicators to be reached** by each country is hard to retrieve. Often, milestones, targets and indicators are included in annexes that can be found in national RRF websites but are only available in national languages. Tables comprising all the milestones, targets, and indicators, are only available in some RRPs and are sometimes divided amongst the different sections of the plan, which makes it difficult to have an overview, keep track of the achievements over time and make a comparison with other countries.
- Some countries make use of other national or European funds and instruments that have the same objectives as the RRF. However, the overlapping and complementarity amongst these funds are not always clear. An **improved horizontal coordination** with other funds and visibility of the actions and initiatives envisaged are needed.
- In their RRPs, many countries have designed measures to digitalise PAs through the provision of systems for electronic identification and the transition to a data-driven governance. However, the **efficient functioning of digitalised PA systems also requires citizens to trust the new tools** introduced. The more people are informed or use technologies, the more they are likely to have a positive opinion about them and trust them. Thus, increasing citizen

awareness of what their countries are doing to embrace the digital transition could be beneficial. A positive communication and awareness campaign is key to let citizens know about the tools and services available to them, but it should also be complemented with initiatives that integrate citizens' needs as users in the service design. As highlighted in section 3.1, some efforts in this direction are made by Cyprus with its user-friendly touch points for citizens and Estonia with the Bureaucrat Programme virtual assistant, however, more is needed especially as far as vulnerable groups are concerned.

- Cybersecurity and safety need to be underpinned by adequate skills and awareness**. Training on cybersecurity is lacking in most RRPs** concerning education, labour and PAs, jeopardising the security of their IT systems. We were able to identify few examples of countries designing measures to foster cybersecurity skills for enterprises, citizens and public administration. This is especially an issue for the field of public administration given that the public sector handles large volumes of sensitive information and is thus very exposed to cyberattacks. Therefore, more efforts to ensure that civil servants are able to respond promptly to this kind of threats should be encouraged.

- As technologies evolve fast, the inadequacy of **digital skills** becomes increasingly significant. While **basic training** in digital skills is often included in educational programmes, schools and training, **specialist digital skills in emerging technologies is often lacking**. As AI algorithms, blockchain, NLP and other tools are gradually becoming more pervasive in our lives, people need to update their skills fast, as well as the understanding of the opportunities and risks. This is also pivotal to fully take advantage of new technologies and new business models and boost the EU economic potential. Initiatives encouraging the development of a digital awareness and mindset for the continuous upskilling could be useful to this end, in order to make citizens and employees more open to embracing new technologies. An example of good practice can be found in Latvia's RRP, focusing on developing advanced digital skills already in higher education, which helps create a proactive and digitally aware mindset from a younger age. This way, digital skills and understanding on emerging technologies are not limited to ICT specialists, but are open to a wider population that could apply it in different fields.

- Only few countries plan initiatives to **balance the gap in digital opportunities faced by specific vulnerable groups and ensure equal access**. Groups from lower socio-economic conditions, immigrant origins, persons with disabilities, have more difficulties not only in accessing basic services, but also in developing digital skills, enabling digital business opportunities and so on. More structural reforms are crucial to ensure equality in living in the digital world. As described in section 6.4, a relevant best practice is Belgium's E-inclusion programme, which includes measure to help prison inmates develop digital skills and facilitate job placement. However, several vulnerable groups are at risk of being excluded from the digital transformation and tailored initiatives are necessary, also depending on each country's specific situation.

- Similarly, more structured reforms are needed to ensure **women's participation,** especially in STEM in order to reach a full gender balance, as per the Digital Decade objectives. Few countries have specifically planned initiatives to achieve this, notwithstanding the gender imbalance in STEM being still quite significant across Europe too. More actions should be planned from a younger age. A systematic initiative to ensure women's participation is made by Spain, but further initiatives are needed both at the educational level – to encourage women's access to STEM degrees and programmes – and in the labour market, to ensure a fair gender balance.

- The **demographic structure** of the population of the EU countries and its high share of people over 65, expected to increase markedly over the next years, is often overlooked. Since the EU population is ageing, in order to achieve a successful transition to a digitalised society, it would be useful to **design specific measures targeting older people to support the adoption of new digitalised systems**, especially regarding public services. Sections 3.1 and 6.4 investigate skills related to public administration and vulnerable groups, however no specific reference is made to older people. Initiatives could be directed towards granting them support in accessing digital public services, such as through specific hubs and contact points, or designing tailored digital skills courses, which would help address their learning needs more accurately and efficiently.
- Although some MSs envisage **multi-country projects** in their RPPs (for instance, in their AI initiatives), they appear as an exception. As the EU is committed to fostering digital technological progress and a single digital market, the RRF could be a powerful tool to reach these targets, especially in the R&D sphere, taking into account the limited funding of other initiatives (i.e., the Digital Europe Programme).
- **Cross-country initiatives** on emerging technologies require wider participation. Some countries are leaders **in specific technologies** (e.g., quantum computing) and facilitating cooperation with other EU MSs can increase knowledge exchange, attracting talent and facilitating innovation. Some measures, taken only at national level, without any coordination with other MSs, could easily free ride on other MSs within any significant benefit for Europe at large. In section 5.2, some key initiatives are described, such as the Netherland's plan to take the lead at European level on quantum technology and Germany's multi-country programme on big data.
- In this respect, the **AI European Strategy**, set in 2018 and targeting up to €20 bn per year in investments in the EU in the second half of the current decade, does not seem to have significantly benefited from the RRF. With few exceptions, the approach to AI was neither strategic nor adequate, with few specific investments and reforms. Most in that area are more generally related to digital transformation in the business sector or PAs, with few specifically targeted actions. Moreover, AI is a field where international collaboration is key if Europe intends to compete with the US and China. However, only few traces of this pivotal challenge can be found overall in the RRPs.
- Another project of supranational relevance for the digital transition of Europe which is not often mentioned in the RRPs regards **Gaia-X** and the **creation of a European cloud**. Representatives from business, politics and science from across Europe and around the globe are working together, to create a federated and secure data infrastructure. Encouraging investments in a European open and transparent cloud project would mean making an important step towards the digitalisation objectives.

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ANNEX

I. Methodological note

In the analysis provided by this paper, we have considered and compared the following sources:

- measures (reforms and investments) and relative expenditure as described by MSs in their RRPs;
- Commission Staff Working documents on the analysis of the recovery and resilience plans of the countries, accompanying the document "Proposal for Council Implementing Decision on the approval of the assessment of the recovery and resilience plan";
- 2022 European Semester: Country Reports;
- Information provided by think tanks, permanent representations and other entities;
- Data and figures from the Recovery and Resilience Scoreboard;
- References to the contribution of each measure to the digital objectives, i.e., considering the application of digital tagging.

II. RRP expenditure breakdown

Country	Measure	Area	Budget (m)
Austria	Connectivity	Connectivity	891.0 €
	Digital skills	Digital skills	171.0 €
	Digital public services	PA	160.0 €
Belgium	C1.2 Emerging energy technologies	AI and Industry 4.0	92.2 €
	C2.1 Cybersecurity	Cybersecurity	78.7 €
	C2.2 Public administration	PA	584.5 €
	C2.3 Optic fibre, 5G and new technologies	Connectivity	94.6 €
	C3.2 Modal shift	Digital skills	108.3 €
	C4.1 Education 2.0	Digital skills	360.9 €
	C4.2 Training and employment for vulnerable groups	Digital skills	92.4 €
	C5.1 Training and Labour market	Digital skills	93.1 €
	C5.2 Supporting economic activity	AI and Industry 4.0	50.1 €

Bulgaria	1b STEM centres and innovation in education – digitalization	Digital skills	121.7 €
	3 Provision of digital skills trainings and set-up of a platform for adult learning	Digital skills	164.7 €
	4 Youth centres	Digital skills	32.3 €
	7a Programme to accelerate economic recovery and transformation through research and innovation - digital objectives	AI and Industry 4.0	27.3 €
	8a Enhancing the innovation capacity of the Bulgarian Academy of Sciences – digital	AI and Industry 4.0	2.6 €
	8b Enhancing the innovation capacity of the Bulgarian Academy of Sciences - quantum platform	AI and Industry 4.0	0.5 €
	8e Enhancing the innovation capacity of the Bulgarian Academy of Sciences	AI and Industry 4.0	1.7 €
	11d Economic Transformation Programme — Fund 1 Growth and Innovation: Grant scheme for information and communication technology and cybersecurity in SMEs	Cybersecurity	15.7 €
	35 Digitisation of processes from farm to fork	AI and Industry 4.0	10.2 €
	37 Large-scale deployment of digital infrastructure	Connectivity	269.6 €
	39a Digital transformation of Bulgarian Post and delivery of complex services – digitalization	PA	34.8 €
	39c Digital transformation of Bulgarian Post and delivery of complex services – telemedicine	PA	3.6 €
	43a Digitalisation in railways transport and ERTMS — Kaspichan section – ERTMS	PA	44.8 €
	43b Digitalisation in railways transport and ERTMS — Kaspichan section – other digitalization	PA	60.5 €
	44a Railways rolling stock — ERTMS	PA	45.1 €
	45 European Train Control System on-board equipment	PA	32.2 €
	47a Road safety - traffic management	PA	1.1 €
	48a Sofia metro line 3 – ERTMS	PA	15.3 €
	49b Green Mobility — Pilot scheme to support sustainable urban mobility - integrated route systems	PA	3.7 €
	56 Digitalisation for integrated management, control and efficient use of water	PA	57.7 €
	59 Strengthening, further developing and building on the Unified Information System of Courts	PA	9.9 €
	60 Digitalisation of key litigation processes in administrative justice	PA	3.6 €

	61 Transformation of the information and communication infrastructure at the Public Prosecutor's Office	Cybersecurity	14.7 €
	62a Improving the quality and sustainability of the security services – digitalization	PA	24.6 €
	64 Supporting a pilot phase for the introduction of Building Information Modelling	PA	4.0 €
	65 Unified Information System for Spatial Planning, Investment Design and Building Authorisation	PA	1.8 €
	66 Digitising data in the administration containing paper registries	PA	48.6 €
	67 Spatial monitoring, control and management through upgrading the Aerospace Monitoring Centre	PA	56.6 €
	68 Upgraded strategic planning system	PA	0.7 €
	69a Ensuring an adequate information and administrative environment for the implementation of the recovery and resilience plan	PA	3.5 €
	85c Modernisation of the Social Assistance Agency - digital component	PA	1.5 €
	86b Modernisation of the Employment Agency - digital component	PA	11.8 €
	88 Digitisation of collections of museums, libraries, and archives	PA	30.4 €
	95 National digital platform for medical diagnostics	PA	12.1 €
	96 Improving the national emergency communication system	PA	23.9 €
	97c Development of outpatient care – Digitalisation	PA	0.6 €
Croatia	C1.1.1. R1-I1 Digitalisation of government and public administration services by business sector (G2B)	PA	4.6 €
	C1.1.1. R1-I2.b Continued administrative and fiscal burden relief, and a better regulatory environment	PA	1.1 €
	C1.1.1. R4-I2.c Financial instruments for micro, small and medium-sized enterprises – digital part	AI and Industry 4.0	23.2 €
	C1.1.1. R6-I1 Transforming and strengthening the competitiveness of cultural and creative industries	AI and Industry 4.0	33.2 €
	C1.1.1. R6-I2 Establishing media fact-check and public disclosure system	PA	6.6 €
	C1.1.2. R3-I1 Preparation of strategic documents for the digital transformation of the economy and artificial intelligence	AI and Industry 4.0	0.4 €
	C1.1.2. R3-I2 Digital vouchers	AI and Industry 4.0	10.0 €

	C1.1.2. R3-I3 Grant support for digitalization	AI and Industry 4.0	27.3 €
	C1.1.2. R4-I1 Support for Digital Innovation Hubs	AI and Industry 4.0	7.5 €
	C1.3. R1-I2.b Programme for the development of public water supply – digital part	AI and Industry 4.0	8.3 €
	C1.4. R1-I1 Electronic tolling system	PA	65.6 €
	C1.4. R1-I2 Improving the system of exercising the rights of persons with disabilities in the field of mobility	PA	2.0 €
	C1.4. R1-I3 National road transport electronic storage and data exchange system (NSCP)	PA	7.7 €
	C1.4. R1-I4 Reporting control system for road passenger and freight transport	PA	1.9 €
	C1.4. R1-I5 Monitoring of Transport of Dangerous Goods by Road (e-ADR)	PA	2.5 €
	C1.4. R2-I7 Upgrading of the IT and sales system and modernization of trains with the IT system	PA	6.4 €
	C1.4. R5-I2.a Research, development and production of new mobility vehicles and supporting infrastructure - infrastructure	PA	11.4 €
	C1.4. R5-I2.b Research, development and production of new mobility vehicles and supporting infrastructure – vehicles	PA	185.7 €
	C1.5. R2-I2 Agricultural Land Monitoring Programme	PA	1.7 €
	C1.5. R3-I1 Deployment of digital public services	PA	1.9 €
	C1.5. R3-I2 Smart Agriculture	AI and Industry 4.0	6.6 €
	C1.5. R3-I3 Traceability System	AI and Industry 4.0	1.7 €
	C1.5 R4 Improving food donation systems	AI and Industry 4.0	0.3 €
	C1.6. R1-I2.c. Strengthening the competitiveness of entrepreneurs and fostering the green and digital transition of the tourism sector – digital part	AI and Industry 4.0	8.3 €
	C2.1. R1-I1 Optimisation, Standardisation and Digitalisation of processes for strategic management and impact assessment of public policies	PA	1.2 €
	C2.2. R1-I2.a e-National Professional exam – infrastructure	PA	0.1 €
	C2.2. R1-I2.b e-National Professional exam – support services	PA	0.6 €

	C2.2. R2-I1.b Improving pay systems in state administration and public services, HRM and COP systems – digital part	PA	3.5 €
	C2.2. R2-I2.a Introduction of a model for hybrid access to the workplace – smartworking – non-digital part	AI and Industry 4.0	1.1 €
	C2.2. R2-I2.c. Introduction of a model for hybrid access to the workplace – smartworking – digital infrastructures	AI and Industry 4.0	8.2 €
	C2.2. R3-I1 Deployment of digital infrastructure and public administration services through the development of a conservation base system	PA	10.8 €
	C2.2. R3-I2.a Improve the digital infrastructure and public sector services by developing the national archives information system and strengthening the national archives network – digitalization	PA	5.3 €
	C2.2. R4-I1.b Further optimisation and decentralisation of JLP(R)S through support for functional blending – digital part	PA	0.9 €
	C2.3. R1 Digital Croatia strategy and strengthening inter-institutional cooperation and coordination for a successful digital transition of society and economy	PA	0.1 €
	C2.3. R2-I1 Establishment of a central interoperability system	PA	14.0 €
	C2.3. R2-I2 Establishing a central data light repository and business analytics system	PA	16.6 €
	C2.3. R3-I1 Upgrading the Shared Services Centre	PA	34.5 €
	C2.3. R3-I2 Strengthening the capacity of the police to tackle cybercrime	Cybersecurity	1.8 €
	C2.3. R3-I3 Establishing a one-stop shop for all e-public helpdesk services	PA	4.1 €
	C2.3. R3-I4 Consolidation of CEZIH health information infrastructure systems	PA	13.3 €
	C2.3. R3-I5 Digital Identity Card Deployment Project	PA	0.9 €
	C2.3. R3-I6 Investments in state information infrastructure networks	Connectivity	31.4 €
	C2.3. R3-I7 Improvement of spatial planning systems, construction and state assets through digitalization	Connectivity	23.9 €
	C2.3. R3-I8 Creation of a digital mobile platform	PA	4.3 €
	C2.3. R3-I9 Establishing a new platform for the Electronic Public Procurement Bulletin of the Republic of Croatia	PA	1.5 €
	C2.3. R3-I10 Digitalisation and computerisation of the CES (eHZZ)	PA	7.6 €
	C2.3. R3-I11 ICT support modernisation (eHZMO)	PA	17.1 €

	C2.3. R3-I12 Digitalisation of the HZMO archives (eArhiva)	PA	6.2 €
	C2.3. R3-I13 Digital transformation of the Tax Administration	PA	56.6 €
	C2.3. R3-I14 Implementation of the non-cash payment system in the economy through eInvoices with integrated e-archives and active tax accounting	AI and Industry 4.0	14.2 €
	C2.3. R3-I15 Putting in place tourism applicative solutions with the aim of administratively relieving entrepreneurs and transforming the tourism model towards sustainability	AI and Industry 4.0	5.3 €
	C2.3. R3-I16 Digitalisation of processes in sport and recreation at local and regional level	PA	1.5 €
	C2.3. R4 Enhancing connectivity as a cornerstone of the digital transition of society and economy	Connectivity	0.4 €
	C2.3. R4-I1 Implementation of projects under the National Framework Programme for the Development of Broadband Infrastructure in areas where there is no sufficient commercial interest in investment	Connectivity	106.2 €
	C2.3. R4-I2 Construction of passive electronic communications infrastructure	Connectivity	19.6 €
	C2.4. R5 Optimisation of State-owned property management	PA	0.3 €
	C2.5. R1-I1 Enhancing the Court Case Management System (efile)	PA	2.9 €
	C2.5. R1-I2 Improvement of land register information system and cadastre	PA	3.1 €
	C2.5. R1-I3 Development of a tool for the publication and search of court decisions	PA	0.2 €
	C2.5. R1-I6 A stable and resilient IT infrastructure for the Justice Information System	PA	16.0 €
	C2.6. R1-I2 Digitalisation of the Ethics System of Civil Servants	PA	0.3 €
	C2.6. R1-I3 Advancing the existing asset declarations system of state officials	PA	0.1 €
	C.2.6. R1-I4.a Supporting efficiency in the fight against corruption and organised crime – digital investments	PA	1.3 €
	C3.1. R2-I1 Digital transformation of higher education	Digital skills	84.0 €
	C3.2. R1-I1.b Development of a system of programming agreements to finance universities and research institutes focused on innovation, research and development – digital part	AI and Industry 4.0	5.9 €
	C3.2. R1-I2.a Strengthening institutional capacity of universities and research institutes for innovation – digital investments	AI and Industry 4.0	4.4 €
	C3.2. R2-I1.a Developing an enabling model for researchers' career progression and conducting cutting-edge scientific research in STEM and ICT fields – granting of scholarships	AI and Industry 4.0	12.1 €

	C3.2. R2-I1.d Developing an enabling model for researchers' career progression and conducting cutting-edge scientific research in STEM and ICT fields – Research support digital	AI and Industry 4.0	3.1 €
	C3.2. R2-I1.e Developing an enabling model for researchers' career progression and conducting cutting-edge scientific research in STEM and ICT fields – support for start-ups	AI and Industry 4.0	7.4 €
	C3.2. R2-I2.a Investing in research – technology infrastructure in STEM and ICT fields – digital equipment	AI and Industry 4.0	15.0 €
	C3.2. R2-I2.b Investing in research – technology infrastructure in STEM and ICT fields – digital research	AI and Industry 4.0	15.0 €
	C3.2. R3-I1.d Introducing a more functional R & D & I project funding programming framework – spin-offs in digital field	AI and Industry 4.0	19.2 €
	C3.2. R3-I1.e Introducing a more functional R & D & I project funding programming framework – digital research cooperation	AI and Industry 4.0	19.2 €
	C4.1. R1a Develop and implement new targeted active employment policy measures for the green and digital transitions of the labour market – green jobs	Digital skills	102.2 €
	C4.1. R1b Develop and implement new targeted active employment policy measures for the green and digital transitions of the labour market – digital jobs	Digital skills	43.8 €
	C4.1. R3b Setting up a voucher system for the education of employed and unemployed people – digital jobs	Digital skills	- €
	C4.1. R3-I1.b Implementation of vouchers for the education of employed and unemployed persons – digital jobs	Digital skills	11.9 €
	C4.3. R1-I1 Enhancing the digitalisation of social benefit systems between national and local levels	Digital skills	0.1 €
	C4.3. R1-I2 Development of a web application on the possibility to receive social benefits at national level	PA	0.4 €
	C4.3. R3-I2 Enhancing the digitalisation of welfare systems and connecting welfare centres and social service providers	PA	0.5 €
	C4.3. R3-I3 Enhancing the digitalisation of welfare systems and implementing systems for the methodology for calculating prices for social services	PA	0.7 €
	C5.1. R1-I4 Digital image diagnostics KBC Split	PA	2.7 €
	C5.1. R1-I6 Digital image diagnostics KB Dubrava	PA	5.3 €
	C5.1. R2-I2 Purchase and implementation of equipment for the establishment of the National Oncological Network and National Oncological Database	PA	10.6 €

	C5.1. R4-I3 Digitising the pathway through health institutions at secondary and tertiary levels of healthcare	PA	2.5 €
	C5.1. R4-I4 Developing a system for monitoring and preventing shortages of medicinal products in Croatia	PA	1.4 €
	C5.1. R4-I5 Introduction of a treatment outcome monitoring system for non-hospital patients with a focus on chronic patients in public pharmacies	PA	0.6 €
	C5.1. R5-I1 Digital integration of operating halls and robotic surgery in KBC Split	PA	8.0 €
	C5.1. R5-I2 TELECORDIS	PA	0.6 €
	C5.1. R5-I3 Teletransfusion	PA	1.6 €
	C5.1. R5-I4 Digitalisation and integration of operating rooms equipped with robotic surgery in KBC Sestre milosrdnica	PA	7.6 €
	C5.1. R5-I5 Digitalisation and equipping of KB Merkur diagnostic units	PA	3.2 €
	C6.1 R3a – digital part Efficiency gains, reduction of administrative burden and digitalisation of the renovation process	PA	2.0 €
	C6.1 R4 Modernisation and integration of seismic data for the renovation process and planning of future construction and monitoring of public infrastructure	PA	0.7 €
	C6.1 R4-I1a Seismological data network development – digital part	PA	8.7 €
	C6.1 R6 Pilot project for the establishment and implementation of systematic energy management and the development of a new financing model	PA	1.6 €
Czechia	1.1 Digital services for citizens and businesses	PA	112.2 €
	1.2 Digital government systems	PA	277.1 €
	1.3 Digital high-capacity networks	Connectivity	227.3 €
	1.4 Digital economy and society, innovative start-ups and new technologies	AI and Industry 4.0	215.7 €
	1.5 Digital transformation of enterprises	AI and Industry 4.0	196.4 €
	1.6 Acceleration and digitalization of Building permit process	PA	56.8 €
	3.1 Innovation in Education in the Context of Digitalisation	Digital skills	190.8 €
	3.3 Modernisation of employment services and labour market development	Digital skills	179.1 €
	4.5 Developing the cultural and creative sectors	AI and Industry 4.0	40.2 €

	5.2 Support for research and development in companies and the introduction of innovations into business practice	AI and Industry 4.0	23.6 €
Cyprus	1.1 Resilient and effective health system, enhanced civil protection	PA	15.0 €
	2.1 Climate neutrality, energy efficiency and renewable energy penetration	PA	17.0 €
	2.2 Sustainable transport	PA	4.0 €
	2.3 Smart and sustainable water management	PA	23.0 €
	3.1 New growth model and diversification of the economy	AI and Industry 4.0	2.0 €
	3.2 Enhanced research and innovation	AI and Industry 4.0	- €
	3.3 Business support for competitiveness	AI and Industry 4.0	17.0 €
	3.4 Modernising public and local authorities, making justice more efficient and fighting corruption	PA	54.0 €
	3.5 Safeguarding fiscal and financial stability	PA	28.0 €
	4.1 Upgrade infrastructure for connectivity	Connectivity	53.0 €
	4.2 Promote e-government	PA	35.0 €
	5.1 Educational system moderation, upskilling and retraining	Digital skills	24.0 €
	5.2 Labour market, social protection, social welfare and inclusion	Digital skills	10.0 €
Denmark	1.2 Digital solutions in the health care sector	PA	2.0 €
	4.1.2 Investment window – digital share	AI and Industry 4.0	163.0 €
	4.2.2 Accelerated depreciation – digital share	AI and Industry 4.0	69.0 €
	6.1 Digital strategy	AI and Industry 4.0	67.0 €
	6.2 Broadband pool	Connectivity	13.0 €
	6.3 SME's digital transition and export	AI and Industry 4.0	9.0 €
	7.1.2 Incentives to boost R&D in companies – digital share	AI and Industry 4.0	59.0 €
Estonia	Digital transformation of enterprises	AI and Industry 4.0	86.3 €
	Digital State	PA	121.7 €

Finland	P2C1 Digital infrastructure	Connectivity	135.0 €
	P2C2 Accelerating the data economy and digitalization	AI and Industry 4.0	62.0 €
	P2C3 Digital security	Cybersecurity	29.8 €
	P3C1 Employment and labour market	Digital skills	170.0 €
	P3C2 Raising the competence level and reform of continuous learning	Digital skills	107.4 €
	P3C4 Strengthening competitiveness and boosting growth in crisis-impacted sectors	AI and Industry 4.0	94.0 €
	P4C1 Improving the availability of social welfare and health care services and increasing cost-effectiveness	PA	404.8 €
France	C6.I1 Preservation of employment in private R&D digital part (40%)	Digital skills	48.0 €
	C6.I2 Innovating for the resilience of our business models (PIA4): Cultural and creative industries	AI and Industry 4.0	300.0 €
	C6.I2 Innovating for the resilience of our business models (PIA4) 5G and future telecommunications technology	Connectivity	300.0 €
	C6.I2 Innovating for the resilience of our business models (PIA4) Cloud Acceleration Strategy	AI and Industry 4.0	300.0 €
	C6.I2 Innovating for the resilience of our business models (PIA4) Quantum technologies	AI and Industry 4.0	350.0 €
	C6.I2 Innovating for the resilience of our business models (PIA4)_Cybersecurity	Cybersecurity	200.0 €
	C6.I2 Innovating for the resilience of our business models (PIA4) Education and digital	Digital skills	350.0 €
	C6.I3 Supporting innovative businesses (PIA4) (digital-related part – 30%)	AI and Industry 4.0	68.0 €
	C7.I1 Digitisation of companies	AI and Industry 4.0	385.0 €
	C7.I2 Digital upgrade of the State and territories	PA	500.0 €
	C7.I3 Cybersecurity of State services	Cybersecurity	136.0 €
	C7.I4 State digital upgrade: digital identity	PA	30.3 €
	C7.I5 Equipment and infrastructure of the Ministry of the Interior	PA	22.7 €
	C7.I6 Ministry of the Interior's applications	PA	76.7 €
	C7.I7 Mobility and teleworking at the Ministry of the Interior	PA	46.5 €
	C7.I9 Educational continuity: digital transformation of the school	Digital skills	131.0 €

	C7.I10 Developing access to higher education throughout the country thanks to digital	Digital skills	35.0 €
	C7.I11 Support for cultural sectors and heritage renovations. Modernisation plan for cultural higher education establishments (digital part)	Digital skills	5.6 €
	C8.I1 FNE-Training digital part (20%)	Digital skills	160.0 €
	C8.I2 Reskilling through dual training programmes (Pro-A) digital part (40%)	Digital skills	108.0 €
	C8.I11 Creation of places in higher education	Digital skills	72.0 €
	C8.I12 Plan for youth: higher education for post-baccalaureate students	Digital skills	30.4 €
	C8.I13 "Personalised guidance towards employment and autonomy" (PACEA) and youth guarantee	Digital skills	93.2 €
	C8.I17 Distance training courses (PIC)	Digital skills	2.0 €
	C8.I18 Digital educational content: platforms for digital content	Digital skills	8.0 €
	C8.I20 Top-up of individual learning accounts for digital skills	Digital skills	2.4 €
	C8.I21 Increase of resources for France Compétences (digital-related part – 40%)	Digital skills	300.0 €
	C9.I1 Digital health	PA	2,000.0 €
	C9.I5 High-speed broadband plan ("France Très Haut Débit")	Connectivity	240.0 €
	C9.I6 Digital Inclusion	Digital skills	250.0 €
	C9.I7 R&D recovery strategy (National Research Agency) (digital part – 40%)	AI and Industry 4.0	171.2 €
	C9.I8 Support teaching, research, development and innovation ecosystems (PIA4) (digital-related part – 25%)	Digital skills	187.5 €
Germany	2.1 Data as the raw material of the future	AI and Industry 4.0	2,684.0 €
	2.2 Digitalisation of the economy	AI and Industry 4.0	2,664.0 €
	3.1 Digitalisation of education	Digital skills	1,206.0 €
	4.1 Strengthening social inclusion	Digital skills	319.0 €
	5.1 Strengthening a pandemic-resilient healthcare system	PA	3,684.0 €
	6.1 Modern public administration	PA	2,920.0 €
Greece	16823 Cybersecurity strategy and policies for the Public Sector & advanced security services for national critical infrastructures[1]	Cybersecurity	5.0 €

	2.1. Connect	Connectivity	521.6 €
	2.2. Modernise	PA	1,280.6 €
	2.3. Digitalisation of businesses	AI and Industry 4.0	375.0 €
	3.1. Promote job creation and participation in the labour market	Digital skills	93.8 €
	3.2. Education, vocational education and training, and skills	Digital skills	1,055.0 €
	3.3. Improve resilience, accessibility and sustainability of healthcare	PA	277.6 €
	3.4. Increase access to effective and inclusive social policies	PA	54.0 €
	4.1. Making taxes more growth friendly and improving tax administration and tax collection	PA	185.1 €
	4.2. Modernise the public administration, including through speeding up the implementation of public investments, improving the public procurement framework, capacity building measures and fighting corruption	PA	108.2 €
	4.3. Improve the efficiency of the justice system	PA	113.0 €
	4.4. Strengthen the financial sector and capital markets	AI and Industry 4.0	12.2 €
	4.5. Promote research and innovation	AI and Industry 4.0	50.0 €
	4.6. Modernise and improve resilience of key economic sectors	AI and Industry 4.0	420.8 €
	4.7. Improve competitiveness and promote private investments and trade	AI and Industry 4.0	2,547.0 €
Hungary	Digital skills	Digital skills	689.0 €
	Digital public services	PA	45.0 €
Ireland	1.5 – 2 Investment: 1.5 National grand challenge programme – digital	AI and Industry 4.0	21.0 €
	2.1 Investment: 2.1 Development of a shared Government data centre	PA	39.0 €
	2.2 Investment: 2.2 Programme to drive the digital transformation of enterprise in Ireland	AI and Industry 4.0	85.0 €
	2.3 Investment: 2.3 Programme to provide digital infrastructure and funding to schools	Digital skills	64.0 €
	2.4 Investment: 2.4 Provision of an online response option for the census of population	PA	10.0 €
	2.5 Investment: 2.5 Using 5G technologies to drive a greener more innovative Ireland	Connectivity	19.0 €

	2.6 Investment: 2.6 Suite of eHealth projects	PA	75.0 €
Italy	M1C1. Digitalisation, innovation and security in the PA[2]	PA	7,050.0 €
	M1C1-I1.5-11 Cybersecurity	Cybersecurity	623.0 €
	M1C2. Digitalisation, innovation and competitiveness of the production system[3]	AI and Industry 4.0	13,685.0 €
	M1C2 I3.1 Fast internet connections (Ultra-broadband and 5G)	Connectivity	6,710.0 €
	M1C3. Tourism and culture 4.0	AI and Industry 4.0	830.0 €
	M2C1. Circular economy and sustainable agriculture	AI and Industry 4.0	446.0 €
	M4C1. Strengthening the provision of education services: from crèches to universities	Digital skills	3,573.0 €
	M4C2. From research to business	AI and Industry 4.0	3,910.0 €
	M5C1. Employment policies	Digital skills	2,420.0 €
	M5C2. Social infrastructure, households, the community and the third sector	PA	275.0 €
	M6C1. Local networks, facilities and telemedicine for local health care	PA	1,280.0 €
	M6C2. Innovation, research and digitalisation of the national health service	PA	3,123.0 €
Lithuania	1 – Improving the quality and accessibility of services and promoting innovation - Establishment of the Competency Platform IS	Digital skills	1.3 €
	1 – Improving the quality and accessibility of services and promoting innovation - Measurement framework	Digital skills	2.5 €
	1 – Improving the quality and accessibility of services and promoting innovation - Developing the digitalisation of the health sector	PA	85.7 €
	2 – More sustainably produced electricity in the country – Installation of other electricity storage infrastructure	Connectivity	40.0 €
	3 – Prerequisites for innovative technological solutions in business and daily life – Developing and deploying digital innovation	AI and Industry 4.0	15.0 €
	3 – Prerequisites for innovative technological solutions in business and daily life – Development and deployment of ESA and AI solutions	AI and Industry 4.0	3.0 €
	3 – Prerequisites for innovative technological solutions in business and daily life – Digitisation of cultural resources	AI and Industry 4.0	30.0 €

	3 – Prerequisites for innovative technological solutions in business and daily life – Digitisation of educational content and resources	Digital skills	20.0 €
	3 – Ensuring the effectiveness of data management and open data – Development of a data management model and data transfer to the national data lake	PA	30.0 €
	3 – Ensuring the effectiveness of data management and open data – Creation of Euroconnector	PA	0.5 €
	3 – Client oriented services – Implementation and monitoring of the projects	PA	115.3 €
	3 – Client oriented services – Developing ICT tools for more efficient communication of persons with disabilities	PA	2.0 €
	3 – Transformation of public information technology governance – Development of ICT infrastructure	PA	95.0 €
	3 – Transformation of public information technology governance – Ensuring cybersecurity requirements	PA	15.0 €
	3 – Step towards 5G – Delivering on Connectivity Innovation	Connectivity	24.5 €
	3 – Step towards 5G – Infrastructure	Connectivity	49.0 €
	4 – Competences for the green and digital transformation are acquired in vocational education and training – Updating the content of vocational education and training (formal and informal programmes)	Digital skills	2.0 €
	4 – Competences for the green and digital transformation are acquired in vocational education and training – Apprenticeship	Digital skills	8.0 €
	4 – Competences for the green and digital transformation are acquired in vocational education and training – National mobility programme	Digital skills	2.4 €
	4 – Competences for the green and digital transformation are acquired in vocational education and training – Acquiring a profession in BU schools	Digital skills	2.4 €
	4 – Access to the development of competences and recognition of qualifications for adults – LAG IT system	Digital skills	2.0 €
	4 – Access to the development of competences and recognition of qualifications for adults – Developing LAG competences	Digital skills	16.2 €
	4 – Modern general education as a basis for acquiring basic competences – Digital education	Digital skills	9.8 €
	6 – Improving tax compliance – Training of municipal staff	PA	0.1 €
	6 – Improving tax compliance – Building ID information system	PA	1.3 €
	6 – Development of the electronic document ecosystem	PA	3,843.0 €

	6 – Smart tax administration to reduce the VAT gap faster	PA	5.1 €
	6 – Smart tax administration to reduce the VAT gap faster	PA	5.0 €
	6 – Smart tax administration to reduce the VAT gap faster	PA	0.6 €
	6 – Smart tax administration to reduce the VAT gap faster – Competency Model (STI)	PA	0.4 €
	6 – Efficient public sector – Human resources management system in the public sector	PA	6.0 €
	6 – Tools available to business to manage insolvency risk	PA	3.2 €
	6 – A single window to pay fines	PA	5.0 €
	7 – Client-centred employment support: Increasing the scope and diversity of employment support measures, contributing to the objectives of digital and green transformation and promoting the circular economy – Measures to promote entrepreneurship (digitisation)	AI and Industry 4.0	13.0 €
	7 – Client-centred employment support: Increasing the scope and diversity of employment support measures, contributing to the objectives of digital and green transformation and promoting the circular economy – Digital skills	Digital skills	462.0 €
	7 – Client-centred employment support: Increasing the scope and diversity of employment support measures, contributing to the objectives of digital and green transformation and promoting the circular economy – Employment platform	Digital skills	7.1 €
Latvia	2.1.1.1i. Administration modernisation and digital transformation of services, including business environment	AI and Industry 4.0	24.4 €
	2.1.2.1i. Centralised governance platforms and systems	PA	70.1 €
	2.1.2.2i. National Federal Cloud of Latvia	PA	12.4 €
	2.1.3.1.i. Data availability, sharing and analysis	PA	21.7 €
	2.2.1.1i. Support for the establishment of Digital Innovation Hubs and Regional Contact Points	AI and Industry 4.0	10.0 €
	2.2.1.2i. Support for the digitisation of processes in commercial activities	AI and Industry 4.0	40.0 €
	2.2.1.3i. Aid for business introduction of new products and services	AI and Industry 4.0	24.3 €
	2.2.1.4i. Financial instruments to facilitate the digital transformation of economic operators	AI and Industry 4.0	45.1 €
	2.2.1.5i. Fostering the digital transformation of media companies	AI and Industry 4.0	5.7 €
	2.3.1.1.i. Delivering high-level digital skills	Digital skills	17.0 €

	2.3.1.2.i. Development of key digital skills of enterprises	Digital skills	20.0 €
	2.3.1.3.i. Development of a self-accompanied training approach for ICT specialists	Digital skills	7.6 €
	2.3.1.4.i. Development of the approach to individual learning accounts	Digital skills	14.3 €
	2.3.2.1 Digital skills for citizens, including young people	Digital skills	12.6 €
	2.3.2.2.i. Development of state and local government digital transformation skills and capabilities	Digital skills	8.2 €
	2.3.2.3i. Closing the digital divide for socially vulnerable students and educational institutions	Digital skills	15.0 €
	2.4.1.1.i. Construction of the Passive Infrastructure on the Via Baltica Corridor for 5G coverage	Connectivity	12.5 €
	2.4.1.2i. Broadband or very high-capacity network "last mile" infrastructure development	Connectivity	4.0 €
	3.1.2.5.i. Participation in the labour market of unemployed, job-seekers and people at risk of unemployment	Digital skills	11.4 €
	6.1.1.1.i. Modernisation of existing analytical solutions	PA	2.1 €
	6.1.1.2.i. Development of new analytical systems	PA	1.8 €
	6.1.2.1.i. Linking railway x-ray equipment to Baxe and use of artificial intelligence for rail freight scanning image analysis	AI and Industry 4.0	3.0 €
Luxembourg	1A. Skilling, reskilling and upskilling	Digital skills	5.6 €
	1B. Strengthening Health System Resilience	PA	1.2 €
	3A. Promotion of a data-driven economy	AI and Industry 4.0	10.0 €
	3B. Modernisation of public administration	PA	12.7 €
Malta	C3.I.1 (a) Strengthening the resilience, security and efficiency of the government digital backbone and investing in appropriate digital solutions, devices and tools that will enable Government to provide proactive action, secure services and streamlined operations to citizens and the business sector - capital costs sub-measure	PA	14.1 €
	C3.I.1 (b) Strengthening the resilience, security and efficiency of the government digital backbone and investing in appropriate digital solutions, devices and tools that will enable Government to provide proactive action, secure services and streamlined operations to citizens and the business sector - training sub-measure	PA	2.6 €
	C3.I.2 The digitalisation of the Merchant Shipping Directorate within Transport Malta, thus providing a more efficient regulatory service to operators	PA	5.9 €

	C3.I.3 Further digitalisation and modernisation of the public administration, including public and intra-facing services, through several solutions to improve the front-end customer experience, data sharing and reuse, virtual desktops, property transfer processes, National Single Window for customs and digital tools for remote-working solutions	PA	17.7 €
	C3.I.4 Rolling out measures to intensify the digitalisation of the private sector	AI and Industry 4.0	15.0 €
	C.4.I.2 Enhancing the resilience of the health system through digitalisation and new technologies	AI and Industry 4.0	15.5 €
	C6.I.1 Digitalisation in the justice system	PA	10.0 €
Netherlands	P2.1I1 Quantum Delta NL	AI and Industry 4.0	263.9 €
	P2.1I2 AiNed and applied AI learning communities	AI and Industry 4.0	59.9 €
	P2.1I3 Digital education impulse	Digital skills	209.4 €
	P2.1I4 Digital Infrastructure Logistics (DIL)	AI and Industry 4.0	36.2 €
	P2.2I1 European Rail Traffic Management System (ERTMS)	AI and Industry 4.0	149.0 €
	P2.2I2 Safe, smart and sustainable Mobility	PA	55.3 €
	P2.2I3 Intelligent Roadside Stations (IWKS)	PA	128.9 €
	P2.3I1 Groundbreaking IT (GrIT)	AI and Industry 4.0	94.1 €
	P2.3I2 Digitalisation of the criminal justice chains	PA	75.2 €
	P4.2I1 National education lab AI	AI and Industry 4.0	36.0 €
	P4.2I5 Laptops and tablets for online and hybrid education to combat and mitigate learning losses	Digital skills	24.0 €
	P5.1I3 Set COVID-19	PA	50.0 €
	P5.1I4Health Research Infrastructure (HRI)	PA	22.0 €
Poland	A1.2.1 Investments for enterprises in products, services and competences of employees and staff related to the diversification of activities (AI and Industry 4.0)[4]	AI and Industry 4.0	100.0 €
	A1.2.1 Investments for enterprises in products, services and competences of employees and staff related to the diversification of activities (Digital skills)[5]	Digital skills	100.0 €
	A1.4.1.2 Agriculture 4.0	AI and Industry 4.0	168.0 €

	A2.1.1 Investments supporting robotisation and digitalisation in enterprises	AI and Industry 4.0	450.0 €
	A2.3.1 Development and equipment of competence centres (specialist training centres, implementation support centres, observatories) and unmanned vehicle industry management infrastructure, as an ecosystem of innovation (AI and Industry 4.0)[6]	AI and Industry 4.0	82.0 €
	A2.3.1 Development and equipment of competence centres (specialist training centres, implementation support centres, observatories) and unmanned vehicle industry management infrastructure, as an ecosystem of innovation (Digital skills)[7]	Digital skills	82.0 €
	A4.4.1 Investments related to equipping workers/companies to work remotely	AI and Industry 4.0	44.0 €
	B2.2.1 Development of transmission networks, smart electricity infrastructure	Connectivity	120.0 €
	C1.1.1 Providing access to very fast internet in the areas of white spots	Connectivity	1.2 €
	C1.2.1 Strengthening the potential of commercial investments in modern electronic communication networks	AI and Industry 4.0	1.4 €
	C2.1.1 Public e-services, IT solutions improving the functioning of administrations and economic sectors, and breakthrough technologies in the public sector, the economy and society	PA	420.0 €
	C2.1.2 Level playing field for schools with mobile multimedia devices – investments related to the fulfilment of minimum equipment standards	Digital skills	550.0 €
	C2.1.3 E-competences	Digital skills	184.0 €
	C2.2.1.1 LAN connection, STEM laboratories – digital part, AI laboratories, examination commissions	Digital skills	621.0 €
	C3.1.1.1 Cyber security – CyberPL	Cybersecurity	193.0 €
	C3.1.1.2 Infrastructure for data processing and delivery of digital services	PA	185.0 €
	C3.1.1.3 Optimization of the infrastructure of law enforcement services	PA	54.0 €
	C3.1.1.4 IPCEI on Next Generation Cloud	PA	11.0 €
	D1.1.2 Accelerating the digital transformation of healthcare by further developing digital healthcare services	PA	1.0 €
Portugal	C1 National Health Service	PA	351.0 €
	C5 Investment and Innovation	AI and Industry 4.0	54.0 €
	C6 Qualifications and Skills	Digital skills	666.0 €
	C7 Infrastructure	Connectivity	26.0 €

	C17 Quality and Sustainability of Public Finances	PA	406.0 €
	C18 Economic Justice and Business Environment	PA	267.0 €
	C19 Digital Public Administration	PA	502.0 €
	C20 Digital School	Digital skills	559.0 €
Romania	C7.R.1 Developing and implementing a unitary framework for defining the architecture of a government cloud system	PA	11.9 €
	C7.I.1 Deployment of the Government Cloud Infrastructure	PA	374.7 €
	C7.I.2 Cloud development and migration	PA	187.1 €
	C7.I.3 Development of eHealth and telemedicine system	PA	400.0 €
	C7.I.4 Digitalisation of the judiciary	PA	127.3 €
	C7.I.5 Digitalisation in the field of the environment	PA	52.0 €
	C7.I.6 Digitalisation in employment and social protection	PA	85.0 €
	C7.I.7 Implementation of the eForms electronic forms in public procurement	PA	0.9 €
	C7.I.8 Qualified electronic identity card and digital signature	PA	200.0 €
	C7.I.9 Digitalisation of the non-governmental organisations sector	PA	10.3 €
	C7.I.10 Digital transformation in civil service management	PA	10.0 €
	C7.I.11 Implementation of a scheme to support the use of communication services through different types of instruments for beneficiaries, with a focus on white areas	PA	94.0 €
	C7.I.12 Ensuring cybersecurity protection for both public and private IT & C infrastructures, with critical value for national security, using smart technologies	Connectivity	100.0 €
	C7.I.13 Development of security systems for the protection of the government spectrum	PA	28.9 €
	C7.I.14 Increase of the resilience and cybersecurity of Internet Service Provider infrastructure services provided to public authorities in Romania	Cybersecurity	18.4 €
	C7.I.15 Creation of new cybersecurity skills for the society and the economy	Cybersecurity	25.0 €
	C7.I.16 Advanced digital skills training programme for civil servants	Digital skills	20.0 €
	C7.I.17 Funding schemes for libraries to become digital skills hubs	Digital skills	21.0 €
	C7.I.18 Digital transformation and Robotic Process Automation in public administration	PA	14.7 €

	C7.I.19 Schemes to upskill/reskill employees in firms	Digital skills	36.0 €
	C8.I.1 Facilitating taxpayers' compliance through the development of digital services	PA	4.2 €
	C8.I.2 Improving tax and tax administration processes, including through the implementation of integrated risk management	PA	196.4 €
	C8.I.3 Ensuring the capacity to respond to current and future information challenges, including in the context of the pandemic, through the digital transformation of Ministry of Finance / National Agency for Fiscal Administration	PA	78.5 €
	C8.I.4 Implementation of electronic customs	PA	28.1 €
	C8.I.5 Improving the budgetary programming mechanism	PA	3.6 €
	C8.I.5 Improving the budgetary programming mechanism	PA	0. €
	C8.I.6 Economic modelling instrument (Pension Reform Options Simulation Toolkit) to improve institutional capacity to forecast pension expenditures	PA	0.4 €
	C8.I.7 Technical support for the revision of the taxation framework	PA	3.0 €
	C8.I.8 Operationalisation of the National Development Bank	PA	9.0 €
	C8.I.9 Supporting the process of assessing pension files	PA	1.3 €
	C8.I.10 Operational efficiency and advanced e-services through digitalisation of the pension system	PA	61.9 €
	C9.I.1 Digital platforms on legislative transparency, de-bureaucratisation and procedural simplification for business	PA	14.0 €
	C9.I.2 Financial instruments for the private sector_ digitising SMEs	AI and Industry 4.0	50.0 €
	C9.I.3 Private sector aid schemes _digitising SMEs	AI and Industry 4.0	315.0 €
	C9.I.3 Private sector aid schemes_IT services and applications for digital skills and digital inclusion	Digital skills	35.0 €
	C9.I.3 Private sector aid schemes _Investments in advanced technologies	AI and Industry 4.0	130.0 €
	C9.I.3 Private sector aid schemes _Development and employment of cybersecurity technologies	Cybersecurity	20.0 €
	C9.I.4 Cross-border and multi-country projects — Low Power Processors and Semiconductor Chips	AI and Industry 4.0	500.0 €
	C11.I.6 Development of a digital system for cultural funding processes	AI and Industry 4.0	3.8 €
	C11.I.7 Accelerating the digitalisation of film production and distribution	AI and Industry 4.0	5.5 €

	C12.I.2 Development of public hospital infrastructure — equipment and facilities, new-born ATI, reduction of the risk of hospital infections — part of telemedicine	PA	70.0 €
	C14.R.1 Enhancing the predictability and efficiency of decision-making processes by strengthening the capacity for policy coordination and impact analysis at the level of the government and coordinating ministries, as well as by strengthening the tools to increase the quality of public consultations at all levels of the administration.	PA	2.8 €
	C14.R.2 Strengthening coordination at the centre of government through an integrated and coherent approach to climate change and sustainable development initiatives	PA	5.2 €
	C14.R.3 Developing performance human resources management in the public sector	PA	5.0 €
	C14.R.9 Improve the procedural framework for the implementation of corporate governance principles in state-owned enterprises	PA	1.5 €
	C14.I.5 Monitoring and implementation of the plan	PA	12.8 €
	C15.I.2 Setting up, equipping and operationalising 412 complementary services for disadvantaged groups — digitalisation part	PA	4.4 €
	C15.I.4 Supporting educational establishments with high risk of drop-outs — part of digitalization	Digital skills	100.0 €
	C15.I.6 Development of 10 regional consortia and development and equipping of 10 vocational campuses — IT services and applications for digital skills	Digital skills	33.8 €
	C15.I.7 Transformation of agricultural high schools into professionalisation centres —digitalization	Digital skills	3.9 €
	C15.I.8 In-service training programme for teaching staff	Digital skills	80.0 €
	C15.I.9 Ensuring digital technology equipment and resources for schools	Digital skills	478.5 €
	C15.I.11 Provision of facilities for pre-university classrooms and school laboratories/workshops — part of digital laboratories	Digital skills	60.0 €
	C15.I.13 Equipping of IT laboratories in vocational education and training (VET) schools	Digital skills	16.4 €
	C15.I.14 Equipping of practice workshops in VET schools — digitisation part	Digital skills	30.0 €
	C15.I.15 Online School: Assessment platform and content development	Digital skills	78.6 €
	C15.I.16 Digitisation of universities and their preparation for the digital professions of the future — National Board of Rectors	Digital skills	10.0 €

	C15.I.16 Digitisation of universities and their preparation for the digital professions of the future — universities	Digital skills	234.0 €
Slovakia	C3 Sustainable transport	PA	145.0 €
	C7 Education for the 21st century	Digital skills	229.0 €
	C8 Improving the performance of Slovak universities	Digital skills	7.0 €
	C9 More efficient governance and strengthening funding for science, research and innovation	AI and Industry 4.0	156.0 €
	C11 Modern and accessible healthcare	PA	41.0 €
	C12 Human, modern and accessible mental health care	PA	2.0 €
	C14 Improve the business environment	AI and Industry 4.0	6.0 €
	C15 Judicial reform	PA	36.0 €
	C16 Fight against corruption and money laundering, security and protection of the population	PA	73.0 €
	C17 Digital Slovakia (state in the mobile, cybersecurity, fast internet for everyone, digital economy)	Connectivity	615.0 €
Slovenia	C2 K1: Digital transformation of the economy	AI and Industry 4.0	56.5 €
	C2 K2: Digital transformation of the public sector and public administration	PA	258.9 €
	C3 K1: RDI – research, development and innovation	AI and Industry 4.0	10.0 €
	C3 K4: Restructuring of Slovenian tourism and investment in infrastructure in the field of tourism and cultural heritage	AI and Industry 4.0	1.0 €
	C3 K5: Strengthening competences, in particular digital competences and those required by the professions of the future and the green transition	Digital skills	60.4 €
	C4 K1: Health	PA	83.0 €
Spain	15. Digital connectivity	Connectivity	3,999.0 €
	13. Support to SMEs	AI and Industry 4.0	3,680.0 €
	19. Digital skills	Digital skills	3,593.0 €
	11. Public administration	PA	3,165.0 €
	12. Industrial policy	AI and Industry 4.0	952.0 €

	22. Care economy, equality and inclusion	AI and Industry 4.0	501.0 €
	16. Artificial Intelligence	AI and Industry 4.0	500.0 €
	23. Labour market	Digital skills	222.0 €
	20. Vocational training	Digital skills	194.0 €
	21. Education	Digital skills	147.0 €
	18. Reform of health system	PA	100.0 €
Sweden	1.3 Energy efficiency in apartment buildings	Connectivity	23.9 €
	2.3 More study places in higher vocational education	Digital skills	41.7 €
	2.4 Resources to meet demands for education at universities and other higher education institutions	Digital skills	123.1 €
	4.1 Joint public administration digital infrastructure	PA	20.7 €
	4.2 Broadband expansion	Connectivity	464.2 €

Sources and Methodology: Each area considers the themes analysed in this paper and excludes measures and investments targeting fields not expressly mentioned in the paper. E.g. Connectivity only relates to digital infrastructures, 5G and networks, thus excluding space and other technologies (even though these were related to the same component in the national plan, they were removed for the purpose of a more standardised analysis).
The name of the measures here reported and their relative budget are drawn directly from the MSs plans, when available. When unavailable, they are taken from Commission Staff Working Documents or direct contact with Permanent Representations.
Note 1 (Greece): This measure is considered on its own as it specifically refers to this area.
Note 2 (Italy): The total budget does not include measure M1C1-I1.5-11, which was considered separately as it refers to a different area.
Note 3 (Italy): The total budget does not include measure M1C2 I3.1, which was considered separately as it refers to a different area.
Nota 4 (Poland): As the measure transversally relates to two different areas, we have divided it equally to comprise both, in absence of further details.
Note 5 (Poland): As above.
Note 6 (Poland): As above.
Note 7 (Poland): As above.

III. Status of implementation of the Digital transition main areas

AUSTRIA

Austria began to distribute digital devices to children in lower secondary schools in 2021.

BELGIUM

One of the projects presented in Belgium's RRP involves the development of an AI Institute to address societal challenges. In April 2022, four pilot projects of the AI for the Common Good Institute were completed and provided support services (such as training, proof-of-concept development of software solutions) to for-profit, non-profit, or public organisations in areas such as AI education, healthcare, and employment in the Brussels Region.

Turning to the measures in the area of the digitalisation of public administrations, a goal was achieved in April 2021. A new platform (CRM) facilitating the interaction between the administration and citizens/businesses and between administrations has become operational in the Brussels Region. The platform of the CRM foundation will be available for the development of specific CRM projects in the region. The objective is to deploy, by the end of 2024, 16 projects distributed between regional and/or local administrations (Parking.Brussels, Hub.Brussels, Bruxelles Économie et Emploi).

Another project regarding public administration digitalisation sees the Flemish government increasingly digitalising its administrative procedures. Contract awards for 18 projects are expected to be set up by October 2022. This step entails that award notification is sent by the Flemish government or the relevant entity (notification authority) for 18 projects (100% of the total) to the successful applicants following the call for proposals under the 4 grant schemes: 1. Towards a low-cost public service for citizens, businesses and associations; 2. Enabling fast and efficient decisions through data; 3. Ensuring a reliable basic infrastructure by strengthening the common information and ICT elements; and 4. Providing a hybrid workplace of the future for every Flemish civil servant).

Belgium's RRP also includes a project to digitalise healthcare in an accessible and secure manner. In January 2022, the law establishing the Health Data Authority, which defines, among other things, the Authority's role and responsibilities entered into force. In April 2022, the requirements, design and solutions for the various eHealth sub-projects were defined.

As of 23rd May 2022, reforms to enable 5G rollout were being put in place. The 5G auction at federal level was expected in the first half of 2022.

BULGARIA

Bulgaria's RRP includes the project 'STEM centres and innovation in education'. The milestones for the implementation of the programme include the establishment of National and Regional STEM Centres. The Ministry of Education and Science has already taken action to establish a STEM Centre at national level to carry out organisational and methodological activities in relation to the already established school STEM Centres, as well as for the setting up of future ones. The centre will carry out research and information activities, activities related to the qualification of pedagogical specialists, to the development of interests, abilities, competences and performance in the field of science, technology, arts and sports.

CYPRUS

Cyprus is adopting measures to enhance open data and transparency. The Cyprus National Action Plan for Public Sector Information (PSI) re-use focuses on the continuous development of the national PSI

Portal, a designated area to showcase open data re-use. A new law reinforcing the principles of transparency and accountability in the public sector is included in the Recovery and Resilience Plan and entered into force at the end of 2020.

CZECHIA

Under Czechia's RRP, funding of ICT equipment for distance learning was planned to be provided to schools by 31 December 2020 in order to support children from disadvantaged socio-economic backgrounds during the school lockdown. The following aims were planned to be fulfilled:

• at least 74,000 digital devices (tablets, laptops, mobile phones, etc.) acquired by schools for distance learning;

• at least 4,102 primary and secondary schools received funding for IT equipment for distance learning.

As of 30 June 2022, in total 62,041 laptops, 11,844 tablets and 216 mobile phones (74,101 in total), different software and other equipment for teachers were acquired by schools in 2020. During the same year, 4,108 schools obtained funding for IT equipment for distance learning.

As of 23 May 2022, Czechia had reported a total of 13 milestones and 1 target as being fulfilled according to regular bi-annual reporting consistent with the RRF regulation. These measures led, among other things, to the launch of the European Digital Media Observatory hub for Central and Eastern Europe and the implementation of reforms such as new curricula for digital literacy.

Other measures are required to speed up. In particular, investments to develop and digitalise public administrations should be closely monitored and accelerated. Next year, the Czech RRP is expected to achieve many objectives such as digital innovation testing facilities and improved e-government services.

FRANCE

France, so far, has reached milestones related to digital skills by creating 16,000 places in higher education, achieving the milestone "Plan for youth: higher education of post-baccalaureate students". In March 2022, France reached another milestone aimed at supporting teaching, research, and development and innovation ecosystems, with the launch of the three projects -"ExcellencES", "Diversification of the resources of higher education and research institutions", and "Transformation of school education by promoting innovation and new forms of organisation and management".

ITALY

Italy, with its €11.252 m allocation, is the country with the highest expenditure in digital skills, targeting the general population, public administrations, education and the labour market. The main achievements of 2022 in digital skills are:

- the School 4.0 project to transform classrooms into innovative learning environments and the reform of the tertiary vocational training system;

- the strengthening of the system of research and technology transfer centres, covering fields such as advanced simulation and big data, quantum computing, Industry 4.0 and AI.

In April 2022, Italy reached a significant milestone related to AI and Industry 4.0 with the entry into force of legal acts to make Transition 4.0 tax credits available to potential beneficiaries and establishing a Scientific Committee. In addition to this, Italy has achieved a milestone in digital health services by approving a plan on the digital update of hospital technological equipment.

LATVIA

Three milestones achieved for this payment request contribute to the digital transition in Latvia. The first milestone was the adoption of a framework for the organisation and implementation of remote learning in educational institutions, which will contribute to closing the digital divide for disadvantaged pupils by expanding their access to learning opportunities. Two other milestones contribute to the digital transition. On the one hand, the adoption of a common model for the development of the last mile broadband connection (to ensure end-user's access to very high-capacity broadband networks in regions and rural areas), based on an analysis of the potential market for very high-capacity networks. On the other hand, the adoption of technical requirements for connected and automated driving. The latter milestone will allow for the development of a route for connected and automated driving alongside the Latvian section of the Via Baltica corridor, a railway connecting Estonia, Latvia and Lithuania to Poland and Czechia.

SPAIN

Spain received two disbursements for the achievement of milestones and targets.

Already in December 2021, Spain had published the Digitalisation of SMEs Plan for 2021-2025, receiving a first disbursement. For connectivity, Spain has published in the Official Journal the legal act on 5G, "Roadmap 5G: Spectrum management and assignment, deployment burden reduction, Cybersecurity Act 5G and Support to Local Authorities".

Concerning digital skills, it has implemented investments in the digital transformation of education and, especially, the equipment of schools with digital infrastructures. In addition, it has published in the Official Journal two main documents: the National Strategy for Artificial Intelligence and Digital Rights Charter. The National Digital Competences Plan was also approved by the Spanish Council of Ministers in 2021.

SLOVAKIA

In July 2022, Slovakia received a first disbursement from the European Commission after approving a landmark reform concerning research, development and innovation. Milestones and targets contributing to this are the approval of reforms in the governance of universities, concentration of excellent educational and research capabilities, and of the organisation and funding of research institutes, in particular, the Slovak Academy of Science.

In July 2022, Slovakia achieved a milestone on the digitalisation of public administrations with the reform on the standardisation of technical and procedural cybersecurity solutions (ITVS – Information technologies for public administrations). In addition, in May 2022, Slovakia issued a national strategic document for the digitalisation of education for 2022 – still not approved by the Commission - and is expected to prepare a new strategy to improve the digital skills of all population groups and meet the Digital Decade targets.

PORTUGAL

Several milestones and targets achieved by Portugal in May 2022 are related to the digital pillar.

In education, an investment was made with the signing of contracts for the purchase of individual computers for pupils and teachers, which will help the digitalisation of schools and improve access to the digital world. The public administration is undergoing a reform with the entry into force of a legal framework for the digital transformation for digital, simple, inclusive and secure public services for citizens and businesses.

Enterprises will benefit from a reform that entered into force on a new management contract template under the new system of incentives/penalties for the management of state-owned enterprises, with the Modernisation and Simplification of Public Financial Management, as well as from investments dedicated to the establishment of Digital Innovation Hubs and the programmes to improve environmental sustainability and digitalisation.

IV. Key deliverables

Country	Key deliverables expected under the RRP	Expected period for completion of measures
Austria	Provision of broadband access to 46% of households.	2022-2023
Belgium	Revision of the regional legislative framework on 5G radiation standards	2022-2023
	Digitisation of the justice system	
	Equipment of schools with ICT infrastructure and devices	
Bulgaria	Launch of the Economic Transformation Programme to support the innovation and growth of Bulgarian businesses, in particular by supporting their green and digital transitions	2022-2023
Croatia	Adopting the Digital Croatia Strategy 2030	2022
Cyprus	The reform of public administration, to simplify procedures and improve efficiency	2022-2023
	The reform of the justice system, by introducing an e-justice system to accelerate the administration of justice and reduce the backlog of cases	
	The adoption of the national e-skills action plan to support the digital transition	
Czechia	Launch of European Centre of Excellence in AI and regulatory sandboxes	2022-2023
Denmark	Launch of the National Digital Strategy	2022-2023
	Implement digital solutions in the health care sector as well as infrastructure and logistics support for critical medical products, and support for COVID-related research	
	3,500 households to gain very high-speed broadband coverage	
Estonia	Digital transition: launch of the first digital public services delivered proactively based on the life or business events (such as a marriage, the birth of a child or the creation of an enterprise)	2022-2023
	Digital transition: launch of the support scheme for the digital transition of small and medium-sized companies and microenterprises	
Finland	Revision of the legal framework for broadband communication networks to provide high-speed internet in more remote areas	2022-2023
France	1,700,000 additional buildings connected to fibre	2022-2023
	Strengthening of public employment services and continued support to employment and training of young people	

Germany	Launch of three IPCEIs on 'hydrogen', 'microelectronics and communication technologies' and 'next generation cloud infrastructure and services'.	2022-2023
	At least 100 of the most important digital administrative services of the Länder and 115 federal government services being implemented nationwide as one-for-all services.	
Greece	Launch of project to promote the digitalisation of SMEs. This project will finance investments in digital technologies and services for 100,000 SMEs.	2022-2023
Hungary	-	-
Ireland	Raising the number of graduates with high-level ICT skills.	2022-2023
	Connection of at least 990 primary schools to high-speed broadband networks.	
Italy	Public administration reform: reform of public employment, rolling out cloud services for the local public administration.	2022-2023
	Business environment: adoption of the Annual Competition Laws 2021 and 2022, completion of the public procurement reform, progress on the *Transizione 4.0* plan, reduction of late payments by the public sector.	
	Digital transition: Cybersecurity, National Digital Data Platform, School 4.0, launch of tenders for smart grids, fast internet connections (5G and ultra-broadband), important projects of common European interest (IPCEI), national 'R&D leaders' on key enabling technologies, and tenders for European Rail Traffic Management System (ERTMS).	
Latvia	Adoption of a digital health strategy	2022-2023
	Creation of five innovation clusters	
	Adoption of a plan to modernise public administration	
Lithuania	Improvements in the quality and accessibility of health services	2022-2023
	Entry into force of amendments enabling faster implementation of the 5G roadmap	
	Entry into force of legislation on adult education, and vocational education and training	
Luxembourg	Implement vocational training programmes under the 'FutureSkills' initiative	2022-2023
	Digitalise healthcare system management	
	Improve digital solutions for public services	
Malta	E-college is operational offering training courses and guidance to all adults.	2022-2023
Netherlands	-	-
Poland	-	-
Portugal	Modernisation of the cadastral information system (land register)	2022-2023
	Legislative package for the re-organisation of the public administration	
	14,100 new or renovated vocational training stations	
	Digitalisation of schools	
Romania	Adoption of the 2021-2026 National Cybersecurity Strategy	2022-2023

Slovakia	Nothing related to the digital transformation	-
Slovenia	Adopt the 2021-2025 broadband plan and deploy the 5G network by 2023.	2022-2023
	Strengthen the key competences of 1,300 young people and help them find work.	
Spain	Entry into force of the Law on 5G cybersecurity.	2022-2023
	Assignment of the 26GHz band (remaining 5G bands to be assigned).	
Sweden	At least 18,400 buildings newly connected to broadband access.	2022-2023

Source: European Semester Documents, Country reports.

V. Measures and indicators provided by each country in their RRP, divided by main areas: connectivity, digital public services, artificial intelligence and Industry 4.0, digital skills, cybersecurity

Table V1: List of measures and indicators* provided by each country in its RRP* – Connectivity

Country	Measure	Indicator	Similar common indicator from the list provided by the EU Commission	Note
Bulgaria	Large-scale deployment of digital infrastructure on the territory of Bulgaria	Transport corridors with continuous 5G connectivity		Starting value – 0 [2021 year], Final value – 5 [2025 year]
Bulgaria	Large-scale deployment of digital infrastructure on the territory of Bulgaria	Settlements with high-speed connectivity with possibility for 5G		Starting value – 5 [2021 year], Final value – 288 [2025 year]
Bulgaria	Large-scale deployment of digital infrastructure on the territory of Bulgaria	Number of towers on transport corridors for 5G		Starting value – 0 [2021 year], Final value – 132 [2025 year]
Bulgaria	Large-scale deployment of digital infrastructure on the territory of Bulgaria	Number of base stations using alternative energy sources		Starting value – 0 [2021 year], Final value – 1000 [2025 year]
Bulgaria	Large-scale deployment of digital infrastructure on the territory of Bulgaria	Increased average data transfer rate		Starting value – 30 Mbps [2021 year], Final value – 1 Gbps [2025 year]
Bulgaria	Large-scale deployment of digital infrastructure on the territory of Bulgaria	Internet users	Indicator n.5. Additional dwellings with internet access provided via very high capacity networks	Starting value – 65 % [2021 year], Final value – 90 % [2025 year]
Bulgaria	Large-scale deployment of digital infrastructure on the territory of Bulgaria	Households covered with high-speed Internet access	Indicator n.5. Additional dwellings with internet access provided via very high capacity networks	Starting value – 80 % [2021 year], Final value – 99 % [2025 year]
Czechia	Supporting the development of the 5G ecosystem	Publication of studies aimed at improving the deployment of 5G networks by the Ministry of Industry and Trade		Unit of measure: Number, Goal:25

Czechia	Supporting the development of the 5G ecosystem	Publication of the guidelines by the Ministry of Industry and Trade		Milestone: Publication of guidelines on the deployment of 5G networks by the Ministry of Industry and Trade
Czechia	Building high-capacity connections	Notification of the award of all grant decisions for connecting address points with the very high capacity network (VHCN) by the Ministry of Industry and Trade		Milestone: Award of all grant decisions for connecting address points with the very high capacity network (VHCN) by the Ministry of Industry and Trade
Czechia	Building high-capacity connections	Completion of address points connected with the very high capacity network (VHCN)	Indicator n.5. Additional dwellings with internet access provided via very high capacity networks	Unit of measure: Number, Goal: 23000
Czechia	Covering 5G corridors and promoting the development of 5G	Completion of enhanced 5G signal coverage of selected rail corridors		Unit of measure: Km, Goal: 210
Czechia	Covering 5G corridors and promoting the development of 5G	Completion of equipping railway wagons with repeaters for passive walls mobile signal coverage		Unit of measure: Number, Goal: 350
Czechia	Covering 5G corridors and promoting the development of 5G	Completion of the installation and testing of a C-ITS system		Milestone: Installation and testing of the deployment of an intelligent transport system (C-ITS).
Czechia	Supporting the development of 5G mobile infrastructure in rural investment-intensive white areas	Notification of the award of all grant decisions for connecting municipalities with high-capacity connection by the Ministry of Industry and Trade		Milestone: Award of all grant decisions for connecting municipalities with high-capacity connection
Czechia	Supporting the development of 5G mobile infrastructure in rural investment-intensive white areas	Completion of base stations for 5G signals		Unit of measure: Number, Goal: 120

Czechia	Scientific research activities related to the development of 5G networks and services	Notification of the award of all grant decisions for scientific research projects related to 5G networks by the Ministry of Industry and Trade		Milestone: Award of all grant decisions for scientific research projects related to 5G networks
Czechia	Scientific research activities related to the development of 5G networks and services	Completion of scientific research projects related to 5G networks		Unit of measure: Number of projects supported, Goal:20
Estonia	Construction of very high capacity broadband networks	Number of addresses	Indicator n.5. Additional dwellings with internet access provided via very high capacity networks	Intermediate target 2023 Q4: 4000 addresses, Final target: Q4 2025: 8097 addresses.
Finland	Digital infrastructure– Improving the quality and availability of telecommunications networks (Ministry of Transport and Communications)	The legislation has been enacted, and it has been published in the Statute Book of Finland.		Milestone description: Legislation for the aid programme passed. Principally, legislation for the aid programme will remain unchanged, but potential GBER amendments are to be assessed. Aid will only be allocated to areas where sufficient commercial services are not available and/or where there are no concrete investment plans to build networks capable of offering such connections. In this way, the aid will not distort competition.
Finland	Digital infrastructure– Improving the quality and availability of telecommunications networks (Ministry of Transport and Communications)	At least 10,000 potential new subscribers are within reach of high- speed (100/100 Mbit/s) broadband.	Indicator n.5. Additional dwellings with internet access provided via very high capacity networks	
Finland	Digital infrastructure– Improving the quality and availability of telecommunications networks (Ministry of Transport and Communications)	At least 25,000 potential new subscribers are within reach of high- speed (100/100 Mbit/s) broadband.	Indicator n.5. Additional dwellings with internet access provided via very high capacity networks	

Italy	M1C2 I3.1 Fast internet connections (Ultra-broadband and 5G)	Extending 1Gbps connectivity to at least 8.5 million additional dwellings through fiber FTTH/B, FWA or 5G by June 2026	Indicator n.5. Additional dwellings with internet access provided via very high capacity networks	six-monthly review
Italy	M1C2 I3.1 Fast internet connections (Ultra-broadband and 5G)	Extending 1Gbps connectivity to at least 9,000 additional schools and 12 279 public health structures by June 2026	Indicator n.5. Additional dwellings with internet access provided via very high capacity networks	six-monthly review
Italy	M1C2 I3.1 Fast internet connections (Ultra-broadband and 5G)	Bringing ultra-wideband connectivity through a new optical backhaul to a minimum of 18 other islands without fibre-optic connections with the mainland by 2023		six-monthly review
Italy	M1C2 I3.1 Fast internet connections (Ultra-broadband and 5G)	Bringing 5G coverage to at least 1 Gbps to a minimum of an additional 12 600 km of roads and suburban corridors by June 2026		six-monthly review
Italy	M1C2 I3.1 Fast internet connections (Ultra-broadband and 5G)	Bringing 5G coverage to at least 1 Gbps to a minimum of an additional 15 000 km^2 of market failure areas	Indicator n.5. Additional dwellings with internet access provided via very high capacity networks	six-monthly review

*non-exhaustive list, subject to public availability.
Source:
For Bulgaria, official website https://nextgeneration.bg/14
For Estonia: Estonia's Recovery and Resilience plan "TAASTE- ja VASTUPIDAVUSKAVA (EE)", 5 October 2021.
For Finland: Sustainable Growth Programme for Finland, Recovery and Resilience Plan, publications of the finnish government 2021:69, available at the following link
https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/163363/VN_2021_69.pdf?sequence=1&isAllowed=y,
For Czechia: official website https://www.planobnovycr.cz
For Italy: official website Italiadomani.gov.it
For the remaining countries, data come from the Recovery and Resilience Scoreboard - European Commission, available at https://ec.europa.eu/economy_finance/recovery-and-resilience-scoreboard/

Table V2: List of measures and indicators* provided by each country in its RRP – **PA**

Country	Measure	Indicator	Common indicator provided by the EU Commission	Note
Cyprus	Digitalisation in various Central Government Ministries - Services	Repository system for audit and control: information for monitoring implementation of RRF		
Estonia	Creation and development of a centre of excellence for data governance and open data	Setting up a data management team in the Statistical Office, the Ministry of Economic Affairs and Communication s and the State Information System Authority		
Estonia	Creation and development of a centre of excellence for data governance and open data	Completion of data quality improvement project		Baseline: 0; Goal: 430 project by 2025.
Estonia	Creation and development of a centre of excellence for data governance and open data	Publication of datasets on the national open data portal		Baseline: 707 Goal: 2600 by 2025
Estonia	Development of event services and proactive digital public services for individuals	Launch of personal life event services and/or proactive services		Baseline: 0; Goal: 2 operational services by 2022, 10 by 2025.
Estonia	#Bürokratt programme (national virtual assistant platform and ecosystem)	Access to digital public services through the virtual assistant platform		Baseline: 0; Goal: 1 public digital service available by 2022, 20 by 2025.
Estonia	#Bürokratt programme (national virtual assistant platform and ecosystem)	Introduction to the Bürokratt virtual assistant in digital public services environments		Baseline: 0; Goal: 18 service environments.
Estonia	Reconfiguration of basic digital services and safe transition to cloud infrastructure	Development of centrally delivered/shared IT base services		

Estonia	Reconfiguration of basic digital services and safe transition to cloud infrastructure	Deployment of national private cloud infrastructure by public authorities		Baseline: 0; Goal: 10 information systems migrated to the national private cloud
Estonia	Reconfiguration of basic digital services and safe transition to cloud infrastructure	Extension of the cloud infrastructure to the data embassy		
Estonia	Reconfiguration of basic digital services and safe transition to cloud infrastructure	Migration of critical systems to the national cloud infrastructure of the data embassy		Baseline: 0; Goal: 10 critical systems
Estonia	Reconfiguration of basic digital services and safe transition to cloud infrastructure	Central security testing of public authorities' information systems		Baseline: 0; Goal: 16 tests performed
Estonia	Renewal of the eHealth Governance	Approval of the eHealth Governance Framework and its implementation roadmap		
Finland	Improving access to health and social services and enhancing cost-effectiveness – Introducing service-oriented digital innovations that will help achieve the care guarantee.	Percentage of all social welfare and health care contacts that are managed remotely by electronic means (phone, chat, remote services)	Indicator n.7 Users of new and upgraded pubic digital services, products and processes	Baseline: 30%; Goal: 45% of all contacts are managed remotely by electronic means (phone, chat, remote services)
Finland	Improving access to health and social services and enhancing cost-effectiveness – Client-oriented digital care information system in Åland	Care information system delivered		
Finland	Improving access to health and social services and enhancing cost-effectiveness – Client-oriented digital care information system in Åland	Percentage of municipal social and health services and / or private care enterprises who have adopted the health information system		
Italy	Cloud first and interoperability	Entry into force of the decree-law for Reform 1.3		

		"Cloud first and interoperability"		
Italy	Digitalisation of justice	Digitalisation of the judiciary system		Milestone description: it becomes mandatory to manage all documents and process of civil law electronically, it is introduced the digitalisation of criminal justice proceedings, it is created a free database, easily accessible.
Italy	Reform of the public administration	Repository system for Audit and Controls: information for monitoring implementation of RRF		
Italy	Reform of the public administration	Entry into force of primary legislation on the governance of the Italian recovery and resilience plan		
Italy	Reform of the public administration	Entry into force of primary legislation on simplification of administrative procedures for the implementation of the Italian recovery and resilience plan.		
Italy	Reform of the public administration	Extending the methodology applied to the Italian recovery and resilience plan to national budget to increase absorption of investment		
Italy	Reform of the public administration	Entry into force of the enabling legislation for the reform of public employment		
Italy	Home as the first place of care and telemedicine	Approval of the Guidelines containing the digital model for the implementation of Home Care		
Italy	Home as the first place of care and telemedicine	Institutional Development Contract approved by Ministry of Health and regions		

Italy	Digital update of hospitals' technological equipment	Reorganization plan approved by Ministry of Health/Italian Regions		
Italy	Digital update of hospitals' technological equipment	Approval of the Institutional Development Contract		
Malta	Strengthening the resilience, security and efficiency of the government digital backbone and investing in appropriate digital solutions, devices and tools	Increased uptime of the Digital Backbone		Baseline: 99.7%; Goal: 99.8%. Target description: Percentage of uptime (total time that service is up, divided by the total number of hours during that period, excluding scheduled downtime) of the digital backbone (Government Network referred to as MAGNET and MITA Corporate Data Centres) measured by Malta Information Technology Agency (MITA).
Malta	Further digitalisation and modernisation of the public administration	Expenditure incurred in relation to the modern digital workplace and solutions to improve the front-end customer experience		Target description: At least a value of EUR 2 500 000 has been paid for contractual obligations relating to measures in relation to the modern digital workplace and solutions to improve the front-end customer experience.
Malta	Further digitalisation and modernisation of the public administration	Increase in uptake of online services	Indicator n.7 Users of new and upgraded pubic digital services, products and processes	Baseline: 63%; Goal: 71%. Target description: DESI indicator: Individuals who used the Internet, in the last 12 months, for interaction with public authorities, expressed as % of Internet users.

Malta	Further digitalisation and modernisation of the public administration	All contracts signed for the digital pathology services at the histopathology department at Mater Dei hospital		
Malta	Enhancing the resilience of the health system through digitalisation and new technologies	Digital pathology services provided at the histopathology department at Mater Dei hospita		
Malta	Enhancing the resilience of the health system through digitalisation and new technologies	All contracts signed for the digitalisation of the new outpatient facility at Mater Dei hospital		
Malta	Enhancing the resilience of the health system through digitalisation and new technologies	Digitalisation of new outpatient facilities at Mater Dei hospital are operational and open to patients		
Malta	Digitalisation in the justice system	Entry into force of (i) Act No. LIII of 2020 (Amendment No. 4); and (ii) Act No. III of 2021 (Amendment No. 2) on digitalisation of the law courts		
Malta	Digitalisation in the justice system	Expenditure incurred for the digitalisation of the justice system		Baseline: 0; Goal: 2 000 000 €
Malta	Digitalisation in the justice system	Launch and availability to users of the developed IT tools and systems		

*non-exhaustive list, subject to public availability.
Source:
For Bulgaria, official website https://nextgeneration.bg/14
For Estonia: Estonia's Recovery and Resilience plan "TAASTE- ja VASTUPIDAVUSKAVA (EE)", 5 October 2021.
For Finland: Sustainable Growth Programme for Finland, Recovery and Resilience Plan, publications of the finnish government 2021:69, available at the following link
https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/163363/VN_2021_69.pdf?sequence=1&isAllowed=y,
For Czechia: official website https://www.planobnovycr.cz
For Italy: official website Italiadomani.gov.it
For Malta: Annex to the Proposal for a Council Implementing Decision on the approval of the assessment of the recovery and resilience plan for Malta, {SWD(2021) 269 final}, European Commission, Brussels, 16.9.2021 COM(2021) 584 final available at the following link
https://eufunds.gov.mt/en/Operational%20Programmes/Documents/Annex%20to%20the%20Proposal%20for%20a%20Council%20Implementing%20Decision.pdf
For the remaining countries, data come from the Recovery and Resilience Scoreboard - European Commission, available at
https://ec.europa.eu/economy_finance/recovery-and-resilience-scoreboard/

Table V3: List of measures and indicators* provided by each country in its RRP – **AI & Industry 4.0**

Country	Measure	Indicator	Common indicator provided by the EU Commission	Note
Estonia	Digital transformation in enterprises	Call for proposals with award criteria and award conditions	Indicator n.6 Enterprises supported to develop or adopt digital products, services and application processes	Number of enterprises being awarded a grant. Baseline: 0; 110 by 2023 and 230 by 2025.
Estonia	Digital transformation in enterprises	Award of grants	Indicator n.6 Enterprises supported to develop or adopt digital products, services and application processes	
Finland	Corporate digital economy – RTE programme (Ministry of Economic Affairs and Employment, Ministry of Finance)	Exchange of digital economic data		
Finland	Corporate digital economy – RTE programme (Ministry of Economic Affairs and Employment, Ministry of Finance)	Ecosystem design and delivery		
Finland	Corporate digital economy – RTE programme (Ministry of Economic Affairs and Employment, Ministry of Finance)	Enabling data sharing		
Finland	Corporate digital economy – RTE programme (Ministry of Economic Affairs and Employment, Ministry of Finance)	Business e-documents		

Finland	6G, AI and quantum computing development facilities	Project selection		
Finland	6G, AI and quantum computing development facilities	Project implementation		
Finland	Accelerating the data economy and digitalisation – Virtual Finland (Ministry of Finance, Ministry for Foreign Affairs, Ministry of Economic Affairs and Employment, etc.)	Virtual Finland shared platform and services		1) Production version of shared platform completed. 2) First and second service integrated into the platform. Both services integrated so that they are operational and available to clients.
Finland	Research infrastructure and piloting – Investments in RDI infrastructures supporting sustainable growth and digitalisation – Competitive funding for research infrastructures (local research infrastructures, Academy of Finland)	Launching application round for local research infrastructures		
Finland	Research infrastructure and piloting – Investments in RDI infrastructures supporting sustainable growth and digitalisation – Competitive funding for research infrastructures (local research infrastructures, Academy of Finland)	Number of funding decisions for local research infrastructure projects, all funding decisions made.		
France	Innovating for the resilience of our business models	Number of strategies validated		

Italy	Transition 4.0	Entry into force of legal acts to make Transition 4.0 tax credits available to potential beneficiaries and establishment of the Scientific Committee	Indicator n.6 Enterprises supported to develop or adopt digital products, services and application processes	
Italy	Strengthening research structures and supporting the creation of "national R&D leaders" on some Key Enabling Technologies	Award of contracts for projects concerning national R&D leaders on key enabling technologies		
Italy	Establishing and strengthening of "innovation ecosystems for sustainability", building "territorial leaders of R&D	Award of contracts for projects concerning innovation ecosystems		
Italy	Fund for construction of an integrated system of research and innovation infrastructures	Award of contracts for the projects concerning: a) integrated system of research and innovation infrastructures		
Malta	Finalise and implement Malta's smart specialisation strategy, with a particular focus on fostering business R&I and strengthening public-private cooperation	Adoption of Malta's Smart Specialisation Strategy		Milestone description: Publication of national smart specialisation strategy.
Malta	Finalise and implement Malta's smart specialisation strategy, with a particular focus on fostering business R&I and strengthening public-private cooperation	Inter-agency account management between Malta Enterprise and Malta Council for Science and Technology	Indicator n.6 Enterprises supported to develop or adopt digital products, services and application processes	Baseline: 0; Goal: 50 undertakings. Target description: Number of undertakings supported through the inter-agency account management between Malta Enterprise and Malta Council for Science and Technology (MCST). Enterprises shall be provided with information, guidance, and support with respect to R&D activities as well as

				exploring internationalisation through participation in European programmes, amongst others.
Malta	Rolling out measures to intensify the digitalisation of the private sector	Launch of the calls for applications	Indicator n.6 Enterprises supported to develop or adopt digital products, services and application processes	Milestone description: Launch of calls for applications for business to receive grant support for digitalisation, including wholesale and retail, tourism (including culture) and manufacturing sectors.
Malta	Rolling out measures to intensify the digitalisation of the private sector	Undertakings supported in digitalisation investments	Indicator n.6 Enterprises supported to develop or adopt digital products, services and application processes	Baseline: 0; Goal: 360 undertakings supported in digitalisation investments
Portugal	Research and innovation agenda for sustainable agriculture, food and agro-industry [Innovation Agenda for Agriculture 20 30]	Tender procedure for research and innovation projects		
Portugal	Catalyst for the Digital Transition of Enterprises	Digital Innovation Hubs (DIHs)		
Spain	Digitalisation and Innovation	Digitalisation of SMEs Plan 2021-2025		
Spain	National AI Strategy	National Strategy for Artificial Intelligence		
Spain	National AI Strategy	Digital Rights Charter		

Spain	Plan to boost the sustainability, research, innovation and digitalisation of the fisheries sector (II): Boosting fisheries and aquaculture research and supporting training	Agreements with Public Research Bodies		

*non-exhaustive list, subject to public availability.
Source:
For Bulgaria, official website https://nextgeneration.bg/14
For Estonia: Estonia's Recovery and Resilience plan "TAASTE- ja VASTUPIDAVUSKAVA (EE)", 5 October 2021.
For Finland: Sustainable Growth Programme for Finland, Recovery and Resilience Plan, publications of the finnish government 2021:69, available at the following link
https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/163363/VN_2021_69.pdf?sequence=1&isAllowed=y,
For Czechia: official website https://www.planobnovycr.cz
For Italy: official website Italiadomani.gov.it
For Malta: Annex to the Proposal for a Council Implementing Decision on the approval of the assessment of the recovery and resilience plan for Malta, {SWD(2021) 269 final}, European Commission, Brussels, 16.9.2021 COM(2021) 584 final available at the following link
https://eufunds.gov.mt/en/Operational%20Programmes/Documents/Annex%20to%20the%20Proposal%20for%20a%20Council%20Implementing%20Decision.pdf
For the remaining countries, data come from the Recovery and Resilience Scoreboard - European Commission, available at
https://ec.europa.eu/economy_finance/recovery-and-resilience-scoreboard/

Table V4: List of measures and indicators* provided by each country in its RRP – **Digital skills**

Country	Measure	Indicator	Common indicator from the list provided by the EU Commission	Note
Cyprus	E-skills Action Plan – Implementation of specific actions	National e-Skills Action Plan is adopted by the Council of Ministers		
Estonia	Skills reform for the digital transformation of businesses	Entry into force of secondary legislation setting out the terms of support for the development of digital skills		
Estonia	Skills reform for the digital transformation of businesses	Enrolment in training activities	Indicator n.10 Number of participants in education or training	Baseline: 0; Goal: 500 by 2023.

Estonia	Skills reform for the digital transformation of businesses	Completion of training activities		Baseline: 0; Goal: 2000 by 2026. Number of people having completed their training course through the training activities supported under this measure, including awareness-raising for SME managers, and upskilling and retraining for ICT specialists. A minimum of 35% of participants having completed these training activities shall be women.
Estonia	Skills reform for the digital transformation of businesses	Number of new upskilling and retraining modules		Baseline: 0; Goal: 5.
Estonia	Skills reform for the digital transformation of businesses	Review of qualification standards for ICT specialists.		Baseline: 0; Goal: 5.
Finland	Upskilling and continuous learning reform – Continuous learning reform	Entry into force of Act on the continuous learning and employment service centre		
Finland	Upskilling and continuous learning reform – Continuous learning reform	Medium-term forecasting model improves forecasting of labour and skills needs		
Finland	Upskilling and continuous learning reform – Continuous learning reform	Application rounds or invitation to tender announced for education and training to improve digital skills and green skills.		
Finland	Upskilling and continuous learning reform – Continuous learning reform	At least 7,800 persons have entered training created for addressing changes in working life or the green and digital transition.	Indicator n.10 Number of participants in education or training	

Finland	Upskilling and continuous learning reform – Continuous learning reform	At least 300 professionals in guidance services have attended continuing education on digital skills, language and culture awareness, the green transition and promoting gender equality.	Indicator n.10 Number of participants in education or training	
Finland	Upskilling and continuous learning reform – Continuous learning digitalisation programme	Target architecture for digital services in continuous learning created in joint effort by the Ministry of Education and Culture, the Ministry of Economic Affairs and Employment and the Digivisio 2030 project.		
Finland	Upskilling and continuous learning reform – Continuous learning digitalisation programme	At least 80% of the service prototypes specified in the target architecture completed.		
Finland	Upskilling and continuous learning reform – Continuous learning digitalisation programme	At least 80% of the service prototypes specified in the target architecture completed and available to various client groups.		
Finland	Upskilling and continuous learning reform – Raising the educational attainment by adding starts in higher education	Universities have increased their admissions in disciplines which support the Sustainable Growth Programme for Finland and in which there are labour shortages.		

Finland	Upskilling and continuous learning reform – Raising the educational attainment by adding starts in higher education	Percentage of modernised courses increased to 70% (of all university courses), including comprehensive digital content (at least 25% of any given course given as distance learning, or at least 30% of the course material of any given course is in digital multimedia form) in degree programmes and Open University courses at the Åland University of Applied Sciences		
France	Plan for youth: higher education for post-baccalaureate students	Places in higher education created		
France	Increase of resources for France Compétences	Signature of the agreement with France Compétences		
France	Support teaching, research, development and innovation ecosystems (PIA4)	All three calls for projects launched ("ExcellencES", "Diversification of the resources of higher education and research institutions", and "Transformation of school education by promoting innovation and new forms of organization and management")		
Italy	Digital civil service	Citizens taking in part in training initiatives promoted by certified entities and on a voluntary basis	Indicator n.10 Number of participants in education or training	At least a million citizens by mid-2025.
Italy	Network of services for digital facilitation	Number of citizens taking part in the new training initiatives by the centres for digital facilitation	Indicator n.10 Number of participants in education or training	At least two million citizens by mid-2026.

Italy	School 4.0: innovative schools, wiring, new classrooms and workshops	School 4.0 Plan to foster the digital transition of the Italian school system is adopted		
Italy	ALMPs and Vocational Training	Entry into force of the Inter-Ministerial Decree establishing a National programme for the Guaranteed Employability of Workers (GOL) and an Inter-Ministerial Decree establishing a National Plan for New Skills		
Latvia	Closing the digital divide for socially vulnerable learners and educational institutions	Entry into force of a regulatory framework laying down procedures for the organisation and implementation of remote learning		
Malta	Deepening the digital transformation through policy reform, with a focus on reducing the digital divide and promoting digital skills	Launch of a scholarship scheme for students to become ICT professionals		Milestone description: In line with Malta Digital Strategy 2021-27, open a scholarship scheme to encourage students to pursue a career in niche ICT areas such as artificial intelligence.
Malta	Deepening the digital transformation through policy reform, with a focus on reducing the digital divide and promoting digital skills	Individuals supported to mitigate digital divide	Indicator n.10 Number of participants in education or training	Baseline: 0; Goal: 1000 individuals. Target description: A two-year pilot scheme shall be launched in 2021 to analyse the impact home internet connection and access to a computer is expected to have on low-income families regarding digital literacy, connectivity, integration of digital technology and computer skills.

Malta	Deepening the digital transformation through policy reform, with a focus on reducing the digital divide and promoting digital skills	Launch of the eCollege		
Malta	Deepening the digital transformation through policy reform, with a focus on reducing the digital divide and promoting digital skills	Learners attracted towards the use of the new e-College platform	Indicator n.10 Number of participants in education or training	Baseline: 0; Goal: 4800 learners by 2024
Portugal	Digital transition in education	Signature of contracts for the purchase of individual computers for pupils and teachers		
Spain	Digital transformation of education	Programme to equip public and publicly subsidised schools with digital tools		
Spain	National Digital Competences Plan	Approval of the National Digital Competences Plan by the Council of Ministers		

Note: non-exhaustive list, subject to public availability.
Source:
For Bulgaria, official website https://nextgeneration.bg/14
For Estonia: Estonia's Recovery and Resilience plan "TAASTE- ja VASTUPIDAVUSKAVA (EE)", 5 October 2021.
For Finland: Sustainable Growth Programme for Finland, Recovery and Resilience Plan, publications of the finnish government 2021:69, available at the following link
https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/163363/VN_2021_69.pdf?sequence=1&isAllowed=y,
For Czechia: official website https://www.planobnovycr.cz
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For the remaining countries, data come from the Recovery and Resilience Scoreboard - European Commission, available at
https://ec.europa.eu/economy_finance/recovery-and-resilience-scoreboard/

Table V5: List of measures and indicators provided by each country in its RRP – **Cybersecurity**

Country	Measure	Indicator	Similar common indicator from the list provided by the EU Commission	Note
Bulgaria	Transformation of the existing information and communication infrastructure (ICI) in the Prosecutor's Office of the Republic of Bulgaria into a new type - fault-tolerant, reserved, productive and protected.	Established Center for Security Management of Information and Communication Systems in the Prosecutor's Office of the Republic of Bulgaria (1 piece).		Initial value - 0 [December 31, 2021], Final value - 1 [December 31, 2023]
Bulgaria	Transformation of the existing information and communication infrastructure (ICI) in the Prosecutor's Office of the Republic of Bulgaria into a new type - fault-tolerant, reserved, productive and protected.	1 piece established and functioning unified secure communication system for secure data exchange.		Initial value - 0 [December 31, 2021], Final value - 1 [December 31, 2023]
Bulgaria	Transformation of the existing information and communication infrastructure (ICI) in the Prosecutor's Office of the Republic of Bulgaria into a new type - fault-tolerant, reserved, productive and protected.	Built security systems - 6 pieces		Initial value - 0 [December 31, 2021], Final value - 6 [December 31, 2023]
Bulgaria	Transformation of the existing information and communication infrastructure (ICI) in the Prosecutor's Office of the Republic of Bulgaria into a new type - fault-tolerant, reserved, productive and protected.	Built data centers - 2 pieces		Initial value - 0 [December 31, 2021], Final value - 2 [December 31, 2023]

Bulgaria	Transformation of the existing information and communication infrastructure (ICI) in the Prosecutor's Office of the Republic of Bulgaria into a new type - fault-tolerant, reserved, productive and protected.	Delivered and installed disk systems - 2 pieces		Initial value - 0 [December 31, 2021], Final value - 2 [December 31, 2023]
Bulgaria	Transformation of the existing information and communication infrastructure (ICI) in the Prosecutor's Office of the Republic of Bulgaria into a new type - fault-tolerant, reserved, productive and protected.	Delivered and installed server systems - 4 pieces		Initial value - 0 [December 31, 2021], Final value - 4 [December 31, 2023]
Bulgaria	Transformation of the existing information and communication infrastructure (ICI) in the Prosecutor's Office of the Republic of Bulgaria into a new type - fault-tolerant, reserved, productive and protected.	Delivered computer configurations - 4000 pieces		Initial value - 0 [December 31, 2021], Final value - 4000 [December 31, 2023]
Bulgaria	Transformation of the existing information and communication infrastructure (ICI) in the Prosecutor's Office of the Republic of Bulgaria into a new type - fault-tolerant, reserved, productive and protected.	Trained court employees to work with virtualization systems - 9 employees	Indicator n.10. Number of participants in an education or training course	Initial value - 0 [December 31, 2021], Final value - 9 [December 31, 2023]
Bulgaria	Transformation of the existing information and communication infrastructure (ICI) in the Prosecutor's Office of the Republic of Bulgaria into a new type - fault-tolerant, reserved, productive and protected.	Trained court employees to administer Windows Server - 100 employees	Indicator n.10. Number of participants in an education or training course	Initial value - 0 [December 31, 2021], Final value - 100 [December 31, 2023]

Bulgaria	Transformation of the existing information and communication infrastructure (ICI) in the Prosecutor's Office of the Republic of Bulgaria into a new type - fault-tolerant, reserved, productive and protected.	Trained court clerks for administration and security configuration of servers with Linux operating systems - 10 clerks	Indicator n.10. Number of participants in an education or training course	Initial value - 0 [December 31, 2021], Final value - 10 [December 31, 2023]
Bulgaria	Transformation of the existing information and communication infrastructure (ICI) in the Prosecutor's Office of the Republic of Bulgaria into a new type - fault-tolerant, reserved, productive and protected.	Trained court staff for activities related to network threats and vulnerabilities, data protection, applications and hosts, identification and implementation of measures and control - 40 employees	Indicator n.10. Number of participants in an education or training course	Initial value - 0 [December 31, 2021], Final value - 40 [December 31, 2023]
Bulgaria	Transformation of the existing information and communication infrastructure (ICI) in the Prosecutor's Office of the Republic of Bulgaria into a new type - fault-tolerant, reserved, productive and protected.	Trained court employees for work with network virtualization and software-defined networks (SDN) - 101 employees	Indicator n.10. Number of participants in an education or training course	Initial value - 0 [December 31, 2021], Final value - 101 [December 31, 2023]
Bulgaria	Transformation of the existing information and communication infrastructure (ICI) in the Prosecutor's Office of the Republic of Bulgaria into a new type - fault-tolerant, reserved, productive and protected.	Trained court employees for event management and monitoring and security - 10 employees	Indicator n.10. Number of participants in an education or training course	Initial value - 0 [December 31, 2021], Final value - 10 [December 31, 2023]
Bulgaria	Transformation of the existing information and communication infrastructure (ICI) in the Prosecutor's Office of the Republic of Bulgaria into a new type - fault-tolerant, reserved, productive and protected.	Trained court employees for operation of platforms for protection against existing and newly discovered cyber threats - 20 employees	Indicator n.10. Number of participants in an education or training course	Initial value - 0 [December 31, 2021], Final value - 20 [December 31, 2023]

Czechia	Digital public administration systems - Cybersecurity	Entry into operation of the fully functional and upgraded Security Information and Event Management system and of additional five information services selected on the basis of a risk and feasibility study.		Milestone: Modernisation of the Security Information and Event Management System of the police of Czechia and extension of its use for cybersecurity protection of further five other information systems, which shall be selected based on risk and feasibility study
Czechia	Digital public administration systems - Cybersecurity	Completion of projects leading to an increase of the number of information systems whose cyber security has been strengthened in line with Act No. 181/2014 Coll., on cyber security		Unit of measure: number, Goal: 10
Estonia	Restructuring the basic services of the digital state and a secure transition to cloud infrastructure	By the end of 2024, 16 comprehensive security tests of public sector information systems will have been carried out by the security testing team to be set up at the RIA.		
Finland	Cyber security research investments	Specifications for cyber knowledge and skills required and for how they are to be taught; digital platform created on this basis in the first phase of the project. Shared training content requirements for the platform conform to the two milestones in the research plan, and the platform is widely available to educational institutions in the Member States in August 2024.		Milestone: Training platform and content available in multiple languages
Finland	Cybersecurity exercises	Three technical and functional exercises held in 2021, and the technical and functional exercise environment improved with the help of the steering group to respond to future needs. Four exercises per year held between 2022 and 2025 for a total of 19 exercises involving about 2,000 trainees from the public administration.		Milestone: Cybersecurity exercises held, and exercise environment improved.
Italy	Investment 1.5: Cybersecurity	Establishment of the new Agency for National Cybersecurity (by Q4 2022)		Qualitative indicator consisting in the Administrative act of establishment (achieved)
Italy	Investment 1.5: Cybersecurity	Initial deployment of national cybersecurity services (by Q4 2022)		Qualitative indicator consisting in the Report outlining the complete architecture of national cybersecurity services

Italy	Investment 1.5: Cybersecurity	Launch of the cybersecurity screening and certification laboratory network (by Q4 2022)		Qualitative indicator consisting in documentation provided to demonstrate the processes and procedures identified to be shared between laboratories and report provided to demonstrate the activation of at least one laboratory.
Italy	Investment 1.5: Cybersecurity	Activation of a central audit unit for PSNC and NIS security measures (by Q4 2022)		Qualitative indicator consisting in Reports provided to demonstrate the start-up of the central audit unit
Italy	Investment 1.5: Cybersecurity	Support for the upgrading of security structures T1 (by Q4 2022)		Quantitative indicator consisting in at least five interventions to improve security structures completed in the areas of the National Cybersecurity Perimeter (PSNC) and the networks and information systems (NIS). The types of interventions include upgrading security operations centres (SOCs), improving defence of IT borders and internal monitoring and control capabilities. Interventions should focus on the health care, energy and environment (drinking water supply) sectors.

Italy	Investment 1.5: Cybersecurity	Support for the upgrading of security structures T2 (by Q4 2024)		Quantitative indicator consisting in at least 50 enhancement interventions carried out in the areas of the National Cyber Security Perimeter (PSNC) and Networks and Information Systems (NIS). The types of interventions concern, for example, security operations centres (SOCs), improvement of cyber border defence and internal monitoring and control capabilities in compliance with NIS and PSNC requirements. Interventions should particularly address the areas of health care, energy and the environment (drinking water supply).
Italy	Investment 1.5: Cybersecurity	Full deployment of national cybersecurity services (by Q4 2024)		Qualitative indicator consisting in Report illustrating the full deployment of national cybersecurity services
Italy	Investment 1.5: Cybersecurity	Completion of the network of laboratories and assessment centres for cybersecurity assessment and certification (by Q4 2024)		Qualitative indicator consisting in Reports provided demonstrating the full activation of at least 10 laboratories, the two evaluation centres (CVs) and the activation of the EU certification laboratory'.
Italy	Investment 1.5: Cybersecurity	Fully operational PSNC and NIS security measures audit unit with completion of at least 30 inspections (by Q4 2024)		Qualitative indicator consisting in Reports provided, reports of inspection reports

Malta	Strengthening the resilience, security and efficiency of the government digital backbone and investing in appropriate digital solutions, devices and tools that will enable the government to provide proactive action, secure services and streamlined operations to citizens and the business sector	NIST level assessed as level 4 in an internal report as validated by an external body		Milestone: Improved level in NIST cyber security framework

*non-exhaustive list, subject to public availability.
Source:
For Bulgaria, official website https://nextgeneration.bg/14
For Estonia: Estonia's Recovery and Resilience plan "TAASTE- ja VASTUPIDAVUSKAVA (EE)", 5 October 2021
For Finland: Sustainable Growth Programme for Finland, Recovery and Resilience Plan, publications of the finnish government 2021:69, available at the following link
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https://ec.europa.eu/economy_finance/recovery-and-resilience-scoreboard/

VI. RRF Funds allocated to digital transformation per Member State

RRF Funds allocated to digital transformation per Member State						
Country	**RRF Funds allocated to the digital transition (bln)**	**Total RRF amount (Grants + Loans) absolute values in billion Euros**	**RRF funds allocated to the digital transition (% of total RRP amount)**	**GDP (2021 current prices)**	**RRF funds allocated to digital objectives (% of GDP)**	**Funds allocated to digital objectives per country / Total**
Austria	1.8	4.50	40%	403.4	0.4%	1.4%
Belgium	1.5	5.93	25%	507.2	0.3%	1.1%
Bulgaria	1.5	6,61	23%	67.9	2.2%	1.1%
Croatia	1.3	6.40	20%	57.2	2.3%	1.0%
Cyprus	0.29	1.23	24%	23.4	1.2%	0.2%
Czechia	1.6	7.07	23%	238.9	0.7%	1.2%
Denmark	0.38	1.56	24%	335.7	0.1%	0.3%
Estonia	0.2	0.98	20%	30.7	0.7%	0.2%
Finland	0.6	2.10	29%	252.9	0.2%	0.5%
France	8.4	40.95	21%	2483.6	0.3%	6.4%
Germany	13.5	27.95	48%	3570.6	0.4%	10.2%
Greece	6.8	26.30	26%	182.8	3.7%	5.1%
Hungary	1.7	7.20	24%	154.1	1.1%	1.3%
Ireland	0.3	0.99	30%	421.5	0.1%	0.2%
Italy	51.08	191.50	27%	1775.4	2.9%	38.7%
Latvia	0.36	1.83	20%	32.9	1.1%	0.3%
Lithuania	0.74	2.22	33%	55.4	1.3%	0.6%
Luxembourg	0.03	0.09	32%	73.3	0.0%	0.0%
Malta	0.1	0.34	29%	14.5	0.7%	0.1%
Netherlands	0.58	4.70	26%	1017	0.1%	0.4%
Poland	7.7	35.97	21%	574.3	1.3%	5.8%
Portugal	3.678	16.58	22%	211.3	1.7%	2.8%
Romania	5.9	29.39	20%	240.2	2.5%	4.5%
Slovakia	1.3	6.55	20%	97.1	1.3%	1.0%
Slovenia	0.54	2.48	22%	52	1.0%	0.4%
Spain	19.46	68.36	28%	1205.1	1.6%	14.7%
Sweden	0.8	3.30	24%	530.3	0.2%	0.6%
Total	132.14	503.09				

Source: I-Com elaboration on data provided on Italiadomani web portal for Italy, IOBE elaboration for Greece, IPP-Lisbon elaboration for Portugal, Elcano Royal Institute elaboration for Spain[21]. For the other Member States calculations are based on Bruegel's dataset https://www.bruegel.org/publications/datasets/european-union-countries-recovery-and-resilience-plans/

[21] The elaborations are included in the PromethEUs Joint Paper "DRIVING DIGITALISATION IN SOUTHERN EUROPE. The role of national Recovery and Resilience Plans and the current EU Policy Agenda", June 2022, available at https://www.prometheusnetwork.eu/wp-content/uploads/2022/07/PromethEUs_RRF_Digital_Joint-Paper_Final-Draft.pdf.

This paper analyses the digital pillar of the national RRPs to identify the key initiatives, examine the distribution of resources, assess the current state of implementation and define the main challenges in reaching the overall objectives.
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