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The progress towards the EU's Digital Decade ambition **Final Report**

Deloitte LLP

25 March 2022

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Executive Summary

Context, scope and purpose of the report

In the context of the EU's digital vision, this report provides an update on the EU's progress towards the Digital Decade targets, the status of the Recovery and Resilience Facility, and identifies policy enablers that alongside digital investment could help deliver the EU's digital ambitions.

Context for the report

The EU's 2030 Digital Compass sets out the ambition for the digital transformation of the EU and Digital Decade targets to measure progress towards that ambition.[1] The Recovery and Resilience Facility (RRF) is a temporary instrument intended to mitigate the impact of the pandemic while supporting digital and green investments.

A report published by Deloitte in June 2021 found that:[2]

- **The Digital Decade targets are ambitious** and will require Member States to make significant progress across each target area.
- **The gap between current and target levels of digitalisation varies greatly** across Member States, with each facing different challenges.
- **Further private and public investment** may be needed in certain areas to achieve targets, **in particular Infrastructure, Digital Skills and Businesses.**

Scope of the report

A year on from the launch of the RRF in February 2021, this report builds on the previous report published by Deloitte in June 2021 by:

- Providing an overview of **the current state of digitalisation** in the EU27 and **progress** made **towards the Digital Decade targets;**
- Summarising the progress of the RRF and the **digital investments** that are being made by Member States from the **RRF;**
- Identifying **key policy enablers**, that could help make digital investments more effective and unlock the further investment that is needed to support the digital transformation.

Purpose of the report

This report, commissioned by Vodafone, is intended to provide a basis for discussion of:

- Where **action** may be needed in order **to achieve the EU's digital targets.**
- What Member States have **already achieved** and how these achievements can **inform future investments.**
- How to **unlock the potential of the RRF** as an opportunity to stimulate digital and sustainable transformation.

1 European Commission 2 Deloitte (2021)

Key findings

The EU's digital vision is ambitious, and while progress is being made towards digitalisation targets, the scale and complexity of the digital transformation means that digital investments and policy enablers are key to realising the vision.

The EU's digital vision

The EU's digital vision presents the ambition for a prosperous digital future

- **The EU's vision** is to become **digitally sovereign** and to develop the **digital capabilities** to empower people and businesses.[1]
- Through its vision, the EU could support **the creation of new digital ecosystems** (e.g. smart cities, smart grids, e-government, e-health) that could generate significant economic, environmental and social benefits.

Digital Decade targets

Progress is being made towards the digital targets, but gaps remain

The Digital Decade targets provide a framework to measure the EU's digital transformation. Reaching the targets will be an important foundation for the vision to be realised.

- Across the EU27, **further progress has been made in reducing the gap** between current and target levels of digitalisation.
- In some areas **progress** towards targets appears to be **slower.**
- **In all areas the gap still exists**, and the size of the gap **varies across Member States.**

The RRF

The RRF is providing significant digital investment to help achieve the targets and realise the EU's vision

RRF funding to support investments is being released, and could support progress towards the Digital Decade targets and the EU Vision.[2] Further public and private sector investment will also be needed to achieve this.

- **21 Member States have started to receive RRF funding**, with 15% of total funding across Member States' RRPs having been disbursed.
- Around **€130bn of RRF funding** is allocated to **digital investments.**
- These investments will be phased and will both **take time to be completed and take effect.**

Key policy enablers

Policy could enhance the impact of planned digital investments and unlock the further investment that is needed

Key policy enablers to support digital investments and unlock the further digital investment that is needed to realise the EU's vision could include:

- **Co-ordination across government** to ensure digital investments are effectively targeted, synchronised, and timed.
- **Connecting digital ecosystems** so that digital investments are more effective in enabling digital ecosystems to emerge.
- **Demonstrating digital value** to help unlock further public and private sector digital investment.
- **Facilitating data sharing** to enable innovation and value creation from digital investments and, in turn, unlock further digital investment.

1 European Commission 2 European Commission

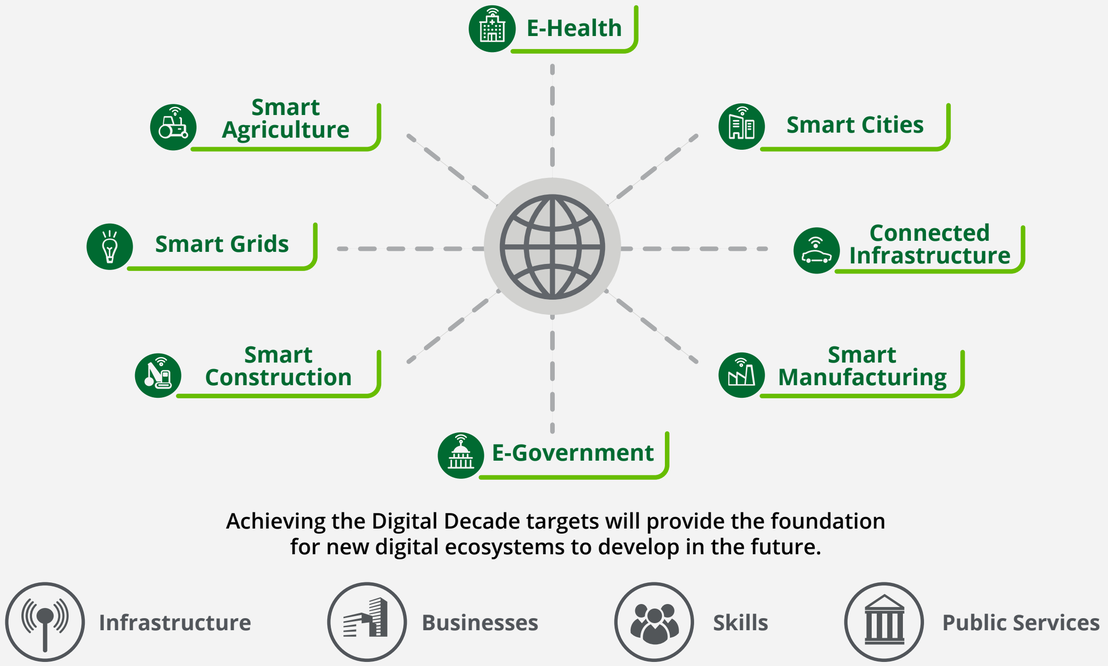
The EU's digital vision | Ambition for a prosperous digital future

The EU's vision is to help build the digital capabilities that empower people and businesses and create digital ecosystems that can generate significant economic, environmental and social benefits.

The EU's vision for a digital future

The EU has the vision to be **digitally sovereign** in an interconnected world by **building and deploying technical capabilities** that empower people and businesses to seize the potential of the digital transformation, and help build a **healthier and greener society**.[1]

New and emerging digital ecosystems



Benefits of digital ecosystems

Economic benefits: Productivity gains and innovation that drive economic growth.

The cumulative **additional GDP** contribution of **new digital technologies** could amount to **€2.2 trillion in the EU by 2030.**[2]

Environmental benefits: Energy efficiency and reduced emissions that support sustainability.

Technologies could help reduce emissions by 7 times more than the amount created by the ICT sector and could reduce global emissions by up to 15%.[3]

Social benefits: Inclusion and better quality of life for all citizens.

Usage-based insurance (UBI), coupled with Assisted driving technologies, which use real-time vehicle data, could help reduce the projected annual death toll of 2m from road accidents by 10% by 2025.[4]

1 European Commission: 2030 Digital Compass; 2 European Commission: Shaping the Digital Transformation in Europe; 3 European Commission: Supporting the Green Transition; 4 World Economic Forum

Digital Decade targets | Summary of progress towards the targets

While gaps still remain, further progress has been made towards the Digital Decade targets over the last year, in particular levels of Very High Capacity Network (VHCN) coverage and cloud computing adoption.

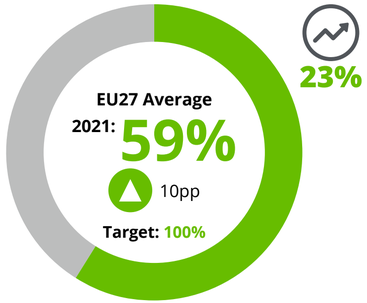
Key takeaways

- **In all areas the gaps** still exist and **vary across Member States.**
- **Progress has been made in reducing the gap** between current and target digitalisation levels over the last year, in particular in increasing **VHCN coverage and cloud computing adoption** (although gaps remain).
- In some areas, such as **business digital intensity and basic digital skills,** progress towards targets appears to be slower.
- **In some cases assessing indicators over a longer time horizon** (e.g. the next 3-4 years) may provide a **better indication of progress towards the targets**, given that planned digital investments will take time to feed through to the indicators (e.g. it may take several years for investments in digital skills to have a material impact on the number of ICT specialists).
- **Further support,** including investment, may be needed in areas that appear **furthest from the target** and/or where there has been **relatively slow progress** to the target.

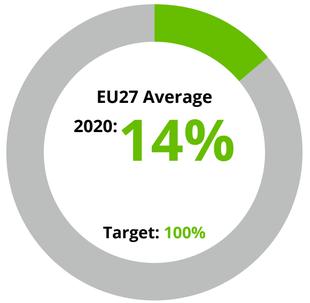
Digital Decade targets

Infrastructure

VHCN Coverage [1]

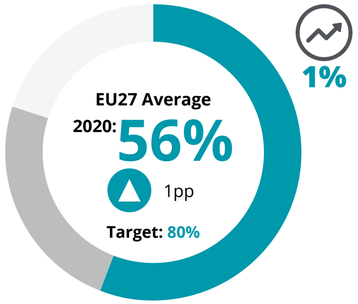


5G Coverage [2]

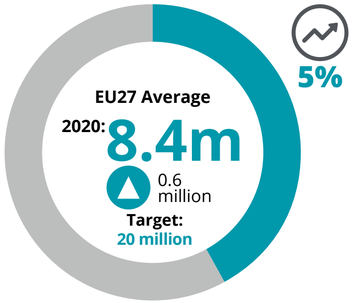


Skills

Adults with basic digital skills [5]

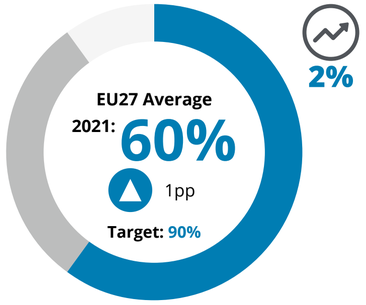


ICT Specialists [6]

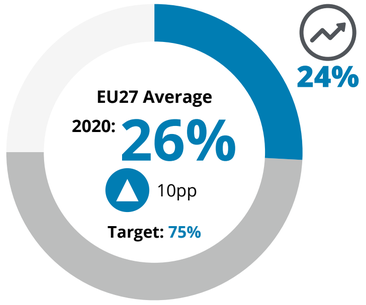


Businesses

Basic digital intensity [3]

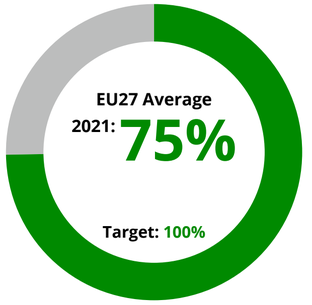


Cloud computing [4]



Public Services

Online Public Services [7]



Average annual growth rate across the past five years (2016-202). Note that data for all interim years is not available for some indicators and/or the average growth rate might take into account a shorter period than 5 years.

Percentage point increase (or increase in the number of ICT Specialists) in the last year for which data is available. Due to data limitations, the number for basic digital intensity and cloud computing represents the change in the last two years.

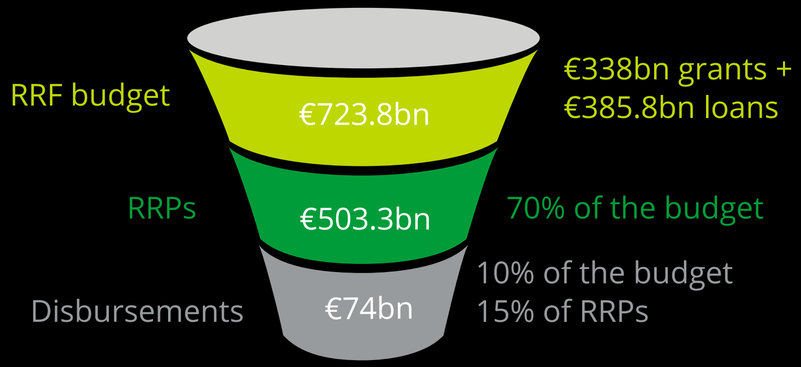
1 DESI; Share of households covered by VHCN; 2 DESI; 5G mobile broadband coverage (% of households). Historic data not available; 3 Eurostat (DII) & DESI; The Digital intensity Index (DII) measures the availability at firm level of 12 different digital technologies; 4 Eurostat; Share of enterprises using at least one cloud computing service; 5 DESI; 6 Eurostat 7 DESI; Share of administrative steps that can be done online for major life events. Historic data not available.
Note: The data represents the latest data available for each indicator. Where 2021 data is not available, data from the latest year available is considered.

The RRF | The disbursement of funding

21 Member States have started to receive RRF funding, with around 15% of total funding across Member States' RRPs having been disbursed, some of which is already being used for digital investments.

Some funding has already been disbursed, but there will be an update to the allocation of grants to reflect changes in GDP growth

- Of the €503.3bn in the RRPs, €74bn (15%) has been distributed to Member States so far. Some of this funding has already been used for digital investments.
- 30% of the grants in RRPs (€101.4bn) are expected to be reallocated to reflect variations between forecast and actual GDP growth, with Member States impacted differently.
- Based on the latest GDP forecasts (published in November 2021), Ireland, Romania and the Netherlands may see the largest relative decreases in grants while Germany, Portugal and Spain may see the largest relative increases.[1]



Member States are at different stages of the process to access RRF funds.

1Based on the European Commission's Autumn 2021 GDP forecasts, European Commission

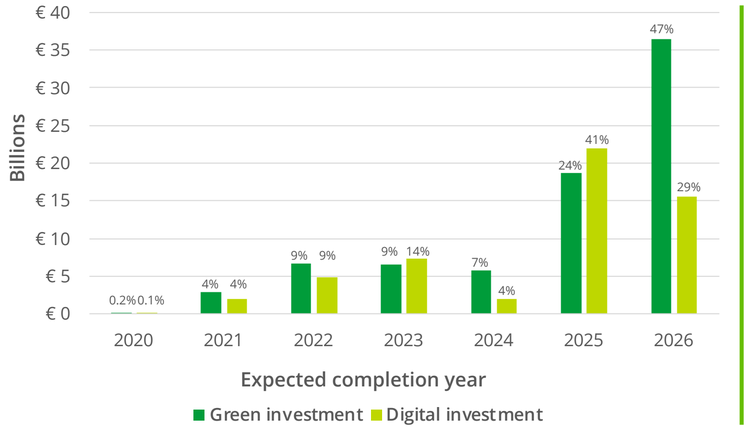
The RRF | Digital and green RRP investments linked to the Digital Decade targets

Around €130bn of RRF funding is allocated to digital investments, with some of the largest digital investments focussed on digital health, infrastructure and SME digitalisation; these investments will be phased and take time to be completed and take effect.

The completion of digital and green projects will take time as most investments will be spread over several years and will be completed towards the end of 2025/26.

Based on the investment timeline, it might take some time until the digital progress enabled through those investments will be reflected in the Digital Economy and Society Index (DESI) score.

Figure 1: **Investment profile of digital and green investment for six of the seven selected Member States**
(incremental proportion of digital/green funding completed over time)[1]



Member States are investing large amounts in digital health, digital skills, the digitalisation of SMEs, and the deployment of digital infrastructure, contributing towards achieving the Digital Decade targets.

Digital expenditure across Member States amounts to 26% of the RRF funding linked to RRPs, around €130bn.[2]

Examples of some of the largest digital investments planned

Selected Member States [3]

Digital health & e-medical records

France

Digital Health
Expected investment completion year: 2024

€2bn
24% of total digital investment

Digitalisation of SMEs

Spain

Digitalisation and innovation of SMEs
Expected investment completion year: 2025

€3.5bn
18% of total digital investment

Digital Skills

Czechia

Digital Schools
Expected investment completion year: 2026

€0.2bn
11% of total digital investment

Digital infrastructure

Italy

Plan Italia 1Gpbs
Expected investment completion year: 2026

€3.9bn
9% of total digital investment

Details on green and digital investments and the Digital Decade targets that those investments address for each of the seven Member States can be found on pages 42 and 43.[3]

Note: 1 Investment year refers to the expected completion date of investment projects and does not show when investments are being carried out (due to data limitations). Some investments may be spread over multiple years. Information is based on the review of the European Commission's RRP assessments and analyses for seven selected Member States; Public information on the investment profile for Italy was limited and ,therefore, it is excluded from the chart. 2 European Commission; 3 The Member States were selected on the basis that they have the highest absolute level of funding, of those Member States whose RRPs contain the relevant information to undertake the analysis.

Key Policy enablers | Proposed key enablers to deliver the EU's 2030 vision

Policy can play a key role in making these digital investments more effective and help unlock the further investment that is needed to support the digital transformation.

Key policy enablers l Enhancing the impact of planned digital investments and unlocking the further investment that is needed

Four key policy enablers have been identified based on a literature review and interviews with policymakers and industry experts.
The following sets out potential policy measures for each enabler.

Co-ordination across government to ensure digital investments are effectively targeted, synchronised, and timed.

Creating a whole-of-government coordinator	Using cross-government liaison offices and events	Developing aligned cross-government Key Performance Indicators (KPIs)

"It's critical to have aligned incentives across government at the central, regional and local authority level"

General Director of an Association for Digitalisation

Connecting digital ecosystems so that digital investments are more effective in enabling digital ecosystems to emerge.

Creating forums for public / private collaboration	Trials and testing facilities for industry collaboration	Creating task forces to help facilitate collaboration

"Building connections and enabling knowledge sharing between private entities is crucial"

Managing partner of a public investment fund

Demonstrating the value of digitalisation to help unlock further public and private sector digital investment.

Creating pilot schemes as proof of concept	Using case studies as benchmarks	Developing measurement frameworks

"A significant amount of our RRF budget for digital development will be invested in a pilot project to support SMEs"

Assistant Secretary of a Member State's Department for Business

Facilitating data sharing to enable innovation and value creation from digital investments and, in turn, unlock further digital investment.

Reducing process complexity	Safeguarding the sharing of data	Creating local data platforms

"Exchanging data between public service systems is key for the digitalisation of the country. This relies on having interoperable standards and systems for data sharing"

Member of a Member State's Parliament

2.
Introduction

The Context | The EU's digital vision, targets and funding

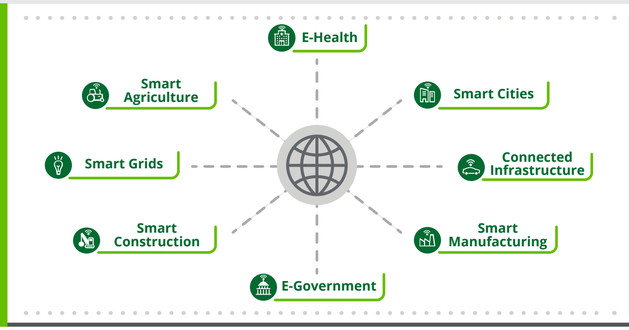
The EU's digital vision is to develop the digital capabilities that empower citizens and businesses; the Digital Decade targets provide a framework to measure progress towards that vision; RRF funding can contribute significantly towards delivering it.

The EU's digital vision presents the ambition for a prosperous digital future

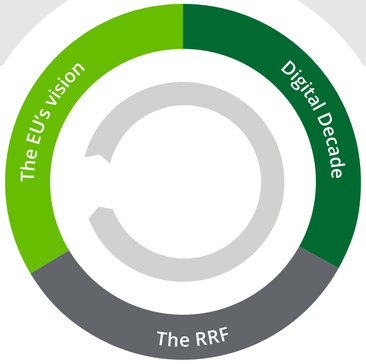
The EU's vision is to become digitally sovereign and develop the digital capabilities to empower people and businesses.[1]

The vision will involve creating new digital ecosystems that could generate significant benefits. For example, new digital technologies could contribute €2.2 trillion to the EU GDP by 2030[2] and the ICT sector could reduce global emissions by up to 15%.[3]

Examples of digital ecosystems



- Economic benefits
- Environmental benefits
- Social benefits



The Digital Decade targets transform the vision into measurable objectives

The Digital Decade targets evolve around four key areas, Infrastructure, Skills, Business and Public Services and form the foundation of the EU's vision and the development of digital ecosystems.

The Digital Decade targets translate the digital ambitions into measurable targets against which progress towards the digital transformation can be assessed.[1]

Digital Decade targets

Infrastructure

100% coverage of fixed gigabit and 5G networks

Skills

80% of adults having basic digital skills and 20m EU ICT specialists

Businesses

75% of enterprises to be using cloud, big data and AI and 90% digitalised SMEs

Public Services

100% of public online services, 100% e-medical records and 80% e-IDs

The RRF provides financial resources to support the twin transition

The RRF seeks to facilitate the EU's digital and green transition. The RRF provides funding for digital investments, which alongside supporting policies, could help to progress towards the Digital Decade targets and the EU's vision of a digital future.[4]

€130bn of the total value of RRPs of €503bn is targeted towards digital projects, including investment in e-health, the digitalisation of businesses and the digital transformation of public services.[5]

1 European Commission: 2030 Digital Compass; 2 European Commission: Shaping the Digital Transformation in Europe; 3 European Commission: Supporting the Green Transition; 4 European Commission: The RRF; 5 European Commission: The RRF Scoreboard

The Context | The previous Deloitte study

Deloitte's previous study found that Member States were committing significant investment to the digital transformation in their RRPs; further private and public investment may be needed in certain areas to achieve targets in particular Infrastructure, Digital Skills and digitalisation of businesses.

Key findings from previous report

In the context of the European Commission's (EC) assessment of RRPs, a Deloitte study published in June 2021 assessed the progress towards the Digital Decade targets and the contribution of RRPs towards achieving those targets. This report found:

- **The Digital Decade targets are ambitious** and will require each Member State to make significant investments across each of the targeted areas over the coming years.
- **The gap between current and target levels of digitalisation varies greatly** across Member States, with each facing different challenges.
- The plans of **20 Member States** that were reviewed, committed **significant investment of around €154bn towards digital transformation** (27% of the total) across the RRPs. Of this amount, up to **€131bn** appeared to be **directly linked to achieving the Digital Decade targets.**[2]
- It is uncertain whether this will be sufficient to achieve the targets, particularly for those Member States that are furthest from the targets.
- **Further private and public investment may be needed in certain areas to achieve targets in particular Infrastructure, Digital Skills and digitalisation of Businesses.**

This report

A year on from the launch of the RRF in February 2021, this report builds on the previous report by:

- Providing an update on the **current state of digitalisation** in the EU27 and how Member States have **progressed towards the Digital Decade targets.**
- Providing an overview of **the progress of the RRF** and the large **digital and green investments** that are being made by selected Member States.
- Identifying **key policy enablers** that could help make digital investments more effective and unlock the further investment that is needed to support the digital transformation.

1 Deloitte, The contribution of NRRPs to achieving Europe's Digital Decade ambition, June 2021 2 Figures are in 2018 EUR

Overview of the approach for this study

The analysis assesses the progress of Member States against the Digital Decade targets, supported by high level analysis of relevant DESI indicators and the European Commission's assessment of individual Member State plans and progress.

Section 3 measures the progress towards the Digital Decade targets using DESI indicators

The latest DESI indicators are used to provide an indicative measure of how Member States are progressing towards achieving the Commission's Digital Decade targets as set out by the Digital Compass.

Section 4 provides a status update of the RRF and a review of the European Commission's RRP assessments to date

The Commission has produced detailed summaries of each Member State's RRP, total RRF funding and the funding linked to the specific target areas. This information is used to highlight where Member States are in the RRF process, how much funding has been disbursed, and some of the largest funding programmes that might contribute to achieving the Digital Decade targets.

Section 5 identifies key policy enablers

Interviews with policy makers and industry stakeholders were conducted alongside a literature review to identify key policy enablers that could support the digital transition.

Limitations of analysis

- **The analysis in this report was completed on 11 March 2022, and has not been updated for events or announcements subsequent to that date.**
- **Some of the analysis only covers a subset of Member States and may therefore not be indicative of the EU27 as a whole.**
- **The analysis relies on the Commission's assessment of Member States; individual RRPs were not reviewed.**
- **The analysis does not reflect any draft or proposed legislation and regulation of the European Parliament and theCouncil in relation to the RRF.**
- **In some instances, DESI indicators used in the first report have changed or are no longer available; where relevant, alternative indicators were used.**
- **The data used represents the latest data available for each indicator. Where 2021 data is not available, data from the latest year available was considered.**

Member States covered in this analysis:

The analysis in this report covers the EU27 at an aggregate level. In addition, a more detailed analysis has been conducted for 12 selected Member States.

Member States covered in country-level analysis

Czechia	Germany	Hungary
France	Greece	Ireland
Italy	Poland	Romania
Netherlands	Portugal	Spain

In some sections of this report, a subset of these Member States are covered. The rationale for this is provided in the relevant section.

Note: See Annex 1 for a list of sources and further details on the approach adopted to linking the RRF, the Digital Decade Targets and DESI Indicators together.

3.

Progress towards the Digital Decade targets

Progress towards the Digital Decade targets | Overview

This section provides a summary of the current stage of digitalisation across the EU27 and the progress made towards the Digital Decade targets.

Structure of this section

This section sets out the progress of the EU27 as a whole and selected Member States towards key Digital Decade targets, covering each of the following areas:

- **Infrastructure**
- **Skills**
- **Businesses**
- **Public Services**

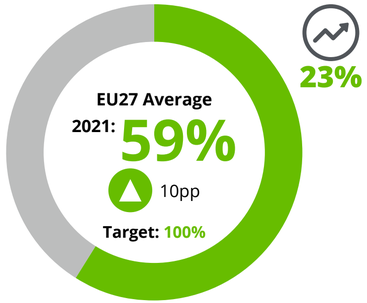
Key takeaways

- **In all areas the gaps still** exist a**nd vary across Member States.**
- **Progress has been made in reducing the gap** between current and target digitalisation levels over the last year, in particular in increasing **VHCN coverage and cloud computing adoption** (although gaps remain).
- In some areas, such as **business digital intensity and basic digital skills, progress** towards targets appears to be **slower.**
- **Further support**, including investment, may be needed in areas that appear **furthest from the target** and/or where there has been **relatively slow progress** towards the target.

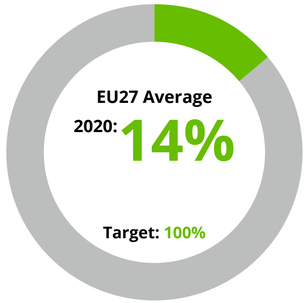
Digital Decade targets

Infrastructure

VHCN Coverage [1]

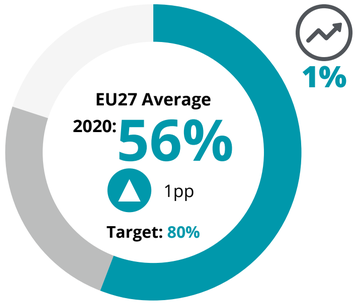


5G Coverage [2]

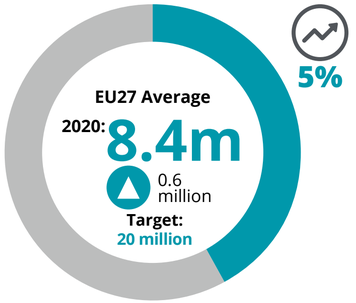


Skills

Adults with basic digital skills [5]

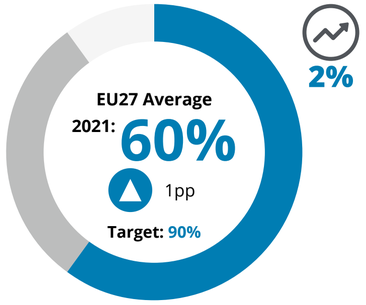


ICT Specialists [6]

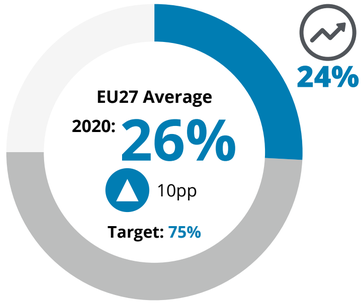


Businesses

Basic digital intensity [3]

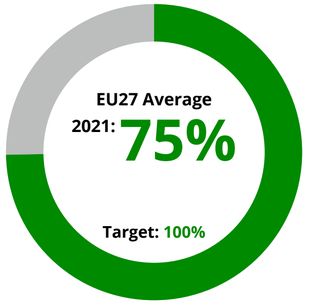


Cloud computing [4]



Public Services

Online Public Services [7]



Average annual growth rate across the past five years (2016-202). Note that data for all interim years is not available for some indicators and/or the average growth rate might take into account a shorter period than 5 years.

Percentage point increase (or increase in the number of ICT Specialists) in the last year for which data is available. Due to data limitations, the number for basic digital intensity and cloud computing represents the change in the last two years.

1 DESI; Share of households covered by VHCN; 2 DESI; 5G mobile broadband coverage (% of households). Historic data not available; 3 Eurostat (DII) & DESI; The Digital intensity Index (DII) measures the availability at firm level of 12 different digital technologies; 4 Eurostat; Share of enterprises using at least one cloud computing service; 5 DESI; 6 Eurostat 7 DESI; Share of administrative steps that can be done online for major life events. Historic data not available.
Note: The data represents the latest data available for each indicator. Where 2021 data is not available, data from the latest year available is considered.

3.1

Infrastructure

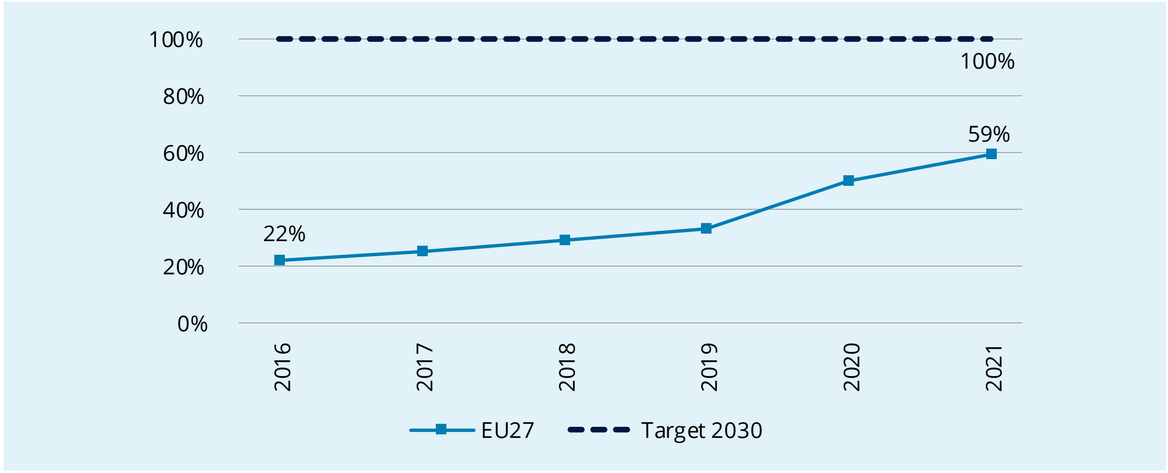
Review of progress towards targets on Very High Capacity Networks (VHCN) and 5G coverage

Infrastructure | Very High Capacity Networks (VHCN)

The rollout of VHCN in the EU27 has increased in the last year; further support will be needed to enable further deployment, particularly in rural areas.

- Overall, the proportion of households covered by VHCN has increased across the EU27 in the last year. In 2021, the proportion of EU27 households covered by VHCN reached 59% compared to 50% in 2020, leaving the EU27 41 percentage points below the 100% target.
- VHCN coverage has increased in all of the 12 Member States that were reviewed. Ireland, Germany and France have seen the biggest percentage point increases in VHCN coverage across the 12 Member States.
- Nevertheless, there could be challenges for most, if not all, Member States in reaching 100% VHCN coverage, for example, due to high costs and operational challenges in deploying to remote areas. Funding from the RRF and national broadband plans may help to overcome some of these challenges.

Figure 2: **VHCN (% of households covered)**



Source: DESI (VHCN); Note: The data represents the latest data available for each indicator. Note: Where 2021 data is not available, data from the latest year available is considered.

Table 1: **VHCN household coverage**

	Member State	VHCN Coverage 2021	Percentage point increase from prior year (2020)	Gap to Digital Decade target (Percentage points)
HIGHEST	Spain	**92%**	3	8
	Netherlands	**90%**	1	10
	Portugal	**87%**	4	13
	Ireland	**83%**	50	17
	Romania	**76%**	8	24
	Poland	**65%**	4	35
	Germany	**56%**	23	44
	France	**53%**	9	47
	Hungary	**49%**	6	51
	Italy	**34%**	4	66
	Czechia	**33%**	4	67
LOWEST	Greece	**10%**	3	90

Figures may not add up to 100% due to rounding.

Source: DESI (VHCN)

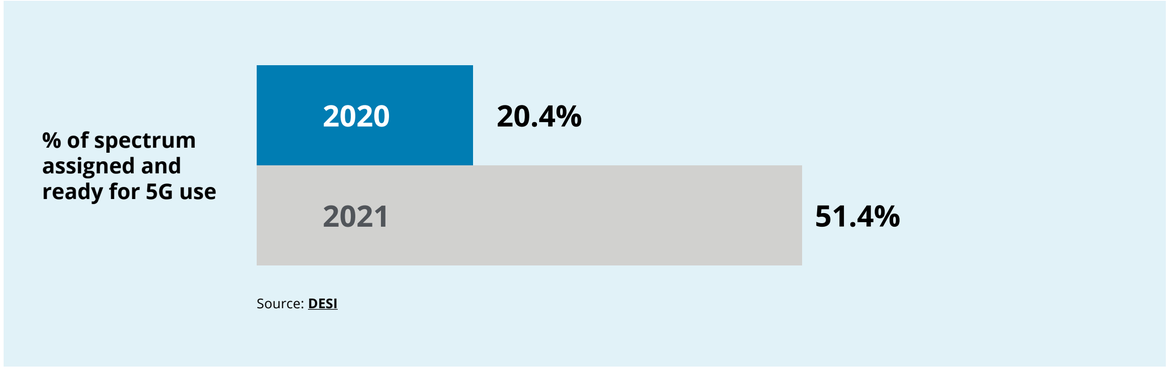
Countries that have recorded the highest growth in the past year are highlighted in blue.

Infrastructure | 5G coverage

5G coverage varied significantly across Member States in 2020. Further 5G spectrum awards over the last few years could help increase levels of coverage although, to meet the targets, significant investment will still be required.

- The EU's ambition, as set out by the Digital Decade targets, is for all Member States to have 5G coverage in all urban areas, major roads and railways by 2025 and all populated areas by 2030.
- Based on the European Commission's digital scoreboard, 5G population coverage across the EU27 as a whole was estimated at 14% in 2020.[1] Member States are progressing at a different pace, with some such as the Netherlands and Ireland positioned relatively closer to the 2030 coverage target.
- Since these coverage figures were reported in 2020, 5G has been launched and 5G coverage has increased in several Member States. The increase in spectrum assigned and ready for 5G use may have facilitated this in some cases.
- However, considering the significant deployment costs involved to cover geographically remote areas, achieving the targets, and in particular the 2030 coverage target, could require significant public and private sector investment and collaboration.

Figure 3: **Spectrum assigned and ready for 5G use has increased which could support increased 5G coverage.**



Source: **DESI**

Table 2: **5G mobile broadband coverage (% of households)**

	Member State	5G mobile broadband coverage (2020)	Gap to 2030 Digital Decade target (Percentage points)
HIGHEST	Netherlands	**80%**	20
	Ireland	**30%**	70
	Germany	**18%**	82
	Spain	**13%**	87
	Romania	**12%**	88
	Poland	**10%**	90
	Italy	**8%**	92
	Hungary	**7%**	93
	Greece	**0%**[2]	100
	France	**0%**[2]	100
	Portugal	**0%**[2]	100
LOWEST	Czechia	**0%**[2]	100

Note: Data for 2021 was not available at the time of publication. Source: **DESI**

In many cases the reported 5G coverage levels are understood to be provided through non-standalone (NSA) 5G network architecture. This may not deliver the full extent of network performance and features (e.g. ultra-high capacity, low latency and high reliability network services) required to support some use cases. Standalone (SA) 5G deployments are expected to deliver this but are likely to require significant additional investment.

1 DESI; 2 Spectrum identified for 5G deployment was either recently awarded or was still to be awarded at the time the estimate was reported, which contributed to 5G not being launched. Note: The data represents the latest data available for each indicator. Where 2021 data is not available, data from the latest year available is considered.

3.2

Skills

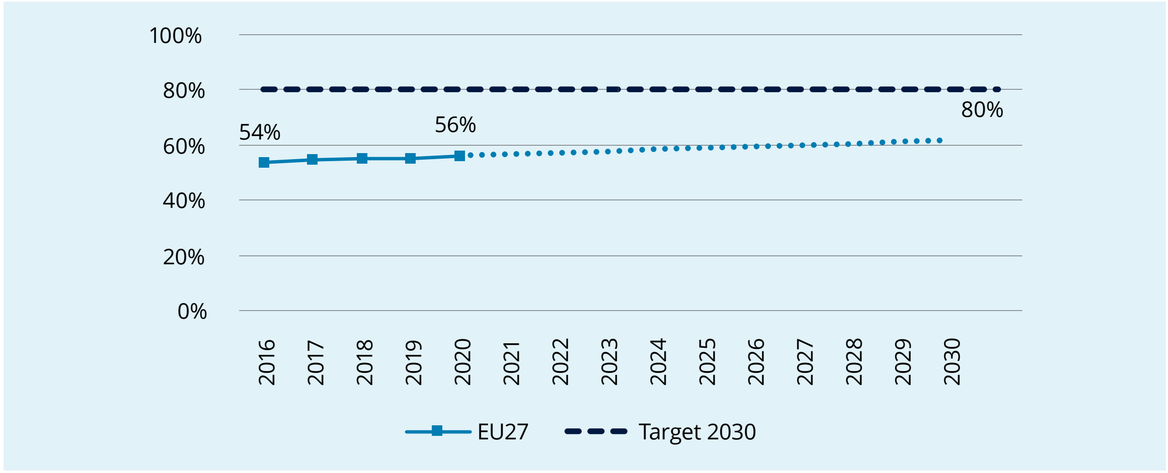
Review of progress towards targets on Adult Basic Digital Skills and ICT Specialists

Skills | Adult Basic Digital Skills

The proportion of adults with digital skills has increased marginally, but meeting the 2030 target will require an acceleration in digital upskilling over the next decade.

- The proportion of adults with at least a basic level of digital skills in the EU27 has increased marginally in the past four years. In 2020, the average proportion of adults with basic digital skills was 56%, 24 percentage points lower than the 80% target.
- The majority of the Member States studied have seen a relatively small increase in the share of adults equipped with basic digital skills. Ireland and Greece experienced the highest percentage point increase between 2019 and 2020, with the share of adults with digital skills increasing by 5.7 and 4.4 percentage points, respectively.
- Achieving and then sustaining widespread digital skills will require continued investment in education and training, including for those Member States that already have relatively high digital skill penetration.

Figure 4: **Individuals with at least basic digital skills (% of population aged 16-74)**



Illustrative projection to 2030 estimated using a simple linear forecast based on historic data from 2016 to 2020
Source: DESI, Deloitte analysis. Dotted lines represent indicative projections based on a linear regression.
Note: The data represents the latest data available for each indicator. Where 2021 data is not available, data from the latest year available is considered.

Table 3: **Share of adult population with at least basic digital skills**

	Member State	Adults with at least basic digital skills (2020)	Percentage point increase from prior year (2019)	Gap to Digital Decade target (Percentage points)
HIGHEST	Netherlands	**79%**	-0.1	1
	Germany	**70%**	2.0	10
	Czechia	**62%**	2.2	18
	France	**57%**	0.2	23
	Spain	**57%**	2.4	23
	Ireland	**53%**	5.7	27
	Portugal	**52%**	1.5	28
	Greece	**51%**	4.4	29
	Hungary	**49%**	-0.9	31
	Poland	**44%**	-1.9	36
	Italy	**42%**	-2.1*	38
LOWEST	Romania	**31%**	1.9	49

*Figures may not add up to 80% due to rounding. *Percentage point difference from 2017 value*

Source: **DESI**

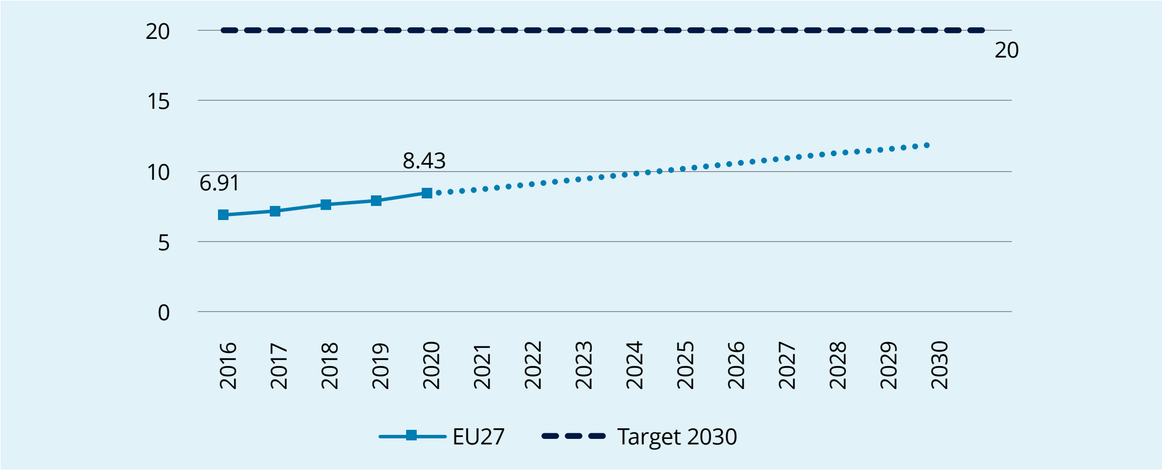
Countries that have recorded the highest growth in the past year are highlighted in blue.

Skills | ICT Specialists

The number of ICT Specialists across the EU27 as a whole has increased by around 22% over the past four years; meeting the 2030 target will require an acceleration in upskilling and training over the coming years.

- The number of ICT specialists across the EU27 as a whole has been increasing over the past four years and currently stands at 8.43 million. Nevertheless, the number needs to more than double by 2030 in order to hit the 20 million target. Continued investment, including through the RRF, in education and training could be needed to achieve the target.
- The number of ICT specialists has increased across most of the Member States, with Germany, Ireland and Hungary experiencing the highest growth in the number of ICT Specialists in the past year.

Figure 5: **Number of ICT Specialists (millions)**



Illustrative projection to 2030 estimated using a simple linear forecast based on historic data from 2016 to 2020
Source: Eurostat , Deloitte analysis. Dotted lines represent indicative projections based on a linear regression.
Note: The data represents the latest data available for each indicator. Where 2021 data is not available, data from the latest year available is considered.

Table 4: **Number of ICT specialists by Member State (millions)**

	Member State	ICT Specialists 2020 (million)	% Change from prior year (2019)	Member State-specific target (million)	Gap to Digital Decade target (million)
HIGHEST	Germany	**1.95**	15%	3.72	1.77
	France	**1.22**	8%	3.01	1.79
	Italy	**0.83**	1%	2.67	1.84
	Spain	**0.73**	2%	2.12	1.39
	Poland	**0.55**	8%	1.70	1.15
	Netherlands	**0.53**	4%	0.78	0.25
	Czechia	**0.22**	3%	0.48	0.26
	Romania	**0.20**	3%	0.86	0.66
	Portugal	**0.19**	9%	0.46	0.27
	Hungary	**0.17**	12%	0.44	0.27
	Ireland	**0.13**	15%	0.22	0.09
LOWEST	Greece	**0.08**	-1%	0.48	0.40

Figures may not add up to the target due to rounding. Source: **Eurostat**

State share of the total EU ICT specialists target (20m) has been apportioned based on population share.
Countries that have recorded the highest growth in the past year are highlighted in blue.

3.3

Businesses

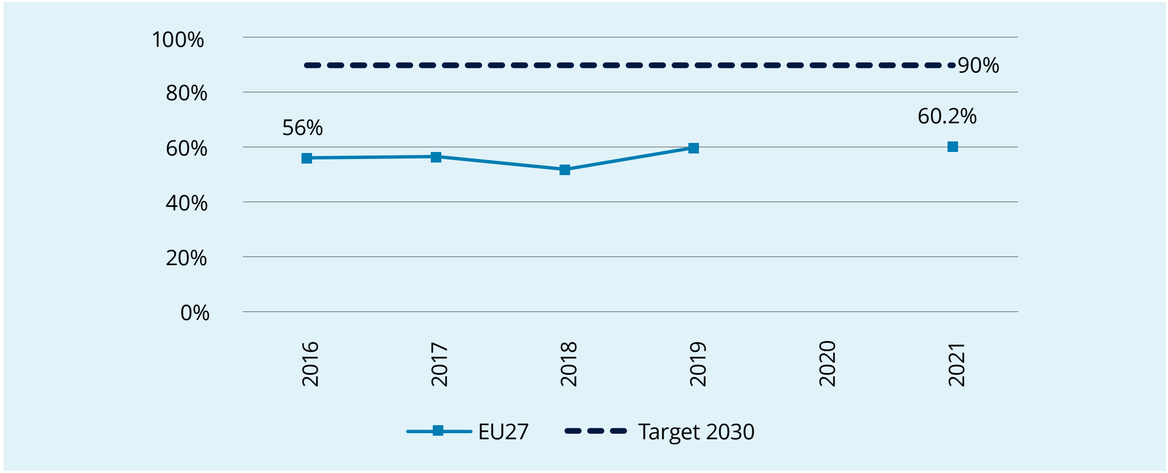
Review of progress towards targets on Digital Intensity of SMEs, and Cloud Computing

Businesses digitalisation | Digital Intensity of SMEs

Digital intensity of SMEs has remained relatively flat over the past four years; Member States could need an acceleration in the digital intensity growth of businesses to meet the Digital Decade aspirations in this area.

- The level of digital intensity appears to be stable over the past three years. The share of SMEs with at least a basic level of digital intensity is 60% in 2021, around 30 percentage points below the target set by the Commission.[1]
- Italy and Poland have seen the highest growth in digital intensity in the past year. Other Member States such as the Netherlands, Italy and Ireland were the closest to the target in 2021. Member States may need to continue to invest to support progress towards reaching the 2030 target.
- In addition to the Digital Intensity Index used in the first report for the years 2016-2019, the DESI has been updated and includes data for the year 2021 which is used in this analysis. The different sources may explain some discrepancies in the data from 2019 to 2021.

Figure 6: **SMEs with at least basic level of digital intensity (%)**



Source: Eurostat (DII) & DESI Note: Data for 2020 not available.
1The Digital intensity Index (DII) measures the availability at firm level of 12 different digital technologies including access to fast broadband (30 Mbps or above) and ICT specialists. SMEs having a score of 4 or higher out of a 12-point scale are considered as having at least a basic digital intensity.
Note: The data represents the latest data available for each indicator. Where 2021 data is not available, data from the latest year available is considered.

Table 5: **SMEs with at least basic digital intensity**

	Member State	SMEs with basic digital intensity (2021)	Percentage point increase from prior year (2019)	Gap to Digital Decade target (Percentage points)
HIGHEST	Netherlands	**75%**	4	15
	Italy	**69%**	11	21
	Ireland	**66%**	-3	24
	Spain	**62%**	-1	28
	Germany	**62%**	-5	28
	Czechia	**59%**	-14	31
	France	**55%**	-2	35
	Poland	**52%**	14	38
	Portugal	**51%**	-9	39
	Hungary	**46%**	4	44
	Romania	**33%**	1	57
LOWEST	Greece	**32%**[2]	-	58[2]

Figures may not add up to target due to rounding. Source: **DESI**

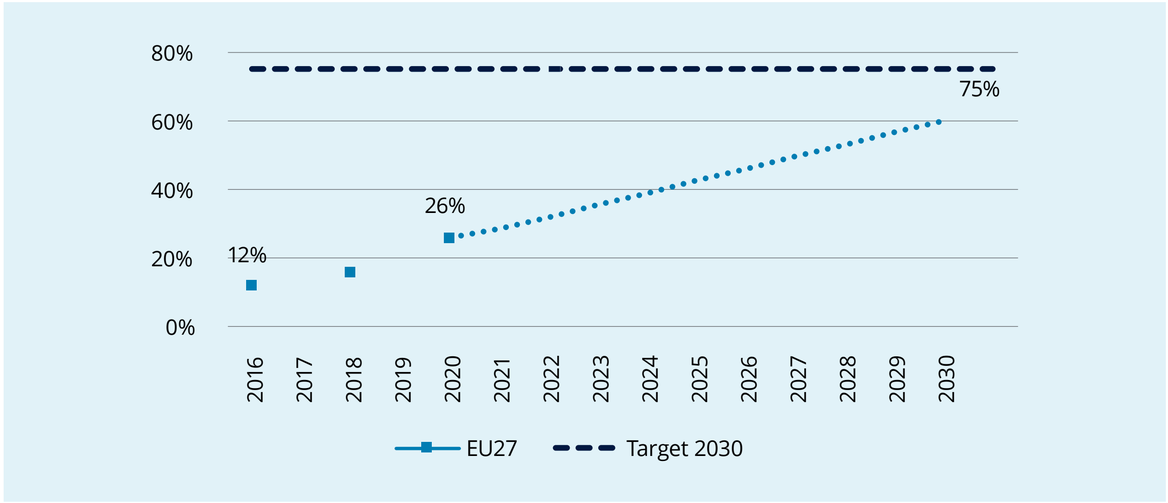
2 Data for 2021 is not available for Greece therefore 2019 data is used.
Countries that have recorded the highest growth in the past year are highlighted in blue.

Businesses digitalisation | Cloud Computing

The share of enterprises using cloud computing has increased across all Member States in the past four years, yet the adoption of cloud computing may need to accelerate to meet the target by 2030.

- The share of enterprises using cloud computing services has more than doubled between 2016 and 2020 and is currently at 26% across the EU27.[1] Despite sustained growth in cloud adoption, the EU27 may need to accelerate adoption to meet the Digital Decade target by 2030.
- The share of enterprises using cloud computing has increased across all the Member States studied from 2018 to 2020. Ireland has recorded the highest growth of cloud adoption since 2018, while the proportion of enterprises in some Member States such such as Italy and Poland, has more than doubled during the period.

Figure 7: **Businesses using Cloud Computing (%)**



Illustrative projection to 2030 estimated using a simple linear forecast based on historic data from 2016 to 2020
Source: Eurostat, Deloitte analysis. Dotted lines represent indicative projections based on a linear regression
1 Cloud computing services refers to the hosting of the enterprise's database, accounting software applications, CRM software and computing power.
Note: The data represents the latest data available for each indicator. Where 2021 data is not available, data from the latest year available is considered.

Table 6: **Share of enterprises using cloud computing**

	Member State	Enterprises using cloud computing (2020)	Percentage point increase from prior year (2018)	Gap to Digital Decade target (Percentage points)
HIGHEST	Netherlands	**47%**	5	28
	Ireland	**41%**	8	34
	Italy	**38%**	23	37
	Spain	**22%**	6	53
	Portugal	**21%**	5	54
	France	**21%**	6	54
	Czechia	**20%**	4	55
	Germany	**20%**	8	55
	Hungary	**17%**	6	58
	Poland	**15%**	8	60
	Romania	**13%**	6	62
LOWEST	Greece	-	-	-

Figures may not add up to target due to rounding. Source: **Eurostat**

Countries that have recorded the highest growth in the past year are highlighted in blue.

3.4

Public Services

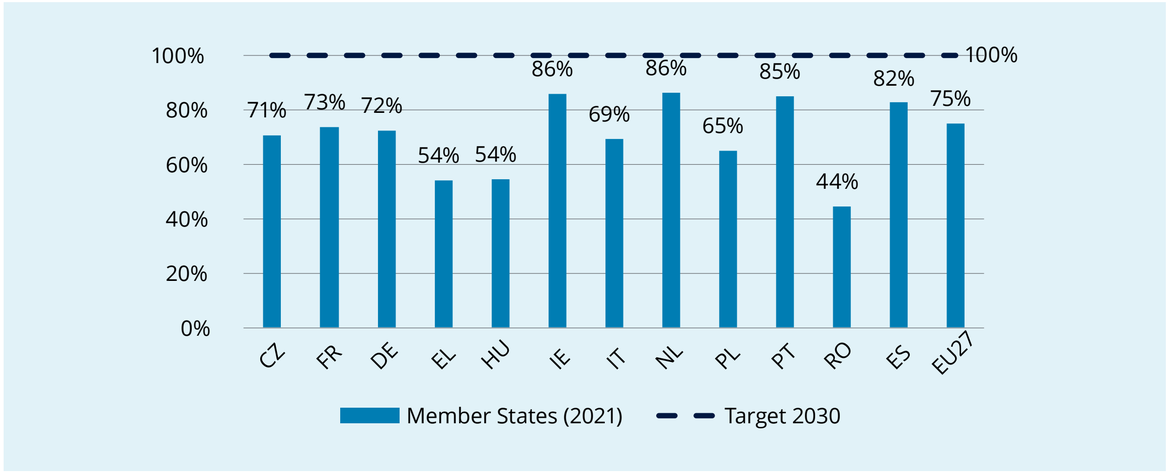
Review of progress towards targets on Digital Public Services for Citizens, and E-medical Records and E-IDs

Public Services | Digital Public Services for Citizens

Member States vary in terms of their gap to the Digital Decade targets; meeting the target by 2030 may need an acceleration in the provision of digital public services across all Member States.

- Across the EU27 as a whole, the average share of administrative steps that can be done online for citizens is 75% (25 percentage points below the 2030 target).
- Some Member States such as the Netherlands, Ireland and Portugal appear to be close to the target with 86%, 86% and 85% of public service administrative steps available online for citizens, respectively. Nevertheless, there will need to be significant growth in the provision of digital public services in all Member States if the Digital Decade target is to be met by 2030.
- It is worth noting that the indicator currently used is different to the 'online service completion' metric used in the previous Deloitte report. Although very similar, the data presented in each indicator is not comparable and therefore previous years covered by the 'online service completion' indicator were not considered in this analysis.

Figure 8: **The share of administrative steps that can be done online for major life events for citizens (%)**



Source: DESI
Note: Digital public services include among others registering a business and family related support.
Note: The data represents the latest data available for each indicator. Where 2021 data is not available, data from the latest year available is considered.

Table 7: **Share of administrative steps that can be done online**

	Member State	Digital public services (2021)	Gap to Digital Decade target (Percentage points)
HIGHEST	Netherlands	**86%**	14
	Ireland	**86%**	14
	Portugal	**85%**	15
	Spain	**82%**	18
	France	**73%**	27
	Germany	**72%**	28
	Czechia	**71%**	29
	Italy	**69%**	31
	Poland	**65%**	35
	Hungary	**54%**	46
	Greece	**54%**	46
LOWEST	Romania	**44%**	56

Note: Historic data is not available

Source: **DESI**

Public Services | E-medical Records and E-IDs

Currently 10% of individuals across the EU27 access medical records online and 60% of the EU27 population can use their national e-IDs cross-border.

There are currently no direct metrics available to track the progress of Member States towards the E-medical records and Electronic identification (e-ID) Digital Decade targets. However alternative relevant metrics are considered to provide an indication of the progress in these areas.

E-medical record target

10%

Of individuals in the EU27 access personal health records online in 2020.

Source: **Eurostat**

56%

Of individuals in the EU27 seek health information online in 2020;

▲ *Three percentage point higher than in 2019*

21%

Of individuals make an appointment with a practitioner via a website in 2020;

▲ *Three percentage point higher than in 2018*

- The Commission has set a target for all citizens to have access to e-medical records by 2030 as part of the EU's digitalisation ambitions.
- While data on the accessibility of e-medical records is not available:
  - 10% of individuals in 2020 access personal health records online.[1]
  - 56% of individuals in the EU27 seek health information online in 2020.[1]
  - 21% of individuals make an appointment with a practitioner via a website in 2020.[1]

E-IDs target

- Ensuring that all citizens within the EU are able to obtain an E-ID by 2030 is among the ambitions of the Commission.
- The provision of e-IDs could be considered an enabler of digital public services. As a result, governments might consider progress towards the targets simultaneously.
- While data on e-IDs accessibility is not currently available, according to the Commission, currently:
  - 60% of the EU27 population in 14 Member States can use their national e-IDs cross-border; and
  - 14% of key public service providers across all Member States allow cross-border authentication with an e-ID system.[2]

1 Eurostat 2 European Digital Identity, European Commission (europa.eu)
Note: The data represents the latest data available for each indicator. Where 2021 data is not available, data from the latest year available is considered.

4.

Status of the Recovery and Resilience Facility (RRF)

Status of the Recovery and Resilience Facility | Overview

This section provides an overview of the progress of the RRF and how the RRPs of selected Member States could contribute to the Digital Decade targets presented in the previous section.

Structure of this section

This section considers how the RRF funding of investments set out in RRPs could contribute to the Digital Decade Targets. This section is structured as follows:

- **The RRF Process** to gain access to funds is set out including where each Member State finds itself in the process.
- **RRF funding and disbursements** are presented including how the planned update of 30% of grants may impact the RRPs of twelve selected Member States.
- **The progress on digital and green investments** is assessed based on a review of the Commission's assessments of the RRPs of seven selected Member states.

Summary of progress in each key area

The RRF Process

Member States are at different stages of the process to access RRF funds

21 Member States have started receiving RRF funding. Most Member States have just received the initial payment to kick-start their planned investments and reforms.

RRF funding and disbursements

The funds disbursed to Member States (€74bn) represent 10% of the total RRF budget (€723.8bn) and 15% of the funds in RRPs (€503.3bn).

30% of the grants in RRPs (€101.4bn) have been allocated partly based on forecasted GDP values for 2020 and 2021. These forecasts must be replaced with actual GDP values which may result in a reallocation of grants.

The progress on digital and green investments

Some of the largest digital investments of selected Member States are in digital health, digital skills, and the digitalisation of SMEs.

Some of the largest green investments of selected Member States are in energy-efficient buildings, renewable energy sources, decarbonisation of the industry, and expansion and renewal of the rail network.

The completion of digital and green projects will take time as most investments will be spread over several years and will be completed towards the end of 2025/26.

4.1

The RRF Process

The process to gain access to funds including where each Member State finds itself in the process

The RRF process | The process to access RRF funds

There are seven steps to gain access to the RRF funds. Member States find themselves at different points in the process and the envisaged timeframes have proved to be flexible.

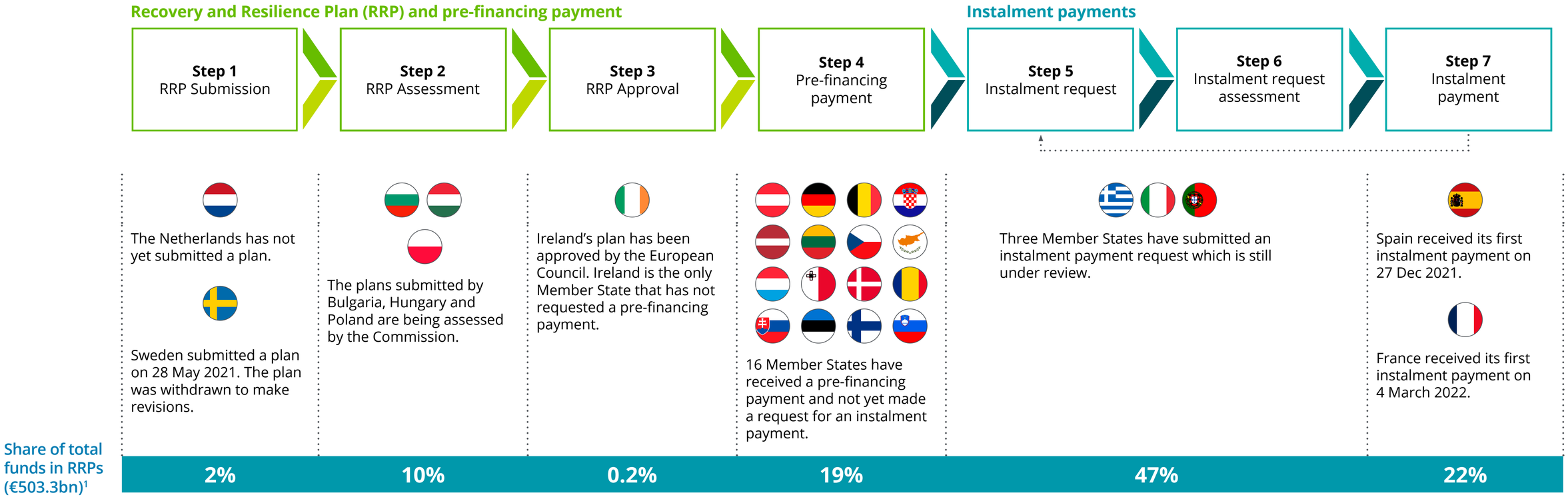
Owner	Member State	European Commission	European Council	European Commission	Member State	European Commission	Member State
Action	Submits a national RRP of investments and reforms, with clear milestones and targets (M&Ts)	Assesses the RRP against 11 criteria (e.g. the RRP contributes appropriately to the six pillars including digital transformation)	Approves the RRP setting out a schedule of payments including a one-off pre-financing payment, and multiple instalment payments subject to the achievement of M&Ts.	Pays up to 13% of the total support as a pre-financing payment to kick-start the recovery	Requests further disbursements upon reaching agreed M&Ts	Prepares a preliminary assessment of the disbursement request	Receives disbursement of EU financial support
Envisaged timeframe	By 30 April 2021 (flexible deadline)	Within two months (e.g. May-Jun 2021)	Within one month (e.g. Jul 2021)	Within two months (e.g. Aug-Sep 2021)	Up to twice a year	Within two months	After consulting expert committee
Example: Spain 	**30-Apr-21** The plan relates to €69.5bn in grants and includes 416 M&Ts.	**16-Jun-21** The plan was found to be in line with the RRF regulation.	**07-Jul-21** The approval identifies the M&Ts that need to be achieved to justify the payment of eight instalments.	**17-Aug-21** €9bn pre-financing payment made to Spain.	**11-Nov-21** The 1st instalment request includes information about the M&Ts achieved.	**03-Dec-21** The M&Ts required to justify the 1st instalment were found to have been achieved.	**27-Dec-21** €10bn 1st instalment payment made to Spain.

Sources: The 2021-2027 EU budget; RRF from plans to payments; RRF Infographic; RRF Timeline; RRF Regulation; RRF Scoreboard

The RRF process | The location of RRPs in the process to access RRF funds

21 Member States had started receiving funds for their approved RRPs as of 11 March 2022; Five Member States have not yet received any funds as their RRPs have both not yet been submitted and approved.

The European Commission's RRF Scoreboard reported that 2% of the RRF's milestones and targets had been completely fulfilled to date (last updated on 7 March 2022). Member States have all made progress towards these milestones, some of which are awaiting approval from the Commission before the milestones are reported as being fulfilled. Additional milestones and targets may since have been reached which will be reflected when the Commission updates the RRF Scoreboard accordingly.



Sources: The 2021-2027 EU budget; RRF from plan to payments; RRF Infographic; RRF timeline; RRF Regulation; RRF Scoreboard
1 The total funds in RRPs refers to: (a) the grants and loans allocated to approved RRPs as of 11 March 2022; or (b) the maximum allocation in grants (according to the RRF Regulation) for RRPs that have not yet been approved as of 11 March 2022.

4.2

The RRF Funding and disbursements

Funds available and disbursements as of 11 March 2022 including potential impacts of planned updates

RRF Funding and disbursements | RRF funds and the update of grants at the EU level

30% of the grants in RRPs are due to be updated by 30 June 2022 when the Commission's forecast of the impact of the coronavirus pandemic on GDP growth is replaced by actual figures.

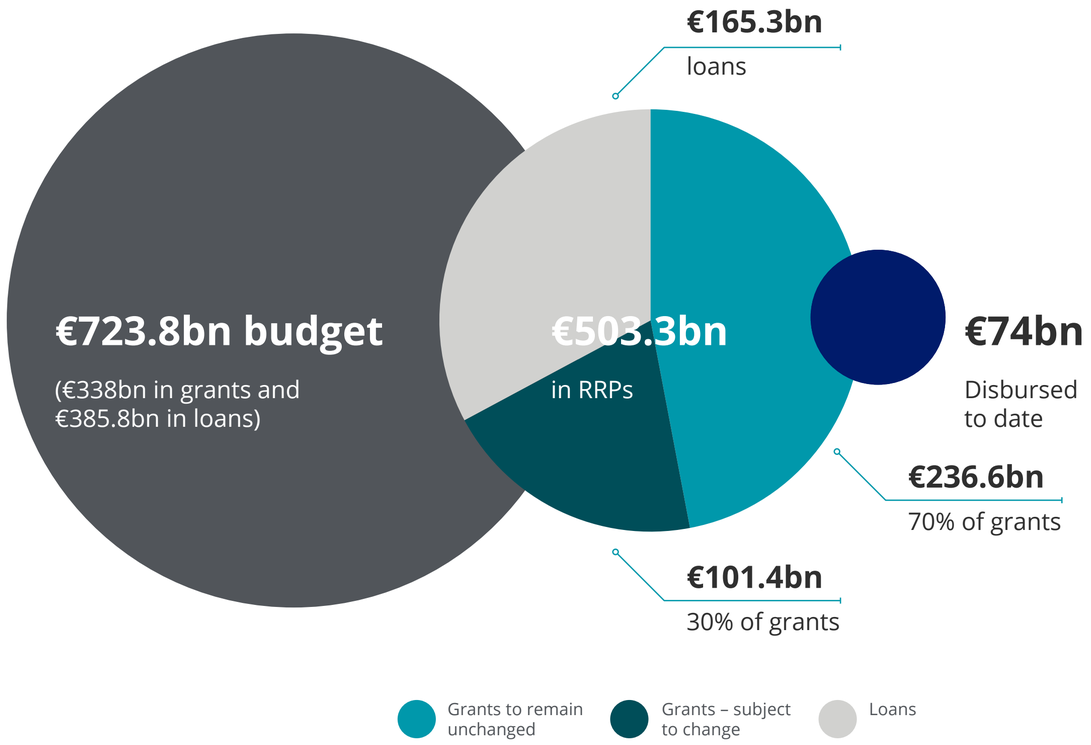
The RRF funds at a glance

- The total RRF budget (€723.8bn) is split into grants (€338bn) and loans (€385.8bn). This represents the fixed amount of funds available to be used in RRPs.
- TThe funds that have been disbursed to Member States amount to €74bn (as of 11 March 2022), representing **10% of the total RRF budget** and **15% of the funds in RRPs**. Some of this funding has already been used for digital investments.
- These amounts are detailed at the Member State level for twelve selected Member States on page 36.

Updates to the allocation of funds among individual RRPs

- 30% of the grants in RRPs (€101.4bn) has been allocated among the RRPs of individual Member States on a preliminary basis.[1]
- **The allocation of the 30% of grants among Member States will be updated by 30 June 2022**, impacting the total amount of funds allocated to individual Member States.
- This potential impact for twelve selected Member States is discussed on page 37.

Figure 9: **Total RRF budget, funds allocated to RRPs and disbursements to Member States in current prices**



1 The preliminary allocation was partly based on the forecasted impact of the coronavirus pandemic on Member States' real GDP growth in 2020 and 2021. These forecasts must be replaced with actual GDP growth rate values (published by Eurostat) by 30 June 2022.
Sources: Deloitte analysis of RRF Regulation(Article 6, Article 37 and Annexes I to IV) & RRF Scoreboard

RRF Funding and disbursements | Disbursements to selected Member States

The twelve selected Member States have received €70bn in total so far from the RRF which is equivalent to 15% of the funds across their RRPs, reflecting the various stages at which Member States find themselves in the RRF process.

Disbursements to selected Member States

- Eight of the twelve selected Member States have received RRF funds in the form of pre-financing (all eight) and/or a first instalment payment (Spain and France).
- Four of the twelve selected Member States (Hungary, Ireland, Netherlands and Poland) have not yet received any funding as their RRPs have not been both submitted and approved.
- Spain and France have received the largest disbursements as a percentage of their respective RRPs and as of 11 March 2022, both have received first instalment payments.
- Italy, Greece, and Portugal have submitted a first instalment payment request which is under review. If approved, their disbursements would increase significantly.

Figure 10: **Disbursements to selected Member States and 1st instalment payment requests under review (billion €)**

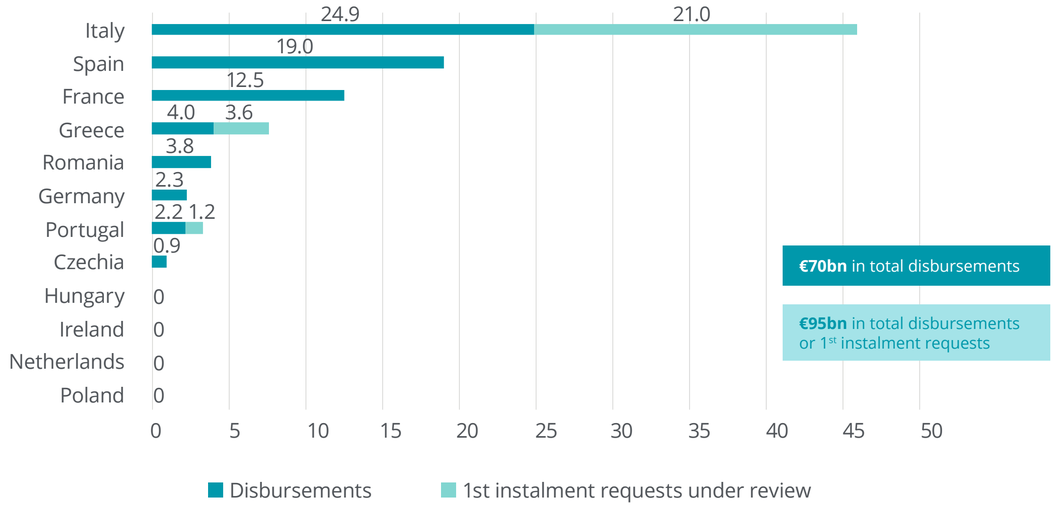
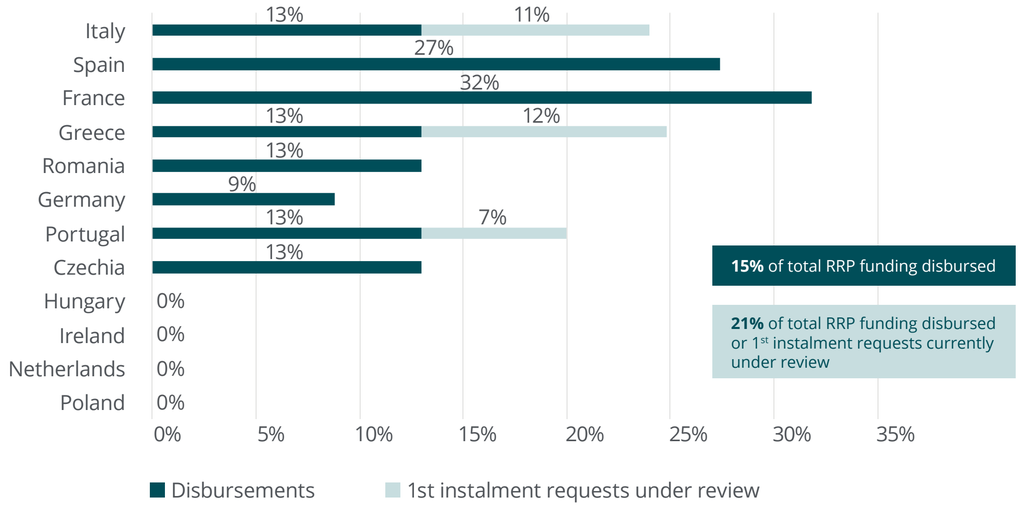


Figure 11: **Disbursements to selected Member States and 1st instalment payment requests under review (% of funds in each RRP)**



1 Germany is the only selected Member State that requested a pre-financing payment below the maximum level offered by the RRF (13%).
Sources: Deloitte analysis of RRF Scoreboard

RRF Funding and disbursements | The impact of the update of 30% of grants on selected Member States

Member States whose GDP fell more than forecast by the Commission will see an increase in the grants available to them, and vice versa.

Indicative impact of the update of 30% of grants

The final impact on the allocation of grants among Member States will be determined based on revised GDP growth rate values by 30 June 2022. Comparing the most recent Autumn Economic forecasts with the forecasts used to determine the initial allocation of the grants provides an indication of the potential impact of this process on Member States' expected RRF allocation. **Based on the latest GDP forecasts** (published in November 2021), this comparison suggests that:

- **Eight of the twelve selected Member States may see a decrease in grants** as their GDP grew more than originally anticipated by the Commission in its Autumn 2020 forecast.
- **Ireland, Romania and the Netherlands may see the largest relative decreases in grants** as their GDP grew significantly more than originally anticipated by the Commission.
- **Germany, Portugal and Spain may see the largest relative increases in grants** as their GDP grew significantly less than originally anticipated by the Commission.
- **Grant reductions could potentially be greater than grant increases** (based on current estimates) given that, in general, the Commission's forecasts suggested greater GDP falls than those that have materialised to date.

The RRF Regulation does not expressly discuss what a Member State should do if the update of 30% of grants leads to a grant decrease for their individual RRP. However, the Commission has indicated that where milestones and targets in RRPs are no longer achievable for objective circumstances, RRPs can be amended.

Table 8: **Potential impact of the update of 30% of grants on selected Member States**

	European Commission's forecast of 2021 Real Gross Domestic Product (% change)			
Member State	**Autumn 2020 forecast[1] (basis for current grants allocation**	**Autumn 2021 forecast[2] (indicative of actual outturns)**	**Differential between forecasts (percentage points)**	**Potential impact in grants after update**
Czechia	3.1%	3.0%	-0.1	▲
France	5.8%	6.5%	0.7	▼
Germany	3.5%	2.7%	-0.8	▲
Greece	5.0%	7.1%	2.1	▼
Hungary	4.0%	7.4%	3.4	▼
Ireland	2.9%	14.6%	11.7	▼
Italy	4.1%	6.2%	2.1	▼
Netherlands	2.2%	4.0%	1.8	▼
Poland	3.3%	4.9%	1.6	▼
Portugal	5.4%	4.5%	-0.9	▲
Romania	3.3%	7.0%	3.7	▼
Spain	5.4%	4.6%	-0.8	▲

1 Published in November 2020 2 Published in November 2021

The update of 30% of grants is not expected to affect disbursements retrospectively.

Sources: Deloitte analysis of the Commission's Autumn 2020 Forecast and Autumn 2021 Forecast; RRF Regulation; RRF Q&A

4.3

The progress on digital and green investments

A review of the Commission's assessment of selected RRPs

Overview of digital and green investments

RRPs of seven selected Member States show particularly large digital investments in the digitalisation of the health care system and SMEs, as well as digital upskilling and the deployment of digital infrastructure.

A review of the European assessments of the RRPs of seven selected Member States was conducted to highlight the largest digital and green investments for each Member State. Member States were selected on the basis that they have the highest absolute level of funding of those Member States whose RRPs contain the relevant information to undertake the analysis.[1]

Purpose: **The aim of this review is to show which Digital Decade targets Member States address with those large digital investments.**

Digital Investment

Overview of common themes across the seven selected Member States:

- Member States are investing particularly large amounts in **digital health, the digitalisation of SMEs, digital skills, and deployment of digital infrastructure.**
- The largest projects in terms of funding tend to consist of smaller projects which are spread over several years and will be completed towards the end of 2025/26.
- It might take some time until the **digital progress enabled by those investments** will be reflected in the DESI scores.
- Some Member States such as Germany and Spain aim to complete large investments by 2022/23.

The following pages provide a deep-dive of the selected Member States and are structured as follows:

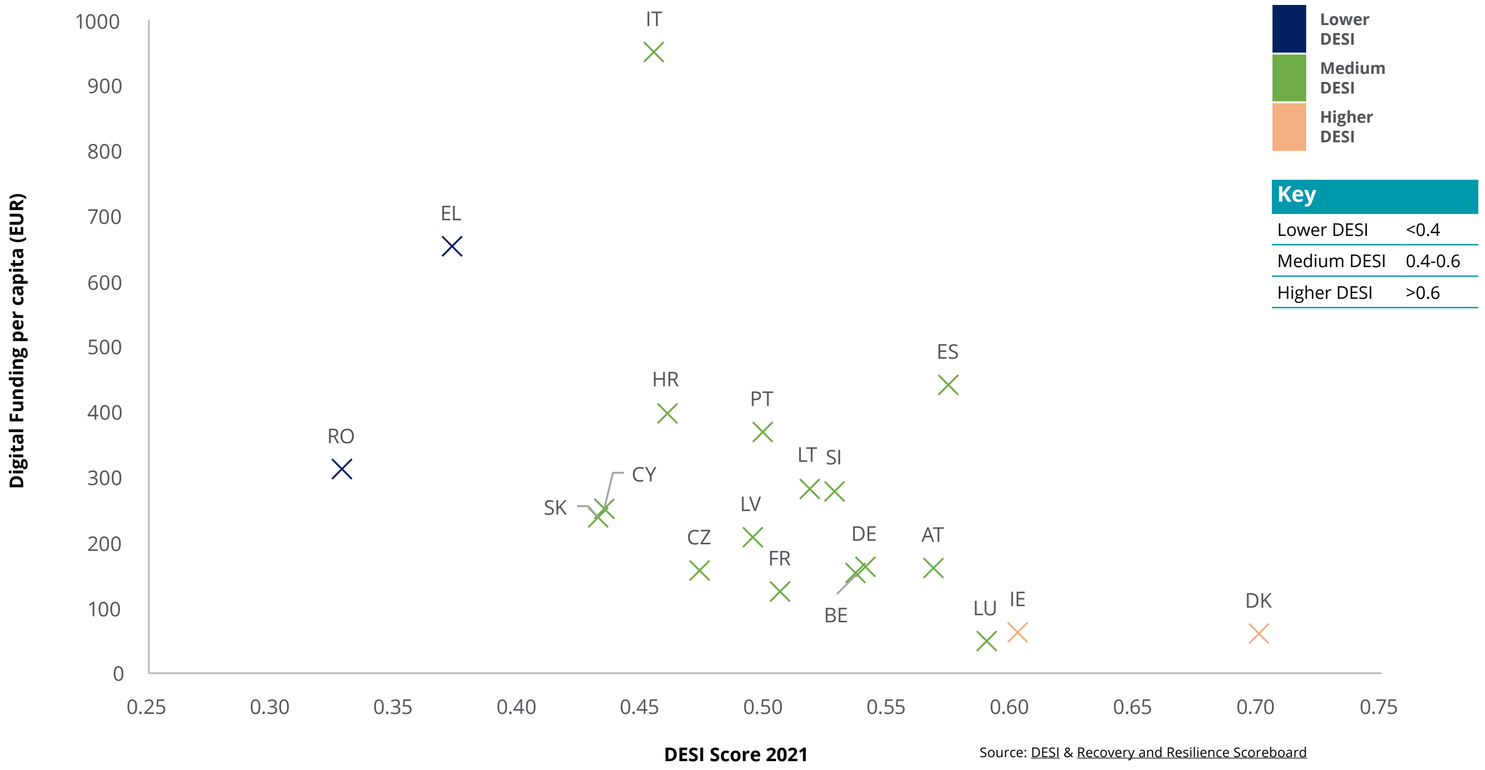
- Overview of the **three largest digital and green investments**, expected completion date of investments and proportion of total digital/green investment for each Member State.
- Current **progress** of the Member State towards **Digital Decade targets that can be linked to major investments.**
- Detailed examples of large digital investments and how they could potentially contribute towards the Digital Decade targets.

1 Note: While the EC's Recovery and Resilience Scoreboard provides an overview of aggregated digital expenditures by category (e.g. E-government, Human Capital in digitalisation), the analysis in this report only sets out the three largest individual green and digital investments based on the European Assessment of the RRPs. The analysis in this report does therefore not take into account smaller investments that may add up to a high proportion of total digital spending.

Overview of Member States' digital development

Many of the Member States with lower DESI scores have allocated some of the highest digital funding per capita; this may reflect a recognition of the need for further investment to support the digital transformation.

Figure 12: **The stage of digital development of 19 Member States and funding linked to digital transformation**



Source: DESI & Recovery and Resilience Scoreboard

Note: Lower/Medium/Higher categories and thresholds are used for illustration purposes only and do not represent an official definition.
Note: The chart covers the 18 Member States analysed in the first report and whose RPP has been approved plus Ireland which is assessed in the current analysis. Poland, Netherlands and Hungary are excluded from the chart since the national plans are yet to be submitted/approved.

DESI Score

- **All Member States have recorded positive growth in their DESI** scores between 2020 and 2021, with an average growth rate of 9% across the selected 19 Member States.
- **Several Member States that have a DESI score below the EU average** (0.51 in 2021), experienced an **above average percentage increase in their DESI score.**

Key takeaways

- On average across the 19 selected Member States, 29% of RRF funding is linked to digital transformation.[1]
- **Some Member States with a DESI score below the EU average** (0.51 in 2021) have **a relatively high level of funding** per capita linked to digital investments. For example Greece and Italy have the highest level of funding per capita linked to digital, and a DESI score below the EU average.
- This may reflect a recognition of the need for further investment to support the digital transformation in these economies.

1 Recovery and Resilience Scoreboard

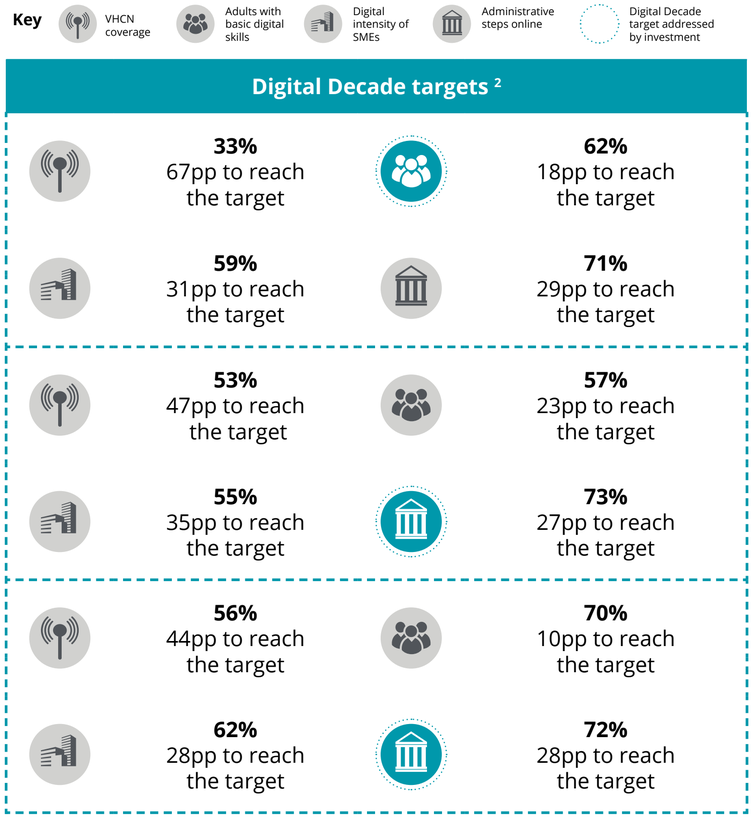
Digital and green investment for selected Member States (1/2)

The majority of large digital investments of selected Member States address the Digital Decade targets.

The following table provides an overview of the three largest green and digital investments for each of the seven selected Member State and the Digital Decade targets that those investments address. For example, Czechia invests €0.2bn in the "Digital Equipment for schools", the second largest digital investment in Czechia overall which accounts for 11% of total digital investment. This investment can be linked to the Skills target as it could increase the proportion of adults with basic digital skills over time.

Table 9: **Summary table of largest digital and green investments of Czechia, France, Germany, and Greece**

Member State	Largest green investment	€ value (% of total green investment)	Largest digital investment	€ value (% of total digital investment)	
Czechia	Forests resilient to climate change	€0.3bn (11%)	Digital transformation of manufacturing	€0.2bn (12%)	n/a[1]
	Renovation and revitalisation	€0.3bn (11%)	Digital Equipment for schools	€0.2bn (11%)	
	Renewable energy sources and installation of RES	€0.3bn (10%)	Employment policy – digital competencies	€0.1bn (8%)	
France	Renovation of public buildings	€3.8bn (21%)	Digital health	€2bn (24%)	
	Support to the railway sector	€2.3bn (13%)	Digital upgrade of the State (digital Identity)	€0.5bn (6%)	
	Energy renovation of private housing	€1.4bn (8%)	Support plan to the aeronautics sector	€0.4bn (5%)	n/a
Germany	Energy-efficient buildings	€2.5bn (23%)	Future proof of hospitals[3]	€3bn (12%)	
	Zero-emission vehicles	€1.4bn (13%)	Digitalisation of the administration	€2.5bn (10%)	
	Purchase of buses with alternative propulsion	€1.1bn (10%)	IPCEI microelectronics and communication technologies[4]	€1.5bn (6%)	n/a



1 Note: Does not appear to directly link to any specific Digital Decade target; 2 Most recently available value for VHCN coverage (2021), adults with basic digital skills (2020), digital intensity of SMEs (2021), and administrative steps online (2021), 3 Future proof of hospitals refers to healthcare planning and design, including changes in technology, 4 IPCEI are "Important Projects of Common European Interest"

Digital and green investment for selected Member States (2/2)

The majority of large digital investments of selected Member States address the Digital Decade targets.

Table 10: **Summary table of largest digital and green investments of Italy, Portugal and Spain**

Member State	Largest green investment	€ value (% of total green investment)	Largest digital investment	€ value (% of total digital investment)	
Greece	Energy efficiency projects	€1.4bn (12%)	Very High Capacity Networks	€0.9bn (13%)	
	Energy renovation – residential buildings	€1.3bn (11%)	Digitalisation of large enterprises	€0.8bn (11%)	
	Renewable energy (solar)	€1.2bn (10%)	Digital upskilling	€0.7bn (10%)	
Italy	Energy efficiency and building safety	€12.1bn (17%)	Transition 4.0 – tax credits	€8.9bn (20%)	n/a[1]
	High-speed railway connections - South	€4bn (6%)	Plan Italia 1Gbps	€3.9bn (9%)	
	High-speed railway connections - North	€3.7bn (5%)	School 4.0	€2.1bn (5%)	
Portugal	Decarbonisation of industry	€0.7bn (11%)	Equipment for digital skills	€0.5bn (5%)	
	Green agenda for business innovation	€0.4bn (6%)	Digital transition in education	€0.5bn (5%)	
	Expansion of the Lisbon Metro Network	€0.3bn (5%)	Digital transition of enterprises	€0.5bn (5%)	
Spain	National Rail transport	€3bn (11%)	Digitalisation and innovation of SMEs	€3.5bn (18%)	
	Innovative renewable buildings and products	€2.4bn (9%)	Digital transformation of education	€1.4bn (7%)	
	Installation of recharging points	€2bn (7%)	Deployment of 5G networks	€1.4bn (7%)	

Key: VHCN coverage; Adults with basic digital skills; Digital intensity of SMEs; Administrative steps online; Digital Decade target addressed by investment

Digital Decade targets [2]			
10% 90pp to reach the target		**51%** 29pp to reach the target	
32% 58pp to reach the target		**54%** 46pp to reach the target	
34% 66pp to reach the target		**42%** 39pp to reach the target	
69% 21pp to reach the target		**69%** 31pp to reach the target	
87% 13pp to reach the target		**52%** 28pp to reach the target	
51% 39pp to reach the target		**85%** 15pp to reach the target	
92% 8pp to reach the target		**57%** 23pp to reach the target	
62% 28pp to reach the target		**82%** 18pp to reach the target	

1 Note: Does not appear to directly link to any specific Digital Decade target;
2 Most recently available value for VHCN coverage (2021), adults with basic digital skills (2020; 2017 value for Italy), digital intensity of SMEs (2021; 2019 for Greece), and administrative steps online (2021)

5.

Key policy enablers

Key policy enablers | Overview

This section sets out some of the key policy enablers that could help enhance the impact of digital investments and unlock further investment that is needed to support the EU's digital transformation by 2030.

Structure of this section

This section sets out:

- **The role of policy** in supporting the EU's digital transformation.
- **Key policy enablers** that, alongside digital investments, could help achieve the Digital Europe 2030 vision. This includes **case studies** highlighting examples of these policy enablers being implemented in practice.

Approach

- The following key policy enablers were identified through a review of the literature and interviews with EU policymakers and industry experts.

Key takeaways

- The scale and complexity of the digital transformation means that **significant digital investments**, including from the RRF, and **policy enablers** will be **key to realising the EU's vision**.
- **Policy** can play a key role in **enhancing the impact** of the planned digital investments and helping **unlock further public and private sector investment** that is needed to achieve the Digital Decade targets and realise the EU's Vision.
- Member States have already undertaken initiatives in these areas as illustrated in the case studies that are set out in the remainder of this section.

Summary of key policy enablers

Co-ordination across government
Effective co-ordination and collaboration across each Member State's government (national, regional and local authorities) could help to ensure that digital investments are effectively targeted, synchronised, and timed.

Connecting digital ecosystems
The emergence of new digital ecosystems will depend on a diverse range of organisations within the ecosystem working together collaboratively; each Member State's government can help facilitate and support this collaboration across the ecosystem.

Demonstrating digital value
Demonstrating the value of digital investments, for example through pilots and effective benefit measurement frameworks, can help unlock further public investment and inform decision-making on future digital investment.

Data sharing
Ensuring that data is accessible, re-usable and secure can help facilitate data sharing that will underpin many digital ecosystems including smart cities, e-health, smart energy, and smart mobility.

5.1

The role of policy in supporting the EU's digital transformation

The role of policy

Digital investments alongside policy enablers will be key to realising the EU's 2030 vision; policy can support the digital transition by enhancing and unlocking further digital investment

Digital investment | Providing the necessary funding

RRF funding: €130bn of the €723.8bn RRF budget has been allocated to the digital transformation, including large investments in the digitalisation of businesses, digital skills, infrastructure, e-government and e-health.[1]

Other public sector investment: The EU provides additional funding such as the Digital Europe Programme, Horizon, EU4Health or the Connecting Europe Facility to support the digital transformation. Member States further provide national funding to digitalise their economy, including national broadband plans.[2]

Private sector investment: the industry will need to continue investing larger amounts in digital infrastructure (e.g. VHCN and 5G network rollout), as well as in research and development for emerging technologies such as AI, cloud-based services and super computing.

Key policy enablers | Enhancing and unlocking digital investment

Co-ordination across government: Coordination and alignment of objectives, incentives and initiatives towards a common digital transformation across government (national, regional and local authorities) and digital funding programmes is key to ensuring that digital investments are effective.[3]

Connecting digital ecosystems: Bringing together a diverse ecosystem of players from a range of traditional value chains to form new digital value chains.

Demonstrating digital value: Providing and evidencing the value of digitalisation to inform the allocation of investments and unlock further digital investment.

Data sharing: Helping facilitate data sharing that is needed to support key digital use cases such as e-health, smart energy, and future mobility.

Large investment has been allocated towards achieving the Digital Decade targets which will provide the foundation for new digital ecosystems and to drive digital innovation.

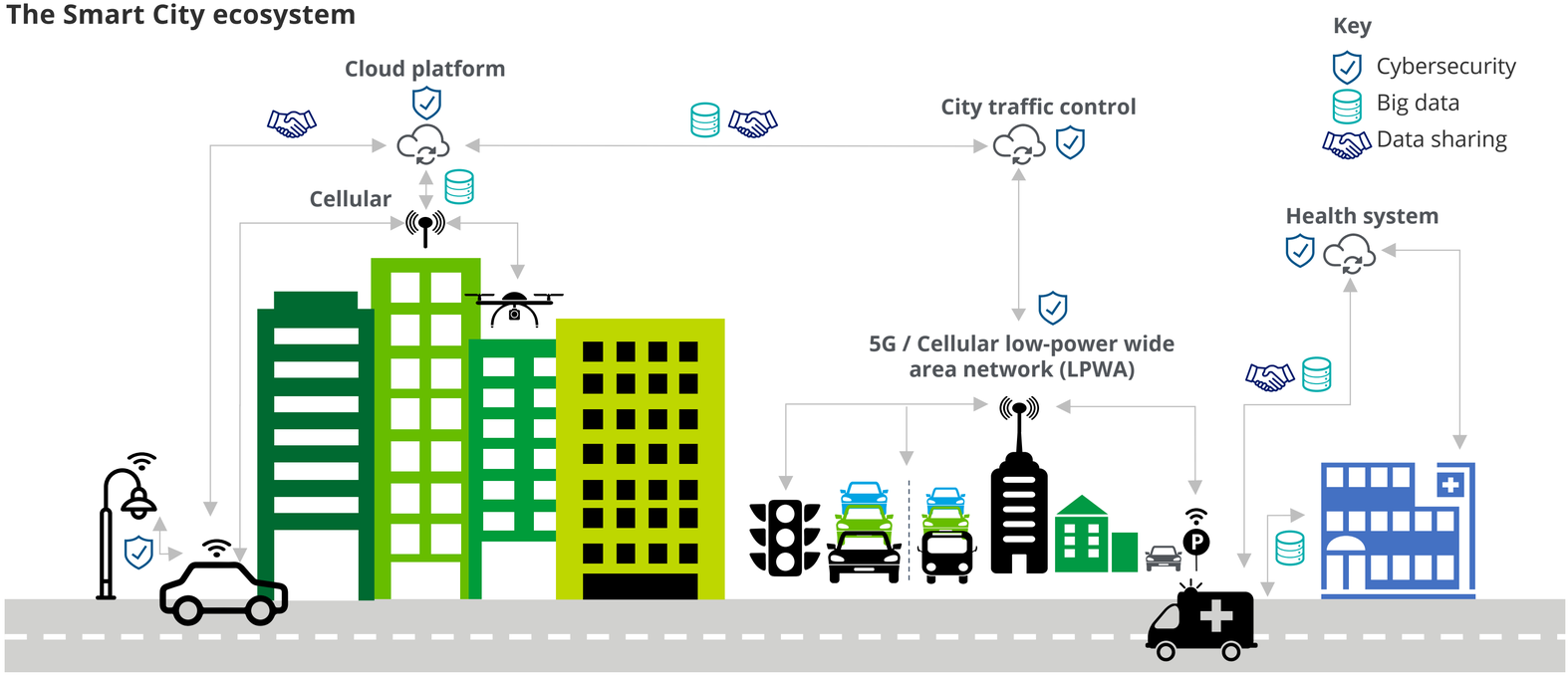
Key enablers are informed by a review of the literature and interviews with policymakers and industry experts. The following pages set these out in more detail.

1 European Commission; 2 Digital Europe Programme; Horizon; EU4Health; Connecting Europe Facility; 3 In Section 5.2 "Key policy enablers of Digital Europe 2030", government refers to each Member State's government rather than the EU government

The role of policy | Smart Cities as an illustrative example

Successful ecosystems will be underpinned by common foundations including infrastructure, digital skills, data sharing and partnerships across government and the ecosystem, as illustrated by the Smart Cities example.

The Smart City ecosystem



Example use cases	Management of infrastructure (e.g. smart buildings)	Emergency Services	Improved traffic management	Intelligent streetlights	Waste Management

Key foundations of the Smart City ecosystems

- **Investment in infrastructure** to provide very high capacity and ultra reliable, connectivity (e.g. 5G, fibre, FWA) that connects IoT devices, applications, etc.
- Investment in people with **advanced digital skills** to develop smart city solutions such as platforms to manage interoperable services and applications, using **Big Data, AI and IoT.**
- Investment in education and training to ensure that **citizens have basic digital skills** to use smart city applications.
- **Large amounts of data are** shared between players in the ecosystem in a secure way that **ensures data privacy.**
- **Businesses and public bodies recognize the value of digital** and adopt technology solutions to provide services to citizens.
- The **diverse range of players** (e.g. local authorities, cloud providers, utility companies, connectivity providers, citizens) in the ecosystem are connected to form **new value chains.**

Key Investment Policy enabler

5.2
Key policy enablers

Key enablers | Overview of key policy enablers

Policy enablers identified include cross-government co-ordination, connecting digital ecosystems, facilitating data sharing, and highlighting the value of digitalisation.

Key policy enablers l Enhancing the impact of planned digital investments and unlocking the further investment that is needed

Four key policy enablers have been identified based on a literature review and interviews with policymakers and industry experts. Member States have already undertaken initiatives in many of these areas, as illustrated in the case studies that are set out in the remainder of this section.

Co-ordination across government to ensure digital investments are effectively targeted, synchronised, and timed.

Examples of policy measures

- **Creating a whole-of-government coordinator** to reconcile objectives, incentives, and actions across government.
- **Using cross-government liaison offices and events** for cross-government representatives to align objectives, incentives, and actions.
- **Developing aligned cross-government Key Performance Indicators (KPIs)** to align objectives and incentives.

Connecting digital ecosystems so that digital investments are more effective in enabling digital ecosystems to emerge.

Examples of policy measures

- **Creating forums** to provide a platform for collaboration on the creation of new digital value chains.
- **Trials and testing facilities** to create opportunities for different players to develop relationships, work collaboratively, and innovate.
- **Creating task forces** to review and modernise legislation, regulations, and guidelines to support new digital value chains.

Demonstrating the value of digitalisation to help unlock further public and private sector digital investment.

Examples of policy measures

- **Pilot schemes – proof of concept** to test new technologies on a small-scale to gather data that can demonstrate the socio-economic value.
- **Case studies – benchmarking** to gather information on examples where similar technologies have been successfully implemented.
- **Measurement frameworks** to set out how to quantify the benefits of digital, including economic, social and environmental indicators.

Facilitating data sharing to enable innovation and value creation from digital investments and, in turn, unlock further digital investment.

Examples of policy measures

- **Reduced process complexity** to ensure that data sharing principles and guidance are easy to understand for all.
- **Safeguarding the sharing of data** by developing appropriate frameworks that are fit for purpose and protect data privacy.
- **Creating local data platforms** to facilitate wthe integration of data flows via open interoperable standards within and across Member States.

Each enabler is discussed in more detail on the following pages.

Key enablers | Co-ordination across government

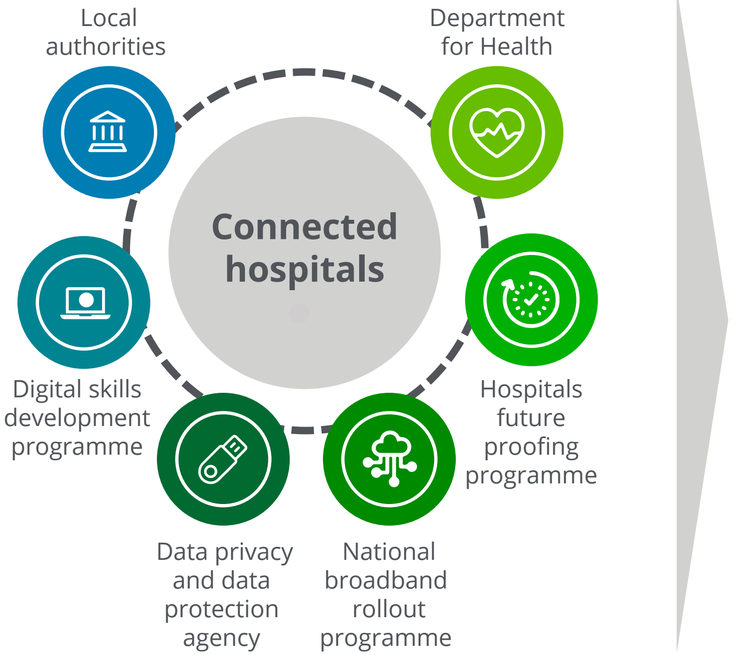
Successful alignment across each Member State's government and funding programmes will help ensure digital investments are targeted effectively, synchronised and timed.

Co-ordination across government is key to the success of digital investments

Effective co-ordination and collaboration across each Member State's government, including at a national, regional and local authority level, in relation to digital funding programmes could be essential. This is particularly important given:

- **The scale and range of digital investments:** The Digital programmes of Member States are wide ranging, from digitalisation of schools and hospitals to investment in rural connectivity, and will therefore require authorities across government to be involved. This could create logistical and co-ordination challenges.
- **The strong interdependencies between digital programmes:** the success of some digital programmes may depend on another programme meeting its objectives, e.g. the success of programmes that seek to incentivise SMEs to digitalise may depend on the extent to which a digital infrastructure programme provides the underlying connectivity for SMEs.
- **The levels of decentralisation or devolution in some Member States:** the powers and responsibilities (political, administrative and financial) across different administrative areas in some Member States mean that co-ordination could be required for the digital transformation to succeed.

Illustrative example: **Making connected hospitals a reality will require co-ordination and collaboration across government and digital funding programmes**



Key initiatives to support co-ordination

Creating a whole-of-government coordinator: This would be a central coordinating government body whose mandate is to bring together representatives from all government departments supporting the digital transformation. The coordinator's role may include reconciling objectives, incentives, and actions across government.[1]

Using cross-government liaison offices and events: National governments can create and make good use of cross-government liaison offices and events (e.g. awareness-raising events and policy roundtables) to support alignment with regional and local authorities on the digital transformation agenda, e.g. by identifying interdependencies between digital programmes, aligning incentives and sequencing initiatives or investments to ensure they support one another.[2]

Developing aligned cross-government Key Performance Indicators (KPIs): KPIs at different levels of granularity could be set to recognise their linkages and, in turn, support co-ordination, e.g. the timing of fund releases could be reconsidered if high speed connectivity penetration (a high-level KPI measured by one government department) is not capturing delays in rural areas (a more granular KPI measured by another department).

1 OECD Policy Coherence for Sustainable Development online toolkit; 2 Ibid

Co-ordination across government | Case Study

Creating regional coordination groups with clear objectives can support co-ordination across government.

Case study l Co-ordination across government as an enabler in Norway[1]

Challenges of cross-government co-ordination: Introducing healthcare technology solutions (e.g. telemedicine) can be difficult for public healthcare organisations as it involves multiple parties (e.g. hospitals and GP surgeries) across different administrative areas which may have different objectives and levels of relevant technical expertise. Without co-ordination of objectives and initiatives among these parties, the introduction of healthcare technology solutions may not take place or be delayed.

Co-ordination is needed because (i) some healthcare services are shared across municipalities; (ii) the more patients and practitioners join a particular technology solution, the more valuable it becomes for all; and (iii) the cost of the solution can be reduced by sharing the costs across a wider group.

Addressing the challenge: In 2016, the Norwegian county of Agder created a public regional co-ordination group (RKG eHealth) to support public healthcare organisations at the county- and municipal-level to introduce joint healthcare technology solutions across 30 municipalities by running joint Information and Communication (ICT) procurement processes and sharing experiences on the rollout of healthcare technology solutions. RKG eHealth includes healthcare managers at the county- and municipal-level who work on strategic and operational aspects of their respective healthcare provision areas, and a group of ICT specialists.[2]

Co-ordination across government as a key enabler:

Creating a co-ordination group: a group that brings together healthcare organisations at different administrative levels and ICT specialists are able to co-ordinate the objectives and initiatives to effectively roll-out healthcare technology solutions.

Key benefits: The technology solutions introduced by RKG eHealth have made it possible for elderly patients to practice self-care at home before and after surgery, enabling them to leave the hospital in just a few days after hospitalisation. This, in turn, has reduced the pressures on health care budgets.

1 Whilst not an EU Member State, Norway is a member of the European Economic Area (EEA) and takes part in cross-border projects with EU Member States. 2 University of Agder

Key policy enablers | Connecting digital ecosystems

Connecting digital ecosystems is key to enhancing the effectiveness of digital investments and enabling new ecosystems to emerge; Member State governments can help facilitate and support collaboration across the ecosystems.

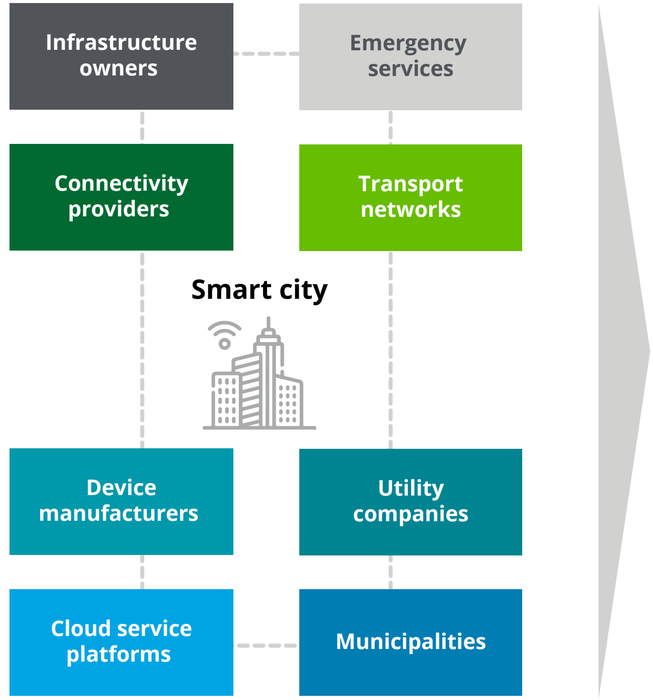
Connecting a diverse range of organisations within digital ecosystems

The emergence of new digital ecosystems will depend on a diverse range of organisations, from different value chains and industry verticals, collaborating and forming commercial and/or operational relationships with one another.

For example, for the full benefits of the smart city ecosystem to be realised, infrastructure owners, connectivity providers, device manufacturers, cloud service platforms, municipalities, utility companies, transport networks and emergency services may need to form new relationships (e.g. partnerships) with one another to digitise public services.

By supporting initiatives that would encourage a diverse range of organisations within the ecosystem to connect and develop relationships with one another, Member State' governments can bring these organisations to work collaboratively. In turn, this would support the emergence of new digital ecosystems.

Creating and realising the full benefits of Smart Cities will require collaboration between a diverse range of organisations



Key initiatives to connect the ecosystems

Creating advisory forums for businesses, experts and government to share their views on the creation of new value chains based on digital technology. For instance, Ireland's Enterprise Digital Advisory Forum (EDAF) provides a forum for businesses (micro businesses, SMEs, large businesses, and multi-national corporations with experience in digital transformation including the adoption and provision of AI) and AI experts to identify areas for AI exploration and, therefore, facilitate the adoption of AI.[2]

Trials and testing facilities to create opportunities for, and encourage, different players within the new digital ecosystem to develop relationships, work collaboratively, and innovate. This could for example provide a platform for smaller emerging technology businesses to test and demonstrate their digital solutions with more established businesses (e.g. utilities).

Creating task forces dedicated to reviewing and, if appropriate, modernising legislation, regulations and guidelines to support the creation of new value chains based on digital technology. For instance, Denmark's Ministry of Health created a task force along these lines to ensure regulation does not prevent the emergence of a new digital value chain in healthcare and social care services. The task force can make recommendations on not only updating existing laws and evaluating the need for entirely new ones, but also reducing the number of regulations to simplify the overall legal framework.[3]

1 Deloitte University Press - The smart factory; 2 A national AI Strategy for Ireland, EDAF Terms of Reference, and EDAF Call for Expression of Interest; 3 OECD Policy Coherence for Sustainable Development online toolkit

Connecting digital ecosystems | Case study

Public-private partnerships that connect the growing ecosystem of digital frontrunners.

Case study l Connecting digital ecosystems as an enabler in Denmark

Challenges of gaining access to digital skills, knowledge and talent: Limited access to digital skills, knowledge and talent can prevent businesses from forming new digital value chains based on new technologies. This can undermine innovation and, in turn, economic growth.

Addressing the challenge: The Danish Government's "Digital Hub Denmark" is a public-private partnership including companies, government authorities, industry organisations and universities, that aims to connect the growing ecosystem of digital frontrunners.[1] The Hub aims to:

- **Establish a digital platform** to match companies facing a digital transformation with entrepreneurs and smaller companies that can contribute with skills, knowledge and talent.
- **Establish a National Centre for Research in Digital Technologies** which will co-finance a pilot project to support collaboration between universities and businesses on digital technologies.
- **Improve access to knowledge and experts on the commercial application of digital technology** by co-financing conferences, and initiating trials and pilot project to promote the commercial use of data.
- **Market Denmark's digital growth environment** by raising awareness internationally about Denmark's position in the digital sphere and attracting foreign investment for tech and IT solutions.[2]

Connecting digital ecosystems as a key enabler: Improving access to digital skills, knowledge and talent aims to bring together players from a range of traditional value chains which is key for the formation of new digital ecosystems.

Key benefits: Digital Hub Denmark could encourage the development of new digital business models and value chains which, in turn, would support innovation and economic growth in Denmark. For instance, the Hub could support the creation of new digital business models and value chains based on innovative ways to commercialise data.

1 The Danish Government defines digital frontrunners as companies that have a digital technology, digital strategy, and digital vision, and use technology for creating new business models, customer relations and production models. 2 Danish Government's Strategy for Digital Growth (2018)

Key enablers | Demonstrating digital value

Demonstrating the value of digital investment by providing proof of concept has the potential to digitalise businesses and digitally transform sectors across Member States.

Demonstrating digital value can help unlock further public investment

Demonstrating the **economic, environmental and social benefits** of digital ecosystems can deliver the evidence base to support further **public investment** in those areas.

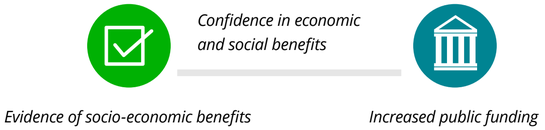
Having robust **measurement frameworks** in place could further help to inform decision-making on the appropriate level of **government spending in digital** and **capital allocation** across different government departments.

New technologies tend to emerge quickly, and often have only limited precedents which might require new measurement frameworks to be developed in order to capture the full value.

Given the uncertain and often capital-intense nature of new technologies, robust evidence of the socio-economic benefits might be crucial to unlock further investment.[1]

Demonstrating digital value can help unlock further public investment

Unlocking further public investment Using digital investments to evidence the socio-economic benefits of new technologies could help to unlock further public sector investments.[2]



The government can act as an early adopter of digitalisation to provide a market for innovative solutions. In addition, raising awareness around the benefits of digitalisation for citizens, businesses and the environment could stimulate digital adoption, driving demand, which in turn helps unlock further public and private investment.

Key initiatives to measure digital value

Testbeds: establish testbeds to foster experimental research and new product development in the ICT sector. Testbeds can be used to test scientific theories, as well as new systems and tools to develop digital ecosystems.[3]

Pilot schemes – "proof of concept": test new technologies on a small scale in pilot schemes to gather data to demonstrate the social and economic value of the solution. Pilots that show a positive value to society can continue or be scaled-up while unsuccessful pilots can be stopped.[4]

Measurement framework: use or develop measurement frameworks that set out how to quantify benefits of digitalisation, which could include measures for economic (e.g. number of jobs), environmental (e.g. reduced emissions), and social indicators (e.g. time-saved). Traditional measurement frameworks might need to be reviewed and updated to be fit-for-purpose to estimate the value of new digital ecosystems.[5]

Case studies: gather information on examples where similar technologies have been successfully implemented in the past and can be used as benchmarks. This can help to validate benefit estimates and to further support the business case.[6]

Business case: gathering evidence from testbeds, pilot schemes, measurement frameworks and case studies to develop a clear business case that sets out the benefits of a digital solution comprehensively.[7]

1.,6 Capgemini – Return on digital investments; 2 European Regional Development Fund; 3 European Institute for Innovation and Technology; 4 European Investment Bank; 5 World Economic Forum; 7 UK Greenbrook;

Demonstrating digital value | Case studies

Demonstrating the value of digital investment by providing proof of concept has the potential to digitalise businesses and digitally transform sectors across Member States.

Case study l Demonstrating digital value, SME pilot scheme in Ireland

Challenges of SMEs: Irish SMEs in the retail sector have a relatively low level of digitalisation which makes it difficult, especially for small retailers, to compete with larger online businesses.

Addressing the challenge: The Enterprise Ireland Retail Scheme provides €1.25m of funding targeted at Irish small and medium-sized retailers to encourage the acceleration of their online offerings as part of a pilot scheme.[1]

Demonstrating digital value as an enabler: The Department of Business, Enterprise and Innovation (DBEI) in partnership with Enterprise Ireland has created a pilot scheme to test whether additional funding would help SMEs to increase the online capabilities of their businesses. The evidence collected from this pilot could be used to support the business case for further public funding.[2]

- **Pilot schemes:** a pilot scheme is able to test the impact of funding on SMEs' digitalisation on a small scale before committing additional funding to other SMEs. The scheme could potentially be scaled-up should the evaluation show an increased usage of online tools by SMEs in Ireland.

Key benefits: Around 25 SMEs in Ireland have received between €10,000 to €25,000 as part of the first phase of the pilot scheme to digitalise their businesses and to offer a more competitive online service to consumers. The scheme enables SMEs to increase their consumer base and build more resilient businesses that are able to compete in the domestic and international market.[3]

Case study l Demonstrating digital value, Smart manufacturing in Germany

Challenges for the manufacturing sector: New advanced technologies such as cloud computing, artificial intelligence, robotics and data analytics have the potential to transform the manufacturing sector. Manufacturers may want to decide which digital solutions they could adopt to increase productivity and to monitor the overall status of factories.

Addressing the challenge: Siemens, a German multinational corporation, has the ambition to digitalise the complete manufacturing value chain. The company has digitalised its major electronics plant in Amberg, a German town, to demonstrate the benefits of Industry 4.0.[4]

Demonstrating digital value as an enabler: Siemens has tested different digital components to increase the efficiency and production speed of its plant in Amberg. Siemens was able to showcase the benefits of digitalising the electronics plant, which could be used as a case study to unlock further investment to digitalise manufacturing plants.

- **Digital twin – proof of concept:** Siemens has developed a Digital Twin of the electronics plant in Amberg to test the effectiveness of specific machine modules on the production speed. The company used the outcomes of the test as a proof of concept to replace these modules with more appropriate components in the plant to increase the overall efficiency of production.[5]

Key benefits: The digitalisation of the electronics plant in Amberg has improved the efficiency of the plant with an output that was 10 times higher than before the digitalisation with a consistent number of employees. It further increased production speed and flexibility with one product manufactured per second. The overall quality rate of the electronics plant has increased to 99.9%.[6]

1,3 Irish Tech News; 2 Ireland's Department of Enterprise, Trade and Employment; 4,5,6 Siemens

Key enablers | Data sharing

Facilitating more data sharing is key to enabling innovation and value creation from digital investments, which can in turn unlock further digital investment.

Data sharing is the foundation of many digital ecosystems

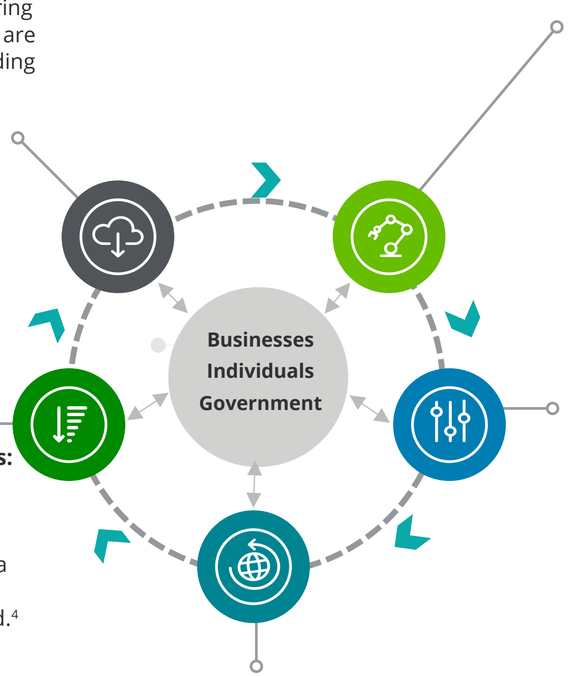
Facilitating data sharing is key to generating value from digital investments which, in turn, can unlock further digital investment:

- The ability to share large volumes of data securely between citizens, businesses and public services is fundamental to enabling many digital ecosystems (e.g. smart cities) to develop and thrive;[1]
- Data sharing enables **more value to be generated** from digital assets;[1] and
- It supports **data-driven decision making** that can generate social and environmental benefits. For example, in the context of smart cities, data sharing can provide real-time information to enable efficient lighting and smart security, but also inform long term planning decisions.[2]

There are different constraints on the sharing of personal data, which is subject to GDPR, compared to non-personal data which is subject to the regulation on the free flow of non-personal data.[3] As a result some of the measures may be appropriate for non-personal data but may not necessarily be relevant or feasible for personal data.

Key policy measures to facilitate data sharing

Reduced process complexity: Ensuring data sharing principles and guidance are easy to understand for all, and providing the training support, could help businesses feel more confident and comfortable sharing data.[1]



Safeguarding the sharing of data: Developing appropriate frameworks that are fit for purpose and protect data privacy and ensure the security of data could incentivise businesses and individuals to further engage in data sharing.[1] Additionally, assigning data owners who are familiar with data sharing requirements and ensure compliance with regulations and standards could reduce the risk of accidental non-compliance and incentivise more data sharing.

Data space for smart communities: Developing a secure environment, for example, where fragmented and dispersed data can be shared, for example by installing integrated data infrastructure that provides remote access to public sector data i.e Cloud.[4]

Local data platforms: Developing interoperable local data platforms that facilitate the integration of data flows via open standards within and across Member States.[4] This could facilitate intragovernmental data sharing, and consequently support the development of digital public services for citizens.

Data portability: Having clear data portability legislation that covers sectors such as, for example, healthcare or entertainment, might encourage more data sharing as it mitigates the risk of potential vendor lock-ins on certain platforms. [5]

1 European Commission 2 Europe connected (2020) 3 European Commission 4 European Commission 5 European Commission, Data protection working party

Data sharing | Case studies

Enabling data sharing has the potential to improve urban mobility and healthcare services across Member States.

Case study l Data Sharing as an enabler for Smart Mobility in Madrid, Spain

Challenges of smart mobility: A lack of information on transport options can act as a barrier for people to use public transport services, which can contribute, for example, to traffic congestion and air pollution.

Addressing the challenge: Mobility as a Service Madrid (MaaS Madrid) is a joint initiative between businesses and government bodies that provides users with information on the duration and price of trips for all the forms of transport in the city through a digital platform (e.g. mobile application). This initiative also aims to collect anonymous data on use of public transport to inform decisions on infrastructure and availability of public transport services.[1]

Data sharing as an enabler: The ability to securely collect, anonymise, pool, and analyse real-time information on private and public transport on an integrated platform is a key enabler for this mobility service to be effective. The key measures to facilitate data sharing include:

- **Safeguarding the sharing of data** by making sure personal data remains anonymous;
- **Developing an interoperable data space** which enables businesses and government bodies to share data in a single integrated platform.

Key benefits: Having access to transport information online could encourage greater use of public transport helping reduce congestion and pollution.

In the future, MaaS solutions could contribute to the widespread adoption of car sharing and autonomous vehicles across cities. The combination of these initiatives could transform the future of transportation and provide sustainable travel options.

Case study l Data sharing as an enabler for Healthcare in Estonia

Challenges of digital healthcare: The lack of digital health records and of an interoperable system to exchange patients' health data across medical specialists limits the ability of patients to consult different specialists and could result in delays and errors in diagnosis.

Addressing the challenge: According to the World Bank, Estonia offers its residents 99% of public services online, including access to health care data in a secure, consistent format.[3] In Estonia, a data exchange platform 'X-Road' enables the secure transfer of datasets including patients' health records, and linked by each citizen's e-ID. Requests to access patients' records are recorded, and are available to the patient upon request.[2]

Further, as of 2019, the data sharing agreement between Estonia and Finland, allows patients to use digital prescriptions issued domestically when visiting a pharmacy across border by accessing an interoperable system.[3,4] This is part the Commission's objective to facilitate access to cross-border healthcare by 2025 by building digital infrastructure.[5]

Data sharing as an enabler: The ability to collect, store and update real-time data on patients' health records on an interoperable system is a key enabler for this healthcare service to be effective. The key measures to facilitate data sharing include:

- **Safeguarding the sharing of data** by enabling patients to deny access to medical specialists and providing transparency over who has accessed the data;
- **Providing data portability by sharing data** in a consistent interoperable format so it can be accessed by medical specialists within and across borders.

Key benefits: Having access to digital health records and e-prescriptions enables citizens to consult multiple medical specialists and provide details regarding previous consultations. The access to historic health data of patients could result in improved communication amongst staff and might reduce the risk of diagnostic errors. Further, it might inform the diagnosis and treatment proposed by the specialists.[5]

1 Support Centre for Data Sharing 2 Worldbank 3 European Commission 4 European Commission 5 European Commission

Annex 1

Approach, Glossary and Member State Codes, Sources

Annex 1 | Alignment between the RRF, the Digital Decade Targets and DESI

A subset of Digital Decade targets has been selected to track the progress of Member States.

The targets, DESI and RRF priorities

Member States were advised by the Commission to consider seven categories of digital investments. These broadly align to the four areas identified in the Digital Decade targets. The exception to this is greening of the digital sector.

The Digital Decade target areas have several targets within them. In this assessment, up to two targets have been selected in each area as representative, but not exhaustive, to provide high-level quantitative analysis to supplement qualitative analysis.

The targets have been selected to produce a set that:

- provides coverage of the four areas set out by the targets;
- enables achievement of wider digital development; and
- is quantifiable and measured where possible.

The selected targets broadly align with DESI indicators. However, DESI does not include direct measures for key targets such as 5G coverage, e-medical records and e-IDs.

Where DESI indicators are not available or not updated, alternative indicators are considered.

Note that public services includes health services, however, because of the Digital Decade targets, education is covered under skills.

Table 11: **Digital Decade targets**

Digital Investment categories	Target area (Digital Decade)	Selected Digital Decade target	Indicator
Connectivity	Infrastructure	**100%** of households with gigabit connectivity	DESI Data: Coverage of households by any fixed Very High Capacity Networks
Digital capacities and advanced technology	Infrastructure	**100%** 5G coverage in populated areas	DESI Data, European Commission, Digital Scoreboard
Digital-related investment in R&D	Businesses	**75%** of European enterprises using cloud computing services	DESI Data: Businesses using cloud services [1]
Digitalisation of businesses	Businesses	**90%** of SMEs with at least a basic level of digital intensity	Digital intensity Index (2016-2019)[2] DESI Data: SME's with at least a basic level of digital intensity (2021)
Human capital	Skills	**80%** of adults with at least basic digital skills	DESI Data: Adults with 'basic' digital skills
Human capital	Skills	**20m** ICT specialists, with convergence between women and men	Eurostat Data: Employed ICT Specialists
E-government	Public Services	**100%** online provision of key public services	DESI Data: Digital Public services for citizens[3]
Greening the digital sector	Public Services	Access to digital medical records and use of digital ID	- [4]

1 The measure is based on a subset of cloud services (hosting of the enterprise's database, accounting software applications, CRM software, computing power).2 The Digital Intensity Index (DII) measures the availability at firm level of 12 different digital technologies including access to fast broadband (30 Mbps or above) and ICT specialists. 3 The following life events are included in the scope: Regular business operations and Business Start-up; Moving; Owning and driving a car; Starting a small claims procedure; Family; Career and Studying 4 Eurostat provides a measure of the % of the population accessing e-medical records, but this is a demand-side metric whereas the Digital Decade target is supply-side. The demand-side measure is still cited as context in some cases in this report.

Annex 1 | Glossary

Table 12: **Glossary**

Acronyms	Descriptions	Acronyms	Descriptions
Bn	Billion	FTTH	Fibre to the home
DD	Digital Decade	ICT	Information and communications technology
DESI	Digital Economy and Society Index	IT	Information technology
DII	Digital Intensity Index	MNOs	Mobile Network Operators
EC	European Commission	PP	Percentage point
E-ID	Electronic identity	R&D	Research and Development
E-medical record	Electronic medical record	RRF	Recovery and Resilience Facility
EU	European Union	RRP	Recovery and Resilience Plan
EU27	The 27 European Union Member States	SMEs	Small to medium sized enterprises
5G	Fifth generation of mobile technology	VHCN	Very High Capacity Network
FTTB	Fibre to the building		

Table 13: **DESI Metrics definition (as set out in the DESI)**

Metric	European Commission's Definition
VHCN	The technologies considered are FTTH and FTTB for 2015-2018 and FTTH, FTTB and Cable Docsis 3.1 for 2019 onwards.
5G	5G is the fifth-generation technology standard for mobile broadband standardised by the 3rd Generation Partnership Project (3GPP) and is capable of supporting downstream speeds of up to 10Gbps.
Adult basic digital skills	Individuals with 'basic' or 'above basic' digital skills in each of the following four dimensions: information, communication, problem solving and software for content creation (as measured by the number of activities carried out during the previous three months).
ICT Specialists	Employed ICT specialists. Broad definition based on the ISCO-08 classification and including jobs such as ICT service managers, ICT professionals, ICT technicians, ICT installers and servicers.
Digital Intensity Index	The digital intensity score is based on counting how many out of 12 selected technologies (including access to fast broadband, resource to ICT specialists etc) are used by enterprises. A basic level requires usage of at least four technologies.
Cloud computing	Enterprises purchasing at least one of the following cloud computing services: hosting of the enterprise's database, accounting software applications, CRM software, computing power.
Digital public services	The share of administrative steps that can be done online for major life events (birth of a child, new residence, etc.) for citizens. The following life events are included in the scope: Regular business operations and Business Start-up, Moving, Owning and driving a car, Starting a small claims procedure, Family, Career and Studying.

Source: **DESI**

Annex 1 | Member State Codes

Table 14: **Member State Codes**

Member State Code	Member State
BE	Belgium
BG	Bulgaria
CZ	Czechia
DK	Denmark
DE	Germany
EE	Estonia
IE	Ireland
EL	Greece
ES	Spain
FR	France
HR	Croatia
IT	Italy
CY	Cyprus
LV	Latvia

Member State Code	Member State
LT	Lithuania
LU	Luxembourg
HU	Hungary
MT	Malta
NL	Netherlands
AT	Austria
PL	Poland
PT	Portugal
RO	Romania
SI	Slovenia
SK	Slovakia
FI	Finland
SE	Sweden

Annex 1 | Sources

Table 15: **Resources (1 of 2)**

Topic	Link to Source
Previous report	— Deloitte's June 2021 Report commissioned by Vodafone titled "The contribution of NRRPs to achieving Europe's Digital Decade ambition"
Digital Transformation and Digital Targets	— European Commission's digital transformation vision — EU's Digital Economy and Society Index (DESI) — EU's Digital Economy and Society Index (DESI) by components — EU's 5G Observatory — Eurostat's Digital Intensity Index (DII) — Europe's Digital Decade: digital targets for 2030 — Eurostat's Information Society Indicators — European Digital Identity
The Recovery and Resilience Facility (RRF) and Recovery and Resilience Plans (RRPs)	— Summarised information about the RRF — European Commission's Guidance to Member States RRPs — The 2021-2027 EU Budget — The RRF – From Plans to Payments — European Council's Infographics on the RRF — RRF timeline — RRF Regulation — Recovery and Resilience Scoreboard — European Commission's Autumn 2020 Economic Forecast — European Commission's Autumn 2021 Economic Forecast — NextGenerationEU: Questions and answers on the RRF

Topic	Link to Source	
European Commission's Analysis of Member States' RRPs	— Czechia — France — Germany — Greece — Italy	— Portugal — Spain
European Commission's Assessment of Member States' RRPs	— Czechia — France — Germany — Greece — Italy	— Portugal — Spain
Key enablers (continues on next page)	— Business Mobility-as-a-Service — Capgemini – Return on digital investments — Danish Government's Strategy for Digital Growth (2018) — Deloitte – The smart factory — Deloitte – Realising the digital promise: Key enablers for digital transformation in financial services — Deloitte – How Smart Factories Can Ignite Productivity — eit Manufacturing – End-to-end digitalised production test beds	

Annex 1 | Sources

Table 16: **Resources (2 of 2)**

Topic	Link to Source
Key enablers	— University of Agder — European Regional Development Fund – England Operational Programme 2014 to 2020 — European Commission's guidance on private sector data sharing — European Commission – Technology Focus on Data sharing — European Commission - First EU citizens using ePrescriptions in other EU country (2019) — European Commission – eHealth: Digital health and care — European Commission – Smart cities and Communities — European Commission Digital Strategy (2018) — Ireland's Department of Enterprise, Trade and Employment — European Commission and European Investment Bank – Financing the digital transformation: Unlocking the value of photonics and microelectronics — Hertie School Jacques Delors Centre – Policy Brief "Data sharing: A European challenge?" — Ireland Government - A National AI Strategy for Ireland — Ireland's Enterprise Digital Advisory Forum (EDAF) – Terms of reference — Ireland's EDAF – Call for Expression of Interest — OECD Policy Coherence for Sustainable Development online toolkit — OECD – Digital Government Strategies for Transforming Public Services in the Welfare Areas

Topic	Link to Source
Key enablers	— OECD – Empowering the health workforce: Strategies to make the most of the digital revolution — Spain's association of businesses managing urban mass public transport - Study on the behaviours and attitudes of non-frequent users of urban mass public transport (2017) — Siemens – Digital transformation: Leading by example — Support Centre for Data Sharing — United Kingdom Government – The Green Book — Vodafone – Europe Connected report (2020) — World Bank – Privacy by Design: Current Practices in Estonia, India and Austria — World Economic Forum – Unlocking Digital Value to Society: A new framework for growth
Other	— European Commission: Supporting the Green Transition — News article on the French government's plans for mobile ID authentication — News article on France's new digital ID cards — News article on Germany's Hospital Future Fund — Spanish Government's press release on its National Digital Skills Plan — European Council's approval of Romania's RRP (Annex) — European Commission's approval of Greece's RRP (Annex)

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