ISSN 1831-9424

European Commission

Methodology to aggregate Member States' Digital Decade targets at European Union level

Torrecillas Jódar, J.
Papazoglou, M.
Signorelli, S.
López Cobo, M. (editor)

2024

Joint Research Centre

EUR 31966 EN

Contact information
Address: Edificio Expo, Calle Inca Garcilaso 3, Sevilla 41092, Spain
Email: JRC-T1-SECRETARIAT@ec.europa.eu

EU Science Hub
https://joint-research-centre.ec.europa.eu

JRC138292

EUR 31966 EN

PDF ISBN 978-92-68-17694-8 ISSN 1831-9424 doi:10.2760/433497 KJ-NA-31-966-EN-N

Luxembourg: Publications Office of the European Union, 2024

How to cite this report: European Commission, Joint Research Centre, Torrecillas Jódar, J., Papazoglou, M. and Signorelli, S., *Methodology to aggregate Member States' Digital Decade targets at European Union level*, López Cobo, M. editor(s), Publications Office of the European Union, Luxembourg, 2024, https://data.europa.eu/doi/10.2760/433497, JRC138292.

Contents

Abstract

This report outlines the proposed methodology for aggregating Digital Decade national targets from EU Member States to monitor progress toward the Digital Decade Policy Programme 2030 at collective EU level. It proposes the use of dynamic and static weighting based on demographic and enterprise data from sources such as population projections or the Eurostat's labour force survey. The proposed methodology ensures consistency across the Digital Decade key performance indicators. The report also provides a brief analysis of the weighting data used and its practical implications on the future evolution of the Digital Decade targets at EU level. This work continues the series of reports for a rigorous assessment of the progress of the EU's digital landscape.

Acknowledgements

The authors are grateful for the collaborative work performed throughout the project with the following colleagues from the co-leading team in Directorate-General Communications Networks, Content and Technology (CNECT) led by Eric Peters (in alphabetical order): Paola Annoni, Julien Burton, Emöke Maembe, Carlos Rocabado and Simone Russo. The authors would like to acknowledge Bruno Carballa Smichowski (Joint Research Centre (JRC)) for his useful comments that helped improving the report. The authors also thank Michele Vespe and Eva Martínez Rodríguez (JRC) for their continuous support and guidance.

Authors

Torrecillas Jódar, Juan

Papazoglou, Michail

Signorelli, Serena

López Cobo, Montserrat (Editor)

Executive summary

Policy context

The European Commission aims to achieve a strong level of digitalization by 2030 through the Digital Decade Policy Programme. The programme sets concrete targets and actions for the four key pillars: digital skills, digital infrastructures, digitalisation of businesses, and digitalisation of public services. A system to monitor progress and a cooperation mechanism ensure a full digital transformation of EU's societies and economies. As part of the cooperation mechanism, EU Member States prepare their national strategic roadmaps —which include explicit concrete commitments regarding the digital targets— to support the collective achievement of the general objectives and the digital targets set by the programme.

Key conclusions

This report proposes a consistent methodology for aggregating Member States' targets at the EU level to monitor progress toward the Digital Decade Policy Programme 2030. The methodology ensures consistency across the Digital Decade key performance indicators.

Main findings

The report identifies three types of indicators based on their definition and formula for calculation. The aggregation method for category 1-indicators (sum or common denominator) is the sum of data for all Member States. Category 2-indicators (ratio with country-specific denominators) are aggregated using a weighted average. Composite indicators (category 3) are aggregated using a simple average, following the aggregation method in the original source.

Related and future JRC work

This report continues a series of JRC technical reports that support the monitoring of the Digital Decade Policy Programme. They include a line of work related to the projection and aggregation of trajectories, and another related to investments that assist the achievement of the Digital Decade targets and general objectives. Future work will involve applying the proposed methodology to national roadmaps and trajectories for each digital target to obtain aggregated EU-level trajectories for annual progress tracking.

Quick guide

Section 1 of the report provides an introduction. Section 2 delineates the methodology and its practical implementation for each Digital Decade key performance indicator. Section 3 presents the weighting factors used for the aggregation and illustrates their evolution over time. Section 4 offers some concluding remarks. The annex provides the tables of weights for all Member States and years when relevant.

1 Introduction

One of the most ambitious goals set by the European Commission is to achieve, by 2030, a strong level of digitalisation, as evidenced by the approval of the Digital Decade Policy Programme 2030 ([1]) (DDPP) in December 2022. The DDPP is specifically designed to promote the integration of digital technologies to enhance economic and social development by creating a favourable environment to innovation and investment in the European Union (EU). The DDPP sets concrete targets and actions for the four key pillars: digital skills, digital infrastructures, digitalisation of businesses and digitalisation of public services. It also establishes targets for the year 2030 and introduces a system to monitor its progress and a cooperation mechanism to ensure a full digital transformation of EU's societies and economies. These targets cover a wide range of digital technologies and domains, and are monitored by a set of key performance indicators (KPIs) ([2]): reaching basic digital skills by 80% of the population, 20 million ICT specialists, full coverage of 5G and gigabit connectivity, 20% share of production in the chips value chain, 10 000 edge nodes, building the first quantum computer, 75% take-up of artificial intelligence, cloud computing or big data technologies by firms, reaching basic levels of digitalisation for 90% of SMEs, doubling the number of unicorns, and digitalising the public sector by providing 100% of public services online, enabling 100% of citizens to have access to their online health data, and electronic identification (eID).

In this context, the State of the Digital Decade Report (SDDR), an annual report providing an overview of the state of the digital transition in the EU, keeps track of the progress of the EU and its Member States towards the Digital Decade general objectives and targets set for 2030. As part of the cooperation mechanism, EU Member States prepare their national strategic roadmaps to support the collective achievement of the general objectives and the digital targets set by the DDPP. The roadmaps present the main planned and adopted policies at national level and explicit concrete commitments regarding the digital targets, and more specifically they include national trajectories for each DD KPI until 2030. As the DD KPIs are defined at EU level, the EU position will be based on the addition of individual national efforts as declared in Member States' strategic roadmaps.

To monitor progress, it is crucial to have accurate and comparable data at the Member State level to obtain a wide and complete picture of the European path towards the targets. Aggregating national data from at EU level should take into account variation in population sizes, household structures, or business ecosystems over geography and time. Country-level weights will have an impact on aggregate results and their interpretation.

In this report, we propose a consistent procedure to aggregate Member States' targets, as reported in their national roadmaps, at the EU level. Aggregation procedures are intended to yield EU level targets and hence should be consistent across KPIs and provide comparable results over time. Therefore, we outline different aggregation methods depending on the nature of the indicator. When indicators are ratios of two country-specific variables, the aggregation is computed as a weighted average of the data from the Member States. When indicators are absolute values, or ratios with a common denominator across countries, the EU aggregate is calculated as the sum of

([1]) Decision (EU) 2022/2481 of the European Parliament and of the Council of 14 December 2022 establishing the Digital Decade Policy Programme 2030 (OJ L 323, 19.12.2022, pp. 426). https://eur-lex.europa.eu/eli/dec/2022/2481/oj

([2]) The KPIs referred to in this report are defined in the Commission Implementing Decision of 30.6.2023 setting out key performance indicators to measure the progress towards the digital targets established by Article 4(1) of Decision (EU) 2022/2481 of the European Parliament and of the Council.

data for all Member States. Indicators that follow a composite indicator are aggregated through a simple average. Finally, the selection of weights for KPIs requires that they mirror as closely as possible the aggregation method at EU level of the KPI's original data source. To this end, we also detail the source of the weighting factors and justify decisions that affect the aggregation of certain KPIs. Finally, we present some descriptive statistics of the weighting factors data compiled and a brief analysis of their distribution across countries and over time.

The remainder of the report is organised as follows. Section 2 briefly describes the methodology, focusing on the aggregation procedure for each type of indicator, weighting factors and data sources. Section 3 presents descriptive statistics of the resulting dataset of weighting factors and distribution across countries and time. Finally, section 4 provides some concluding remarks and next steps.

2 Methodology

This section first describes the three different types of KPIs and proposes the aggregation methods applicable to each case. Then it details the application of the methodology to each DD KPI, justifying the choices and enumerating the data sources used.

2.1 Aggregation methods

We identify three types or categories of indicators based on their definition and formula for calculation: category 1, composed by indicators defined as a sum or as a ratio with a common denominator; category 2, composed by ratio indicators with country-specific denominators; and category 3, composite indicators. Analytically, they can be represented as follows:

$$\text{Category 1: } Y_i = y_i \text{ OR } Y_i = \frac{n_i}{d}$$

$$\text{Category 2: } Y_i = \frac{n_i}{d_i}$$

Category 3: *[complex multivariate method]*

That is, KPI Y belongs to category 1 if its value in country i can be expressed as a real positive number y_i or as a ratio with country-specific numerator n_i and a common denominator across countries, *d*. A KPI Y belongs to category 2 if it is defined as the ratio between a country-specific numerator n_i and a country-specific denominator d_i. The composite indicators used for two of the KPIs are obtained using a complex multivariate method with a non-linear aggregation formula.

A close look at KPI definitions used to monitor the DD targets allows us to classify the KPIs in these three categories, as shown in **Table 1** and further justified in the next sub-section (**Table 2**).

Table 1. List of key performance indicators classified within each category

Category 1	Category 2	Category 3
• ICT specialists (number of individuals) • Semiconductors • Edge nodes • Quantum computing • Unicorns • e-ID	• Basic digital skills • ICT specialists (share of individuals over employment) • Gigabit/FTTP coverage • 5G coverage • Cloud computing • Artificial intelligence • Digital late adopters	• Public services for citizens; Public services for businesses • e-Health

Source: Authors' elaboration.

The aggregation method for category 1-indicators takes the form of a **sum** and that for category 2-indicators is a **weighted average**, where country values are weighted following an objective criterion:

$$EU_m = \begin{cases} \sum_{i=1}^{27} y_{i,m} \ \forall\, m \in M_1 \\ \sum_{i=1}^{27} y_{i,m} * w_{i,m} = \ (\sum_{i=1}^{27} \frac{n_{i,m}}{d_{i,m}}) * \frac{d_{i,m}}{\sum_{i=1}^{27} d_{i,m}} \forall\, m \in M_2 \end{cases}$$

Where EU_m refers to EU aggregate of KPI m, M_1 is the set of DD KPIs belonging to category 1 and M_2 is the set of DD KPIs belonging to category 2. Member States are indexed as $i \in [1, 27]$. In words, this means that the EU aggregate of a category1-KPIs is the sum of the KPI value for all Member States: $\sum_{i=1}^{27} y_{i,m}$ .The aggregate of a ratio indicator with different country-denominators (category 2) is the weighted average across all Member States, using the country-denominator of the ratio as weighting factor, $\sum_{i=1}^{27} y_{i,m} * w_{i,m}$.

The weighting factor for category 2-KPIs must be the denominator to correctly account for the size of the different elements of the ratio, for example, population or number of enterprises. Thus, we ensure that countries with larger population or number of enterprises have a greater influence on the overall aggregated target. Additionally, the use of the denominator ensures consistency in the calculations across all indicators.

Finally, the aggregation method for category-3 **composite** indicators, such as e-Health and the online provision of digital public services mirrors the original data source aggregation method (i.e., simple average).

2.2 Application to Digital Decade key performance indicators

This sub-section presents the application of the aggregation method to the Digital Decade KPIs, and adjustments made to the aggregation method for each KPI when applicable.

Table 2 presents a summary of the KPIs used to monitor the Digital Decade targets, their definition, the operationalisation of the calculation in a formula and the proposed aggregation method at EU level (including the proposed weighting factor when applicable). More details on the Digital Decade KPIs definitions, data sources and calculation can be found in the KPI implementing act ([3]) and in the Communication establishing Union-level trajectories for the digital targets ([4]). Table A. 1 in the annex summarises the variables employed to quantify the KPIs, its descriptions and the data sources.

Note that for category 1-indicators (ICT specialists (number), semiconductors, edge nodes, quantum computing, unicorns, and e-ID), the aggregation method is the sum of data for all Member States, and hence, we do not further comment these KPIs in this section.

([3]) Commission Implementing Decision (EU) C(2023) 4288 final of 30.6.2023 setting out key performance indicators to measure the progress towards the digital targets established by Article 4(1) of Decision (EU) 2022/2481 of the European Parliament and of the Council.

([4]) C(2023) 7500 'Communication from the Commission establishing the Union-level projected trajectories for the digital targets'.

Table 2. Summary of KPIs and Weighting approach

DD target	KPI definition	Actual calculation formula	KPI category	Weighting factor
Basic digital skills	Percentage of individuals aged between 16 and 74 years old with "basic" or "above basic" digital skills in each of the following five dimensions: information, communication, problem solving, digital content creation and safety skills	$\frac{basic_i + above_i}{population_{i,16-74}}$	Category 2	Population 15-74 years old
ICT specialists	Number of individuals aged 15-74 who are employed as ICT specialists [as a share of employment/labour force]	In absolute terms: $ICT_{i,15-74}$ [In relative terms: $\frac{ICT_{i,15-74}}{Labour\_force_{i,15-74}}$ OR $\frac{ICT_{i,15-74}}{Employment_{i,15-74}}$]	Category 1 [Category 2]	Labour force 15-74 or Persons employed 15-74
Gigabit/FTTP coverage	Percentage of households covered by fixed Very High-Capacity Networks (VHCN) / Fibre-to-the-Premisses (FTTP).	$\frac{Households\_covered_i}{Households_i}$	Category 2	Number of households
5G coverage	Percentage of populated areas covered by at least one 5G network regardless of the spectrum band used	$\frac{Households\_covered_i}{Households_i}$ Populated areas covered are proxied by households covered	Category 2	Number of households
Semiconduc-tors	Value generated, in terms of revenues, by semiconductor activities in the Union, in all stages of the value chain, with respect to the global market value	$\frac{Value_i}{Global\_Market\_Value}$	Category 1	-
Edge nodes	Number of compute nodes providing latencies below 20 milliseconds	$Nodes_i$	Category 1	-
Quantum computing	Number of operational quantum computers or quantum simulators, including accelerators of high performance computing supercomputers, deployed and accessible to the user communities	$Quantum\_computers_i$	Category 1	-
Cloud computing	Percentage of enterprises using at least one of the following cloud computing services: finance or accounting software applications, enterprise resource planning (ERP) software applications, customer relationship management (CRM) software applications, security software applications, hosting the enterprise's database(s), and computing platform providing a hosted environment for application development, testing or deployment	$\frac{Enterprises_{Cloud_i}}{Enterprises_i}$	Category 2	Number of enterprises
Data analytics	Percentage of enterprises analysing big data from any data source (internal or external). As of 2024: percentage of enterprises performing data analytics (internally or externally)	$\frac{Enterprises_{DA_i}}{Enterprises_i}$	Category 2	Number of enterprises
Artificial intelligence	Percentage of enterprises using at least one artificial intelligence technology	$\frac{Enterprises_{AI_i}}{Enterprises_i}$	Category 2	Number of enterprises

DD target	KPI definition	Actual calculation formula	KPI category	Weighting factor
Digital late adopters	Percentage of SMEs with at least a basic level of digital intensity, i.e., using at least 4 of 12 selected digital technologies	$\frac{SME\_DII_i}{SME_i}$	Category 2	Number of SMEs
Unicorns	Sum of unicorns	$Unicorns_i$	Category 1	-
Public services for citizens	Share of administrative steps that can be done fully online for major life events. The following life events are considered: moving; transport; starting a small claims procedure; family; career; studying; health.	$PSC\_Composite_i$ Composite indicator: average score of services offered across the country	-	Simple average
Public services for businesses	Share of administrative steps needed to start a business and conduct regular business operations, which can be done fully online	$PSB\_Composite_i$ Composite indicator: average score of services offered across the country	-	Simple average
e-Health (i)	Nationwide availability of online access services for citizens to their electronic health services	$eHealth\_Composite_i$ Composite indicator with 12 components	-	Simple average
e-Health (ii)	Percentage of individuals that have the ability to obtain or make use of their own minimum set of health-related data currently stored in public and private electronic health-record (EHR) systems			
e-ID (i)	Number of MS that have notified at least one national e-ID scheme	eID_Scheme_i	Category 1	-
e-ID (ii)	Number of MS that have provided access to secure privacy-enhancing e-ID via the European Digital Identity Wallet	eID_Access_i	Category 1	-

Source: Authors' elaboration. Note: index i refers to country i.

Basic digital skills

The basic digital skills KPI corresponds to category 2, as it is calculated as a share with country-specific denominator. Hence, the EU level aggregate of national targets is calculated as a weighted average using the projected population between 16 and 74 years old.

EUROPOP2023 are the latest Eurostat population projections produced for all EU Member States, among other countries, estimated annually for the 2022-2100 period and broad age groups (Eurostat, 2023a). Projections are considered a hypothetical scenario of the evolution of population based on several factors, such as fertility rates, mortality or migration rates. The dataset contains a baseline projection and 5 sensitivity tests based on different values of fertility rates, mortality and net migration.

We use the EUROPOP2023 baseline projections from 2022 to 2030 for the 15-74 age group as weighting factor. This age group approximates very well the 16-74 age group for which the KPI is defined, so we assume the weights are equivalent. The use of this dataset has two main advantages. Firstly, it represents an official European data source, hence a consistent and robust option. Secondly, the projections allow us to use dynamic weighting, where the weights evolve over the 2022-2030 period according to the projected evolution of the population. This allows us to

incorporate into the EU target the expected changes in the population structure within country (varying weight of the age group in a country) and across the EU27 countries (varying weight of a Member State in the EU aggregate). In this way, the growing or decreasing weight of countries' population will be reflected in the EU aggregated target. Thus, we can apply a dynamic weighting, where weights evolve yearly according to the projected composition of population across Member States over the total EU27 population.

ICT specialists

According to the KPI implementing act, the ICT specialists indicator is expressed as the absolute number of specialists and falls under category 1, therefore the EU target is obtained as the sum of national targets. However, it can also be considered as category 2 when calculated relative to the size of the labour force or of total employment of the country. To this end, we provide weights to calculate the share of ICT specialists in the labour force and the share of ICT specialists in total employment, both in the 15-74 age group for which the KPI is calculated. With this in mind, we use both variables as weighting factors for this KPI. Note that, in this case, no projections are available for these variables. Hence, we apply a static weighting to this KPI, where weights are equal to the latest measured value (2023, Q4) and remain constant over time.

The source used is the Labour force survey (LFS), a large household sample survey designed to capture the main statistics on the labour market. The sample is conducted quarterly. It covers persons aged 15 years old or more that live in a private household. In this report, we use seasonally adjusted data, not calendar adjusted data, from the 2023 Q4 survey (Eurostat, 2024).

Gigabit and FTTP coverage

As these KPIs are defined as a percentage of households covered, they correspond to category 2. To aggregate national targets we propose the number of households as weighting factor. In order to incorporate the expected evolution of the population structure over time into the aggregated Digital Decade targets, we project the number of households for the period 2022-2030 as follows. We estimate the yearly number of households at country level by dividing the total population projected from EUROPOP2023 by the country's average household size according to the EU-SILC survey ([5]), from which the latest available data refers to 2022. Thus, we apply a dynamic weighting for these KPIs.

We assume that the average household size will remain constant between 2022 and 2030. This assumption seems realistic as average household size is relatively stable over time. According to the EU-SILC survey (Eurostat, 2023b), the EU27 average household size has shown a very light decrease from 2.4 in 2010 to 2.3 in 2022. In fact, according to the same source, household size also remains fairly stable over time at the country level. Therefore, the use of a fixed household size over the 2022-2030 period should not affect the results significantly.

5G coverage

This KPI is defined as the "percentage of populated areas covered by 5G", therefore, it belongs to category 2. Due to the difficulty to measure populated areas, the Broadband Coverage in Europe

([5]) The EU-SILC survey aims at providing "comparable cross-sectional and longitudinal data on income, poverty, social exclusion and living conditions" (Eurostat, 2023b). The survey provides two types of data. First, it provides cross-sectional information at a given time on statistics related to poverty, social exclusion and living conditions. On the other hand, it provides longitudinal data on individuals over a period of 4 years. Importantly for our purpose, it provides information on the average household size per Member State in 2022.

study ([6]) measures it as the share of households covered by 5G. Hence, we follow the same approach and use the number of households as weighting factor to calculate this aggregation.

As in the case of gigabit, we use the estimated number of households for the period 2022-2030 to aggregate national targets at EU level, using population projections and average household size.

Take-up of digital technologies (cloud, data analytics, artificial intelligence)

The three indicators of adoption of digital technologies (cloud, data analytics – big data until 2022 - and artificial intelligence) belong to category 2, as they are calculated as a share with a country-specific denominator. To aggregate the trajectories, we propose the number of enterprises with 10 or more persons employed by country as weighting factor. Following the Eurostat's survey on ICT usage and e-commerce in enterprises (used as source for this KPI), we exclude enterprises with nine or less persons employed and microenterprises (Eurostat, 2023c). The data source is the enterprises population counts and their distribution across size categories that National Statistical Institutes submit to Eurostat. Since no forecasts are available, we use the value of this variable as of 2023 for all the period until 2030.

Digital late adopters

This is a category 2-indicator, and we propose to use the number of small and medium-sized enterprises (SMEs) in the country as a weighting factor to aggregate the national targets of this KPI at EU level. Following the Eurostat's survey on ICT usage and e-commerce in enterprises, SMEs are defined as enterprises with between 10 and 249 persons employed. Microenterprises and enterprises with between two and nine persons employed are excluded from this definition. As in the previous KPI, we use National Statistical Institutes' submissions to calculate the number of SMEs by Member State as of 2023, and weights remain constant over time.

Digital public services

This target presents two different KPIs: the share of administrative steps that can be done fully online for major life events (moving; transport; starting a small claims procedure; family; career; studying; health); and the share of administrative steps needed to start a business and conduct regular business operations, which can be done fully online. Each online service (for major life events) receives a score calculated using online availability criteria defined by the eGovernment benchmark ([7]), and measured in different administrative levels (central / regional / local) depending on the service and Member State. For each service, the final score is the aggregation of individual binary scores. The eGovernment benchmark estimates the EU value as a simple average of national scores (see European Commission et al. (2023a) for more details). In order to be consistent with the original source we propose a simple average to aggregate national targets at EU level.

e-Health

The two KPIs used to measure this target are operationalised through a 12-component composite indicator (see European Commission et al. (2023b) for details), and the EU value is calculated as a simple average of national scores. As in the case of digital public services, we opt to be consistent with the original data source and use a simple average to aggregate national targets at EU level.

([6]) https://digital-strategy.ec.europa.eu/en/library/broadband-coverage-europe-2022

([7]) https://digital-strategy.ec.europa.eu/en/library/egovernment-benchmark-2023

3 Weighting factor dataset: descriptive statistics

Table 3 provides descriptive statistics for the main variables used as weighting factors and the resulting weights. Panel A focuses on the average levels of the variables used at country level, where variables that are used dynamically (population and households) are showed as an average of the 9-year long projection values (2022 to 2030). The average EU country has about 7.6 million employed persons, with 56 thousand enterprises (54 thousand of which are SMEs) and an average population of 16.7 million inhabitants and 7.4 million households between now and 2030. However, there is significant heterogeneity across Member States. Some countries have as few as 500 thousand inhabitants, such as Malta, while others, like Germany, have around 85 million inhabitants. This heterogeneity is reflected in the relatively large standard deviations, displayed in the next column, which are larger than the mean in all cases. Annex 2 provides the detailed tables of weights for all Member States and years when relevant.

Panel B shows descriptive statistics for the weights used for the aggregation. We see that the distribution of weights across all variables is fairly similar. The weight value for an average country is of 0.037 in all variables, and its standard deviation is regularly close to 0.05. The large heterogeneity is also visible in this panel, where the largest country in terms of all measured weighting factors, Germany, accounts for weights in most cases larger than 0.2. Germany and France account solely for around 40% of employment, labour force, number of enterprises and SMEs, population and households. This share grows up to 55-60% when including Spain and Italy, reflecting the relevance of these few large countries in the EU aggregate, and therefore the crucial role of their performance to achieve the Digital Decade targets.

The relevance of these few large Member States is also visible in **Figure 1**, which illustrates the evolution of weighting variables for these four countries together and the rest of countries. The combined weight of these four countries for household and population metrics ranges between 55 and 60%. The remaining 23 Member States weigh between 40 and 45%. Additionally, there is a very slight upward trend, where the four largest countries increase their relevance in determining EU level performance when approaching 2030. This increase, however, is very small in magnitude, showing that the country weight composition is very stable over time and therefore we can expect a minor impact of this trend in the evolution of the EU level target over time.

Figure 2 shows the cumulative distribution of weights across countries for the seven weighting variables: employment, labour force, SMEs, enterprises, population, population between 16 and 75 years old, and households. In general, the distribution is similar across all variables. The 10 largest countries account for more than 80% of the total weights in all cases, and the 10 smallest countries account for less than 10% of the total weights. This distribution highlights the statistical importance of the largest countries, whose performance is crucial in determining EU level targets and hence for the EU to achieve the Digital Decade targets.

In sum, the use of these weights has several practical implications. First, the performance of the largest countries is the most determinant factor in explaining the evolution at EU level. Second, weight composition is homogeneous across weighting factors, implying that the relative importance of each country does not vary significantly depending on the variable used to aggregate the EU-level targets. Third, dynamically, the weights are relatively stable and do not change significantly over time.

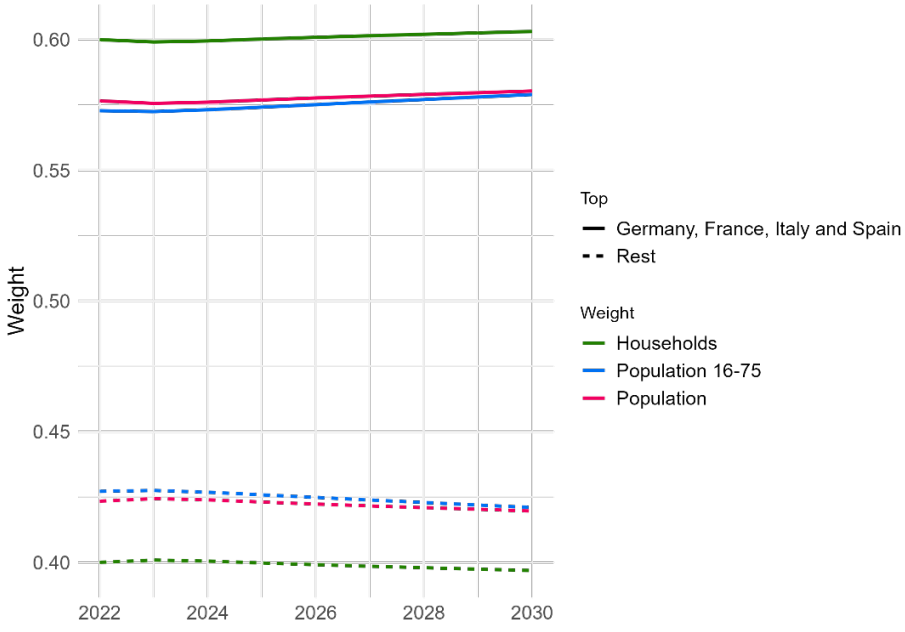
Table 3. Weighting factors: summary statistics

Panel A: Variables' levels (in thousands)	**Observations** (number of: MS or MS x years)	**Mean**	**Standard deviation**	**Median**	**Min**	**Max**	**Range**
Employment 15-74 y.o.	27	7,608	10,326	4,211	303	42,977	42,674
Labour force 15-74 y.o.	27	8,098	10,932	4,708	312	44,361	44,049
Enterprises 10+ employees	27	56	79	30	3	360	357
SMEs	27	54	77	29	3	348	346
Population 15-74 y.o.	243 (27 x 9)	12,518	16,535	6,894	407	63,590	63,182
Population	243 (27 x 9)	16,746	22,239	9,126	521	85,351	84,830
Households	243 (27 x 9)	7,392	10,363	3,949	217	42,676	42,458
Panel B: Weights (in shares in range [0,1])							
Employment 15-74 y.o.	27	0.037	0.050	0.020	0.001	0.208	0.207
Labour force 15-74 y.o.	27	0.037	0.050	0.022	0.001	0.201	0.200
Enterprises 10+ employees	27	0.037	0.052	0.020	0.002	0.239	0.237
SMEs	27	0.037	0.052	0.020	0.002	0.238	0.237
Population 15-74 y.o.	243 (27 x 9)	0.037	0.049	0.020	0.001	0.187	0.186
Population	243 (27 x 9)	0.037	0.049	0.020	0.001	0.188	0.187
Households	243 (27 x 9)	0.037	0.052	0.020	0.001	0.213	0.212

Note: Data in Panel A is presented in levels. Data in Panel B represents the weights associated to each country and weighting factor, namely the result of dividing the value of a variable in a country by the sum of the values of that variable for all countries. Variable definitions and sources are detailed in Table 2.

Source: Authors' elaboration

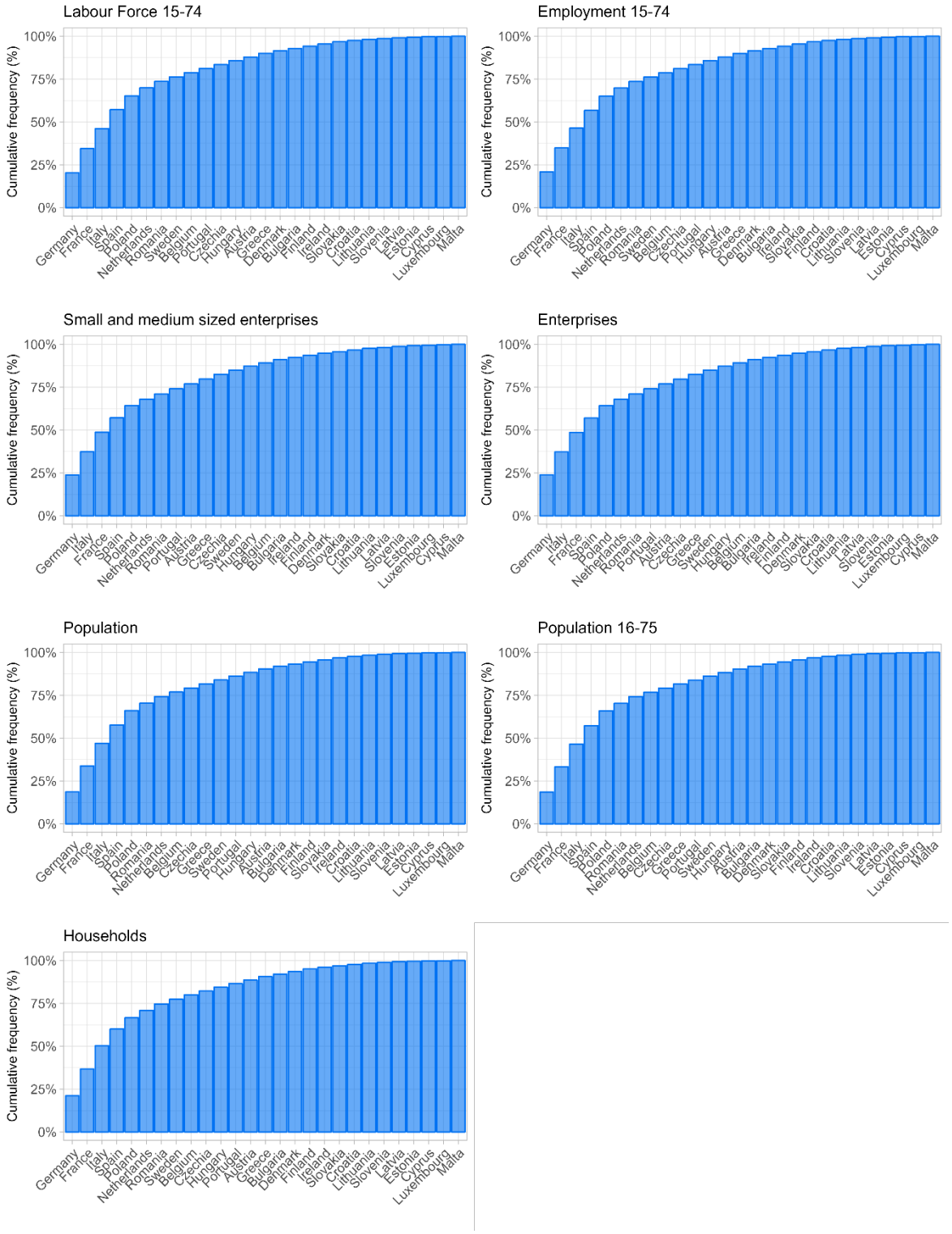
Figure 1. Weight share of the four largest EU Member States and the rest of Member States over time



Note: The figure shows the evolution over time of the relative weights of the four largest countries and the rest of Member States. The y-axis shows the total weights. The x-axis is the reference year. The solid line represents the sum of the weights of the four largest countries. The dashed line represents the sum of the weights of the remainder Member States. Each colour represents a weighting factor: households, population between 15 and 74 years old and total population. The dashed and solid lines of each weighting factor add to 1. Interpretation: For example, in 2022 the four largest countries accounted for 60% of total households in Europe, while the rest of countries accounted for the remaining 40%. This share of the largest countries stagnates over time, representing 61% of the total in 2030, with the rest of Member States accounting for the remaining 39%.

Source: Authors' elaboration

Figure 2. Cumulative distribution of weights across EU Member States



Note: The figure shows the cumulative weights of each variable by country. The x-axis shows countries in descending order by weight. The y-axis represents the cumulative weight of the country in the x-axis plus all the countries to its left. Interpretation: For example, in the first panel, the vertical bar for Sweden, represents that Sweden plus all the countries to its left (Germany, France, Italy…) account for 75% of the total labour force of the European Union.

Source: Authors' elaboration

4 Conclusions

Digitalisation is seen by the EU as one of the most relevant areas for the present and future development. In this context, the Digital Decade Policy Programme is of utmost importance for accomplishing a successful digital transition of the European economy and society. Monitoring its progress is, therefore, a necessary exercise to ensure its efficiency.

This report provides a systematic methodology for aggregating Member State targets at EU level to assess progress towards the European Union's digital targets. By implementing a coherent aggregation method, we have established a framework capable of yielding comparable EU-level metrics for the Digital Decade targets. The study also reveals the significance of methodological choices in aggregation. The adoption of annual weighting for the period 2022-2030, when data availability allows, aligns the aggregated data with expected demographic changes. In cases where static weighting (i.e., same for all years) is applied, the analysis still captures a snapshot that is reliable for policy assessment. Finally, we ensure maximum consistency by using official European statistics, and by mirroring in the aggregation method the original KPI methodology as close as possible. This grants that the EU level values obtained would reflect in the best possible way the reality of the European Union state of digitalisation.

As the 2030 target year approaches, ongoing tracking becomes crucial. Joint with previous reports (see e.g. Torrecillas et al., 2023 and Papazoglou et al., 2023), this work sets the basis for accomplishing a rigorous monitoring of the European Union digitalisation and its progress towards the 2030 set targets.

Once the national roadmaps are defined and national trajectories for each digital target exist, the next step entails applying the methodology proposed in this report to combine the national trajectories into an EU level aggregated trajectory, which will enable the yearly progress tracking.

References

European Commission, Directorate-General for Communications Networks, Content and Technology, (2023a). *eGovernment benchmark : method paper 2020-2023*, Publications Office of the European Union. https://data.europa.eu/doi/10.2759/263717

European Commission, Directorate-General for Communications Networks, Content and Technology, Deimel, L., Hentges, M., Latronico, V. (2023b). *Digital decade e-Health indicators development : final report*, Publications Office of the European Union. https://data.europa.eu/doi/10.2759/530348

Eurostat (2024) Labour Force Survey - Employment and activity - LFS adjusted series: Employment and activity by sex and age - quarterly data (lfsi_emp_q). https://ec.europa.eu/eurostat/web/main/data/database?node_code=employ. https://doi.org/10.2908/LFSI_EMP_Q. Last access: 15-03-2024

Eurostat (2023a) EUROPOP2023 - Population projections at national level (2022-2100) (proj_23n) https://ec.europa.eu/eurostat/web/products-datasets/product?code=proj_23np. https://doi.org/10.2908/PROJ_23NP. Last access: 13-11-2023

Eurostat (2023b) EU-SILC survey – Private households - Average household size – EU-SILC survey (ilc_lvph01). https://doi.org/10.2908/ILC_LVPH01. Last access: 12-12-2023

Eurostat (2023c) ICT usage in enterprises (isoc_e). https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Statistics_on_ICT_usage_and_e-commerce_introduced

Papazoglou, M., Torrecillas, J., Cardona, M., Calza, E., Vazquez-Prada Baillet, M. & Righi, R. (2023). Mapping EU level funding instruments to Digital Decade targets (No. JRC134647). Joint Research Centre (Seville site).

Torrecillas, J., Papazoglou, M., Calza, E., Cardona, M., & Vazquez-Prada Baillet, M. (2023). International benchmarking of private investments in Digital Decade thematic areas (No. JRC134743). Joint Research Centre (Seville site).

List of abbreviations and definitions

CRM	Customer relationship management
DD	Digital decade
EHR	Electronic health-record
e-ID	Electronic identification
ERP	Enterprise resource planning
EU	European Union
EU-SILC	European Union Survey on Income and Labour Conditions
FTTP	Fibre-to-the-premises
ICT	Information and communication technology
KPI	Key performance indicator
LFS	Labour force survey
NSI	National statistics institute
SDDR	State of the digital decade report
SME	Small and medium-sized enterprise
VHCN	Very high-capacity networks

List of figures

List of tables

Annexes

Annex 1. Data sources

Table A. 1. Weighting factors and its correspondent data sources

Indicator	Definition	Source and Notes	Link
Total Employment (thousand persons)	Employed persons are all persons between 15-74 years old who worked at least one hour for pay or profit during the reference week or were temporarily absent from such work.	Eurostat Labour Force Survey – quarterly data (2023, Q4) [*lfsi_emp_q*]	lfsi_emp_q
Persons in the Labour Force (thousands)	Population inside the Labour Force is defined as the sum of employed and unemployed persons between 15-74 years old.	Eurostat Labour Force Survey – quarterly data (2023, Q4) (*lfsi_emp_q*)	lfsi_emp_q
Total number of Firms (C-J, L-N, S95.1) and >10 employees (thousand firms) according to ICT Usage Survey	Total number of firms with more than 10 persons employed and under NACE Rev. 2 codes C-J, L-N and S95.1	National Statistical Institutes submissions to Eurostat (2023). Retrieved from CIRCABC. Data from Belgium completed using National Metadata from the ICT Usage for Enterprises Survey	NSIs
Total number of Firms (C-J, L-N, S95.1) between 10 and 249 employees (thousand firms) according to ICT Usage Survey	Total number of firms with between 10 and 249 persons employed and under NACE Rev. 2 codes C-J, L-N and S95.1	National Statistical Institutes submissions to Eurostat (2023). Retrieved from CIRCABC. Data from Belgium completed using National Metadata from the ICT Usage for Enterprises Survey	NSIs
Population from 15 to 74 years old	Baseline population projections from 2022-2030 for the 15-74 age group.	Eurostat EUROPOP23 – Population projections at national level (2022-2100) [*proj_23np]*	proj_23np
Total Population	Baseline population projections from 2022-2030.	Eurostat EUROPOP23 – Population projections at national level (2022-2100) [*proj_23np]*	proj_23np
Total Households	Total number of households projections from 2022-2030. The projection is calculated by multiplying the average household size from 2022 by the population projections from 2022-2030 (population).	Eurostat EUROPOP23 – Population projections at national level (2022-2100) [*proj_23np]*	proj_23np
		European Union Statistics on Income and Living Conditions (2023) [*ILC_LVPH01]*	ILC_LVPH01

Source: Authors' elaboration

Annex 2. Weighting factors datasets

This annex presents the weighting factors datasets, displaying the weighting variables values and their associated weights across countries. **Table A. 2** shows the static weights and **Table A. 3** displays the dynamic weights.

Table A. 2. Static weighting factors by Member State: levels and weights

Country	Employment 15-74	Weight of Employment 15-74	Labour force 15-74	Weight of Labour force 15-74	Enterprises	Weight of Enterprises	SMEs	Weight of SMEs
Belgium	5,072	0.025	5,368	0.025	30.1	0.020	29.1	0.020
Bulgaria	2,871	0.014	3,006	0.014	27.4	0.018	26.8	0.018
Czechia	5,033	0.025	5,170	0.024	42.5	0.028	40.8	0.028
Denmark	3,027	0.015	3,215	0.015	18.2	0.012	17.7	0.012
Germany	42,977	0.209	44,361	0.203	359.9	0.239	348.2	0.238
Estonia	696	0.003	742	0.003	6.7	0.004	6.5	0.004
Ireland	2,676	0.013	2,797	0.013	20.6	0.014	20.0	0.014
Greece	4,211	0.020	4,708	0.022	42.5	0.028	41.7	0.029
Spain	21,221	0.103	24,051	0.110	125.4	0.083	121.7	0.083
France	28,583	0.139	30,923	0.141	172.3	0.115	167.4	0.115
Croatia	1,612	0.008	1,707	0.008	13.5	0.009	13.1	0.009
Italy	23,692	0.115	25,599	0.117	200.0	0.133	196.2	0.134
Cyprus	463	0.002	492	0.002	4.5	0.003	4.4	0.003
Latvia	877	0.004	943	0.004	9.2	0.006	9.0	0.006
Lithuania	1,444	0.007	1,559	0.007	13.4	0.009	13.0	0.009
Luxembourg	319	0.002	338	0.002	4.7	0.003	4.5	0.003
Hungary	4,738	0.023	4,960	0.023	33.6	0.022	32.7	0.022
Malta	303	0.001	312	0.001	2.7	0.002	2.7	0.002
Netherlands	9,801	0.048	10,153	0.046	55.6	0.037	53.7	0.037
Austria	4,478	0.022	4,723	0.022	43.0	0.029	41.7	0.029
Poland	17,188	0.084	17,708	0.081	108.2	0.072	104.4	0.071
Portugal	4,957	0.024	5,304	0.024	44.4	0.030	43.4	0.030
Romania	7,684	0.037	8,138	0.037	47.4	0.032	45.8	0.031
Slovenia	996	0.005	1,032	0.005	8.6	0.006	8.3	0.006
Slovakia	2,622	0.013	2,778	0.013	14.2	0.009	13.6	0.009
Finland	2,620	0.013	2,833	0.013	18.4	0.012	17.8	0.012
Sweden	5,258	0.026	5,715	0.026	36.8	0.024	35.6	0.024

Source: Authors' elaboration

Table A. 3. Dynamic weighting factors by Member State and year: levels and weights

Country	Year	Population 16-75	Weight of Population 16-75	Population	Weight of Population	Households	Weight of Households
Belgium	2022	8,620,913	0.026	11,617,623	0.026	5,051,140	0.026
Belgium	2023	8,700,781	0.026	11,730,662	0.026	5,100,288	0.026
Belgium	2024	8,745,294	0.026	11,789,713	0.026	5,125,962	0.026
Belgium	2025	8,777,211	0.026	11,829,411	0.026	5,143,222	0.026
Belgium	2026	8,809,345	0.026	11,867,591	0.026	5,159,822	0.026
Belgium	2027	8,839,596	0.026	11,904,193	0.026	5,175,736	0.026
Belgium	2028	8,863,414	0.026	11,939,128	0.026	5,190,925	0.026
Belgium	2029	8,884,048	0.026	11,974,068	0.026	5,206,117	0.026
Belgium	2030	8,902,370	0.026	12,009,045	0.027	5,221,324	0.026
Bulgaria	2022	5,225,350	0.016	6,838,937	0.015	2,973,451	0.015
Bulgaria	2023	5,276,346	0.016	6,941,042	0.015	3,017,844	0.015
Bulgaria	2024	5,248,276	0.015	6,918,672	0.015	3,008,118	0.015
Bulgaria	2025	5,198,698	0.015	6,860,349	0.015	2,982,760	0.015
Bulgaria	2026	5,144,388	0.015	6,802,438	0.015	2,957,582	0.015
Bulgaria	2027	5,099,573	0.015	6,744,339	0.015	2,932,321	0.015
Bulgaria	2028	5,051,513	0.015	6,685,753	0.015	2,906,849	0.015
Bulgaria	2029	5,002,429	0.015	6,629,192	0.015	2,882,257	0.014
Bulgaria	2030	4,958,488	0.015	6,574,153	0.015	2,858,327	0.014
Czechia	2022	7,929,063	0.024	10,516,707	0.024	4,572,481	0.023
Czechia	2023	8,224,322	0.024	10,963,888	0.024	4,766,908	0.024
Czechia	2024	8,269,181	0.024	11,049,464	0.024	4,804,115	0.024
Czechia	2025	8,231,638	0.024	11,017,341	0.024	4,790,148	0.024
Czechia	2026	8,191,300	0.024	10,984,063	0.024	4,775,680	0.024
Czechia	2027	8,142,550	0.024	10,950,186	0.024	4,760,950	0.024
Czechia	2028	8,094,870	0.024	10,914,981	0.024	4,745,644	0.024
Czechia	2029	8,051,773	0.024	10,882,453	0.024	4,731,501	0.024
Czechia	2030	8,015,470	0.024	10,851,301	0.024	4,717,957	0.024
Denmark	2022	4,361,591	0.013	5,873,420	0.013	2,936,710	0.015
Denmark	2023	4,387,415	0.013	5,927,971	0.013	2,963,986	0.015
Denmark	2024	4,399,159	0.013	5,959,324	0.013	2,979,662	0.015
Denmark	2025	4,404,628	0.013	5,979,924	0.013	2,989,962	0.015
Denmark	2026	4,409,246	0.013	5,998,728	0.013	2,999,364	0.015
Denmark	2027	4,410,313	0.013	6,015,778	0.013	3,007,889	0.015
Denmark	2028	4,408,425	0.013	6,030,799	0.013	3,015,400	0.015
Denmark	2029	4,403,999	0.013	6,045,664	0.013	3,022,832	0.015
Denmark	2030	4,401,391	0.013	6,059,699	0.013	3,029,850	0.015
Germany	2022	62,334,912	0.186	83,237,124	0.186	41,618,562	0.211
Germany	2023	63,278,314	0.187	84,551,929	0.187	42,275,965	0.212
Germany	2024	63,587,857	0.187	85,041,941	0.188	42,520,971	0.213
Germany	2025	63,590,437	0.187	85,207,514	0.188	42,603,757	0.213
Germany	2026	63,540,350	0.187	85,309,747	0.188	42,654,874	0.213
Germany	2027	63,436,754	0.187	85,351,038	0.188	42,675,519	0.213
Germany	2028	63,290,512	0.187	85,324,918	0.188	42,662,459	0.213
Germany	2029	63,162,756	0.187	85,304,262	0.188	42,652,131	0.213

Country	Year	Population 16-75	Weight of Population 16-75	Population	Weight of Population	Households	Weight of Households
Germany	2030	63,047,503	0.187	85,284,256	0.188	42,642,128	0.213
Estonia	2022	989,033	0.003	1,331,796	0.003	634,189	0.003
Estonia	2023	1,018,630	0.003	1,371,817	0.003	653,246	0.003
Estonia	2024	1,025,981	0.003	1,380,158	0.003	657,218	0.003
Estonia	2025	1,024,751	0.003	1,377,519	0.003	655,961	0.003
Estonia	2026	1,024,234	0.003	1,374,354	0.003	654,454	0.003
Estonia	2027	1,021,734	0.003	1,370,686	0.003	652,708	0.003
Estonia	2028	1,018,390	0.003	1,366,487	0.003	650,708	0.003
Estonia	2029	1,015,255	0.003	1,362,440	0.003	648,781	0.003
Estonia	2030	1,011,695	0.003	1,358,611	0.003	646,958	0.003
Ireland	2022	3,732,190	0.011	5,060,004	0.011	1,946,155	0.010
Ireland	2023	3,824,993	0.011	5,174,288	0.011	1,990,111	0.010
Ireland	2024	3,878,241	0.011	5,225,872	0.012	2,009,951	0.010
Ireland	2025	3,917,885	0.012	5,257,383	0.012	2,022,070	0.010
Ireland	2026	3,957,435	0.012	5,289,027	0.012	2,034,241	0.010
Ireland	2027	3,995,806	0.012	5,320,882	0.012	2,046,493	0.010
Ireland	2028	4,030,501	0.012	5,353,001	0.012	2,058,847	0.010
Ireland	2029	4,063,326	0.012	5,384,987	0.012	2,071,149	0.010
Ireland	2030	4,092,057	0.012	5,416,927	0.012	2,083,433	0.010
Greece	2022	7,834,213	0.023	10,459,782	0.023	4,022,993	0.020
Greece	2023	7,804,526	0.023	10,416,542	0.023	4,006,362	0.020
Greece	2024	7,779,706	0.023	10,371,572	0.023	3,989,066	0.020
Greece	2025	7,752,511	0.023	10,320,364	0.023	3,969,371	0.020
Greece	2026	7,713,396	0.023	10,266,269	0.023	3,948,565	0.020
Greece	2027	7,662,866	0.023	10,209,059	0.023	3,926,561	0.020
Greece	2028	7,608,885	0.023	10,149,281	0.022	3,903,570	0.020
Greece	2029	7,551,457	0.022	10,090,457	0.022	3,880,945	0.019
Greece	2030	7,489,857	0.022	10,032,545	0.022	3,858,671	0.019
Spain	2022	36,069,646	0.108	47,432,893	0.106	18,973,157	0.096
Spain	2023	36,574,611	0.108	47,980,384	0.106	19,192,154	0.096
Spain	2024	36,928,514	0.109	48,346,319	0.107	19,338,528	0.097
Spain	2025	37,204,985	0.110	48,614,060	0.107	19,445,624	0.097
Spain	2026	37,444,610	0.110	48,822,977	0.108	19,529,191	0.098
Spain	2027	37,626,201	0.111	48,973,279	0.108	19,589,312	0.098
Spain	2028	37,721,644	0.112	49,069,647	0.108	19,627,859	0.098
Spain	2029	37,795,859	0.112	49,167,929	0.109	19,667,172	0.098
Spain	2030	37,878,077	0.113	49,266,930	0.109	19,706,772	0.099
France	2022	49,384,199	0.147	67,871,925	0.152	30,850,875	0.156
France	2023	49,519,112	0.146	68,227,636	0.151	31,012,562	0.156
France	2024	49,586,835	0.146	68,467,799	0.151	31,121,727	0.156
France	2025	49,627,382	0.146	68,658,223	0.152	31,208,283	0.156
France	2026	49,659,296	0.146	68,828,579	0.152	31,285,718	0.156
France	2027	49,691,311	0.147	68,981,139	0.152	31,355,063	0.157
France	2028	49,696,281	0.147	69,115,954	0.153	31,416,343	0.157
France	2029	49,708,077	0.147	69,251,760	0.153	31,478,073	0.157

Country	Year	Population 16-75	Weight of Population 16-75	Population	Weight of Population	Households	Weight of Households
France	2030	49,707,992	0.148	69,386,211	0.153	31,539,187	0.158
Croatia	2022	2,949,577	0.009	3,862,305	0.009	1,430,483	0.007
Croatia	2023	2,937,916	0.009	3,854,381	0.009	1,427,549	0.007
Croatia	2024	2,920,764	0.009	3,834,008	0.008	1,420,003	0.007
Croatia	2025	2,898,715	0.009	3,810,628	0.008	1,411,344	0.007
Croatia	2026	2,876,241	0.008	3,788,113	0.008	1,403,005	0.007
Croatia	2027	2,854,875	0.008	3,766,531	0.008	1,395,011	0.007
Croatia	2028	2,821,507	0.008	3,734,553	0.008	1,383,168	0.007
Croatia	2029	2,796,060	0.008	3,713,774	0.008	1,375,472	0.007
Croatia	2030	2,769,725	0.008	3,693,206	0.008	1,367,854	0.007
Italy	2022	44,385,295	0.132	59,030,133	0.132	26,831,879	0.136
Italy	2023	44,402,616	0.131	59,058,615	0.131	26,844,825	0.135
Italy	2024	44,357,450	0.131	59,011,788	0.130	26,823,540	0.134
Italy	2025	44,330,443	0.131	58,951,070	0.130	26,795,941	0.134
Italy	2026	44,314,296	0.131	58,898,864	0.130	26,772,211	0.134
Italy	2027	44,320,889	0.131	58,857,408	0.130	26,753,367	0.134
Italy	2028	44,330,787	0.131	58,825,941	0.130	26,739,064	0.134
Italy	2029	44,316,190	0.131	58,797,473	0.130	26,726,124	0.134
Italy	2030	44,274,194	0.132	58,773,783	0.130	26,715,356	0.134
Cyprus	2022	695,462	0.002	904,705	0.002	347,963	0.002
Cyprus	2023	709,371	0.002	926,006	0.002	356,156	0.002
Cyprus	2024	715,171	0.002	936,083	0.002	360,032	0.002
Cyprus	2025	717,843	0.002	941,765	0.002	362,217	0.002
Cyprus	2026	719,941	0.002	946,441	0.002	364,016	0.002
Cyprus	2027	720,955	0.002	950,152	0.002	365,443	0.002
Cyprus	2028	721,689	0.002	952,823	0.002	366,470	0.002
Cyprus	2029	721,931	0.002	955,378	0.002	367,453	0.002
Cyprus	2030	722,274	0.002	957,744	0.002	368,363	0.002
Latvia	2022	1,392,408	0.004	1,875,757	0.004	852,617	0.004
Latvia	2023	1,407,220	0.004	1,894,146	0.004	860,975	0.004
Latvia	2024	1,400,781	0.004	1,883,405	0.004	856,093	0.004
Latvia	2025	1,384,849	0.004	1,863,089	0.004	846,859	0.004
Latvia	2026	1,368,684	0.004	1,842,409	0.004	837,459	0.004
Latvia	2027	1,351,756	0.004	1,821,191	0.004	827,814	0.004
Latvia	2028	1,335,715	0.004	1,799,221	0.004	817,828	0.004
Latvia	2029	1,321,362	0.004	1,777,599	0.004	808,000	0.004
Latvia	2030	1,307,316	0.004	1,756,334	0.004	798,334	0.004
Lithuania	2022	2,125,613	0.006	2,805,998	0.006	1,402,999	0.007
Lithuania	2023	2,172,542	0.006	2,869,396	0.006	1,434,698	0.007
Lithuania	2024	2,179,072	0.006	2,875,218	0.006	1,437,609	0.007
Lithuania	2025	2,170,499	0.006	2,860,472	0.006	1,430,236	0.007
Lithuania	2026	2,158,935	0.006	2,842,081	0.006	1,421,041	0.007
Lithuania	2027	2,143,249	0.006	2,819,971	0.006	1,409,986	0.007
Lithuania	2028	2,124,033	0.006	2,793,634	0.006	1,396,817	0.007
Lithuania	2029	2,105,527	0.006	2,767,640	0.006	1,383,820	0.007

Country	Year	Population 16-75	Weight of Population 16-75	Population	Weight of Population	Households	Weight of Households
Lithuania	2030	2,086,805	0.006	2,741,927	0.006	1,370,964	0.007
Luxembourg	2022	500,183	0.001	645,397	0.001	280,607	0.001
Luxembourg	2023	513,117	0.002	662,537	0.001	288,060	0.001
Luxembourg	2024	522,953	0.002	675,611	0.001	293,744	0.001
Luxembourg	2025	531,570	0.002	687,081	0.002	298,731	0.001
Luxembourg	2026	540,066	0.002	698,278	0.002	303,599	0.002
Luxembourg	2027	548,189	0.002	709,190	0.002	308,343	0.002
Luxembourg	2028	555,876	0.002	719,777	0.002	312,947	0.002
Luxembourg	2029	563,350	0.002	730,190	0.002	317,474	0.002
Luxembourg	2030	570,597	0.002	740,420	0.002	321,922	0.002
Hungary	2022	7,464,606	0.022	9,689,010	0.022	4,212,613	0.021
Hungary	2023	7,447,795	0.022	9,689,361	0.021	4,212,766	0.021
Hungary	2024	7,416,298	0.022	9,670,111	0.021	4,204,396	0.021
Hungary	2025	7,378,125	0.022	9,644,847	0.021	4,193,412	0.021
Hungary	2026	7,331,843	0.022	9,620,993	0.021	4,183,040	0.021
Hungary	2027	7,286,478	0.022	9,597,450	0.021	4,172,804	0.021
Hungary	2028	7,246,038	0.021	9,573,344	0.021	4,162,323	0.021
Hungary	2029	7,195,908	0.021	9,550,024	0.021	4,152,184	0.021
Hungary	2030	7,141,249	0.021	9,526,758	0.021	4,142,069	0.021
Malta	2022	407,659	0.001	520,971	0.001	217,071	0.001
Malta	2023	415,048	0.001	532,640	0.001	221,933	0.001
Malta	2024	421,989	0.001	543,300	0.001	226,375	0.001
Malta	2025	428,985	0.001	553,623	0.001	230,676	0.001
Malta	2026	435,936	0.001	563,990	0.001	234,996	0.001
Malta	2027	443,605	0.001	574,387	0.001	239,328	0.001
Malta	2028	451,382	0.001	584,802	0.001	243,668	0.001
Malta	2029	458,887	0.001	594,914	0.001	247,881	0.001
Malta	2030	466,124	0.001	604,727	0.001	251,970	0.001
Netherlands	2022	13,311,499	0.040	17,590,672	0.039	8,376,510	0.042
Netherlands	2023	13,442,889	0.040	17,823,388	0.039	8,487,328	0.043
Netherlands	2024	13,510,084	0.040	17,957,617	0.040	8,551,246	0.043
Netherlands	2025	13,549,714	0.040	18,048,588	0.040	8,594,566	0.043
Netherlands	2026	13,580,658	0.040	18,125,648	0.040	8,631,261	0.043
Netherlands	2027	13,598,836	0.040	18,189,995	0.040	8,661,902	0.043
Netherlands	2028	13,597,732	0.040	18,240,986	0.040	8,686,184	0.043
Netherlands	2029	13,594,336	0.040	18,291,923	0.040	8,710,440	0.044
Netherlands	2030	13,593,084	0.040	18,341,701	0.041	8,734,143	0.044
Austria	2022	6,837,668	0.020	8,978,929	0.020	4,081,331	0.021
Austria	2023	6,884,008	0.020	9,073,118	0.020	4,124,145	0.021
Austria	2024	6,890,532	0.020	9,101,003	0.020	4,136,820	0.021
Austria	2025	6,888,193	0.020	9,111,243	0.020	4,141,474	0.021
Austria	2026	6,894,192	0.020	9,125,881	0.020	4,148,128	0.021
Austria	2027	6,906,336	0.020	9,145,233	0.020	4,156,924	0.021
Austria	2028	6,920,644	0.020	9,168,872	0.020	4,167,669	0.021
Austria	2029	6,934,297	0.021	9,192,199	0.020	4,178,272	0.021

Country	Year	Population 16-75	Weight of Population 16-75	Population	Weight of Population	Households	Weight of Households
Austria	2030	6,947,847	0.021	9,214,690	0.020	4,188,495	0.021
Poland	2022	29,121,627	0.087	37,654,247	0.084	12,984,223	0.066
Poland	2023	29,563,020	0.087	38,482,931	0.085	13,269,976	0.067
Poland	2024	29,553,049	0.087	38,557,391	0.085	13,295,652	0.067
Poland	2025	29,395,919	0.087	38,381,332	0.085	13,234,942	0.066
Poland	2026	29,207,733	0.086	38,197,684	0.084	13,171,615	0.066
Poland	2027	28,979,379	0.086	38,007,503	0.084	13,106,036	0.065
Poland	2028	28,744,034	0.085	37,809,068	0.083	13,037,610	0.065
Poland	2029	28,493,228	0.084	37,614,410	0.083	12,970,486	0.065
Poland	2030	28,254,278	0.084	37,420,524	0.083	12,903,629	0.065
Portugal	2022	7,829,943	0.023	10,352,042	0.023	4,140,817	0.021
Portugal	2023	7,851,854	0.023	10,392,897	0.023	4,157,159	0.021
Portugal	2024	7,831,374	0.023	10,390,841	0.023	4,156,336	0.021
Portugal	2025	7,798,134	0.023	10,372,141	0.023	4,148,856	0.021
Portugal	2026	7,766,042	0.023	10,350,500	0.023	4,140,200	0.021
Portugal	2027	7,727,096	0.023	10,326,352	0.023	4,130,541	0.021
Portugal	2028	7,680,432	0.023	10,300,157	0.023	4,120,063	0.021
Portugal	2029	7,632,701	0.023	10,274,413	0.023	4,109,765	0.021
Portugal	2030	7,585,263	0.023	10,249,138	0.023	4,099,655	0.021
Romania	2022	14,494,238	0.043	19,042,455	0.043	7,616,982	0.039
Romania	2023	14,481,535	0.043	19,030,292	0.042	7,612,117	0.038
Romania	2024	14,414,808	0.042	18,943,880	0.042	7,577,552	0.038
Romania	2025	14,298,517	0.042	18,831,698	0.042	7,532,679	0.038
Romania	2026	14,178,409	0.042	18,714,611	0.041	7,485,844	0.037
Romania	2027	14,049,448	0.041	18,593,302	0.041	7,437,321	0.037
Romania	2028	13,915,163	0.041	18,466,574	0.041	7,386,630	0.037
Romania	2029	13,780,973	0.041	18,341,717	0.041	7,336,687	0.037
Romania	2030	13,644,927	0.041	18,218,553	0.040	7,287,421	0.036
Slovenia	2022	1,595,436	0.005	2,107,180	0.005	877,992	0.004
Slovenia	2023	1,600,418	0.005	2,116,709	0.005	881,962	0.004
Slovenia	2024	1,602,330	0.005	2,119,872	0.005	883,280	0.004
Slovenia	2025	1,601,755	0.005	2,120,770	0.005	883,654	0.004
Slovenia	2026	1,599,886	0.005	2,121,073	0.005	883,780	0.004
Slovenia	2027	1,597,865	0.005	2,120,985	0.005	883,744	0.004
Slovenia	2028	1,594,918	0.005	2,120,443	0.005	883,518	0.004
Slovenia	2029	1,590,728	0.005	2,119,727	0.005	883,220	0.004
Slovenia	2030	1,586,885	0.005	2,118,806	0.005	882,836	0.004
Slovakia	2022	4,218,091	0.013	5,434,712	0.012	1,753,133	0.009
Slovakia	2023	4,264,815	0.013	5,523,904	0.012	1,781,905	0.009
Slovakia	2024	4,259,330	0.013	5,534,826	0.012	1,785,428	0.009
Slovakia	2025	4,239,336	0.012	5,521,368	0.012	1,781,086	0.009
Slovakia	2026	4,215,643	0.012	5,507,802	0.012	1,776,710	0.009
Slovakia	2027	4,189,810	0.012	5,494,075	0.012	1,772,282	0.009
Slovakia	2028	4,164,780	0.012	5,479,845	0.012	1,767,692	0.009
Slovakia	2029	4,140,109	0.012	5,465,314	0.012	1,763,005	0.009

Country	Year	Population 16-75	Weight of Population 16-75	Population	Weight of Population	Households	Weight of Households
Slovakia	2030	4,115,676	0.012	5,450,183	0.012	1,758,124	0.009
Finland	2022	4,120,392	0.012	5,548,241	0.012	2,920,127	0.015
Finland	2023	4,153,337	0.012	5,608,235	0.012	2,951,703	0.015
Finland	2024	4,158,243	0.012	5,632,559	0.012	2,964,505	0.015
Finland	2025	4,154,219	0.012	5,640,423	0.012	2,968,644	0.015
Finland	2026	4,150,766	0.012	5,644,445	0.012	2,970,761	0.015
Finland	2027	4,146,272	0.012	5,644,503	0.012	2,970,791	0.015
Finland	2028	4,137,211	0.012	5,640,624	0.012	2,968,749	0.015
Finland	2029	4,129,702	0.012	5,636,361	0.012	2,966,506	0.015
Finland	2030	4,121,059	0.012	5,631,487	0.012	2,963,941	0.015
Sweden	2022	7,570,793	0.023	10,452,326	0.023	5,226,163	0.027
Sweden	2023	7,633,811	0.023	10,561,077	0.023	5,280,539	0.027
Sweden	2024	7,673,724	0.023	10,640,372	0.023	5,320,186	0.027
Sweden	2025	7,710,988	0.023	10,705,814	0.024	5,352,907	0.027
Sweden	2026	7,757,035	0.023	10,770,866	0.024	5,385,433	0.027
Sweden	2027	7,804,107	0.023	10,835,254	0.024	5,417,627	0.027
Sweden	2028	7,852,591	0.023	10,898,809	0.024	5,449,405	0.027
Sweden	2029	7,900,079	0.023	10,960,521	0.024	5,480,261	0.027
Sweden	2030	7,951,232	0.024	11,020,442	0.024	5,510,221	0.028

Source: Authors' elaboration

Getting in touch with the EU

In person

All over the European Union there are hundreds of Europe Direct centres. You can find the address of the centre nearest you online (european-union.europa.eu/contact-eu/meet-us_en).

On the phone or in writing

Europe Direct is a service that answers your questions about the European Union. You can contact this service:

— by freephone: 00 800 6 7 8 9 10 11 (certain operators may charge for these calls),

— at the following standard number: +32 22999696,

— via the following form: european-union.europa.eu/contact-eu/write-us_en.

Finding information about the EU

Online

Information about the European Union in all the official languages of the EU is available on the Europa website (european-union.europa.eu).

EU publications

You can view or order EU publications at op.europa.eu/en/publications. Multiple copies of free publications can be obtained by contacting Europe Direct or your local documentation centre (european-union.europa.eu/contact-eu/meet-us_en).

EU law and related documents

For access to legal information from the EU, including all EU law since 1951 in all the official language versions, go to EUR-Lex (eur-lex.europa.eu).

EU open data

The portal data.europa.eu provides access to open datasets from the EU institutions, bodies and agencies. These can be downloaded and reused for free, for both commercial and non-commercial purposes. The portal also provides access to a wealth of datasets from European countries.

Science for policy

The Joint Research Centre (JRC) provides independent, evidence-based knowledge and science, supporting EU policies to positively impact society

EU Science Hub
joint-research-centre.ec.europa.eu

Publications Office
of the European Union