Study on the monitoring data on ERDF and Cohesion Fund operations, and on the monitoring systems operated in the 2014-2020 period

Contract N° 2019CE16BAT214/2020CE16BAT075

Deliverable 7:

Report on the construction of Database of Indicators and the reliability of common output indicators

Written by PPMI

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LIST OF ABBREVIATIONS

AT	Austria
AIR(s)	Annual Implementation Report(s)
BE	Belgium
BG	Bulgaria
CF	Cohesion Fund
CP	Cooperation Programme
CY	Cyprus
CZ	Czech Republic
DE	Germany
DB	Database
DG REGIO	Directorate-General Regional and Urban Policy
DK	Denmark
EC	European Commission
EE	Estonia
EL	Greece
EN	English
ERDF	European Regional Development Fund
ESF	European Social Fund
ESIF	European Structural and Investment Funds
EU	European Union
EUR	Euro (currency)
FI	Finland
FoI	Field of Intervention
FR	France
HR	Croatia
ID	Identification/Identity/Identifier
IE	Ireland

IP	Investment Priority
IT	Italy
LT	Lithuania
LU	Luxembourg
LV	Latvia
MA(s)	Managing Authority(ies)
MS	Member State(s)
MT	Malta
N.A.	Not available/Not applicable
NL	(The) Netherlands
OP(s)	Operational Programme(s)
PL	Poland
PLD	Project-level data
PT	Portugal
RO	Romania
SFC	System for Fund Management
SI	Slovenia
SK	Slovakia
TO	Thematic Objective
TC	Transnational Cooperation
UK	United Kingdom

Foreword and synthesis

The European Commission awarded CSIL – Centre for Industrial Studies, in partnership with Prognos and PPMI, a contract to carry out the "Study on the monitoring data on ERDF and Cohesion Fund operations, and on the monitoring systems operated in the 2014-2020 period".

The project aims at providing **reliable and robust monitoring data on expenditure and achievement indicators** that will feed into the Commission's ex-post evaluation of Cohesion Policy programmes in the 2014-2020 programming period. The work carried out under this contract provides input to the ex-post evaluation in terms of (1) creating interlinked databases of the funded operations and classifying them according to their scope of intervention, form of finance and type of beneficiary and (2) gathering, classifying and quality assessing the output indicator data collected by Managing Authorities (MAs). Under this study, we collected, analysed and synthesised the vast amount of monitoring data available in the national/regional monitoring systems so that it can be processed further and used for later analysis and evaluation work.

This report (**Deliverable D7**) presents the results of the task, which aimed to validate the common output indicator data reported to the Commission by Member States and provide an overall assessment of the plausibility and reliability of each common output indicator (CO) used to monitor the progress of implementation of the operational programmes (OPs) funded through the European Regional Development Fund (ERDF) and the Cohesion Fund (CF) during the 2014-2020 programming period. The report is accompanied by MS Excel spreadsheets **(Deliverable D6)** providing the assessment for each common indicator at the investment priority level (IP), broken down by the operational programme and Member State, with cumulative total values, estimated under- or overreporting and with the expenditure of the programme that contributes to the deliverable expressed by the common indicator.

To assess the reliability of common output indicators, the study team (1) aggregated data on common output indicators at the operation level available in the national/regional monitoring data; (2) reconciled it with the data reported in Annual Implementation Reports (AIRs) for 2020, and (3) conducted analytical tests, and quantitative and qualitative cross-checks to identify deviations and potential cases of under- and overreporting. The quantitative analysis and further cross-checks of data on indicators showed that for the values of common indicators reported in AIRs 2020, 89% of selected (i.e. contracted) values and 78% of implemented values were assessed as plausible[1].

The report is accompanied by a **Database (DB) of Indicators** at the operation level, which contains data on the target and achieved values of both common and programme-specific output indicators relevant for the operations listed in the Database of Operations. The data included has four main strong points:

1. **Representativeness:** the Database of Indicators covers 24 Member States and 245 operational programmes: 187 national and regional programmes out of 217 (86.2%) and 53 Cooperation Programme out of 76 (69.7%). Overall, the database contains 1,435,059 rows of data by output indicator.
2. **Interlinkability:** the Database of Indicators is interlinked with the Database of Operations and the Database of Beneficiaries through a unique ad-hoc identifier of the operation, allowing linking the data on output indicators to the related operation

[1] Plausible values include those common indicators for which values reported in AIRs and on project level matched within 10% discrepancy, or their values are likely to be higher or lower and can be estimated based on project-level data, or their values are likely to be higher, but cannot be estimated.

and beneficiaries and vice versa. The Database of Indicators includes data for a total of 421,629 operations and covers 72.1% of operations and 85.06% of operational programmes included in the Database of Operations. Moreover, in the Database of Indicators, each operation is already linked to the Priority Axis, Investment Priority, Thematic Objective and programme it contributes to so that the causality chain from strategic objectives to funded projects and **delivered output** can be established.

3. **Comparability:** Data has been cleaned and harmonised to allow aggregation at MS and EU levels and the distinction between common and programme-specific output indicators. Where missing in the data already available in monitoring systems, SFC codes of common output indicators were assigned using registers of indicators, reviewing texts of operational programmes or after ad hoc clarifications with managing authorities.

The report is organised as follows:

- **Chapter 1** presents our approach to analysis and validation of values of common output indicators reported to the Commission in Annual implementation reports (AIRs).
- **Chapter 2** provides an overview of the DB of Indicators, its coverage and the construction process.
- **Chapter 3** presents data checks and analysis undertaken to validate the plausibility and reliability of common indicators values and calculates the estimated CO values.
- **Chapter 4** presents the summary of the assessment results and an overview of the results of reliability assessment for each common indicator.

The report is complemented by **Annex I** which contains **metadata on common output indicators**, including calculation methodologies, reporting rules and data quality checks implemented in 26 Member States.

1. Our approach to validation of common output indicators

This section presents the general approach and main steps undertaken to assess the reliability of common output indicators. To implement this task, the study team conducted desk research of previous studies on monitoring systems, reviewed AIR data, initiated the collection of operation level data on output indicators and collected the metadata on CO calculation methodologies and quality checks at the national level. Based on operation level data collected, we constructed a database of indicators that allowed us to conduct quantitative assessments and cross-analysis aimed at assessing the reliability of values of common indicators reported in AIRs 2020.

1.1. Qualitative assessment

As the first step to the analysis of the reliability of common output indicators, desk research was conducted, including:

- review of DG Regio provided AIRs 2019 data (accessible via smartpeg.site);
- analysis of AIRs 2020 data (dated 1st July 2021 and 1st October 2021);
- analysis of the tests on common output indicator values in AIR data for 2019 and 2020 conducted by DG Regio and shared with the study team;
- review of previous studies on monitoring indicators and identification of potential inconsistencies in definitions and the calculation methodologies;
- clustering of common indicators according to the following identified features:
  - type of indicator (process, output, result);
  - ambiguous definition (CO18-CO21, CO28-CO34);
  - the methodology set by MA (CO08-09, CO20-21, CO28-29, CO34);
  - risk of double counting (CO01-CO05, CO20-21, CO28, CO36-37, CO43-46).

Table 1 below presents the results of the clustering of indicators that was used to identify the list of selected indicators on which metadata were collected.

Table 1 – Clustering of common indicators based on identified features

Indicator code	Measurement unit	Indicator name	Type	Definition	Methodology set by MA	Risk of double counting
CO01	enterprises	Number of enterprises receiving support	Process			+
CO02	enterprises	Number of enterprises receiving grants	Process			+
CO03	enterprises	Number of enterprises receiving financial support other than grants	Process			+
CO04	enterprises	Number of enterprises receiving non-financial support	Process	+		+
CO05	enterprises	Number of new enterprises supported	Process	+		+
CO06	EUR	Private investment matching public support to enterprises (grants)	Input	++		

CO07	EUR	Private investment matching public support to enterprises (non-grants)	Input	++		
CO08	FTE	Employment increase in supported enterprises	Result	+	+	
CO09	Visits/year	Increase in expected number of visits to supported sites of cultural or natural heritage and attractions	Result	++	+	
CO10	households	Additional households with broadband access of at least 30 Mbps	Result	+		
CO11	Km	Total length of new railway line	Output			
CO11a	Km	Total length of new TEN-T railway line	Output			
CO12	Km	Total length of reconstructed or upgraded railway line	Output			
CO12a	Km	Total length of reconstructed or upgraded TEN-T railway line	Output			
CO13	Km	Total length of newly built roads	Output			
CO13a	Km	Total length of newly built TEN-T roads	Output			
CO14	Km	Total length of reconstructed or upgraded roads	Output			
CO14a	Km	, of which: TEN-T	Output			
CO15	Km	Total length of new or improved tram and metro lines	Output			
CO16	Km	Total length of new or improved inland waterway	Output			
CO17	tonnes/year	Additional waste recycling capacity	Output			
CO18	persons	Additional population served by the improved water supply	Result	++		
CO19	population equivalent	Additional population served by improved wastewater treatment	Result	++		
CO20	persons	Population benefiting from flood protection measures	Result	++	+	+
CO21	persons	Population benefiting from forest fire protection measures	Result	+++	+	+
CO22	Hectares	Total surface area of rehabilitated land	Output			
CO23	Hectares	Surface area of habitats supported in order to attain a better conservation status	Output			
CO24	FTE	Number of new researchers in supported entities	Result	++		
CO25	FTE	Number of researchers working in improved research infrastructure facilities	Result	+		
CO26	enterprises	Number of enterprises cooperating with research institutions	Result	+		
CO27	EUR	Private investment matching public support in innovation or R&D projects	Input			
CO28	enterprises	Number of enterprises supported to introduce new to the market products	Process	+	+	+
CO29	enterprises	Number of enterprises supported to introduce new to the firm products	Process		+	
CO30	MW	Additional capacity of renewable energy production	Output			

CO31	households	Number of households with improved energy consumption classification	Result	+		
CO32	kWh/year	Decrease of annual primary energy consumption of public buildings	Result	+		
CO33	Users	Number of additional energy users connected to smart grids	Result			
CO34	tons of CO2 equivalent	Estimated annual decrease of GHG	Result	++	+	
CO35	persons	Capacity of supported childcare or education infrastructure	Result	+		
CO36	persons	Population covered by improved health services	Result	+		+
CO37	persons	Population living in areas with integrated urban development strategies	Result			+
CO38	square meters	Open space created or rehabilitated in urban areas	Output	++		
CO39	square meters	Public or commercial buildings newly built or renovated in urban areas	Output			
CO40	housing units	Rehabilitated housing	Output	+		
CO40a	housing units	Rehabilitated housing, of which for migrants and refugees (not including reception centres)	Output	+		
CO41	enterprises	Number of enterprises participating in cross-border, transnational or interregional research projects	Result			
CO42	organisations	Number of research institutions participating in cross-border, transnational or interregional research projects	Result			
CO43	participants	Number of participants in cross-border mobility initiatives	Output			+
CO44	participants	Number of participants in joint local employment initiatives and joint training	Output			+
CO45	participants	Number of participants in projects promoting gender equality, equal opportunities and social inclusion across borders	Output			+
CO46	participants	Number of participants in joint education and training schemes to support youth employment, educational opportunities and higher and vocational education across borders	Output			+
CO47	persons	Capacity of infrastructures supporting migrants and refugees (other than housing)	Result			

Source: PPMI.

Based on desk research results, a **metadata collection** request to country experts was launched, including the tailored templates for metadata collection on selected common indicators for each Member State and a guidance note. The metadata at the investment priority level on the definitions, calculation methodologies, sources of data and internal quality checks on 28 selected indicators (CO04-10, CO18-21, CO24-28, CO30-38, CO40-42) were collected in 26 Member States on 194 Operational Programmes and 59 Cooperation Programmes (see Table 2 and Annex I for the results of metadata collection).

Metadata collected have enabled qualitative qualification of the plausibility/reliability of each common indicator, focusing on clarity and comparability of definitions of indicators, their

calculation methodologies and quality checks implemented by the MAs and other bodies in charge of reporting the data on indicators.

Table 2 – The coverage of collected metadata on common output indicators (number of indicator uses at IP level)

Ind.Cd.	AT	BE	BG	CY	CZ	DE	DK	EE	ES	FI	FR	GR	IE	IT	LT	LU	LV	MT	NL	PL	PT	RO	SE	SK	SI	CP	UK	Total
CO04		9	1	1	1	6		2	30	5	50	17	4	7	1		2	1	6	20		2	40	12	2	44	8	**271**
CO05		4	1		3	14		1	27	2	21	23	2	29	2		1			8	8	1	14	13	1	8	6	**189**
CO06	5	1	2	1	11	9	6		6	3	32	16	2	15	3		1		9	52	24	2	7	8	1	11	3	**230**
CO07			2		4	14			3	3	31	12		6	3		2		4	24		3	10	6	1		5	**133**
CO08	3	4	1	2	5	18		2	27	8	24	41	2	32	2		2	2	1	29	33		24	13	1	11	10	**297**
CO09			1	1	1	5			11		12	15		11	1		1	2		17	7	2				29		**116**
CO10					1				9		9	1		5	1		1			1		1			1		2	**32**
CO18			1		1			1	6		4	15		4	1			1		12	2	1		3	1	2		**55**
CO19			1	1	1			1	11		6	11		4	1		1			16	1	1		2	1	1		**60**
CO20			1		1	5			2		9	11		9	1		1			13	2	1		1	2	8		**67**
CO21									1			7		2						5	1					5		**21**
CO24	6	2	1	1	3	14			8		16	7	2	12			1			3		2		8	1	7	2	**96**
CO25		2	1		2	16		1	16		16	7		5	1	1	1	1		17	8	1	1	8	1	6	2	**114**
CO26	2	3	1	1	4	14	2	1	15		34	15	2	20	1	1	1		3	19	8	1	10	6	1	35	5	**205**
CO27		1	1	1	1	13		1	15	4	31	6	1	13	1		1		6	16		2	5	8		11	3	**141**
CO28		3	1	1	2	11	2	1	9	3	12	11		15	1		1		6	17	7	1	7	11	1	22	3	**148**
CO30		3			4	8			20		27	5		16	2	1	3	3	2	26	2	1		4	1	3	1	**132**
CO31		1	2	1	1			1	8		28	14	2	2	1	1	1		1	16	5	1	2	1	1	5	3	**98**
CO32		3	2	1	3	7			16		15	15		17	1	1	1	1		18	8	1		6	1	3	1	**121**
CO33						2			2		2	1		4	1					1		2			1			**16**
CO34	4	6	4	3	8	31	6	1	36		65	27	2	29	2	2	3	4		66	11	3	3	11	2	8	5	**342**
CO35			3		2	3			11		5	20		10	1		1			22	7	2		2		1		**90**
CO36								1	8		2	13		4	1		1	1		16	6	2		1		2		**58**
CO37	2	1		1		11		3			25	5	2	4	1			1		5		1		1	1			**64**

CO38		2	1	1		10		2	5		9	11		1	1		1			6	16	5		1	1	1		**74**
CO40			1						5		1			6				2		2	6				1			**24**
CO41																										34		**34**
CO42																										43		**43**
Total	**22**	**45**	**29**	**17**	**59**	**211**	**16**	**19**	**307**	**28**	**486**	**326**	**21**	**282**	**31**	**7**	**28**	**19**	**38**	**447**	**162**	**39**	**123**	**126**	**24**	**300**	**59**	**3272**

Source: compiled by PPMI.

1.2. Quantitative assessment and cross-analysis of data on COs

Quantitative assessment of plausibility and reliability of common indicators and achieved values reported in AIRs was conducted by analysing data on common output indicators at the project level and comparing it to the data reported by Member States in AIRs. This included:

- aggregation of AIRs data on common indicators to IP level by MS, OP and CO;
- aggregation of operation level data on common indicators to investment priority (IP) level by MS, OP and CO;
- assessment of operation level data on total expenditures allocated and paid to operations contributing to the achievement of CO;
- identification of values of common indicators reported in AIRs 2020 that are likely to be higher or lower based on the analysis of project-level data (PLD);
- estimation of probable values of COs for which the declared values may have been under- or overreported;

The quantitative assessment covered 5623 common indicators at IP. It was complemented by a cross-analysis of the metadata collected by country experts and **additional checks on selected significant indicators conducted at the national and regional levels**. A detailed description of the structure and coverage of operation level data on output indicators and checks applied to assess the plausibility of CO values are presented in chapters 3 and 4 of the report.

2. Presentation of the Database of Indicators

The Database of Indicators includes information on the target and achieved values of both common output indicators and programme-specific output indicators, relevant for the operations listed in the database of operations.

2.1. A quick guide for potential users of the Database of Indicators

The Database of Indicators accompanying this report covers 421,629 operations and 245 operational programmes. Thus, it covers 72.1% of operations and 85.06% of operational programmes included in the Database of Operations. Overall, the Database of Indicators contains 1,435,059 rows of data by output indicator.

The Database of Indicators is interlinked through a unique ad-hoc identifier of the operation with the Database of Operations and the Database of Beneficiaries. This allows linking the list of beneficiaries and operations to the related output indicator. In the Database of Indicators, each operation is already linked to its respective Priority Axis, Investment Priority, Thematic Objective and OP. In this way, the chain from the OP (and related expenditures), to output indicators can be established through the operations and data included in a specific database can be integrated into the others.

This rich dataset makes available to evaluators and researchers a unique data source on ERDF and CF programmes funded during 2014-2020. Both in terms of granularity and coverage, it expands much beyond what is available in public lists of operation, public open data platforms at the national level as well as in Annual Implementation Reports.

Thanks to the Database of Indicators and further available interlinkages with the Database of Operations and Database of Beneficiaries, it is possible in particular to:

- Filter, count and sum the **outputs,** and, in particular**, values of common output indicators,** reported by country, programme and operations as well as the targets (forecasts from selected operations) and implemented values of outputs to measure operations achievements;
- Filter, count and sum **outputs** by key features including Thematic Objective, Investment Priority, Field of Intervention, Priority Axis and Specific Objective;
- Filter and sum **financial resources** allocated and paid, distinguishing by operation, indicator, programme and territory.

Thanks to the **harmonisation at EU level**, data from these datasets allows comparing data across regions and territories (until NUTS3) of the EU, facilitating benchmarking exercises and cross-region and cross-countries learnings.

There are also **limitations**, which require interpreting data with care to draw meaningful conclusions. In particular:

- The picture provided by this data **cannot be considered complete** and data coverage is varied depending on countries and types of variables. This holds true in particular for financial data, data on beneficiaries (especially those of intermediated instruments and those not being lead partners in collaborating projects), some of the standard EU categories, the list of indicators and the variables allowing the link with external databases.
- While an operation corresponds to a project in most cases, this does not always hold true. Depending on the approach adopted by the MA, an operation can also be an intermediated instrument, a group of projects, a complex investment project or a self-standing component of a larger investment project. Not in all cases, it was possible to flag this distinction. Accordingly, this affected target and implemented values reported at the level of operation (e.g. target value reported for a group of projects, and implemented values of individual projects).
- Financial data at the operation level should be interpreted with care when assessing EU **contribution to the achieved outputs**. Most of the operations contribute to the achievement of more than one indicator and it is not possible to distinguish the amount of funding used to achieve each of them.
- Operation-level data on output indicators were not available for national and regional operational programmes implemented in Austria, Hungary, Portugal and the United Kingdom.
- The **cut-off date is different**, ranging from the end of December 2020 to July 2021.

The following sections provide a detailed description of the strategy for constructing the database, the coverage of data and the structure of the database.

2.2. Data collection, cleaning and harmonisation

The database was constructed based on the data on output indicators received from country experts who submitted a request for data to all MAs across the 27 Member States and the UK (details of the process of data collection were provided in **Deliverable 2**). The data collection process for output indicators at the operation level was officially closed at the end of July 2021. However clarifications and additional rounds of interaction with country experts continued. Operation-level data on common and programme-specific output indicators were collected for 245 programmes out of 293.

The first step for integrating the relevant data was **screening the datasets** delivered by the Managing Authorities to select only the pertinent values for the database of output Indicators. This included a thorough examination of the files containing the data and **identifying the variables** to be included in the database. Different interpretations of the regulatory framework undertaken by regional and national authorities made it necessary to perform cleaning and harmonisation activities to ensure a comprehensive mapping of data on output indicators. In some Member States, data on achieved outputs in national monitoring systems were kept separately from the data entries on operations, beneficiaries and target values. Therefore, data matching was needed to retrieve a full list of variables for the DB of indicators. The data files submitted by the Managing Authorities differed in their format among Member States but also OPs of the same Member State. A crucial step in creating the database was to first identify the relevant information for the variables used in the DB of indicators to then extract these data and display it in a format that could ease the automated integration of the data.

This **screening** envisaged the following steps:

- Verification of the existence of **a unique operation identifier** (project number) and **CCI number** between the different data provided on output indicators and operations to identify an effective strategy to merge the different datasets provided;
- Exploration of the possibility to retrieve missing information (e.g. **on the type of indicator**) from other sources (OP texts, national guidance and manuals, registers of indicators) to reduce the burden of the request of additional clarifications to the MAs.

Data cleaning procedures for the database of output indicators included identification and elimination of the following information:

- Data on output indicators at IP and/or measure level;
- Data on operations funded by ESF and YEI;
- Data on programme-level result indicators;
- Data on specific project-level (not programme-level) output indicators;
- Operations with missing both selected and implemented values (blank or “0”);

Data harmonisation and **enrichment** procedures for the operation level data on output indicators included:

- Identification and assignment of missing CCI number and project number;
- Translation of the names of common output indicators;
- Identification of the type of indicators (common/programme-specific) based on national and/or SFC codes using supporting documents on national monitoring systems and data reported in AIRs;
- Identification and assignment of SFC codes of common output indicators;
- Elimination of duplicate rows;
- Aggregation of values reported under the same operation but for different categories of regions[2];

[2] For Greece, target and achieved values for the same operation were separately reported by region. The indicator database does not include a variable to differentiate between more developed and less developed regions. This is why these different values were aggregated to provide a total achieved and target value for these concrete operations.

- Identification of the unit of measurement of common and programme-specific output indicators (where available) based on OP texts, supporting documents on national monitoring systems and data reported in AIRs.

The different activities performed consisted of manual and (semi-)automated procedures performed in MS Excel and Python, depending on the complexity of the procedure implemented. Some procedures were programme-specific and were performed separately for the given OP/CP in light of its specificities.

The next step of the harmonisation and enrichment process consisted of **the matching of** the dataset on output indicators **with the Database of Operations** performed in Python. This enabled the integration of operation level data on strategic (thematic objective, priority axis, investment priority) and expenditure (allocated and paid expenditures) variables with the relevant information on indicators. Several systemic checks were undertaken to ensure an appropriate quality of the match, aiming to perform a perfect match of as many OPs and operations as it was feasible. The following checks were performed:

- Harmonising the format of common variables for the merging process to avoid mismatches related to different formats;
- Checking the output of the merging process for each OP for which data were available in both databases, including additional checks with the original data submitted by MAs and sample-based test of merged data;
- Elimination of unmatched operations, where only data on indicators or operations were available;
- Elimination of other inconsistencies.

The result of matching of two datasets was the **Database of Indicators** which allows experts to analyse project-level data on output indicators linked to strategic and expenditure values of DB of operations. Finally, the DB was enriched with the results of Task 3b of the study that aimed to identify significant programme-specific indicators across the Member States and determine to what degree programme-specific indicators could be merged (or aggregated) within MS. With the support of country experts, individual indicators that seek to capture the same output were merged into a new indicator. One essential requirement for such aggregation was that the measurement unit is the same for the indicators that are merged.

2.3. The structure of the DB of Indicators

The **Database of Indicators** has been constructed using the following variables described in Table 3. Data on operation identification, strategic and categorisation variables and financial information were retrieved by matching the data on indicators with the Database of Operations.

Table 3 – The structure of the DB of Indicators

Variable	Column name	Description
Operation identification		
Ad-hoc operation identifier	prj_row_ID	This is an alphanumeric code attributed by the Core Team by numbering the total number of operations of each Operational/Cooperation Programme in ascending order. It allows the link with the beneficiaries database. In general, there is one code for each row. However, there are some exceptions to this rule:

		The Spanish SMEi OP (2014ES16RFSM001): in the data extracted by the MA, there were six different operations under the OP (each with a different official operation identifier), but the list of final recipients was provided at the OP level. This is why a unique ad-hoc operation identifier has been assigned to all operations. Some Slovak OPs: in some cases, the MA provided a unique list of the final recipients covering different operations. This is why, also, in this case, a unique ad-hoc operation identifier has been assigned to all operations.
Ad-hoc row identifier	prj_ID	This is an alphanumeric code attributed by the Core Team by numbering the total number of rows of each operation and Operational/Cooperation Programme in ascending order. It has been included to identify rows in a univocal way (which is not possible based on the ad-hoc operation identifier) to therefore allow the link between the DB of operations and the DB of indicators.
Country code (2 digit ISO)	country_code	This variable provides information on the country covered by the programme under which the operation is funded. In the case of Cooperation Programmes, the variable includes the acronym "TC", which stands for Territorial Cooperation.
CCI number	op	Unique identification number for each operational programme
OP short title	op_short_title	This is the short title of the Operational/Cooperation Programme in English.
Official operation identifier	prj_nr	Unique identification number for each operation belonging to a concrete operational programme. In general, this is an (alpha)numeric string allowing the distinction between different operations in the national and regional monitoring systems, thus taking different formats depending on the Member State and/or region. In combination with the CCI code, this code allowed the link of the database of operations with the output indicators database. This code is available when already included in the raw data provided by MAs or in the public list of operations. There are cases in which the official operation identification code is missing, and the Core Team has assigned only an ad-hoc operation identification code
Operation name	prj_name	This is the name of the operation translated into English. The operation name in English is the result of the translation exercise carried out by the Core Team
Operation EU Fund	prj_fund_type	This variable includes the information on the type of co-financing fund under which the operation is funded, which can be ERDF, Cohesion Fund or a combination of the two.
Operation status	prj_status	This is the status of the operation at the moment of the cut-off date. In particular, it distinguishes between: **Completed operations**: those which, as of the cut-off date, have been already implemented and closed. **Ongoing operations**: those which, as of the cut-off date, are still under implementation
Strategic and categorisation variables		
Priority Axis code	prj_priority_axis_code	This is the code of the Priority Axis, i.e., a major priority of the OP strategy, under which the operation is funded, as mentioned in the programme. In the case of multiple Priority Axes, the codes have been reported separated "|".
Priority Axis name	prj_priority_axis_title	This is the title of the Priority Axis, i.e., a major priority of the OP strategy, under which the operation is funded, as mentioned in the programme. In the case of multiple Priority Axes, the titles have been reported separated "|". This is the title of the Priority Axis translated into English.
Specific Objective code	prj_paxis_objective_code	This is the code of the Specific Objective under which the operation is funded, as mentioned in the programme. Under each Priority Axis, the MAs can define one or more Specific Objectives.
Specific Objective name	prj_paxis_objective_title	This is the title of the Specific Objective translated into English.

Thematic Objective(s)	prj_to_code	This variable includes the code(s) and label(s) of the Thematic Objective(s), under which the operation is funded, separated by "|" in case of multiple Thematic Objectives.
Investment Priority(ies)	prj_ip_code	This variable includes the code(s) and label(s) of the EU Investment Priority(ies) under which the operation is funded. The possible EU Investment Priority(ies) are listed in Art.5 of the Regulation (EU) No 1301/2013 for operations funded under the ERDF OPs, in Art.7 of Regulation (EU) NO 1299/2013 for operations funded under ERDF CPs and in Art.4 of the Regulation (EU) No 1300/2013 for operations funded under Cohesion Fund OPs.
Operation's financial information		
Total operation cost (EUR)	prj_tot_cost	This amount corresponds to the total cost of the operation, irrespective of the sources of funding and of the eligibility of expenses, in EUR (or converted into EUR if provided in another currency in the raw data).
Total eligible expenditure allocated (EUR)	prj_tot_exp_alloc	This variable includes the amount of the total eligible expenditure of the operation approved in the document setting out the conditions for support (data field 41 of the Regulation (EU) No 480/2014). In general, this information is available only for those programmes for which the EU contribution is calculated on the basis of the Total eligible expenditure (i.e., the calculation method for the EU contribution is "Total").
Public eligible expenditure allocated (EUR)	prj_tot_pub_alloc	This variable includes the amount of the total eligible expenditure constituting public expenditure as defined in Article 2(15) of Regulation (EU) No 1303/2013 (data field 42 of the Regulation (EU) No 480/2014).
EU contribution allocated (EUR)	prj_tot_eu_alloc	This variable includes the amount corresponding to the EU (including both ERDF and Cohesion Fund) contribution allocated to the operation under consideration.
ERDF contribution allocated (EUR)	prj_erdf_alloc	This variable includes the amount corresponding to the ERDF funding allocated to the operation under consideration.
CF contribution allocated (EUR)	prj_cf_alloc	This variable includes the amount corresponding to the CF funding allocated to the operation under consideration.
Private contribution allocated (EUR)	prj_private_alloc	This variable includes the amount corresponding to the private contribution allocated to the operation under consideration.
Total eligible expenditure paid (EUR)	prj_tot_exp_paid	This variable includes the amount of the total eligible expenditure paid to the operation as of the cut-off date. In general, this information is available only for those programmes for which the EU contribution is calculated based on the Total eligible expenditure (i.e., the calculation method for the EU contribution is "Total").
Total public eligible expenditure paid (EUR)	prj_tot_pub_paid	This variable includes the amount of the eligible public expenditure paid to the operation as of the cut-off date.
EU contribution paid (EUR)	prj_tot_eu_paid	This variable includes the amount corresponding to the EU (including both ERDF and Cohesion Fund) contribution paid to the operation as of the cut-off date.
ERDF contribution paid (EUR)	prj_erdf_paid	This variable includes the amount corresponding to the EU (including both ERDF and Cohesion Fund) contribution paid to the operation as of the cut-off date.
CF contribution paid (EUR)	prj_cf_paid	This variable includes the amount corresponding to the EU (including both ERDF and Cohesion Fund) contribution paid to the operation as of the cut-off date.
Private contribution paid (EUR)	prj_private_paid	This variable includes the amount of the private contribution paid to the operation as of the cut-off date.

Multiple variables identifying estimate	prj_eu_cofinancing_rate _est	These are different variables that have been created for each financial variable whenever the latter was estimated by the Core Team. These variables have been manually filled by the Core Team whenever an estimate of a financial variable was done.
Information on indicators		
National indicator code	indicator_code	Code provided by the MAs together with the data on target and implemented values; in some cases, it corresponds to the SFC code.
Indicator name	indicator_name	Generally provided by MAs together with the data on target and implemented values
Type of indicator	indicator_type	Type of common indicator assigned by the Core team based on the desk research
SFC code	sfc_code	Codes that are used by MAs to report data on output indicators in AIRs; these codes are unified for common output indicators (CO01, CO02, etc.)
Identification of common output indicator	common_indicator	This “Y/N” variable enables the direct differentiation between common output indicators (“Y”) and programme-specific indicators (“N”)
Unit of measurement	measurement_unit	Provided by the Managing Authorities or identified and harmonised for common output indicators by the study team
Target value	target_value	Target set for each of the common output and programme-specific output indicators assigned to each operation
Implemented value	implemented _value	Implemented values for each indicator assigned to each operation
Target value in national currency	target_value_nat_curr	Provided by the Managing Authorities and used by the study team to harmonise the unit of measurement of CO6, CO7 and CO27
Implemented value in national currency	implemented_value_nat_ curr	Provided by the Managing Authorities and used by the study team to harmonise the unit of measurement of CO6, CO7 and COO27
Exchange rate	exchange_rate	The currency exchange rate used to harmonise the unit of measurement
Name of the proposed programme-specific indicator at MS level (national language)	ms_level_aggregated_ indicator_name_original	The variable flags individual programme-specific indicators that seek to capture the same output and can be merged into a new indicator at the Member State level. One essential requirement for such aggregation was that the measurement unit is the same for the indicators that are merged. The name of a newly proposed indicator is provided in the national language.
Name of proposed programme-specific indicator at MS level (English)	ms_level_aggregated_ indicator_name_english	The variable flags individual programme-specific indicators that seek to capture the same output and can be merged into a new indicator at the Member State level. One essential requirement for such aggregation was that the measurement unit is the same for the indicators that are merged. The name of a newly proposed indicator is provided in English.

Source: PPMI.

2.4. Coverage of the integrated DB of indicators

The integrated DB of indicators includes data for **a total of 421,629 operations** and **245 operational programmes**. Thus, it covers 72.1% of operations and 85.06% of operational programmes included in the database of operations. Overall, the database of output indicators contains 1,435,059 rows of data by output indicator.

As for the geographical coverage, the integrated indicators database includes data on ongoing and complete operations for a total of 24 Member States: Belgium, Bulgaria, Cyprus, the Czech Republic,

Germany, Denmark, Ireland, Estonia, Spain, Finland, France, Greece, Croatia, Italy, Lithuania, Luxembourg, Latvia, Malta, the Netherlands, Poland, Romania, Sweden, Slovenia and Slovakia. Also, the DB of indicators covers 58 TC programmes. Operation-level data on output indicators were not available for national and regional operational programmes implemented in Austria, Hungary, Portugal, and the United Kingdom (see Table 4 below).

Table 4 – Coverage of the DB of Indicators

MS	Number of unique operations covered	Number of data rows included
BE	953	1 990
BG	3 871	10 730
CY	83	158
CZ	33 463	74 477
DE	28 350	89 004
DK	148	911
EE	9 459	16 066
ES	82 831	150 673
FI	6 491	28 614
FR	13 015	30 056
GR	39 525	135 162
HR	7 575	36 606
IE	874	3 257
IT	104 626	299 640
LT	13 009	22 002
LU	25	25
LV	1 591	3 460
MT	319	824
NL	889	5 223
PL	54 112	456 623
RO	744	1 616
SE	890	2 655
SI	6 758	30 354
SK	4 449	10 345
TC	7 579	24 588
Total	**421 629**	**1 435 059**

Source: integrated DB of output indicators.

3. Methods of the assessment of the reliability of common indicators

To assess the reliability of CO values reported in AIRs, the study team focused on:

- The aggregation of operation level data on indicators, target and implemented values and allocated and paid expenditures to IP level by MS and OP;

- Integration of aggregated project-level data with SFC 2014 data on target, selected and achieved CO values in AIRs for 2020 (dated 1st October 2021) aggregated to IP level by MS and OP;
- Tests and cross-checks to assess possible inaccuracies in reported data and identify potentially over-or underreported values at the level of investment priority (IP) of a particular OP which contributes to the CO achievement;
- Interpretation of the results of the tests based on information and knowledge acquired during desk research, the process of construction of DB of indicators and from metadata on CO definitions, calculation methodologies and quality control methods;
- Additional clarifications with country experts and the MAs on the most significant COs for which our assessment showed probable over-or underreporting, discrepancies in AIR and project-level data, or the project-level data were missing.

Sub-section 3.1. presents in detail the structure of the MS Excel sheet used to integrate the data and conduct tests and checks, and the logic behind the calculations and overall assessment of the reliability of reported achieved values of COs. The results of calculations and plausibility tests and the data used for calculations are provided in an MS Excel spreadsheet allowing filtering of the data by MS, OP and IP for each CO (**Deliverable 6**).

3.1. Data checks and tests based on project-level data

To conduct the calculations and the plausibility tests, the SFC2014 data from 31.12.2020 (extracted from SCF on 1 October 2021) on common indicators were compared to project-level data available from the DB of Indicators and aggregated to IP level. The comparison resulted in 3,725 data rows matched at IP level; for 1,798 data rows, the match with project-level data was not possible due to the limitations of coverage of DB of Indicators (i. e., missing target or implemented values or missing IP identifier).

The data and calculations in the MS Excel sheet ‘D6’ are presented in three main blocks. The detailed structure of the spreadsheet and data used for the assessment is presented in Table 5 below.

Table 5 – Data used to assess the reliability of CO values

SFC 2014 data as of 31.12.2020 extracted on 01.10.2021 (columns A-L and O-P)		
Identification of MS, OP, CCI, IP and CO	**MS**	Country code (2 digit ISO)
	CCI	Unique identification number for each operational programme
	Title (EN)	Title of operation programme in English
	IP	Investment priority code
	Ind.Cd	Common output indicator code
	Ind.Name	Common output indicator name
	Meas Unit	Measurement unit of CO
Targets, selected and implemented	**AIR target**	Target values at OP level for 2023 aggregated at IP level
	AIR target % of EU target	The ratio of CO target values represented by particular OP and IP to EU-level target for 2023 (%). The percentage shows the material significance of target values planned under OP.
	AIR_selected	Cumulative value of planned CO values contracted by the end of 2020 aggregated at IP level

	AIR sel % of EU target	% of EU-level target for 2023 represented by particular OP and IP
	AIR sel % of EU sel	The ratio of CO selected values represented by particular OP and IP to aggregated EU-level selected values (%). The percentage shows the material significance of CO values selected under OP.
	AIR_implemented	Cumulative value of achieved CO values reported by the end of 2020 aggregated at IP level
	AIR impl % of EU impl	The ratio of CO implemented values represented by particular OP and IP to aggregated EU-level implemented values (%). The percentage shows the material significance of CO values implemented under OP.
Project-level data (columns S-T, AS-BC)		
	PLD_selected	Aggregation of project-level (PLD) data on target values to IP level (by OP and CO)
	PLD_implemented	Aggregation of project-level data (PLD) on implemented values to IP level (by OP and CO)
	Count of selected_value	Number of project-level data rows in integrated DB of indicators available on target values by OP before aggregation to IP level
	Count of implemented _value	Number of project-level data rows in integrated DB of indicators available on implemented values by OP before aggregation to IP level
	Count of prj_tot_exp_alloc	Number of project-level data rows in integrated DB of indicators available on project total expenditures allocated by OP before aggregation to IP level
	Count of prj_tot_exp_paid	Number of project-level data rows in integrated DB of indicators available on project total expenditures paid by OP before aggregation to IP level
	Count of completed projects	Number of project-level data rows in integrated DB of indicators available on project total expenditures paid by OP before aggregation to IP level
	Sum of prj_tot_exp_alloc_CO	Aggregation of project-level data on project total expenditures allocated to IP level (by OP and CO)
	% of IP alloc_pub_tot	The ratio of aggregated “Sum of prj_tot_exp_alloc” to aggregated total expenditures allocated to a particular IP (by OP) based on data from DB on operations (%)
	Sum of prj_tot_exp_paid_CO	Aggregation of project-level data on project total expenditures paid to IP level (by OP and CO)
	% of IP paid_tot	The ratio of aggregated “Sum of prj_tot_exp_paid” to aggregated total expenditures paid to a particular IP (by OP) based on data from DB on operations (%)
	Sum of prj_tot_exp_alloc	Aggregation of project-level data on project total expenditures allocated to IP level (by OP and CO)
	Sum of prj_tot_exp_paid	Aggregation of project-level data on project total expenditures paid to IP level (by OP and CO)
Preparatory calculations (columns AE-AR)		
	Sel_PLD/Sel_AIR	The ratio of PLD aggregated selected values to selected values reported in AIRs 2020 (%)
	Sel_PLD/Targ_AIR	The ratio of PLD aggregated selected values and target values reported in AIRs 2020 (%)
	Impl_PLD/Impl_AIR	The ratio of PLD aggregated implemented values to implemented values reported in AIRs 2020 (%)
	AIR_impl/AIR_sel	The ratio of implemented values to selected values reported in AIRs 2020 (%)

	PLD_impl/PLD_sel	The ratio of PLD aggregated implemented values to PLD selected values (%)
	Paid/allocated	The ratio of PLD aggregated paid expenditures to PLD aggregated allocated expenditures (%)
	Alloc_per output	Funding allocated per one unit of measurement of CO in all (ongoing and completed) projects
	Paid per output	The funding paid per one unit of measurement of CO in all (ongoing and completed) projects
	AVE_alloc_compl	Average allocated funding per one unit of measurement of CO in completed projects for particular OP and IP
	AVE_paid_compl	Average paid expenditures per one unit of measurement of CO in completed projects for particular OP and IP
	Min_AVE_planned	The minimum amount of allocated funding per one unit of measurement of CO in completed projects for particular IP across all OPs
	Max_AVE_planned	The maximum amount of allocated funding per one unit of measurement of CO in completed projects for particular IP across all OPs
	Min_AVE_impl	The minimum amount of paid funding per one unit of measurement of CO in completed projects for particular IP across all OPs
	Max_AVE_impl	The maximum amount of paid funding per one unit of measurement of CO in completed projects for particular IP across all OPs
Metadata (column BD)		
	Actual or planned values	Based on the EU-level definition of CO and metadata collected, two different types of CO values were identified: 'planned' - possibility to access services (e.g. CO10 “Additional households with broadband access of at least 30 Mbps” with the possibility to access the broadband, not actually connected) or nominal capacity (e.g. CO35 "School capacity (nominal)") 'actual' - actual use of improved infrastructure or services (e.g. CO18 “Additional population served by improved water supply”, which covers persons in households with actual (i.e. not potential) connection to the water supply system.) The criteria were used to assess if the exact match of selected and implemented CO values can be justified (e.g. in case of planned values)

Source: compiled by the authors. * Missing data is marked as “NA” in Deliverable 6.

3.2. General assumptions underlying the reliability tests

The study team conducted analytical tests based on the AIR and project-level data merged to assess the reliability of the achieved values of COs reported in AIRs 2020.. The general assumptions of this assessment were:

- Data on implemented values reported in AIRs are of high quality and consistency level, ensured by the internal quality checks conducted by the Managing authorities and other actors of management and control systems (as revealed by metadata collected);
- Project-level data on operations and expenditures allocated and paid provide more consistent information on ERDF and CF investments at IP level;
- Project-level data on common indicators are more consistent for the completed operations which can be used for the calculation of average values.

Table 6 presents the data checks and tests used to assess the reliability of CO values reported in AIRs 2020 and to identify potentially over- and under-reported achieved values.

Table 6 – Checks and tests to assess the reliability of CO values

Test	Description of the test
AIR sel =AIR impl	**"Warning"** status if AIR selected values exactly match AIR implemented values, when reporting is not based on planned (not actual) values. Potentially estimation-based and unreliable reporting.
AIR sel=na, PLD_alloc>na	**"Warning"** status if AIR selected value is 0, count of PLD completed operations>1; PLD paid expenditures (CO) >0. Potentially under-reported values.
"000"-AIR sel	**"Warning"** status on "000"-ending values in AIR which looks like rough estimations
"000"-AIR impl	**"Warning"** status on "000"-ending values in AIR which looks like rough estimations
No of PLD op	**The low** number of operations allows assuming more reliable PLD which can be used to estimate CO values in case of identified under- or overreporting.
PLD sel=PLD impl	**"Warning"** status if PLD selected values exactly match PLD implemented values, when reporting is not based on planned (not actual) values. Potentially estimation-based and unreliable reporting.
"000"_PLD sel	**"Warning"** status on "000"-ending values in AIR and PLD which looks like rough estimations
"000"_PLD impl	**"Warning"** status on "000"-ending values in AIR and PLD which looks like rough estimations
Alloc per output is in AVE range	PLD average allocation per output in the range of average allocations in completed projects allows assuming more reliable PLD which can be used to estimate selected CO values in case of identified under- or overreporting.
Paid per output is in AVE range	PLD average paid expenditures per output in the range of average allocations in completed projects allows to assume more reliable PLD which can be used to estimate implemented CO values in case of identified under- or overreporting.

Source: PPMI.

3.3. Assessment framework

To assess the reliability of CO values reported in AIRs, the study team developed an assessment framework based on the data cross-checks and conditions to be met based on calculations and data tests (see Tables 7 and 8). The results of this assessment are presented in MS Excel sheet (**Deliverable 6**) in columns M ("Assessment_selected") and Q ("Assessment_implemented").

Table 7 – Conditions of the assessment of the reliability of selected CO values

The assessment status of the values reported in AIRs 2020	Conditions	Additional checks implemented
1. OK	• AIR values match PLD values within 10% discrepancy and are **largely robust**.	! AIR selected exactly match AIR implemented, when reporting is not based on planned (not actual) values; ! AIR selected is 0, PLD allocated expenditures (CO) >0; ! "000"-ending values in AIR and PLD which looks like rough estimations
2. Likely to be higher, can be estimated from PLD	• PLD selected values > AIR selected or target values (above 10%) • Number of PLD operations is low • PLD average allocation per output is in the range of average values in the completed projects • There are no warnings in other data tests.	
3. Likely to be higher, cannot estimate	• PLD selected values > AIR selected or target values (above 10%) • The aforementioned conditions are not met, some PLD is missing	
4. Likely to be lower, can be estimated from PLD	• PLD selected values < AIR selected or target values (above 10%) • Number of PLD operations is low • PLD average allocation per output is in the range of average values in completed projects • There are no warnings in other data tests.	
5. Likely to be lower, cannot estimate it	• PLD selected values > AIR selected or target values (above 10%) • The aforementioned conditions are not met, some PLD is missing	
6. Cannot be estimated	• PLD is present, however other data (on operations, expenditures, averages) are lacking or not sufficient to estimate potential under-or overreporting	
7. PLD missing	• Operation level data on CO is missing	
8. PLD not submitted	• PLD was not submitted for all OPs implemented by AT, HU, PT and UK.	

Source: PPMI.

Table 8 – Conditions of the assessment of the reliability of implemented CO values

The assessment status of the values reported in AIRs 2020	Conditions	Additional checks implemented
1. OK	• AIR values match PLD values within 10% discrepancy and are **largely robust**	! AIR selected exactly match AIR implemented, when reporting is not based on planned (not actual) values; ! AIR selected is 0, PLD allocated expenditures (CO) >0; ! "000"-ending values in AIR and PLD which looks like rough estimations
2. Likely to be higher, can be estimated from PLD	• PLD implemented values > AIR implemented values (above 10%) • The number of PLD operations is low • PLD average paid expenditures per output is in the range of average values in completed projects	
3. Likely to be higher, cannot estimate	• PLD implemented values > AIR implemented values (above 10%) • The aforementioned conditions are not met, some PLD is missing	
4. Likely to be lower, can be estimated from PLD	• PLD implemented values < AIR implemented values (above 10%) • The number of PLD operations is low • PLD average allocation per output is in the range of average values in completed projects • ! Coverage of PLD corresponds to the ratio of PLD selected and implemented values (% of paid expenditures matches the ratio of PLD selected/implemented values). However, it could be problematic to estimate values for infrastructure projects.	
5. Likely to be lower, cannot estimate it	• PLD implemented values < AIR implemented values (above 10%) • The aforementioned conditions are not met, some PLD is missing	
6. Cannot be estimated	• PLD is present, however other data (on operations, expenditures, averages) are lacking not sufficient to estimate potential under-or overreporting	
7. PLD missing	• Operation level data on CO is missing	
8. PLD not submitted	• PLD was not submitted for all OPs implemented by AT, HU, PT and UK.	

Source: PPMI.

All data quality checks, tests and estimations needed for the assessment of the plausibility of achieved CO values were completed in MS Excel spreadsheets which include all data and formulas used for calculations. The data can be filtered by any variable to extract the information on a particular Member State, operational programme, investment priority, common indicator or assessment status. Section 4 below provides an overall assessment of CO reliability and a summary of our assessment results at CO level.

4. Results of the assessment of the reliability of common indicators

In this section of the report, we present an overall CO reliability assessment and summarise the results of qualitative, quantitative and cross-check analysis. First, we present the summary of the results of a quantitative comparison of CO values reported in AIRs 2020 and aggregated CO values in project-level data extracted by the Managing authorities from their national and/or regional monitoring systems. Then we provide an overview of the results of the assessment based on cross-checks presented in Tables 7 and 8 and provide explanations on the statuses and the significance of indicators. Finally, based on the qualitative and quantitative data analysis and results of the assessment, we summarise our findings for each common indicator.

4.1. Aggregate results of the qualitative and quantitative checks

Matching AIRs 2020 and project-level data for cross-analysis allowed us to assess the overall correspondence of data collected in the monitoring systems and reported in AIRs. Worth noting that project-level data used for the analysis had several limitations:

1) Three MSs (AT, HU, PT) and the UK did not submit project-level data on COs;
2) Some managing authorities did not submit data on indicators for particular OPs or groups of operations (data on indicators covered 72.1% of operations and 85.06% % of operational programmes included in the database of operations)
3) Project-level data on indicators and/or operations did not contain IP variables, and it was not possible to assign the values of CO to specific IPs.

Despite these limitations, an overall matching of AIRs data and PLD showed a good match for a substantial part of the indicators. Within 5% discrepancy, **the selected values of 67% of COs and the implemented values of 65% of COs matched**. The range of matching for selected indicators varied from 40% (CO45) to 100% for indicators in the transport sector. For implemented values, this match varied from 34 % to 83 % (see Table 9). Our calculations showed that the results of match within 10% discrepancy are similar to those within 5% band, however, an increase by 5 p.p. for the selected values can be observed when 20% band is applied.

The results of the match were lower for several groups of indicators:

- FIRMS: due to the risk of double-counting, some countries do not monitor some of these indicators at the project level; also, a high number of projects and limited availability of data on financial instruments affects the accuracy and reliability of project-level data. Our analysis showed that values reported at the project level are subject to multiple quality checks by the implementing bodies and managing authorities before the aggregated values are reported in AIRs.
- ROAD – CO13 and CO14: in many cases, project-level data do not specify for these indicators if indicators CO13a or CO14a measuring new and reconstructed TEN-T roads are used.
- URBAN – CO37: in many cases, the indicator is not monitored at the project level and is calculated outside the monitoring system.
- INTERREG: the results of the match were affected by a high percentage of missing values; also, data on indicators measuring participation in multiple cooperation or inclusion actions are prone to be less accurate and reliable at the project level.

At **the Member State level**, the **range of matching within 5% discrepancy varied from 23% to 96%** for both selected and implemented values (see Table 10). The results of this match do not consider the material significance of indicators, only the number of indicators by CO and by MS. In case the indicator is rarely used across the Member States or the total number of indicators at the Member State level is low, the effect of missing or unmatched values on the results of the comparison is disproportionate:

- In the case of Estonia, where the total number of used CO is comparatively low, and some COs are calculated outside the monitoring system (using statistical data on population) or are not monitored at the operation level to avoid double counting, the results of the match are lower compared to other countries.
- In the case of Slovakia, the low results of the match between AIRs data and PLD collected in the course of the study can be explained by the fact that many operations were lacking IP identifier or contributed to more than one IP, and it was not possible to aggregate data on selected and implemented indicators at IP level.

Table 9 – Match of CO values reported in AIRs 2020 and at project level (by CO)

				Precise match			Match within 5% discrepancy			Match within 10% discrepancy		
CO	Count of CO	Short name	CO type	Selected values	Implemented values	Both	Selected values	Implemented values	Both	Selected	Implemented	Both
CO01	790	FIRMS: All firms	Process	25%	20%	15%	65%	65%	59%	65%	65%	60%
CO02	491	FIRMS: grant aided	Process	25%	16%	12%	63%	63%	56%	63%	63%	57%
CO03	259	FIRMS: non-grant aided	Process	32%	21%	14%	61%	48%	42%	61%	48%	42%
CO04	283	FIRMS: advised	Process	39%	30%	24%	67%	68%	60%	67%	68%	60%
CO05	204	FIRMS: New Enterprises	Process	30%	29%	20%	66%	67%	60%	66%	67%	60%
CO06	232	FIRMS: Private match grant aid	Input	6%	5%	2%	50%	48%	47%	50%	48%	47%
CO07	137	FIRMS: Private match non-grant	Input	14%	17%	9%	55%	52%	46%	55%	52%	46%
CO08	293	FIRMS: New direct jobs	Result	28%	30%	17%	63%	60%	47%	63%	60%	47%
CO09	116	Tourism: New visitors	Result	28%	28%	12%	63%	55%	45%	63%	55%	45%
CO10	38	Broadband access	Result	47%	53%	32%	71%	63%	42%	71%	63%	42%
CO11	6	RAIL: new	Output	100%	83%	83%	100%	83%	67%	100%	83%	67%
CO11a	2	RAIL: TEN-T new	Output	100%	50%	50%	100%	50%	50%	100%	50%	50%
CO12	46	RAIL: Reconstructed	Output	70%	65%	59%	83%	59%	52%	83%	59%	52%
CO12a	21	RAIL: TENT-T Reconstructed	Output	71%	52%	52%	86%	81%	67%	86%	81%	67%
CO13	59	ROAD: New	Output	32%	41%	29%	56%	34%	47%	56%	34%	47%
CO13a	19	ROAD: TEN-T new	Output	47%	53%	37%	79%	79%	68%	79%	79%	68%
CO14	77	ROAD: reconstructed	Output	31%	35%	26%	61%	57%	42%	61%	57%	42%
CO14a	16	ROAD: TEN-T reconstructed	Output	50%	69%	44%	81%	81%	75%	81%	81%	75%
CO15	18	Tram or metro (new / improved)	Output	61%	61%	44%	83%	83%	61%	83%	83%	61%
CO16	5	Inland waterway	Output	20%	60%	20%	100%	60%	40%	100%	60%	40%
CO17	43	ENV: Waste Recycling	Output	44%	35%	26%	74%	53%	40%	74%	53%	40%
CO18	56	ENV: Improved water supply	Result	38%	38%	20%	86%	77%	71%	86%	77%	71%
CO19	62	ENV: Waste water treatment	Result	50%	35%	24%	81%	71%	61%	81%	71%	61%
CO20	70	ENV: Flood protection	Result	37%	56%	29%	79%	80%	59%	79%	80%	59%
CO21	22	ENV: Forest fire protection	Result	32%	55%	23%	77%	55%	45%	77%	55%	45%
CO22	52	ENV: Rehabilitated land	Output	23%	29%	8%	71%	67%	60%	71%	67%	60%
CO23	105	ENV: Habitats conserved	Output	35%	33%	20%	73%	71%	55%	73%	71%	55%
CO24	89	RTDI: New researchers	Result	20%	26%	11%	70%	70%	61%	70%	70%	61%
CO25	114	RTDI: Researchers with improved infra	Result	34%	38%	25%	75%	72%	52%	75%	72%	52%
CO26	210	RTDI: Firms working with Ris	Result	36%	30%	21%	73%	72%	63%	73%	72%	63%
CO27	142	RTDI: Private match investment	Input	18%	13%	6%	77%	75%	66%	77%	75%	66%
CO28	147	RTDI: New to market products	Process	24%	22%	12%	67%	65%	62%	67%	65%	62%
CO29	156	RTDI: New to firm products	Process	21%	21%	10%	66%	67%	62%	66%	67%	62%
CO30	142	ENERGY: RE production	Output	8%	19%	6%	60%	58%	49%	60%	58%	50%
CO31	93	ENERGY: improved performance in houses	Result	49%	33%	23%	78%	77%	68%	78%	77%	68%
CO32	124	ENERGY: reduced consumption public building	Result	29%	27%	16%	76%	69%	53%	76%	69%	53%
CO33	19	ENERGY: users on smart grids	Result	42%	58%	37%	79%	68%	42%	79%	68%	42%
CO34	341	Decrease of GHG	Result	21%	23%	11%	72%	68%	57%	72%	68%	57%
CO35	88	Schools renovated (capacity)	Result	45%	30%	23%	80%	75%	74%	80%	75%	74%
CO36	61	Health service improved (population)	Result	26%	23%	7%	77%	67%	62%	77%	67%	62%
CO37	65	Urban population with integrated strategy	Result	18%	18%	11%	55%	55%	48%	55%	55%	48%
CO38	71	Urban: open space renovated	Output	32%	32%	20%	59%	61%	48%	59%	61%	48%
CO39	68	Urban: Building renovated	Output	28%	35%	16%	60%	63%	46%	60%	63%	46%
CO40	27	Rehabilitated housing	Output	26%	26%	15%	63%	59%	52%	63%	59%	52%
CO41	33	INTERREG: Firms in RD cooperation	Result	18%	12%	9%	55%	58%	55%	55%	58%	55%
CO42	44	INTERREG: Research inst. in cooperation act	Result	34%	27%	23%	55%	59%	45%	55%	59%	48%
CO43	14	INTERREG: Participants in labour mobility	Output	29%	29%	21%	64%	64%	57%	64%	64%	57%
CO44	25	INTERREG: Participants in labour & training	Output	12%	12%	0%	64%	64%	64%	64%	64%	64%
CO45	5	INTERREG: participants in includion actions	Output	20%	20%	20%	40%	40%	40%	40%	40%	40%
CO46	23	INTERREG: Participants in youth actions	Output	30%	30%	22%	61%	65%	61%	61%	65%	61%
Total	**5623**			**28%**	**25%**	**16%**	**67%**	**65%**	**55%**	**67%**	**65%**	**56%**

Source: PPMI own calculations.

Note: Calculations represent all common indicators at IP level reported in AIRs 2020, excluding countries which did not submit project-level data (AT, HU, PT and UK) and common indicators for which data on selected or implemented values were missing or not sufficient to match due to the missing IP identifier. The results of the match within 5% band include the results of precise match, the results of the match within 10% band include the results of precise match and the match within 5%band.

Table 10 – Match of CO values reported in AIRs 2020 and at project level (by MS)

		Precise match			Match within 5% discrepancy		
MS	Count of indicators	Selected values	Implemented values	Both	Selected values	Implemented values	Both
AT	22	0%	0%	0%	0%	0%	0%
BE	78	36%	31%	21%	69%	67%	50%
BG	47	23%	26%	15%	66%	64%	55%
CY	29	14%	28%	7%	62%	55%	41%
CZ	102	4%	8%	1%	53%	51%	42%
DE	363	20%	31%	14%	65%	72%	58%
DK	14	0%	14%	0%	71%	71%	71%
EE	35	3%	14%	3%	23%	43%	17%
ES	473	54%	15%	12%	86%	78%	75%
FI	43	16%	16%	12%	40%	40%	40%
FR	666	23%	29%	15%	81%	81%	72%
GR	500	40%	49%	33%	69%	68%	39%
HR	43	16%	23%	12%	95%	86%	81%
HU	127	0%	0%	0%	0%	0%	0%
IE	30	20%	20%	20%	47%	47%	47%
IT	715	17%	27%	11%	85%	81%	75%
LT	56	48%	48%	43%	79%	75%	70%
LU	8	38%	38%	38%	63%	50%	50%
LV	47	43%	36%	32%	83%	81%	74%
MT	34	18%	24%	9%	68%	62%	47%
NL	67	24%	0%	0%	49%	42%	42%
PL	731	42%	19%	15%	88%	77%	68%
PT	269	0%	0%	0%	0%	0%	0%
RO	72	31%	35%	26%	54%	54%	44%
SE	184	80%	80%	78%	96%	96%	92%
SK	112	14%	12%	11%	23%	23%	22%
SI	39	36%	44%	21%	90%	92%	87%
TC	546	23%	25%	14%	55%	60%	47%
UK	171	0%	0%	0%	0%	0%	0%
Total	**5623**	**28%**	**25%**	**16%**	**67%**	**65%**	**55%**

Source: PPMI own calculations.

Note: Project-level data on AT, HU, PT and UK were not made available for our analysis. For other MSs and OPs calculations exclude those COs for which project-level data were missing in the data extracted or it was not possible to match it with AIR data due to the missing IP identifier.

The quantitative analysis and further cross-checks of data showed that for **the indicator selected values of COs** reported in AIRs 2020, indicators that are largely robust ("OK" status) compose **45% of all indicators** or **68% of those selected values on which data were available for the analysis**[3]. Moreover, 89% of all selected values for CO indicators (see Table 11) fall into the following categories, either

- largely robust,
- their values are likely to be higher or lower and can be estimated based on PLD,
- their values are likely to be higher but cannot be estimated.

The material significance of indicators[4] that were assessed as largely robust varies from 7% for CO21 to 100% for CO13 and 13a. Our analysis showed that some indicators, especially those measuring the population covered by funded operations (CO20, CO21, CO36 and CO37), are not monitored at the project level; their values are reported based on national registers or statistical data. The lower percentage of largely robust values of common indicators measuring support to enterprises (FIRMS: CO01-CO08) can be explained by the fact that PLD often lack data on financial instruments and do not eliminate double-counting of supported enterprises.

Analysis of **implemented values** showed that 38% of COs reported in AIRs 2020 or **57% of those implemented values on which data were available for the analysis** are **largely robust**. Moreover, 78% of all implemented values for CO indicators (see Table 11) fall into the following categories, either

- indicators that are largely robust,
- their values are likely to be higher or lower and can be estimated based on PLD,
- their values are likely to be higher but cannot be estimated.

Our analysis showed that potential over-reporting of selected values in AIRs can be identified only in 1% of Cos. However, some of them compose a significant part of selected values at the EU level (e.g. CO16 which compose 10% of the EU total). Similar results were detected for the potential under-reported values that comprise 1% of COs. For these values, the study team suggested estimated values based on PLD and the results of consultations with the country experts (see Deliverable 6).

Analysis at the Member State level (see Tables 13 and 14) showed that in some countries, largely robust values ("OK" status) compose more than **60% of selected indicators**. These are Sweden (82%), Poland (73%), Spain (71%), Croatia (70%), Latvia (66%) and Lithuania (63%). Also, in nine Member States, indicators that are largely robust, or their values are likely to be higher or lower and can be estimated based on PLD, or their values are likely to be higher but cannot be estimated compose more than 90% of indicators: Czech Republic, Finland, Greece, Ireland, Luxembourg, the Netherlands, Poland, Spain, Sweden. Though **implemented values** were assessed as largely robust in only 38% of cases across the Member States, some countries demonstrated high results for implemented values, e.g., Sweden (84%), Lithuania (61%), Slovenia (59%), Latvia (55%), Greece (52%).

Analysis of metadata, workshop with country experts and clarifications with the Managing authorities showed that the discrepancies of data on common indicators reported in AIRs and available in the monitoring systems at the national and regional level can be caused by the features and functionalities of monitoring arrangements, monitoring and reporting rules, and methodologies of calculation of CO values. The identified **main reasons for the discrepancy** of the selected and implemented CO values reported in AIRs 2020 and project-level data extracted from the monitoring systems are the following:

- **Different sources of data:** in large countries with multiple regional OPs (e.g. PL, IT) the source for AIR data is the OP monitoring systems (based on an extraction from the OP monitoring system, the MA manually inputs data into SFC), while the data submitted for this study were extracted from the centralised monitoring systems at the national level. The national system and the OP monitoring systems are **not aligned**. OP monitoring systems are more updated than the

[3] i.e. excluding those indicators for which PLD was missing or was not submitted by MS.

[44] % of sum of values selected or implemented at the EU-level that were assigned with a particular assessment status.

national system, as data transmission to the national level takes place on ex-ante defined schedule (e.g. every 2 months in Italy). Before validating the data received from OP systems, the coordinating body conducts checks on the data transmitted from OP monitoring systems. The national monitoring system can provisionally exclude some operations from the centralised database, if the data received does not appear correct or complete.

- **Indicator values are calculated outside the OP monitoring system, drawing from external sources,** e.g. national or regional registers or calculated by statistics offices or based on surveys.The values of these indicators are not available from the project-level data extracted from monitoring systems for this study.
- **Double counting:** some COs may be prone to double counting as revealed by the desk research. This is mainly relevant to those COs related to enterprises (in case enterprises receive the same support twice or two supports), health and education infrastructure, the population covered by flood and forest fire protection measures or integrated urban strategies. Though data is correct at the operation level, aggregation of project-level data does not lead to AIR data. Procedures aimed at the elimination of double-counting were established at the national level to ensure that the risk of double counting is reduced or eliminated.The results voting by the MAs and Intermediate bodies during the workshop with ERDF/CF stakeholders showed, that in 61% of cases most double counting in the aggregation of CO values on supported enterprises is detected and removed, whereas 15% of participants stated that data reported in AIRs completely clear from the double counting. In the same voting 11% of participants voted that double-counting stays largerly undetected and unremoved, and 13% that is only partially detected and removed.
- **Manual errors:** as AIRs are filled in manually, manual errors may occur. Also, manual review of monitoring data is often conducted to clear it from double counting. However, due to internal quality control and data checks implemented by the MAs, also automatic SFC 2014 checks, this only applies to minor discrepancies, not large discrepancies.

All reasons mentioned above are also relevant for **implemented values** of COs reported in AIRs 2020. In addition, the implemented values reported in AIRs can be lower because **the implemented values are reported in AIRs only when the project is completed and approved by the external audit**, for infrastructure projects implemented in ICT, transport, environment or energy sectors, also health and education infrastructure projects, though in the monitoring systems values are reported by the beneficiaries together with the submission of the applications for payments.

Our analysis shows that quality and consistency of indicators data reported in AIRs is ensured by the internal control procedures and plausibility checks conducted by the Mas and IBs during the process of annual reporting. However, in the 2021-2027 programming period the MAs will simply transmit the monitoring data to the EC as no formal AIR is required. This potentially rises the risk of less attention being paid to the indicator values and their reliability by the MSs.

Table 11 – Results of the assessment based on PLD analysis and cross-checks: selected values

CO code	CO short name	OK		likely to be higher, can be estimated from PLD		likely to be lower, can be estimated from PLD		likely to be higher, cannot estimate		likely to be lower, cannot estimate		cannot be estimated		PLD missing		PLD not submitted				% of CO assessed as "OK", likely to be higher or lower and can be estimated, and likely to be higher, but cannot be estimated
		Count of IND.CD	Sum of AIR sel %of EU sel	Count of IND.CD	Sum of AIR sel %of EU sel	Count of IND.CD	Sum of AIR sel %of EU sel	Count of IND.CD	Sum of AIR sel %of EU sel	Count of IND.CD	Sum of AIR sel %of EU sel	Count of IND.CD	Sum of AIR sel %of EU sel	Count of IND.CD	Sum of AIR sel %of EU sel	Count of IND.CD	Sum of AIR sel %of EU sel	Total Count of IND.CD	Sum of AIR sel %of EU sel	
CO01	FIRMS: All firms	314	21%	5	0%	4	1%	103	22%	82	26%	7	1%	193	14%	82	15%	790	100%	83%
CO02	FIRMS: grant aided	201	33%	1	0%			64	14%	40	21%	2	0%	125	14%	58	18%	491	100%	86%
CO03	FIRMS: non-grant aided	98	15%	3	1%	9	2%	31	7%	11	56%	4	1%	70	14%	33	3%	259	100%	90%
CO04	FIRMS: advised	142	41%	2	0%	3	0%	28	12%	12	8%	4	1%	73	12%	19	25%	283	100%	92%
CO05	FIRMS: New Enterprises	86	22%	4	1%	2	0%	23	9%	9	26%	13	5%	38	15%	29	22%	204	100%	84%
CO06	FIRMS: Private match grant aid	84	35%	3	0%	1	0%	19	2%	8	5%	2	0%	74	26%	41	32%	232	100%	91%
CO07	FIRMS: Private match non-grant	44	18%	2	0%	1	0%	23	42%	5	2%	3	1%	42	21%	17	15%	137	100%	90%
CO08	FIRMS: New direct jobs	136	28%	2	0%	3	0%	23	8%	14	9%	6	1%	58	8%	51	45%	293	100%	89%
CO09	Tourism: New visitors	49	39%					17	9%	6	6%	1	0%	33	20%	10	26%	116	100%	90%
CO10	Broadband access	21	57%	1	0%	1	3%	5	35%					6	1%	4	4%	38	100%	100%
CO11	RAIL: new	6	100%															6	100%	100%
CO11a	RAIL: TEN-T new	2	100%															2	100%	100%
CO12	RAIL: Reconstructed	35	70%					3	3%	1	3%			2	5%	5	19%	46	100%	97%
CO12a	RAIL: TENT-T Reconstructed	17	72%	1	1%									1	7%	2	20%	21	100%	100%
CO13	ROAD: New	30	42%			1	0%	1	0%			1	31%	23	21%	3	6%	59	100%	97%
CO13a	ROAD: TEN-T new	13	40%					2	44%					3	10%	1	6%	19	100%	100%
CO14	ROAD: reconstructed	35	29%	2	0%	1	1%	5	4%	4	8%			25	52%	5	6%	77	100%	91%
CO14a	ROAD: TEN-T reconstructed	11	79%					1	0%	1	13%			2	2%	1	6%	16	100%	92%
CO15	Tram or metro (new / improved)	14	66%					1	1%					2	22%	1	10%	18	100%	100%
CO16	Inland waterway	3	35%	1	10%	1	55%											5	100%	100%
CO17	ENV: Waste Recycling	25	78%	1	0%	1	0%	4	3%	1	2%			9	1%	2	17%	43	100%	97%
CO18	ENV: Improved water supply	33	67%			2	1%	10	16%	3	3%			5	1%	3	11%	56	100%	94%
CO19	ENV: Waste water treatment	43	81%	1	0%	1	0%	5	12%					10	1%	2	6%	62	100%	100%
CO20	ENV: Flood protection	35	46%	4	0%	1	0%	13	33%	4	4%			10	8%	3	9%	70	100%	93%
CO21	ENV: Forest fire protection	7	7%	1	5%	1	4%	8	44%					3	13%	2	27%	22	100%	100%
CO22	ENV: Rehabilitated land	24	51%			1	2%	9	26%	3	4%			11	13%	4	3%	52	100%	92%
CO23	ENV: Habitats conserved	50	58%	5	1%	1	0%	17	5%	3	0%	1	0%	23	35%	5	2%	105	100%	95%
CO24	RTDI: New researchers	44	63%					11	5%	5	5%	2	1%	18	16%	9	10%	89	100%	89%
CO25	RTDI: Researchers with improved infra	60	61%					17	21%	8	4%	2	0%	14	7%	13	6%	114	100%	89%
CO26	RTDI: Firms working with Ris	108	33%	1	0%	3	1%	33	13%	7	15%	2	1%	36	25%	20	14%	210	101%	94%
CO27	RTDI: Private match investment	72	50%	2	0%			17	3%	14	17%	4	2%	28	20%	5	7%	142	100%	83%
CO28	RTDI: New to market products	60	48%					27	14%	9	9%	4	3%	32	6%	15	21%	147	100%	87%
CO29	RTDI: New to firm products	62	33%					26	8%	11	7%	3	0%	32	6%	22	46%	156	100%	86%
CO30	ENERGY: RE production	46	89%	5	0%	6	0%	20	2%	8	3%	1	0%	45	5%	11	1%	142	100%	90%
CO31	ENERGY: improved performance in houses	61	62%	2	8%			4	1%	5	4%	1	0%	9	21%	11	5%	93	100%	92%
CO32	ENERGY: reduced consumption public buildir	69	58%	2	0%	2	0%	11	1%	9	7%			19	14%	12	19%	124	100%	90%
CO33	ENERGY: users on smart grids	11	99%					2	0%	1	0%			5	1%			19	100%	93%
CO34	Decrease of GHG	190	66%	1	0%	2	1%	32	7%	19	13%	3	1%	63	6%	31	7%	341	100%	91%
CO35	Schools renovated (capacity)	53	94%					14	1%	2	0%	1	0%	10	3%	8	1%	88	100%	96%
CO36	Health service improved (population)	18	32%	6	8%	1	0%	20	37%	1	0%			6	7%	9	15%	61	100%	98%
CO37	Urban population with integrated strategy	13	11%	2	1%	1	1%	15	23%	2	2%	3	3%	25	50%	4	8%	65	100%	86%
CO38	Urban: open space renovated	34	45%					6	4%	2	1%			13	17%	16	33%	71	100%	95%
CO39	Urban: Building renovated	29	32%	1	0%	1	2%	6	4%	3	2%	1	0%	15	24%	12	35%	68	100%	90%
CO40	Rehabilitated housing	12	54%					4	3%					3	0%	8	43%	27	100%	100%
CO41	INTERREG: Firms in RD cooperation	7	14%			1	1%	5	5%	5	15%			15	66%			33	100%	72%
CO42	INTERREG: Research inst. in cooperation ac	17	29%					3	7%	3	2%	1	1%	20	60%			44	100%	83%
CO43	INTERREG: Participants in labour mobility	5	12%					3	2%			1	0%	5	86%			14	100%	89%
CO44	INTERREG: Participants in labour & training	4	14%					7	42%	4	9%	1	0%	9	35%			25	100%	69%
CO45	INTERREG: Participants in includion actions	1	2%							1	45%			3	53%			5	100%	50%
CO46	INTERREG: Participants in youth actions	9	38%					4	12%			1	1%	9	49%			23	100%	93%
Grand Total		**2543**		**61**		**52**		**702**		**326**		**75**		**1275**		**589**		**5623**		**89%**

Table 12 – Results of the assessment based on PLD analysis and cross-checks: implemented values

CO code	CO short name	OK		likely to be higher, can be estimated from PLD		likely to be lower, can be estimated from PLD		likely to be higher, cannot estimate		likely to be lower, cannot estimate		cannot be estimated		PLD missing		PLD not submitted		Total		% of CO assessed as "OK", likely to be higher or lower and can be estimated, and likely to be higher, but cannot be estimated
		Count of IND.CD	Sum of AIR sel %of EU sel	Count of IND.CD	Sum of AIR sel %of EU sel	Count of IND.CD	Sum of AIR sel %of EU sel	Count of IND.CD	Sum of AIR sel %of EU sel	Count of IND.CD	Sum of AIR sel %of EU sel	Count of IND.CD	Sum of AIR sel %of EU sel	Count of IND.CD	Sum of AIR sel %of EU sel	Count of IND.CD	Sum of AIR sel %of EU sel	Total Count of IND.CD	Sum of AIR sel %of EU sel	
CO01	FIRMS: All firms	267	38%			2	0%	142	12%	62	14%	51	7%	184	13%	82	15%	790	100%	78%
CO02	FIRMS: grant aided	138	21%			1	0%	102	21%	28	11%	41	9%	123	21%	58	18%	491	100%	78%
CO03	FIRMS: non-grant aided	73	65%			2	0%	17	2%	12	4%	35	8%	87	17%	33	3%	259	100%	66%
CO04	FIRMS: advised	118	36%			2	0%	29	10%	9	3%	38	15%	68	11%	19	25%	283	100%	76%
CO05	FIRMS: New Enterprises	79	36%	1	0%	4	2%	12	9%	13	6%	30	10%	36	14%	29	22%	204	100%	69%
CO06	FIRMS: Private match grant aid	50	18%	1	0%	1	0%	40	17%	2	0%	21	7%	76	26%	41	32%	232	100%	80%
CO07	FIRMS: Private match non-grant	32	13%			5	30%	11	4%	4	3%	24	10%	44	24%	17	15%	137	100%	63%
CO08	FIRMS: New direct jobs	128	26%			1	1%	16	7%	10	5%	22	8%	65	8%	51	45%	293	100%	82%
CO09	Tourism: New visitors	38	17%			1	0%	13	16%	7	2%	7	7%	40	32%	10	26%	116	100%	79%
CO10	Broadband access	20	73%			1	2%	4	20%	2	1%			7	1%	4	4%	38	100%	93%
CO11	RAIL: new	5	35%									1	65%					6	100%	83%
CO11a	RAIL: TEN-T new	1	3%					1	97%									2	100%	100%
CO12	RAIL: Reconstructed	32	53%					3	6%	2	2%			4	20%	5	19%	46	100%	95%
CO12a	RAIL: TENT-T Reconstructed	14	48%							1	1%	2	20%	2	10%	2	20%	21	100%	82%
CO13	ROAD: New	26	36%					4	5%	1	0%	4	32%	21	21%	3	6%	59	100%	86%
CO13a	ROAD: TEN-T new	11	37%					3	47%	1	0%			3	10%	1	6%	19	100%	93%
CO14	ROAD: reconstructed	30	21%					9	14%	3	4%	4	3%	26	52%	5	6%	77	100%	85%
CO14a	ROAD: TEN-T reconstructed	11	78%							1	1%	1	13%	2	2%	1	6%	16	100%	85%
CO15	Tram or metro (new / improved)	13	28%					1	37%			1	3%	2	22%	1	10%	18	100%	93%
CO16	Inland waterway	3	35%									2	65%					5	100%	60%
CO17	ENV: Waste Recycling	18	52%					6	8%	2	1%	4	22%	11	1%	2	17%	43	100%	80%
CO18	ENV: Improved water supply	29	48%					4	13%	4	3%	9	22%	7	3%	3	11%	56	100%	72%
CO19	ENV: Waste water treatment	28	64%			1	0%	9	23%	4	4%	2	0%	16	3%	2	6%	62	100%	86%
CO20	ENV: Flood protection	44	36%			2	2%	5	22%	2	0%	5	23%	9	8%	3	9%	70	100%	88%
CO21	ENV: Forest fire protection	12	36%					2	10%			2	12%	4	15%	2	27%	22	100%	88%
CO22	ENV: Rehabilitated land	23	58%			1	0%	6	13%	3	3%	4	9%	11	12%	4	3%	52	100%	81%
CO23	ENV: Habitats conserved	47	55%					16	9%	3	2%	8	4%	26	27%	5	2%	105	100%	85%
CO24	RTDI: New researchers	41	35%					6	3%	7	33%	9	4%	17	15%	9	10%	89	100%	75%
CO25	RTDI: Researchers with improved infra	56	54%			3	0%	16	16%	8	15%	3	3%	15	6%	13	6%	114	100%	87%
CO26	RTDI: Firms working with Ris	87	30%	2	1%			35	14%	3	0%	31	20%	32	21%	20	14%	210	101%	78%
CO27	RTDI: Private match investment	44	40%	1	0%			25	16%	11	5%	32	11%	24	20%	5	7%	142	100%	62%
CO28	RTDI: New to market products	54	39%					19	19%	6	3%	19	11%	34	7%	15	21%	147	100%	74%
CO29	RTDI: New to firm products	51	20%					21	9%	6	3%	26	17%	30	6%	22	46%	156	100%	69%
CO30	ENERGY: RE production	43	88%	1	0%	1	1%	24	4%	3	0%	15	1%	44	5%	11	1%	142	100%	79%
CO31	ENERGY: improved performance in houses	49	66%			2	0%	6	3%	2	1%	15	5%	8	20%	11	5%	93	100%	77%
CO32	ENERGY: reduced consumption public buildir	56	42%	1	0%	1	0%	17	7%	6	9%	8	2%	23	21%	12	19%	124	100%	84%
CO33	ENERGY: users on smart grids	12	99%					3	0%					4	1%			19	100%	100%
CO34	Decrease of GHG	139	29%			1	0%	58	27%	24	15%	19	2%	69	20%	31	7%	341	100%	82%
CO35	Schools renovated (capacity)	39	91%					18	4%	4	0%	5	1%	14	3%	8	1%	88	100%	86%
CO36	Health service improved (population)	20	31%	3	1%	2	2%	10	17%	2	2%	5	21%	10	11%	9	15%	61	100%	83%
CO37	Urban population with integrated strategy	20	32%	2	1%			5	6%	2	0%	7	10%	25	42%	4	8%	65	100%	75%
CO38	Urban: open space renovated	35	46%			1	0%	5	3%	2	1%	1	0%	11	17%	16	33%	71	100%	93%
CO39	Urban: Building renovated	28	27%					7	9%	6	5%	4	3%	11	21%	12	35%	68	100%	78%
CO40	Rehabilitated housing	9	35%					4	10%	1	3%	2	8%	3	0%	8	43%	27	100%	81%
CO41	INTERREG: Firms in RD cooperation	9	15%					4	3%	3	4%	3	12%	14	66%			33	100%	68%
CO42	INTERREG: Research inst. In cooperation ac	17	31%					4	2%	3	6%	2	1%	18	59%			44	100%	81%
CO43	INTERREG: Participants in labour mobility	6	11%					2	2%	1	0%	1	0%	4	86%			14	100%	80%
CO44	INTERREG: Participants in labour & training	7	12%					4	38%	2	2%	3	14%	9	35%			25	100%	69%
CO45	INTERREG: participants in includion actions	1	2%							1	45%			3	53%			5	100%	50%
CO46	INTERREG: Participants in youth actions	8	13%					5	36%	1	1%	1	1%	8	49%			23	100%	87%
Total		**2121**		**12**		**35**		**753**		**280**		**529**		**1304**		**589**		**5623**		**78%**

Table 13 – Results of the assessment based on PLD analysis and cross-checks at MS level: selected values

MS	OK		likely to be higher, can be estimated from PLD		likely to be lower, can be estimated from PLD		likely to be higher, cannot estimate		likely to be lower, cannot estimate		cannot be estimated		PLD missing		PLD not submitted				% of CO assessed as "OK", likely to be higher or lower and can be estimated, and likely to be higher, but cannot be estimated
	Count of IND.CD	%of Ind at MS level	Count of IND.CD	%of Ind at MS level	Count of IND.CD	%of Ind at MS level	Count of IND.CD	%of Ind at MS level	Count of IND.CD	%of Ind at MS level	Count of IND.CD	%of Ind at MS level	Count of IND.CD	%of Ind at MS level	Count of IND.CD	%of Ind at MS level	Total Count of IND.CD	%of Ind at MS level	
AT															22	100%	22	100%	0%
BE	37	47%	1	1%		0%	4	5%	7	9%	5	6%	24	31%		0%	78	100%	78%
BG	23	49%		0%		0%	5	11%	4	9%		0%	15	32%		0%	47	100%	88%
CY	4	14%		0%		0%	10	34%	6	21%		0%	9	31%		0%	29	100%	70%
CZ	30	29%	1	1%		0%	18	18%	2	2%		0%	51	50%		0%	102	100%	96%
DE	140	39%	5	1%	2	1%	66	18%	16	4%	9	2%	125	34%		0%	363	100%	89%
DK	2	14%		0%		0%	2	14%	5	36%	1	7%	4	29%		0%	14	100%	40%
EE	5	14%		0%		0%	1	3%		0%	2	6%	27	77%		0%	35	100%	75%
ES	338	71%	5	1%	1	0%	49	10%	4	1%	2	0%	74	16%		0%	473	100%	98%
FI	16	37%		0%		0%	1	2%		0%		0%	26	60%		0%	43	100%	100%
FR	319	48%	9	1%	14	2%	97	15%	89	13%	13	2%	125	19%		0%	666	100%	81%
GR	253	51%	11	2%	7	1%	58	12%	15	3%	4	1%	152	30%		0%	500	100%	95%
HR	30	70%	1	2%		0%	5	12%	4	9%	1	2%	2	5%		0%	43	100%	88%
HU				0%		0%									127	100%	127	100%	0%
IE	9	30%		0%		0%	4	13%		0%		0%	17	57%		0%	30	100%	100%
IT	307	43%	15	2%	12	2%	173	24%	89	12%	19	3%	100	14%		0%	715	100%	82%
LT	35	63%		0%		0%		0%	4	7%	5	9%	12	21%		0%	56	100%	80%
LU	4	50%		0%	1	13%		0%		0%		0%	3	38%		0%	8	100%	100%
LV	31	66%		0%		0%	3	6%	5	11%		0%	8	17%		0%	47	100%	87%
MT	11	32%	1	3%		0%	4	12%	7	21%		0%	11	32%		0%	34	100%	70%
NL	20	30%		0%		0%	11	16%	2	3%		0%	34	51%		0%	67	100%	94%
PL	534	73%	6	1%	8	1%	69	9%	24	3%	5	1%	85	12%		0%	731	100%	96%
PT				0%		0%									269	100%	269	100%	0%
RO	29	40%		0%	1	1%		0%	6	8%	3	4%	33	46%		0%	72	100%	77%
SE	150	82%	3	2%		0%	21	11%	2	1%		0%	8	4%		0%	184	100%	99%
SK	17	15%	1	1%		0%	5	4%	3	3%		0%	86	77%		0%	112	100%	88%
SI	21	54%		0%		0%	7	18%	6	15%	2	5%	3	8%		0%	39	100%	78%
TC	178	33%	2	0%	6	1%	89	16%	26	5%	4	1%	241	44%		0%	546	100%	90%
UK				0%		0%									171	100%	171	100%	0%
Total	**2543**	**45%**	**61**	**1%**	**52**	**1%**	**702**	**12%**	**326**	**6%**	**75**	**1%**	**1275**	**23%**	**589**	**10%**	**5623**	**100%**	**89%**

Table 14 –Results of the assessment based on PLD analysis and cross-checks at MS level: implemented values

MS	OK		likely to be higher, can be estimated from PLD		likely to be lower, can be estimated from PLD		likely to be higher, cannot estimate		likely to be lower, cannot estimate		cannot be estimated		PLD missing		PLD not submitted				% of CO assessed as "OK", likely to be higher or lower and can be estimated, and likely to be higher, but cannot be estimated
	Count of IND.CD	%of Ind at MS level	Count of IND.CD	%of Ind at MS level	Count of IND.CD	%of Ind at MS level	Count of IND.CD	%of Ind at MS level	Count of IND.CD	%of Ind at MS level	Count of IND.CD	%of Ind at MS level	Count of IND.CD	%of Ind at MS level	Count of IND.CD	%of Ind at MS level	Total Count of IND.CD	%of Ind at MS level	
AT		0%													22	100%	22	100%	0%
BE	36	46%		0%	1	1%	6	8%	5	6%	6	8%	24	31%		0%	78	100%	80%
BG	21	45%		0%		0%	10	21%		0%		0%	16	34%		0%	47	100%	100%
CY	9	31%		0%		0%	1	3%	6	21%		0%	13	45%		0%	29	100%	63%
CZ	21	21%		0%		0%	9	9%	5	5%	16	16%	51	50%		0%	102	100%	59%
DE	170	47%	1	0%		0%	36	10%	17	5%	39	11%	100	28%		0%	363	100%	79%
DK	6	43%		0%		0%	3	21%		0%	1	7%	4	29%		0%	14	100%	90%
EE	6	17%		0%		0%	1	3%		0%	8	23%	20	57%		0%	35	100%	47%
ES	135	29%	1	0%	3	1%	132	28%	10	2%	117	25%	75	16%		0%	473	100%	68%
FI	14	33%		0%		0%	1	2%		0%	2	5%	26	60%		0%	43	100%	88%
FR	292	44%	3	0%	5	1%	112	17%	53	8%	86	13%	115	17%		0%	666	100%	75%
GR	261	52%	3	1%	5	1%	20	4%	35	7%	24	5%	152	30%		0%	500	100%	83%
HR	16	37%		0%		0%	6	14%	8	19%	8	19%	5	12%		0%	43	100%	58%
HU		0%													127	100%	127	100%	0%
IE	9	30%		0%		0%	2	7%		0%	2	7%	17	57%		0%	30	100%	85%
IT	347	49%	2	0%	7	1%	118	17%	50	7%	76	11%	115	16%		0%	715	100%	79%
LT	34	61%		0%		0%	2	4%		0%	6	11%	14	25%		0%	56	100%	86%
LU	4	50%		0%		0%	1	13%		0%		0%	3	38%		0%	8	100%	100%
LV	26	55%		0%	1	2%	2	4%	4	9%	6	13%	8	17%		0%	47	100%	74%
MT	13	38%		0%		0%	2	6%	4	12%	2	6%	13	38%		0%	34	100%	71%
NL		0%		0%		0%	29	43%		0%	3	4%	35	52%		0%	67	100%	91%
PL	287	39%		0%	10	1%	172	24%	35	5%	73	10%	154	21%		0%	731	100%	81%
PT		0%													269	100%	269	100%	0%
RO	30	42%		0%		0%	2	3%		0%	7	10%	33	46%		0%	72	100%	82%
SE	154	84%	1	1%		0%	7	4%		0%	14	8%	8	4%		0%	184	100%	92%
SK	17	15%		0%		0%	3	3%	7	6%		0%	85	76%		0%	112	100%	74%
SI	23	59%		0%		0%	7	18%	2	5%	4	10%	3	8%		0%	39	100%	83%
TC	190	35%	1	0%	3	1%	69	13%	39	7%	29	5%	215	39%		0%	546	100%	79%
UK		0%													171	100%	171	100%	0%
Total	**2121**	**38%**	**12**	**0%**	**35**	**1%**	**753**	**13%**	**280**	**5%**	**529**	**9%**	**1304**	**23%**	**589**	**10%**	**5623**	**100%**	**78%**

4.2. Findings by common indicator

Below, we provide the CO sheets with the assessment results and summary of metadata collected, which reveal the differences in calculation methodologies (when they differ from the common approach) and national monitoring systems, as well data quality checks implemented at the national level.

CO01: Number of enterprises receiving support

Definition of the indicator:	The number of enterprises receiving support in any form from ERDF (whether the support represents state aid or not). Enterprise: an organisation producing products or services to satisfy market needs in order to reach profit. The legal form of the enterprise may be various (self-employed persons, partnerships, etc.).
Type of indicator	Process
Results of cross-checking analysis:	Plausible values[5] compose 83 % of selected values and 78 % of implemented values.
Calculation methodologies at the national level:	No metadata was collected.
Source of data:	Projects
Quality control and plausibility checks:	- SFC2014 checks; - Elimination of double counting; - Verification based on external registers and statistics; - Risk assessment-based checks by MA, IB and auditors.
Reasons for inconsistencies	Reasons for possible mismatches between AIR data and PLD is that values reported in the AIR exclude double counting of enterprises that have received support more than once. Smaller inconsistencies between the values reported and AIRs might be due to different dates of data extraction for the current study and the AIRs. The limited availability of data on financial instruments also incurs possible inconsistencies.

CO02: Number of enterprises receiving grants

Definition of the indicator:	The number of enterprises receiving support in the form of non-refundable direct financial support conditional only to the financial completion of the project (grants). A subset of 'Number of enterprises receiving support'.
Type of indicator	Process.
Results of cross-checking analysis:	Plausible values compose 86% of selected values and 78 % of implemented values.
Calculation methodologies at the national level:	No metadata was collected.
Source of data:	Projects.
Quality control and plausibility checks:	- SFC2014 checks; - Elimination of double counting; - Verification based on external registers and statistics;

[5] Plausible values include those common indicators for which values reported in AIRs and on project level matched within 10% discrepancy, or their values are likely to be higher or lower and can be estimated based on project level data, or their values are likely to be higher, but cannot be estimated.

	- Risk assessment-based checks by MA, IB and auditors.
Reasons for inconsistencies	Reasons for possible mismatches between AIR data and PLD is that values reported in the AIR exclude double counting of enterprises that have received support more than once. Smaller inconsistencies between the values reported and AIRs might be due to different dates of data extraction for the current study and the AIRs.

CO03: Number of enterprises receiving financial support other than grants

Definition of the indicator:	The number of enterprises receiving non-grant type financial support, in the forms of loan, interest subsidy, credit guarantee, venture capital or other financial instruments. A subset of 'Number of enterprises receiving support'.
Type of indicator	Process.
Results of cross-checking analysis:	Plausible values compose 90% of selected values and 66 % of implemented values.
Calculation methodologies at the national level:	No metadata was collected.
Source of data:	Projects.
Quality control and plausibility checks:	- SFC2014 checks; - Elimination of double counting; - Verification based on external registers and statistics; - Risk assessment-based checks by MA, IB and auditors.
Reasons for inconsistencies	Reasons for possible mismatches between AIR data and PLD is that values reported in the AIR exclude double counting of enterprises that have received support more than once. Smaller inconsistencies between the values reported and AIRs might be due to different dates of data extraction for the current study and the AIRs. The limited aavailability of data on financial instruments also incurs possible inconsistencies.

CO04: Number of enterprises receiving non-financial support

Definition of the indicator:	The number of enterprises receiving support that does not involve direct financial transfer (guidance, consultancy, enterprise incubators, etc.). Venture capital is considered financial support. A subset of 'Number of enterprises receiving support'.
Type of indicator	Process.
Results of cross-checking analysis:	Plausible values compose 92% of selected values and 76% of implemented values.
Calculation methodologies at the national level:	Calculation methodologies are mainly in line with EC guidelines. The computation of target values is often based on reference ratios defined at the national level. The metadata collected by country experts show that the MAs in Cyprus, Estonia, France, Ireland, Lithuania, Romania, Sweden use the unique ID numbers of beneficiaries (e.g. VAT number, Tax registration number, organisation number, etc.) to compute implemented values and to avoid double counting.
Source of data:	Projects.
Quality control and plausibility checks:	- SFC2014 checks; - Elimination of double counting by checking that one enterprise is registered only once - Verification based on external registers and statistics;

	- Risk assessment-based checks by MA, IB and auditors; - Registering a unique identifier for each enterprise to avoid multiple counting is a good practice; - Consistency checks based on a comparison of values to the previous years, assessment of deviation from the average of other target values within the same indicator; - Ad hoc checks of abnormal values.
Reasons for inconsistencies	Reasons for possible mismatches between AIR data and PLD are that values reported in the AIR exclude double counting of enterprises that have received support more than once. Smaller inconsistencies between the values reported and AIRs might be due to different dates of data extraction for the current study and the AIRs.

CO05: Number of new enterprises supported

Definition of the indicator:	The number of enterprises created receiving financial aid or support (consultancy, guidance, etc.) from ERDF or ERDF financed facility. The created enterprise did not exist three years before the project started, but the Managing Authority or national legislation may set lower the time criterion. An enterprise will not become new if only its legal form changes. A subset of 'Number of enterprises receiving support'.
Type of indicator	Process.
Results of cross-checking analysis:	Plausible values compose 84% of selected values and 69% of implemented values.
Calculation methodologies at the national level:	Calculation methodologies are mainly in line with EC guidelines. According to national guidelines, this indicator is defined as the number of newly created companies receiving financial or non-financial support from the ERDF/ERDF-funded infrastructures. The company must be at most 3 years old, though it can be less based on the MA decision. This excludes changes in the legal personality of companies to rebrand them as "new". Implemented values are calculated by counting the ID numbers of beneficiaries.
Source of data:	Projects.
Quality control and plausibility checks:	- SFC2014 checks; - Elimination of double counting; - Verification based on external registers and statistics; - Risk assessment-based checks by MA, IB and auditors; - Registering a unique identifier for each enterprise to avoid multiple counting is a good practice; - Ad hoc checks of abnormal values.
Reasons for inconsistencies	A mismatch between AIR data and PLD may appear due to different dates of data extraction and unaligned regional and national monitoring systems. In Italy, for instance, new Covid-19 related business support measures might have also created mismatches between the data of both sources.

CO06: Private investment matching public support to enterprises (grants)

Definition of the indicator:	The total value of private contribution in a supported project that qualifies as state aid where the form of support is a grant (see Common Indicator 2 'Number of enterprises receiving grants'), including non-eligible parts of the project.
Type of indicator	Input.
Results of cross-checking analysis:	Plausible values compose 91% of selected values and 80% of implemented values.

Calculation methodologies at the national level:	According to national guidelines, the indicator is defined as the total value of the private contribution for supported projects (including parts that are non-eligible under EU rules). Targets are set at the national level following different approaches, e.g., values based on the ratio of co-financing and the programmed funding; based on the relevant calls; computed based on the eligible financial basis or based on factually incurred cost/private investments. In Estonia, the indicator is calculated as a sum from the several support measures (4.2.3, 4.4.1 and 4.4.2). For Romania and the operational programme 2014RO16RFOP001, the value of the indicator is the total amount of the private contribution in RDI projects, including the non-eligible expenditure of the project.
Source of data:	Projects, other documentation.
Quality control and plausibility checks:	- SFC2014 checks; - Elimination of double counting; - Verification based on external registers and statistics; - Risk assessment-based checks by MA, IB and auditors; - Sample check conducted at the end of the project implementation; - Ad hoc checks of abnormal values.
Reasons for inconsistencies	A mismatch between AIR data and PLD may appear due to different dates of data extraction. Also new Covid-19 related business support measures, different currency and exchange rates used to convert the financial data.

CO07: Private investment matching public support to enterprises (non-grants)

Definition of the indicator:	The total value of private contribution in a supported project that qualifies as state aid where the form of support is other than grant (see Common Indicator 3 'Number of enterprises receiving financial support other than grants'), including non-eligible parts of the project.
Type of indicator	Input.
Results of cross-checking analysis:	Plausible values compose 90% of selected values and 63% of implemented values.
Calculation methodologies at the national level:	According to national guidelines, the indicator is defined as the total value of the private contribution for supported projects (including parts that are non-eligible under EU rules). Targets are set at the national level following different approaches, e.g., values based on the ratio of co-financing and the programmed funding; based on the relevant calls; computed based on the eligible financial basis or based on factually incurred cost/private investments. In Germany, it is specified that for the operational programme 2014DE16RFOP008, the calculation of this indicator includes a statistical analysis and calculation by an external expert which is followed by a separate calculation for every specific objective and it then finishes with aggregation on the level of priority access. The analysis and calculation is based on the data from the supported projects.
Source of data:	Projects, FI monitoring systems, external providers private (e.g. ISB Rhineland-Palatinate in Germany).
Quality control and plausibility checks:	- SFC2014 checks; - Elimination of double counting; - Verification based on external registers and statistics; - Risk assessment-based checks by MA, IB and auditors; - Plausibility checks conducted by the MA as part of the AIR preparation; - Cross-verification with the adopted methodological assumptions; - Ad hoc checks of abnormal values.
Reasons for inconsistencies	A mismatch between AIR data and PLD may appear due to different dates of data extraction, also new Covid-19 related business support measures, limited availability of data on financial instruments and different currency and exchange rates used to convert the financial data.

CO08: Employment increase in supported enterprises

Definition of the indicator:	Gross new working positions in supported enterprises in full-time equivalents (FTE). Essentially a 'before-after' indicator that captures the part of the employment increase that is a direct consequence of the financial completion of the project (workers employed to implement the project are not counted). The positions need to be filled (vacant posts are not counted) and increase the total number of jobs in the enterprise. If total employment in the enterprise does not increase, the value is zero – it is regarded as realignment, not increase. Safeguarded etc, jobs are not included. Gross: Not counting the origin of the jobholder as long as it directly contributes to the increase of total jobs in the organisation. The indicator should be used if the employment increase can plausibly be attributed to the support. Full-time equivalent: Jobs can be full time, part-time or seasonal. Seasonal and part-time jobs are to be converted to FTE using ILO/statistical/other standards. Durability: Jobs are expected to be permanent, i.e. last for a reasonably long period depending on industrial-technological characteristics; seasonal jobs should be recurring. Figures of enterprises that went bankrupt are registered as a zero-employment increase. Timing: Data is collected before the project starts and after it finishes; Managing Authorities are free to specify the exact timing. Using average employment, based on 6 months or a year, is preferred to employment figures on certain dates.
Type of indicator	Result.
Results of cross-checking analysis:	Plausible values compose 89% of EU-level selected values and 82% of EU-level implemented values.
Calculation methodologies at the national level:	Calculation methodologies are mainly in line with EC guidelines. For instance, in the case of Ireland, this output indicator captures a key output of the planned investment by Local Enterprise Offices (LEOs) in support of micro-enterprises. It measures the employment increase that is a direct consequence of the co-funded financial completion of the project. For 2014IT16RFOP013, data is entered by the beneficiary. The documents that prove the quantification of the indicator are the data provided by the National Institute for Social Security or the employment contract. For 2014EE16M3OP001, the indicator is calculated once a year during the preparation of AIR based on data in SFOS (Structural Funds Operating Sysytem). The indicator is a sum of the actual achievements (FTE calculated based on the EC guidance.
Source of data:	Projects.
Quality control and plausibility checks:	- SFC2014 checks; - Elimination of double counting (e.g. FTE reported earlier); - Verification based on external registers; - Plausibility checks are conducted by the Managing Authorities during the preparation of AIRs; - Risk assessment-based checks by MA, IB and auditors, analysis of project documentation; - Ad hoc checks of abnormal values.
Reasons for inconsistencies	A mismatch between AIR data and PLD may appear due to different dates of data extraction. There is a high risk of "spontaneous changes" of values of this CO, i.e. changes that are not caused by the funded operation.

CO09: Increase in the expected number of visits to supported sites of cultural or natural heritage and attractions

Definition of the indicator:	The ex-ante estimated increase in the number of visits to a site in the year following the financial completion of the project. Valid for site improvements that aim to attract and accept visitors for sustainable tourism. It includes sites with or without previous tourism activity (e.g., nature parks or buildings converted to the museum). One visitor can make multiple visits; a

	group of visitors counted as the number of members of the group. The Managing Authorities set the methodology for estimating the expected number that can be based on demand analysis.
Type of indicator	Result.
Results of cross-checking analysis:	Plausible values compose 90% of selected values and 79% of implemented values.
Calculation methodologies at the national level:	MS apply different methodologies to calculate or estimate the values based on project monitoring or using other evidence (incl. statistics). One Interreg operational programme (2014TC16RFCB035) uses a calculation methodology requiring the beneficiary to attach useful documentation to demonstrate how the progress of the indicator was calculated by referring to objective data (statistics from official sources, tickets issued, registered visitors, etc.). In the case of Malta (2014MT16M1OP001), data for the number of visits will be based on actual visitors where systems are in place to record such visits. In the absence of these recording systems, estimated figures, or figures based on extrapolation will be used to calculate the increase in the number of visits to that particular site. For Spain, the methodology for estimating the number of visits is based on demand analysis, and the method used in each case will be described. A visitor can make multiple visits, and the number of visits is counted, regardless of whether the same person makes them.. A group of visitors should be counted as many as there are individuals in the group. In the case of Italy, the calculation methodologies vary among different Operational Programmes. For 2014IT16RFOP020, the indicator values must be inserted by the beneficiary of the intervention at the conclusion of the infrastructure works for the redevelopment of the site in the year following the conclusion of the interventions. For 2014IT16RFOP015, the target value for the indicator was estimated on the database on visitors for the year 2014 provided by Parks and Marine Protected Areas located in the areas of strategic importance covered by the policies to enhance natural attractors and cultural aspects of the POR. For 2014IT16RFOP011, assumptions are made for individual attractions and then aggregated. For 2014DE16RFOP011, the total number, the target value and, if applicable, the value for the milestone were determined during technical discussions with the funding unit or intermediary body.
Source of data:	Overall, records of the data come directly from projects (project documentation and monitoring system). Beneficiaries indicate the target value in the finance request and the achieved value in the technical progress report. National statistical offices and regional services data systems are also involved in the reporting of data.
Quality control and plausibility checks:	- SFC2014 checks; - Verification based on external registers; - Consistency checks during the AIR preparation; - Risk assessment-based checks by MA, IB and auditors, analysis of project documentation; - Ad hoc checks of abnormal values.
Reasons for inconsistencies	A mismatch between AIR data and PLD may appear due to different dates of data extraction. ! There is a risk of "spontaneous changes" of values of this CO, i.e. changes that are not caused by the funded operation.

CO10: Additional households with broadband access of at least 30 Mbps

Definition of the indicator:	The number of households with internet access with a download speed of at least 30 Mb/sec and who before only had more limited access or did not have access at all. The capacity to access must be a direct consequence of the support. The indicator measures households with the possibility to access, not whether the people living in the homes actually choose to be connected or not.
Type of indicator	Result.
Results of cross-checking analysis:	Plausible values compose 100% of selected values and 93% of implemented values.

Calculation methodologies at the national level:	Overall, the possibility to be connected and not the actual connection is taken into account for this indicator. Following EC guidelines, the measurement unit is not the number of plugs but the household units with the possibility of access. Therefore, the calculation does not depend on whether people live in the households at the time choose to be connected or not. In Italy (2014IT16RFOP011), an assumption is made that 30% of households in Liguria will be reached based on available resources. For 2014IT16RFOP016, the reference targets coincide with the political-strategic objectives of the European Digital Agenda, of the Italian Ultra Broadband Strategy and the Regional Digital Agenda. For 2014LV16MAOP001, the Managing Authority uses the data at the project level or the level of specific support objectives from the Management Information System of the Cohesion Policy Funds as entered by the responsible authorities (sector ministries) or the liaison bodies (agencies managing specific ERDF or CF programmes).
Source of data:	Data is mainly reported from projects. In Italy, for the operational programme 2014IT16RFOP004, the data source is the Ministry of Economic Development.
Quality control and plausibility checks:	- SFC2014 checks; - Verification based on external registers; - In-depth analysis of project documentation; - Ad hoc checks of abnormal values. Plausibility checks are generally conducted by the Managing Authorities. In some cases, external entities are also involved in the process of checking the data, such as in Greece and the Information Society Observatory. In the case of Slovenia, intermediate bodies check reported values and confirm them in the IT system. In one FR programme,2014FR16M0OP009 data is verified by the instructing service. It is noted that, in some cases, it is impossible to verify the declarations of households, and there is a risk of double-counting the same household within a single operation. There is also a risk of double counting the localisation.
Reasons for inconsistencies	A mismatch between AIR data and PLD may appear due to different dates of data extraction and possible double-counting at operation level.

CO11: Total length of the new railway line

Definition of the indicator:	Length of railroads constructed by the project where no railroad existed before.
Type of indicator	Output.
Results of cross-checking analysis:	Plausible values compose 100% of selected values and 83% of implemented values.
Calculation methodologies at the national level:	No metadata was collected.
Source of data:	Projects.
Reasons for inconsistencies	Separate records on this indicator are missing in the monitoring systems of 2014ES16RFOP002 and 2014GR16M1OP001 for those projects that contribute to CO11a. When comparing AIRs and aggregated project-level data, manual checks and calculation have to be made. Implemented values are only reported at the financial completion of the project, leading to time lags in reporting of implementation. Other likely reasons for potential mismatches include the misalignment between national monitoring systems (source for PLD) and regional systems (source for AIR). In addition, indicator data calculated outside the monitoring systems can also be a source for missmatches.

CO11a: Total length of new TEN-T railway line

Definition of the indicator:	The total length of new railway line within TEN-T.
Type of indicator	Output.
Results of cross-checking analysis:	Plausible values compose 100% of selected values and 100% of implemented values.
Calculation methodologies at the national level:	No metadata was collected.
Source of data:	Projects.
Reasons for inconsistencies:	Implemented values are only reported at the financial completion of the project, leading to time lags in reporting of implementation.

CO12: Total length of reconstructed or upgraded railway line

Definition of the indicator:	Length of railroads of which quality or capacity have been improved. This can include electrification, developing a single-track railroad into the double track, increasing the possible speed on the track, or any combination of these, but excludes installation of signalling systems (incl. ensuring ERTMS (European Rail Traffic Management System) compatibility). The approach chosen here is to exclude signalling systems as they distort the values. Signalling systems should be treated in a separate (programme-specific) indicator.
Type of indicator	Output.
Results of cross-checking analysis:	Plausible values compose 97% of selected values and 95% of implemented values.
Calculation methodologies at national level:	No metadata were collected.
Source of data:	Projects.
Reasons for inconsistencies	Separate records on this indicator are missing in the monitoring system for those projects that contribute to CO12a under 2014BG16M1OP001, 2014EE16M3OP001, 2014ES16RFOP002 and 2014LT16MAOP001, 2014LV16MAOP001 and 2014SK16M1OP001. Implemented values are only reported at the finantial completion of the project, leading to time lags in reporting of implementation.

CO12a: Total length of reconstructed or upgraded TEN-T railway line

Definition of the indicator:	The total length of reconstructed or upgraded railway line within TEN-T.
Type of indicator	Output.
Results of cross-checking analysis:	Plausible values compose 100% of selected values and 82% of implemented values.

Calculation methodologies at the national level:	No metadata was collected.
Source of data:	Projects.
Reasons for inconsistencies	Implemented values are only reported at the financial completion of the project, leading to time lags in reporting of implementation.

CO13: Total length of newly built roads

Definition of the indicator:	Length of roads (in kilometres) constructed by the project where: no road existed before, or · as a consequence of project completion, the capacity and quality of the previously existing local/secondary road is significantly improved to reach a higher classification (e.g. national road or equivalent); in this case, the road cannot be counted under indicator "Total length of reconstructed or upgraded roads".
Type of indicator	Output.
Results of cross-checking analysis:	Plausible values compose 97% of selected values and 86% of implemented values.
Calculation methodologies at the national level:	No metadata were collected.
Source of data:	Projects.
Reasons for inconsistencies	Separate records on this indicator are usually missing in the monitoring system for those projects that contribute to CO13a under 2014BG16M1OP001, 2014EE16M3OP001, 2014GR16M1OP001, 2014LT16MAOP001 and 2014PL16M1OP001. Implemented values are only reported at the financial completion of the project, leading to time lags in reporting of implementation.

CO13a: Total length of newly built TEN-T roads

Definition of the indicator:	The total length of newly built roads within TEN-T.
Type of indicator	Output.
Results of cross-checking analysis:	Plausible values compose 100% of selected values and 93% of implemented values.
Calculation methodologies at the national level:	No metadata was collected.
Source of data:	Projects.
Reasons for inconsistencies	Implemented values are only reported at the financial completion of the project leading to time lags in reporting of implementation.

CO14: Total length of reconstructed or upgraded roads

Definition of the indicator:	Length of roads where the capacity or quality of the road (including safety standards) was improved. If the upgrade is significant enough for the road to qualify as a new road, it will be counted under "Total length of newly built roads" and not under this indicator (see above).
Type of indicator	Output.
Results of cross-checking analysis:	Plausible values compose 91% of selected values and 85% of implemented values.
Calculation methodologies at the national level:	No metadata was collected.
Source of data:	Projects.
Reasons for inconsistencies	Separate records on this indicator are usually missing in the monitoring system for those projects that contribute to CO14a under 2014EE16M3OP001, 2014GR16M1OP001 (7a IP) and 2014LV16MAOP001 (7i IP). Implemented values are only reported at the financial completion of the project, leading to time lags in reporting of implementation.

CO14a: of which: TEN-T

Definition of the indicator:	The total length of reconstructed or upgraded roads within TEN-T.
Type of indicator	Output.
Results of cross-checking analysis:	Plausible values compose 92% of selected values and 85% of implemented values.
Calculation methodologies at national level:	No metadata collected.
Source of data:	Projects.
Reasons for inconsistencies	Implemented values are only reported at the financial completion of the project, leading to time lags in reporting of implementation.

CO15: Total length of new or improved tram and metro lines

Definition of the indicator:	Length of metro, tram or suburban train lines constructed or upgraded. The service along the upgraded lines must significantly improve due to the project completion. Double counting for this indicator and indicators 11 and 12 needs to be eliminated (e.g., suburban trains). It is up to the MA for which indicator the built/upgraded track is counted, but it must be counted only once.
Type of indicator	Output.
Results of cross-checking analysis:	Plausible values compose 100% of selected values and 93% of implemented values.

Calculation methodologies at the national level:	No metadata was collected.
Source of data:	Projects.
Reasons for inconsistencies	Implemented values are only reported at the financial completion of the project, leading to time lags in reporting of implementation.

CO16: Total length of new or improved inland waterway

Definition of the indicator:	Length of the inland waterway with new or improved navigation capacity. The improvement may concern improved transport capacity or safety aspects.
Type of indicator	Output.
Results of cross-checking analysis:	Plausible values compose 100% of EU-level selected values and 60% of EU-level implemented values.
Calculation methodologies at the national level:	No metadata was collected.
Source of data:	Projects.
Reasons for inconsistencies	Implemented values are only reported at the financial completion of the project, leading to time lags in reporting of implementation.

CO17: Additional waste recycling capacity

Definition of the indicator:	Annual capacity of newly built waste recycling facilities. It also includes extension of existing facilities.
Type of indicator	Result.
Results of cross-checking analysis:	Plausible values compose 97% of selected values and 80% of implemented values.
Calculation methodologies at the national level:	No metadata was collected.
Source of data:	Projects.
Reasons for inconsistencies	Implemented values are only reported at the financial completion of the project, leading to time lags in reporting of implementation. Different dates of data extraction may also affect the results of AIR data and PLD match.

CO18: Additional population served by improved water supply

Definition of the indicator:	The number of persons provided with drinking water through drinking water supply network as a consequence of increased drinking water production/transportation capacity built by the project and who were previously not connected or were served by sub-standard water supply.

	It includes improving the quality of drinking water. The indicator covers persons in households with actual (i.e. not potential) connections to the water supply system. It includes reconstruction projects but excludes projects aiming to create/improve irrigation systems.
Type of indicator	Result.
Results of cross-checking analysis:	Plausible values compose 94% of selected values and 72% of implemented values.
Calculation methodologies at national level:	EC guidelines on CO calculation are mainly followed by MS. For this indicator, France and Poland specify that it covers persons in households with actual, and not potential, connection to the water supply system. In Spain, before the implementation of the programmes contributing to this indicator, the population of the area in which this is going to be performed and the target population are first calculated using national statistics. Demographic projections are also taken into account (Italy, operational programme 2014IT16RFOP022). In Greece, the indicator is used only for new houses connections to the water supply network and not for simple reconstruction projects. In Poland, it is stated that the indicator includes reconstruction projects but excludes projects aiming to create or improve irrigation systems. In Romania, the indicators measure the equivalent number of the population targeted by the infrastructure financed by the project, consistent with the EU definition. The number of connected people is proven by the concluded water supply contracts and the information in these contracts concerning the number of persons or the average number of persons on contracts / households in that locality.The impact of the project works is proven on the basis of the taking-over certificate at the end of the work approved by the investor.
Source of data:	In addition to the project documentation and declarations by beneficiaries, sources of data for this indicator include different governmental agencies (i.e. Ministry of Environment in Italy), national statistics institutes, annual index reports (annual indicator reports from the monitoring system in Greece) and project proposals presented for funding by the applicants.
Quality control and plausibility checks:	- SFC2014 checks; - Verification based on external registers; - Risk assessment-based checks by MA, IB and auditors, analysis of project documentation; - Ad hoc (manual) checks of abnormal values.
Reasons for inconsistencies	Implemented values are only reported at the financial completion of the project, leading to time lags in reporting of implementation. Different dates of data extraction may also affect the results of AIR data and PLD match.

CO19: Additional population served by improved wastewater treatment

Definition of the indicator:	The number of persons whose wastewater is transported to wastewater treatment plants through wastewater transportation network due to increased wastewater treatment/transportation capacity built by the project and who were previously not connected or were served by sub-standard wastewater treatment. It includes improving wastewater treatment levels. The indicator covers persons in households with actual (i.e., not potential) connections to the wastewater treatment system.
Type of indicator	Result.
Results of cross-checking analysis:	Plausible values compose 100% of selected values and 86% of implemented values.
Calculation methodologies at the national level:	MS mainly follows EC guidelines on CO calculation.The indicator measures the number of individuals in households with actual access to water treatment systems. In Spain, it is stated that if several operations act on the same population (e.g. increase of wastewater treatment plant and increase of sewerage network), the population has to be counted once; the indicator value will be put into one operation only.

	In Slovenia, the target values are defined based on the number of inhabitants living within the areas. In Greece, the process for the calculation of this indicator includes 1) spatial planning that defines the areas that will be served by the future network connections and 2) approvement by the Special Secretariat for Water on which of the settlements (A, B, C priority) will be included in the wastewater management network project. The Special Secretariat for Water also collects the relevant values concerning the population included in project plans. In Poland, the methodology for calculation is consistent with EU's definition, i.e., indicator measures the number of persons (population equivalent) whose wastewater is transported to wastewater treatment plants through the wastewater transportation network as a result of increased wastewater treatment/transportation capacity built by the project, and who were previously not connected or were served by sub-standard wastewater treatment. It includes improving wastewater treatment level. The indicator covers persons in households with actual (i.e., not potential) connection to the wastewater treatment system. In Romania, the indicator measures the equivalent number of the population targeted by the infrastructure financed by the project and is consistent with the EU definition. This indicator refers to the number of people connected to the sewerage and wastewater treatment system as a result of the project implementation. Thus, they are considered for this indicator: 1) the number of new connected persons, as a result of the works within the project; 2) the number of persons who were connected prior to the start of the project but wastewater treatment does not correspond to the applicable standards. The number of connected people is proven by the concluded water supply contracts and the information in these contracts concerning the number of persons or the average number of persons on contracts / households in that locality. The impact of the project works is proven based on the taking-over certificate at the end of the work approved by the investor.
Source of data:	Generally, data is declared by beneficiaries in the project documentation. In Greece, a special Secretariat for Water collects the relevant values concerning the population included in project plans. In France, data can be provided by cities, it can be checked by governmental agencies.
Quality control and plausibility checks:	- SFC2014 checks; - Verification based on external registers; - In-depth quantitative and qualitative checks; - Risk assessment-based checks by MA, IB and auditors, analysis of project documentation; - Automated and ad hoc manual checks of abnormal values.
Reasons for inconsistencies	Implemented values are only reported at the financial completion of the project, leading to time lags in reporting of implementation. Different dates of data extraction may also affect the results of AIR data and PLD match.

CO20: Population benefiting from flood protection measures

Definition of the indicator:	The number of people exposed to flood risk where vulnerability decreased as a direct consequence of a supported project. This indicator should exclude multiple counting where different risk prevention measures benefit the same population.
Type of indicator	Result.
Results of cross-checking analysis:	Plausible values compose 93% of selected values and 88% of implemented values.
Calculation methodologies at national level:	Though MS follow EC monitoring guidelines, the methodologies for the calculation of this indicator vary somewhat across Member States. In Greece, the indicator value is defined as the population exposed to reduced flood risk as a direct consequence of a funded project. The index counts projects aimed at protecting human life and not private or public properties (e.g. flood defences or drainage systems that protect agricultural land). In Italy, for the operational programme 2014IT16RFOP016, the target value can be calculated based on historical data related to the cost and average size for intervention related to programming 2007-2013 and then can be adapted to available resources. The average cost of a single intervention of securing population areas is estimated to be 1.5 million euros. The

	identification of the population who is potentially affected by floods is based on data provided by civil protection and experts involved in the preparation of each project. Metadata included in national statistics datasets are also used.
Source of data:	Data is mainly declared by beneficiaries in the project documentation. Other sources of values include the project proposals presented for funding by the applicants and approved by the MA. In Germany, data might also be retrieved from expert opinion by the water management office or state environmental agency. In Italy, data for some operational programmes is retrieved from monitoring systems and the Italian National Institute for Environmental Protection and Research (ISPRA), local authorities, data from the initial project fiche and the national statistical office data (Italy).
Quality control and plausibility checks:	- SFC2014 checks; - Verification based on external registers; - Risk assessment-based checks by MA, IB and auditors, analysis of project documentation; - Ad hoc (manual) checks of abnormal values. In addition to the plausibility checks conducted by the Managing Authorities in the process of preparing the Annual Implementation Reports, quarterly plausibility checks are carried out by an external service provider (Germany) and specific analysis is performed in case of 20% distance from the target (Italy).
Reasons for inconsistencies	Implemented values are only reported at the financial completion of the project, leading to time lags in reporting of implementation. Different dates of data extraction and double counting of the population at the project level may also affect the results of AIR data and PLD match.

CO21: Population benefiting from forest fire protection measures

Definition of the indicator:	The number of people exposed to forest fire hazards where vulnerability decreased as a direct consequence of a supported project. This indicator should exclude multiple counting where different risk prevention measures benefit the same population.
Type of indicator	Result.
Results of cross-checking analysis:	Plausible values compose 100% of selected values and 88% of implemented values.
Calculation methodologies at the national level:	Overall, MS follow EC monitoring guidelines. This indicator measures the sum of the number of people exposed to the risk of fire in places where vulnerability decreased as a result of the projects supported.
Source of data:	The primary source of data are projects, in which beneficiaries indicate relevant information. National Statistics Institutes are also relevant sources of data as it is the case in Spain, Portugal and Italy. Regional monitoring systems and project fiches are also commonly used sources.
Quality control and plausibility checks:	- SFC2014 checks; - Verification based on external registers; - Manual checks on the consistency of data; - Risk assessment-based checks by MA, IB and auditors, analysis of project documentation; - Ad hoc (manual) checks of abnormal values.
Reasons for inconsistencies	Implemented values are only reported at the financial completion of the project, leading to time lags in reporting of implementation. Different dates of data extraction and double counting of the population at the project level may also affect the results of AIR data and PLD match.

CO22: Total surface area of rehabilitated land

Definition of the indicator:	The surface of remediated or regenerated contaminated or derelict land made available for economic (except non-eligible, e.g., agriculture or forestry) or community activities.
Type of indicator	Output.
Results of cross-checking analysis:	Plausible values compose 92% of selected values and 81% of implemented values.
Calculation methodologies at the national level:	No metadata was collected.
Source of data:	Projects.
Reasons for inconsistencies	Implemented values are only reported at the financial completion of the project, leading to time lags in reporting of implementation. Different dates of data extraction and double counting at project level may also affect the results of AIR data and PLD match.

CO23: Surface area of habitats supported in order to attain a better conservation status

Definition of the indicator:	The surface of restored or created areas aimed to improve the conservation status of threatened species. The operations can be carried out both in or outside of Natura 2000 areas, capable of improving the conservation status of targeted species, habitats or ecosystems for biodiversity and the provisioning of ecosystem services. Areas that receive support repeatedly should be counted only once.
Type of indicator	Output.
Results of cross-checking analysis:	Plausible values compose 95% of selected values and 85% of implemented values.
Calculation methodologies at the national level:	No metadata was collected.
Source of data:	Projects.
Reasons for inconsistencies	Implemented values are only reported at the financial completion of the project, leading to time lags in reporting of implementation. Different dates of data extraction and double counting at the project level may also affect the results of AIR data and PLD match.

CO24: Number of new researchers in supported entities

Definition of the indicator:	Gross new working positions (that did not exist before) to directly perform R&D activities in full-time equivalents. The post must be a consequence of project implementation or its financial completion, be filled (vacant positions are not counted) and increase the total number of research jobs in the organisation. Support staff for R&D (i.e., jobs not directly involved in R&D activities) is not counted. The indicator focuses on employed personnel; the supported entity may be new or already existing. Gross: Not counting the origin of the jobholder as long as it directly contributes to the increase of total research jobs in the organisation. Full-time equivalent: Jobs can be full time, part-time or seasonal. Seasonal and part-time jobs are to

	be converted to FTE using ILO/statistical/other standards. In the field of RTD the duration of jobs tends to be shorter ("project support"). The jobs created for different projects should be added up (provided that all projects receive support); this is not regarded as multiple counting.
Type of indicator	Result.
Results of cross-checking analysis:	Plausible values compose 89% of selected values and 75% of implemented values.
Calculation methodologies at the national level:	EC monitoring guidelines are followed by MS to calculate the values. Germany states that the number of scientists newly hired as a result of the project and directly engaged in R&D activities should be reported. Furthermore, it is recommended to count all scientists who are remunerated by their own or third-party funds. Spain also establishes concrete requirements for the calculation of the indicator and provides that the position must be a consequence of the realisation of the project, be actually filled (vacant positions are not counted), and the total number of researches in the organisation has to be increased. France declares that vacant positions and research support staff (e.g., assistant engineers, technicians, secretaries) are not counted.
Source of data:	Projects and data declared by beneficiaries in the project documentation are the primary sources of data.
Quality control and plausibility checks:	- SFC2014 checks; - Elimination of double counting; - Verification based on external registers; - Risk assessment-based checks by MA, IB and auditors, analysis of project documentation; - Ad hoc checks of abnormal values.
Reasons for inconsistencies	A mismatch between AIR data and PLD may appear due to different dates of data extraction. There is a high risk of "spontaneous changes" of values of this CO, i.e. changes that are not caused by the funded operation.

CO25: Number of researchers working in improved research infrastructure facilities

Definition of the indicator:	Existing working positions in research infrastructure facilities that (1) directly perform R&D activities and (2) are directly affected by the project. The posts must be filled (vacant positions are not counted). Support staff for R&D (i.e., jobs not directly involved in R&D activities) is not counted. If more researchers are employed in the facilities due to the project, thus the number of research jobs increases and the new posts are included (see also "Number of new researchers in supported entities"). The facilities may be private or public. The project must improve the facilities or quality of equipment, i.e., maintenance or replacement without quality increase is excluded. Full-time equivalent: Jobs can be full time, part-time or seasonal. Seasonal and part-time jobs are to be converted to FTE using ILO/statistical/other standards.
Type of indicator	Result.
Results of cross-checking analysis:	Plausible values compose 89% of selected values and 87% of implemented values.
Calculation methodologies at the national level:	EC monitoring guidelines are followed by MS to calculate the values.
Source of data:	Projects.
Quality control and plausibility checks:	- SFC2014 checks; - Elimination of double counting; - Verification based on external registers;

	- Risk assessment-based checks by MA, IB and auditors, analysis of project documentation; - Ad hoc checks of abnormal values.
Reasons for inconsistencies	A mismatch between AIR data and PLD may appear due to different dates of data extraction. There is a high risk of "spontaneous changes" of values of this CO, i.e. changes that are not caused by the funded operation.

CO26: Number of enterprises cooperating with research institutions

Definition of the indicator:	The number of enterprises that cooperate with research institutions in R&D projects. At least one enterprise and one research institution participate in the project. One or more of the cooperating parties (research institution or enterprise) may receive the support, but it must be conditional to the cooperation. The cooperation may be new or existing. The cooperation should last at least for the duration of the project. Enterprise: Organisation producing products or services to satisfy market needs in order to reach profit. The origin of the enterprise (inside or outside of the EU) does not matter. In case one enterprise takes the formal lead, and others are subcontractors but still interact with the research institution, all enterprises should be counted. Enterprises cooperating in different projects should be added up (provided that all projects receive support); this is not regarded as multiple counting. Research institution: an organisation of which R&D is a primary activity.
Type of indicator	Result.
Results of cross-checking analysis:	Plausible values compose 94% of selected values and 78% of implemented values.
Calculation methodologies at the national level:	EC monitoring guidelines are followed by MS to calculate the values. The number of enterprises that cooperate with research institutions in the framework of the project (project partner organisations included). The cooperation may be new or existing, and it should last at least for the duration of the project. In Germany, it is stated that the companies should cooperate substantially in the area of research with regard to technology development (e.g. testing, analyses, etc.). Purely service-providing or supplying companies should not be defined as "cooperating" for monitoring purposes.
Source of data:	Projects
Quality control and plausibility checks:	- SFC2014 checks; - Elimination of double counting; - Verification based on external registers; - Manual qualitative checks; - Risk assessment-based checks by MA, IB and auditors, analysis of project documentation; - Ad hoc checks of abnormal values.
Reasons for inconsistencies	A mismatch between AIR data and PLD may appear due to different dates of data extraction.

CO27: Private investment matching public support in innovation or R&D projects

Definition of the indicator:	The total value of private contribution in supported innovation or R&D projects, including non-eligible parts of the project.
Type of indicator	Input

Results of cross-checking analysis:	Plausible values compose 83% of selected values and 62% of implemented values
Calculation methodologies at the national level:	EC monitoring guidelines are usually followed to calculate the values of CO. The indicator refers to the total value of the private contribution to the support when it takes the form of a grant.
Source of data:	Projects, monitoring systems.
Quality control and plausibility checks:	- SFC2014 checks; - Elimination of double counting; - Verification based on external registers and statistics; - Cross-verification with the methodological assumptions; - Risk assessment-based checks by MA, IB and auditors; - Ad hoc checks of abnormal values.
Reasons for inconsistencies	A mismatch between AIR data and PLD may appear due to different dates of data extraction, and different currency and exchange rates used to convert the financial data.

CO28: Number of enterprises supported to introduce new to the market products

Definition of the indicator:	The indicator measures if an enterprise receives support to develop a 'new to the market' product in any of its markets. Includes process innovation as long as the process contributes to the development of the product. Projects without the aim of actually developing a product are excluded. If an enterprise introduces several products or receives support for several projects, it is still counted as one enterprise. In the case of cooperation projects, the indicator measures all participating enterprises. A product is new to the market if there is no other product available on a market that offers the same functionality, or the technology that the new product uses is fundamentally different from the technology of already existing products. Products can be tangible or intangible (incl. services). Supported projects that aimed to introduce new to the markets products but did not succeed are still counted. If a product is new both to the market and to the firm, the enterprise should be counted in both relevant indicators (see indicator 29 'Number of enterprises supported to introduce new to the firm products'). The boundaries of the market (either geographical or other) are defined by the Managing Authority based on the business activity of the enterprise receiving support.
Type of indicator	Process.
Results of cross-checking analysis:	Plausible values compose 87% of selected values and 74% of EU-level implemented values.
Calculation methodologies at the national level:	MS mainly follow the EC monitoring guidelines. The indicator measures if an enterprise receives support through the project to develop a `new to the market ' product in any of its markets. Target values are, in some cases, calculated by taking into account the experience of previous programming periods. In other cases, they can also be determined on the basis of the number of beneficiary companies, taking into account the maximum contribution to be paid in the form of aid. Spain specifies that if a company introduces several products or receives support for several projects, it shall be counted as one company. In the case of cooperative projects, the value of the indicator shall include all participating companies. In the case of Finland, it is specified that the monitoring of the indicator is based on data on companies (with business ID) provided by the beneficiaries.
Source of data:	Projects.
Quality control and plausibility checks:	- SFC2014 checks; - Elimination of double counting; - Verification based on external registers and statistics; - Risk assessment-based checks by MA, IB and auditors; - Ad hoc (manual) checks of abnormal values.

Reasons for inconsistencies	A mismatch between AIR data and PLD may appear due to different dates of data extraction and stages of project implementation. Implemented values are only reported at the financial completion of the project, leading to time lags in reporting of implementation.

CO29: Number of enterprises supported to introduce new to the firm products

Definition of the indicator:	The indicator measure if an enterprise is supported to develop a 'new to the firm' product. Includes process innovation as long as the process contributes to the development of the product. Projects without the aim of actually developing a product are excluded. If an enterprise introduces several products or receives support for several projects, it is still counted as one enterprise. In the case of cooperation projects, the indicator measures all participating enterprises to which the product is new. A product is new to the firm if the enterprise did not produce a product with the same functionality or the production technology is fundamentally different from the technology of already produced products. Products can be tangible or intangible (incl. services). Supported projects that aimed to introduce new to the firm products but did not succeed are still counted. If a product is new both to the market and to the firm, the enterprise should be counted in both relevant indicators (see indicator 28 'Number of enterprises supported to introduce new to the market products').
Type of indicator	Process.
Results of cross-checking analysis:	Plausible values compose 86% of selected values and 69% of implemented values.
Calculation methodologies at the national level:	No metadata were collected.
Source of data:	Projects.
Reasons for inconsistencies	A mismatch between AIR data and PLD may appear due to different dates of data extraction, and stage of project implementation. Implemented values are only reported at the financial completion of the project, leading to time lags in reporting of implementation.

CO30: Additional capacity of renewable energy production

Definition of the indicator:	Increase in energy production capacity of facilities using renewable energy resources built/equipped by the project. It includes electricity and heat energy. Renewable energy resource: Any energy source that is not fossil or nuclear. See regulation 2009/28, art. 2(a).
Type of indicator	Output.
Results of cross-checking analysis:	Plausible values compose 90% of selected values and 79% of implemented values.
Calculation methodologies at national level:	The EC monitoring guidelines are followed by MS. Renewable energy is assumed to be GHG neutral and to replace non-renewable energy. The indicator measures the increase in the energy production capacity of the plants that use renewable energy sources (expressed in Mw) built or equipped following the interventions of the programme. The target can be estimated as a function of technical characteristics of the planned interventions, based on the availability of resources. It can also be based on assumptions regarding the scale and technologies of funded projects.

Source of data:	Projects.
Quality control and plausibility checks:	- SFC2014 checks; - Elimination of double counting; - Verification based on external registers and statistics; - Risk assessment-based checks by MA, IB and auditors; - Automatic alerts for implausible values (indicator values outside of the interval set); - In-depth qualitative and quantitative checks, cross-verification with the adopted methodological assumptions - Ad hoc (manual) checks of abnormal values.
Reasons for inconsistencies	A mismatch between AIR data and PLD may appear due to different dates of data extraction, and stage of project implementation, use of different measurement unit at national level. Implemented values are only reported at the financialcompletion of the project, leading to time lags in reporting of implementation.

CO31: Number of households with improved energy consumption classification

Definition of the indicator:	The number of households in improved energy class – see Directive 2010/31/EU. Improved class must be the direct consequence of the project completion.
Type of indicator	Result.
Results of cross-checking analysis:	Plausible values compose 92% of selected values and 77% of implemented values.
Calculation methodologies at the national level:	MS follow the EC guidelines on the calculation of values for this CO.
Source of data:	In addition to data found in projects, grant agreements and technical reports, monitoring systems and final verification reports are all relevant sources of data.
Quality control and plausibility checks:	- SFC2014 checks; - Elimination of double counting; - Verification based on external registers and statistics; - On-spot control procedures and documentary checks; - Risk assessment-based checks by MA, IB and auditors; - Ad hoc (manual) checks of abnormal values.
Reasons for inconsistencies	A mismatch between AIR data and PLD may appear due to different dates of data extraction and stages of project implementation. Implemented values are only reported at the financial completion of the project, leading to time lags in reporting of implementation.

CO32: Decrease of annual primary energy consumption of public buildings

Definition of the indicator:	Calculations are based on the energy certificate of buildings (see Art.12.1.b of Directive 2010/31/EU). In line with the deadlines set in the Directive, the indicator must apply to all public buildings above 500m2 total useful area and were reconstructed using Structural Funds support. If the construction starts after 9 July 2015, the threshold for public buildings decreases to 250m2 total useful area. The Managing Authority may include buildings in the calculation with less than 250m2 (or 500m2 before 9/7/2015). The value will be calculated from the energy certificates issued before and after the reconstruction. The indicator will show the total decrease of annual consumption, not the total saved consumption.
Type of indicator	Result.

Results of cross-checking analysis:	Plausible values compose 90% of selected values and 84% of EU-level implemented values.
Calculation methodologies at the national level:	Overall, the calculations are based on the energy performance certificates and energy audits of buildings. Spain specifies that the calculations shall be based on the energy performance certificate of the buildings (see Art.12.1.b of Directive 2010/31/EU). The same requirement is applied in Lithuania. In the case of 2014DE16RFOP008, statistical analysis and calculation by an external expert and a separate calculation for every specific objective and then aggregation on the level of priority axis is conducted. The analysis and calculation is based on the data from the supported projects. For 2014IT16RFOP020, the indicator is calculated by constructing an energy model of the building-plant system before and after the intervention, consistent with the technical reference standards.
Source of data:	Projects
Quality control and plausibility checks:	- SFC2014 checks; - Elimination of double counting; - Verification based on external registers and statistics; - Risk assessment-based checks by MA, IB and auditors; - Ad hoc (manual) checks of abnormal values.
Reasons for inconsistencies	A mismatch between AIR data and PLD may appear due to different dates of data extraction, and stage of project implementation, use of different measurement unit at national level. Implemented values are only reported at the financial completion of the project, leading to time lags in reporting of implementation.

CO33: Number of additional energy users connected to smart grids

Definition of the indicator:	Smart grid: Electricity network that integrates the actions of energy users by exchanging digital information with the network operator or supplier. An energy user can be consumer, generator, or both. Enterprises can be users too.
Type of indicator	Result.
Results of cross-checking analysis:	Plausible values compose 93% of EU-level selected values and 100% of EU-level implemented values.
Calculation methodologies at the national level:	New energy users connected to smart grids produced by the realisation of the co-financed operation. Target values can be calculated based on an estimation taken into account the basis of the technical characteristics of the planned interventions and based on the availability of resources. It can also be calculated according to the experience of the current funding period. In Poland, the methodology is consistent with the EU's definition, i.e. indicator measures the number of additional energy users connected to smart grids where the smart grid is defined as Electricity network that integrate the actions of energy users by exchanging digital information with the network operator or supplier. An energy user can be a consumer, generator, or both. Enterprises can be users too. Measurement method: The value of the indicator is determined on the basis of the reporting documentation of the program beneficiaries and verified as part of on-site inspections based on the acceptance and as-built documentation as well as the use permit. In Italy, the target was estimated on the basis of the technical characteristics of the planned interventions based on the availability of resources. It should be noted that the quantification of the target takes into account a heterogeneous supply power (with both industrial and residential uses). Therefore it is lower than that which would be considered a "standard" user (equivalent user for low voltage).
Source of data:	Projects, regional services data systems and also administrative units such as prefectures in the case of Greece. In Poland, the value of the indicator is determined on the basis of the reporting documentation of the program beneficiaries and verified as part of on-site inspections based on the acceptance and as-built documentation as well as the use permit.

Quality control and plausibility checks:	- SFC2014 checks; - Verification based on external registers and statistics; - Risk assessment-based checks by MA, IB and auditors; - Consistency checks were performed during the AIR preparation; - Ad hoc (manual) checks of abnormal values.
Reasons for inconsistencies	A mismatch between AIR data and PLD may appear due to different dates of data extraction and stages of project implementation.

CO34: Estimated annual decrease of GHG

Definition of the indicator:	This indicator is calculated for interventions directly aiming to increase renewable energy production (see indicator 30) or to decrease energy consumption through energy-saving measures (see indicators 31 and 32). Thus its use is mandatory only where these indicators are relevant. Uses for other interventions with possible GHG impact are optional with the methodology developed by the Managing Authority. The indicator will show the total estimated annual decrease by the end of the period, not the total decrease throughout the period. In case of renewable energy production, the estimate is based on the amount of primary energy produced by supported facilities in a given year (either one year following project completion or the calendar year after project completion). Renewable energy is supposed to be GHG neutral and replace non-renewable energy production. GHG impact of non-renewable energy is estimated through the MS total GHG emission per unit of non-renewable energy production. In the case of energy-saving measures, the estimate is based on the amount of primary energy saved in a given year supported operations (either one year following the financial completion of the project or the calendar year after). Saved energy is supposed to be replacing non-renewable energy production. GHG impact of non-renewable energy is estimated through the MS total GHG emission per unit of non-renewable energy production.
Type of indicator	Result.
Results of cross-checking analysis:	Plausible values compose 91% of selected values and 82% of implemented values.
Calculation methodologies at the national level:	In general, the decrease is measured by comparing the situation before and after support in tonnes of carbon equivalent (a metric measure used to compare the emissions of various greenhouse gases based on their global warming potential, by converting the quantities of the different gases emitted into the equivalent amount of carbon dioxide with the same global warming potential). The indicator is calculated by taking into consideration the annual decrease of greenhouse gases, with reference in the year of the financial completion of the interventions. Target values can be calculated starting from the value of energy savings achieved by applying an appropriate factor CO2 equivalent emissions based on the fuels used in the pre and post-intervention situation. However, variations in terms of calculation methodologies established at national and regional levels can be observed from the metadata collected. For 2014DE16RFOP015, it is specified that the calculation of the potential CO2 savings of the individual measures is conducted on the basis of feasibility studies as well as monitoring by means of a query on the annual mileage and the electricity composition (e-bus). In the case of subsidised vehicles (e-buses), a tank-to-well analysis of the CO2 savings potential is usually carried out. For 2014DE16RFOP008 the calculation method is based on statistical analysis and calculation by an external expert. A separate calculation for every specific objective is conducted, and then aggregation is performed on the level of priority axis. The analysis and calculation is based on the data from the supported projects. For 2014DE16M2OP001 (Lower Saxony), the savings values are determined by the energy experts or experts for energy saving/efficiency and wastewater treatment involved in the preparation and processing of applications on the basis of the information provided by the beneficiaries and the engineering offices accompanying them. In Denmark, at the time of application, the applicant must set target figures (expected values) for the indicator divided into six months in the project period in the electronic application form. In Greece, the CO values are calculated for the projects directly affect the reduction of primary energy consumption, either through energy saving measures or through the use of renewable energy sources. In the case of energy-saving measures, the calculation is based on the amount of primary energy saved within a calendar year as a result of the financial completion of the co-financed projects. In the case of RES projects, the calculation methodology is based on the amount of renewable energy produced within a calendar year as a result of the financial completion of the co-financed projects. Renewable energy has no effect in terms of greenhouse gas emissions and replaces energy production from non-renewable sources. In

	France (2014FR16M0OP001), to measure the indicator, the French methodological guidelines clarify that it will be assumed that renewable electric energy is used as an alternative to non-renewable electric energy and that renewable thermal energy is used as an alternative to non-renewable thermal energy. This makes it possible to correct the bias introduced by a highly decarbonised electric mix and to promote the substitution of the most greenhouse gas-emitting energies. Concerning calculation principles, all gases are counted as CO2 with a particular gas weight. The calculation method proposed by the EC is not relevant here: the data make no sense in France as renewable energy does not replace what is actually consumed. In Italy (2014IT16RFOP004), a survey, based on data collected directly by companies, quantified the average consumption of electricity for medium-sized enterprises and for small companies. On the basis of the survey data relating to consumption and the statistical data on SMEs, the region Abruzzo has estimated an average annual consumption per company of 70,377 kWh (weighted average). The expected reduction in the consumption of electricity produced from fossil sources as a result of the substitution with RES has been estimated at approximately 40%. For 2014IT16RFOP011, the calculation is undertaken using the CO2MPARE model created by ENEA on behalf of the EC.The application of the model is based on the financial and output information from the supported projects. In Spain, in the case of renewable energy production, the estimate is based on the amount of primary energy produced by those installations supported in a given year (either the year after the end of the project or the calendar year after the end of the project). Renewable energy is assumed to be GHG neutral and to replace non-renewable energy. For the estimation of greenhouse gas emissions from non-renewable energy that would result from savings in non-renewable energy, or the production of the same energy with renewable energy, the total greenhouse gas emissions emitted per unit of non-renewable energy production occurring in the Member State are taken into account (MS, i.e. the total greenhouse gas emissions per unit of non-renewable energy production occurring in the Member State. The conversion factor from non-renewable energy to C02 emissions to be used in the regional and multi-regional OPs (Spain) is 0.521 kg C02/kWh of final energy (factor obtained from the report "C02 emission factors and primary energy pass-through coefficients of different final energy sources consumed in the building sector in Spain" (Version 03/03/2014) prepared by "IDAE").
Source of data:	In addition to the project documentation, data from other monitoring systems, certificates issued by energy agencies or external experts, regional data services systems, reports of energy assessors, estimation based on the data of different Ministries are relevant sources for data.
Quality control and plausibility checks:	- SFC2014 checks; - Elimination of double counting; - Verification based on external registers and statistics; - Risk assessment-based checks by MA, IB and auditors; - Checking for outliers; - Coherence controls conducted periodically; - Ad hoc (manual) checks of abnormal values.
Reasons for inconsistencies	A mismatch between AIR data and PLD may appear due to different dates of data extraction, and stage of project implementation, use of different measurement unit at the national level. Implemented values are only reported at the financial completion of the project, leading to time lags in reporting of implementation.

CO35: Capacity of supported childcare or education infrastructure

Definition of the indicator:	The number of users who can use newly built or improved childcare or education facilities. "Users" in this context mean the children, pupils, or students, not teachers, parents or other persons who may use the facilities too. It includes new or improved buildings or new equipment provided by the project. It measures nominal capacity (i.e. number of possible users which is usually higher than or equal to the number of actual users). The indicator measures potential users.
Type of indicator	Result.
Results of cross-checking analysis:	Plausible values compose 96% of EU-level selected values and 86% of EU-level implemented values.

Calculation methodologies at national level:	This indicator measures the number of users who can use newly built or improved childcare or education facilities. "Users" in this context mean the children, pupils, or students, not teachers, parents or other persons who may use the facilities too. It includes new or improved buildings, or new equipment provided by the project. It measures nominal capacity (i.e. number of possible users). In Italy (2014IT05M2OP001) when two operations, one on infrastructural improvement and the other on new equipment, concern the same school, the school is counted twice. The estimates are calculated according to the repartition of the budget on the intervention for infrastructural improvement and/or new equipment in the different types regions taking into account, for each type region, the average number of students in 2014 / 2015. The target was set considering: 1) an average value of € 1.000.000 by school for the infrastructural component; 2) an average value of € 100.000 by school for new equipment. The number of users of new or renovated measures the nominal capacity (not the actual one). It is calculated as a standard technical parameter of the ratio surface/personnel/user as indicated in the authorisation registry act. For 2014RO16RFOP002, it is reported that the beneficiary indicates the target value in the Finance request and the achieved value in the quarterly technical progress report. For 2014SK05M0OP001 and 2014SK16RFOP002, the values are controlled during the verification of payment request by the project manager in close cooperation with the manager in charge of monitoring based on the submitted documentation.
Source of data:	In addition to project-level data, official school statistics, monitoring systems and regional services data systems are relevant sources of data.
Quality control and plausibility checks:	- SFC2014 checks; - Elimination of double counting; - Verification based on external registers and statistics; - Risk assessment-based checks by MA, IB and auditors; - Ad hoc (manual) checks of abnormal values.
Reasons for inconsistencies	A mismatch between AIR data and PLD may appear due to different dates of data extraction, and stage of project implementation. Implemented values are usually reported at the financial completion of the project, leading to time lags in reporting of implementation.

CO36: Population covered by improved health services

Definition of the indicator:	The population of a particular area expected to benefit from the health services supported by the project. It includes new or improved buildings or new equipment for various type of health service (prevention, outpatient or inpatient care, aftercare). The indicator excludes multiple counting even if the intervention benefits more services targeting the same persons: one person still counts as one even if that person will use several services which were supported by Structural Funds. For example, an aftercare facility is developed in a city with a population of 100,000 inhabitants. It will serve half the city's population. Thus the indicator value will increase by 50,000. If later a prevention service is developed in the same city that will serve the whole population, the indicator value will increase by another 50,000.
Type of indicator	Result.
Results of cross-checking analysis:	Plausible values compose 98% of selected values and 83% of implemented values.
Calculation methodologies at national level:	In general, MS follow the EC monitoring guidelines. This indicator measures the population of a given area that is expected to benefit from the health services financed in the project. In the definition of the indicator, it is specified how double counting is avoided, e.g. by counting solely one person even if this person benefits from multiple services (e.g. in Poland and Portugal). In Spain, for instance, this includes both new facilities and improvements to existing facilities or new equipment provided for different types of health services (prevention, hospital consultations, or health centres, post-operative treatment). In the case of Italy and 2014IT16RFOP011, the indicator is calculated assuming that the entire population of the region will be covered. For 2014IT16RFOP015, the target value was quantified by estimating the population of the districts of the urban areas identified in the

	POR and of the internal areas (areas identified within the National Strategy for Inland Areas) on which the intervention line will be operated. In Greece, the indicator of the population covered by improved health services does not include multiple calculations, even if the intervention concerns services that benefit the same people. In the case of many interventions that benefit the same people, the population is calculated once and at the highest level of the health unit. For example, if a hospital and a health centre are included in the same regional unit, then the reference population of the index at OP level is equal to the reference population that corresponds to the regional unit related to the hospital. If in a ROP that has joined two health centres or regional clinics in different regional units, then the reference population of the index at ROP level is equal to the sum of the reference populations of the two regional modules related to the integrated health units. The cumulative value of the indicator at ROP level cannot exceed the total population of the specific region (region or country).
Source of data:	The primary source of data is project -level data. Monitoring reports and systems, regional health care systems and annual index reports are other resources from which data is extracted.
Quality control and plausibility checks:	- SFC2014 checks; - Elimination of double counting; - Verification based on external registers and statistics; - Risk assessment-based checks by MA, IB and auditors; - Consistency checks are performed when drafting the AIRs; - Ad hoc (manual) checks of abnormal values.
Reasons for inconsistencies	A mismatch between AIR data and PLD may appear due to different dates of data extraction, and stages of project implementation, use of different measurement units at the national level. Implemented values are only reported at the financial completion of the project, leading to time lags in reporting of implementation.

CO37: Population living in areas with integrated urban development strategies

Definition of the indicator:	Population living in areas with integrated urban development strategies within the meaning of Article 7 of Regulation 1301 / 2013 (ERDF). Use the indicator only once for each area.
Type of indicator	Result.
Results of cross-checking analysis:	Plausible values compose 86% of selected values and 75% of implemented values.
Calculation methodologies at the national level:	This indicator measures the population living in areas with integrated urban development strategies. This population includes only the population domiciled in the area and does not include tourist accommodation, hospitals, prisons,etc. Targets can be calculated according to the experience of the current funding period. They can also be calculated based on data from statistical offices. In Germany, to avoid double counting for 2014DE16RFOP015, the project with the highest value for this indicator is recorded for each municipality and used for the calculation of aggregate values. The stated population of the individual projects is determined by the municipalities. For the OP Berlin e.g. the population covered by urban development strategies is calculated by the IB at the level of the action counting each deprived neighbourhood only once (independent from the number of projects addressing each neighbourhood). For Germany, challenges might arise if actions target the municipal and county level simultaneously as a municipality might be part of a county. Double counting across OPs is not possible because each OP only addresses population within their region and there is no overlap. In Estonia, the data on the population living in areas with integrated urban development strategies is reported once a year during preparation of AIR based on data from Estonian Statistics. It is a statistical indicator illustrating the number of urban population covered by the strategy.
Source of data:	Project-level data and statistical offices and reports are the most common sources of data. Public authorities from municipalities also intervene in the process of collecting data.

Quality control and plausibility checks:	- SFC2014 checks; - Elimination of double counting; - Verification based on external registers and statistics; - Risk assessment-based checks by MA, IB and auditors; - Ad hoc (manual) checks of abnormal values.
Reasons for inconsistencies	A mismatch between AIR data and PLD may appear due to different dates of data extraction, and stages of project implementation, use of different measurement unit at the national level. Implemented values are only reported at the financial completion of the project, leading to time lags in reporting of implementation.

CO38: Open space created or rehabilitated in urban areas

Definition of the indicator:	Size of renovated / newly developed publicly accessible open-air areas. It does not include developments covered by the 'standard' common indicators (e.g. roads, rehabilitated land, schoolyards, etc.).
Type of indicator	Output.
Results of cross-checking analysis:	Plausible values compose 95% of selected values and 93% of implemented values.
Calculation methodologies at national level:	This indicator measures the total square meters of renovated or new, publicly accessible outdoor areas in urban areas. In some MS, it is specified that this does not include developments covered by the 'standard' common indicators (e.g. roads, rehabilitated land, schoolyards, etc). The unit of measurement is, therefore, the sum of square meters of open spaces created or rehabilitated in the projects supported.
Source of data:	Projects.
Quality control and plausibility checks:	In addition to the regular checks implemented by Managing Authorities, Audit Authorities also perform checks. Encoding errors and duplicated values are also corrected.
Quality control and plausibility checks:	- SFC2014 checks; - Elimination of double counting; - Verification based on external registers and statistics; - Data quality audits; - Periodic coherence controls; - Risk assessment-based checks by MA, IB and auditors; - Ad hoc (manual) checks of abnormal values.
Reasons for inconsistencies	A mismatch between AIR data and PLD may appear due to different dates of data extraction, and stages of project implementation, use of different measurement units at the national level. Implemented values are only reported at the financial completion of the project, leading to time lags in reporting of implementation.

CO39: Public or commercial buildings newly built or renovated in urban areas

Definition of the indicator:	Size of renovated / newly developed public and commercial areas.
Type of indicator	Output.
Results of cross-checking analysis:	Plausible values compose 90% of selected values and 78% of implemented values.
Calculation methodologies at the national level:	No metadata were collected.

Source of data:	Projects.

CO40: Rehabilitated housing

Definition of the indicator:	The number of renovated or newly developed housing units. The housing units may be supported as part of urban rehabilitation initiatives or as part of the support provided outside of urban areas. It should include, when relevant, housing provided for migrants and refugees (not including temporary reception centres) – see the sub-indicator 40a. This indicator was originally listed under "Urban Development specific indicators" (see below). In view of the 2017 Omnibus regulation modifications, the guidance now broadens the scope of this common indicator for those programmes that are in a position to report on it. The uses of the definition in its original form is not to be put in question by this extension in scope.
Type of indicator	Output.
Results of cross-checking analysis:	Plausible values compose 100% of selected values and 81% of implemented values.
Calculation methodologies at national level:	In general, MS follow the EC monitoring guidelines, but there are some variations in place. E.g., target values in Malta were quantified taking into account the statements made by municipalities affected based on the data produced by the competent management offices of public residential housing. For the operational programme 2014IT16M2OP006, the target was estimated on the basis of the technical characteristics and the planned interventions, based on the availability of resources and at an average cost per housing unit of approximately 35 thousand euros.
Source of data:	Projects
Quality control and plausibility checks:	- SFC2014 checks; - Elimination of double counting; - Verification based on external registers and statistics; - Risk assessment-based checks by MA, IB and auditors; - Specific analysis in case of 20% distance from target; - Comparison of data with previous reporting periods; - Checks using the certificates of work receipt; - Ad hoc (manual) checks of abnormal values.
Reasons for inconsistencies	A mismatch between AIR data and PLD may appear due to different dates of data extraction, and stage of project implementation, use of different measurement unit at the national level. Implemented values are only reported at the financial completion of the project, leading to time lags in reporting of implementation.

CO41: Number of enterprises participating in cross-border, transnational or interregional research projects

Definition of the indicator:	The variant of indicator 26 'Number of enterprises cooperating with research institutions' with the difference that the research project must qualify as crossborder, transnational or interregional. If a participating enterprise has departments operating in different places, the location of the participating department(s) should be taken into account to qualify as cross-border project.
Type of indicator	Result.
Results of cross-checking analysis:	Plausible values compose 72% of selected values and 68% of implemented values.

Calculation methodologies at national level:	Companies actively cooperating with research organisations are counted here following the EC guidelines. For 2014TC16RFCB009, it is specified that only those companies that are directly involved in the project as project partners (incl. associated partners) are counted for this output indicator. Other research institutions and intermediaries not listed as partners in the project proposal are not counted.
Type of values reported:	Actual data.
Source of data:	Projects.
Quality control and plausibility checks:	- SFC2014 checks; - Elimination of double counting; - Verification based on external registers and statistics; - Risk assessment-based checks by MA, IB, Joint Secretariat and auditors; - Ad hoc (manual) checks of abnormal values.
Reasons for inconsistencies	A mismatch between AIR data and PLD may appear due to different dates of data extraction, and stages of project implementation and possible double-counting at the project level.

CO42: Number of research institutions participating in cross-border, transnational or interregional research projects

Definition of the indicator:	Variant of indicator 41 'Number of enterprises participating in cross-border, transnational or interregional research projects' with the difference that it counts cooperating research institutions instead of enterprises. If a participating organisation has departments operating in different places, the location of the participating department(s) should be taken into account to qualify as a cross-border project.
Type of indicator	Result.
Results of cross-checking analysis:	Plausible values compose 83% of EU-level selected values and 81% of EU-level implemented values.
Calculation methodologies at the national level:	MS follows the EC monitoring guidelines.
Source of data:	Projects.
Quality control and plausibility checks:	- SFC2014 checks; - Elimination of double counting; - Verification based on external registers and statistics; - Administrative checks and contact with the beneficiaries when needed; - Risk assessment-based checks by MA, IB and auditors; - Site visits; - Ad hoc (manual) checks of abnormal values.
Reasons for inconsistencies	A mismatch between AIR data and PLD may appear due to different dates of data extraction, and stages of project implementation and possible double-counting at the project level.

CO43: Number of participants in cross-border mobility initiatives

Definition of the indicator:	Cross-border mobility initiatives are those supported under the investment priority set out in art. 7 (a) (i) of the ETC regulation. Participants are those who start in such initiatives.

	Managing authorities are encouraged to exclude double counting due to multiple participations.
Type of indicator	Output.
Results of cross-checking analysis:	Plausible values compose 89% of selected values and 81% of implemented values.
Calculation methodologies at the national level:	No metadata were collected.
Source of data:	Projects.

CO44: Number of participants in joint local employment initiatives and joint training

Definition of the indicator:	Joint local employment initiatives are those supported under the investment priority set out in art. 7 (a) (i) of the ETC regulation. Participants are those who start in such initiatives. Managing authorities are encouraged to exclude double counting due to multiple participations.
Type of indicator	Output.
Results of cross-checking analysis:	Plausible values compose 69% of selected values and 69% of implemented values.
Calculation methodologies at the national level:	No metadata was collected.
Source of data:	Projects.

CO45: Number of participants in projects promoting gender equality, equal opportunities and social inclusion across borders

Definition of the indicator:	Projects supported under the investment priority set out in art. 7 (a) (ii) of the ETC regulation. Participants are those who start in such initiatives. Managing authorities are encouraged to exclude double counting due to multiple participations.
Type of indicator	Output.
Results of cross-checking analysis:	Plausible values compose 50% of selected values and 50% of implemented values.
Calculation methodologies at the national level:	No metadata was collected.
Source of data:	Projects.

CO46: Number of participants in joint education and training schemes to support youth employment, educational opportunities and higher and vocational education across borders

Definition of the indicator:	Joint education and training schemes are those supported under the investment priority set out in art. 7 (a) (iii) of the ETC regulation. Participants are those who start in such initiatives. Managing authorities are encouraged to exclude double counting due to multiple participations.
Type of indicator	Output.
Results of cross-checking analysis:	Plausible values compose 93% of selected values and 87% of implemented values.
Calculation methodologies at the national level:	No metadata was collected.
Source of data:	Projects.

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Annex 1. Metadata on common output indicators (MS Excel)

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