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Measuring R&I contribution to the achievement of the Sustainable Development Goals

The development of Planet, Prosperity and People dashboards

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Contents

Abstract

This technical report provides methodological guidance for the Directorate General on Research and Innovation (DG R&I) in the development of the three dashboards on Planet, Prosperity and People, as defined by grouping together relevant Sustainable Development Goals (SDGs). This initiative aims to measure the contribution of research and innovation (R&I) in the achievement of the SDGs under each wider SDG area and to complement the efforts undertaken by the Commission itself and other organisations to monitor the SDGs implementation through its 169 targets. This report assesses the selection of indicators and framework delivered by a consortium of universities and research organisations to DG R&I and provides several suggestions for further improvement.

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Authors

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1 Introduction

This technical report provides methodological guidance for the Directorate General on Research and Innovation (DG R&I) in the development of the three dashboards on Planet, Prosperity and People, as defined by grouping together relevant Sustainable Development Goals (SDGs). This initiative aims to measure the contribution of research and innovation (R&I) in the achievement of the SDGs under each wider SDG area and to complement the efforts undertaken by the Commission itself and other organisations to monitor the SDGs implementation through its 169 targets[1].

The identification, rationalisation and analysis of indicators, alongside the elaboration of a conceptual framework, underpinned by theoretical and empirical evidence, was commissioned to a consortium consisting of the EFIS Centre, Orkestra, 4Front and Maastricht University in 2022. The final, explanatory study, published in 2023 (European Commission, 2023) included a literature review on the role of research and innovation in achieving the SDGs as well as theoretical frameworks to construct the dashboard. The review focuses on sustainable transitions research, which aims to understand how existing non-directional and market-oriented R&I policies can be redesigned to address sustainability and grand societal challenges. This literature points out the need to make R&I policy goal-directed and user-oriented. The literature review also touches on two theoretical frameworks, which show the interaction between inputs, actors, outputs and impacts of R&I envisioned within a system. Furthermore, the literature review highlights several areas that need to be included beyond the usual technological innovation framework. These include measures of social, grassroots, mission-oriented, inclusive/frugal, digital and collaborative innovation. The consortium notes that shifting focus to these types of innovation also implies a shift from its current focus on developing technologies and industries towards meeting user needs, distinguishing actors and assessing overall system change. Lastly, the consortium reports on existing and available dashboards, composite indicators and frameworks that address the impact of R&I on the SDGs. These provide several useful sources of data, but none is broad enough for the 3Ps dashboard envisioned by DG-R&I.

In consideration of the literature review, the consortium proposes that the dashboard should consist of one domain for each of the 3Ps: People, Planet and Prosperity, which each include an input and output pillar. They propose to populate these pillars with indicators which are categorized into HOW (technology, education, infrastructure, finance) and WHO (private sector, public sector, knowledge actors, citizen engagement) categories. Additionally, they propose to track SDG impact indicators as well as framework conditions.

To populate the 3Ps framework, the consortium collected information on 211 potential indicators. Out of the 211 potential indicators, 40 were in the People domain, 105 in the Planet domain and 66 in the Prosperity domain. These indicators were screened based on data availability criteria and their applicability to the SDGs. After screening they recommend 114 R&I indicators (23 in People, 43 in Planet and 48 in Prosperity).

The aim of this report is to support DG R&I in the operationalisation of these indicators and frameworks into dashboards. This report is structured as follows. Section 2 assesses the framework provided by the consortium and suggests several improvements. Section 3 provides a categorization of indicators into the framework developed in Section 2. Section 4 validates the indicators collected by the consortium by a correlation analysis with SDG impact indicators. Lastly, Section 5 presents the conclusions.

[1] At EU level, the Commission –through Eurostat- developed a reference indicator framework to monitor the SDGs in the EU context. In 2021, Eurostat published its fifth report, which builds on the EU SDG indicator set of 102 indicators, developed in cooperation with a large number of stakeholders. Other examples of initiatives in this area include: 1) the SDG Tracker, a free, open-access resource, which is a joint collaborative effort between researchers at the University of Oxford and the Global Change Data Lab and where users can track and explore global and country-level progress towards each of the 17 Sustainable Development Goals through interactive data visualizations; or the OECD report "Measuring Distance to the SDG Targets", which is part of the OECD Action Plan on SDGs and aims to assist member countries with their national implementation of the 2030 Agenda for Sustainable Development.

2 The Framework for the 3Ps dashboard

A dashboard aims to guide users through a series of indicators to provide a multi-dimensional view of a phenomenon. Therefore, it is useful for a dashboard to have clearly separated thematic areas and pillars, which can help users intuitively find indicators and discover new ones. Moreover, the location of the indicator in a dashboard should facilitate its interpretation and be unidimensional.

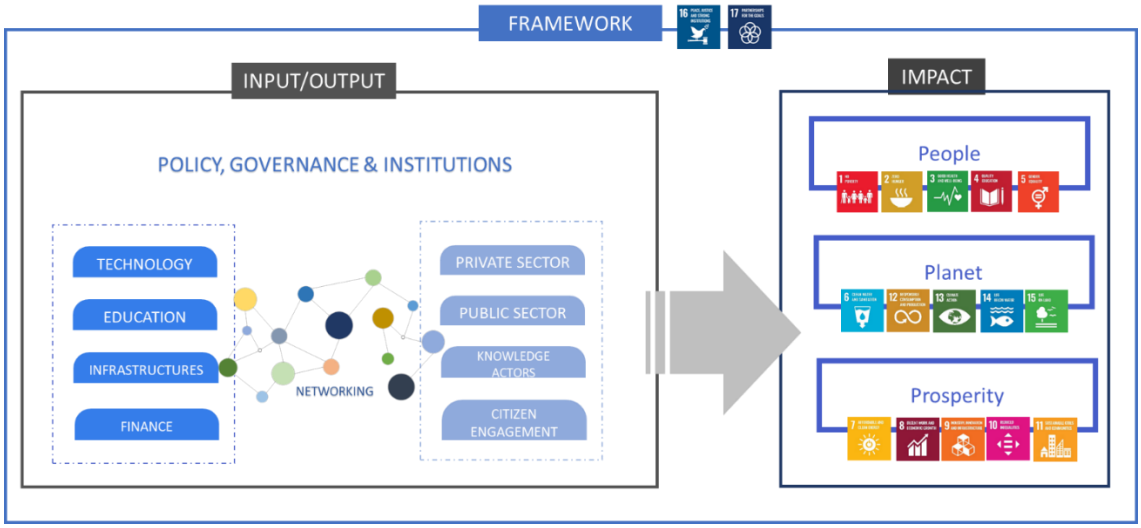

Figure 1. Conceptual Framework created by the consortium.

Source: European Commission 2023

The consortium created the framework depicted in **Figure 1**. It includes Input and Output indicators. These are categorized into categories of HOW R&I contribute to the achievement of SDGs, specifically through technology, education, infrastructures or finance and WHO is implicated in the process including private sector, public sector, knowledge actors or citizen engagement. Additionally, the impacts are measured using the SDG impact indicators[2] developed by Eurostat (European Commission 2022). Lastly, indicators can also be categorized as Framework indicators which pertain to SDG 16 and 17. Each indicator was categorized into one or more of these categories based on definitions of input, output and impacts[3] described in the report. All indicators were also scored on their country coverage, data availability, frequency of data releases and relevance to the framework. Indicators were then selected based on an aggregation of these scores.

Although the framework offered by the consortium follows naturally from the literature review, it does not provide a user-friendly structure for a dashboard. Many indicators are classified into both a WHO and a WHAT or multiple WHO or WHAT categories. Additionally, the logic behind the categorization of the indicators is not always intuitive. For example, indicators including researchers and air emission are categorised as infrastructure. Furthermore, the final selection of indicators is based on a subjective scoring of the relevance of indicators to the SDGs. For example, publication indicators are included in Prosperity and Planet but deemed not sufficiently relevant in the People dashboard. These aspects make the framework less suitable for visualisation in a dashboard.

Other more general issues with the indicator selection include a lack of coverage in certain areas. Important dimensions of the framework are not covered (e.g., collaboration, social innovation and infrastructure) because publicly available data is scarce or non-existent. Future works could search and provide indicators for other areas: basic technical infrastructures in water, energy, ICT, transport and urban structures and R&I

2 https://ec.europa.eu/eurostat/en/web/main/data/database

[3] Input indicators generally refer to the resources committed to innovation, including the investment in R&D and intellectual capital but they may also capture other drivers of innovation performance, such as framework conditions. Output indicators capture the results of research and innovation investments and activities, for example scientific output, new products, new process, etc. Impact indicators capture the effects of research and innovation on the economy, environment, and society, consequently on the achievement (or not) of the goals (European Commission 2023, p. 18).

specialised infrastructures such R&I laboratories and demonstration facilities. The report also emphasized the role of society in addressing grand social challenges and SDGs but pointed to the lack of quantitative indicators on this dimension. Indeed, there is an overrepresentation of innovation indicators such as patents, R&D expenditure and publications which are clustered in the Prosperity and Planet dashboards while the People dashboard is under developed. While international comparable data on the involvement of the society in the innovation process is currently unavailable, national and cross-country household and enterprise surveys should be regularly monitored given the increasing policy interest in this domain.

Building on the work done by the consortium, the JRC proposes a revision of the framework. The revision aimed to provide intuitive categories such that indicators are easily found and interpreted. The revised framework is hierarchical and assigns each indicator to one of nine driver or output categories as well as one of five actor categories. At the most general level, this framework keeps the 3Ps – People, Planet and Prosperity. As an example, the People dashboard is visualised in **Figure 2**. Within each of the 3Ps there are drivers and outputs of the innovation process. Drivers include finance, human capital, ICT, knowledge flows, framework conditions and infrastructure. In the JRC proposal the framework conditions are a sub-category of each of the 3P domains, as opposed to the consortium which envisioned these as a separate set of indicators. Putting framework conditions as a sub-category allows users to better understand what these framework conditions facilitate and integrates these indicators smoothly into one of the 3P dashboards. The outputs include research outputs (codified knowledge) and innovation outputs (codified products). Additionally, both drivers and outputs are sorted into different types of actors within the innovation eco-system. The actors include knowledge, private, public, civil society and an "all actors" category. Below are descriptions of each category within the proposed 3Ps dashboards.

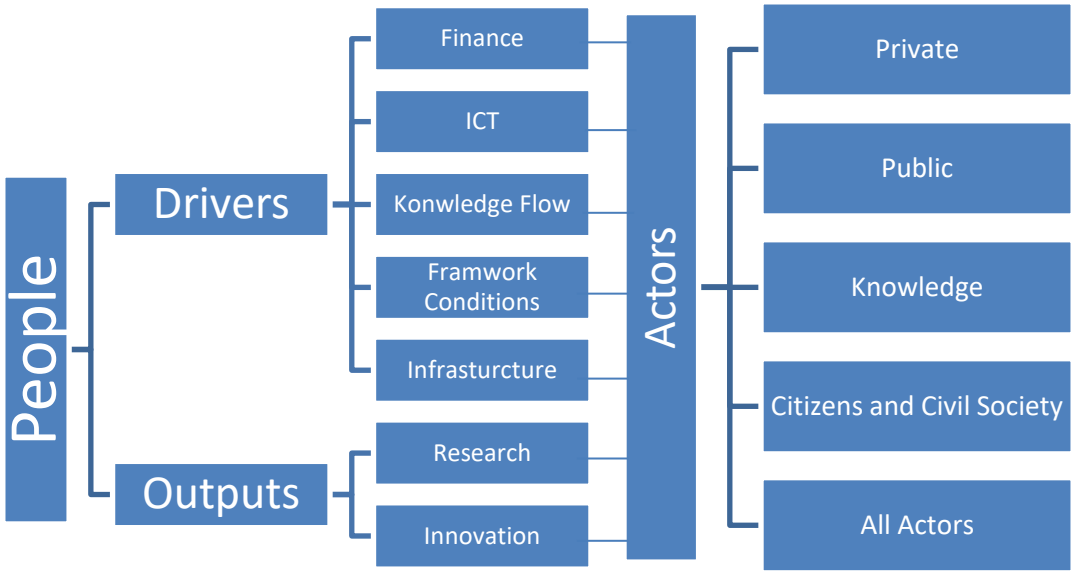

Figure 2. Example of CC-COIN framework for the People dashboard.

Source: European Commission

Drivers: Drivers are the resources, conditions and skills needed to produce innovation which may impact the SDGs.

- **Finance:** Any financial resources deployed to employ personnel, fund R&D and invested capital to support firms and activities that contribute to moving towards an SDG.
- **Human capital:** Any human capital devoted to research and development towards attaining the SDGs
- **ICT:** Implementation of ICT systems and digitization can make processes more efficient and sustainable. In this category, indicators are collected to measure the extent to which ICT systems and digitalization are implemented and available, enabling progress towards the SDGs.
- **Knowledge flow:** This dimension refers to all knowledge-based relationships shared by the actors of the Science, Technology, Innovation (STI) systems. These interactions, which can occur without an explicit agreement, can facilitate the creation, acquisition and transfer of knowledge in a STI system and contribute to the SDGs
- **Framework conditions:** The framework conditions indicators capture the social and political environment, laws and institutions that facilitate actors to progress towards the SDGs.
- **Infrastructure:** This includes basic technical infrastructures in water, energy, transport and urban structures and R&I specialised infrastructures such R&I laboratories and demonstration facilities.

Outputs: Outputs are the outcomes of a research or innovation process that facilitate the achievement of SDGs and their targets. These are categorized into three types, namely research outputs and innovation outputs.

- **Research outputs:** Research refers to experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, with or without any particular application or use in view. It also includes systemic research towards achieving a specific goal, using solution-based, outcome-oriented approach. Research output includes published work, as well as data, code, material, and other types of information.
- **Innovation outputs:** Innovation refers to the introduction of new products and processes that bring actors closer to the SDGs. This dimension includes all innovation outputs, which are generated by innovation activities.

Actors: Actors are the institutions, organizations and individuals that use drivers to create outputs.

- **Private:** The private sector refers to all private institutions and organisations, excluding higher education institutions.
- **Public:** The public sector refers to all institutions and organisations controlled by the government, excluding higher education institutions.
- **Knowledge:** All universities and other institutions providing formal tertiary education or performing research activities.
- **Citizens and Civil Society:** Citizens, who are members of a geographic and political community, and the civil society, which include non-governmental organisations, can take part in the innovation and research processes and influence the directionality of the outcomes.
- **All actors:** All of the above are capable of being involved or carrying out the action or indicator.

3 Variables in the JRC framework

In this section we provide a summary of the re-categorization of indicators. The JRC examined all 211 indicators and added additional ones as data became available to bring the total number of indicators up to 274[4] All the 274 indicators were screened based on data availability. All indicators have data for at least 20 EU MS and were collected recently (no later than 2018) on at least one occasion. The additional indicators include the amount of public procurement for innovation by sector, which follows under the "Finance" sub-category, and the number of co-publications by science field, which is categorised under "Knowledge flow". The former comes from a study commissioned by DG CNECT to PwC, which estimated the amount of public innovation procurement in 30 European countries (European Commission, 2021). Indicators on co-publications were derived by Science-Metrix using the Elsevier's Scopus database. The data on public innovation procurement and the data on publications also pass the data availability criteria.

Table 1 shows the number of collected and the number of selected indicators within each of the 3Ps disaggregated to their driver and output sub-domains. There are less indicators in the People domain compared to Planet and Prosperity and more indicators in the driver sub-domain than in the output sub-domain. Especially the output sub-domain for People may benefit from having more indicators.

Table 1 Number of indicators by People, Planet and Prosperity domains

3Ps	Number of indicators collected		Number of indicators chosen based on data availability	
	Output	Driver	Output	Driver
People	13	52	8	50
Planet	45	64	33	57
Prosperity	22	67	20	54
Total	80	183	61	161

Table 2 and **Table 3** show the breakdown of the number of indicators in each Output and Driver pillar in each of the 3Ps domains. There is an unbalanced number of indicators across the two pillars and within each of the 3Ps. In particular, the People domain requires more indicators in innovation output. Within the Driver domain, the sub-categories ICT, framework conditions and infrastructure are those with the lowest number of indicators (**Table 3**).

Table 2 Number of indicators selected in each Output pillar within each of the 3Ps.

	People	Planet	Prosperity
Research Output	7	19	5
Innovation Output	1	12	11
Total Output	8	31	16

[4] Please refer to European Commission (2023) for the full list of 211 indicators selected by the consortium. The list of additional indicators is provided in the Annex.

Table 3 Number of indicators selected in each Driver pillar within each of the 3Ps.

	People	Planet	Prosperity
Finance	12	32	25
Human capital	15	11	13
ICT	1	0	0
Knowledge flow	21	12	16
Framework conditions	1	1	0
Infrastructure	0	1	0
Total Driver	50	57	54

Table 4 shows the breakdown of the number of indicators included in each actor category within each of the 3Ps. The categories Public and Civil actors are underpopulated in the Outputs while the Civil and "All actors" (meaning all actors are implicated in an indicator) categories are underpopulated in Drivers.

Table 4 Number of indicators selected in each Actor pillar within each of the 3Ps.

Subdomain	Actor	People	Planet	Prosperity	Total
output	private	1	1	11	14
	public	0	0	0	0
	civil	0	0	0	0
	knowledge	7	19	5	31
	All actors	0	9	0	9
Driver	private	6	13	11	30
	public	6	20	15	41
	civil	4	1	0	5
	knowledge	34	23	25	82
	All actors	0	0	3	3

Overall, these figures show that further research is needed to populate those dimensions of the dashboards that currently lack information and include: the Drivers sub-categories ICT, framework conditions and infrastructure and the role of citizens and civil society. Data on infrastructure (ICT, transportation and energy) could be retrieved from the following data sources: Eurostat ICT usage in households and by individuals Database, Eurostat ICT usage in enterprises Database, OECD Broadband Portal, OECD ICT Access and Usage by Households and Individuals Database, OECD ICT Access and Usage by Businesses Database, Eurostat statistics on transportation, and the ITF Transport Statistics database. Indicators on fixed and mobile broadband subscriptions, ICT tools and activities in enterprises, passenger and freight transportation, for instance, could be derived based on these data sources. The statistics from the OECD and Eurostat reports all cover EU MS and are released data periodically. Therefore these sources will also provide data that will be timely and with adequate coverage.

Finally, since diversity can improve the quality of research and the relevance of its outcomes for society (Smith-Doerr, Alegria and Sacco, 2017), indicators on human capital could as well be complemented with data on gender equality. These could include the dissimilarity index for researchers disaggregated by sector, proportion of self-employed women among ICT professionals, sex differences in international mobility of researchers, and the proportion of research organisations with measures towards gender equality and research funding success rate sex differences. Unfortunately, these data are not collected into a single dataset and must be gathered from many data sources. The "She Figures" reports of the European Commission provide a good overview of these indicators and a list of potential data sources. Many of these data sources will meet data coverage and availability as the She Figures reports have similar criteria. The

main data source is Eurostat but also includes reoccurring surveys (e.g. MORE4 survey), publicly available data (e.g. Scopus) and other official statistics offices such as the International Labour Organization and the Organization for Economic Cooperation and Development.

4 Correlations of between collected 3P indicators and SDG target indicators

This section provides an analysis of the indicators selected by the consortium by correlating them with the SDG target indicators created by Eurostat. The consortium provided data on all indicators that are publicly available, meaning a subset of the recommended indicators described in Section 3. For this purpose, an overview of the available indicators is shown in **Table 5**. Most indicators can be grouped into three broad types: R&D expenditure in relevant industries, researchers in relevant industries and graduates in the relevant fields of study.

Note that the consortium provided each indicator in several different measurement units and often disaggregated into categories of socio-demographic attributes (e.g. sex, citizenship status) or economic activity. For the purposes of this report, the most general indicators are used (i.e. totals), as relations between indicators and specific SDG targets were left unspecified in the report. If multiple units of measurement were provided, the measure that is most comparable across countries (for example, measures using GDP or population as denominator) was used. In some cases, the low correlations may be due to a mismatch between the units of measurement. The below observations focus on correlations between R&I indicators and SDG indicator targets where some impact may be expected. All correlation tables can be found in the annex.

Table 5 Number of recommended indicators for which data is provided

	R&D Expenditure	Researchers	Graduates	Patents	Other	Total
People	6	6	5	0	0	18
Planet	10	10	1	0	0	29
Prosperity	13	9	2	6	6	36

4.1 Correlations between Planet SDG target indicators and the R&I indicators.

Among the R&I indicators in the Planet domain there are several that show a promising correlations with SDG planet target indicators provided by Eurostat:

- There is a moderate positive relationship between the R&I indicator on energy productivity (GDP/ gross energy consumption) with the SDG target indicators “resource productivity and domestic material consumption”.
- The R&I indicator “Development of environment-related technologies per capita” is positively related to three SDG target indicators including population connected to waste water treatment, circular material use rate, and gross value added in environmental goods and services.
- The Government budget allocation for R&D in environment has a negative correlation with nitrate in groundwater and positive correlation with share of forest area.
- The R&I indicator “number of ISO 14001 certificates” is correlated positively with resource productivity and material domestic material consumption and circular material use.
- R&D expenditure in manufacturing is associated with lower biochemical oxygen demand and higher circular material use rate.
- R&D expenditure in manufacture of paper and paper products is positively related to gross value added of environmental goods and services as well as share of forest area.
- The number of researchers in the selected industries correlates well with resource productivity and domestic material consumption as well as circular material use rate. These are consistently good indicators for SDG 12.
- Researchers in mining and quarrying is positively related to share of renewable energy in gross final energy consumption and the recycling rate of municipal waste, it is also negatively related to the energy import dependency.
- The percentage of researchers in architectural and engineering activities, technical testing and analysis is correlated with recycling rate of municipal waste.

Several indicators in the planet domain do not correlate with SDG target indicators including R&D expenditure in sewerage, waste collection and treatment and other waste management services and the environmentally related tax revenue indicator.

There are also several indicators that correlate with SDG indicators in the desired direction in some cases and in an undesirable direction in other cases. For example:

- Material productivity R&I indicator is positively related to two SDG target indicators including gross value added in environmental goods and services sector and share of forest area and negatively correlated to the soil-sealing index[5]. However, it is negatively related to two other SDG target indicators including the "resource productivity and domestic material consumption" and "circular material use".
- R&D expenditure in agriculture, forestry and fishing is associated with higher Biochemical oxygen demand and lower share of forest area but also associated with lower GHG emissions intensity of energy consumption.
- R&D expenditure in building of ships and boats has a high correlation with circular material use rate but negative correlation with phosphate in rivers.
- R&D expenditure in electricity, gas, steam and air condition supply and water collection, treatment and supply is associated with higher gross value added in environmental goods and services and the share of forest area but also with higher generation of hazardous waste.

The combination of desirable and undesirable directionality in these correlations indicates that some SDG targets are trade-offs that can occur when investing in the economy, people or the planet. These indicators should therefore be treated with caution and presented with sufficient context when incorporated in the dashboard.

4.2 Correlations between People SDG target indicators and the R&I indicators.

There is no systematic relationship between People R&I indicators and the SDG People target indicators. The lack of correlations is likely due to a mismatch between the topics that the two cover. In that the SDG indicators are very specific targets such as pesticide use while the R&I indicators are much broader, e.g. researchers in agriculture or graduates in the field of agriculture. Therefore, developing indicators that are more specific may help. A careful selection of indicators and matching the unit of measurement to the SDG target indicators may come to a more favourable assessment of the pool of R&D indicators in the People domain. There are two indicators which are correlated in the desirable direction with some SDG indicators. Graduates in health is negatively correlated with the inactive population due to caring responsibilities, severely materially deprived people, and with smoking prevalence while positively related to adult participation in learning and the share of individuals with basic digital skills.

4.3 Correlations between Prosperity SDG target indicators and the R&I indicators.

Many of the prosperity R&I indicators have adequate correlations with SDG Prosperity target indicators. All R&I indicators on patent applications (agriculture, health, ICT, natural sciences, education) are positively related to gross domestic expenditure on R&D and R&D personnel by sector. They are also correlated with the employment rate and recycling rate of municipal waste. The indicators on biotech and medical patents are correlated with most SDG target indicators. Therefore the other patent indicators, which are less often correlated with the same SDG targets, could be dropped if a more succinct dashboard is required.

R&I indicators on personnel, R&D expenditures and researchers in business are correlated strongly to almost all SDG target indicators and in the direction indicating improvement. However, the same indicators pertaining to government and higher education are correlated with the SDG targets in an undesirable direction. For example, R&D personnel in higher education and in government are positively associated with the rate of road traffic accidents and negatively related to recycling rate of municipal waste. Admittedly there is only a

[5] Soil sealing index estimates the sealed soil surfaces with impervious materials due to urban development and construction.

tenuous conceptual link between R&D indicators in government and higher education with the SDG target indicators.

5 Conclusions

This technical report provides methodological guidance to DG R&I for the development of 3Ps (People, Planet and Prosperity) dashboards to measure the contribution of R&I to the SDGs. It builds on and reviews the selection of indicators and conceptual framework delivered by a consortium consisting of the EFIS Centre, Orkestra, 4Front and Maastricht University, The consortium collected 211 indicators which were categorized into a framework developed based on a literature review. The consortium suggested to categorize indicators into People, Planet and Prosperity, which each include an input and output pillar. Each of these pillars includes HOW (technology, education, infrastructure, finance) and WHO (private sector, public sector, knowledge actors, citizen engagement) categories which contain indicators. The framework thus appropriately addresses several important aspects emerging out of the literature review on the impacts R&I can have on the SDGs, these include a focus on people's needs and users, new types of innovation and actors including civil society. However, indicators were often categorized into several HOW and WHO categories which makes their presentation difficult in the context of a dashboard.

This report assesses the indicators and framework and provides several suggestions for further improvement. These include the reorganization and renaming of the categories to facilitate the use of the framework to find, explore and interpret indicators. First, Inputs are renamed to Drivers and include finance, human capital, ICT, knowledge flow, framework conditions and infrastructure. Second, the outputs are categorized into research outputs and innovation output. Third, the actors include private, public, civil, knowledge and all categories. It also highlights the categories that are currently underpopulated and on which further research is needed. These includes indicators ICT, framework conditions and infrastructure categories within the Drivers and public and civil actors under the Output pillar of all three Ps. Suggestions on possible data sources are provided.

Lastly, the report includes a correlation analysis between the R&I indicators collected by the consortium and the SDG impact indicators developed by Eurostat. These correlations reveals that several indicators in the Prosperity and Planet domains have a sufficiently strong correlation with the relevant SDG impact indicators to warrant inclusion in the dashboard. Indicators in the People domain do not fare as well and may require further attention. One suggestion is to further specify which unites of measurement to use to capture SDG relevant changes and which denominators to use to make the measures comparable across countries. Future work on the dashboards could build on these analysis by taking a fine grained approach, for example by correlating dashboard and SDG indicators within countries to examine trends over time (c.f. European Commission 2022) or conduct principle component analysis to assess to what extent indicators jointly share common variance.

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Annex 1. List of indicators added to the dataset by JRC

Table 6. Prosperity indicators added by the JRC to the 3P dashboard dataset

Prosperity Indicators	Description	Source
Public Procurement for Innovation Definition	To what extent there is a clear official definition for Innovation Procurement, R&D procurement, Pre-Commercial Procurement (PCP) and Public Procurement of Innovative solution (PPI) in the country. In addition, the indicator takes into account the level of clarity, completeness and compliance of the national definitions with the EC definition.	Final report SMART 2016/0040
General public services, public administration, economic and financial affairs	type of public procurer that is procuring any type of innovation in goods and services	Final report SMART 2016/0041
Public Innovation Procurement in public transport	type of public procurer that is procuring any type of innovation in goods and services	Final report SMART 2016/0042
Public Innovation Procurement in energy	type of public procurer that is procuring any type of innovation in goods and services	Final report SMART 2016/0044
Public Innovation Procurement in construction, housing and communities amenities	type of public procurer that is procuring any type of innovation in goods and services	Final report SMART 2016/0046
Public Innovation Procurement postal services	type of public procurer that is procuring any type of innovation in goods and services	Final report SMART 2016/0050
Public Innovation Procurement defence	type of public procurer that is procuring any type of innovation in goods and services	Final report SMART 2016/0051
Public Innovation Procurement other sectors	type of public procurer that is procuring any type of innovation in goods and services	Final report SMART 2016/0052
Total amount of R&D procurement	Total amount of expenditure in public procurement on R&D	Final report SMART 2016/0053
Share of R&D procurement out of total public procurement	Expenditure in public procurement on R&D as a percentage of total public procurement	Final report SMART 2016/0054
Public/Private co-publications by Field of Research (FOR) for applied and labour economics, and related	Number of public/private co-publications by Field of Research (FOR) for applied and labour economics, and related	Scopus
Public/Private co-publications by Field of Research (FOR) for information sciences, economics, and related	Number of public/private co-publications by Field of Research (FOR) for information sciences, economics, and related	Scopus
Public/Private co-publications by Field of Research (FOR) for materials, electrical and electronic engineering,	Number of public/private co-publications by Field of Research (FOR) for materials,	Scopus

chemistry, and related	electrical and electronic engineering, chemistry, and related	
Public/Private co-publications by Field of Research (FOR) for studies in human society and economics, and related	Number of public/private co-publications by Field of Research (FOR) for studies in human society and economics, and related	Scopus
Public/Private co-publications by Field of Research (FOR) for studies in human society and geography, engineering and built environment, and related	Number of public/private co-publications by Field of Research (FOR) for studies in human society and geography, engineering and built environment, and related	Scopus
Domestic co-publications by Field of Research (FOR) for applied and labour economics, and related	Number of domestic co-publications by Field of Research (FOR) for applied and labour economics, and related	Scopus
Domestic co-publications by Field of Research (FOR) for information sciences, economics, and related	Number of domestic co-publications by Field of Research (FOR) for information sciences, economics, and related	Scopus
Domestic co-publications by Field of Research (FOR) for materials, electrical and electronic engineering, chemistry, and related	Number of domestic co-publications by Field of Research (FOR) for materials, electrical and electronic engineering, chemistry, and related	Scopus
Domestic co-publications by Field of Research (FOR) for studies in human society and economics, and related	Number of domestic co-publications by Field of Research (FOR) for studies in human society and economics, and related	Scopus
Domestic co-publications by Field of Research (FOR) for studies in human society and geography, engineering and built environment, and related	Number of domestic co-publications by Field of Research (FOR) for studies in human society and geography, engineering and built environment, and related	Scopus
International co-publications by Field of Research (FOR) for applied and labour economics, and related	Number of international co-publications by Field of Research (FOR) for applied and labour economics, and related	Scopus
International co-publications by Field of Research (FOR) for information sciences, economics, and related	Number of international co-publications by Field of Research (FOR) for information sciences, economics, and related	Scopus
International co-publications by Field of Research (FOR) for materials, electrical and electronic engineering, chemistry, and related	Number of international co-publications by Field of Research (FOR) for materials, electrical and electronic engineering, chemistry, and related	Scopus
International co-publications by Field of Research (FOR) for studies in human society and economics, and related	Number of international co-publications by Field of Research (FOR) for studies in human society and economics, and related	Scopus
International co-publications by Field of Research (FOR) for studies in human society and geography, engineering and built environment, and related	Number of international co-publications by Field of Research (FOR) for studies in human society and geography, engineering and built environment, and related	Scopus

Table 7. People indicators added by the JRC to the 3P dashboard dataset

People Indicators	Description	Source
Number of private/public co-publications by Field of Research (FOR) for studies in human society, political science and law and legal studies	Number of private/public co-publications by Field of Research (FOR) for studies in human society, political science and law and legal studies	Scopus
Number of private/public co-publications by Field of Research (FOR) for studies in human society, sociology, cultural studies and related	Number of private/public co-publications by Field of Research (FOR) for studies in human society, sociology, cultural studies and related	Scopus
Number of private/public co-publications by Field of Research (FOR) for studies in overlapping FOR areas	Number of private/public co-publications by Field of Research (FOR) for studies in overlapping FOR areas	Scopus
Number of private/public co-publications by Field of Research (FOR) in education and related	Number of private/public co-publications by Field of Research (FOR) in education and related	Scopus
Number of private/public co-publications by Field of Research (FOR) in medical and health sciences and related	Number of private/public co-publications by Field of Research (FOR) in medical and health sciences and related	Scopus
Number of private/public co-publications by Field of Research (FOR) in the fields of economics, studies in human society, policy and administration and related	Number of private/public co-publications by Field of Research (FOR) in the fields of economics, studies in human society, policy and administration and related	Scopus
Number of private/public co-publications by Field of Research (FOR) in the fields of health, biological and agricultural sciences and related	Number of private/public co-publications by Field of Research (FOR) in the fields of health, biological and agricultural sciences and related	Scopus
Number of domestic co-publications by Field of Research (FOR) for studies in human society, political science and law and legal studies	Number of domestic co-publications by Field of Research (FOR) for studies in human society, political science and law and legal studies	Scopus
Number of domestic co-publications by Field of Research (FOR) for studies in human society, sociology, cultural studies and related	Number of domestic co-publications by Field of Research (FOR) for studies in human society, sociology, cultural studies and related	Scopus
Number of domestic co-publications by Field of Research (FOR) for studies in overlapping FOR areas	Number of domestic co-publications by Field of Research (FOR) for studies in overlapping FOR areas	Scopus
Number of domestic co-publications by Field of Research (FOR) in education and related	Number of domestic co-publications by Field of Research (FOR) in education and related	Scopus
Number of domestic co-publications by Field of Research (FOR) in medical and health sciences and related	Number of domestic co-publications by Field of Research (FOR) in medical and health sciences and related	Scopus
Number of domestic co-publications by Field of Research (FOR) in the fields of economics, studies in human society, policy and administration and related	Number of domestic co-publications by Field of Research (FOR) in the fields of economics, studies in human society, policy and administration and related	

Number of domestic co-publications by Field of Research (FOR) in the fields of health, biological and agricultural sciences and related	Number of domestic co-publications by Field of Research (FOR) in the fields of health, biological and agricultural sciences and related	Scopus
Number of international co-publications by Field of Research (FOR) for studies in human society, political science and law and legal studies	Number of international co-publications by Field of Research (FOR) for studies in human society, political science and law and legal studies	Scopus
Number of international co-publications by Field of Research (FOR) for studies in human society, sociology, cultural studies and related	Number of international co-publications by Field of Research (FOR) for studies in human society, sociology, cultural studies and related	Scopus
Number of international co-publications by Field of Research (FOR) for studies in overlapping FOR areas	Number of international co-publications by Field of Research (FOR) for studies in overlapping FOR areas	Scopus
Number of international co-publications by Field of Research (FOR) in education and related	Number of international co-publications by Field of Research (FOR) in education and related	Scopus
Number of international co-publications by Field of Research (FOR) in medical and health sciences and related	Number of international co-publications by Field of Research (FOR) in medical and health sciences and related	Scopus
Number of international co-publications by Field of Research (FOR) in the fields of economics, studies in human society, policy and administration and related	Number of international co-publications by Field of Research (FOR) in the fields of economics, studies in human society, policy and administration and related	Scopus
Number of international co-publications by Field of Research (FOR) in the fields of health, biological and agricultural sciences and related	Number of international co-publications by Field of Research (FOR) in the fields of health, biological and agricultural sciences and related	
Public Innovation Procurement in healthcare and social services	type of public procurer that is procuring any type of innovation in goods and services	Final report SMART 2016/0043
Public Innovation Procurement in education, recreation, culture and religion	type of public procurer that is procuring any type of innovation in goods and services	Final report SMART 2016/0047
Public Innovation Procurement public order, safety and security	type of public procurer that is procuring any type of innovation in goods and services	Final report SMART 2016/0049
Public Innovation Procurement water	type of public procurer that is procuring any type of innovation in goods and services	Final report SMART 2016/0048

Table 8. People indicators added by the JRC to the 3P dashboard dataset

People Indicators	Description	Source
Public/private co-publications by Field of Research (FOR) for Earth, biological and environmental sciences, and related	Number of Public/private co-publications by Field of Research (FOR) for Earth, biological and environmental sciences, and related	Scopus
Public/private co-publications by Field of Research (FOR) for ecology, biological and environmental sciences, and related	Number of Public/private co-publications by Field of Research (FOR) for ecology, biological and environmental sciences, and related	Scopus
Public/private co-publications by Field of Research (FOR) for engineering, commerce, business, management and related	Number of Public/private co-publications by Field of Research (FOR) for engineering, commerce, business, management and related	Scopus
Public/private co-publications by Field of Research (FOR) for environmental sciences, health, engineering, and related	Number of Public/private co-publications by Field of Research (FOR) for environmental sciences, health, engineering, and related	Scopus
domestic co-publications by Field of Research (FOR) for Earth, biological and environmental sciences, and related	Number of domestic co-publications by Field of Research (FOR) for Earth, biological and environmental sciences, and related	Scopus
domestic co-publications by Field of Research (FOR) for ecology, biological and environmental sciences, and related	Number of domestic co-publications by Field of Research (FOR) for ecology, biological and environmental sciences, and related	Scopus
domestic co-publications by Field of Research (FOR) for engineering, commerce, business, management and related	Number of domestic co-publications by Field of Research (FOR) for engineering, commerce, business, management and related	Scopus
domestic co-publications by Field of Research (FOR) for environmental sciences, health, engineering, and related	Number of domestic co-publications by Field of Research (FOR) for environmental sciences, health, engineering, and related	Scopus
international co-publications by Field of Research (FOR) for Earth, biological and environmental sciences, and related	Number of international co-publications by Field of Research (FOR) for Earth, biological and environmental sciences, and related	Scopus
international co-publications by Field of Research (FOR) for ecology, biological and environmental sciences, and related	Number of international co-publications by Field of Research (FOR) for ecology, biological and environmental sciences, and related	Scopus
international co-publications by Field of Research (FOR) for engineering, commerce, business, management and related	Number of international co-publications by Field of Research (FOR) for engineering, commerce, business, management and related	Scopus
international co-publications by Field of Research (FOR) for environmental sciences, health, engineering, and related	Number of international co-publications by Field of Research (FOR) for environmental sciences, health, engineering, and related	Scopus
Public Innovation Procurement in Environment	type of public procurer that is procuring any type of innovation in goods and services	Final report SMART 2016/0045

Annex 2. Correlation Tables between 3P R&I indicators and SDG impact indicators

Table 9. People R&I indicators with SDG impact indicators

	% Female Enrolled	Graduates in the field as percentage of total					Researchers in the field as percentage of total		
	Tertiary	agriculture	health	ICT	Natural Sciences	Education	Health	publication	Textiles
People at risk of poverty or social exclusion	0.07	0.32	-0.22	-0.06	-0.03	0.14	0.27	-0.25	0.24
People at risk of income poverty after social transfers	0.11	0.18	-0.11	-0.08	0.00	0.11	0.09	-0.38	0.08
Severely materially deprived people	0.23	0.28	-0.38	-0.23	-0.17	0.20	0.20	-0.17	0.11
People living in households with very low work intensity	-0.23	-0.08	0.26	-0.09	0.25	0.06	0.32	-0.12	0.04
In work at-risk-of-poverty rate	0.02	0.08	-0.22	-0.19	0.13	0.03	0.16	-0.23	0.06
Population living in low quality housing	0.17	-0.02	-0.25	-0.38	-0.11	0.27	0.40	-0.13	0.31
Obesity rate by body mass index	0.23	0.06	-0.05	0.58	0.00	-0.10	-0.36	-0.03	-0.22
Agricultural factor income per annual work unit	0.30	0.27	-0.26	-0.15	-0.26	0.18	0.26	-0.12	0.41
Government support to agricultural research and development	-0.05	-0.30	0.28	0.11	0.02	0.10	0.12	0.56	-0.20
Area under organic farming	0.01	0.10	0.05	0.01	0.05	-0.04	-0.03	-0.34	0.14
Harmonised risk indicator for pesticides	0.34	-0.14	-0.11	0.12	-0.16	0.22	0.02	0.36	-0.21
Ammonia emissions from agriculture	-0.28	-0.35	0.02	0.17	-0.13	-0.04	0.18	0.26	-0.21
Healthy life years at	-0.24	-0.37	0.19	0.05	0.08	-0.13	0.22	0.40	-0.08

	% Female Enrolled	Graduates in the field as percentage of total					Researchers in the field as percentage of total		
	Tertiary	agriculture	health	ICT	Natural Sciences	Education	Health	publication	Textiles
birth									
Share of people with good or very good perceived health	-0.35	-0.37	0.17	0.15	0.15	-0.21	0.25	0.46	-0.24
Smoking prevalence	0.33	0.44	-0.48	-0.21	-0.05	0.16	0.05	0.01	0.04
Standardised death rate due to tuberculosis, HIV and hepatitis	0.31	0.11	-0.14	-0.20	-0.15	0.18	-0.07	-0.28	0.11
Early leavers from education and training	0.08	-0.12	0.04	0.00	-0.12	-0.18	0.20	0.02	-0.02
Early leavers from education and training	0.26	0.17	0.08	-0.04	0.00	-0.14	0.11	-0.29	0.17
Participation in early childhood education aged 4 and over	-0.19	-0.46	0.23	0.07	0.15	0.06	0.03	0.30	0.12
Adult participation in learning	-0.31	-0.46	0.40	0.21	0.12	-0.11	-0.15	0.16	-0.18
Share of individuals having at least basic digital skills	-0.33	-0.39	0.30	0.16	0.18	-0.07	-0.37	0.12	-0.39
Gender pay gap in unadjusted form	-0.07	-0.07	-0.11	0.18	0.25	0.01	-0.04	-0.02	-0.22
Gender employment gap	-0.04	0.18	-0.18	0.03	0.20	-0.35	0.04	0.00	-0.09
Inactive population due to caring responsibilities	0.28	0.04	-0.31	0.15	0.07	0.07	0.01	0.07	-0.31

Table 10. Correlations between Planet domain SDG target indicators and R&I indicators on technology, energy and environment

	Development of environment-related technologies		Energy productivity (GDP/gross inland energy consumption, €/toe)	Environmentally related tax revenue, percentage of total tax revenue	Renewable energy public RD&D budget, % total energy public R&D	Material productivity (GDP/Domestic Material Consumption tonnes per capita)	Government Budget Allocations for R&D (GBARD)		Iso 14001
	% all Tech	inventions per capita					Energy (% of GDP)	Environment (% of GDP)	
Real GDP per capita (sdg_08_10)	0.11	0.59	0.38	-0.54	0.41	0.24	0.17	0.09	-0.08
Population having neither a bath, nor a shower, nor indoor flushing toilet in their household by poverty status (sdg_06_10)	0.07	-0.33	-0.13	0.23	-0.25	0.07	-0.15	0.01	0.01
Population connected to at least secondary waste water treatment (sdg_06_20)	0.02	0.52	-0.07	-0.29	0.19	0.05	0.32	0.15	0.08
Biochemical oxygen demand in rivers (sdg_06_30)	0.22	-0.34	-0.21	-0.35	0.14	0.01	-0.06	0.06	0.20
Nitrate in groundwater (sdg_06_40)	0.22	-0.02	0.27	0.00	-0.16	-0.22	-0.21	-0.42	-0.14
Phosphate in rivers (sdg_06_50)	0.13	-0.26	-0.25	-0.19	-0.16	-0.27	-0.19	-0.19	0.21
Water exploitation index, plus (sdg_06_60)	-0.06	-0.23	0.18	0.10	0.08	-0.15	-0.19	-0.18	0.00
Resource productivity and domestic material consumption	-0.21	0.24	0.53	-0.27	0.05	-0.52	0.00	-0.12	0.36
Average CO2 emissions per km from new passenger cars (sdg_12_30)	0.12	-0.11	-0.36	0.13	-0.13	0.09	-0.05	0.07	-0.04
Circular material use rate (sdg_12_41)	0.15	0.31	-0.16	-0.18	-0.23	-0.38	0.42	0.02	0.34
Generation of waste excluding major mineral wastes by hazardousness (sdg_12_50)	0.39	-0.02	-0.27	0.09	-0.33	0.21	0.02	0.75	-0.12
Gross value added in environmental goods and services sector (sdg_12_61)	0.11	0.38	-0.17	-0.12	-0.13	0.53	0.12	0.07	-0.10
Greenhouse gas emissions intensity of energy consumption	-0.10	-0.28	0.04	0.23	0.04	-0.09	-0.10	-0.03	0.05

	Development of environment-related technologies		Energy productivity (GDP/gross	Environmentally related tax revenue,	Renewable energy public RD&D budget,	Material productivity (GDP/Domestic Material Consumption	Government Budget Allocations for R&D (GBARD)		Iso 14001
Bathing sites with excellent water quality by locality (sdg_14_40)	-0.12	-0.11	0.23	0.10	0.20	-0.24	-0.06	-0.14	-0.02
Marine waters affected by eutrophication (sdg_14_60)	0.11	0.23	-0.03	0.09	0.08	0.07	0.16	0.11	-0.02
Share of forest area (sdg_15_10)	-0.13	-0.09	-0.53	0.14	-0.19	0.40	0.06	0.30	-0.11
Soil sealing index (sdg_15_41)	0.13	0.09	0.54	0.00	0.02	-0.35	0.03	-0.24	-0.06

Table 11. Correlations between Planet domain SDG target indicators and R&I indicators covering R&D expenditures in specific NACE industries as percentage of total R&D expenditure.

	A Agriculture forestry & fishing	C Manufacturing	C17 Manufacture of paper and paper products	C301 Building of ships and boats	C31 Manufacture of furniture	D35_E36 Utilities	E37-E39 Sewerage, waste management
Real GDP per capita (sdg_08_10)	0.52	0.42	0.19	0.48	0.05	0.15	0.06
Population having neither a bath, nor a shower, nor indoor flushing toilet in their household by poverty status (sdg_06_10)	-0.06	-0.36	-0.13	-0.18	0.13	-0.09	-0.09
Population connected to at least secondary waste water treatment (sdg_06_20)	0.11	0.47	0.14	-0.04	-0.09	0.21	0.13
Biochemical oxygen demand in rivers sdg_06_30)	0.34	-0.36	-0.24	0.08	-0.02	-0.10	0.01
Nitrate in groundwater (source: EEA) (sdg_06_40)	-0.01	-0.15	-0.19	-0.16	-0.01	-0.40	-0.01
Phosphate in rivers (sdg_06_50)	-0.31	-0.13	-0.34	-0.44	-0.04	-0.10	-0.10
Water exploitation index, plus (sdg_06_60)	-0.09	-0.23	-0.15	-0.15	-0.11	-0.16	-0.16
Resource productivity and domestic material consumption	0.19	0.20	-0.28	0.29	-0.04	-0.12	-0.21
Average CO2 emissions per km from new passenger cars (sdg_12_30)	-0.13	-0.04	0.03	-0.15	-0.02	-0.03	0.01
Circular material use rate (sdg_12_41)	-0.03	0.48	-0.17	0.72	-0.02	0.24	0.11
Generation of waste excluding major mineral wastes by hazardousness (sdg_12_50)	0.22	-0.05	-0.06	0.16	-0.06	0.33	0.16
Gross value added in environmental goods and services sector (sdg_12_61)	-0.07	0.18	0.56	-0.18	0.01	0.48	-0.17
Greenhouse gas emissions intensity of energy consumption	-0.34	-0.03	-0.13	0.10	0.39	-0.42	-0.01
Bathing sites with excellent water quality by locality (sdg_14_40)	-0.08	-0.04	-0.15	0.01	-0.07	-0.30	-0.14
Marine waters affected by eutrophication (sdg_14_60)	-0.05	0.15	0.01	0.07	0.04	0.02	0.01
Share of forest area (sdg_15_10)	-0.38	0.07	0.45	-0.15	0.07	0.36	0.15
Soil sealing index (sdg_15_41)	-0.20	0.07	-0.05	-0.14	-0.23	-0.21	0.25

Table 12. Correlations between Planet domain SDG target indicators and R&I indicators covering Researchers in specific NACE industries as percentage of employment

	A Agriculture forestry & fishing	C Manufacturing	C13-C15 Manufacture of textiles, wearing apparel, leather and	C17 Manufacture of paper and paper products	C301 Building of ships and boats	C31 Manufacture of furniture	D35_E36 Electricity, gas, steam and air conditioning supply	I Accommodation and food service activities
Real GDP per capita (sdg_08_10)	0.22	0.16	0.01	0.32	0.36	0.11	0.10	0.18
Population having neither a bath, nor a shower, nor indoor flushing toilet in their household by poverty status (sdg_06_10)	-0.10	-0.19	-0.19	-0.25	-0.17	-0.19	-0.14	-0.11
Population connected to at least secondary waste water treatment (sdg_06_20)	0.28	0.36	0.21	0.36	0.31	0.37	0.19	0.24
Biochemical oxygen demand in rivers sdg_06_30)	0.32	-0.13	-0.05	-0.07	0.05	-0.13	0.16	-0.15
Nitrate in groundwater (source: EEA) (sdg_06_40)	-0.13	-0.01	-0.14	-0.11	-0.18	-0.25	-0.11	-0.14
Phosphate in rivers (sdg_06_50)	-0.03	0.01	0.20	-0.27	-0.14	0.08	-0.01	0.23
Water exploitation index, plus (sdg_06_60)	-0.10	-0.08	0.01	-0.16	-0.15	-0.09	-0.07	-0.13
Resource productivity and domestic material consumption	0.39	0.35	0.55	0.23	0.43	0.57	0.31	0.50
Average CO2 emissions per km from new passenger cars (sdg_12_30)	-0.13	0.02	-0.17	-0.05	0.00	-0.10	-0.10	-0.02
Circular material use rate (sdg_12_41)	0.25	0.41	0.57	0.41	0.53	0.49	0.39	0.42
Generation of waste excluding major mineral wastes by hazardousness (sdg_12_50)	0.09	-0.13	-0.09	-0.14	0.08	-0.13	-0.09	-0.10
Gross value added in environmental goods and services sector (sdg_12_61)	-0.13	-0.11	-0.15	0.23	-0.12	-0.09	-0.09	-0.11
Greenhouse gas emissions intensity of energy consumption	0.01	0.08	0.03	-0.07	0.07	0.03	0.04	0.03

	A Agriculture forestry & fishing	C Manufacturing	C13-C15 Manufacture of textiles, wearing apparel, leather and	C17 Manufacture of paper and paper products	C301 Building of ships and boats	C31 Manufacture of furniture	D35_E36 Electricity, gas, steam and air conditioning supply	I Accommodation and food service activities
Bathing sites with excellent water quality by locality (sdg_14_40)	-0.05	0.01	0.12	-0.18	-0.10	-0.10	-0.01	-0.11
Marine waters affected by eutrophication (sdg_14_60)	-0.05	-0.04	-0.06	-0.01	-0.06	-0.06	0.00	-0.02
Share of forest area (sdg_15_10)	-0.41	-0.21	-0.10	-0.08	-0.23	-0.22	-0.07	-0.25
Soil sealing index (sdg_15_41)	-0.08	0.13	0.01	0.08	0.05	-0.07	-0.07	-0.09

Table 13. Correlations between Prosperity SDG target indicators and R&I indicators covering PCT patent applications as % of all applications and R&D personnel as % of all personnel.

	PCT patent applications						R&D Personnel		
	AI	Biotech	ICT	Medical	Nanotech	Pharma	Business	Higher education	Government
Final energy consumption in households per capita (sdg_07_20)	0.02	0.11	0.24	0.11	0.11	0.08	0.37	-0.24	-0.25
Energy productivity (sdg_07_30)	0.19	0.21	0.02	0.18	0.07	0.23	0.11	-0.01	-0.16
Share of renewable energy in gross final energy consumption by sector (sdg_07_40)	-0.17	-0.20	0.05	-0.21	-0.18	-0.22	-0.02	0.12	-0.08
Energy import dependency by products (sdg_07_50)	0.04	0.04	0.05	0.06	0.06	0.05	-0.02	0.03	-0.03
Population unable to keep home adequately warm (sdg_07_60)	-0.17	-0.30	-0.30	-0.28	-0.20	-0.29	-0.59	0.32	0.49
Real GDP per capita (sdg_08_10)	0.10	0.30	0.23	0.31	0.21	0.31	0.48	-0.26	-0.38
Investment share of GDP (sdg_08_11)	0.00	0.02	0.07	0.00	-0.06	0.05	0.21	-0.19	-0.07
Young people neither in employment nor in education and training (sdg_08_20)	-0.09	-0.19	-0.25	-0.25	-0.07	-0.14	-0.53	0.23	0.49
Young people neither in employment nor in education and training (sdg_08_20a)	-0.14	-0.28	-0.30	-0.31	-0.14	-0.24	-0.62	0.34	0.55
Employment rate (sdg_08_30)	0.20	0.22	0.27	0.28	0.08	0.19	0.42	-0.15	-0.47
Employment rate (sdg_08_30a)	0.23	0.36	0.38	0.37	0.18	0.34	0.46	-0.20	-0.49
Long-term unemployment rate (sdg_08_40)	-0.12	-0.22	-0.23	-0.21	-0.07	-0.19	-0.55	0.42	0.37
Gross domestic expenditure on R&D by sector (sdg_09_10)	0.35	0.35	0.46	0.38	0.38	0.33	0.71	-0.45	-0.56
R&D personnel by sector (sdg_09_30)	0.23	0.37	0.38	0.34	0.21	0.33	0.73	-0.49	-0.53
Air emission intensity from industry (sdg_09_70)	-0.12	-0.33	-0.26	-0.32	-0.29	-0.33	-0.58	0.62	0.10
Purchasing power adjusted GDP per capita (sdg_10_10)	0.08	0.16	0.12	0.15	0.14	0.17	0.47	-0.30	-0.33
Relative median at-risk-of-poverty gap (sdg_10_30)	-0.11	-0.21	-0.28	-0.18	-0.17	-0.16	-0.58	0.31	0.59
Income share of the bottom 40 % of the population (sdg_10_50)	-0.02	0.07	0.15	0.09	0.04	0.04	0.55	-0.38	-0.41
Asylum applications (sdg_10_60)	0.07	0.15	0.29	0.19	0.00	0.14	0.33	-0.23	-0.27

	PCT patent applications							R&D Personnel	
	AI	Biotech	ICT	Medical	Nanotech	Pharma	Business	Higher education	Government
Overcrowding rate	-0.26	-0.41	-0.33	-0.36	-0.31	-0.38	-0.57	0.23	0.69
Population living in households considering that they suffer from noise (sdg_11_20)	0.16	0.33	0.22	0.39	0.28	0.29	0.15	-0.09	-0.18
Settlement area per capita (sdg_11_31)	-0.10	-0.11	0.38	-0.10	-0.06	-0.14	0.07	0.10	-0.23
Road traffic deaths (sdg_11_40)	-0.31	-0.42	-0.38	-0.41	-0.29	-0.41	-0.65	0.29	0.67
Exposure to air pollution by particulate matter	-0.16	-0.15	-0.27	-0.13	-0.05	-0.12	-0.30	-0.10	0.58
Recycling rate of municipal waste (sdg_11_60)	0.39	0.58	0.50	0.60	0.42	0.57	0.67	-0.49	-0.42

Table 14. Correlations between Prosperity SDG target indicators and R&I indicators covering innovation and ICT

	Venture capital expenditures (% of GDP)	Trademark applications / bil. GDP	Design applications / bil. GDP	Share of enterprises that introduced a product innovation	ICT specialists % of employment
Final energy consumption in households per capita (sdg_07_20)	0.10	-0.14	-0.12	0.24	0.53
Energy productivity (sdg_07_30)	0.10	-0.12	-0.03	-0.08	0.05
Share of renewable energy in gross final energy consumption by sector (sdg_07_40)	-0.09	-0.22	-0.28	0.26	0.25
Energy import dependency by products (sdg_07_50)	0.02	0.20	0.25	-0.25	-0.13
Population unable to keep home adequately warm (sdg_07_60)	-0.26	-0.12	-0.08	-0.08	-0.62
Real GDP per capita (sdg_08_10)	0.44	0.21	0.24	0.34	0.63
Investment share of GDP (sdg_08_11)	0.16	-0.05	-0.06		0.31
Young people neither in employment nor in education and training (sdg_08_20)	-0.26	-0.28	-0.19	-0.18	-0.61
Young people neither in employment nor in education and training (sdg_08_20a)	-0.33	-0.33	-0.26		-0.63
Employment rate (sdg_08_30)	0.19	0.13	0.07	0.18	0.55
Employment rate (sdg_08_30a)	0.28	0.11	0.05		0.61
Long-term unemployment rate (sdg_08_40)	-0.29	-0.19	-0.18		-0.51
Gross domestic expenditure on R&D by sector (sdg_09_10)	0.06	-0.08	0.12		0.66
R&D personnel by sector (sdg_09_30)	0.23	0.08	0.25		0.74
Air emission intensity from industry (sdg_09_70)	0.01	-0.14	-0.20	-0.18	-0.32
Purchasing power adjusted GDP per capita (sdg_10_10)	0.47	0.32	0.28	0.25	0.62
Relative median at-risk-of-poverty gap (sdg_10_30)	-0.32	-0.29	-0.23	-0.36	-0.60
Income share of the bottom 40 % of the population (sdg_10_50)	0.02	0.03	0.03	0.20	0.49
Asylum applications (sdg_10_60)	0.06	0.23	0.33		0.22
Overcrowding rate	-0.39	-0.37	-0.26	-0.49	-0.57
Population living in households considering that they suffer from noise (sdg_11_20)	0.25	0.43	0.41	0.05	-0.12
Settlement area per capita (sdg_11_31)	-0.08	-0.10	-0.13	0.35	0.50

	Venture capital expenditures (% of GDP)	Trademark applications / bil. GDP	Design applications / bil. GDP	Share of enterprises that introduced a product innovation	ICT specialists % of employment
Road traffic deaths (sdg_11_40)	-0.33	-0.28	-0.14		-0.71
Exposure to air pollution by particulate matter	-0.43	-0.26	0.05	-0.53	-0.58
Recycling rate of municipal waste (sdg_11_60)	0.11	-0.11	0.20		0.54

Table 15. Correlations between Prosperity SDG target indicators and R&I indicators covering R&D expenditures and Researchers in the business, government and higher education sector as percentage of total.

	R&D Expenditures			Researchers in		
	Business	Government	Higher education	Business	Higher education	Government
Final energy consumption in households per capita (sdg_07_20)	0.32	-0.12	-0.27	0.38	-0.30	-0.16
Energy productivity (sdg_07_30)	0.10	-0.07	-0.08	0.05	0.04	-0.15
Share of renewable energy in gross final energy consumption by sector (sdg_07_40)	-0.11	0.28	-0.14	0.03	0.01	-0.04
Energy import dependency by products (sdg_07_50)	0.02	-0.06	-0.01	-0.07	0.10	-0.05
Population unable to keep home adequately warm (sdg_07_60)	-0.48	0.21	0.39	-0.55	0.35	0.37
Real GDP per capita (sdg_08_10)	0.24	-0.01	-0.29	0.40	-0.21	-0.34
Investment share of GDP (sdg_08_11)	0.24	-0.20	-0.08	0.24	-0.25	-0.02
Young people neither in employment nor in education and training (sdg_08_20)	-0.30	-0.08	0.46	-0.54	0.29	0.44
Young people neither in employment nor in education and training (sdg_08_20a)	-0.37	0.02	0.49	-0.62	0.39	0.45
Employment rate (sdg_08_30)	0.28	0.09	-0.50	0.46	-0.24	-0.43
Employment rate (sdg_08_30a)	0.35	0.01	-0.52	0.51	-0.28	-0.45
Long-term unemployment rate (sdg_08_40)	-0.41	0.17	0.38	-0.57	0.48	0.28
Gross domestic expenditure on R&D by sector (sdg_09_10)	0.72	-0.43	-0.59	0.80	-0.62	-0.51
R&D personnel by sector (sdg_09_30)	0.65	-0.33	-0.53	0.71	-0.53	-0.42
Air emission intensity from industry (sdg_09_70)	-0.54	0.52	0.12	-0.51	0.53	0.07
Purchasing power adjusted GDP per capita (sdg_10_10)	0.23	-0.08	-0.22	0.35	-0.19	-0.27
Relative median at-risk-of-poverty gap (sdg_10_30)	-0.40	0.05	0.57	-0.61	0.36	0.55
Income share of the bottom 40 % of the population (sdg_10_50)	0.45	-0.19	-0.43	0.57	-0.43	-0.33
Asylum applications (sdg_10_60)	0.16	0.02	-0.27	0.36	-0.22	-0.28
Overcrowding rate	-0.37	-0.06	0.67	-0.56	0.22	0.68
Population living in households considering that they suffer from	-0.12	0.15	-0.03	0.13	-0.04	-0.20

	R&D Expenditures			Researchers in		
	Business	Government	Higher education	Business	Higher education	Government
noise (sdg_11_20)						
Settlement area per capita (sdg_11_31)	0.05	0.14	-0.26	0.18	-0.04	-0.25
Road traffic deaths (sdg_11_40)	-0.50	0.06	0.68	-0.64	0.31	0.63
Exposure to air pollution by particulate matter	-0.17	-0.24	0.50	-0.32	-0.03	0.56
Recycling rate of municipal waste (sdg_11_60)	0.60	-0.37	-0.43	0.65	-0.51	-0.33

Table 16. Correlations between Prosperity SDG target indicators and Researchers in selected industries as percentage of total.

	Mining and quarrying	C30 manufacturing transport equipment	financial and insurance activities	Architectural and engineering activities; technical testing and analysis
Final energy consumption in households per capita (sdg_07_20)	0.26	0.08	0.15	0.00
Energy productivity (sdg_07_30)	0.02	0.16	0.12	0.15
Share of renewable energy in gross final energy consumption by sector (sdg_07_40)	0.59	-0.27	0.12	-0.01
Energy import dependency by products (sdg_07_50)	-0.94	0.06	-0.17	-0.19
Population unable to keep home adequately warm (sdg_07_60)	-0.22	-0.22	-0.08	-0.30
Real GDP per capita (sdg_08_10)	0.60	0.13	0.23	0.21
Investment share of GDP (sdg_08_11)	0.13	-0.04	0.01	0.17
Young people neither in employment nor in education and training (sdg_08_20)	-0.30	0.26	-0.13	-0.06
Young people neither in employment nor in education and training (sdg_08_20a)	-0.29	0.12	-0.27	-0.34
Employment rate (sdg_08_30)	0.23	-0.23	0.15	-0.17
Employment rate (sdg_08_30a)	0.29	-0.04	0.22	0.26
Long-term unemployment rate (sdg_08_40)	-0.20	0.07	-0.14	-0.30
Gross domestic expenditure on R&D by sector (sdg_09_10)	0.01	0.19	0.12	0.29
R&D personnel by sector (sdg_09_30)	0.20	0.16	0.35	0.24
Air emission intensity from industry (sdg_09_70)	0.00	-0.24	0.12	-0.22
Purchasing power adjusted GDP per capita (sdg_10_10)	0.42	0.14	0.13	0.19
Relative median at-risk-of-poverty gap (sdg_10_30)	-0.08	0.00	-0.11	-0.16
Income share of the bottom 40 % of the population (sdg_10_50)	0.31	-0.09	0.06	0.15
Asylum applications (sdg_10_60)	0.13	-0.11	0.03	0.21
Overcrowding rate	-0.15	-0.16	-0.24	-0.34
Population living in households considering that they suffer from noise (sdg_11_20)	-0.26	0.06	-0.02	0.22
Settlement area per capita (sdg_11_31)	-0.09	-0.18	0.20	-0.05
Road traffic deaths (sdg_11_40)	-0.30	-0.17	-0.19	-0.29

	Mining and quarrying	C30 manufacturing transport equipment	financial and insurance activities	Architectural and engineering activities; technical testing and analysis
Exposure to air pollution by particulate matter	-0.23	0.09	-0.32	-0.17
Recycling rate of municipal waste (sdg_11_60)	0.60	-0.37	-0.43	0.65

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