資料２

総合科学技術・イノベーション会議有識者議員懇談会

国際機関・主要諸国等における国レベルを対象とした研究・イノベーション指標の開発・利用に関する取組の概況[*1]

2021年7月1日
東京，内閣府／ウェブ会議システム

成城大学 社会イノベーション学部
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*1　本資料で示される見解は専ら発表者のものであり，必ずしもいかなる機関の見解を代表するものではない．

本発表の目標及び視野

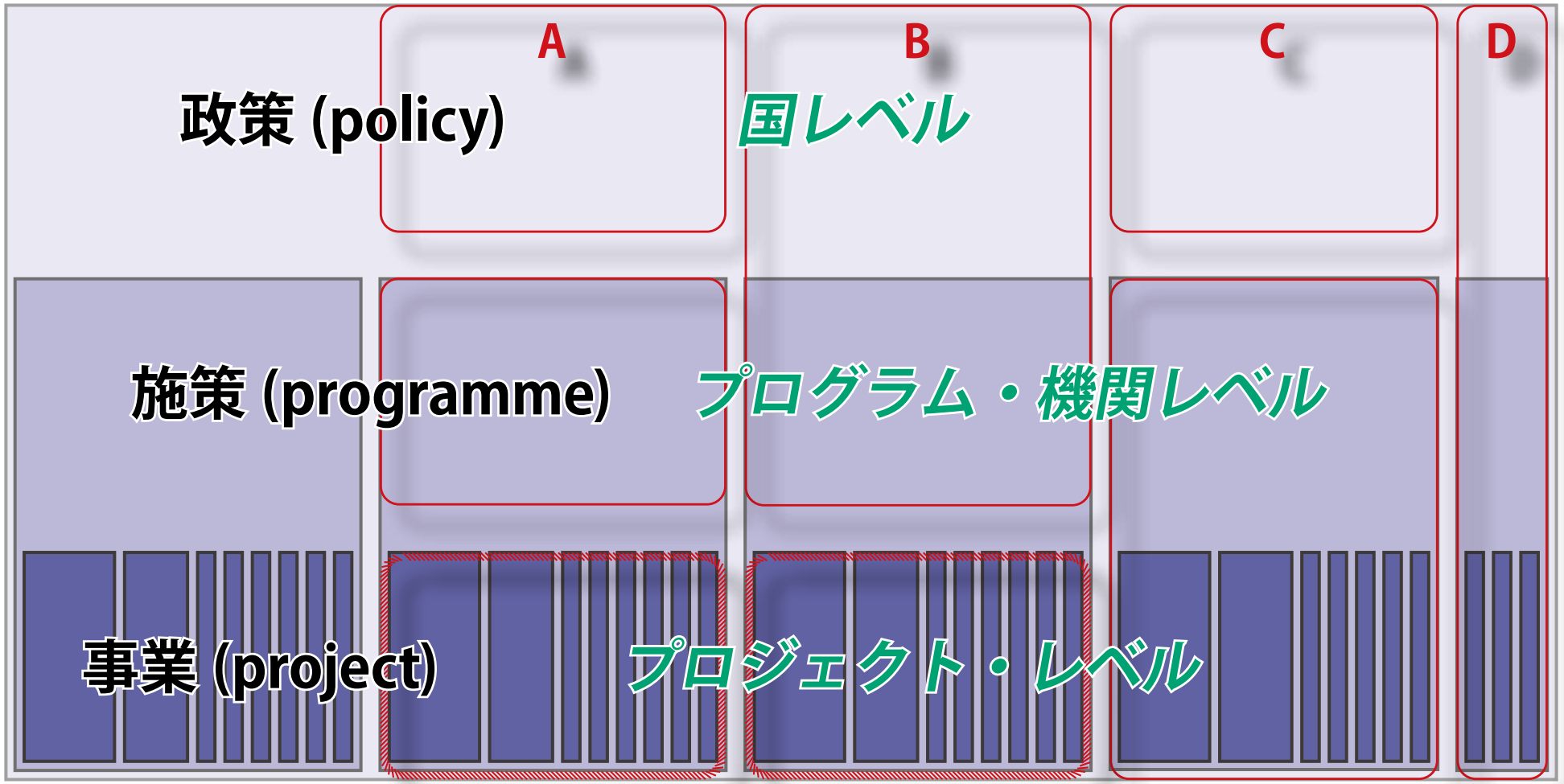
- ご依頼内容によれば，以下について参考となる情報を提供することが期待されているものと思料して，今回の発表を行う：

> 今後の検討課題
>
> ①研究力を分析・評価する指標に関するこれまでの状況整理
>
> - 諸外国における研究力の分析・評価に関する新たな仕組み・動向の把握：調査対象国・地域や項目を整理の上、調査を実施

- 国レベル（政策レベル）[→次ページ参照]

＊ 時間が限られていることから，たとえば，指標群の元となるデータの収集等といった測定に係る観点までは言及できない点もあることについて，ご了解いただきたい.

政策 – 施策 – 事業と機関との対応（概念図）



- “機関”（C下）（例．国立研究開発法人）も，広義の“プログラム”の一部であると考えることができる

簡単な自己紹介及び背景

- たとえば，OECD[*1]/CSTP[*2]/NESTI[*3] の Delegate であり，かつその Bureau の一員で Vice Chair の一人として務めており，国際機関や諸外国における動向等も把握しているが，このような背景や経験を参考にしつつ，本発表は，専ら発表者個人によるものとして行う．

*1 OECD: Organisation for Economic Co-operation and Development（経済協力開発機構）
*2 CSTP: Committee for Scientific and Technological Policy（科学技術政策委員会）
*3 NESTI: Working Party of National Experts on Science and Technology Indicators（科学技術指標各国専門家作業部会）

本発表のアウトライン

- イントロダクション
  - 「研究力」をどう捉えるか：本発表の背景として
- 国際機関・主要諸国等における国レベルを対象とした
  研究・イノベーション指標の開発・利用に関する取組の概況

* *参考資料*

- 研究・イノベーション指標に係る全般的留意事項の詳細

「研究力」をどう捉えるか：本発表の背景として

- “**National research capability**” *or* “National research capacity”?
  - Cf. 研究に関わる “Capability” や “Capacity” に係る，ある見方の例

  - 次の 3 つの相違に留意：“Capability”, “Capacity”, “Performance”
  - Cf. “ 軍事力 ”：“Military capability”, “Defence capability”

研究・イノベーション指標に係る全般的留意事項

- 指標 (indicator) と指数 (index) との違い
- 測定対象の全体と測定可能な範囲
- 統計調査における標本 (sample) と誤差 (error)
  - 標本誤差，非標本誤差
- 測定単位 (measurement unit) と単位量に対する暗黙の仮定
- 正規化 (normalisation) とその必要性；正規化された指標の解釈
- 一定時間（例．年，月，週，日）内の総量，１時点での状態量
- フロー (flow)，ストック (stock)
  - インプット，アウトプット，アウトカム；パフォーマンス<フロー>

研究・イノベーション活動と研究・イノベーション指標の元となる変数の例

- インプット
  - 投入する資源：資金，人
- アウトプット
  - 産出される成果：
    論文，特許出願（発明），登録特許；新プロダクト（プロダクト・イノベーション），新ビジネス・プロセス（ビジネス・プロセス・イノベーション）；商標，意匠；新たな知識，新たなノウハウ，…
- パフォーマンス
- アウトカム
  - 産出された成果に対する受け手による反応：
    論文被引用，…

「政策 (policy)」 レベル・「施策 (programme)」 レベルにおける指標

- 「政策レベル」
  - 例. 国全体の研究**システム**及びイノベーション・**システム**
    （又は科学技術・イノベーション政策の対象） 等において,
    その “インプット”, 内部構造, “パフォーマンス” (“アウトプット” を含む)
    や “アウトカム” 等として
    何を測定して把握すればよいか
- 「施策レベル」
  - 例. 研究開発**プログラム**等において,
    その “インプット” についてはもとより,
    その活動の “パフォーマンス” や
    （研究開発活動から生み出された） “アウトカム” として
    何を測定して把握すればよいか

指標利用上の留意点

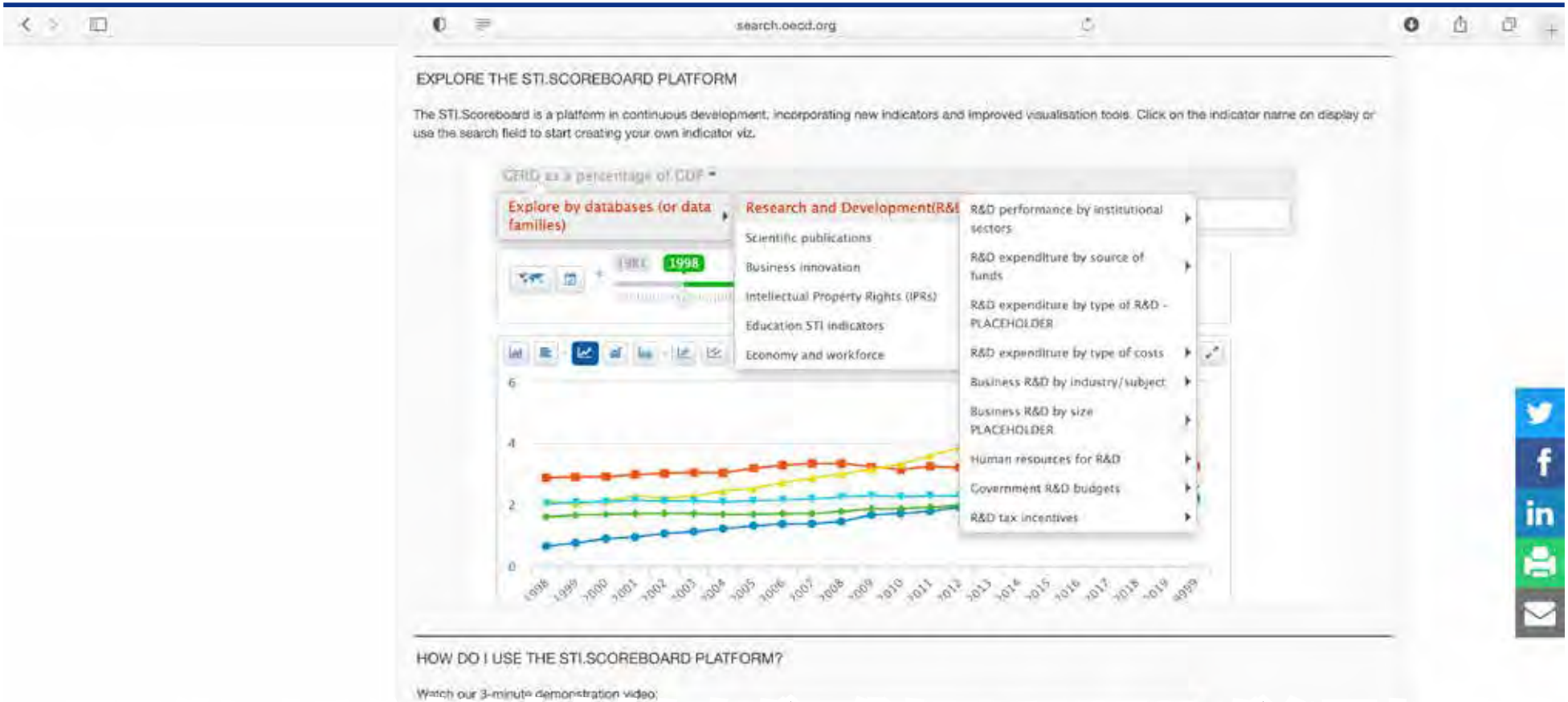
- 指標を混濁して用いてはならない
- 指標が何を指しているかについてよく考えた上で用いる必要がある
  - データ源やその特性等についても留意する
  - 「単位」について留意する
- 既存の指標にとらわれず，
  目的とする内容を的確に代表する指標を設定し，
  またそれについてモニタリングできるようにすべきである
  （なお，指標を，モニタリングを超えて何らかの評価に用いると，
  それにより関係者の行動を変容させることが知られている
  →単一の指標や限定的指標群を継続して用いることの危険性）

国際機関・主要諸国等における国レベルを対象とした研究・イノベーション指標の開発・利用に関する取組の概況

STI Scoreboard – OECD (1/2)

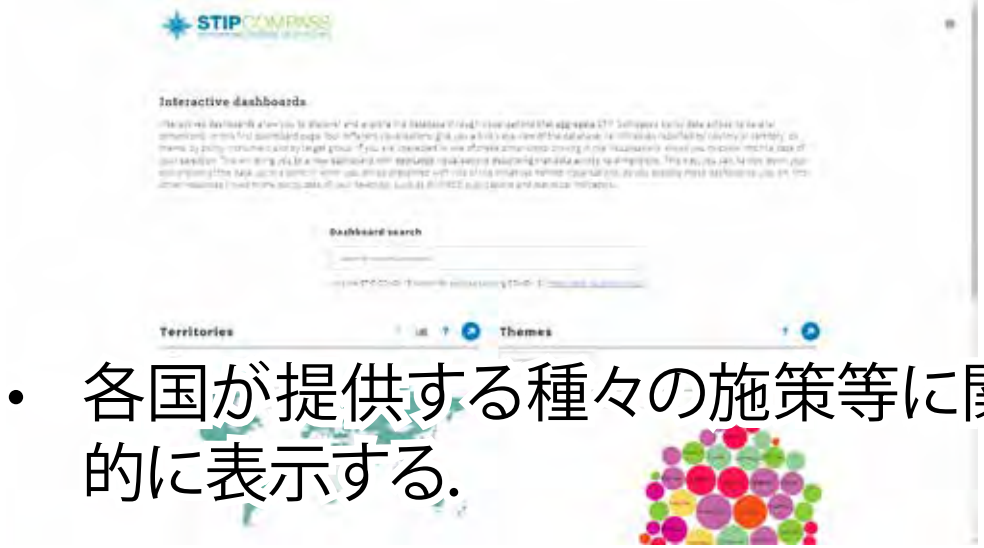
- 各国・地域間の比較：「**政策レベル**」

STI Scoreboard – OECD (2/2)



- 冊子体による公表は中止されたが，代わって，OECD が各国より収集して公表している国際比較可能な統計データや OECD 事務局において整理している書誌情報に基づくデータ等に基づき，複数の指標を自由に組み合わせて表示することが可能となるように図られている.

STIP Compass – OECD and EU



- 各国が提供する種々の施策等に関する情報を集約して，特徴を定量的に表示する.
- 各国が提供する情報の「全体性」に依存する.

Horizon Europeにおける Key Impact Pathways Indicators[*1] – EU (1/6)

- EUの施策としてのFramework Programmeの展開をモニタリングする.

*1 Key Impact Pathways Indicators（主要インパクト達成経路指標群）

Horizon Europe における Key Impact Pathways Indicators – EU (2/6)

IMPACT ASSESSMENT OF THE 9TH EU FRAMEWORK PROGRAMME FOR RESEARCH AND INNOVATION

5 HOW WILL PERFORMANCE BE MONITORED AND EVALUATED?

5 HOW WILL PERFORMANCE BE MONITORED AND EVALUATED?

The monitoring and evaluation framework of the new Framework Programme[1] will have three main building blocks:

- **Annual monitoring of the programme performance**: tracking of performance indicators in the short, medium and longer-term according to key impact pathways towards Programme objectives, based on baselines and targets where possible;
- Continuous collection of programme management and implementation data;
- **Two fully-fledged (meta)-evaluations** of the programme at mid-term and ex-post (upon completion).

Impact pathways, and related key impact pathway indicators, will structure the annual monitoring of the programme performance (see Annex 4) towards its objectives. The objectives translate into three complementary impact categories (each being tracked along several pathways), which reflect the non-linear nature of R&I investments:

1. **Scientific impact**: related to supporting the creation and diffusion of high-quality new knowledge, skills, technologies and solutions to global challenges;
2. **Societal impact**: related to strengthening the impact of research and innovation in developing, supporting and implementing EU policies, and support the uptake of innovative solutions in industry and society to address global challenges;
3. **Economic impact**: related to fostering all forms of innovation, including breakthrough innovation, and strengthening market deployment of innovative solutions.

Figure 10: Tracking performance along key impact pathways towards impact categories translating the Horizon Europe general objectives

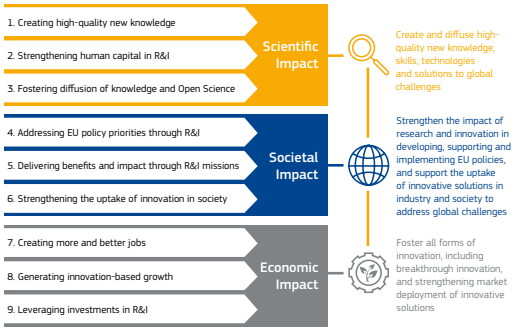


Table 9: Monitoring and Evaluation Frameworks

Horizon 2020	The new Framework Programme
3 headline indicators not directly attributable to the programme[2] 55 Horizon 2020 Key performance and Cross-Cutting issues indicators: › 27 are related to management and implementation data (e.g. funding, participation) › 28 are related to outputs, results or impacts, out of which: • none is related to the programme as a whole (covering only programme parts) • 9 relate to publications • 7 relate to intellectual property rights and innovations • 4 relate to leveraged funding • 4 relate to researchers' mobility and access to infrastructures	› All Horizon 2020 indicators related to outputs, results and impacts are maintained but streamlined and further specified to cover the whole Programme › Management and implementation data are still collected and made available in close-to-real time through Dashboard but are not part of "performance indicators" › Key indicators are set at Programme level according to the Programme objectives and are attributable to the Programme › Key indicators are classified according to 9 key impact pathways, for tracking impact through short, medium and long term indicators – for more accurate reporting over time › Higher reliance on external data sources, qualitative data and automated data tracking to minimise burden on beneficiaries › Possibility for programme part or action specific indicators (but not in the legal base)

The impact pathways will be time-sensitive: they will distinguish between the short (typically as of one year, when the first projects are completed), medium (typically as of three years, and for the interim evaluation) and long term (typically as of five years, and for the ex-post evaluation). The impact pathway indicators will contain both qualitative and quantitative information, the availability of which will depend on the state of implementation of the Programme. These indicators serve as proxies to report on the progress made towards each type of impact at Programme level. Individual programme parts will contribute to these indicators to a different degree and through different mechanisms. Additional indicators might be used to monitor individual programme parts when relevant and commensurate. These indicators proposed (see Annex 4) reflect the lessons learnt from the interim evaluation of Horizon 2020: all Horizon 2020 indicators related to outputs, results and impacts are maintained but streamlined and further specified to cover the whole programme. The management and implementation data is still collected but is separated from the key performance indicators, as illustrated in Table 9.

- 科学的インパクト，社会的インパクト，経済的インパクトという 3 種の目標に結びつく 9 つのインパクト範疇に向かう経路のパフォーマンスをモニタリング及び評価しようとしている.

Horizon Europe における Key Impact Pathways Indicators – EU (3/6)

The micro-data behind the key impact pathway indicators will be collected in a centrally managed and harmonised way, with minimal reporting burden. This will be achieved, for example, by collecting at proposal stage the unique identifiers of applicants, by sourcing data automatically from existing external public and private databases also after project's end (e.g. data on publications, patents, employment and turnover), by adopting new ICT tools (e.g. text mining) and by using alternative primary data sources (e.g. expert reviews). Longer-term impact indicators may be estimated based on dedicated studies. The data collected will allow tracking disaggregated indicators and be analysed per type of action, type of organisation, type of collaboration, sectors, disciplines, calls, countries (including associated and third countries).

Baselines, targets, and benchmarks will be established prior to the Programme's launch. External experts will help establish accurate and timely baselines, and propose targets with appropriate benchmarks, where relevant. To the extent possible data will also be collected for control groups to allow counterfactual evaluation designs:

- Propensity score matching- based on pairing with similar researchers/companies and the development of panel data;
- Regression discontinuity design based on the comparison of the performance between successful and unsuccessful applicants (pending their approval on data use);
- Difference-in difference based on the comparison of the performance of beneficiaries before/after the Programme.

Management and implementation data for all parts of the Programme and all delivery mechanisms[3] will continue to be collected in close to real-time. This data will be collected in a centrally managed and harmonised way through the Common Support Centre. It will also continue to be publicly available on a dedicated on-line portal in close to real-time allowing extraction per programme parts, types of actions and types of organisations (including specific data for SMEs). This will include inter alia proposals, applications, participations and projects (number, quality, EU contribution etc.); success rates; profiles of evaluators, applicants and participants (partly based on unique identifiers, and including country, gender, turnover, role in project etc.); implementation (including time-to-grant, error rate, satisfaction rate and the rate of risk taking etc.); and financial contribution to EU climate and environmental objectives and other mainstreaming targets. A yearly analysis of progress on key dimensions of the Framework Programme's management and implementation will be carried out.

The evaluations of the new Framework Programme will ensure coherence of methodologies and comprehensiveness of coverage (i.e covering all programme parts and all delivery mechanisms). Evaluation of individual programme parts can continue to make use of specific indicators that complement relevant the Programme-level indicators. The evaluation of the Framework Programme will build on the coordinated evaluations of each programme part, type of actions and delivery mechanism according to common evaluation criteria and standard methodologies (incl. counterfactual analysis and qualitative approaches such as case studies). The comprehensive interim evaluation of the entire Framework Programme is foreseen by 2024, to draw the first lessons from the changes introduced in the new Framework Programme. A full-scale ex-post evaluation is planned by 2030 to provide a full assessment of the new Programme and report on the longer-term impacts of previous ones.

Lastly, evaluations will better account for the coordinated impact of R&I support at EU, national and regional level, building on existing work to better track the impact of EU R&I Programmes at national level[4]. The European RTD Evaluation Network[5] will provide the basis for a substantially increased cooperation with Member States and Associated States.

1 Including Missions and European Partnership Initiatives.

2 Share of GDP invested in research and development; evolution of the Innovation Output Indicator, share of researchers as part of the active population.

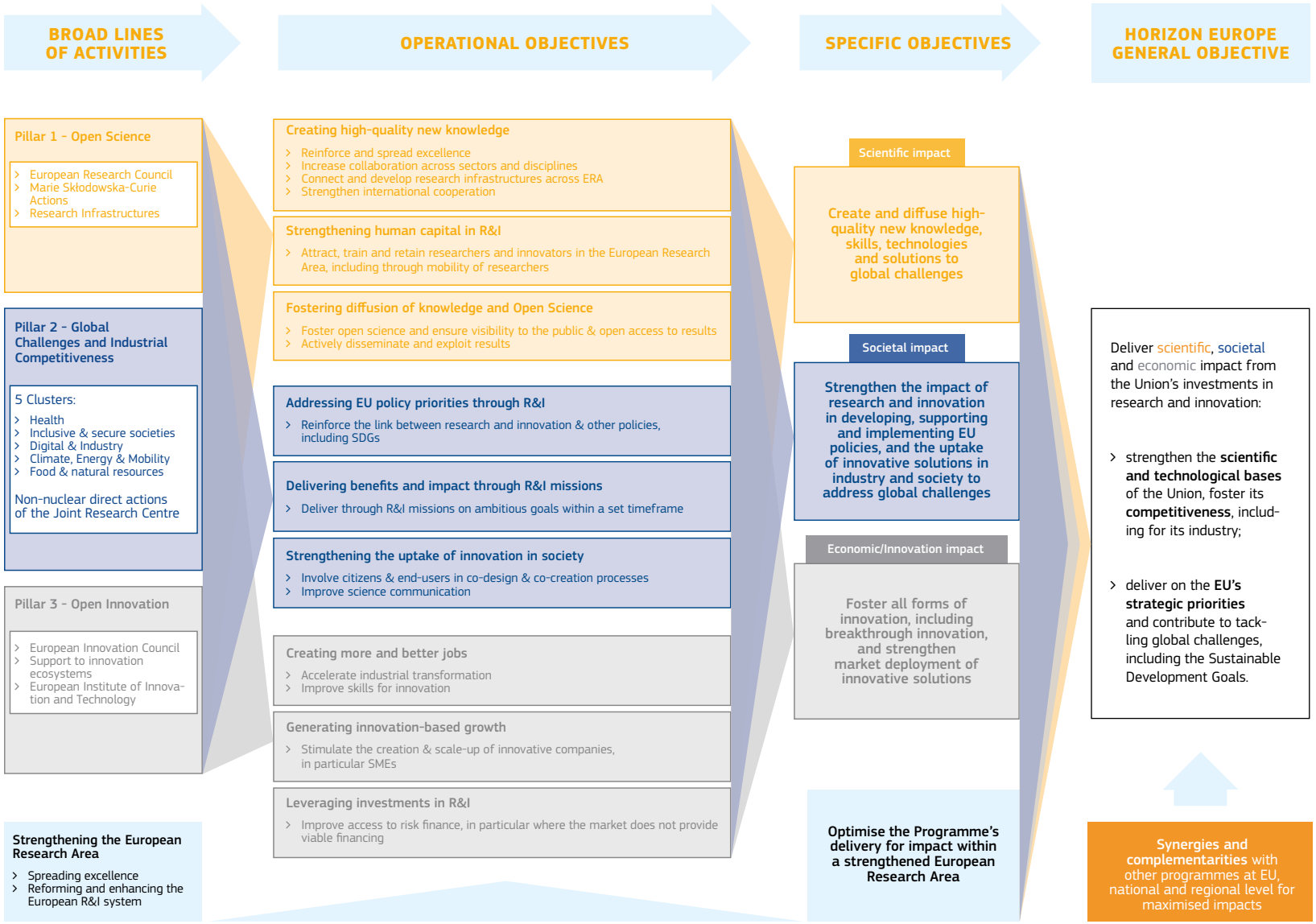
3 Including European Partnerships.

4 European Research Area and Innovation Committee (2017), Final Report of the ERAC Ad-hoc Working Group on Measuring the Impact of EU Framework Programmes for Research and Innovation at National Level. Available at: http://data.consilium.europa.eu/doc/document/ST-12067-2017-INIT/en/pdf.

5 More information available at: https://ec.europa.eu/research/evaluations/index.cfm?pg=network.

- 施策の基盤として（換言すれば，Horizon Europe 以外の他の EU のプログラム等や各国における施策等も含めて），EU 全体及び各国における ERA (European Research Area) の進展を想定している．
  ［次ページ；ERA については，後述する］

Horizon Europe における Key Impact Pathways Indicators – EU (4/6)



Horizon Europe における Key Impact Pathways Indicators – EU (5/6)

ANNEXES

ANNEX 4: INDICATORS

ANNEX 4: INDICATORS

1 KEY IMPACT PATHWAYS INDICATORS

1.1 Scientific impact pathway indicators

Horizon Europe is expected to generate scientific impact by creating high-quality new knowledge and enabling its diffusion, strengthening human capital in R&I and promoting Open Science. Progress towards achieving this impact will be monitored through the proxy indicators outlined in Figure 12, which are categorised as three key 'impact pathways'.

Figure 12: Key scientific impact pathways indicators

Short-term	Medium-term	Longer-term	Scientific impact
1 Message: Horizon Europe generates world-class science, as shown by the high-quality publications that become influential in their field and worldwide[1].			
Publications Number of FP peer reviewed scientific publications[2]	**Citations** Field-Weighted Citation Index of FP peer reviewed publications	**World-class science** Number and share of peer reviewed publications from FP projects that are core contribution to scientific fields	**Creating of high-quality new knowledge**
Data needs: identification of publications co-funded by the FP through the insertion of a specific DOI for the FP (funding source code) when publishing, allowing follow-up tracking of the perceived quality and influence through publication databases and topic mapping.			
2 Message: Horizon Europe strengthens human capital, as shown by the improvement in skills, reputation and working conditions of participants[3].			
Skills Number of researchers having benefitted from upskilling activities in FP projects (through training, mobility and access to infrastructures)[4]	**Careers** Number and share of upskilled FP researchers with more influence in their R&I field	**Working conditions** Number and share of upskilled FP researchers with improved working conditions	**Strengthening human capital in R&I**
Data needs: collection of unique identifiers of individual applicants to the FP at proposal stage, allowing follow-up tracking of their influence in their field through publication and patent databases, awards and prizes, as well as evolution of working conditions through salary levels and benefits.			
3 Message: Horizon Europe opens up science, as shown by research outputs shared openly, re-used and stimulating new transdisciplinary/trans-sectoral collaborations[5].			
Shared knowledge Share of FP research outputs (open data/ publication/ software etc.) shared through open knowledge infrastructures	**Knowledge diffusion** Share of open access FP research outputs actively used/cited after FP	**New collaborations** Share of FP beneficiaries having developed new transdisciplinary/ trans-sectoral collaborations with users of their open FP R&I outputs	**Fostering diffusion of knowledge and Open Science**
Data needs: Identification of research outputs (in particular publications and research data) co-funded by the FP through the insertion of a specific DOI for the FP when publishing or sharing openly (e.g. OA journals/ platforms (publications) and open FAIR repositories (data)), allowing follow-up tracking of open access performance in terms of active use/citations and collaborations.			

1.2 Societal impact pathway indicators

Horizon Europe is expected to have societal impact by addressing EU policy priorities through R&I, delivering impact through R&I missions and strengthening the uptake of R&I within society. Progress towards this impact will be monitored according to the proxy indicators and impact pathways set out in Figure 13 below.

Figure 13: Key societal impact pathways & progress indicators

Short-term	Medium-term	Longer-term	Societal impact
4 Message: Horizon Europe helps addressing EU policy priorities (including meeting the SDGs) through R&I, as shown by the portfolios of projects generating outputs which help to tackle global challenges.			
Outputs Number and share of outputs aimed at addressing specific EU policy priorities (including meeting the Sustainable Development Goals (SDGs))	**Solutions** Number and share of innovations and scientific results addressing specific EU policy priorities (including meeting the SDGs)	**Benefits** Aggregated estimated effects from use of FP-funded results on tackling specific EU policy priorities, including contribution to policymaking and legislation	**Addressing EU policy priorities through R&I**
Data needs: Projects classified according to the specific EU policy priorities (including the SDGs) pursued and follow-up tracking of their outputs, results and impacts. Portfolio analysis on effects from scientific results & innovations in specific EU policy priority/SDGs areas, text mining.			
5 Message: Horizon Europe produces knowledge and innovation that contribute to achieving missions of EU interest[6].			
R&I mission outputs Outputs in specific R&I missions	**R&I mission results** Results in specific R&I missions	**R&I mission targets met** Targets achieved in specific R&I missions	**Delivering benefits and impact through R&I missions**
Data needs: Projects classified according to the missions pursued and follow-up tracking of their outputs, results and impacts according to the target set. Portfolio analysis on effects from scientific results & innovations in mission areas.			
6 Message: Horizon Europe creates value for European citizen, as shown by the engagement of citizen in the projects and beyond the projects by improved uptake of scientific results and innovative solutions[7].			
Co-creation Number and share of FP projects where EU citizens and end-users contribute to the co-creation of R&I content	**Engagement** Number and share of FP beneficiaries with citizen and end-user engagement mechanisms after FP project	**Societal R&I uptake** Uptake and outreach of scientific results and innovative solutions co-created in the FP	**Strengthening the uptake of innovation in society**
Data needs: Collection of data at proposal stage on the roles of partners (incl. citizen) in the projects, structured survey of beneficiary entities and tracking of uptake and outreach through patents and trademarks and media analysis.			

Horizon Europe における Key Impact Pathways Indicators – EU (6/6)

1.3 Economic impact pathway indicators

Horizon Europe is expected to have an economic/innovation[8] impact by stimulating the creation and growth of companies, creating jobs both directly and indirectly and by leveraging investments for R&I. Progress towards this impact will be monitored according to the proxy indicators and impact pathways set out in Figure 14 below.

Figure 14: Key economic impact pathways indicators

Short-term	Medium-term	Longer-term	Societal impact
7 Message: Horizon Europe is a source of economic growth, as shown by the patents and innovations that are launched on the market and generate added value for businesses[9].			
Innovative outputs Number of innovative products, processes or methods from FP (by type of innovation[10]) & Intellectual Property Rights (IPR) applications[11]	**Innovations** Number of innovations from FP projects (by type of innovation) including from awarded IPRs	**Economic growth** Creation, growth & market shares of companies having developed FP innovations	**Innovation-based growth**
Data needs: Reporting of beneficiaries on innovative products, processes or methods from FP and their practical use, and insertion of a specific DOI for the FP (funding source code) when filling IPR applications, allowing follow-up tracking of the patents through patent databases and trademarks ("follow the investor approach").			
8 Message: Horizon Europe generates more and better jobs, initially in the projects, and then through the exploitation of the results and their diffusion in the economy[12].			
Supported employment Number of FTE jobs created, and jobs maintained in beneficiary entities for the FP project (by type of job[13])	**Sustained employment** Increase of FTE jobs in beneficiary entities following FP project (by type of job)	**Total employment** Number of direct & indirect[14] jobs created or maintained due to diffusion of FP results (by type of job)	**Creating more and better jobs**
Data needs: Collection of information on individuals involved in FP projects at proposal stage, including their workload (Full Time Equivalent) and job profile allowing follow-up tracking of employment in beneficiary organisations. Longer-term indicator will be an estimate based on a dedicated study.			
9 Message: Horizon Europe is leveraging investments for R&I in Europe, initially in the projects, and then to exploit or scale-up their results[15].			
Amount of public & private investment[15] mobilised with the initial FP investment	Amount of public & private investment mobilised to exploit or scale-up FP results	EU progress towards 3% GDP target due to FP	**Leveraging investment**
Data needs: Data on co-funding in FP projects by source of funds including other EU funds (e.g. ESIF), collection of unique identifiers of applicants to the FP at proposal stage (e.g. VAT), allowing follow-up tracking of their capital. Longer-term indicator will be an estimate based on a dedicated study.			

2 KEY MANAGEMENT AND IMPLEMENTATION DATA

This section outlines the key data to be collected in order to assess how the programme is being implemented. The data covers the inputs and activities of Horizon Europe, including the European Partnership initiatives.

- *Number of proposals and applications submitted, EC contribution requested and total costs of submitted proposals (by source of funds)*
- *Number of proposals reaching the quality threshold (funded/not funded)*
- *Number of retained proposals*
- *Success rates of proposals*
- *EC contribution and total costs of retained proposals (by source of funds)*
- *Number of participations and single participants*

This information shall be collected according to:

- *Types of action*
- *Types of organisations, including Civil Society Organisations (with specific data for SMEs)*
- *Countries and regions of applicants and participants (including from associated and third countries)*
- *Sectors*
- *Disciplines*

Data shall also be monitored on the profiles of beneficiaries and proposal evaluators, including:

- *Gender balance (in projects, evaluators)*
- *Role(s) in project*[17]
- *Share of newcomers to the Programme*

Data shall also be monitored on project implementation issues, including:

- *Time-to-grant*
- *Time-to-pay*
- *Error rate*
- *Satisfaction rate*
- *Rate of risk taking*

Data shall also be monitored on:

- *The financial contribution that is climate-related*

Data shall also be collected on:

- *Communication of R&I results*
- *Dissemination of R&I results*
- *Exploitation and deployment of R&I results, including through monitoring the funding allocated for uptake of R&I results through the other proposals for the long-term EU budget.*

1 Indicators on publications are collected under Horizon 2020, for instance the number of peer reviewed publications and top 1% or 10% citations but with different coverage across programme parts.

2 The indicators will be tracked also for co-authored publications across types of organisations, disciplines, sectors, countries (including associated and third countries).

3 Data on individual researchers and innovators is collected only under some programme parts under Horizon 2020 (ERC, MSCA). It is proposed to extend the coverage to the whole Programme and to look at the overall effects of the FP on individuals based on the collection of unique identifiers for each beneficiary at project's start. This shall allow for a more solid and automated analysis of the contribution of the Programme to the strengthening of human capital without further data requests to beneficiaries.

4 By type of activities: training, mentoring/coaching, mobility, access to infrastructures.

5 Two indicators were specified as a cross-cutting issue under Horizon 2020 for open access publications and open access to data.

6 Missions are a new element under the Framework Programme, which did not exist under Horizon 2020 and will be not be specified at the stage of the legal proposal. The interim evaluation of Horizon 2020 pinpointed to the lack of data to track the societal impact of the Programme beyond publications and patents in fields related to societal challenges. It is proposed to assess the progress towards the achievement of the targets set in each mission.

7 Data on responsible research and innovation was collected under Horizon 2020 at the level of the activities within projects. It is proposed to go beyond this indicator to assess the effects of the co-creation on the development of citizen engagement mechanisms in beneficiary entities (such as citizen fora, participatory research, co-creation facilities, etc.) to then assess the extent this affects the uptake and outreach of the scientific results (e.g. changing behaviours) and innovative solutions from the programme.

8 An innovation is a new or improved product or practice (policy, process or procedure) of an institutional unit, or a combination thereof, that differs significantly from the unit's previous products and practices and has been brought into practical use by the unit or made available to others.

9 Horizon 2020 includes an indicator on the growth and job creation in participating SMEs but no data is collected. It is proposed to extend this indicator to the whole programme and to collect information on the types of jobs created or maintained based on the collection of unique identifiers of companies. This shall allow for a more solid and automated analysis of the contribution of the Programme to the creation of more and better jobs without further data requests to beneficiaries.

10 Types of innovation: by level of novelty of the innovation (e.g. based on the Oslo Manual definition), by objective of the innovation (incl. social innovation) and by source of innovation (i.e. technological (Key Enabling Technologies, other) /non-technological).

11 Patents, trademarks, standards. The indicators will be tracked also for co-authored IPR across types of organisations, disciplines, sectors, countries (including associated and third countries).

12 Data on innovative products, process or methods developed in FP projects is collected under Horizon 2020 but the effects on company creation, growth and market shares are not monitored.

13 Types of jobs: by level of qualification (low, medium, high (based on ISCED 1997 levels) and contract duration (short, long term).

14 Direct jobs: jobs within beneficiaries entities. Indirect jobs: Jobs in non-FP beneficiary entities (e.g. suppliers).

15 Public and private funding leveraged under Horizon 2020 is computed on different ways depending on the types of action. It is proposed to use an overall indicator of the direct and indirect public and private investment leveraged including venture investment, loans and other co-financing, to be able to assess the overall contribution of the Programme to the achievement of the 3% target for R&D investments.

16 Including venture investment, loans and other co-financing.

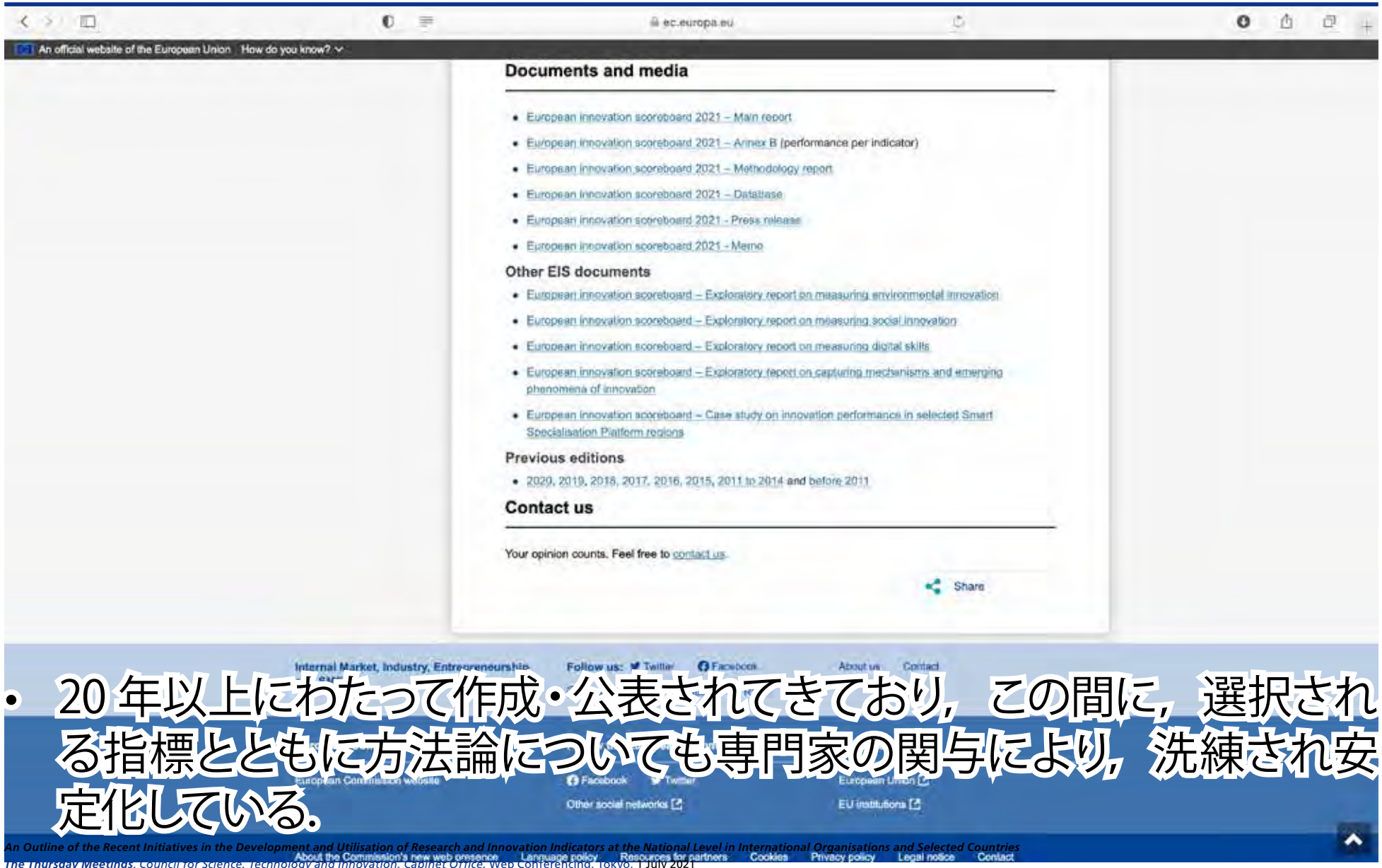
17 e.g. Research performer; Technology development; Testing / validation; Demonstration (proof of viability); Scale-up; Private buyer of solutions to be developed; Public procurer of innovative solutions; Finance provider; Provision of the technology basis; Provision of the technology infrastructure; Representative of civil society interests/needs; Co-definition of a research / market need; Training, dissemination activities).

- Key Impact Pathways Indicators 及び Key Management and Implementation Data として，指標の概要及び必要とされる／収集されるべき情報・データについて示されている.

European Innovation Scoreboard – EU (1/4)

- EU のメンバー国等における状況やその変化をモニタリングする.

European Innovation Scoreboard – EU (2/4)



- 20 年以上にわたって作成・公表されてきており，この間に，選択される指標とともに方法論についても専門家の関与により，洗練され安定化している．

European Innovation Scoreboard – EU (3/4)

- 2021 年版では，12 の次元にわたる 32 の指標から構成されている．
  ［次ページ］

European Innovation Scoreboard – EU (4/4)

Table 1: Measurement framework of the European Innovation Scoreboard

FRAMEWORK CONDITIONS

Human resources

1.1.1 New doctorate graduates (in STEM)
1.1.2 Population aged 25-34 with tertiary education
1.1.3 Lifelong learning

Attractive research systems

1.2.1 International scientific co-publications
1.2.2 Top 10% most cited publications
1.2.3 Foreign doctorate students

Digitalisation

1.3.1 Broadband penetration
1.3.2 Individuals who have above basic overall digital skills

INVESTMENTS

Finance and support

2.1.1 R&D expenditure in the public sector
2.1.2 Venture capital expenditures
2.1.3 Direct government funding and government tax support for business R&D

Firm investments

2.2.1 R&D expenditure in the business sector
2.2.2 Non-R&D innovation expenditures
2.2.3 Innovation expenditures per person employed in innovation-active enterprises

Use of information technologies

2.3.1 Enterprises providing training to develop or upgrade ICT skills of their personnel
2.3.2 Employed ICT specialists

INNOVATION ACTIVITIES

Innovators

3.1.1 SMEs with product innovations
3.1.2 SMEs with business process innovations

Linkages

3.2.1 Innovative SMEs collaborating with others
3.2.2 Public-private co-publications
3.2.3 Job-to-job mobility of Human Resources in Science & Technology

Intellectual assets

3.3.1 PCT patent applications
3.3.2 Trademark applications
3.3.3 Design applications

IMPACTS

Employment impacts

4.1.1 Employment in knowledge-intensive activities
4.1.2 Employment in innovative enterprises

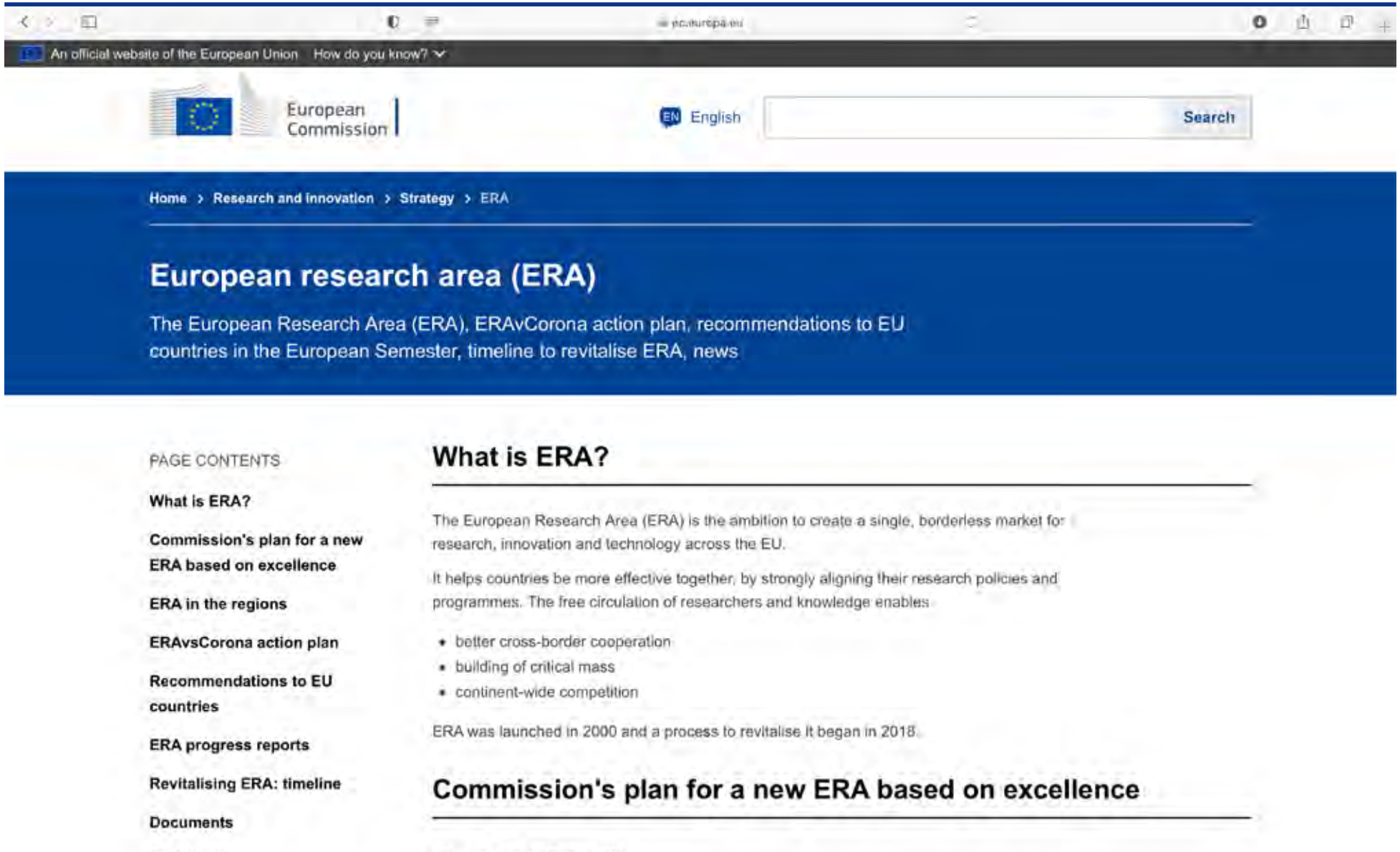
Sales impacts

4.2.1 Medium and high-tech product exports
4.2.2 Knowledge-intensive services exports
4.2.3 Sales of product innovations

Environmental sustainability

4.3.1 Resource productivity
4.3.2 Air emissions by fine particulates PM2.5 in Industry
4.3.3 Development of environment-related technologies

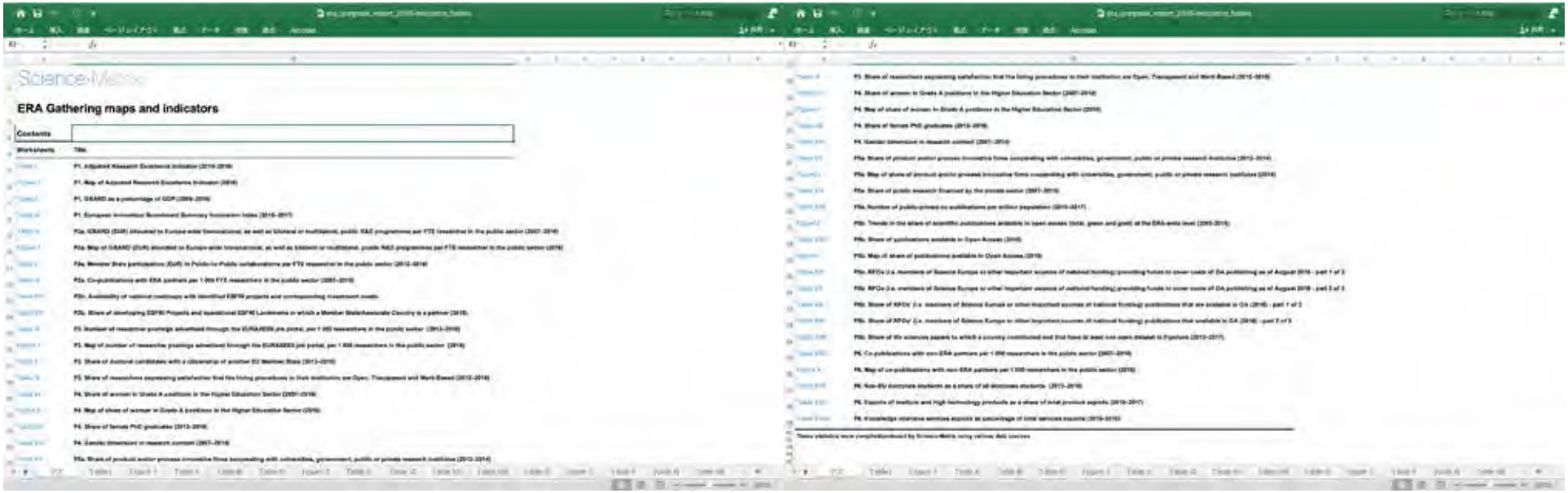
ERA (European Research Area) – EU (1/5)



ERA (European Research Area) – EU (2/5)

- この Progress Report 2018 では, EU 全体及びメンバー国における ERA (European Research Area) の進展を，研究に関わるさまざまな局面から捉えようとしていることが窺える.

ERA (European Research Area) – EU (3/5)



ERA (European Research Area) – EU (4/5)

- 改めて EU 及びメンバー国が取るべき 14 の行動が示されており，その進捗をモニタリングしていくことになると推察される．［次ページ］

ERA (European Research Area) – EU (5/5)

The EU and Member States will shape the new European Research Area through 14 actions:

1. Reaffirm the target of 3% GDP on EU research and development investment and propose a new EU 1.25% GDP public effort target to be achieved by Member States by 2030.
2. Support Member States in the coordination and prioritisation of national research and innovation funding and reforms through an European Research Area Forum for Transition. Voluntarily commit 5% of national public research and development investments to joint programmes and European partnerships by 2030.
3. Support Member States that are below the EU average level of research and innovation investments to increase their investment by 50% in the next 5 years.
4. Support Member States that have lower performance in training their researchers to access and develop excellence and increase their number of highly cited publications by one-third over 5 years.
5. Develop common industrial technology roadmaps to maximise innovation in strategic areas like Artificial Intelligence, circular industries and resilient health industries.
6. Develop and test a networking framework in support of Europe's research and innovation ecosystems, building on existing capacities, to strengthen excellence and maximise the value of knowledge creation, circulation and use.
7. Update and develop guiding principles for creating value from knowledge and a code of practice for the smart use of intellectual property.
8. Deliver a toolbox of measures to support researchers' careers, through a mobility scheme, trainings and more, in order to make Europe more attractive for talent.
9. Launch a platform of peer-reviewed open access publishing and incentivise open science practices by improving the research assessment system.
10. Support the creation of world-class research infrastructures and establish an updated governance structure for research and technological infrastructures.
11. Develop a roadmap of actions for creating synergies between higher education and research, notably building on the dual role of universities.
12. Develop concrete plans with Member States to promote gender equality, as well as diversity and inclusiveness, in science, research and innovation.
13. Organise citizen science campaigns and hackathons to engage citizens, especially young people, in science and innovation.
14. Develop with Member States a new approach to set and implement strategic priorities for the European Research Area, through a Pact for Research and Innovation in Europe.

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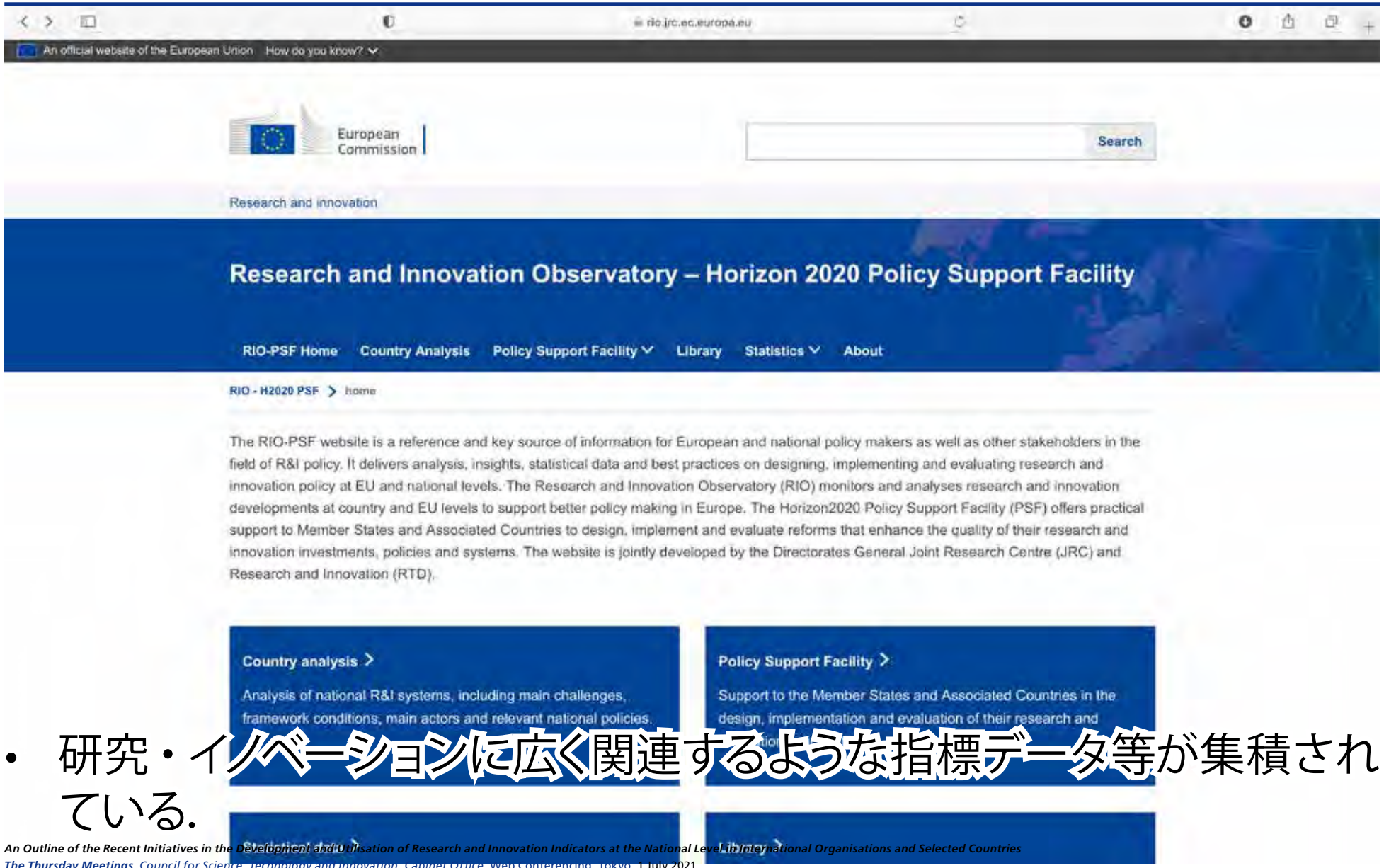
RIO (Research and Innovation Observatory) – EU (1/2)



- 研究・イノベーションに広く関連するような指標データ等が集積されている.