



## ASSESSING THE IMPACT PATHWAYS OF IA/RIA SC5 PROJECTS THROUGH THE USE OF PORTFOLIO ANALYSIS

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### D4.3 Actionable Knowledge Toolkit

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## 1 The IMPACT-SC5 Actionable Knowledge Toolkit

At the beginning of the 1980s, the European Commission proposed the framework programme (FP) for research and innovation as a strategic tool to manage the adoption of research programmes in a more coherent way. As the FPs evolved, the instruments used for its implementation diversified. The initial grants for transnational cooperative research projects were complemented, inter alia, by the development of public-public and public-private partnerships, the establishment of new structures such as the European Research Council (ERC) and the European Institute for Innovation and Technology (EIT), specific instruments for SME support, and individual mobility grants. With Horizon 2020 the FP became a programme of programmes covering all aspects of the innovation process and implementing various EU policies<sup>1</sup>.

In this context, the results, outcomes and impacts from these particular FPs as well as their awarded projects have been documented in multiple evaluation exercises and dedicated studies either from evaluation practitioners or the European Commission itself. For the post-2020 Programme, [Horizon Europe](#), the European Commission proposed a revamped indicator framework built around a set of **Key Impact Pathways**. As such, the time dependent impact areas (i.e. outputs, outcomes and impacts) are divided into three complementary and non-exclusive impact categories, including<sup>2</sup>:

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

The emergence of the impact pathways approach has been associated to the limitations of conventional tools such as logical framework to predict the non-linear R&I impact trajectories embedded in the context dependent system. The impact pathways are inherently characterised by learning, backward and forward feedback loops, trial and error, etc. and thus are ill-fitted with linear models for understanding the impact generation process.

Our [IMPACT-SC5](#) – “Assessing the impact pathways of IA/RIA SC5 projects through the use of portfolio analysis” – aims to review the impacts of the projects granted under Horizon 2020 Societal Challenge

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<sup>1</sup> European Parliamentary Research Service (2017), EU framework programmes for research and innovation, Evolution and key data from FP1 to Horizon 2020 in view of FP9, September 2017 — PE 608.697, available at: <https://op.europa.eu/en/publication-detail/-/publication/7857e8f0-a4c1-11e7-837e-01aa75ed71a1/language-en>

<sup>2</sup> Bruno Nelly, and Martina Kadunc (2019). "Impact Pathways: Tracking and communicating the impact of the European Framework Programme for research and innovation." *fteval Journal for Research and Technology Policy Evaluation* 47 (2019): 62-71.

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5 (SC5) as well as its supplementary Work Programmes and calls (e.g. Water-2014, Waste2015, EE-2014, etc.). This evaluation and impact assessment focusses on the 87 RIA and IA projects funded under the SC5 Work Programme 2014-2015 and looks at them in terms of their scientific, economic, societal and environmental performance, both individually and across portfolios of projects.

With that in mind, we have designed an **Actionable Knowledge Toolkit** which translates our experience drawn from the implementation of the IMPACT-SC5 project into understandable and usable (actionable) adding-value content, tailored to policymakers and evaluation practitioners. As such, the IMPACT-SC5 Actionable Knowledge Toolkit includes the lessons learnt, guidelines and recommendations on how to design, integrate and monitor the impact pathways into the policy programme. In addition, it presents the barriers encountered from SC5 projects during their implementation as well as the success factors that helped the projects accomplish their objectives as well as, thus being relevant for future project beneficiaries.

Along these lines, the IMPACT-SC5 Actionable Knowledge Toolkit is structured around 4 main chapters as indicated below:

- 1) **Chapter 1:** provides introductory information about the context in which the IMPACT-SC5 Actionable Knowledge Toolkit has been elaborated;
- 2) **Chapter 2:** presents the Societal Challenge 5 Work Programme 2014-2015 along with the barriers encountered from the awarded projects during their implementation as well as the success factors that helped the projects accomplish and the added value of the Programme;
- 3) **Chapter 3:** offers our policy recommendations on how impact pathways can be effectively and efficiently integrated and monitored into the policy cycles as well as provides a series of prerequisites for the impact pathways analysis;
- 4) **Chapter 4:** illustrates a number of tools that can support the enhancement of potential impact of actions funded under Horizon Europe.

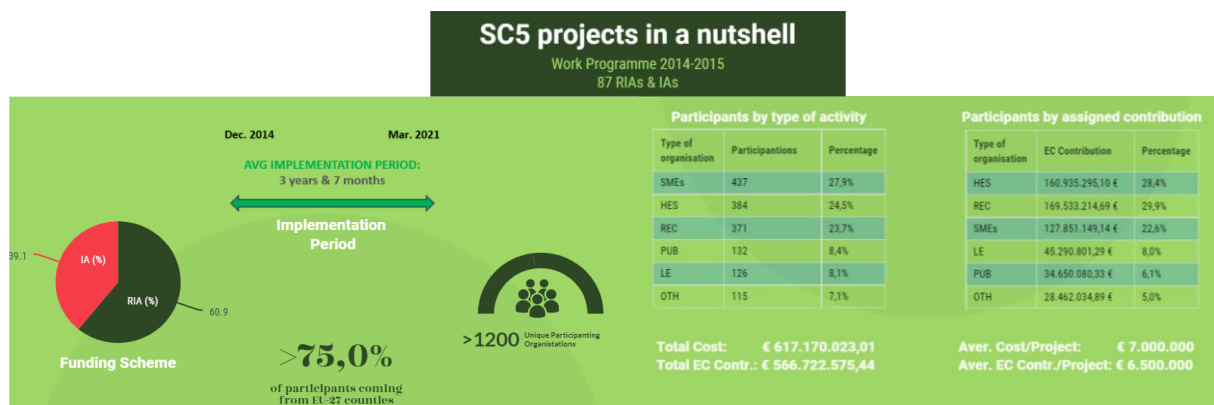
In addition, annexed to this document can be found our evaluation exercise **Intervention Logic** (Annex I), the **List of Indicators** employed (Annex II), the **Interview Guide** used for interviewing the SC5 project coordinators and SC2 project beneficiaries (Annex III) and the **Survey Questionnaire** (Annex IV).

## 2 The Societal Challenge 5 Work Programme 2014-2015

### 2.1 The Societal Challenge 5 Work Programme 2014-2015 in a nutshell

The Societal Challenge 5 Work Programme 2014-2015 (SC5 WP 2014-2015) aimed at investing in innovation for a green economy, addressing the gaps in the knowledge base needed to understand the changes occurring in the environment, identifying policies, methods and tools that would most effectively tackle the abovementioned challenges, and supporting innovators and businesses to bring green solutions to the market. Waste and water were selected as particular priorities for the SC5 WP 2014-2015. In a nutshell, some key facts and figures on the 87 SC5 projects under scrutiny are illustrated below:

Figure 1: Facts & Figures on the SC5 projects under scrutiny.



Within this context, in total eighty-seven (87) projects were funded from thirty (30) different topics from which, three fifths (60,9% or 53 projects) constitute Research and Innovation Actions (RIAs) while the remaining 39,1% (or 34 projects) were Innovation Actions (IAs). The average implementation period for all the 87 projects is calculated at around 3 years and 7 months.

#### CloseWEEE, INFINITY OptiOre

CloseWEEE, INFINITY and OptiOre were the first projects to kick-off the SC5 WP 2014-2015 – All three started in December 2014

#### CRESCENDO

The SC5 WP 2014-2015 was completed with the final curtain of CRESCENDO (March 2021)

These 87 projects involved more than 1,200 unique participating organisations, of which approximately one third (36,0%) are Private-for-profit entities, 24,5% Higher or Secondary Education Establishment and 23,7% Research Organisations. The remaining 15,7% of the participation came from Non-profit Research Organisation (8,4%) and Other Establishments (7,3%). Interesting is the fact that the vast majority of the private for-profit entities that participated are SMEs (77,6% or accounting for the 27,9% of the total participation) while only a fifth are Large Enterprises (22,4% or accounting for the 8,1% of the total participation).

#### AtlantOS

**AtlantOS** was the project including the most non-EU-27 partners. More specifically, AtlantOS included **19 non-EU-27 partners** coming from Canada, the USA, Brazil, South Africa as well as Norway and the UK.

Overall, **organisations from around seventy (70) different countries were involved**. The vast majority of the participating organisations came from EU-27 countries (around 75,0%). In parallel, a considerable number of beneficiaries coming from the UK was involved, accounting for 11,3% of the total participation.

Finally, a number of beneficiaries was engaged coming from all over the world (such as the US, Canada, Australia, Japan, China, different African countries, etc.).

As expected more than half of the participation (50,2%) in the IA projects under scrutiny came from Private-for-profit entities, most of which representing SMEs. Participation from Higher or Secondary Education Establishment and Research Organisations was calculated at 33,1%. On the other hand, RIA SC5 projects involved mostly academic partners and research-oriented partners (56,9%) while the participation of private establishments reached 27,9%.

#### AtlantOS

**AtlantOS** was also the project receiving the highest EC contribution amongst all the SC5 projects. In further detail the project received more than EUR 20M. The project was RIA.

On top of the abovementioned, the total cost of all the projects under investigation was EUR 617,170,023.01 with an **EC maximum contribution of EUR 566,722,575.44**. In further detail, approximately **two thirds of the EC maximum contribution (65,0%) were allocated to RIAs while the remaining one third (35,0%) to IAs**. The cost of projects ranges from EUR 2,361,622.50 (REMEB project) to EUR 20,652,921.00 (AtlantOS project). The average cost of the projects is approximately EUR 7,000,000.00 while the average EC

#### FORCE

**FORCE** was the IA that received the highest budget compared to the other IA of the WP. The EC max contribution for FORCE was a little less than EUR 10M.

contribution reached around EUR 6,500,000.

Research Organisations and Higher or Secondary Education Establishments absorbed more than half of the EC funding (around 58%). This is aligned with the fact that around two-thirds of the projects represent RIAs. **Private for-profit entities absorbed 30,6% of the EC contribution, most of which allocated to SMEs**. Last but not least, Public Bodies received in their accounts around EUR 34M or 6,1% of the total funding, while 5,0% of the money has been absorbed by other organisations types.

When looking only at the **IAs where the funding rate is associated with the type of organisation** (in principle, the rate is 70 percent for profit-making legal entities and 100 percent for non-profit legal entities) approximately EUR 238,000,000 were acquired from such projects while EUR 199,000,000 were eventually reimbursed (or 83,5% funding rate). In relation to the **private-for-profit entities participating in IAs**, these absorbed two fifths of the overall IA funding (**40,6% or around EUR 80M**). The majority of IA funding was allocated specifically to SMEs. When observing the RIAs, the amount of budget dedicated to private-for-profit entities dropped to a quarter of the total RIA awarded budget (**25,2% or around EUR 90M**).

## 2.2 Barriers encountered from SC5 projects during their implementation

According to our analysis, in general the SC5 WP 2014-2015 managed to satisfactorily achieve the expected objectives of its various calls. However, during the implementation of this Programme, the awarded projects encountered a number of barriers that hindered their successful implementation. Along these lines, based on a series of interviews that our team conducted with a number of SC5 project coordinators and partners the following barriers were reported.

### 1. Time constraints

One of the main barriers reported from the SC5 project beneficiaries was associated with the timeframe initially dedicated to the projects. In most of the cases, projects were designed to kick-off as three-years RIAs or IAs. In reality, this proved to be very challenging as more time was needed for the successful implementation of all projects' activities. In this context, a number of projects asked for 3 to 6 months extensions with a mind to accomplishing their objectives and targets.

#### EQUINOX

The project was designed and kicked-off as a three-year RIA. The EQUINOX officer well understood the specific needs of the project and provided the necessary extension (6 months) that proved to be pivotal to the successful accomplishment of the EQUINOX objectives.

~ EQUINOX Project Coordinator ~

#### OPTIMORE

We lacked a little time, we asked for an extension and managed to meet 100% of the project's objectives and even more in some respects but taking into account the dynamics of the project we would have gone much further if we had had 6 more months.

~ OPTIMORE Project Coordinator ~

### 2. Legislative issues

Apart from the abovementioned, projects mostly implementing real-life demonstrations and pilot cases in the water and waste domain faced national regulative obstacles. Each country has differences in water and waste regulations and these differences restricted the initial workplans of some SC5 projects. In particular cases, pilot cases were cancelled due to legislation restrictions and new pilot locations were explored and selected to host the pilot activities.

#### DECISIVE

During the implementation of our project we faced regulatory difficulties. A pilot case in Barcelona had to be cancelled due to legislative restrictions. We had to find a new location in Italy to host the pilot technology. This is through a common in research projects with pilot cases.

~ DECISIVE Project Coordinator ~

#### FORCE

Beaurocratic procedures that did not allow us to perform all the pilot activities that we intended to, especially in Hamburg and in Genova.

~ FORCE Project Coordinator ~



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**INNOQUA**

The legal framework was the main barrier encountered during INNOQUA. Difficulty in implementing project's system in the real world due to the restrictions from the water legislations.

~ INNOQUA Project Coordinator ~

**STORM**

National bureaucracy when it comes to the use of cultural heritage sites for experimentation and use in research projects.

~ STORM Project Coordinator ~

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### 3. Follow-up activities

Another barrier heavily reported by SC5 project beneficiaries was related to the follow-up activities required so as to continue the projects' activities after the EC funding. In this context, SC5 project beneficiaries reported that in terms of follow-up opportunities and bringing project outcomes to the market, there is a lack continuity of topics. In further detail, in most of the cases SC5 projects made efforts and some applications in other calls which have been eventually rejected. Only in some minor occasions, projects achieved to obtain additional funding with a view to implement follow-up projects or market related activities.

**HISER**

The HISER project developed technologies up to TRL5. This means that the developed technologies are not industrially applicable yet, but further funding is needed. In this sense, we have not yet found any appropriate funding source to make follow-up activities.

~ HISER Project Coordinator ~

**CLOSEWEEE**

In terms of follow-up opportunities and bringing project outcomes to the market, there is a lack of funding opportunities. Instead of building on outputs and funding projects to move further along the value chain and closer to market, the EC changes the topics, and a relevant call may not come around for several years.

~ CloseWEEE Project Coordinator ~

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### 4. Difficulty in coordinating large and multi-cultural consortia

In addition, the coordination of large and multi-cultural partnership proved to be a considerable barrier that SC5 WP 2014-2015 projects encountered during their implementation. As the project beneficiaries reported, cultural miscommunication made it difficult sometimes to meet the project deadlines. Moreover, working sites in remote areas such as in Africa and South America made in even more challenging the coordination of the projects. Last but not least, the above mentioned resulted in minor day to day management and implementation issues that in most of the cases were settled.

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### SOLSA

The coordination of a multi-cultural partnership was one the main barrier encountered during the first implementation year of SOLSA. Within the project, there were partners from France, Italy, Lithuania and so forth who needed different approaches in communicating the concept of SOLSA and eventually to having a mutual understanding of the project. In this respect, a considerable number of face-to-face meetings has been organised with each and every partner with a view to reaching a common understanding.

~ SOLSA Project Coordinator ~

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## 5. COVID-19 outbreak (for projects still running during 2020)

The COVID-19 pandemic has caused an unprecedented disruption to the normal operating procedures in not only Horizon 2020 projects but also to our everyday lives. As such, projects running amidst the COVID-19 outbreak faced a number of obstacles associated with that. In general, this sanitary crisis did not allow the projects to effectively perform some of the planned activities. The latter activities were mainly related to physical workshops and trainings as well as demonstration activities happening in different parts of Europe.

### BlueNodules

On the timeframe for exploitation, it was to be a very important year for ISA in the development and approval of regulations, but the covid-19 pandemic significantly delayed the negotiations. There was a draft of the regulations to be discussed in July 2020 which was delayed. In addition, it has been more difficult to do work in the field. However, for the project it was fortunate that the impact of the pandemic was limited as it only impacted the last 4-5 months of project.

~ BlueNodules Project Coordinator ~

### MAGIC

The COVID-19 has negatively influenced the execution of some of the activities foreseen in 2020 and has been the reason that explains the extension of the project implementation period.

~ MAGIC Project Coordinator ~

### WADI

COVID-19 had an impact on training sessions for end-users. The last training course for instance had to be carried out in a virtually and was less impactful than the previous ones.

~ WADI Project Coordinator ~

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## 2.3 Success factors that helped SC5 projects accomplish their objectives and targets

### 1. Vigorous and Multidisciplinary team

By far, the most important success factor that helped SC5 WP 2014-2015 projects accomplish their objectives and targets was related to the good partnership, eager of team members and blend of disciplines within the consortia. Good partnership with good cooperation and skills among the partners along with willingness to work together was reported to be a major success factor. Moreover, the interdisciplinary character of the projects including a broad range of organisations (universities, industries, SMEs, etc.) helped a lot the accomplishment of their objectives. Last but not least, it was also indicated that in order to develop successful projects, it is important to know the people you work with, have confidence, be aware that they are reliable and that they have complementary skills.

#### Flintstone 2020

Good alignment of the partners and interdependence on one another. The goal was to reach a certain point on the value chain (from research to demonstration and medium-scale production) and all partners worked in the knowledge that that had to be achieved. People – good collaboration, a strong team, reliability of the partners.

~ Flintstone 2020 Project Coordinator ~

#### RESCCUE

The excellence of the team that has participated in the project, the teams of the participating partners have worked with professionalism, with desire and motivation to carry out the project.

~ RESCCUE Project Coordinator ~

#### EU-CIRCLE

Excellent consortium that involved public institutions as partners that provided the data necessary for the conduct of the research.

~ EU-CIRCLE Partner ~

#### REMEB

The good working environment achieved in the project: everyone provided help when needed, everyone responded on time and worked very seriously.

~ REMEB Project Coordinator ~

#### REPAiR

80% of the success goes to the people that were part of the consortium. It was crucial that partners were open and able to make the step out of his or her own comfort zone.

~ REPAiR Project Coordinator ~

#### RESIN

Huge success factor was the composition of the consortium and that most of the partners knew each other before.

~ RESIN Project Coordinator ~

## 2. Supportive project officers and EC services

Another important success factor for SC5 projects was the flexibility shown by the EC and more specifically the active participation of the Project Officers, who well understood projects' needs. Moreover, it was also reported that Project Officers and overall, the EC administrative services were implementing the procedures in a flexible and non-bureaucrat manner. It was also mentioned that the EC selected in the end the right reviews, having the necessary technical knowledge, to review the projects.

### CYTO-WATER

The outstanding assistance of the Commission in the management of the project. An amendment had to be made and the Commission provided all kinds of casuistry for solving the problems with the partners  
 ~ CYTO-WATER Project Coordinator ~

### AMBER

The project was very well-supported by the EC (despite changes in personnel) and benefited from good clarity from EC finance people. The external advisers who reviewed the deliverables were very supportive  
 ~ AMBER Project Coordinator ~

### ECOPOTENTIAL

Excellent choice of the two reviewers appointed by the EC helped to ensure a successful elaboration of the project in line with the proposal  
 ~ ECOPOTENTIAL Project Coordinator ~

### REMEB

The relation and exchanges with the EC Project Officer were very good. He supported the coordinator all through the different amendments to the Grant Agreement.  
 ~ REMEB Project Coordinator ~

### ROBUST

EC review team with technical skills, who contributed to resolving some of the technical issues confronted during ROBUST's implementation.  
 ~ ROBUST Project Coordinator ~

## 3. Transparent and collaborative approach of project management

On top of the abovementioned, another success factor reported is associated with the transparent and collaborative approach of project management, not only covering the implementation phase but starting even from the proposal stage. As such, at proposal stage projects pointed that they made sure that the complete team had a common understanding of the project, that a good planning had been achieved and that people with different backgrounds having different ways of thinking agreed on their role and contribution to the project. At implementation phase, frequent meetings, proactive discussions and planning among the partners were important for recognizing critical project phases and challenges early on.

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**BINGO**

Fluid communication on what was going on was shared among partners and partners were invited to be part of the solutions adopted

~ *BINGO Project Coordinator* ~

**METGROW PLUS**

Proactive discussions and planning among the partners were important for recognizing critical project phases and challenges early on.

~ *METGROW PLUS Project Coordinator* ~

**Ground Truth 2.0**

The very collaborative cooperative way of working that the consortium developed. The semester face to face meeting helped people to form a strong team. Also, the collaboration amongst diverse disciplines went very well.

~ *Ground Truth 2.0 Project Coordinator* ~

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#### 4. Collaboration with other projects and initiatives

Collaboration activities and synergies with other research projects and programmes was another success factor that helped SC5 projects in achieving their scopes. The main value of collaboration and synergies with other research programmes and projects was (and in some cases still is) on the sharing of knowledge and project results, organisation of a number of project-specific events and activities with other projects, conferences and policy-related activities. This way of operating has created research opportunities and business opportunities – past, present and future.

**SIM4NEXUS**

Together with other sister projects, we initiated the Nexus Project Cluster. The Nexus Project Cluster is a group of independent research initiatives who team up for increased and more impacting communication and dissemination of the Nexus.

~ *SIM4NEXUS Project Partners* ~

**BlueNodules**

The most significant impact of interaction with other H2020 projects was information sharing. Discussions between research and industry can lead to common agreements on issues of mutual interest, even impacting projects in which industry cannot take part.

~ *BlueNodules Project Partners* ~

**PRIMAVERA**

We had active collaboration in sharing data and results with other H2020 European projects (in particular, Blue-Action and APPLICATE that applied PRIMAVERA's HighResMIP simulations to the Arctic) and the COPERNICUS climate roadmap project CRECP (providing model data, analyses and advice on modelling).

~ *PRIMAVERA Project Partners* ~

**REPAiR**

Our project was originally designed to stimulate multidisciplinary collaboration not only within the project but also with external stakeholders

~ *REPAiR Project Partners* ~

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## 5. The funding received from SC5 WP 2014-2015

Last but not least, the financial support received via the SC5 WP 2014-2015 was also considered an important success factor for SC5 projects. In further detail, it was pinpointed that without the SC5 funding, some of the projects would have been smaller and longer by many years. The projects would also have been less ambitious in scientific terms. The SC5 funding enabled bringing together multidisciplinary consortium, including experts from universities, research institutions, public sector organisations and business. Moreover, the SC5 funding provided the opportunity to the projects to test the solutions in a number of locations around the Europe.

### SIM4NEXUS

With skilled partners and enough financial resources you can perform good work. EU funding is a challenge to get it but when you get it, you have the room for creativity so as to achieve your expectations.

~ SIM4NEXUS Project Coordinator ~

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## 2.4 The added value of SC5 WP 2014-2015

Last but not least, participating in the SC5 WP 2014-15 has produced the following added value for the **research capabilities** of project partners:

- Interdisciplinary collaboration skills: Learning to work with experts in different domains, e.g. by co-authoring research articles.
- Acquiring experience in standardisation activities: Developing standards for new technological fields.
- Junior career development: Enabling junior researchers to work with senior scientists and gain experience.
- Media skills: Learning to interact with journalists on a regular basis.
- Market knowledge: Gaining reliable knowledge on market demand for new technologies.
- User knowledge: Becoming more sensitive to different user needs.
- Coordination skills: Learning coordinating skills for running large-scale research initiatives.
- Networking skills: Building new collaborative relationships, e.g. between industry and academia.
- Gaining academic visibility: Making a research topic visible in the academic community.

Considering **horizontal collaboration**, the project coordinators have a key role to play according to the partner interviews. The coordinators contribute to horizontal collaboration with other European research projects, initiatives and clusters mainly through information sharing activities. More profound horizontal collaboration, which would also involve the project partners, could be anticipated only in presence of a shared agenda connecting the collaborating parties.

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## 3 Recommendations associated with the impact pathways

### 3.1 Policy Makers

Based on the feedback received during five thematic policy workshops (climate, environment, raw materials, waste and water) organised in May 2021 and the final dissemination event of IMPACT-SC5 in June 2021, we have created the following key recommendations for policy makers to effectively integrate impact pathways in policy programme cycle and monitoring of Horizon Europe:

- The impact pathways approach should inform the full programme cycle, starting already during the agenda-setting phase while addressing indicator issues, as well. The call texts of work programmes have a strong guiding effect on proposal writers. The more knowledgeable of expected impacts the call text is, the better impact-informed proposals can be expected. Especially, the proposal writers need guidance on the societal impact pathway and related indicators, which requires particular care already before the call texts are being prepared. In practice, the issue of measuring and monitoring impacts (indicators) should be addressed when designing the programme, with a clear balance and distinction between RIAs and IAs (e.g. through a more consistent use of TRL) and a particular focus on the indicators concerning the societal impact pathway.
- Clear and transparent impact terminology is needed for avoiding differences in interpretation of impact pathways. Different organisational and disciplinary backgrounds result in high variations in understanding of key concepts of impact pathways thinking, such as outputs, outcomes and impacts. There is a need for shared understanding among the users of impact pathways concepts and indicators, which would support consistency in terms of reporting, as well. In practice, indicator and impact pathways trainings should be organised at various levels (policy makers, programme managers and project partners).
- The numerous EU platforms for dissemination of research results, data and other project materials should be made accessible in one place to support the realization of long-term impacts. Information on the past research projects is scattered on general and domain-specific online project legacy platforms. For more effective use of this information, a shared web portal including effective information search tools should be made available. In turn, this would support preparation of more informed project applications since applicants would be in better position to build on the results and insights achieved in previous research, which is a necessary condition for the achievement of long-term impacts.

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### 3.2 Practitioners

As identified during the implementation of the project IMPACT-SC5, the successful integration of impact pathways within projects will require changes and improvements to be implemented also in the way projects are conceptualized, designed and performed.

Following the outcomes of our research as well as the discussions with experts, practitioners and policymakers, the endorsement of impact pathways in R&I projects would need:

- Organisation of trainings to set a common language and understanding. Better understanding of policymakers, programme designers and project practitioners of the notion and concept of impact pathways will help towards the design of projects and monitoring / evaluation indicators that can effectively, efficiently and appropriately conceptualise and record the impact pathways of the projects. Hence, trainings on the impact pathways as well as the indicators developed thereafter can help towards setting a common understanding and clarifying the terminology and jargon associated with impacts analysis.
- Design of project and organisational processes that consider the time factor as well as the specificities of impact pathways. Impact pathways aim to record the process through which project results transform into outputs, mid-term and long-term impacts. Therefore, the overall time-horizon of the impact pathways usually spans between 3 to 5 years after funding completion. Current project reporting practices tend to meticulously report projects progress up until the end of the project funding period, but do not record the changes that occur on a medium and longer term as a result of the Programme activities. Such recordings would allow for a more realistic assessment and communication of the progress made over time and moving beyond the mere monitoring of programme and project management and implementation data.<sup>3</sup> To be able to record impacts it is important to design project and organisational process that will monitor project results course after the end of the projects funding period.

Moreover, such new processes – complemented by the design of relevant templates to accommodate the new processes – would help towards the improvement of availability and quality of the data that are most needed for the elaboration of efficient and effective evaluations and impact assessment. Of course, this line of activity should be supported on regulatory level also, as current GDPR and privacy data regulations prevent the access to project data for evaluation purposes.

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<sup>3</sup> Bruno, N., & Kadunc, M. (2019). Impact Pathways: Tracking and communicating the impact of the European Framework Programme for research and innovation. *fteval Journal for Research and Technology Policy Evaluation*, (47), 62-71



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- Design indicators that address programmes and projects objectives, serve partners needs and simultaneously promote responsible research and gender monitoring. Following the principles of Traceability, Holism and Stability it is important to minimise the reporting burden on beneficiaries by developing automatic data harvesting from external public and private databases (“Once-Only”) and use additional primary data sources such as project officers, evaluators and reviewers, while at the same time promote the notions of RRI and gender monitoring not so much as quantitative indicators but more as storylines of how projects have achieved to influence organisational structures, policy processes and cultural norms towards the improvement of these aspects. Hence, indicators need to be reconceptualised from quantitative flashes of accomplishment towards beacons of meaningful projects progress supplemented by qualitative impact stories.
  - To balance the importance between R&I and communication and dissemination activities at project level. The accomplishment of medium-and-longer term impacts relies not only on the successful implementation of the research and innovation activities of the projects, but also to the insurance that the projects have been designed with a view to addressing real issues as well as that their results may be taken up by end users. To this end, communication, engagement and consultation with stakeholders and end users right from the conceptualisation and design of the project is needed and considered important, together with the inclusion of relevant stakeholders in the projects partners spectrums. Through such endeavours, consortia may ensure that end users voices are heard during the projects’ activities implementation. Moreover, communication and dissemination should be performed by all partners as on the one hand will allow for different partners to communicate different aspects of the project to different target audiences, but also efforts should be made for academic and research partners to address also “non-traditional” R&I related target audiences, e.g. citizens communities, local policymakers, so as to understand better the specificities of such target audiences and ultimately this may pave the way towards a more calibrated and end-user related design of projects and activities therein.

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## 4 Tools for supporting the conceptualisation of impact pathways

Above we presented our recommendations with regards to the integration of impact pathways across the stages of:

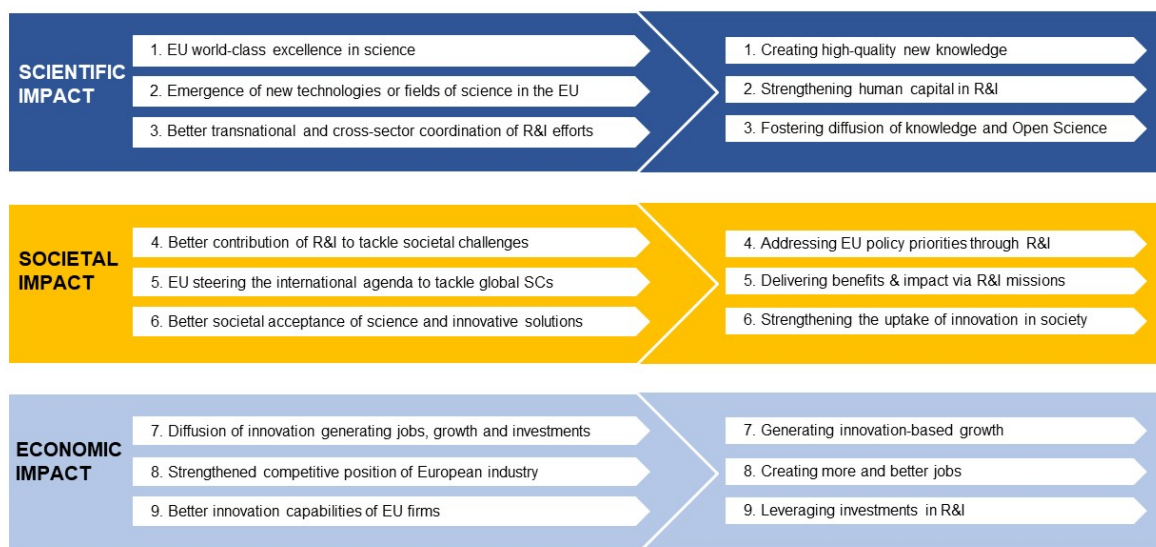
- Programme design;
- Programme implementation; and
- Monitoring and Evaluation (M&E).

In this section, we present a set of tools to enhance the uptake of project and programme results towards scientific, societal and economic impact. Most obvious is the tooling to systematically and consistently integrate impact pathways in the programme cycle, from design to monitoring and evaluation. Participants in our workshops showed a great interest in, but also lack of knowledge and understanding of, impact pathways. It can therefore not be taken for granted that policy officers, project officers and applicants, project coordinators and partners across all institutions grasp the concept from the outset. In this section we therefore start with the overview of tools already developed by the EC to describe and support impact pathways. The second part is a description of tools for communication, engagement, training and consultation. The latter is important, because having the impact pathway approach without active and continuous communication, engagement, training and consultation to support understanding and uptake (ex-ante) and consistent and harmonised data collection and analysis (ex-post) will lead to frustration on all sides.

### 4.1 Impact pathways as a tool to design, implement and monitor impact in the Horizon Europe programme and projects

One important finding from IMPACT-SC5, stemming from the survey and interviews, is that the understanding and interpretation of concepts and terms needs to be shared and consistently applied to get comparable results. Scientific, societal and economic impacts were expected from Horizon 2020 and part of the project application, but the relationship between the overarching indicators, the calls and the projects are not obvious. This has been strengthened in Horizon Europe. The figure below shows the evolution from Horizon 2020 to Horizon Europe high-level impact indicators.

Figure 2: Impact pathways evolution from H2020 to Horizon Europe



Each of the high-level impact indicators has been elaborated with short-term, medium-term and longer-term indicators in the domains of science, society and economy. These are shown in the tables below. To make data reporting and collection at project, portfolio and programme level feasible and manageable, the consistent application of impact pathways and indicators need to be taught and applied during work programme and call design, implementation and monitoring and evaluation.

Table 1: Indicators for achieving scientific impact

Toward scientific impact	Short-term	Medium-term	Longer-term
<b>Creating high-quality new knowledge</b>	Publications – Number of FP peer reviewed scientific publications.	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.
<b>Strengthening human capital in R&amp;I</b>	Skills – Number of researchers having benefitted from upskilling activities in FP projects.	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.

Toward scientific impact	Short-term	Medium-term	Longer-term
<b>Fostering diffusion of knowledge and Open Science</b>	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.	New collaborations – Share of FP beneficiaries having developed new transdisciplinary / trans-sectoral collaborations with users of their open FP R&I outputs.

Table 2: Indicators for achieving societal impact

Toward societal impact	Short-term	Medium-term	Longer-term
<b>Addressing EU policy priorities through R&amp;I</b>	Outputs – Number and share of outputs aimed at addressing specific EU policy priorities.	Solutions – Number and share of innovations and scientific results addressing specific EU policy priorities.	Benefits – Aggregated estimated effects from use of FP funded results, on tackling specific EU policy priorities, including contribution to the policy and law-making cycle-
<b>Delivering benefits and impact through R&amp;I missions</b>	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.
<b>Strengthening the uptake of innovation in society</b>	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 beneficiary entities with citizen and end-users engagement mechanisms after FP project.	Societal R&I uptake – Uptake and outreach of FP co-created scientific results and innovative solutions.

Table 3: Indicators for achieving economic impact

Toward economic impact	Short-term	Medium-term	Longer-term
<b>Generating innovation-based growth</b>	Innovative outputs – Number of innovative products, processes or methods from FP (by type of innovation) & Intellectual Property Rights applications.	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.
<b>Creating more and better jobs</b>	Supported employment – Number of FTE jobs created, and jobs maintained in beneficiary entities for the FP project (by type of job).	Sustained employment – Increase of FTE jobs in beneficiary entities following FP project (by type of job).	Total employment – Number of direct and indirect jobs created or maintained due to diffusion of FP results (by type of job).
<b>Leveraging investments in R&amp;I</b>	Co-investment – Amount of public & private investment mobilised with the initial FP investment.	Scaling up – Amount of public & private investment mobilised to exploit or scale up FP results.	Contribution to ‘3% target’ – EU progress towards 3% GDP target due to FP.

To make impact pathways concrete and actionable at project level, the new application form includes a clearer link to impact pathways. Applicants are required to describe “credible pathways” how their scientific, societal and/or economic results will lead to mid-term outcomes and long-term impacts. To guide and standardise this process, the following 2-part canvas has been developed.

Figure 3: Canvas part 1

SPECIFIC NEEDS	EXPECTED RESULTS	D & E & C MEASURES
<p><i>What are the specific needs that triggered this project?</i></p> <p>Example 1 Most airports use process flow-oriented models based on static mathematical values limiting the optimal management of passenger flow and hampering the accurate use of the available resources to the actual demand of passengers.</p> <p>Example 2 Electronic components need to get smaller and lighter to match the expectations of the end-users. At the same time there is a problem of sourcing of raw materials that has an environmental impact.</p>	<p>What do you expect to generate by the end of the project?</p> <p>Example 1 <b>Successful large-scale demonstrator:</b> Trial with 3 airports of an advanced forecasting system for proactive airport passenger flow management.</p> <p><b>Algorithmic model:</b> Novel algorithmic model for proactive airport passenger flow management.</p> <p>Example 2 Publication of a <b>scientific discovery on transparent electronics.</b></p> <p><b>New product:</b> More sustainable electronic circuits.</p> <p><b>Three PhD students trained.</b></p>	<p>What dissemination, exploitation and communication measures will you apply to the results?</p> <p>Example 1 <b>Exploitation:</b> Patenting the algorithmic model.</p> <p><b>Dissemination towards the scientific community and airports:</b> Scientific publication with the results of the large-scale demonstration.</p> <p><b>Communication towards citizens:</b> An event in a shopping mall to show how the outcomes of the action are relevant to our everyday lives.</p> <p>Example 2 <b>Exploitation of the new product:</b> Patenting the new product; Licencing to major electronic companies.</p> <p><b>Dissemination towards the scientific community and industry:</b> Participating at conferences; Developing a platform of material compositions for industry; Participation at EC project portfolios to disseminate the results as part of a group and maximise the visibility vis-à-vis companies.</p>

Figure 4: Canvas part 2

TARGET GROUPS	OUTCOMES	IMPACTS
<p><i>Who will use or further up-take the results of the project? Who will benefit from the results of the project?</i></p> <p>Example 1  <b>9 European airports:</b> Schiphol, Brussels airport, etc.</p> <p><b>The European Union aviation safety agency.</b></p> <p><b>Air passengers (indirect).</b></p> <p>Example 2  <b>End-users:</b> consumers of electronic devices.</p> <p><b>Major electronic companies:</b> Samsung, Apple, etc.</p> <p><b>Scientific community</b> (field of transparent electronics).</p>	<p><i>What change do you expect to see after successful dissemination and exploitation of project results to the target group(s)?</i></p> <p>Example 1  <b>Up-take by airports:</b> 9 European airports adopt the advanced forecasting system demonstrated during the project.</p> <p>Example 2  <b>High use of the scientific discovery published</b> (measured with the relative rate of citation index of project publications).</p> <p><b>A major electronic company</b> (Samsung or Apple) <b>exploits/uses the new product</b> in their manufacturing.</p>	<p><i>What are the expected wider scientific, economic and societal effects of the project contributing to the expected impacts outlined in the respective destination in the work programme?</i></p> <p>Example 1  <b>Scientific:</b> New breakthrough scientific discovery on passenger forecast modelling.</p> <p><b>Economic:</b> Increased airport efficiency            Size: 15% increase of maximum passenger capacity in European airports, leading to a 28% reduction in infrastructure expansion costs.</p> <p>Example 2  <b>Scientific:</b> New breakthrough scientific discovery on transparent electronics.</p> <p><b>Economic/Technological:</b> A new market for touch enabled electronic devices.</p> <p><b>Societal:</b> Lower climate impact of electronics manufacturing (including through material sourcing and waste management).</p>

## 4.2 Tools for communication, engagement, training and consultation with stakeholders

The year 2020, due to the COVID-19 pandemic, has seen an incredible increase and improvement of tools to allow people to communicate, interact, train and work together at a distance. While it cannot be said that face-2-face meetings, workshops and conferences have become obsolete, it is certainly true that we now have much more sophisticated tools at our disposal for physical, hybrid and online communication, engagement, training and consultation. Platforms such as Microsoft Teams, Zoom, Webex, GoToMeeting/Webinar have improved their user friendliness and functionalities, including integration with interactive tools such as Slido or Mentimeter. Regardless of regaining the ability to travel we would recommend keeping the organisation of online events (meetings, workshops, webinars, trainings, etc.) in every toolbox as these have proven their value. They lower the threshold for participation from any location, overcoming time zones and the need for travel budgets. Indeed, online meetings have allowed participation from all parts of the globe. There are however some lessons learnt from a year+ of online events. In the sections below we describe the steps towards an engaging and interactive event; while written for an online experience most “rules” are true also for offline communication (we have all seen participants in the room more concentrated on their phone than the screen). We also include a range of different platforms available on the market.

### A virtual conference

Creating a virtual conference is a challenging activity for conference organisers, as the attendee experience is completely different. A conference schedule that works well “in person” may not translate well to an online conference, due in part to the lack of interactivity between the speakers and the audience.

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To overcome this, we recommend making use of a wide range of media content, as well as two-way interactivity between the virtual attendees and organisers. Segments should be kept relatively short – no longer than 20 minutes – and interspersed with interactive content such as Q&A sessions, polls and chat.

### **Physical Presence**

Although there is no technical limitation on the presence of all participants, we recommend a small production team and moderator meet in a central location in order to produce the event. Keeping these communication lines short will allow rapid response to remote viewers questions and ensure that the moderator is always ready to take over a remote session that is suffering from technical issues.

Remote presenters can be located anywhere with a decent internet connection and a laptop computer. Ideally, they will also have access to a good quality webcam and microphone, although these can be supplied if necessary.

Viewers can be located anywhere with a reasonable web connection. Although a computer is the best option to view the stream, virtually all streaming providers support mobile devices.

### **Event Organisation**

It is better to think of a virtual conference as an evening news show – a presenter speaks to the camera and then introduces both live and pre-recorded content from remote locations. The role of the moderator is to act as a news anchor – introducing the speakers and content. They will also act as a conduit for user feedback via the chat panels and can ask questions to remote presenters.

Remote presenters can be connected singly or in groups for panel discussions. With working as a solo presenter, they can also broadcast their screens from the computer to demonstrate content or play back slideshows. Any multimedia content (such as video presentations) should be sent to the production team in advance and played from the production console to guarantee quality.

*Note that event moderation and presenting, whether live or online, is a profession in its own right which not everybody automatically is able to pick up. Getting a professional moderator and/or training staff in creating and delivering effective presentations (for example through a course in science education or communication) is money well spent.*

It can be useful to have several pre-recorded pieces of content that can be dropped into a broadcast in order to create time to prepare the next set of live broadcasters and to give the moderator time to review the questions they have received.

It is also important to have several breaks throughout the broadcast – while a live audience may feel compelled to remain seated for two uninterrupted hours, a remote audience may lose concentration and it is easier for them to disappear without being noticed “to leave the room”.

A typical seminar may be made up of several one-hour segments, composed of one or two presentations, for example:

Moderator Introduction	Remote Presenter 1	Q&A	Remote Presenter 2	Q&A	PreRecorded Content	Moderator	Break
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The “Questions & Answers” sessions between the remote presenter and the moderator allow for a brief handover to reinforce any key elements of the presentation and to respond to any questions that have been submitted by viewers during the presentation.

A non-exhaustive overview of tools and platforms is shown in the table below. Tools and platforms can be used to involve and engage participants both inside and outside your own organisation or platform.

Table 4: Overview of tools and platforms for engaging participants

Tool / platform	Description of function
<a href="#">Vimeet</a>	Organise your event from A to Z... Functions: exhibition, congress, corporate event, job forum, institutional event, online meetings.
<a href="#">Remo</a>	An interactive virtual event platform that empowers growth and engage audiences. Functions: presenting, networking, booths
<a href="#">Slido</a>	Audience engagement in the office, online or in-between. Can be used with Webex, PowerPoint, Teams, Google Slides and YouTube Functions: live polls, Q&A, quizzes, word clouds
<a href="#">Kahoot</a>	Focused on education through Kahoot! at school, Kahoot! at work and Kahoot! at home Functions: deliver training, presentations, meetings and events on any video conferencing platform
<a href="#">Mentimeter</a>	Create interactive presentations and meetings and collect real-time input; remote, hybrid or face-to-face Functions: live polls, quizzes, word clouds, Q&A
<a href="#">Brella</a>	Interactive events and networking. Virtual, hybrid and in-person Functions: matchmaking and networking (1:1)
<a href="#">idloom</a>	Event creation and management; digital corporate communication Functions: website, registration, reservation, payment, intra/extranet, newsletter



Tool / platform	Description of function
<a href="#">Proximum365</a>	Move from single one-off event to sustainable community management. Works with Vimeet. Functions: events (online, hybrid, physical)
<a href="#">Hopin</a>	All-in-one event management platform to plan, produce and relive events Functions: Virtual, hybrid and in-person event experiences
<a href="#">Orbiit</a>	Community activation (part of Hopin) Functions: 1:1 peer connections
<a href="#">Mentorjam</a>	Mentoring platform to share experiences with your community Functions: web-based SaaS platform, mentoring (matchmaking mentor-mentee)
<a href="#">Miro</a>	Online collaborative whiteboard platform to bring teams together, anytime, anywhere Functions: meetings & workshops, ideation & brainstorming, research & design, mapping & diagramming, strategy & planning
<a href="#">Cvent</a>	Online engagement Functions: virtual and hybrid events, webinars
<a href="#">Lets get digital</a>	Real and engaging virtual events Functions: customisable platform, lobby, networking
<a href="#">Kinly</a>	Workplace transformation Functions: video conferencing, audio-visual integration, lifecycle services
<a href="#">Big Blue Button</a>	Global teaching platform Functions: virtual classroom, 65 languages, open source
<a href="#">IdeaBoardz</a>	Ideation, brainstorming Function: electronic sticky notes
<a href="#">Mural</a>	Digital workspace for team working Functions: visual collaboration for brainstorm, meetings, innovation, planning
<a href="#">B2Match</a>	An all-in-one event management solution for virtual, hybrid, and physical events specialized in b2b matchmaking. Functions: 1:1 matchmaking, event management, communication & marketing, ticketing & registration

Tool / platform	Description of function
<a href="#">Survey Monkey</a>	Satisfaction measurement, event surveys, opinion polls Functions: online survey
<a href="#">Mailchimp</a>	Marketing and commerce tools Functions: newsletter, audience management, creative tools, CRM

**ANNEX I – Intervention Logic**

**ANNEX II – List of indicators**

**ANNEX III – Interview Guide**

**ANNEX IV – Survey Questionnaire**