Deliverable 3.2: Policy brief on impacts from three bio-economy Partnerships

ERA-LEARN:
enabling systematic interaction with the P2P community

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1. Executive Summary

This document is an ERA-LEARN Policy Brief presenting results of the impact assessment of three bio-economy Partnerships: SUSFOOD, ICT-Agri, CORE ORGANIC II and their supported projects. The brief draws on the results of the on-line centralised impact assessment survey hosted by ERA-LEARN (responses submitted by participants up to December 2019 only). The survey has been complemented with thirty interviews held with partnership members and project beneficiaries. The findings from the survey and the interviews are integrated following a mixed methods approach. The main reason for considering the results collectively was to ensure an adequate interpretation of the survey results and examine:

— the motivations of project beneficiaries of the specific ERA-NETs in the bio-economy sector, including agriculture and food, and

— the expected and future impacts as well as any possible pathway(s) to impact (outputs, outcomes and organisational impact).

1.1. Motivations and expected outcomes

Overall, the motivations of responders for participating in ERA NET supported projects can be summarised in three main factors. Respondents joined transnational projects in order to 1) internationalise their activities and build capacity to access EU-wide funding opportunities in the future, 2) develop new knowledge through access to overseas facilities, engage with foreign partners and learn international good practices and 3) build new and strengthen existing relationships with partners through accessing public funding. As confirmed by the interviewed ERA-NET members, participation was mostly motivated by improving the research base but also by creating linkages between research and private organisations and practitioners. Interviewees suggested that ERA-NETs constitute a concrete chance to engage with a broader range of stakeholders and amplify the impact of knowledge exchange for researchers. For higher education and public research organisations, motivations were also linked to new opportunities to expand their cooperation platforms for broader research partnership (such as H2020). For newcomers, motivations mainly relate to their potential to extend the organisation's policy outreach, or to foster their organisation's performance.

When comparing transnational with national projects, the survey respondents consider that transnational projects are valued more for aspects related to improved access to expertise, technological readiness, research results, and levels of ambition. However, they do not think

that transnational projects require less administrative effort to manage or less time to complete. As emerged from the interviews, transnational projects add value to existing national funding schemes, especially complementing those at the sub-national level. In particular, some ERA-NETs were deemed instrumental to embed EU-level priorities more clearly into national and regional agendas.

Exploitable project outcomes seem to be innovation-related or research-related. In particular, it is possible to identify four main factors: 1) innovation items including product and service innovation, process innovation and organisational innovation outcomes, 2) links to transnational resources including network, markets and future transnational funding, 3) project outcomes related to research activities such as new data, methods and technologies and scientific evidence base and 4) enhancing research capacity of the organisation.

1.2. Expected impacts on own organisation

The impact expectations on own organisation may be summarised in four main factors: 1) 'increased economic benefits', 2) 'increased research benefits', 3) 'better evidence for policy making and high level of influence' and 4) 'expected increase in organisational performance, including skills, competences and environmental performance'. For the majority of respondents impacts related to research are more likely to occur than economic impacts. Interestingly, whereas economic benefits (such as 'additional commercial income', 'better access to external investments', and 'increased European/global market share') are, as expected, more connected to private companies, research-related impacts seem to dominate expectations across all different types of project beneficiary. As revealed in the interviews, the opportunity offered by these projects to link research and innovation activities alongside their 'problem-driven' nature and solve 'real-life problems for companies and practitioners' was appreciated by both the business and research communities alike. The fruitfulness of this public/research-private/practice collaboration is echoed across all the three partnerships both by project participants and partnership coordinators.

Following that, the science and innovation-related impact was achieved as expected or more than originally expected by the majority of the respondents. This is not surprising since, ERA-NET supported projects are strongly oriented towards collaborative research and innovation. The on-line survey respondents consider that ERA-NET supported projects offer the opportunity to find research and industry partners for cooperation in publicly funded projects and the research and innovation outcomes are linked to expected economic benefits for the participants.

However, although the projects are particularly set out towards research-underpinned innovation, they particularly focus on excellent research. Innovation activities, either in the form of standardisation and IP, or as outcomes (engagement with users, market access etc.) and innovation-related impacts, are seen by the interviewees as important determinants of the ERA-

NET supported projects and integrated elements of the R&I package deal. Yet, the innovation dimension appears to be less important. As the interviews showed, overall, the research side of the projects is sensibly stronger than the industrial side, although innovation plays a central role in linking them. This is due primarily to the composition of the projects' consortia (high level of involvement of research partners). Nonetheless, the innovation end of R&I is a strong driver for private companies participating to the transnational projects. These actors see transnational projects as a means to innovate, link to important transnational networks (market and research) and foster their internationalisation strategy.

1.3. Future impacts beyond own organisation

Prospective impact expected beyond the respondents' organisations can be clustered in three factors: namely 1) prospective societal impact, 2) prospective economic impact and 3) prospective policy impact. In particular, for more than half of the survey respondents, future innovations in products and services and future science and technology advances in complementary areas are seen as high impact. Overall, there is a strong and significant association between effective societal impact of the projects and prospective societal impact. In other words, respondents believe that if project's outcomes are directly related to societal impact within the project duration, then there are strong expectations to extend societal impact beyond the project. In addition, high project-based societal impact is associated with high prospective policy impact beyond the boundaries of the project. In terms of prospective economic impact, innovation outcomes are statistically significant as expected, meaning that project innovation outcomes such as new products and services, new processes or new organisational innovations, have a strong potential effect on economic impact beyond the project's lifetime. However, future economic-related impacts such as job creation overall are not considered relevant nor highly likely.

1.4. Impact pathways evolve around certain outcomes and impacts but also specific management factors

Our analysis reveals that future impact is strictly related to outcomes and impact achieved as well as ERA-NETs support structures in place for transnational projects. More specifically, the delivery of societal impact is achieved through producing scientific advancements such as new methods, data and/or technologies, and improving the scientific evidence base together with traditional dissemination activities such as publications (in peer-reviewed and specialist press) and presentation at conference, with policy makers and users.

Economic impact is achieved to a lesser extent than societal and research and innovation impact; nonetheless, it is significantly associated to certain factors such as 1) project management and 2) transnational resources. Association with management factors means that items such as time to launch/completion and administrative burden play an important role in generating overall economic impact. This is strongly echoed by many interviewees that lamented how the misalignment of national deadlines and/or the different burden of red-tape slowed down projects and partners' activities particularly, at the beginning/launch of the projects.

The main contributors to R&I impact are: 1) interaction within the project through the application of knowledge and expertise within the consortium, project's leadership and management and interactions with project partners and users and 2) innovation activities; R&I impact is associated with successful products and services, process and organisational innovation. These findings are very important since they highlight how the relevance of research and innovation activities and their respective impact are not separated. Instead, they are complementary elements working towards the same objective. These elements, as the interviews highlighted, constitute valid foundations to achieve science, technology and innovation (R&I) impact after the project has ended.

Ultimately, ERA-NET supported projects in the bio-economy, including food and agriculture, offered a chance to build a network of trust amongst project participants that relies on an open approach to knowledge, capability sharing and capability building. The linkages created among researchers, businesses and users are extensively appreciated, although the composition of the consortia and nature of research might still be slightly leaning more towards research rather than innovation objectives. Yet, the fact that beneficiaries believe that research and innovation outcomes are linked to expected economic benefits is encouraging in pursuing the exploitation of the project results. In this regard, it is important to know that prospective economic impact does not only rely on external conditions such as access to transnational resources but also internal management factors during the project lifetime. The impact pathway for future policy impacts goes through a high project-based societal impact, the delivery of which is associated both with producing scientific advancements and improving the scientific evidence base as well as with disseminating activities targeting academic and policy audiences. At the same time, the pathway of the research and innovation impact is also linked to managerial factors and, more importantly, shows that research and innovation are inseparable and work complementarily in achieving the same objective.

1.5. Policy implications

Based on our analysis, it is clear that the nature of the projects, the pathways to progress towards achieving valuable research and innovation outcomes and longer-term consolidated results for the project participants are a strong indicator of future impact. However, project

results are not followed-up once projects end partly due to lack of resources. In addition, as noted by some project beneficiaries, once the technology developed and/or the research and innovation findings leave the projects, the societal impact is in the hand of users. Yet, the level of involvement of users has been reported less than desired. As a result, it is important to find the resources needed to follow up project results even after the projects' life-time and to also involve users from the onset at a greater level. Although identifying impacts is difficult for various reasons, it makes sense to dedicate resources to longer-term impact tracing despite the challenges associated with this endeavour.

The measures being discussed in view of setting up a central system for the launching of calls and project monitoring and evaluation are a step in the right direction as they are expected to ease the current burden on national agencies. On the other side, increasing the levels of involvement of users on ERA-NET supported projects has already been identified as an area of improvement and this should be effectively taken up in the new version of partnerships under Horizon Europe.

Transnational projects are attractive propositions for both research performers and private companies mainly due to prospective benefits in relation to the opportunities offered that are linked to internationalisation and the strong research underpinning of innovative activities. Both these factors are linked to the achievement of science and technology impact and economic impact beyond the boundaries of the single projects and/or participating organisations. Organisational and process innovation through transnational projects are really important for participants besides research excellence. Thus, a strategic approach to blending research and innovation activities from the onset may contribute to enhancing projects' contributions to societal impact. This is another reason for supporting a stronger involvement of users from the onset.

Last but not least, there is still room for improvement before administration and management of transnational projects can be considered adequate. Misalignments across national requirements are still often causes for delay in R&I activities. A single set of procedures synchronised for all partners from different countries would be beneficial not only for project beneficiaries but also for the agencies managing partnership participation. Current discussions around centralisation of calls for projects are certainly relevant and important.

2. Introduction

As prescribed in the ERA-LEARN Description of Work, **two bi-annual impact assessment exercises** will be carried-out in 2020 and 2022. The assessment issues will be defined based on the results of the centralised on-line impact assessment survey that has been available since the beginning of 2018. Methods to apply would include interviews, on-line surveys supported by the central system of data collection (Task 3.1), and case studies at the project and/or network level depending on the issue addressed in each assessment exercise.

The centralised impact assessment survey had gathered, until December 2019, 110 responses (See table 1 – Annex II for details). The three most populated partnerships (in terms of responses) belonged to the bio-economy, food and agriculture sector (CORE Organic, SUSFOOD and ICT-AGRI).

Given the available responses to the on-line impact assessment survey, we decided to use this sector to carry out our Impact assessment. We looked at the motivations offered by opportunities and expected impact to gauge the reasons why participants joined the transnational projects and their pathways to impact. That is how the actors of CORE Organic, SUSFOOD and ICT-AGRI engaged in ERA-NET and perceived their achievements in terms of output, outcomes and impacts.

The report is organised as follows: a methodological section, a main analytical section and discussion and conclusions. In the methodology chapter we look at the study set up. The logic behind it is a 'mixed-methods approach' where results are drawn by reflecting on both the survey analysis and the interviews.

In the main analytical section of the report, we look at the motivation of participants for joining transnational projects in relation to the opportunities offered by such projects and their impact expectations. We also look at the relationships between output, outcomes and impacts obtained set against their original expectations. In other words, we look at whether participants' expectations of societal impact are somewhat fulfilled or not in relation to the output, outcomes and organisational impact achieved throughout the duration of the projects. These aspects, originating from the statistical elaborations of the survey, are blended with insights from the interviews. Interviews have helped interpreting the findings of the statistical elaborations, allowing more depth and understanding of the participants' reasons for joining the transnational projects and the pathways to impact. The report concludes with a discussion of findings. The report also includes a statistical annex where all the elaborations are documented.

Acknowledgements

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3. Methodology

The report is based on the findings of the survey responses that were gathered until December 2019 (details of the questions asked are reported below, and the full questionnaire in Annex I) and of interviews of the three main Partnerships that were conducted up to April 2020 (details of interview scripts are also reported in Annex I).

The rationales of this approach are various. The most relevant advantage is that we are looking to understand in depth how ERA-NETs engaged in the bio-economy sector, including agriculture and food, are motivated to join transnational projects and how they perceive their future/expected wider impact in relation to the pathway(s) to impact (outputs, outcomes and organisational impact) achieved through the partnerships.

From a statistics point of view, it is important to clarify that the survey responses cannot be generalised to other ERA-NETs and that the insights of this Impact Assessment exercise are specific to the cases at hand. Indeed, answering the centralised ERA-LEARN survey is not mandatory and responses are not enough to be representative of the total population. A further issue is linked to GDPR and data collection. In summary, this report can only work with the data provided by selected respondents (e.g.: convenience sample) rather than with information pertaining to the total number of project beneficiaries. As a result, any generalisation of the responses should be taken with caution, even though they do share similarities with other assessment studies.

3.1. Mixed methods approach

As noted earlier, we applied a mixed methods research approach. It includes two distinctive parts: 1) quantitative and 2) qualitative. These have been then integrated in order to provide an overarching interpretation of the impact assessment.
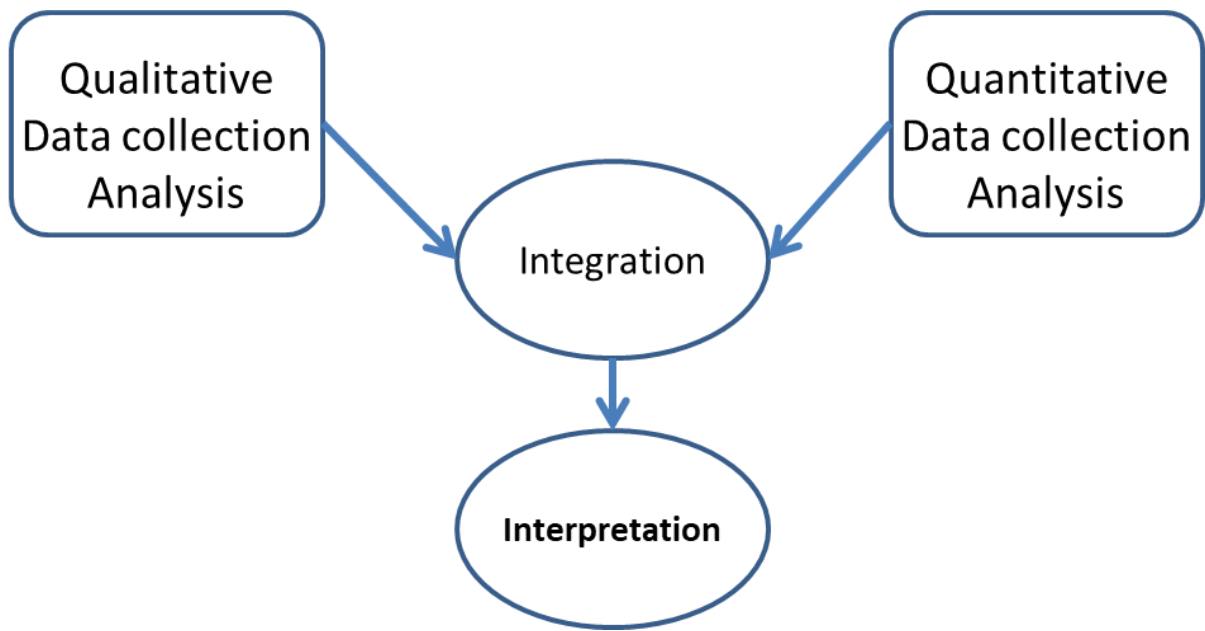
Figure 1: Mixed Method Approach

The quantitative part is based on information collected by an on-line survey questionnaire targeted at the participants in projects funded by ERA-NET partnerships. It attracted 89 responses in total.

Data for the analysis are drawn upon three cases, Core Organic (57% of respondents), ICT-AGRI (20.5%) and SUSFOOD (23%). We use 88 responses for our exercise as for one network there is only 1 response and its marginal contribution to our analysis is minimal.

Most respondents belonged to Higher Education organisations (41%) and Public Research organisations (34%). The remaining were private companies (12.5%) and Private Non-Profit Organisations (10%).
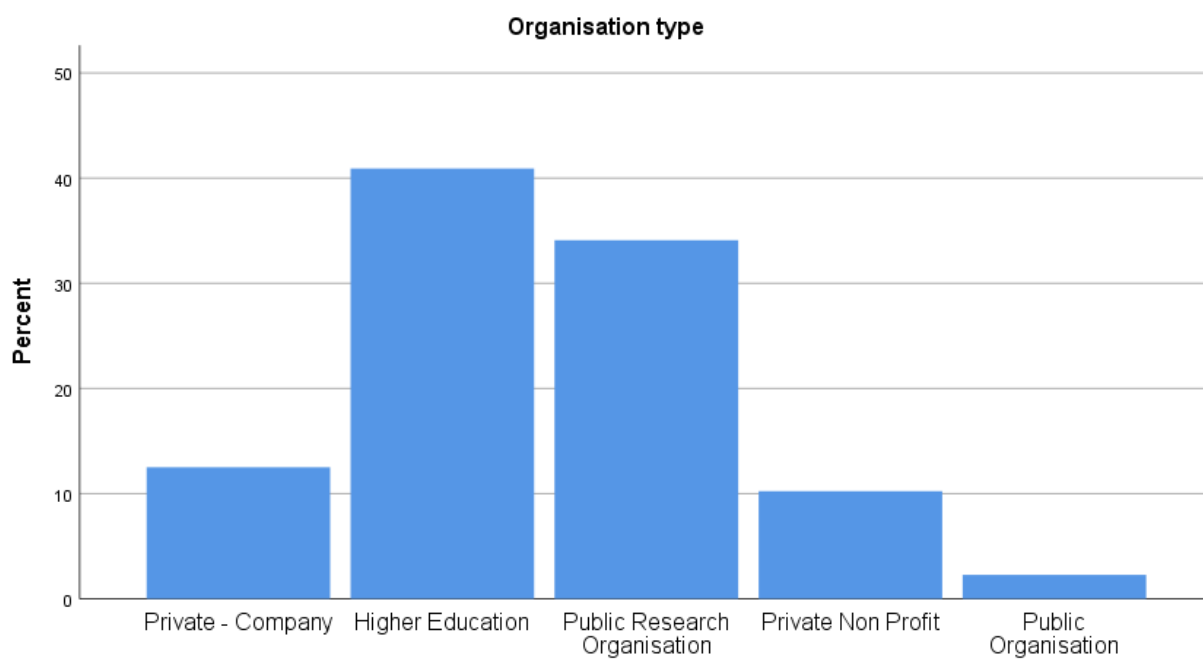
Organisation type

Figure 2: Type of Organisation

Role in the project	Frequency	Percent
Partner Organisation	65	73.9
Project Coordinator	18	20.5
Other	5	5.7
Total	88	100

Their role in the project included 18 respondents acting as Project Coordinator (20%), 65 from Partner organisations (74%) while 5% of the respondents self-identified themselves as 'other' (i.e. projects' associate organisations).

The distribution of responses also shows that there is no major bias towards a particular country and the geographical distribution of the participants reflects to some extent the participation in these three networks.
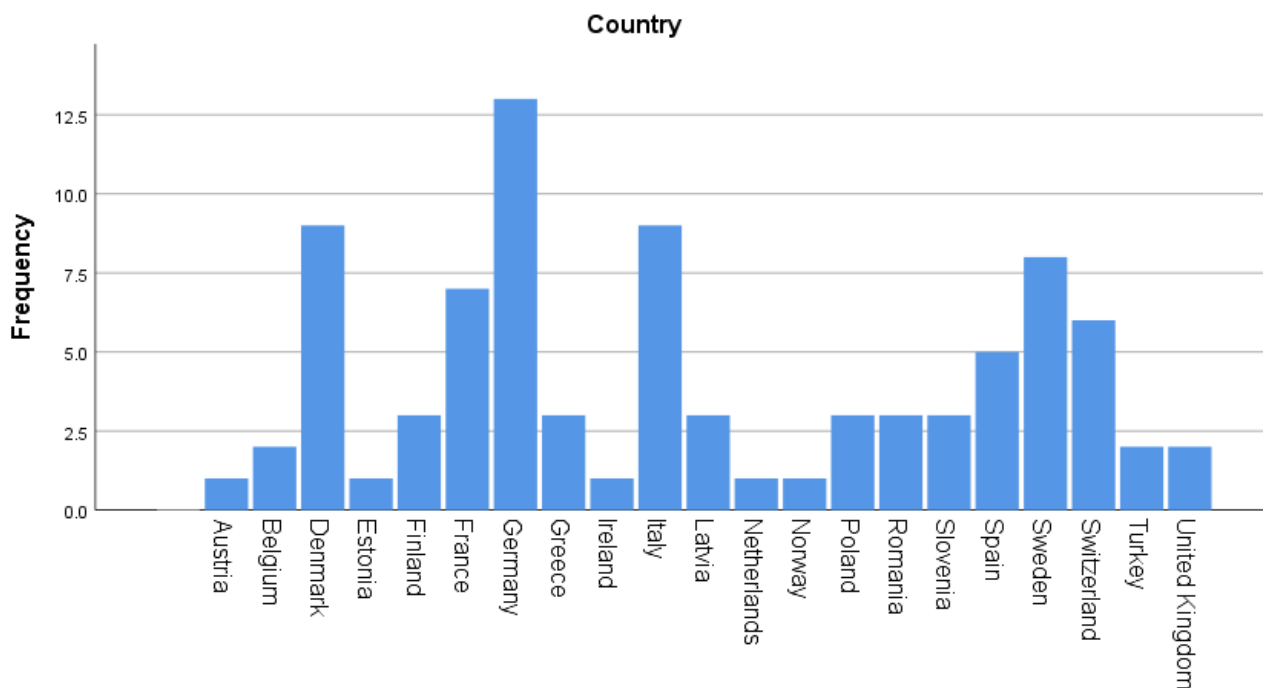
Figure 3: Responses by country

For the qualitative side of the research, we carried out semi-structured interviews with key stakeholders of the partnerships involved in the different stages of initiative design and research implementation and diffusion. These include the partnership coordinators and members, the call secretariat and the chair or a member of the advisory board. The purpose of the network interviews is to understand the strategic aims of the network, its evolution over time, the main achievements and challenges, and aspirations for the future. In addition, we talked to project coordinators to complement the picture with hands-on experiences and perceived benefits and challenges. The information collected and collated through the interviews have been used to shed light and explain the findings from the statistical analyses. In total we conduct 30 interviews. In the remainder, the results presented integrate our findings from the quantitative and qualitative analyses.

	No NETWORK INTERVIEWS	No PROJECT INTERVIEWS
SUSFOOD	3	11
ICT-AGRI	6	3
CORE Organic II	2	5
Total	11	19

4. Analysis of the results

4.1. Motivations, Opportunities and Outcomes

In this section we look at the rationales, extent and focus of the participation to ERA-NETs projects. The idea is to understand the links between expected impact by the participants' organisations and the opportunities offered by transnational partnerships and underlying factors. To do so, we explore the links between expected impact from participating to the specific transnational project (Q8) with the extent to which operational opportunities motivated the organisation to participate in the project (Q2). To qualify further, we also investigate whether transnational projects may offer opportunities superior to national-only partnerships in relation to similar projects (Q3).

Expected impact on the organisation from joining a transnational project

Expected impact on the organisation from joining the project plays a critical role on the motivation to join such projects. Question 8 delves deep into exploring reasons for participants joining the ERA-NET supported projects. The items reflect on the benefits that an organisation may reap from joining such projects. Specifically, the question is: What are the expected impacts on your organisation from participating in the specific transnational project (i.e. how will your organisation benefit from the exploitable outcomes)?

— Additional research income

— Additional commercial income

— Better access to external investment

— Reduced operating costs

— Increased European/global market share

— Improved competences and skills

— Improved access to networks, consortia, etc.

— Higher profile in the European/international research community

— Improved environmental performance of your organisation

— Better evidence to make policy/strategy decisions

— Higher level of influence on third parties (e.g. policy makers, industry, NGOs)

— Increased interest in seeking research & innovation partnerships with organisations in other European countries

— Increased interest in seeking commercial partnerships with organisations in other European countries

— Increased interest in collaborating with organisations outside Europe

Summary of the responses are reported in Figure 4.
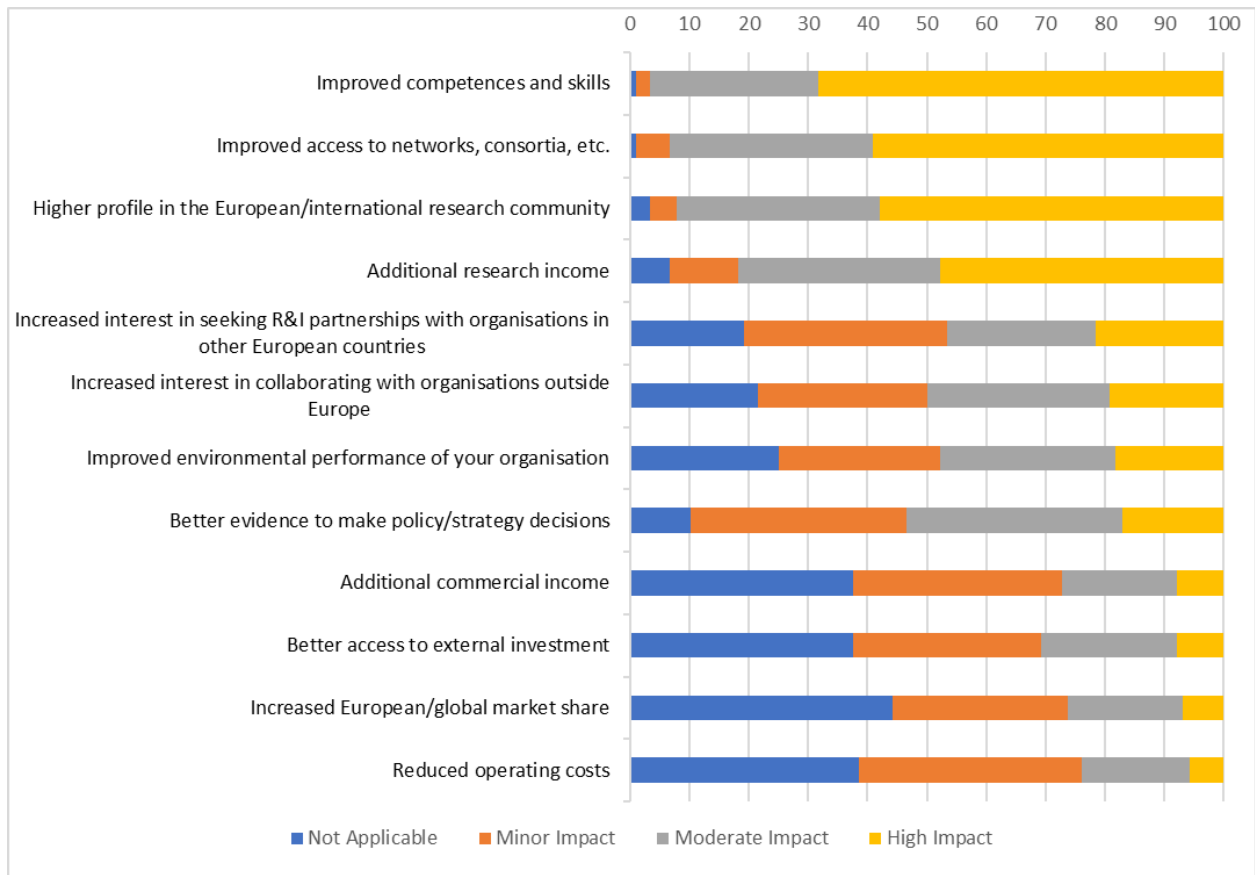
Figure 4: What are the expected impacts on your organisation from participating in the specific transnational project (i.e. how will your organisation benefit from the exploitable outcomes)?

Overall, the impact expectations may be summarised in four main factors: 1) 'increased economic benefits', 2) 'increased Research Benefits', 3) 'better evidence for policy making and high level of influence' and 4) 'expected increase in organisational performance, including skills, competences and environmental performance' (Annex II).

It is important to note that overall, answers from respondents scored mostly 'moderate' to 'high' in relation to expected research impact, whilst those linked to economic factors have no or low impact. In particular, the scores to questions such as expected increase in research outcomes, increase in competences and skills, improved access to networks and consortia, increased

profile in the research community and increased interests in seeking research and innovation partnerships in other EU countries are of moderate and high impact for over 80% of the respondents.

Interestingly, research-related questions seem to be somewhat relevant for all respondents independently from the type of organisation they belong to. Instead, economic motives such as 'additional commercial income', 'better access to external investments', and 'increase European/global market share' are more directly associated to the type of organisation. Impact expectations are particularly high for private companies compared, for example, to public research organisations and for project coordinators compared to project participants[2].

This aspect is confirmed and expanded on through the interviews. Respondents have in fact highlighted that companies are strongly motivated to join transnational projects in order to link research to their innovation activities through networking and extend their potential markets outside national boundaries. At the same time, other project beneficiaries (Universities/PROs) stressed the 'problem-driven' nature of the projects and their aim to solve 'real-life problems for companies and practitioners' constitute strong drivers to joining transnational projects.

Remarkably, this supports the view that ERA-NET supported projects are contributing to the diffusion of innovation in the bio-economy sectors by promoting a closer integration of research (on ecology, ICT) into the sector practices. The fruitfulness of these public/research-private/practice collaborations is echoed in the interviews across all the networks both by project participants and by the network coordinators.

The survey results highlight a significantly positive relationship between expected impact and previous experience in transnational projects. This is somehow intuitive, as experienced participants will have acquired valuable knowledge from their previous ERA-NET supported projects. Indeed, interviews confirm that for first-time project participants the 'learning-curve is steep at first' due to the different research focus required compared, for example, to national research projects. However, the interviewees also stressed that previous experience in ERA-NETs creates several advantages and in particular 'aligns research expectations between different partners'. It also allows to create that relational capital (with the partnership coordinator, with the national funding agencies, with other partners) that is both necessary for the successful implementation of the project, but also for the project beneficiaries themselves and their own management skills. This latter point is particularly echoed in interviews with universities but also with funding agencies.

On the other hand, this result also shows that participants with no experience of transnational projects might gain more from such projects relatively to experienced partners, and that their motivation to join could lead to the development of new skills, access to higher level research communities and learning from other countries' experience.

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[2] Test performed: Pearson Chi-Square test, Likelihood Ratio Chi-Square test and Linear-by-Linear association.

Motivations of participation: Operational opportunities

The survey presents 9 operational opportunities offered by ERA-NET supported projects responding to the question: **To what extent did the following opportunities motivate your organisation to participate in the project?**

— Access to public funding

— Access to knowledge/facilities in other countries

— Develop new knowledge in the subject area

— Strengthen existing relationships with organisations in other countries

— Build new relationships with organisations in other countries

— Build or enhance engagement with organisations (e.g. third parties, end users, etc.) that can benefit from the research results

— Become more internationally orientated

— Build capacity to access EU funding in the future

— Learn about good practice from peers in other countries

Summary of the responses are reported in Figure 5.

Figure 5: To what extent did the following opportunities motivate your organisation to participate in the project?

Responses show that the opportunities offered by the ERA-NET supported projects are solid motivations for joining. Indeed, more than 50% of respondents reported 'high motivation' to join

for each category and 90% of them declaring 'Develop new knowledge in the subject area' as high motivation to join. Respondents score very high in terms of motivation irrespective of the type of their organisation, or their role in ERA-NET supported projects (i.e. partners, coordinator or other) and whether they had previous experience in transnational projects or are at the first experience.

Overall, the motivations of responders for participating in ERA NET projects can be summarised by three main factors. Respondents joined transnational project in order to 1) Internationalise their activities and build capacity to access EU-wide funding opportunities in the future 2) Develop new knowledge through access to overseas facilities, engage with foreign partners and learn international good practices and 3) Transnational projects in order to build new and strengthen existing relationships with partners through accessing public funding.

Motivations of participation: Operational opportunities offered by transnational projects compared with national projects

The third section of the questionnaire asks: To what extent was the transnational project opportunity superior to participating in a similar project with only national partners in your country?

The statements proposed to the respondents are as follows:

— The transnational project provided access to higher-quality additional expertise and/or facilities than would have been possible with a national project

— The transnational project allowed us to participate in a type of project (e.g. TRL level) that would be very difficult, or impossible, to be funded in our country

— The transnational project produced higher quality research results

— The transnational project delivered the results in less time than would have been the case in a national project

— The transnational project required less administrative effort to manage than would have been the case with a national project

— The transnational project pursued more ambitious objectives

Summary of the responses are reported in Figure 6.
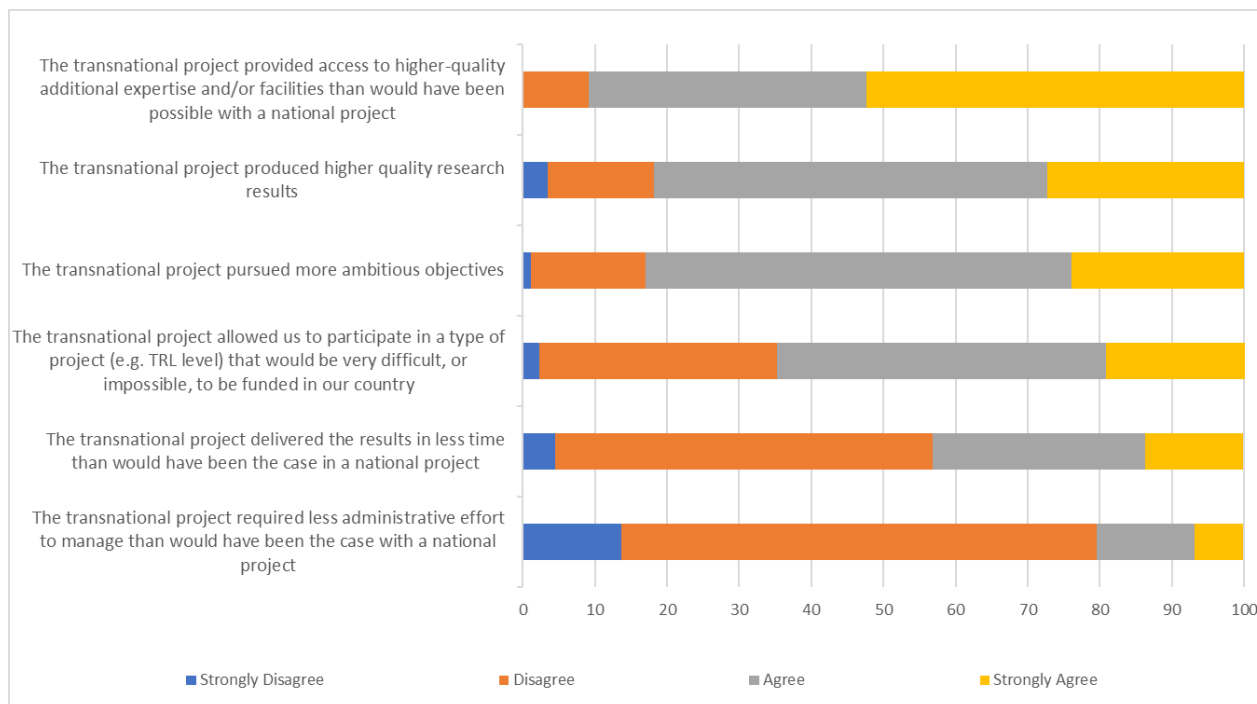
Figure 6:To what extent was the transnational project opportunity superior to participating in a similar project with only national partners in your country?

The majority of respondents agree or strongly agree with the statements provided except for two items.

— Over 56% of the respondents disagreed or strongly disagreed that 'The transnational project delivered the results in less time than would have been the case in a national project'. This reaction is perhaps not surprisingly given that R&I activities have a set time that may be independent on whether the projects is organised at a national level or transnationally. As interviewees confirmed, national funding agencies have different timings and deadlines associates to the projects which affects ERA-NET supported projects timelines.

— 'The transnational project required less administrative effort to manage than would have been the case with a national project' where about 80% of the respondents felt that transnational projects did not have a lower administrative burden than national projects. This datum highlights that notwithstanding the effort of partnerships to minimise the administrative burden, this is overall heavier than in participating in other national projects.

The main opportunities offered by transnational projects when compared to national ones can be summarised in two main factors:1) aspects related to the quality of the endeavour such

expertise, technological readiness, research results, ambitions and 2) those linked to management issues such as admin and time to complete[3].

One important aspect that emerged strongly from our interviews in relation to the comparative elements between national and transnational projects consists in the fact that transnational projects appear to be adding value to existing national funding schemes, especially those at the sub-national level. Projects have not been considered in the survey, yet, as, with national level projects, transnational projects provide a valuable complement. In particular, some interviewees noted how ERA-NETs were instrumental to embed EU-level priorities more clearly into national and regional agendas. In fact, some interviewees highlighted that ERA-NET priorities help shape the national agenda in some countries (i.e. Belgium and Greece). This finding from the interviews is particularly important since subnational level

The quantitative analysis provides several insights on the links between expected impact from joining transnational research projects and the opportunities that they offer also compared to national projects[4]. A key conclusion from the previous analysis is that the most important prospect benefit motivating participants to join transnational projects concerns the research itself. The main motivator consists in the access to enhance capabilities such as access to knowledge/facilities in other countries, develop new knowledge, engage with third parties and learn about good practices. These elements are all directly linked to outputs, outcomes and impact creation.

This aspect is also confirmed by the interviews, where it was highlighted that the push of joining ERA-NETs was mostly motivated by improving the research base but also by creating linkages between research and private organisations and practitioners. Interviewees suggested that ERA-NET constitute a concrete chance to engage with a broader range of stakeholders and amplified the impact of knowledge exchange for researchers.

The result on the benefit of research is linked to other practical aspects. For higher education and public research organisations, research benefits are obtained from new opportunities to expand their cooperation platforms for broader research partnership (e.g.: H2020). Indeed, several interviewees suggested that the ERA-NET supported project was pivotal for them to both acquire necessary managerial experience in transnational projects, but also to establish trust within a network of partners that spurred into further expansion (successful funding) of a joined research agenda.

It is also interesting to notice that motivations linked to economic benefits from participating in transnational projects are more important for project coordinators (and companies associated to the project) than other types of project beneficiaries.

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[3] See Q3 Factor analysis-Principal component analysis in Annex II.

[4] Regression model I (see Annex II)

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Respondents belonging to organisations with no previous experience of transnational projects are particularly interested to join because of their potential to extend the organisation's policy outreach, that is to produce better evidence for policy/decision making and achieve higher level influence. The same group of respondents, those with no previous experience in transnational research projects, are motivated to join to foster their organisation's performance.

Motivations of participation: Outcomes as key factors

At this point we investigate to what extent the motivations to join a transnational project reflect on the outcomes. As an ex-post impact survey, the participants have answered after the completion of the projects, therefore, their original motivations for joining, aside from transnational projects' practical opportunities and considerations of project quality and management issues, may be due also to knowledge of outcomes achieved. Whilst this exercise may be affected by hindsight bias, it certainly gives a good idea of the links between motivations to join a transnational project and (ex-post) project outcomes. This variable is obtained by the answers to the direct question: What have been the main exploitable outcomes of the project for your organisation? The question (Q6) includes 9 items.

— Increased research capacity

— Improved scientific evidence base

— New method, data or technology

— New/improved product or service

— New technical process

— New organisational process

— Better access to international network/markets

— Better understanding of other European cultures/issues

— Enhanced research network to compete for future European project funding

Summary of the responses are reported in Figure 7.
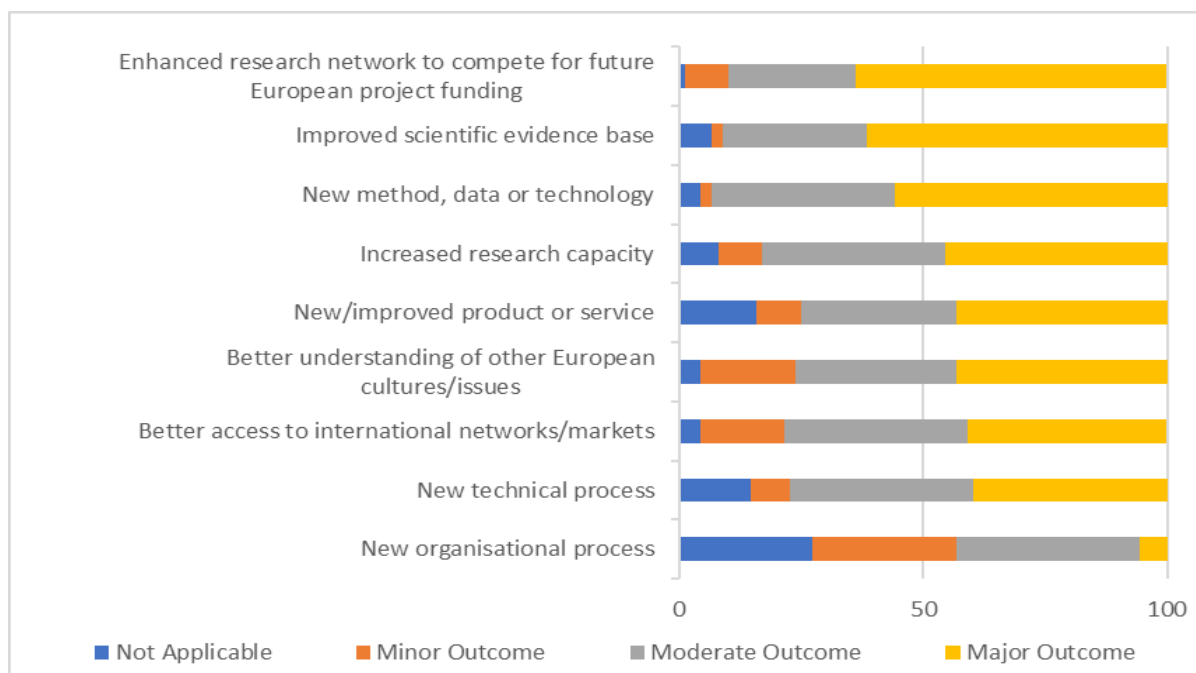
Figure 7: What have been the main exploitable outcomes of the project for your organisation?

The items on this list score rather high in termsof outcomes. Elements such as improved scientific evidence base, new methods, data or technology, and enhanced research network, scored well over 50% for major outcome. On the other end of the spectrum, an important innovation items (new organisational process) presents a clustering of responses between minor outcome (30%) and moderate outcome (37%) of responses and no outcome/not applicable of 27%.

Exploitable outcomes seem to gravitate around innovation-related or research-related outcomes. In detail, four main factors can be identified: 1) innovation related items (including product and service innovation outcomes, process innovation and organisational innovation); 2) links to transnational resources including network, markets and future transnational funding; 3) project outcomes related to research activities such as new data, methods and technologies and evidence based. 4) enhancing research capacity of the organisation is the 4th factor which stands distinguished from other research items[5]. This is because the former research variables are related to tangible research activities and outcomes whilst the latter highlight research capacity of the participants' organisations.

Further analysis of the survey responses reveals that there is a strong and significant link between the expected economic benefits of joining a transnational project and the innovation outcomes consisting of products and services innovation, process innovation and organisational innovation. At the same time, there is a positive association between expected organisational

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[5] Based on Principle Component Analysis (PCA)

performance and research outcomes such as new data, methods or technologies and improved evidence base.

From a network perspective, ERA-NET supported projects offer the opportunity to find research and industry partners for cooperation in publicly funded projects. From the analysis conducted and the interviews it emerged that, overall, the research side of the transnational projects is sensibly stronger than the industrial side, however innovation plays a central role in linking them[6]. This is especially evident when considering that innovation and research outcomes are linked to expected economic benefits of the participants. As also evidenced from the analysis of opportunities (Q2 above), private companies have a great opportunity in participating in transnational projects since they may provide a launch-pad for their internationalisation. Ultimately, ERA-NET supported projects offered a chance to build a network of trust amongst partners that relies on an open approach to knowledge, capability sharing and capability building. These, are essentials element of a successful cooperation.

4.2. The pathway(s) to Impact: Impact achieved vs. expectations

Impact is usually obtained sometime after the completion of projects. In our study we explored to what extent the respondents had achieved particular classes of impact. In our survey, Q9 below (Annex I), probes whether participants had achieved more, as or less than expected impact in the following categories.

— The economic impacts

— The science related impacts

— The innovation related impacts

— The environmental impacts

— The policy-related impacts

— The behavioural impacts

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[6] Whilst this result is important in highlighting the links between research and innovation, we should stress that it can be affected by the fact that we have comparatively fewer companies than higher education and publica research organisations amongst the respondents.

Summary of the responses are reported in Figure 8.
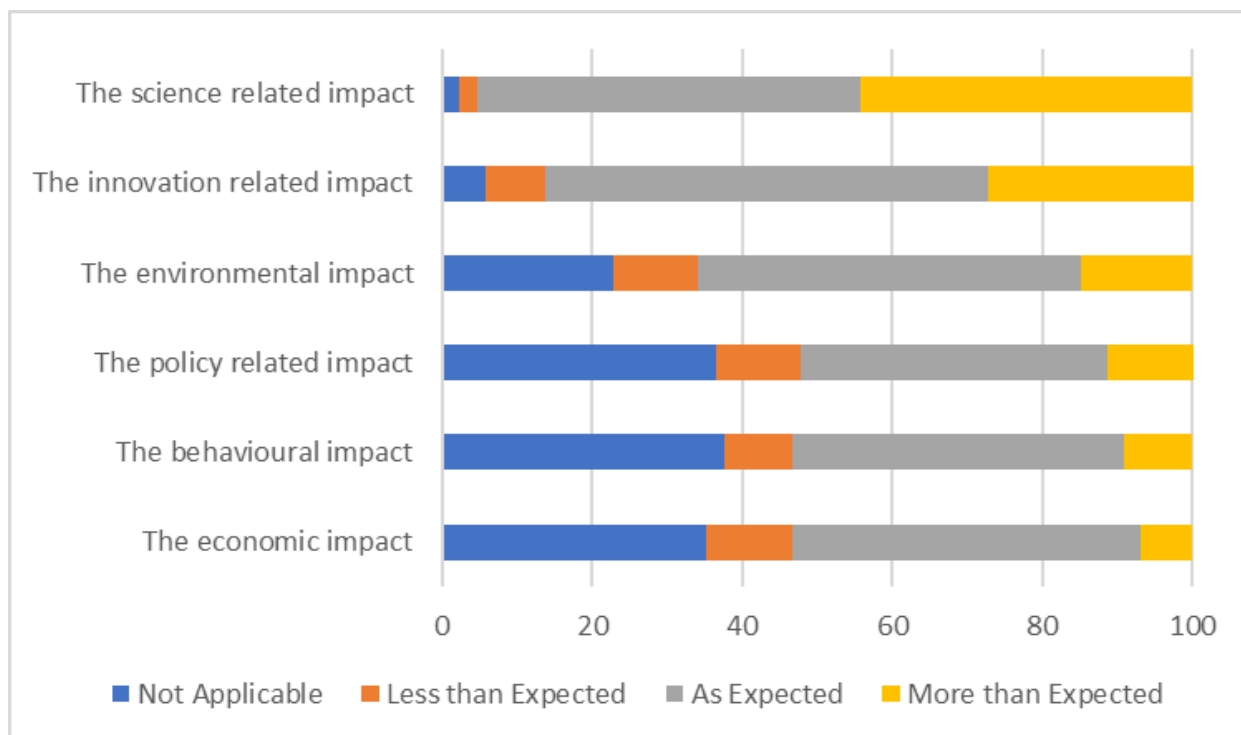
Figure 8: How do you judge the level of achievement of the impacts on your organisation until now compared with your original expectations?

Respondents scored quite high on the science and innovation impact. Over 75% of the respondents stated that they either achieved the impact they expected or more than that after project completion. This is not surprising since, ERA-NET transnational projects are strongly oriented towards collaborative research and innovation. The projects are characterised by a diversity of actors from academia and industry joining the partnership because of strong research interests and intention to pursue and expand their research and innovation activities. For economic and environmental impact, the scores were relatively lower overall with 46% of the respondents achieving just what was planned whilst in over 35% of the cases an economic impact was not achieved or was not applicable to the project. For environmental impact, over 50% achieved just what was expected whilst some 15% achieved more environmental impact than expected. Notwithstanding such differences, the performance of the respondents is in line with expectations.

Based on a factor analysis, the six items can be grouped to the following three types of impact: 1) Societal impact, including environmental, policy and behavioural impact, 2) Research and Innovation (R&I) impact, including science-related impact and innovation related impact and 3) Economic impact.

Key factors affecting impact delivery

Impact, as mentioned, is achieved some time after project completion and through the accumulation of various intermediate milestones. These milestones may be related to output, the activities undertaken under the banner of a project and projects' outcomes, those medium-term effects of an intervention that are likely to have permanent consequences on the organisation, partnership or broader impact to the community (research/practitioners/national or subnational). To obtain impact and the relative milestone achievements a series of 'support structures' are also necessary played out through the ERA-NET networks. These support structures consist in 1) resources available, 2) support from administration agencies, 3) inter-project interactions; 4) external engagement with stakeholders.

When examining the contributions of such factors to the achievement of different types of impact some interesting findings emerge.

Societal impact is significantly associated with intermediate innovation activities such as involvement in standardisation activities or the generation and protection of intellectual property. These are activities that contribute to and lead to products and services innovation, process innovation and organisational innovation. Also, academic engagement is strongly associated to societal impact. This type of engagement includes activities such as academic peer-reviewed publications, and other publications and public presentations aimed at disseminating the projects' activities within the academic sector and with users. The role of academic engagement in producing societal impact is further validated by the significant association with research outcomes. From the interviews it emerges that making a "contribution to … user-stakeholders in the sectors – through the research results" was a central element for many beneficiaries from research organisations.

In other words, for our respondents, societal impact is achieved through producing scientific advancements such as new methods, data and/or technologies, and improve the scientific evidence based together with traditional dissemination activities such as publications (in peer-reviewed and specialist press) and presentation at conference, with policy makers and users.

Science, technology and innovation (R&I) impact, as mentioned, is the main focus of most transnational projects surveyed[7].;

The main contributors to R&I impact are:

— interaction within the project achieved through the application of knowledge and expertise within the consortium, project's leadership and management and interactions with project partners and users and

— innovation activities; R&I impact is associated with successful products and services innovations, process and organisational innovation.

These findings are very important since they highlight how the relevance of research and innovation activities and their respective impact are not separated. Instead they work as complementary elements towards the same objective (R&I impact). These elements, as the interviews highlighted, constitute valid foundations to achieve science, technology and innovation (R&I) impact after the project has ended.

Interviewees also pointed out that "the nature of the networks themselves gave the perfect opportunity to engage in interdisciplinary research and how the output-oriented approach and the involvement of stakeholders from industry and end-users improved both the research produced and the chance to achieve the expected results" (ICT-AGRI).

Economic impact is achieved by transnational projects to a lesser extent than societal and R&I impact; nonetheless, it is significantly associated to 1) project management and 2) transnational resources. Association with management factors means that items such as time to completion and administrative burden play an important role in generating overall economic impact. This is strongly echoed by many interviewees that lamented how the misalignment of national deadlines and/or the different burden of red-tape slowed down projects and partners' activities. This directly impact on network integration/access to international networks and markets, and on their capacity to compete for future projects, e.g.: their capacity to achieve critical mass. This highlights how management processes (including projects timing and administrative burden) and access to transnational resources such as access to international networks and markets and enhanced research networks, are critical for achieving economic impact and are specific fixtures of ERA-NETs and their transnational projects that need to be sustained by national governments and agencies.

Expectations of Societal impact beyond the respondents' organisations

Survey respondents were asked about their views on the extent to which they anticipate any longer-term impacts beyond their organisation (i.e. for third parties, society and/or the environment) from their exploitable outcomes. From a pathway to impact perspective, it means that future societal impact might evolve from the outcomes and impact of the projects and disseminate beyond the boundaries of respondents' organisations. Technically this means that future impact is strictly related to outcomes and impact achieved as well as ERA-NETs support structures in place for transnational projects.

Future impact beyond respondents' organisations are explored through the following items:

— The users will be able to reduce their operating costs

— The users will be able to improve the quality of their products or service

— Research jobs will be created

— Non-research jobs will be created

— There will be benefits for public health, safety and/or quality of life

— The outputs will make a contribution to advances in complementary scientific or technology areas

— The outputs will provide new information and/or tools for use in education

— The users will be able to improve their environmental performance

— The exploitable outcomes will enable better-informed public policies

— The exploitable outcomes will support the development of new or improved regulations/standards

Summary of the responses are reported in Figure 9.
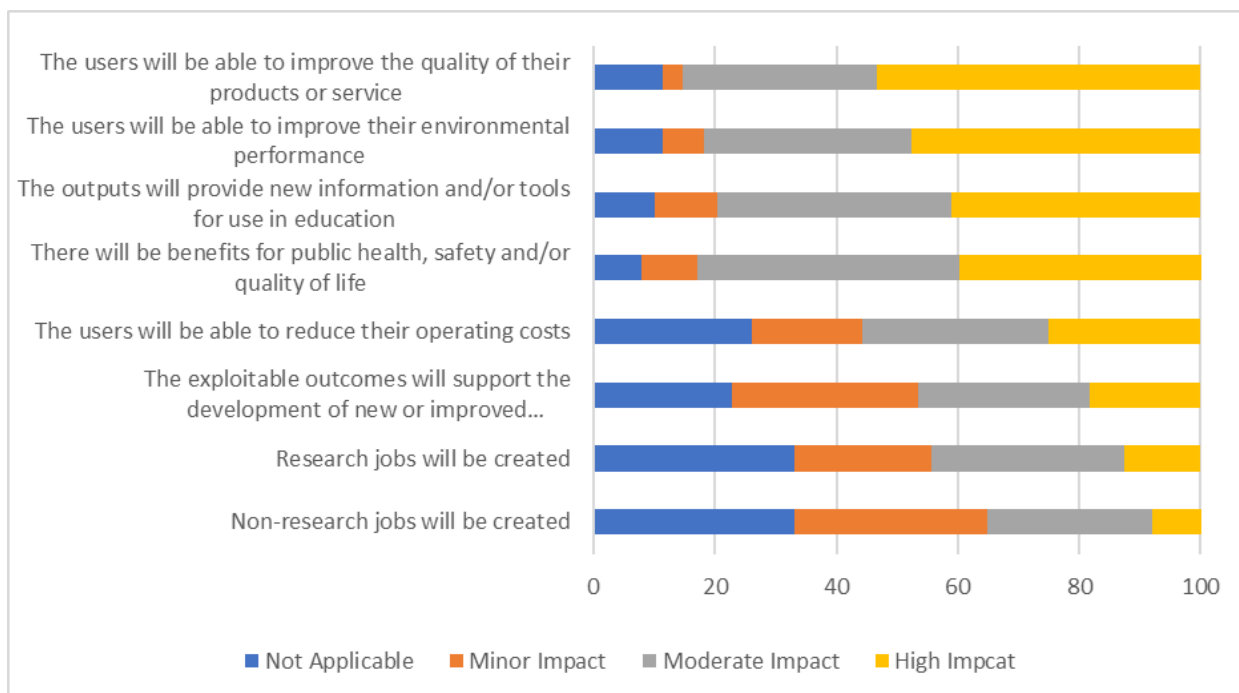
Figure 9: To what extent do you anticipate any of the following impacts beyond your organisation (i.e. for third parties, society and/or the environment) from your exploitable outcomes?

Two items from the list attract particular consensus from the respondents who consider products and services innovation as well as contributions to complementary science and technology areas carrying particularly important future implications for their projects. In particular, future innovations in products and services are seen as high impact by over 50% of the respondents whilst future science and technology advances in complementary areas are seen as high impact by 49%. On the contrary, some future types of economic impact such as job creation (in research or in the economy) are not seen as related to the projects' activities and indeed not highly likely. Both type of job creations – research and non-research jobs – are not applicable/no impact for 33% of the respondents.

Not surprisingly, expected impact beyond the respondents' organisations can be clustered in three groups: namely 1) prospective societal impact, 2) prospective impact and 3) prospective

policy impact (Annex II). Interestingly, to items a) 'The outputs will make a contribution to advances in complementary scientific or technology areas' and b) 'The outputs will provide new information and/or tools for use in education', though pertaining to the domain of Science and technology, are clustered in prospective societal impact. This may reflect on the views of respondents, confirmed by many interviewees, that science, technology and innovation may have wider expected societal impacts, but that those are hard to measure 'as after the end of the project there is no chance to track down the effects of collaboration: we build a prototype, help the farmer, but then don't know what happens after we deliver'.

In relation to the first element (Prospective Societal Impact), we may highlight a strong and significant association between effective societal impact of the projects and prospective societal impact. This is not surprising as respondents believe that if project's outcomes are directly related to societal impact within, the project duration, then it is likely that there are strong expectations to extend societal impact beyond the project. Given the nature of such projects, variables such as 'Research Outcomes' and 'Science and technology (R&I) impact' are highly associated with prospective societal impact.

In terms of prospective economic impact, innovation outcomes are statistically significant as expected. Meaning that high project innovation outcomes such as new products and services, new processes or new organisational innovations, have a strong potential effect on economic impact beyond the project's lifetime. It is also important to underline that organisations associated to the project and project coordinators are particularly sensitive to this aspect.

Finally, in order to underscore the importance of the interrelation of the three factors object of this analysis, a high project-based societal impact is associated with a prospective policy impact beyond the boundaries of the project.

5. Conclusions and policy implications

The combined analysis of the survey questionnaire and the interviews offers insightful conclusions about the motivations, outcomes, expected impacts and pathways to impacts for the networks and beneficiaries of the bio-economy, food and agriculture sector and the associated benefits and challenges linked to ERA-NETs participation.

Specifically, motivations to participate and expectations from joining the networks were mostly associated to three elements: internationalisation (of own research), capacity building (generation of new scientific and managerial knowledge to access more EU-funding), and building or strengthening research collaborations.

Similarly, expected impacts for the organisation clustered around three aspects including: an increased capacity to achieve economic and research benefits, improvement of the organisational performance (skills) and provision of grounded evidence for policy making. This last aspect was particularly perceived in certain countries/regions where ERA-NETs acted as trailblazer for the implementation of own priorities related to the agri-food sector.

Finally, in terms of impacts exceeding beyond the organisation, responses grouped around specific themes such as: societal impact, economic impact and policy impact.

Some of the most relevant findings of the study may be summarised as follows.

ERA-NETs successfully allowed the building of fruitful relationships between research beneficiaries, industry and practitioners involved in the projects. Motivations and expected outcomes from project participation were considered overall achieved. Importantly, these refer to the capacity to deliver innovation-driven research projects with societal impact. More specifically, on the research side, projects were considered instrumental in building capability linked to project management and extend international networks. One aspect, perhaps, is worth noting: better alignment of national deadlines and reduction of red-tape across the projects are considered fundamental to improve their economic impact.

Exploitable outcomes from the projects mostly regarded innovation and research related outcomes. Beneficiaries were satisfied with the outcomes of the projects, finding the ERA-NET experience positive and a route to create societal impact while expanding their capacity to achieve pathways to impact of research beyond research-related outputs.

Prospective impacts were mostly associated to research and in particular its effects on future product/service innovation and technology advances.

From an organisation's point of view, expected impacts were associated to research and innovation rather than innovation alone or economic impact. This is possibly linked to the fact that the majority of survey responses were from Research organisations. Nonetheless, the capacity to collaborate for research and business sectors was echoed as beneficial across all the partnerships examined and regarded as a strong enabling factor of societal impact from research.

Although less than research, innovation impact is also seen as crucial and its link to research activities and their successful implementation 'into practice' fully understood and appreciated.

Economic impact beyond the boundaries of the organisation is certainly achieved by transnational projects to a significant extent. Nonetheless, participants and interviewees perceive such impact mostly linked to network-based factors such as project management and access to transnational resources, rather than linked to broader factors (e.g.: creation of innovative products/services, job creation or increased productivity). This is perhaps a reflection of the fact that project participants have little interaction with external users once the project ends and and therefore relatively little control, or indeed knowledge of the subsequent diffusion of the products, prototypes and new methods in the community.

Policy implications

We may draw important policy lessons from this impact assessment exercise. Societal Impact cannot be fostered directly by the project participants as, once the technology developed and/or the research and innovation findings leave the projects, the societal impact rests on the end-users side. However, it is clear that the nature of the projects, the pathways to progress towards achieving valuable research and innovation outcomes and longer-term consolidated results for the project participants are a strong indicator of future impact. Thus, to fully appreciate the societal and economic impact, an important consideration is that it would be relevant to follow up the project results after the end of the projects' life-time directly with the end-users. Indeed, this aspect was identified as crucial by several ERA-NET members (funding agencies and ministries). Even though they seemed positive towards following up on societal and economic impact, no actions were implemented due to a lack of internal resources. Moreover, such aspect was not included amongst the ERA-NET targets.

It is also acknowledged that tracing impacts after the end of projects would be challenging due to mobility of project participants and the decreasing ability to link impacts to specific projects as time passes by. However, if users were already involved during the project life-time – which has also been reported as another aspect that needs improvement – it would be easier to identify post-project impact. Such a measure, along with the actions designed to centralising the launch of calls and the administration of projects which are expected to ease the burden on national agencies, would be serious steps in the right direction.

Beyond the actions to improve current understanding of societal impact as discussed above, there are two other main factors that may be seen as policy levers to improve further the

performance of the ERA-NET supported projects. The first consists in limiting hindrances for R&I project activities, especially those related to administration and management. This aspect concerns specifically the coordination and intermediation role of ERA-NETs across different national interests, expectations and practices. Major progress have been made. However, project participants reported that there is still room for improvement before administration and management of transnational projects can be considered adequate. In particular, the misalignment across national requirements often causes delays in planned R&I activities with a direct negative impact on timing and final outcomes. For example, project participants (coordinators and partners) would benefit greatly by adhering to a single set of procedures, synchronised for all partners, from different countries. Indeed, the capacity to have an established set of rules was reported in the interviews as a success factor among returning partnerships. Current discussions around centralisation of calls for projects are certainly relevant.

The second aspect includes the strategic approach to research and innovation. Indeed, as it emerged from the statistical analysis and interviews, transnational projects are attractive propositions for both research performers and private companies. Motivations for this can be ascribed to the internationalisation opportunities linked to ERA-NET supported projects and the strong research-into-practice underpinning of the innovative activities pursued in the projects. Both these factors are linked to the achievement of science and technology impact and economic impact beyond the boundaries of the single projects and/or participating organisations. Moving towards excellent research and producing product and services, organisational and process innovation through transnational projects are really important aspects for participants. This in turn signals that a strategic approach to blending research and innovation activities from the onset may contribute to enhancing projects' contribution to societal impact. This points towards the need for a stronger involvement of users which has been reportedly less than adequate, although much desired. A strategic approach to blending research and innovation may certainly contribute to strengthening the mission/problem-driven approach of ERA-NETs.

Imprint

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6. Annex

6.1. Survey Questionnaire

1. Please identify yourself

   o Name

   o Email address

   o Name of organisation (start typing and options are pulled from the database)

   o Country (drop down list)

   o Organisation type (radio buttons)

   o Name of project (start typing and options are pulled from the database)

   o Role in project (radio buttons)

   o Funding network (start typing and options are pulled from the database)

2. To what extent did the following opportunities motivate your organisation to participate in the project? (high, medium, low motivation)

   1. Access to public funding

   2. Access to knowledge/facilities in other countries

   3. Develop new knowledge in the subject area

   4. Strengthen existing relationships with organisations in other countries

   5. Build new relationships with organisations in other countries

   6. Build or enhance engagement with organisations (e.g. third parties, end users, etc.) that can benefit from the research results

   7. Become more internationally orientated

   8. Build capacity to access EU funding in the future

   9. Learn about good practice from peers in other countries

10. Other (provide details)

Please elaborate if appropriate

3. To what extent was the transnational project opportunity superior to participating in a similar project with only national partners in your country? (strongly agree, agree, disagree, strongly disagree)

    1. The transnational project provided access to higher-quality additional expertise and/or facilities than would have been possible with a national project

    2. The transnational project allowed us to participate in a type of project (e.g. TRL level) that would be very difficult, or impossible, to be funded in our country

    3. The transnational project produced higher quality research results

    4. The transnational project delivered the results in less time than would have been the case in a national project

    5. The transnational project required less administrative effort to manage than would have been the case with a national project

    6. The transnational project pursued more ambitious objectives

4. Does your organisation have prior experience of international research and innovation funding schemes? (yes/no tick boxes)

    1. Transnational research & innovation projects that were co-funded by a national or regional funding agency in your country (e.g. ERA-NET)

    2. EU Framework Programmes for research and/or innovation (e.g. Horizon 2020, FP7, CIP)

    3. International schemes that extend beyond Europe (e.g. Belmont Forum, Intelligent Manufacturing Systems)

    4. Other

Please elaborate if appropriate

5. If you have some experience of EU Framework Programmes (optional question depending on answer to Q4), to what extent do you agree with the following? (strongly agree, agree, disagree, strongly disagree)

    1. Proposals for transnational projects (co-funded by national agencies) have a higher probability of success than EU Framework Programme projects

2. Transnational projects are more flexible (e.g. project design, number of partners, changes) than EU projects

3. Transnational projects are less bureaucratic in administration than EU Framework Programme projects

4. Transnational projects produce higher quality results (e.g. scientific excellence) than EU Framework Programme projects

5. Transnational projects produce results that are more solutions-orientated than EU Framework Programme projects

6. Transnational funding projects are limited to a more restricted choice of geographic partners than EU Framework Programme projects

6. What have been the main exploitable outcomes of the project for your organisation? (major outcome, moderate outcome, minor outcome, not applicable)

1. Increased research capacity

2. Improved scientific evidence base

3. New method, data or technology

4. New/improved product or service

5. New technical process

6. New organisational process

7. Better access to international network/markets

8. Better understanding of other European cultures/issues

9. Enhanced research network to compete for future European project funding

10. Other (provide details)

Please elaborate if appropriate

7. Which of the following actions have you undertaken (or are planning) to enable exploitation of your research results (yes, no, future action)

o Peer reviewed publication(s) aimed at communicating the results to the research community

o Specific publication(s) aimed at communicating the exploitable results to potential users beyond the research community

- o Presentation of the results at conferences/events for potential users of the research results

- o Presentation of the results at conferences/events for important policy stakeholders

- o Participation in standardisation activities that will support the wider exploitation of the results

- o Formal protection of intellectual property through patents, trademarks, etc.

8. What are the expected impacts <u>on your organisation from participating in the specific transnational project</u> (i.e. how will your organisation benefit from the exploitable outcomes)? (not applicable, high impact, moderate impact, minor impact)

1. Additional research income

2. Additional commercial income

3. Better access to external investment

4. Reduced operating costs

5. Increased European/global market share

6. Improved competences and skills

7. Improved access to networks, consortia, etc.

8. Higher profile in the European/international research community

9. Improved environmental performance of your organisation

10. Better evidence to make policy/strategy decisions

11. Higher level of influence on third parties (e.g. policy makers, industry, NGOs)

12. Increased interest in seeking research & innovation partnerships with organisations in other European countries

13. Increased interest in seeking commercial partnerships with organisations in other European countries

14. Increased interest in collaborating with organisations outside Europe

15. Other

Please elaborate if appropriate

9. How do you judge the level of achievement of the impacts on your organisation until now compared with your original expectations (achieved more than expected, achieved more or less as expected, achieved less than expected, not applicable)

   1. The economic impacts

   2. The science related impacts

   3. The innovation related impacts

   4. The environmental impacts

   5. The policy-related impacts

   6. The behavioural impacts

10. To what extent would you agree with the following statements about key factors that may have affected the course of your project? (strongly agree, agree, disagree, strongly disagree)?

   - The administrative burden for the project reporting/management was not excessive

   - The resources available (time, money) were adequate

   - The consortium partners possessed the necessary knowledge/expertise

   - The consortium leadership and management was of high-quality and effective

   - The communication and support from the national funding agency was effective

   - There was good quality interaction with the other project partners

   - There was good quality interaction with end-users

   - other

Please elaborate if appropriate

11. To what extent do you anticipate any of the following impacts beyond your organisation (i.e. for third parties, society and/or the environment) from your exploitable outcomes? (minor impact, moderate impact, high impact, not applicable)

   1. The users will be able to reduce their operating costs

   2. The users will be able to improve the quality of their products or service

   3. Research jobs will be created

   4. Non-research jobs will be created

5. There will be benefits for public health, safety and/or quality of life

6. The outputs will make a contribution to advances in complementary scientific or technology areas

7. The outputs will provide new information and/or tools for use in education

8. The users will be able to improve their environmental performance

9. The exploitable outcomes will enable better-informed public policies

10. The exploitable outcomes will support the development of new or improved regulations/standards

Please elaborate if appropriate

12. Finally, is there any other feedback you would like to provide about your experience of such transnational projects and their impacts.

Semi-structured Interview Script

Discussion theme 1: Rationales, extent and focus of participation

1. What are the types of organisations that are usually your partners (funding agencies, ministries, other?)

2. **What are the overall motivations for participation?**

3. Can different patterns or behaviours be identified across different countries or types of agencies?

4. How would you judge the level of national investments to ERA-NET actions? Any identifiable patterns of behavior across countries or type of agencies?

Discussion theme 2: Expectations, and impacts

1. **What have been the overall expectations from the network? How much have these expectations been achieved?**

2. **Have any unforeseen impacts been realised?**

3. How would you define success in the specific network? With which criteria would you try to measure success?

4. Are ERA-NETs likely to achieve their objectives in terms of coordination of national programmes, creation of critical mass and contribution to the establishment of a durable cooperation between partners? Are there any specific changes necessary?

Discussion theme 3: Challenges and good practice elements

1. What have been the good practice elements in the design, operation and management of the network?.

What obstacles have occurred in the design, operation and management of the network? Have they been tackled and how? What lessons can be learnt about the preparation and implementation of the specific ERA-NET?

6.2. Statistical Annex

Motivations (opportunities and expected impact)

Model 1a Dependent variable
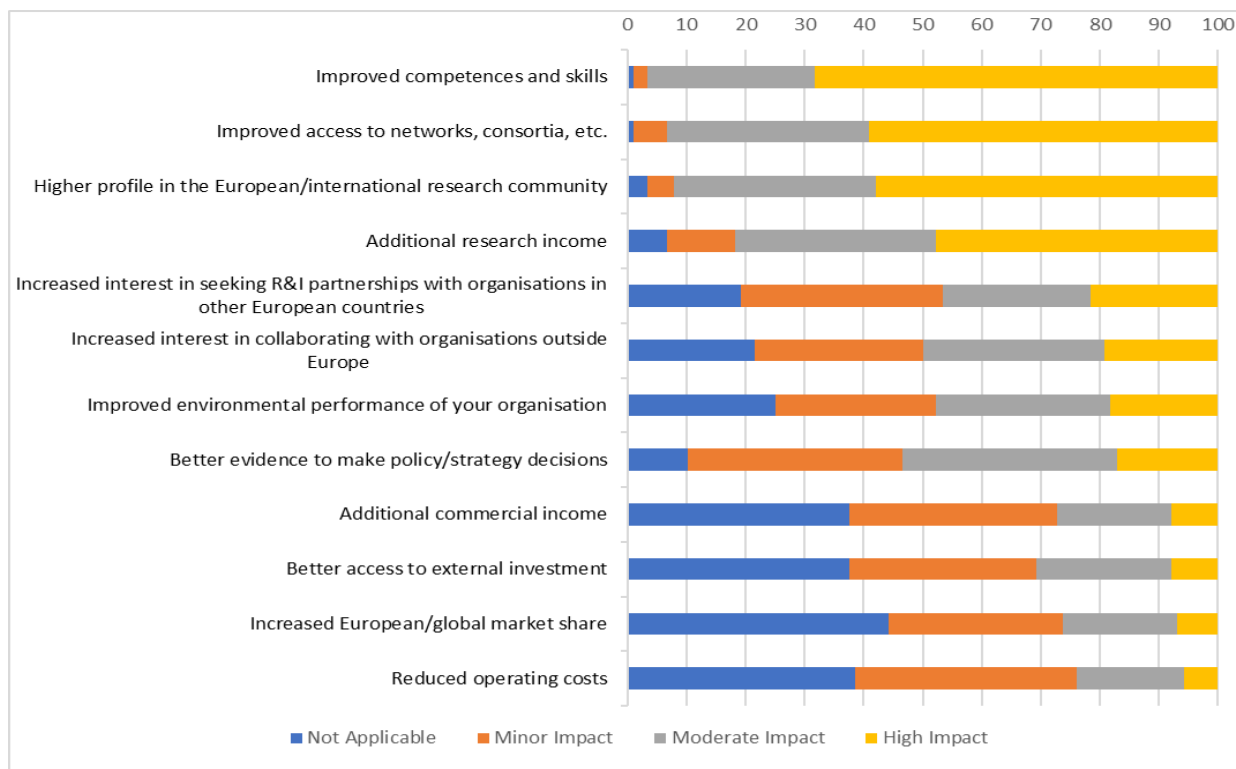
Figure 1: All a, b. - What are the expected impacts on your organisation from participating in the specific transnational project (i.e. how will your organisation benefit from the exploitable outcomes)?

Factor Analysis – Principal Component Analysis Q8

What are the expected impacts on your organisation from participating in the specific transnational project (i.e. how will your organisation benefit from the exploitable outcomes)?

1. Additional research income
2. Additional commercial income
3. Better access to external investment
4. Reduced operating costs
5. Increased European/global market share
6. Improved competences and skills
7. Improved access to networks, consortia, etc.
8. Higher profile in the European/international research community
9. Improved environmental performance of your organisation
10. Better evidence to make policy/strategy decisions
11. Higher level of influence on third parties (e.g. policy makers, industry, NGOs)
12. Increased interest in seeking research & innovation partnerships with organisations in other European countries
13. Increased interest in seeking commercial partnerships with organisations in other European countries
14. Increased interest in collaborating with organisations outside Europe

Factor 1) Increased Economic Benefits
a. Additional commercial income
b. Better access to external investment
c. Reduced operating costs
d. Increased European/market share
e. Increased interests in commercial partnerships
f. Increased interests in collaborating with organisations outside Europe
Var = Economic Benefits

Factor 2) Increased Research Benefits
a. Additional research income
b. Improved access to networks, consortia, etc.
c. Increased interest in seeking R&I partnerships in other EU countries
Var = Research Benefits

Factor 3) Increased Policy Reach
a. Better evidence to make policy/strategic decisions
b. Higher influence on third parties (policy makers, industry, NGOs)
Var = Policy Reach

Factor 4) Increased Internal Standing
a. Improve competences and skills
b. Improve environmental performance of the organisation
Var = Organisational Performance

Rotation criteria oblimin. Test statistics: Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.665 (fair) – cut-off point 0.6; Bartlett's Test of Sphericity, Chi-Square   395.569 (sig. 0.000)

Model Ia - Independent Variable: Opportunities
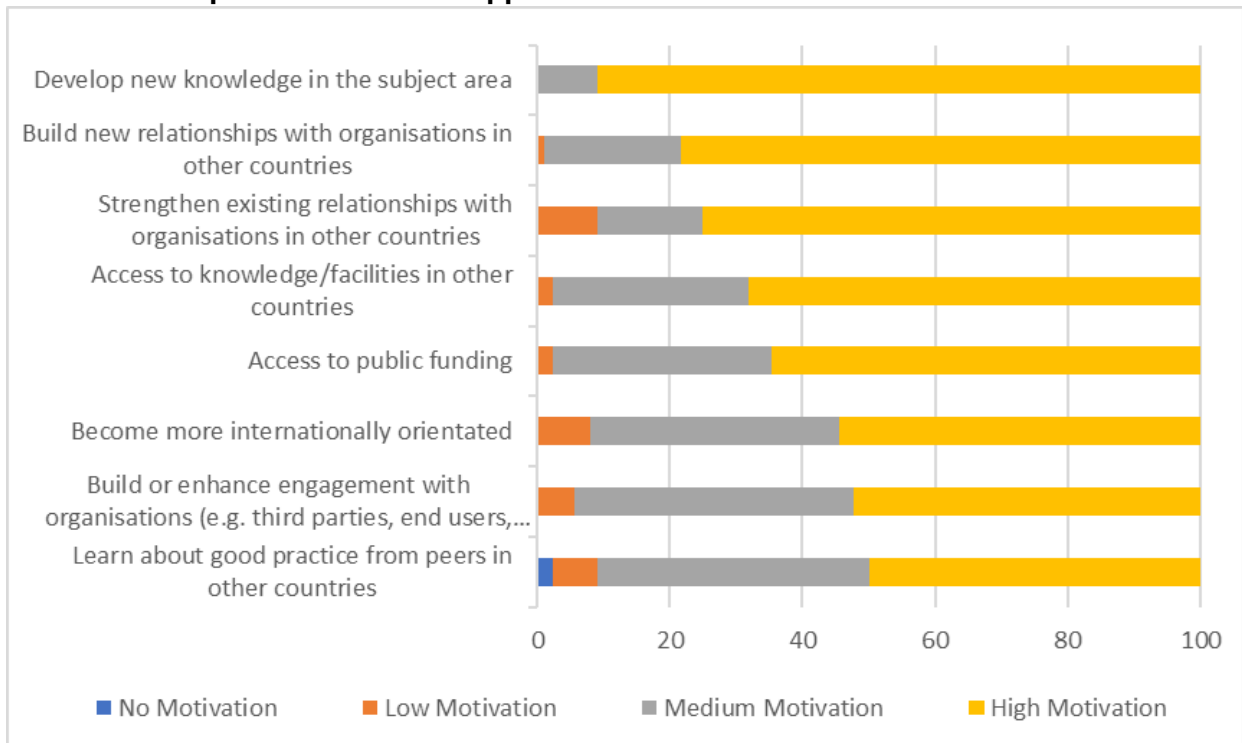
Figure 2: All a, b. - To what extent did the following opportunities motivate your organisation to participate in the project?

Factor Analysis – Principal Component Analysis Q2

To what extent did the following opportunities motivate your organisation to participate in the project?

1. Access to public funding
2. Access to knowledge/facilities in other countries
3. Develop new knowledge in the subject area
4. Strengthen existing relationships with organisations in other countries
5. Build new relationships with organisations in other countries
6. Build or enhance engagement with organisations (e.g. third parties, end users, etc.) that can benefit from the research results
7. Become more internationally orientated
8. Build capacity to access EU funding in the future
9. Learn about good practice from peers in other countries

Factor 1) internationalise and build capacity to access EU funding in the future

a. Become more internationally oriented
b. Build capacity to access EU funding in the future
Var = extend future capacity

Factor 2) develop new knowledge through access facilities, engage with partners and learn good practices abroad

a. Access to knowledge/facilities in other countries
b. Develop new knowledge in the subject area
c. Build or enhance engagement with organisations (e.g. third parties, end users, etc.) that can benefit from the research results
d. Learn about good practice from peers in other countries
Var = extend capabilities

Factor 3) build and strengthen relationships with partners to access public funding.

a. Access to public funding
b. Strengthen existing relationships with organisations in other countries
c. Build new relationships with organisations in other countries
Var = networking and access to funding

Rotation criteria oblimin. Test statistics: Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.61 (fair) – cut-off point 0.6; Bartlett's Test of Sphericity, Chi-Square   112.744 (sig. 0.000)
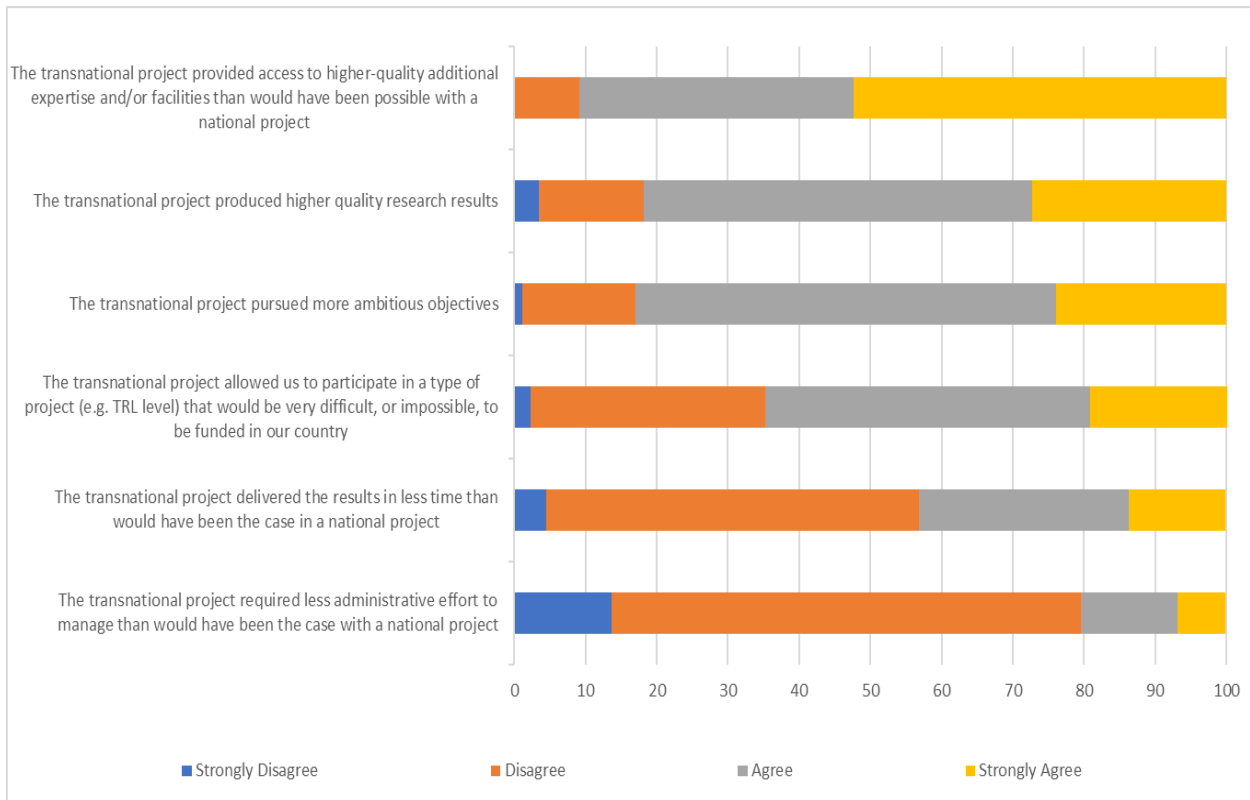
Figure 3: All a, b. - To what extent was the transnational project opportunity superior to participating in a similar project with only national partners in your country?

Factor Analysis – Principal Component Analysis Q3

To what extent was the transnational project opportunity superior to participating in a similar project with only national partners in your country?

1. The transnational project provided access to higher-quality additional expertise and/or facilities than would have been possible with a national project
2. The transnational project allowed us to participate in a type of project (e.g. TRL level) that would be very difficult, or impossible, to be funded in our country
3. The transnational project produced higher quality research results
4. The transnational project delivered the results in less time than would have been the case in a national project
5. The transnational project required less administrative effort to manage than would have been the case with a national project
6. The transnational project pursued more ambitious objectives

Factor 1) Quality of the projects
a. The transnational project provided access to higher-quality additional expertise and/or facilities than would have been possible with a national project
b. The transnational project allowed us to participate in a type of project (e.g. TRL level) that would be very difficult, or impossible, to be funded in our country
c. The transnational project produced higher quality research results
d. The transnational project pursued more ambitious objectives

Var = Quality of the Projects

Factor 2) Management issues
a. The transnational project delivered the results in less time than would have been the case in a national project
b. The transnational project required less administrative effort to manage than would have been the case with a national project

Var = Management Issues

Rotation criteria Oblimin. Test statistics: Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.667 (fair) – cut-off point 0.6; Bartlett's Test of Sphericity, Chi-Square 130.247 (sig. 0.000)

Model IIa - Including Projects outcomes
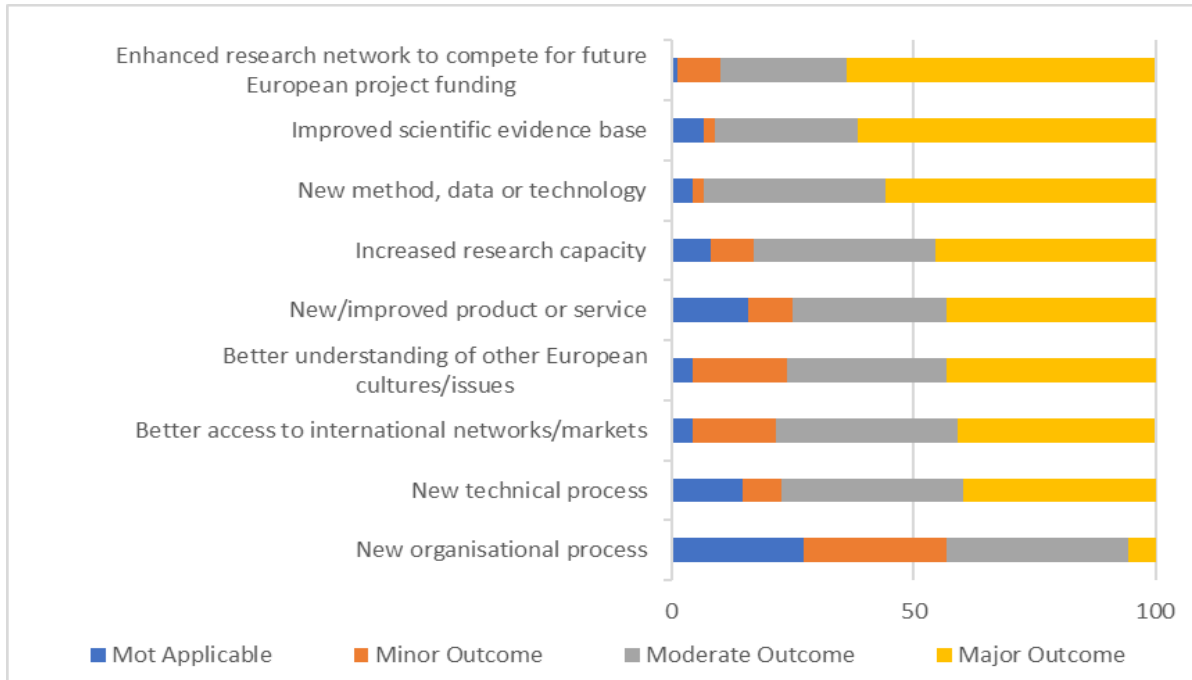
Figure 4: All a, b. - What have been the main exploitable outcomes of the project for your organisation?

Factor Analysis – Principal Component Analysis Q6

To what extent was the transnational project opportunity superior to participating in a similar project with only national partners in your country?
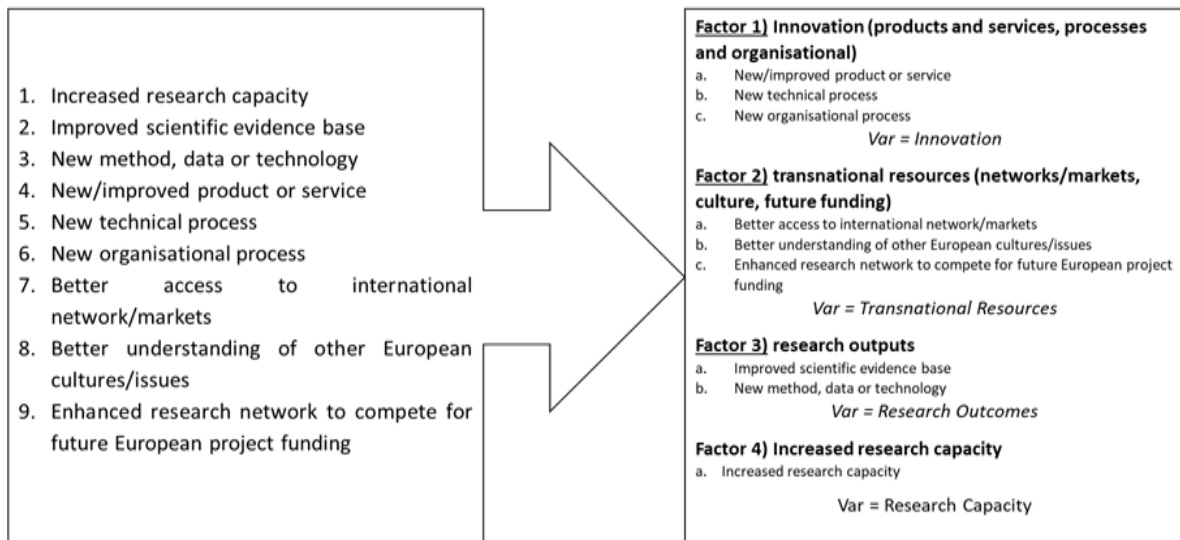
Rotation criteria Oblimin. Test statistics: Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.635 (fair) – cut-off point 0.6; Bartlett's Test of Sphericity, Chi-Square   215.414 (sig. 0.000)

Model selection

The statements in the sections of the questionnaire are to be considered inter-linked (as items pertaining to a single question)[8]. We use MANOVA in order to test such hypothesis - links between the variables (i.e.). There is a significant link between the variables (Tests of Between-Subjects Effects). Therefore, we have to consider them as a multivariate dependent variable and run a simple Multivariate General Linear regression model as standard SPSS (Ver. 25.0.0.1, 64 bit). The results are reported in the Parameter Estimates table below.

Tests of Between-Subjects Effects (Model Ia)

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Partial Eta Squared
Corr. Model	ECONOMIC_BENEFITS	16.224a	8	2.028	2.264**	0.186
	RESEARCH_BENEFITS	19.117b	8	2.39	2.781***	0.22
	POLICY_REACH	14.898c	8	1.862	2.04*	0.171
	ORG_PERFORMANCE	8.402d	8	1.05	1.056	0.097

a R Squared = .186 (Adjusted R Squared = .104)
b R Squared = .220 (Adjusted R Squared = .141)
c R Squared = .171 (Adjusted R Squared = .087)
d R Squared = .097 (Adjusted R Squared = .005)
There are significant links between the dependent variables (in the corrected model form), therefore we may consider the multivariate model.

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[8] Following the data reduction - PCA (rotation method: oblim; factor scores: regression), the ordinal variables have been factored as scale variables (with 0 means). This way we have standardised and comparable variables across the various questions.

Parameter Estimates	ECONOMIC_BENEFITS			RESEARCH_BENEFITS			POLICY_REACH			ORG_PERFORMANCE		
Parameter	B (St.Error)	t	Partial Eta Squared	B (St.Error)	t	Partial Eta Squared	B (St.Error)	t		B (St.Error)	t	Partial Eta Squared
Intercept	1.13 (0.369	3.06***	0.106	-0.213 (0.362)	-0.589	0.004	0.076 (0.373)	0.203	0.001	-0.014 (0.389)	-0.035	0
Organisation type	-0.219 (0.118)	-1.86*	0.042	0.173 (0.115)	1.507	0.028	0.056 (0.119)	0.468	0.003	0.206 (0.124)	1.664	0.034
Role in project	-0.409 (0.181)	-2.259**	0.061	-0.026 (0.177)	-0.149	0	0.181 (0.182)	0.994	0.012	0.098 (0.191)	0.514	0.003
Trans R&I Exp	-0.146 (0.267)	-0.547	0.004	-0.001 (0.262)	-0.004	0	-0.574 (0.27)	-2.131**	0.054	-0.568 (0.281)	-2.017**	0.049
EXT_FUT_CAPACITY	0.029 (0.116)	0.247	0.001	0.22 (0.114)	1.935*	0.045	-0.159 (0.117)	-1.358	0.023	-0.113 (0.122)	-0.922	0.011
EXT_CAPABILITIES	0.044 (0.107)	0.416	0.002	0.216 (0.104)	2.068**	0.051	-0.219 (0.108)	-2.041**	0.05	0.128 (0.112)	1.142	0.016
NETWORK_FUNDING	0.09 (0.103)	0.873	0.01	-0.074 (0.101)	-0.731	0.007	-0.077 (0.104)	-0.735	0.007	-0.065 (0.109)	-0.596	0.004

Parameter Estimates	ECONOMIC_BENEFITS			RESEARCH_BENEFITS			POLICY_REACH			ORG_PERFORMANCE		
Parameter	B (St.Error)	t	Partial Eta Squared	B (St.Error)	t	Partial Eta Squared	B (St.Error)	t		B (St.Error)	t	Partial Eta Squared
PROJECT_QUALITY	0.03 (0.11)	0.276	0.001	-0.098 (0.108)	-0.912	0.01	-0.102 (0.111)	-0.921	0.011	-0.055 (0.116)	-0.474	0.003
MANAGEMENT	0.207 (0.121)	1.713*	0.036	0.24 (0.118)	2.033**	0.05	0.057 (0.122)	0.468	0.003	0.148 (0.127)	1.166	0.017

* p<.1, ** p<.05, *** p<.01

Tests of Between-Subjects Effects Model IIa

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Partial Eta Squared
Corr. Mod.	ECONOMIC_BENEFITS	33.042a	12	2.753	3.827***	0.38
	RESEARCH_BENEFITS	23.201b	12	1.933	2.273**	0.267
	POLICY_REACH	21.331c	12	1.778	2.03**	0.245
	ORG_PERFORMANCE	15.245d	12	1.27	1.328	0.175

a R Squared = .380 (Adjusted R Squared = .281)

b R Squared = .267 (Adjusted R Squared = .149)

c R Squared = .245 (Adjusted R Squared = .124)

d R Squared = .175 (Adjusted R Squared = .043)

As in the previous model, the inks between the various items is significant, therefore we run a multivariate general linear regression model.

Parameter Estimates	ECONOMIC_BENEFITS			RESEARCH_BENEFITS			POLICY_REACH			ORG_PERFORMANCE		
Parameter	B (St.Error)	t	Partial Eta Squared	B (St.Error)	t	Partial Eta Squared	B (St.Error)	t	Partial Eta Squared	B (St.Error)	t	Partial Eta Squared
Intercept	0.964 (0.335)	2.881***	0.1	-0.248 (0.364)	-0.682	0.006	0.138 (0.369)	0.373	0.002	0.033 (0.386)	0.086	0
Organisation type	-0.18 (0.106)	-1.696*	0.037	0.184 (0.115)	1.597	0.033	0.027 (0.117	0.233	0.001	0.205 (0.122)	1.673*	0.036
Role in project	-0.267 (0.165)	-1.618	0.034	-0.043 (0.179)	-0.238	0.001	0.175 (0.182)	0.961	0.012	0.011 (0.19)	0.056	0
Trans R&I Exp	-0.307 (0.245)	-1.252	0.02	0.057 (0.267)	0.215	0.001	-0.586 (0.271)	-2.165**	0.059	-0.441 (0.283)	-1.559	0.031
EXT_FUT_CAPACITY	0.039 (0.112)	0.348	0.002	0.14 (0.121)	1.151	0.017	-0.087 (0.123)	-0.709	0.007	-0.141 (0.129)	-1.092	0.016
EXT_CAPABILITIES	0.108 (0.098)	1.103	0.016	0.17 (0.107)	1.589	0.033	-0.184 (0.108)	-1.694*	0.037	0.064 (0.113)	0.562	0.004
NETWORK_FUNDING	0.125 (0.097)	1.291	0.022	-0.052 (0.106)	-0.49	0.003	-0.139 (0.107)	-1.301	0.022	-0.032 (0.112)	-0.288	0.001

Parameter Estimates	ECONOMIC_BENEFITS			RESEARCH_BENEFITS			POLICY_REACH			ORG_PERFORMANCE		
Parameter	B (St.Error)	t	Partial Eta Squared	B (St.Error)	t	Partial Eta Squared	B (St.Error)	t	Partial Eta Squared	B (St.Error)	t	Partial Eta Squared
PROJECT_QUALITY	0 (0.099)	0.005	0	-0.106 (0.108)	-0.98	0.013	-0.095 (0.11)	-0.868	0.01	-0.033 (0.115)	-0.291	0.001
MANAGEMENT	0.138 (0.11)	1.25	0.02	0.224 (0.12)	1.868*	0.044	0.089 (0.121)	0.734	0.007	0.163 (0.127	1.287	0.022
INNOVATION	0.463 (0.101)	4.591***	0.219	0.051 (0.11)	0.461	0.003	-0.172 (0.111)	-1.543	0.031	-0.168 (0.116)	-1.446	0.027
TRANS_RESOURCES	-0.016 (0.099)	-0.165	0	0.047 (0.108)	0.433	0.002	-0.012 (0.109)	-0.106	0	-0.067 (0.114)	-0.586	0.005
RESEARCH_OUTCOMES	-0.21 (0.1)	-2.097**	0.055	0.148 (0.109)	1.359	0.024	-0.189 (0.111)	-1.712*	0.038	0.266 (0.116)	2.3 **	0.066
RESEARCH_CAPACITY	-0.14 (0.098)	-1.43	0.027	0.153 (0.107)	1.44	0.027	-0.056 (0.108)	-0.52	0.004	0.123 (0.113)	1.084	0.015

 * p<.1, ** p<.05, *** p<.01

Impact achieved and expectations
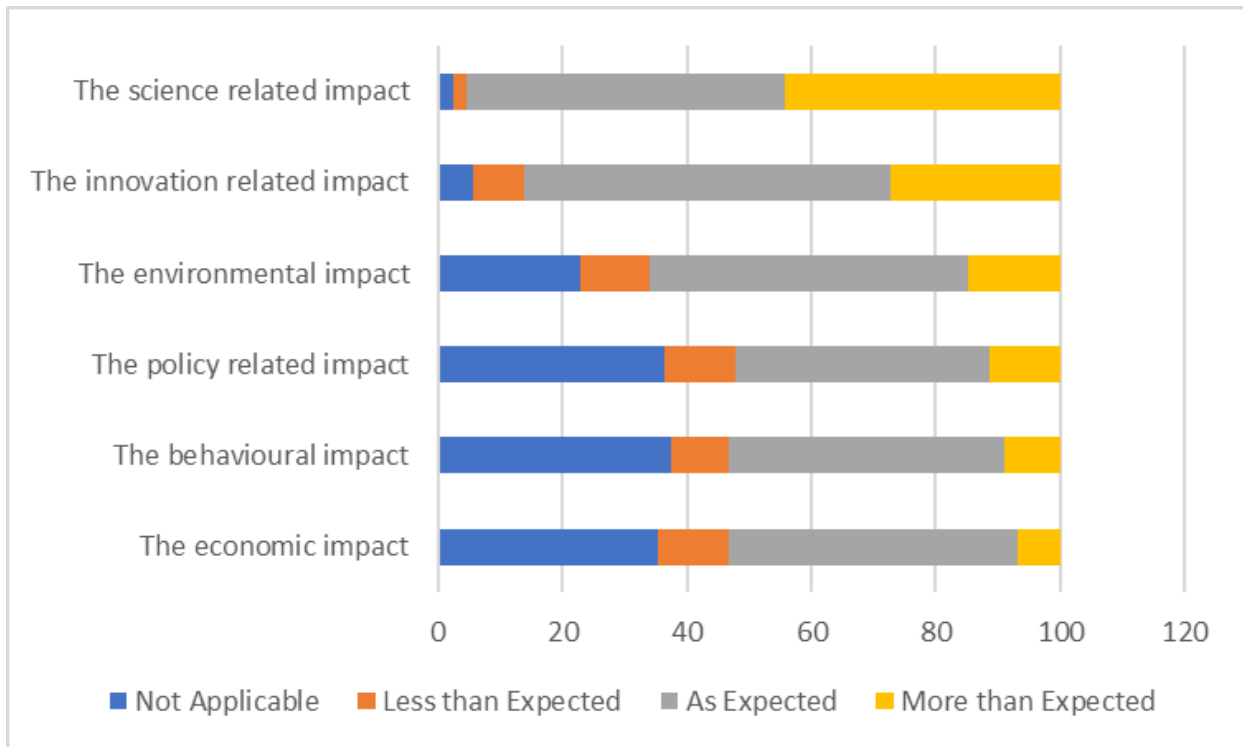
Figure 5: All a, b. - How do you judge the level of achievement of the impacts on your organisation until now compared with your original expectations?

Factor Analysis – Principal Component Analysis Q9

How do you judge the level of achievement of the impacts on your organisation until now compared with your original expectations?

1. The economic impacts
2. The science related impacts
3. The innovation related impacts
4. The environmental impacts
5. The policy-related impacts
6. The behavioural impacts

Factor 1) Societal impact

a. The environmental impacts
b. The policy-related impacts
c. The behavioural impacts

  Var = societal impact

Factor 2) Science and Innovation impact

a. The science related impacts
b. The innovation related impacts

  Var = Science & Technology Impact

Factor 3) Economic impact

a. The economic impacts

  Var = Economic Impact
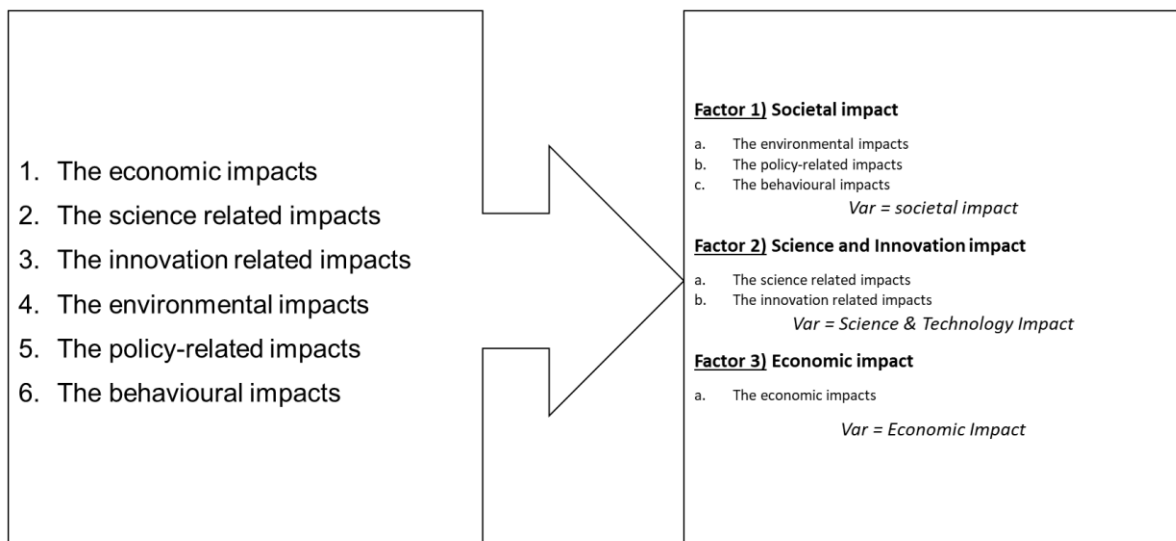
Rotation criteria Oblimin. Test statistics: Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.730 (good) – cut-off point 0.6; Bartlett's Test of Sphericity, Chi-Square 94.795 (sig. 0.000)
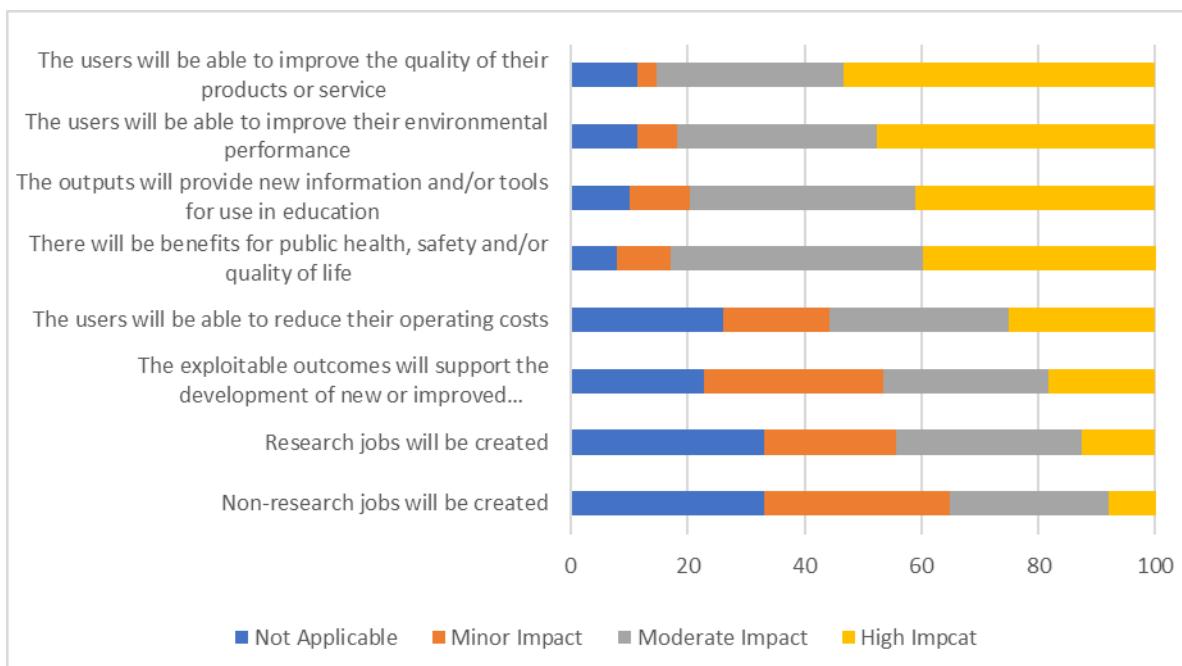
Figure 6: All a, b. - To what extent do you anticipate any of the following impacts beyond your organisation (i.e. for third parties, society and/or the environment) from your exploitable outcomes?

Factor Analysis – Principal Component Analysis Q11

To what extent do you anticipate any of the following impacts beyond your organisation (i.e. for third parties, society and/or the environment) from your exploitable outcomes?

1. The users will be able to reduce their operating costs
2. The users will be able to improve the quality of their products or service
3. Research jobs will be created
4. Non-research jobs will be created
5. There will be benefits for public health, safety and/or quality of life
6. The outputs will make a contribution to advances in complementary scientific or technology areas
7. The outputs will provide new information and/or tools for use in education
8. The users will be able to improve their environmental performance
9. The exploitable outcomes will enable better-informed public policies
10. The exploitable outcomes will support the development of new or improved regulations/standards

Factor 1) Prospective Societal impact
a. The users will be able to improve the quality of their products or service
b. There will be benefits for public health, safety and/or quality of life
c. The outputs will make a contribution to advances in complementary scientific or technology areas
d. The users will be able to improve their environmental performance

Factor2) Prospective Economic impact
a. The users will be able to reduce their operating costs
b. Non-research jobs will be created*

Factor 3) Prospective Policy impact
a. The exploitable outcomes will enable better-informed public policies
b. The exploitable outcomes will support the development of new or improved regulations/standards

* The item 'Research jobs will be created' has been deleted because of almost perfect correlation with 'Non-research jobs will be created'

Rotation criteria Oblimin. Test statistics: Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.774 (good) – cut-off point 0.6; Bartlett's Test of Sphericity, Chi-Square 226.626 (sig. 0.000)
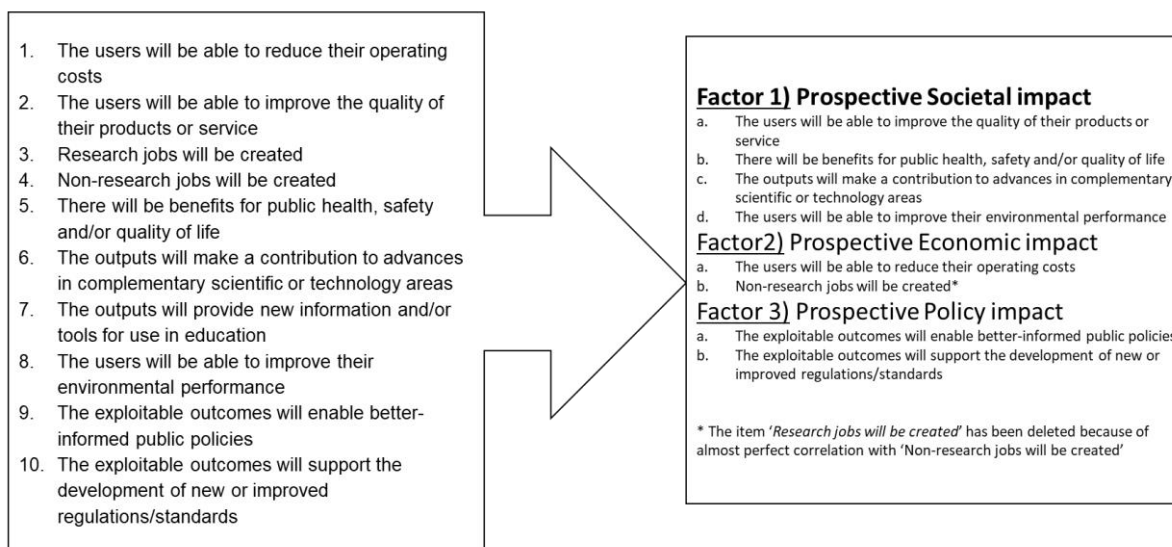
Model I.b (long-term Impact of transnational projects)

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Partial Eta Squared
Corr. Mod.	Societal Impact	25.276a	13	1.944	2.331**	0.291
	R&I Impact	29.917b	13	2.301	2.983***	0.344
	Economic Impact	18.403c	13	1.416	1.527	0.212

a R Squared = .291 (Adjusted R Squared = .166)

b R Squared = .344 (Adjusted R Squared = .229)

c R Squared = .212 (Adjusted R Squared = .073)

The between-subject effect shows that the various classes of impacts are significantly interconnected. Whilst technically this means that they cannot be studied separately, it also shows that ERA-NETS projects are more R&I and societal impact oriented rather than economic impact-oriented.

Parameter	Societal Impact				Science & Technology Impact 6				Economic Impact			
	B	Std. Error	t	Partial Eta Squared	B	Std. Error	t	Partial Eta Squared	B	Std. Error	t	Partial Eta Squared
Intercept	0.155	0.377	0.411	0.002	-0.477	0.363	-1.314	0.023	0.114	0.398	0.287	0.001
Organisation type	0.027	0.113	0.239	0.001	0.167	0.109	1.533	0.031	-0.090	0.119	-0.753	0.008
Role in project	-0.008	0.181	-0.045	0.000	0.110	0.174	0.631	0.005	0.072	0.190	0.379	0.002
Trans R&I Exp	-0.225	0.282	-0.798	0.009	0.054	0.271	0.200	0.001	-0.126	0.297	-0.423	0.002
PROJECT_QUALITY	0.079	0.111	0.709	0.007	-0.070	0.107	-0.658	0.006	-0.148	0.117	-1.266	0.021
MANAGEMENT	-0.223	0.130	-1.711	0.038	-0.152	0.125	-1.214	0.020	0.316	0.137	2.305**	0.067
ACADEMIC_ENGAGEMENT	0.251	0.109	2.294**	0.066	0.141	0.105	1.343	0.024	-0.001	0.115	-0.011	0.000
PREP_INNO	0.345	0.109	3.159***	0.119	0.112	0.105	1.072	0.015	0.184	0.115	1.596	0.033

Parameter	Societal Impact				Science & Technology Impact 6				Economic Impact			
	B	Std. Error	t	Partial Eta Squared	B	Std. Error	t	Partial Eta Squared	B	Std. Error	t	Partial Eta Squared
PROJECT_INTERAC TIONS	0.176	0.115	1.534	0.031	0.316	0.110	2.866***	0.100	0.008	0.121	0.068	0.000
SUPPORT_AND_RE SOURCES	0.093	0.123	0.754	0.008	0.164	0.118	1.386	0.025	0.011	0.130	0.083	0.000
INNOVATION	0.154	0.112	1.385	0.025	0.300	0.107	2.8***	0.096	-0.128	0.118	-1.088	0.016
TRANSNATIONAL_R ESOURCES	0.028	0.106	0.260	0.001	0.158	0.102	1.547	0.031	0.238	0.112	2.127**	0.058
RESEARCH_OUTCO MES	0.243	0.104	2.331**	0.068	0.163	0.100	1.632	0.035	0.040	0.110	0.368	0.002
RESEARCH_CAPAC ITY	-0.013	0.104	-0.123	0.000	0.088	0.100	0.873	0.010	-0.006	0.110	-0.051	0.000

Model II.b (Expected impact beyond respondents' organisations)

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Partial Eta Squared
Corr. Mod.	Prospective Societal Impact	34.648a	16	2.165	2.937***	0.398
	Prospective Economic Impact	36.885b	16	2.305	3.266***	0.424
	Prospective Policy Impact	29.827c	16	1.864	2.315***	0.343

a R Squared = .398 (Adjusted R Squared = .263)

b R Squared = .424 (Adjusted R Squared = .294)

c R Squared = .343 (Adjusted R Squared = .195)

The test of between-subject effect shows that the various classes of expected impact are significantly interconnected. Technically, this means that they cannot be studied separately but also that they may be considered interdependent.

Parameter	Societal Impact				Science & Technology Impact 6				Economic Impact			
	B	Std. Error	t	Partial Eta Squared	B	Std. Error	t	Partial Eta Squared	B	Std. Error	t	Partial Eta Squared
Intercept	-0.211	0.36	-0.587	0.005	0.995	0.352	2.827**	0.101	0.211	0.376	0.562	0.004
Organisation type	-0.057	0.109	-0.525	0.004	-0.301	0.106	-2.835**	0.102	-0.011	0.113	-0.097	0
Role in project	0.234	0.17	1.374	0.026	-0.324	0.167	-1.946	0.051	-0.019	0.178	-0.109	0
Trans R&I Exp	-0.121	0.267	-0.454	0.003	-0.001	0.261	-0.003	0	-0.201	0.279	-0.721	0.007
PROJECT_QUALITY	-0.051	0.106	-0.482	0.003	-0.182	0.104	-1.755	0.042	-0.141	0.111	-1.275	0.022
MANAGEMENT	-0.059	0.13	-0.45	0.003	-0.238	0.128	-1.867	0.047	0.069	0.136	0.504	0.004
ACADEMIC_ENGAGEMENT	-0.004	0.107	-0.039	0	0.035	0.105	0.331	0.002	0.078	0.112	0.699	0.007
PREP_INNO	0.044	0.111	0.402	0.002	0.245	0.108	2.268**	0.068	-0.074	0.116	-0.637	0.006

Parameter	Societal Impact				Science & Technology Impact 6				Economic Impact			
	B	Std. Error	t	Partial Eta Squared	B	Std. Error	t	Partial Eta Squared	B	Std. Error	t	Partial Eta Squared
PROJECT_INTERAC TIONS	-0.119	0.115	-1.038	0.015	-0.057	0.112	-0.51	0.004	0.139	0.12	1.161	0.019
SUPPORT_AND_RE SOURCES	0.183	0.118	1.556	0.033	0.137	0.115	1.195	0.02	-0.138	0.123	-1.124	0.017
INNOVATION	-0.09	0.112	-0.801	0.009	0.288	0.109	2.626**	0.089	0.027	0.117	0.232	0.001
TRANSNATIONAL_R ESOURCES	-0.08	0.104	-0.762	0.008	-0.147	0.102	-1.437	0.028	-0.006	0.109	-0.056	0
RESEARCH_OUTCO MES	0.216	0.103	2.106**	0.059	0.038	0.1	0.375	0.002	0.066	0.107	0.618	0.005
RESEARCH_CAPAC ITY	-0.034	0.099	-0.349	0.002	0.105	0.097	1.082	0.016	-0.015	0.103	-0.147	0
SOCIETAL_IMPACT	0.376	0.111	3.394***	0.14	-0.026	0.108	-0.235	0.001	-0.503	0.116	-4.339***	0.21

	Societal Impact				Science & Technology Impact 6				Economic Impact			
Parameter	B	Std. Error	t	Partial Eta Squared	B	Std. Error	t	Partial Eta Squared	B	Std. Error	t	Partial Eta Squared
SCIENCE_TECHNOLOGY_IMPACT	0.251	0.115	2.19**	0.063	0.098	0.112	0.875	0.011	-0.114	0.12	-0.951	0.013
ECONOMIC_IMPACT	-0.104	0.104	-0.996	0.014	0.069	0.102	0.673	0.006	-0.017	0.109	-0.157	0