

## RESPONSIBLE RESEARCH AND INNOVATION IN ACADEMIA – CONTEXT OF REGIONAL SMART SPECIALIZATIONS

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**Purpose:** The paper aims to discover the challenges of implementing the Responsible Research and Innovation (RRI) concept in higher education institutions.

**Design/methodology/approach:** The approach included several steps. First, the necessary literature review was conducted to present RRI concept. Then, the information was gathered to present the lodzkie region in the area of R&D and economy. The last (empirical) part was the study in the form of workshops being organized to obtain information on factors influencing the implementation of RRI concept.

**Findings:** Implementing RRI approach encounters barriers, in particular, the idea needs wider popularization, especially in terms of the benefits of its application. There is also insufficient social trust in science. This emphasizes a need to promote reliable scientific knowledge and to strengthen social awareness of its role in the development of the world. The role of internal and external stakeholders is important here. Communication between participants in innovation processes can improve the efficiency of activity in the sphere of RRI, including mechanisms of inclusive decision-making. The channels and models of communication have to take into consideration the heterogeneity of the recipients. This requires human resources with relevant competencies to execute efficient communication patterns.

**Research limitations/implications:** The workshop was conducted on a relatively small sample and the attendants were already involved in socially/economically/environmentally responsible activity. Although it was possible to capture the main ideas on how to foster RRI concept, it is important to execute wider research on a sample representative for a whole quadruple helix population, including scientists not yet interested in “responsible science”.

**Practical implications:** Findings are important for entities interested in promoting responsible research, e.g. public (e.g. regional) bodies.

**Social implications:** A better understanding of the factors influencing RRI concept implementation can result in fostering the process which in turn would be beneficial for the society as RRI concept promotes research oriented on public interest.

**Originality/value:** The paper presents publicly important findings that (with awareness of their limitations) can entail a commitment to achieving sustainable, ethically acceptable, and socially desirable results of research conducted within universities.

**Keywords:** Responsible Research and Innovation (RRI), R&D, university, knowledge commercialization, quadruple helix.

**Category of the paper:** Research paper.

## 1. Introduction

The role of universities has evolved over the centuries. Contemporary universities not only teach or perform science but also engage in the economic and social world. They also consider the natural environment aiming at sustainable development and the preservation or restoration of natural resources. Policymakers as well as scientists actively promote responsible research and innovation (RRI) referring to a research and development process integrating research into a broader social context (Owen, 2013; von Schomberg, 2013). von Schomberg (2013) defined RRI as "a transparent and interactive process in which social actors and innovators respond to each other about the acceptance, sustainability and social needs of innovation processes and their commercial products, to properly integrate scientific and technological advances into our society" (von Schomberg, 2013). This concept has gained importance in the European Union over the past decade. It is therefore essential to understand the factors that can enable the implementation of the concept within higher education institutions and to be aware of the barriers that limit the approach. The paper aims to understand these circumstances with the use of a literature review, retrieved statistical data, and empirical study. The approach included several steps. First, the necessary literature review was conducted to present RRI concept. Then, the information was gathered to present the lodzkie region in the area of R&D and economy. The last (empirical) part was the study in the form of workshops being organized to obtain information on factors influencing the implementation of RRI concept. The paper aims to answer the following research questions:

1. Do researchers and other R&D process stakeholders have any experience with RRI concept?
2. Did implementing RRI concept in research meet any obstacles?
3. Are there any factors fostering RRI?
4. How could we avoid the barriers?

Based on the above-mentioned research questions, the following hypotheses were formulated:

1. Researchers as well as stakeholders of R&D processes have experience with RRI or related approaches.
2. RRI implementation is limited by internal or external factors.
3. Efficient communication between stakeholders can foster RRI implementation.
4. The barriers can be limited or avoided mostly through a better understanding of the idea.

Although scientific research on RRI has been conducted within the last decade (12 years of reference count the average h index 60), there are still some blind fields and the concept as an object of the research loses attractiveness. There are also publications from earlier period of time (Hellstrom, 2003; Gustom, 2004) that refer to responsible innovation, but until then the full term RRI was not used. Five of the most quoted publications concentrate on 2011-2013,

but in recent years the field of study is still present, although not as important as before in quantity. Perhaps now it is generally agreed that responsible forms of innovation must be adapted to the needs of society (de Saille, 2015). The paper brings some important insight into the mechanisms of RRI concept implementation which is important for all stakeholders of R&D and innovation processes (e.g. public bodies and academia management bodies, policy makers) to support research beneficial for the present and future society.

## **2. Methods**

The approach included several steps. First, the necessary literature review was conducted to present RRI concept. Then, the information was gathered to present the lodzkie region in the area of R&D and economy. Statistical data as well as analysis prepared for the public bodies for the purpose of strategic plans preparation were exploited here. The last (empirical) part was the study in the form of workshops being organized to gather information on factors influencing the RRI concept. The workshops aimed to stimulate discussion (in inter-disciplinary groups) about the possibility of including the approach of RRI in R&D projects and university development processes. A detailed description of this last step is presented later in the paper.

## **3. Responsible Research and Innovation concept**

Responsible Research and Innovation (RRI) is a concept that has gained special significance in the last decade in the European Union (EU), referring to a research and development process integrating research into a broader social context (Owen, 2013; von Schomberg, 2013). Google Scholar literature research on “responsible research and innovation” conducted for the period 2000-2023 reveals that such research has been carried out since 2011 and that these 12 years of reference count the average h index 60. There are also publications from earlier period of time (Hellstrom, 2003; Gustom, 2004) that refer to responsible innovation, but until then the full term RRI was not used. Five of the most quoted publications concentrate on 2011-2013, but in recent years the field of study is still present, although not as important as before in quantity. Perhaps now it is generally agreed that responsible forms of innovation must be adapted to the needs of society (de Saille, 2015), and such research as a separate field has lost such an attractiveness. This hypothesis should probably be studied in another paper leading to discoveries of directions of interest in scientific research. As in De Saille (de Saille, 2015), the declaration of the of European Research Area Board in 2009 suggesting a “paradigm change” in the European Research Areas reflects the long journey from the “republic of

science” model (Polanyi, 1962), which perceives science as a neutral space that is not affected by political, social and ethical issues, to the more recent constructivism model, which assumes that science and scientists are intrinsically connected to the world of society, economy and politics (Sturgis and Allen, 2004), and simultaneously constructs science and society (Jasanoff, 2006). This is in line with the development of contemporary universities. RRI promotes open multilateral cooperation with scientists, citizens, policy makers, enterprises and third-party organizations to discuss how science and technology should be best formed, not only to solve today's problems but also to create a desirable world for future generations. More specifically, von Schomberg (2013) defined RRI as "a transparent and interactive process in which social actors and innovators respond to each other with regard to the acceptance, sustainability and social needs of innovation processes and their commercial products, in order to properly integrate scientific and technological advances into our society" (von Schomberg, 2013). The process of RRI can be described in four clusters (Table 1).

**Table 1.**  
*Four clusters of RRI process requirements*

Cluster	Description
Diversity and inclusion	Diverse and integrated RRI processes must involve a wide range of stakeholders in the early development of science and technology, as well as broaden and diversify sources of expertise, disciplines and perspectives, for reasons of normative democracy. In this regard, inclusive practices should lead to a variety of practices. In contrast, different practices are more likely to include everyone.
Openness and transparency	Openness and transparency are conditions for accountability, liability and thus responsibility. This is an important aspect of establishing public trust in science and politics. However, more openness does not automatically lead to greater trust: information must be adapted to the needs of the stakeholders to make sense to them.
Anticipation and reflexivity	Anticipation involves understanding how the present dynamics of research and innovation practices shape the future and envisioning the future. Thus, one can act on future challenges. To act appropriately and to be open to changes in direction, there is also a need for reflection. This reflection means learning about the definitions of the problem, commitments, practices and individual and institutional values, assumptions and routines.
Responsiveness and adaptive change	Responsiveness means responding to new knowledge, perspectives, views and standards. Responsiveness is a condition for adaptive change. RRI requires the ability to change or shape existing practices and organizational structures and systems in response to changing circumstances, new insights and stakeholders and public values.

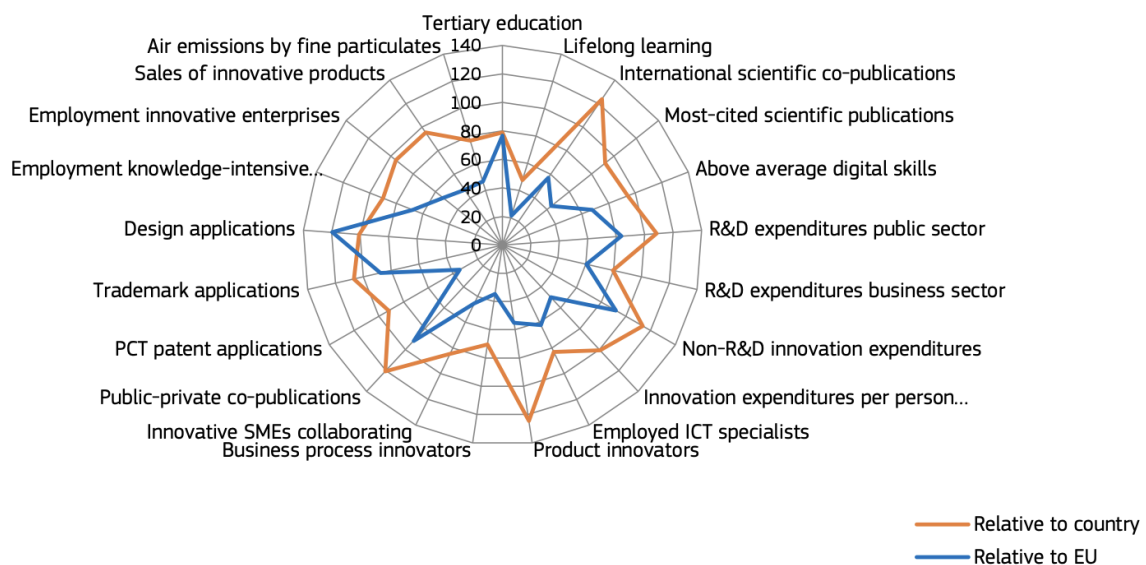
Source: Kupper, Klaassen, Rijnen, Vermeulen, Broerse, 2015.

The RRI aims to create a society in which the practices and results of R&I (research and innovation) are committed to achieving sustainable, ethically acceptable and socially desirable results. According to the RRI approach, all people and institutions influencing and devoted to research and innovation are responsible for our future. RRI is interested in predicting the future results of research and innovation processes. Results are not determined individually, but are from and/or present in the description of process requirements. Consequently, attention should be paid to the integrated nature of processes and results in the implementation of the RRI.

#### 4. Regional economy and intelligent specializations in the lodzkie region

The lodzkie region is located in the central part of Poland and covers an area of 18,219 km<sup>2</sup> (9th place among voivodeships). According to data from the Lodzkie Statistical Office (*Rocznik...*, 2022), in June 2020, lodzkie region was inhabited by 2,448,713 people (6th place in Poland). The population density was higher than the average in Poland and amounted to 135 people/km<sup>2</sup> (Poland 123 people/km<sup>2</sup>), in cities it reached 1320 people/km<sup>2</sup>, and in rural areas 54 people/km<sup>2</sup>. The urbanization rate was 62.4%, which gave the lodzkie region 7th place in Poland.

The lodzkie region is quite well developed economically. In 2021, almost 60% of people aged 15 and over in the region were professionally active. In 2021, according to the Lodzkie Statistical Office (*Rocznik...*, 2022), the voivodeship generated 6.1% of gross domestic product, which gave it 6th place in the country. It is worth noting that this share has been almost unchanged for several years (2000 - 6.1%, 2010 - 6%, 2014 - 6.1%, 2018 - 6.0%). In terms of GDP per capita, the voivodeship ranked 5th in the country with regional GDP constituting 95.9% of the national average.



**Figure 1.** Indicators of the innovation scoreboard – lodzkie region with relation to the country and EU.

Source: Regional Innovation Scoreboard 2023. Regional profiles. Poland. European Commission (2023). Retrieved from: [https://ec.europa.eu/assets/rtd/ris/2023/ec\\_rtd\\_ris-regional-profiles-poland.pdf](https://ec.europa.eu/assets/rtd/ris/2023/ec_rtd_ris-regional-profiles-poland.pdf)

With accordance to Regional Innovation Scoreboard 2023 Regional..., 2023), the lodzkie region is an emerging innovator +. Innovation performance has increased over time. The radar diagram (Figure 1) presents relative strengths compared to Poland (orange line) and the EU (blue line), showing relative strengths (e.g. design applications) and weaknesses (e.g. lifelong learning).

According to the operational program for EU funds for the lodzkie region (*Program regionalny...*, 2022), the reasons for the voivodeship's low innovativeness can be found in its outdated economic profile, uncompetitive industrial processing and the predominance of micro-enterprises, usually characterized by low innovation potential. According to the provisions of this document, the challenge in the coming years is the industrial transformation of the region through the development of more technologically advanced sectors and departments, which will enable the inclusion of regional companies in international chains of producing innovative products.

In 2019, internal expenditure on R&D in the voivodeship accounted for 4.49% of national expenditure, and the enterprise sector is responsible for only approximately 1/3 of them. As stated in the operational program (*Program regionalny...*, 2022) it is necessary to increase the involvement of companies in the implementation of research projects and support cooperation between the science sector and the business area to create lasting relationships. In 2019, in the lodzkie region, only 33.4% of entities operating in the R&D area were equipped with scientific and research equipment, and its consumption rate was one of the highest in Poland (nearly 86%, 15th position in the country). The low level of entrepreneurship among residents and the use of the region's potential in terms of services (including innovative and logistics) were also considered a challenge.

In Regional Innovation Strategy for the Lodzkie Region LORIS 2030 (*Regional...*, 2013) industries with the greatest potential for growth in the lodzkie region have been selected. They include:

- Modern textile and fashion industry (including design).
- Advanced building materials.
- Medicine, pharmacy, cosmetics.
- Energy, including generation of energy from renewable sources;
- Innovative agriculture and food processing.
- IT and telecommunications.

Smart regional specializations are a concept for implementing innovation policy, which involves the effective and synergistic use of public support to strengthen innovative capabilities by focusing on the most promising areas of comparative advantage. Smart specialization can be defined as "the entrepreneurial process of identifying areas of science and technology that can benefit a selected region from specialization" (Foray, 2009). It is currently assumed that in order to effectively use the funds invested in science, research and development, regions should strive to position themselves on the regional "market" rather than fragment investments in areas where they will remain catching-up regions anyway. This approach is intended to ensure an increase in the impact of individual European Union policies on regional economies. The result would be a more efficient use of public funds, while simultaneous stimulation of grassroots activities. Scientific projects that comply with regional smart strategies can be perceived as reflecting the RRI perspective as they respond to economic needs and challenges of the regional environment.

## 5. Academy and R&D in lodzkie region – main data

The lodzkie voivodship is a significant academic centre in Poland, where, according to the Lodzkie Statistical Office (*Rocznik...*, 2022), in the academic year 2021/22 there were 19 higher education institutions with 71038 students with a staff of 5953. In terms of positions in the *Ranking Perspektywy 2023 – ranking of Polish universities (Ranking...*, 2023), in 2020 the positions of public universities in Łódź ranged from 9th (Łódź University of Technology) through 11th (Medical University of Łódź) to 25th (University of Łódź) out of approximately 90 universities in the country.

According to the Lodzkie Statistical Office (*Rocznik...*, 2022), in 2021 412 entities conducted research and development activities in the lodzkie voivodship compared to 299 in 2019 which means an increase of 37% (*Rocznik...*, 2023) In 2019, intramural expenditure on research and development (GERD) amounted to 1360 000 000 PLN (at current prices) and rose by 11.4% per year and 58.4% compared to 2017 (*Nauka...*, 2020). The R&D intensity indicator (GERD/GDP) for 2018 reached 0.94%, and was 0.22% higher than for 2017. Current expenditure dominated intramural R&D expenditure structure – 86.2%, while capital expenditure accounted for 13.8%. In the lodzkie region, intra-mural expenditures on R&D were financed mainly from government sectors and corporate funds. The resources of these sectors accounted for 41.7% and 32.8% of intra-mural expenditure in R&D. The structure of intra-mural expenditure on R&D projects is dominated by basic research, which accounts for 794.6 million PLN, or 58.4% of total expenditure. Funds of 428.0 billion PLN have been allocated for experimental development and 137.4 billion PLN for applied research. As in previous years, the largest expenditures on research and development activities were devoted to engineering (34.1%), medical and health (26.7%) and natural sciences (14.5%). The share of other research and development areas in intra-mural research and development expenditure was 24.7%. In 2019, research and development personnel numbered 13.9 thousand, i.e. 10.1% more than the previous year and 5.2% more than 2017. The actual involvement of research and development personnel in scientific research and experimental development was 7.2 thousand full-time equivalents in 2019. Researchers accounted for 74.2% of internal research and development staff, measured as full-time equivalents (2018 72.4% and 2017 80.4%). More than one quarter of R&D personnel had at least a Ph.D. degree, and the personnel structure was dominated by people with master's, bachelor's or equivalent degrees (41.0% in 2019).

According to *The Development Strategy of the Lodzkie Region 2030 (The Development Strategy...*, 2021), Research and Development Centers provide additional technical and scientific support for specific industries and specializations. These are scientific units or entrepreneurs that are not research institutes but conduct research or development work. In 2020, 41 entities in Poland had the CBR status, including 445 from the lodzkie region.

The problem, however, is the insufficient level of cooperation between the R&D sphere and enterprises - in the lodzkie region, less than 4.5% of enterprises cooperated in the field of innovative activities, compared to 5.1% on average in the country.

## **6. Factors affecting the implementation of Responsible Research and Innovation concept in scientific projects –workshop study approach**

As part of the activities of the University of Lodz in RiEcoLab project, a participatory approach of various stakeholders (internal and external) was applied to the process of integrating the concept of RRI into higher education. RiEcoLab stands for *Responsible Innovation-led Entrepreneurial University Transformation Centres (Ecosystem Integration Labs)*. The project was developed under Horizon 2020 and was supported by EIT (European Institute of Innovation & Technology) within HEI Initiative: Innovation Capacity Building for Higher Education. The main aim and an overall joint vision of the RiEcoLab project (<https://riecolab.eu>) is to develop a novel way R&D is being performed in universities to ensure immediate commercialization (spinoffs) and involvement of a large number of internal stakeholders (academic and non-academic staff, students).

For the purpose of gathering information on factors affecting the RRI implementation process, the workshop was conducted. The workshop aimed to stimulate discussion (in interdisciplinary groups) about the possibility of including principles of responsible research and innovation in R&D projects and university development processes.

It was assumed that the research interests of the scientific team applying for the workshop must be reliant on the smart specializations of the lodzkie region. Smart specializations reflect the publicly important research areas from a regional point of view. The recruitment process was open and finally, the workshop involved researchers of 8 scientific projects which complied with the smart specialization of the lodzkie region:

- 1 project in compliance with “IT and personalized design”,
- 2 project in compliance with sustainable agriculture and agri-food industry,
- 5 projects in compliance with “innovative medical industry, pharmaceuticals and cosmetics”.

The workshop was also addressed to internal and external stakeholders of University of Lodz. They were recruited mainly via networking, already existing links with the university and faculty’s partners and stakeholders. During the workshop the following stakeholders took part:

1. Academia.
2. NGO.
3. Industry.



4. Public sector.
5. Internal.

A total of 31 participants took part in this workshop.

The agenda of Responsible Research and Innovation workshop included presentation of the project RiEcoLab, presentations of the scientific projects, presentations of the participants, presentation of Responsible Research and Innovation concept, workshop on embedding Responsible Research and Innovation in university R&D processes.

During the main part of the workshop, participants worked in groups consisting in 6-7 people. They were provided with sheets of paper and worked on the following issues:

1. The past, which is behind us:
  - a. What is behind us, i.e. what we have already implemented?
  - b. What we have achieved, i.e. examples of good practices (adopted solutions).
  - c. What could have gone better, or where we went wrong. How could we avoid them? What actions have been taken (i.e. how have we managed the risk)?
  - d. Who did we include in the research process to meet the requirements consistent with RRI? Who was the key partner from this point of view? What was his contribution? At what stages of the research/project was it involved?
  - e. Which of the previously used solutions was valuable, and we can already use it due to, for example, system solutions?
2. The present, which is here and now:
  - a. Do we find the RRI principles valuable? Why?
  - b. What are our strengths?
  - c. What are our weaknesses?
  - d. What drives us, i.e. what motivates us?
  - e. What drives us to follow RRI principles?
  - f. What is the greatest value of our research/project?
  - g. What do we still not know?
  - h. Have our attitudes changed or are we just following the system?
3. The future is what lies ahead:
  - a. What are we planning for the future?
  - b. What about the RRI principles, or how will we apply them?
  - c. What is the biggest challenge/limitation? (including gender balance, data access and management, open access publication, ethics).
  - d. What are the biggest risks and how can we counteract them?
  - e. What do we need (what resources) to comply with RRI principles?
  - f. What kind of partners do we need to meet the RRI principles? In what areas can they play a key role? Do they want to get involved? How do we want to engage them?
  - g. What role could the university play?
  - h. What role could co-operating units play?

- i. What changes should take place in your institution?
- j. How to make the results of works/research "responsive", "market oriented", "user friendly". What will this mean in practice?

Above listed questions were not closed list and motivated participants to brainstorming, vivid discussions and ideas and experiences sharing. 4 moderators assisted participants helping to generate ideas and clarify or collect them. Ideas were noted on the small adhesive stickers. This enabled the broader discussion while presenting the results of brainstorming in groups.

## 7. Results

The RRI workshop revealed some important factors present in the concept implementation processes and possibilities of embedding. The study confirmed hypotheses which were formulated. Some factors are supporting, other limiting the R&D processes in universities to become more responsible and environment/stakeholders oriented. Key lessons learned are:

1. Science already has some experience in implementing this approach, although these activities are not free of barriers and limitations.
2. The principles of RRI require wider popularization, especially in terms of the benefits of their application.
3. There is no doubt about the important role of internal and external stakeholders of the activities carried out, although, as noted, universities encounter certain problems here, such as insufficient social trust in science, which was, for example revealed during Covid 19 pandemic.
4. There is a need to promote reliable scientific knowledge, to strengthen social awareness of its role in the development of the world. The channels and models of communication have to take into consideration heterogeneity of the recipients.
5. It is necessary to strengthen the understanding of the seemingly different points of view of different stakeholders on expected values.
6. Communication between participants in innovation processes is important in order to improve the efficiency of activity in the sphere of RRI, including mechanisms of inclusive decision-making.
7. Not all scientific projects are successful right away and need support.
8. The scope of political or policy interference in science seems to be oversized.
9. Universities need well-qualified administrative structures enabling RRI to be vertically and horizontally implemented in higher education institutions.
10. Not all scientists are interested in achieving wider impact of their scientific achievements. There is a need of broader dissemination of the 3rd role of contemporary universities.

## 8. Discussion

The presented research has many shortcomings. First, it would be recommended to deeply investigate in what directions international research has evolved in terms of fields related to the RRI concept. Knowing these trends, the analysis of internal and external mechanisms influencing the possibility of RRI concept implementation in academia would be more precious. Secondly, the study provides insight based on one study with a relatively small sample. What is more, the attendants were already involved in socially/economically/environmentally responsible activity as researchers represented projects that complied with regional specializations. Also, the stakeholders were reached through channels of contacts related to entities already involved in some relations with academia. Although it was possible to capture the main ideas on how to foster the RRI concept, it is important to execute wider research on a sample representative for a whole quadruple helix population, including scientists not interested in “responsible science”. Thirdly, it should be investigated if and which stakeholders still need to be familiarized with the necessity of involving science in positive change in the world. It would also be worth confirming whether the academic society is widely in such an agreement. The analysis of the practical dimension of the use of RRI concepts should involve various research methods.

## 9. Summary

The concept of Responsible Research and Innovation enables a broader view of university research and development activities. It is an approach that allows for a new perspective on the impact of academia on the external environment. From a regional perspective, such support can be executed within projects in compliance with regional smart specializations. This is why for the purpose of the study, representatives of scientific projects responding for the needs of such smart specializations have been selected. The study confirmed the hypotheses which were formulated. It confirmed that science already has some experience in implementing RRI approach, although these activities are not free of barriers and limitations. The principles of RRI require wider popularization, especially in terms of the benefits of their application. There is no doubt about the important role of internal and external stakeholders of the activities carried out. However, as noted, universities encounter certain problems here, such as insufficient social trust in science. The research revealed some important factors affecting the ability to implement the RRI concept. One of the most important findings is that there is a need to promote reliable scientific knowledge, to strengthen social awareness of its role in the socio-economic system. What is more, it is necessary to strengthen the understanding of the apparent

different views of different stakeholders on the expected values. Finally, communication between participants in innovation processes and cooperation is important in order to improve the efficiency of activity in the sphere of responsible research and innovation, including mechanisms of inclusive decision-making.

Generalization of the results is yet limited. The literature study needs to be deepened and include other than RRI but similar concepts. Secondly, the study provides insight based on one study with a relatively small sample, and the choice of participants was oriented toward those who engage themselves in wider participation (with various stakeholders of R&D processes). Thirdly, it should be investigated if and which stakeholders still need to be familiarized with the necessity of involving science in positive change in the world. It would also be worth confirming whether the academic society is widely in such an agreement. Further research should be based on more differential study methods.

Nevertheless, the paper has some practical and theoretical implications. From the practical point of view, the results are useful for R&D practitioners as well as bodies supporting R&D processes as they help optimize innovation and research processes in the field of their public value. From the theoretical point of view, it should be noticed, that regarding the limitations of the study, more advanced research should be conducted to wider and deepen the knowledge on limitations and drivers of RRI.

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For more information about a project, please refer to the following website:  
<https://riecolab.eu>

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