Living Knowledge
The International Science Shop Network

EnRRICH
A LIVING KNOWLEDGE PROJECT

Connecting the European Higher Education Agenda with Open Science and Responsible Research and Innovation

This document is aimed at those working in higher education policy internationally, though it may also be of use to national and institutional level policymakers. It summarizes the findings of the project 'Enhancing Responsible Research and Innovation through Curricula in Higher Education (EnRRICH)' which received funding of €1.5m from the European Union's Horizon 2020 research and innovation programme.

Responsible Research and Innovation in the EnRRICH Project

EnRRICH was funded through Horizon 2020 to examine how Responsible Research and Innovation (RRI) could be embedded in higher education curricula. The main goal was to use this approach to create graduates who are capable of contributing to Open Science and mission oriented research. In order to tackle this goal, EnRRICH developed a range of practical resources to support educators, alongside influencing policy by encouraging higher education policymakers to examine how RRI could synergise with their own activities and goals.

> *'Responsible Research and Innovation (RRI) implies that societal actors (researchers, citizens, policy makers, business, third sector organisations, etc.) work together during the whole research and innovation process in order to better align both the process and its outcomes with the values, needs and expectations of society.'*

EnRRICH conceptualised the RRI and Open Science approach through the lens of the 12 Science Shops who participated in the project. Science Shops focus on bringing the needs of civil society organisations into research agendas. The project therefore chose to focus on how RRI and Open Science approaches could help students to develop their capacity for undertaking engaged research in response to civil society needs. This leveraged the expertise of our consortium and our international networks.

The Future of RRI and Open Science

Europe has made significant investments in developing policy and practice to embed RRI in research practices over the lifetime of Horizon 2020. This investment is now reaching implementation stages with RRI projects having developed capacity in a range of different countries and organisations. For EnRRICH, developing RRI through higher education curricula has built capacity for a mission-oriented research and an open science - the ongoing transition in how research is performed and how knowledge is shared. The further consolidation of RRI by means of a specific funding stream in Horizon Europe will continue to build capacity to address the Sustainable Development Goals and build towards the vision of Open Science.

About this document

This document suggests policy measures needed to enhance a structural embedding of RRI and Open Science principally in European policy for Higher Education but also in Framework Programme 9 'Horizon Europe'. In order to make arguments directly consistent with the European Higher Education agenda, this brief is structured around the four main policy priorities for action identified by Europe in the Renewed EU Agenda for Higher Education:

1. Tackling future skills mismatches and promoting excellence in skills development
2. Building inclusive and connected higher education systems
3. Ensuring higher education institutions contribute to innovation
4. Supporting effective and efficient higher education systems

The conclusion offers recommendations for Research and Innovation, particularly in the context of the development of '*Horizon Europe'.*

Policy Brief

Policy Brief

The EnRRICH Experience

The EnRRICH findings emerge from the work of 12 partner organisations across Europe who have been trialling and piloting RRI in academic curricula, alongside consulting with a wide range of stakeholders including policy makers, funders, education and research experts, students and civil society organizations (CSOs). EnRRICH has systematically also gathered evidence by means of ongoing evaluation. Thereafter the project has co-produced knowledge in an incremental way.

The experience with EnRRICH clearly showed the value of the RRI approach to teaching and learning agendas. In turn, the embedding of RRI in education systems will help to produce graduates who are ready to tackle the United Nations Sustainable Development Goals (SDGs). The European Union has made a commitment to addressing these goals in the next European research funding programme Horizon Europe. According to the Paris Communique, Europe is also looking for ways to harmonise the European Higher Education Area and the European Research Area. Our experiences in EnRRICH have shown that RRI and Science Shops offer a very good model to do this at local and institutional levels.

EnRRICH Activities

Over 33 months, EnRRICH ran over 120 pilots engaging almost 6,000 students and 230 Civil Society Organisations (CSOs) across 79 academic courses and programmes across Europe.

From this, EnRRICH produced 26 Promising Practices and case studies on embedding RRI in higher education curricula. Alongside this, three new Science Shops were established and three fledgling Science Shops were supported. All have demonstrated their value to their HEI and have been funded beyond the project to continue their work.

A wide range of stakeholders who work in the fields of public and civic engagement, education and RRI were engaged with the project, in part through the project's international Advisory Board but also through conferences and meetings.

A community of practice has been developed to ensure co-operation, knowledge sharing and continuity. Formative evaluation on 11 case studies promoted reflexive learning. All of these experiences have been written up in deliverable reports which are available on the project website www.enrrich.eu

EnRRICH in numbers

Pilots and courses: Over 120 pilots ◆79 Courses/programmes delivered ◆5,926 students involved ◆231 Local CSOs involved in planning and delivery of pilots ◆26 Promising practices identified.

Dissemination: 208 Conference/seminars presentations ◆32 Published articles ◆266 International delegates from 28 countries & 5 continents at 7th Living Knowledge International Science Shop Conference ◆52 Mentoring activities ◆12 Issues of Living Knowledge Newsletter shared with 1000+ subscribers ◆1,085 Twitter followers ◆200+ average website views per month.

Policy: 6 National HE/RRI policy case studies ◆10 National/institutional policy documents ◆3 Policy briefs ◆11 Experts involved in international Advisory Board ◆18 National and international policy makers consulted.

Evaluation: 11 Formative peer evaluation case studies based on interviews, direct observations, document analysis and focus groups ◆1 Independent summative evaluation based on workshops, questionnaires, focus groups, observation, interviews.

Policy Brief

EU Policy Priority 1: Tackling future skills mismatches and promoting excellence in skills development

The Renewed EU Agenda for Higher Education has identified that many students graduate without the range of skills they need for resilience in a changing world. They need to acquire advanced transversal skills and key competencies such as autonomy, critical thinking and a capacity for problem solving. Well-designed curricula are crucial in this respect. Europe identifies the need to acquire skills and experiences through activities based around real world problems and the importance of supporting educators to design, build and deliver robust study programmes.

"LEARNING ABOUT LEADERSHIP IN A RESPONSIBLE WAY HAS SHOWN ME THAT A TRUE LEADER DOES SO MUCH MORE THAN JUST DELEGATING. IT IS ABOUT EMPATHY, TOUGH LOVE, AND ABOUT BEING AN INSPIRING PERSON WHO KNOWS THAT THE REAL WAY FORWARD CAN ONLY BE ACHIEVED TOGETHER IN COOPERATION."

A student involved in pilot activities

RRI methodologies can develop and enhance the quality of teaching and learning

EnRRICH concluded that embedding RRI in curricula is a successful way to develop and enhance the quality of teaching and learning. Many EnRRICH pilots focused on revising already existing modules and courses. This approach is relatively easy to implement and is seen by educators as less time-consuming and lower risk than developing new modules.

The EnRRICH trials demonstrated the value of connecting higher education teaching to societal needs and challenges. The evaluation concluded that they enhanced students' ability to address local and global issues; further connected education and research while offering opportunities for transdisciplinary and interdisciplinary approaches which are high on the agenda for teaching and learning policy-makers and are particularly suited to developing RRI competencies in students.

Students valued their learning whilst also identifying that learning through engagement challenged them more than other parts of their curricula. Educators felt that the support offered by Science Shop structures for embedding societal engagement in research curricula was vital.

EU Policy Priority 1: Tackling future skills mismatches and promoting excellence in skills development

Expected benefits to students and society from embedding RRI in curriculum include

- ✓ Enhanced engagement skills
- ✓ Project based learning
- ✓ Ability to address issues of social relevance

Participants in EnRRICH pilots especially valued

- ✓ Working on issues that are meaningful to society and developing the tools and capacities to do this
- ✓ A practical way to do inter- and transdisciplinary teaching by addressing real world problems and cases
- ✓ The opportunity to effectively respond to students' needs
- ✓ Support in developing research focused and student centered study programs

Recommendations for Education Policymakers:

- Develop a funding stream to support the rolling out of RRI and Open Science through curricula and thus stimulate a 'bottom up' movement, building skills in educators, academic professionals, early stage researchers and in citizens.
- Widely reflect skills and competencies connected with RRI in European frameworks like the European Qualifications Framework (EQF) and build into higher education curricula at all levels.
- Promote and support study and research programmes that actively pursue crossover between STEM (Science, Technology, Engineering and Mathematics), SSH (Social Sciences and Humanities) and CAD (Creative Arts and Design) disciplines.

Policy Brief

EU Policy Priority 2: Building inclusive and connected higher education systems

Higher education must play its part in facing up to Europe's social and democratic challenges and addressing the Sustainable Development Goals. Breaking down barriers between higher education and the rest of society can help students develop their social and civic competences and research with and for CSOs can help students develop their wider practical experience and skills.

"AN INTERESTING EXPERIENCE CHALLENGING MY WAY OF THINKING WHILE NOTABLY IMPROVING MY SOCIAL AWARENESS AND ETHICAL THINKING."
A student involved in pilot activities

Connecting students to civil society benefits from dedicated support structures

A significant amount of work is required to create an environment conducive to the successful and sustainable integration of societal needs in the curricula, extending far beyond designing and delivering one-off staff workshops. Systematic and stable organizational support with strong connections to CSOs, particularly when combined with a good understanding of pedagogic competences, made the process of developing RRI projects in curricula much more feasible for educators.

Building communities of practice within and beyond institutions helped to demystify RRI in curricula and helped ensure that the best practices in the integration of RRI are widely available and well known. Educators who participated in the pilots identified the benefits of having dedicated support in terms of developing the work with CSO partners since they were able to build on already existing relationships. It was also easier to clearly define the scope of a project in the knowledge that other issues outside the scope of a particular pilot could potentially be picked up by other teachers and students.

The project concluded that the Science Shop approach is uniquely suited to developing RRI competences in students. New Science Shops funded under EnRRICH have gone on to become embedded in their HEI and will be sustained beyond the life of the project, demonstrating the benefit of early stage funding for such initiatives.

EU Policy Priority 2: Building inclusive and connected higher education systems

Expected benefits to students and society from embedding RRI in curriculum include

- ✓ Exposure to social issues affecting those most disadvantaged in society
- ✓ Opportunity for meaningful research for/with CSOS from students while developing practical research tools

Participants in EnRRICH pilots especially valued

- ✓ The social relevance of the issues addressed
- ✓ The contacts with groups and people outside HEIs
- ✓ The possibility to engage in real world social challenges
- ✓ The opportunity to effectively connect scientific and social and civic competences
- ✓ The possibility to experience cooperation among people, groups, institutions and organizations

Recommendations for Education Policymakers:

- Support the creation of communities of practice (national, international, institutional) to further integrate Open Science and RRI into the curriculum in higher education e.g. by establishing a working group at European level bringing together interested national and international bodies to explore opportunities for collaborative funding of Open Science methodologies.
- Promote public engagement as a core element of the education mission of European universities to include valorising multiple ways of thinking, knowing and doing.
- In recognition of current under-representation of CSOs, refine award criteria for participation in European Commission working groups on Education and develop the capacity of CSOs and CSO networks to participate in such working groups.

EU Policy Priority 3: Ensuring higher education institutions contribute to innovation

Policy Brief

Many higher education institutions are developing new solutions to economic, social and environmental problems. High quality training, particularly at postgraduate levels, is critical. One way to innovate is to strengthen the relationship between teaching and research, including promoting research based teaching, interdisciplinary education and research and bring practical innovation into the classroom. Further development and testing of teaching methods for creativity and innovation should be supported

"COLLEAGUES WERE REPORTING ABOUT TANGIBLE CHANGES IN THE CONTENT OR PROCESSES OF THEIR TEACHING AND LEARNING ACTIVITIES AS A RESULT OF THE RRI FACULTY DEVELOPMENT."
A teacher involved in pilot activities

The RRI and Open Science approach supports creativity and innovation.

EnRRICH found that RRI strongly linked to the interests and priorities of both educators and policymakers. The integration of the research needs of local level CSOs into curricula helped to make the Sustainable Development Goals (SDGs) real to students and educators and also contributes to the societal mission of universities (sometimes known as third mission).

Universities can also incorporate RRI into curricula to make a clear contribution to the Sustainable Development Goals at local levels in their cities and regions, through small scale student research projects addressing local needs. RRI through curricula can also help to develop strong links between research and teaching and create graduates who understand engaged research and can bring it into future professional practice.

RRI also offered opportunities to further develop policy and practice on the basis of shared values and concerns, such as encouraging innovation and developing skills for engaged research.

EU Policy Priority 3: Ensuring HEI contribute to innovation

Expected benefits to students and society from embedding RRI in curriculum include

- ✓ Innovation in teaching and learning with framework of support
- ✓ Using small scale approaches from agile and grassroots CSOs to address larger challenges

Participants in EnRRICH pilots especially valued

- ✓ The focus on leadership, stewardship and responsibility
- ✓ The possibility to elaborate new solutions to actual economic, social and environmental problems
- ✓ The possibility to creatively apply new knowledge and skills
- ✓ Opportunities to ensure that innovation has positive social change outcomes for CSO partners

Recommendations for Education Policymakers:

- Create opportunities for collaboration between European Commission Departments charged with innovation in higher education in service of teaching and learning (DG Education, Youth, Sport and Culture); Regional Development (DG Regional and Urban Policy) and Research (DG Research and Innovation) to share knowledge on responsible innovative practices.
- Ensure that higher education policies consider the societal implications of innovation and enhance its capacity to respond to societal needs.
- Develop work programmes that clearly address social innovation in order to build capacity to tackle the Sustainable Development Goals

Policy Brief

EU Policy Priority 4: Supporting effective and efficient higher education systems

Higher education needs adequate human and financial resources and needs to target and balance investment. Setting incentives, objectives and quality standards for the higher education systems which recognise excellence in teaching, in engagement and in research is vital to incentivising good practices at individual, national and international levels.

"THE RESPONSIBLE INNOVATION CONCEPT TRAINS PEOPLE TO CONSIDER ETHICAL AND SOCIETAL QUESTIONS BEFORE ACTIONS. THIS APPROACH GIVES ME INSIGHTS HOW TO CREATE INNOVATIONS WHICH HAVE ANTICIPATION, RESPONSIVENESS, REFLEXIVITY AND INCLUSIVENESS. THUS, THE INNOVATIONS WILL TACKLE COMPLEX ISSUES AND BE ACCEPTED BY DIFFERENT STAKEHOLDERS."

A student involved in pilot activities

The current system of governance in higher education is challenging for fully embedding RRI in curricula

There is a longstanding tension between academic freedom (at both individual and HEI levels) and system governance. For EnRRICH partners, the rigidity of the system caused difficulty for some in trying to embed RRI. In general, whilst RRI in curricula is uniquely suited to building links between teaching and research and supporting inter- and trans- disciplinary approaches, HEIs did not have curriculum structures to enable this work.

Encouraging collaboration across different disciplines helps students to understand multi-stakeholder approaches in a different way. Whilst there is a lot of attention paid to assessment both institutionally and at national and international levels, no coherent assessment models for examining engagement and RRI in curricula exist. Such assessment models need to align with the character of the learning outcomes, the teaching and learning methods selected, the potential for engagement with and impact on external stakeholder partners.

The EnRRICH approach offers a model which should be examined for the European Education Area by offering a strategic mechanism for integrating teaching and learning with research and service to communities.

EU Policy Priority 4: Supporting effective and efficient higher education systems

Expected benefits to students and society from embedding RRI in curriculum include

- ✓ Integration of research into teaching and learning while engaging with local and regional issues
- ✓ Interdisciplinary approach to real world issues
- ✓ Interactive learning

Participants in EnRRICH pilots especially valued

- ✓ The interactive nature of the sessions and the projects involved
- ✓ The connection between teaching, research and third mission of universities
- ✓ The chance to develop higher teaching standards through innovative teaching approaches and curriculum improvement

Recommendations for Education Policymakers:

- Develop funding to skill up higher education professionals to design curriculum spaces for transdisciplinary and interdisciplinary work and institutional and multi-actor cooperation.
- Encourage and support the development of assessment models, measures and procedures that can examine societal impact in order to incentivise supporting RRI in teaching (including societal impact as defined by civil society).
- Take positive action with European and National Quality assurance and evaluation agencies to develop a robust set of measures based on social accountability principles and practices, co-developed with relevant societal actors.

Policy Brief

Conclusions

There is significant value in continuing to invest in RRI and Open Science. Europe is committed to developing excellent mission-oriented research which involves all stakeholders from the outset in order to stimulate and encourage innovation for society and the economy. In order to create a generation of citizens who can carry out this excellent research and tackle the Sustainable Development Goals, we need to build on the gains made by RRI in Horizon 2020.

The work of the EnRRICH project and previous RRI projects such as RRI-Tools have made significant advances in the creation of materials, resources and tools to utilise in teaching and research. Beyond the EnRRICH project, Science Shops will continue to support the integration of RRI both in research processes and in curricula, in particular through the International Science Shop Network: Living Knowledge.

However these efforts urgently need strategic support at European level. Breaking new ground is hard work and effort needs to continue in order to safeguard gains made. The European Union should now focus on integrating previous learning into the Open Science approach, and on building on progress made. Policy action at all levels (Global, European, national, institutional) is therefore recommended to ensure the durability of successful interventions through structural change.

Key policy conclusions for the development of Horizon Europe

- Maintain and strengthen Responsible Research and Innovation (RRI) and Transdisciplinary Research as a cross cutting issue throughout all funding streams in Horizon Europe to support Open Science and mission orientation and citizen involvement, resulting in societal impact and innovation.
- Preserve and build on expertise in RRI and Open Science at a European level, through the continuation of Science With and For Society as an expert unit which brings together knowledge from across other streams, including education. This should include a specific dedicated funding stream to continue to develop best RRI practices for Open Science.
- Fund and further develop mechanisms which build capacity in small and underserved civil society organisations so that they can participate in research agenda setting.
- Create an international working group to implement RRI and Transdisciplinary Research and thereby address sustainable development Goals. This should include under-represented citizen groups and those whose voices are unheard in research processes from inside and outside Europe, including the Global South.
- Develop a shared funding stream across European Commission Departments e.g. Research and Innovation and Education, Youth, Sport and Culture (particularly the Higher Education Section) to get maximum impact from investment and stimulate international interest in embedding methodologies for Open Science (including RRI) in academic curricula.

Policy Brief

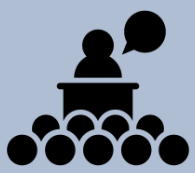
If you want to know more about the work of EnRRICH and the resources developed by the project, including case studies and *The EnRRICH Tool for Educators*, see www.enrrich.eu

Over the last 2.5 years, the Enhancing Responsible Research and Innovation (RRI) through Curricula in Higher Education (EnRRICH) project has offered students and staff in HEIs across Europe a chance to pilot Responsible Research and Innovation in higher education curricula by participating in engaged research with Civil Society Organisation (CSO) partners.

5,926 students engaged

10 national/institutional **documents** refer to RRI in curriculum

208 conference/seminar presentations



231 CSOs **involved in planning and delivery of pilots**

266 international **delegates** from 28 countries & 5 continents attended **7th Living Knowledge International Science Shop Conference in Dublin**

79 courses/programmes **delivered**

18 national/regional **policy meetings** with **international policymakers**

Disciplines

- Architecture
- Business
- Design
- Engineering
- Environmental Studies
- Geography
- History
- Sociology and Social Work
- Sustainability
- Tourism

Multidisciplinary

32 published articles

* **Key EnRRICH paper:** '(Re-) designing higher education curricula in times of systemic dysfunction: a responsible research and innovation perspective.' Higher Education Journal. November 21, 2017 *(Downloaded 1,600 times by Jan. 31, 2018)*

920 followers

All figures correct to Dec. 31, 2017 unless stated otherwise

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