foRMAtion

Lesson 2 - Responsible Research and Innovation approach: EU drivers for Impact

Keywords

- Responsible development
- Public Engagement (PE)
- Open Science – Open Access
- Ethics
- Research integrity
- Ethical research conduct
- Ethics dumping
- Ethics Data Management
- Gender equality
- Science education
- Science governance

Learning Objectives

③④
⑩⑪

Scan for complete LOs

Go to the exercise

https://learningapps.org/watch?v=p0znvmvvk22

While planning their research impacts, researchers and R&I institutions must consider the EU focus areas of impact defined in the **Responsible Research and Innovation Policy**. At the same time, addressing Responsible Research and Innovation (RRI) also means approaching impact by looking at how R&I meets the current social, ethical and political demands.
This lesson explores RRI and the different aspects it involves.

Responsible Research and Innovation approach: a vision for research impact

Research and Innovation (R&I) have improved our world and our lives, and all evidence suggests they will continue to transform our future. Nevertheless, although research and innovation bring about positive impacts on societal development, R&I is **socially, ethically and politically entangled** and, as such, it may have potentially widespread, uncertain and **unpredictable social effects**.

Since R&I developments can generate a certain level of **new risks and ethical dilemmas**, with impact on citizens, several policy meetings, research groups, projects and networks around the world have highlighted the need to **conceptualize and implement responsible R&I**.

The term **responsible development** was first used back in 2003, in the US Act about nanotechnology development, and, from 2009, in Europe, by the Netherlands Organization for Scientific Research (NWO). Since then, many efforts have been put in place worldwide, leading to the EU Programme for Research and Innovation 2014-2020 (*Horizon 2020*) approach called *Responsible Research and Innovation (RRI)*. EU definition: cf:

Responsible research and innovation is an approach that anticipates and assesses potential implications and societal expectations concerning research and innovation, intending to foster the design of inclusive and sustainable research and innovation.

The RRI approach aims at diminishing the **gap between science and society** which implies that societal actors (such as researchers, citizens, policymakers, companies and civil society organisations) work together in the whole research and innovation process to better align both the process and its outcomes with the values, needs and expectations of society. RRI aims to promote the development of **ethically acceptable, sustainable and socially desirable research and innovation outcomes**. This has become, from Horizon 2020 onwards, a guiding principle for the European Research Area.
Although the RRI concept is recently gaining momentum, general agreement on its definition, contents and details is still missing. On this aspect, it is important to reference the EU-funded project MoRRI: Monitoring the Evolution and Benefits of Responsible Research and Innovation, having the main objective of providing scientific evidence, data, analysis and policy intelligence to directly support the Directorate General for Research and Innovation's (DG-RTD) research funding and policy-making activities in relation to Responsible Research and Innovation (RRI).
To tackle this policy approach, RRI acts on different aspects of the **relationship between R&I and society**:

- **public engagement,**
- **open access,**
- **ethics,**
- **gender,**
- **science education,**
- **science governance.**

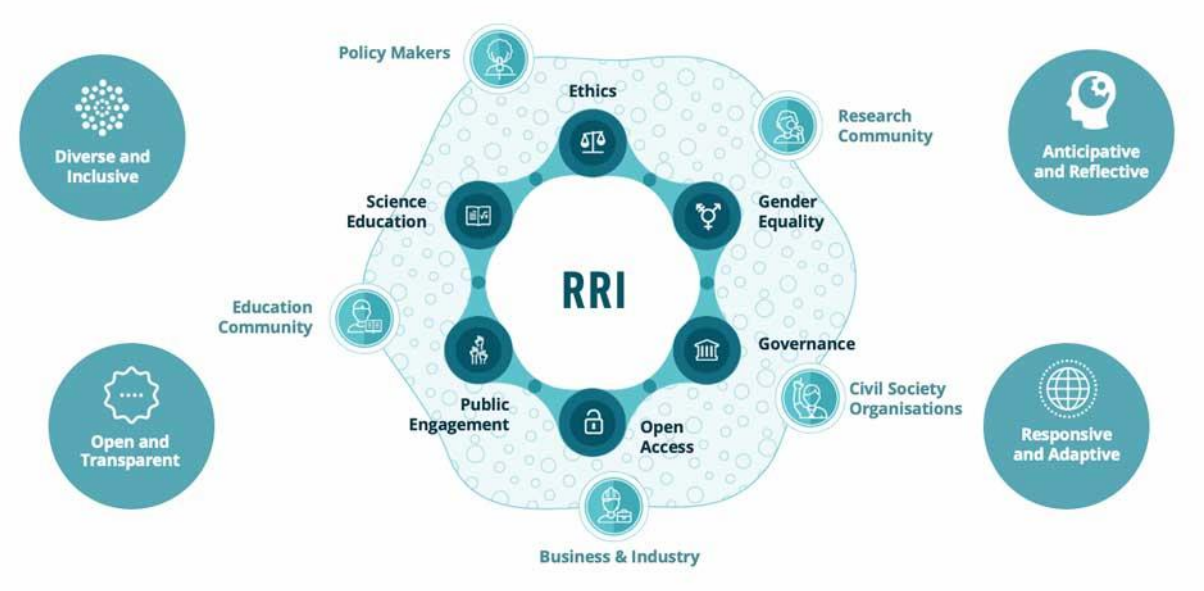

Figure 48 - EU RRI Tools project
(Source: rri-tools.eu)

Each aspect is described below, along with a selection of case studies representing the best practices that aim to provide a concrete vision of each RRI element.

The **role of RMAs** in the accomplishment of each of these **RRI elements** is also relevant, as they:

1. **provide technical support** for researchers and institutions in RRI,
2. **train the research community** to enroll in such activities,
3. **advocate, raise awareness** and contribute to developing such policies within the institutions,
4. **monitor** such practices and policies.

Public engagement (PE)

This RRI challenge involves bringing new voices and creative perspectives into R&I design and results, aiming specifically at:

- contributing to a **more scientifically literate society**, able to support democratic processes and R&I developments;
- fostering R&I outcomes that are more focused on **tackling societal challenges**.

In brief, RRI seeks the **democratization of science and research**.

Approaches to engagement with the public have been evolving over the last two decades, from ***Promoting the Understanding of Science*** (**one-way communication** of research results

to the audience) to the ambitious concept of ***Publicly Engaged Science and Innovation*** (where public engagement is the strategy that allows **inputs from the participants**). In the public engagement process both citizens and scientists have a say on the discussed subjects.

While 'public engagement' is commonly understood concept, it is still unclear how to actually engage the public, how to deal with contradictory positions between the different audiences (including researchers) and at what stages of R&I the public should be involved. Public Engagement in Responsible Research and Innovation: A Critical Reflection from the Practitioner's Point of View is a doctoral thesis that, besides providing a literature review on the matter, develops an empirical study of these topics in action, highlighting some of the challanges tied to practical implementation. It is also particularly relevant because it addresses the issue of **practitioners (RMAs who are responsible for public engagement activities)**.

Public Engagement case studies

- https://www.publicengagement.ac.uk/do-engagement/inspire-me/case-studies
- https://ec.europa.eu/research/swafs/index.cfm?pg=policy&lib=engagement

Role of RMAs

RMAs involved in public engagement activities have a dual role: they act as **moderators** between the different actors (e.g., civil society organisations, public representatives, and individual citizens) and are also responsible for the whole **engagement process**.
They must master **communication skills** as well as **conflict management** and creative **problem-solving**, while understanding the policy context, the political processes and the types of knowledge with which political actors and institutions engage, including their ability to communicate effectively (Powell & Colin, 2009). Open University's description of these RMA points to people *who can actively listen by connecting meaningfully with people from different academic disciplines and roles, and with multiple external stakeholders*. *This role also requires analytical and rhetorical skills to filter ideas and construct arguments that work in particular contexts. At times, this may require flexibility, adaptability, tact and diplomacy; at other times, a progressive vision might be required* (Holliman et al., 2015, p.13).

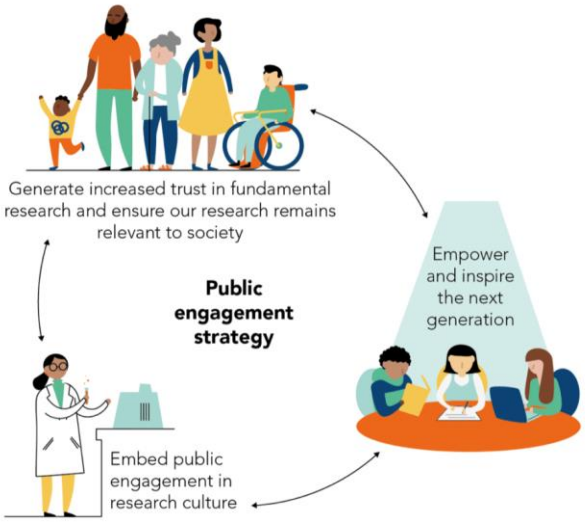

Figure 19 - Public Engagement strategy
(Source: https://www.gurdon.cam.ac.uk/public-engagement/public-engagement-strategy/)

Open Science (+ Open Access)

Open Science is based on the evidence that **making scientific results more accessible** will improve science's overall contribution and boost the development of **new products and services** in the public and private sectors. It is also based on the sociological argument that scientific knowledge is a **product of social collaboration** and its ownership **belongs to the community** and on the economic argument that **scientific outputs** generated by public research are a **public good** that everyone should be able to use at no cost.

By openly sharing R&I knowledge among the whole scientific community, but also with society and companies, Open Science aims to increase the recognition of science and maximise its social and economic impact. In 2012, the **European Commission** issued a clear recommendation encouraging all EU Member States to **share public-funded research results with the public sphere** and, in 2016, published the book *Open Innovation, Open Science, Open to the World - A Vision for Europe*, developed under the lead of Carlos Moedas, the EC Commissioner for Research, Science, and Innovation at the time. Here, the European Commission provides the following definition of Open Science:

A new approach to the scientific process based on cooperative work and new ways of diffusing knowledge by using digital technologies and new collaborative tools.

Other definitions of Open Science include the OECD definition: *to make the primary outputs of publicly funded research results – publications and research data – **publicly accessible in a digital format** with no or minimal restriction*. Nevertheless, while Open Science encompasses **open access to data and publications**, it also represents the openness of the scientific process on the whole, reinforcing the concept of RRI. As the Open Science and Research Initiative highlights, Open Science integrates several ***open* movements** (such as open access to publications, open research data, open source software, open collaboration, open peer review, open notebooks, open educational resources, and open monographs), **citizen science** and **research crowdfunding**. The **openness** to the scrutiny of science and scientific practices by the citizens, who may access data and take part in R&I discussions, intends to stimulate **public trust in science**, a major goal of RRI.

Open Science concepts can be extended to the whole project lifecycle, as exemplified in Figure 50.

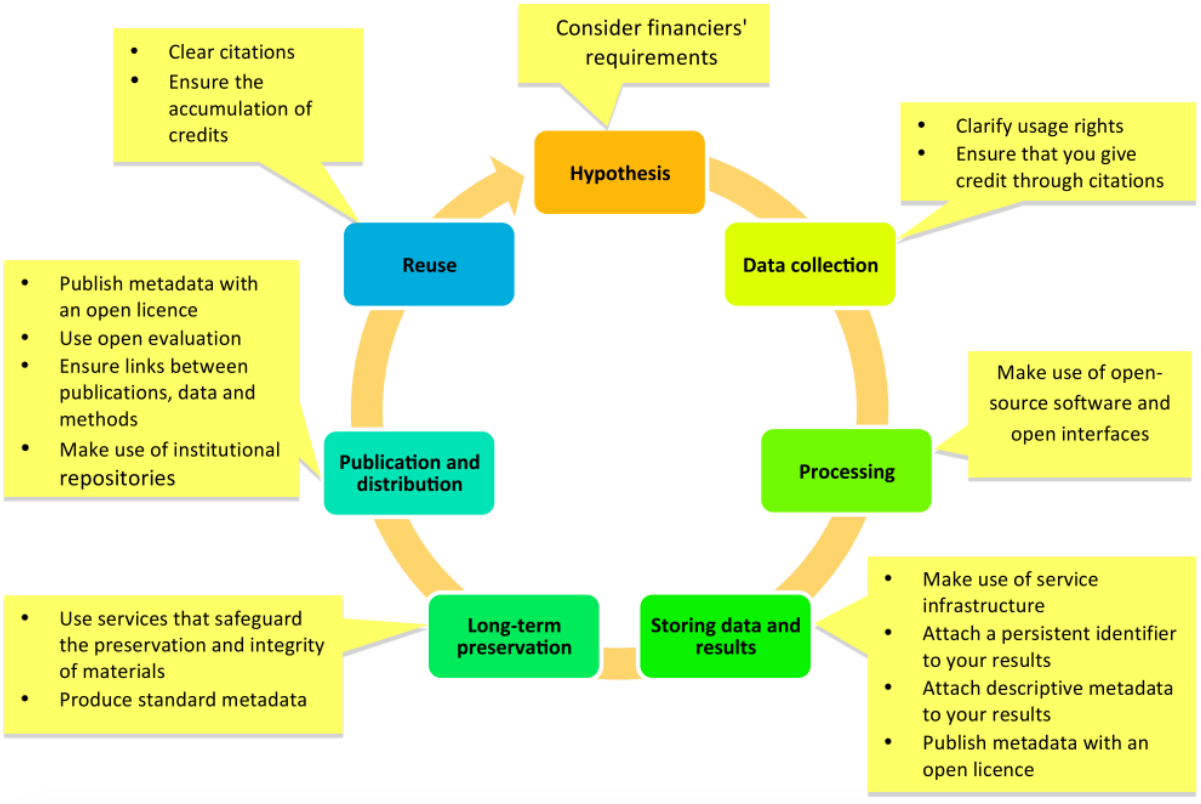

Figure 50 - Open science throughout the project lifecycle
(Source: Open Science and Research Initiative, 2014)

In all R&I projects funded by the European Commission, as set out in the European Code of Conduct for Research Integrity, providing sound and **FAIR data** (**Findable, Accessible, Interoperable and Reusable**) is an essential part of good research practice and **research integrity**. For more information, see the section below on Data Management.

Open Science case studies

- Facts and Figures for open research data and case studies related to accessing and reusing data generated during scientific production
- UK Open Research Data Task Force: case-studies
- Case studies on Open Science in the context of ERC projects - 5 sets of case-studies

Role of RMAs

Research and Innovation institutions have the responsibility to create an **enabling environment for open data**, with RMAs playing an important role in:

- effectively **training and supporting** the evolving information needs of researchers,
- providing **support to the infrastructures** to share publications, articles or data,
- **advocating, raising awareness and contributing** to developing open access policies within the institutions,
- **carrying out and monitoring Open Access policies**.

As such, the EU-funded project Foster Plus (Fostering the practical implementation of Open Science in Horizon 2020 and beyond) highlights the following RMA-powered tasks on this matter:

- advise on **preserving research outputs** (e.g., publications) and **project records** (e.g., correspondence);
- contribute to the development and governance of **repositories** of publications and data, regarding an appraisal, selection, description and metadata application, curation and preservation; information retrieval; monitoring data reuse, citation and impact, etc.
- support researchers in complying with the various mandates of funders, including **open access requirements**;
- assist researchers in the **identification of potential funders** for Open Science activities;
- provide **advice and training in data management, preservation and analysis** to assist researchers in **opening and sharing their research workflows** and reusing research outputs produced by others.

Ethics (+ Data Management)

Ethics in the RRI approach includes all ethical issues which may arise from the beginning to the end of the research lifecycle. It represents the **commitment to ethical research conduct**, which implies the application of fundamental ethical principles and legislation to scientific research in all possible domains.

All R&I activities are obliged to **comply with ethical norms and principles**. The US National Institute of Environmental Health Sciences (NIEHS) highlights the relevance of such norms since they:

- **promote the nature of the research purpose:** search for knowledge, truth, and avoidance of error;
- **promote the essential values for collaborative work**, such as trust, accountability, mutual respect, and fairness, which are especially relevant for cross-discipline and cross-institutional cooperation and coordination;
- **make researchers accountable** for their research practices, boosting the public support for research;
- **integrate a set of important moral and social values**, such as social responsibility, human rights, animal welfare, compliance with the law, and fulfilment of public health and safety, which are especially relevant as some research activities may potentially harm human and/or animal subjects, students, and the public.

Research integrity

Related to ethical principles is the concept of **research integrity,** which refers to developing research in such a way which allows others to have **trust and confidence** in the methods, findings and publications that result from this research. According to the European Code of Conduct for Research Integrity this means complying with the **4 main principles** below.

1. **Reliability** in ensuring the quality of research is reflected in the design, methodology, analysis and t use of resources;
2. **Honesty** in developing, undertaking, reviewing, reporting and communicating research in a transparent, fair, full and unbiased way;
3. **Respect** for colleagues, research participants, society, ecosystems, cultural heritage and the environment;
4. **Accountability** for the research, from idea to publication, including its wider impacts; accountability for research management and organisation, including training, supervision and mentoring aspects.

Figure 21 - 4 fundamental principles of research integrity
(Source: http://www.eurodoc.net/news/2021/integrity-transparency-openness-key-issues-for-european-research)

Besides the application of fundamental **ethical principles** by researchers and their institutions, **ethical research conduct** also involves compliance with ethical norms and principles **specifically related to the R&I activity** in question. Although this obligation is mostly linked to **medical research** - which has a longer ethical history, beginning in 1964 with the declaration on research ethics by the World Medical Association - research ethics principles are of crucial importance for any field of research.

12 golden rules to ethical research conduct

In the document Ethics for Researchers - Facilitating Research Excellence in FP7, the European Commission identified **12 Golden Rules to Ethical Research Conduct**. The researcher must ensure that his/her research:

1. Respects the integrity and **dignity of persons** (this intrinsic worth protects them from being used for greater perceived benefits).
2. Follows the ***Do no harm* principle**. Any risks must be communicated to the subjects involved.
3. Recognises the **rights of individuals** to privacy, personal data protection and freedom of movement.
4. Honours the requirement of **informed consent** and continuous dialogue with research subjects.
5. Treats animals with respect and works under **humane conditions** before, during and after the research.

6. Designs animal research following the **3 Rs**: Replacement, Reduction, Refinement.
7. Respects the principle of **proportionality**: not imposing more than is necessary on the subjects or going beyond stated objectives (mission creep).
8. Treats **societal concerns** seriously - a researcher's first obligation is to listen to the public and engage with them in a constructive dialogue, transparently, honestly and with integrity.
9. Tries to prevent being openly available for **misuse or malignant dual use** by terrorists or military organisations.
10. Recognises the **wholeness of an individual** and that any modification (genetic or technological) does not interfere with this principle.
11. Respects **biodiversity** and does not impose irreversible change that threatens the environment or **ecological balance**.
12. Builds on the understanding that any benefits are for the **good of society**, and any widely shared **expressions of concern** about threats coming from his/her research must be considered (with the acceptance that, perhaps, certain research practices might have to be abandoned).

The above principles are legally converted and linked to specific domains of research both in EU and international legislation. Examples are: the EU Clinical Trials Regulation, the Code of Ethics of the International Sociological Association or, with a broader scope, the Charter of Fundamental Rights of the European Union and the European Convention on Human Rights.

During the application to an R&I EU-funded programme, researchers are requested to identify any ethical issues related to the project and, if any ethical issues* arise, to **complete an ethics self-assessment**. *Ethical issues are categorised in 11 macro groups:

1. Human embryos & foetuses
2. Human beings
3. Human cells or tissues
4. Personal data
5. Animals
6. Non-EU countries
7. Environment, health & safety
8. Dual use
9. Exclusive focus on civil applications
10. Potential misuse of research results
11. Other ethics issues

The funding proposals that identify ethical issues are then submitted to an **ethics Review process**.

Ethics dumping

Another key concept related to ethics is **ethics dumping**, which is the exportation of non-compliance research practices **outside Europe**. This issue is of particularly relevant in the current era of **globalization of research activities**, where EU organisations develop their work outside the EU and where **international science collaboration and diplomacy** are needed.

Ethics and Data management

During the implementation of most Research and Innovation (R&I) projects, it is necessary to collect, preserve and disseminate data. **Managing data ethically** is critical for maintaining participants' confidentiality and privacy. In R&I projects funded by the European Commission, the researcher must submit a **Data Management Plan (DMP)** within the first 6 months of the project. A DMP details the procedures for the collection, storage, use, re-use, access, retention and destruction of research data. The Commission provides a DMP template that can be used for this purpose.

Regarding ethics, it is in this DMP that the researcher must answer the following questions:

- *Are there any **ethical or legal issues** that can have an impact on data sharing?*
  These can also be discussed in the context of the ethics review. If relevant, include references to ethics deliverables and the ethics chapter in the Description of the Action (DoA).
- *Is **informed consent** for data sharing and long-term data preservation included in questionnaires dealing with personal data?*

Data management according to FAIR principles (Findable, Accessible, Interoperable and Reusable) is closely linked to the concept of Open Data and, in the end, to Open Science.

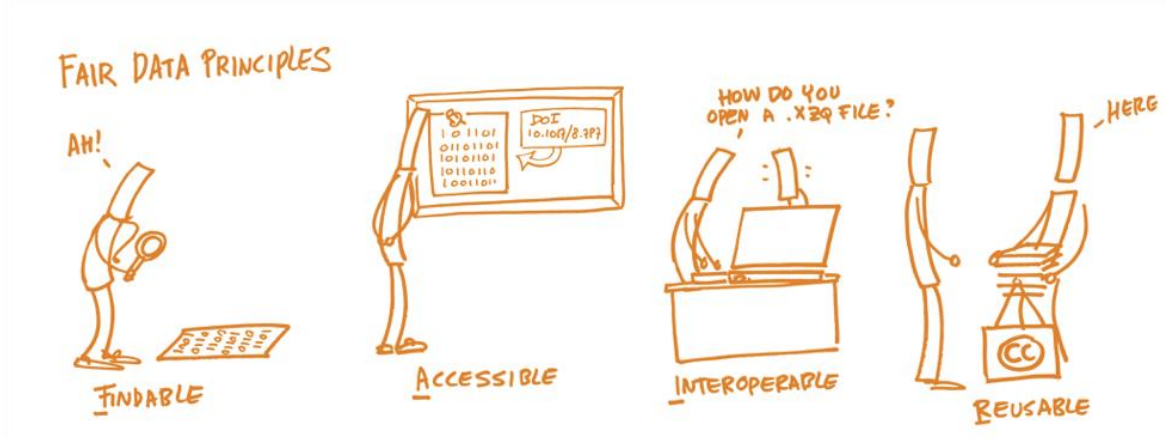

Figure 32 - FAIR principles
(Source: https://www.openaire.eu/how-to-make-your-data-fair)

Ethics case studies

- The European Commission provides other important guidelines in Ethics for researchers: Facilitating Research Excellence in FP7
- 3 case studies on ethical dilemmas and research misconduct (in the USA)
- TRUST report on ethics dumping

Role of RMAs

Even if not directly involved in the actual research process, RMAs have an important role in promoting RRI in their institutions by:

- working in compliance with a **core of ethical principles** (for example see the National Council of University Research Administrators (NCURA) Statement of Principles;
- **identifying real and potential ethical issues** related to research activities (at the level of planning and implementation of a research project, but also in daily research activities at the institution).

Related to this, Boston College has developed the online program called Administrators and the Responsible Conduct of Research with 5 modules devoted to specific case studies of ethical issues for a series of RMA tasks related to:

- Conflict of Interest
- Financial Management
- Mentor-Trainee Responsibilities
- Collaborative Research
- Data Management

Gender

The target of promoting **gender equality** in the EU was laid out in the 2012 European Commission's Communication for a Reinforced European Research Area (2012). Specifically, regarding R&I, it encloses 3 objectives:

1. Integrating the **gender dimension in the R&I context** (i.e., analysing and taking into consideration the possible differences between men and women, boys and girls, or males and females, in the **R&I subject analyses**);
2. Promoting **equality in scientific careers** (i.e., aim for a 50/50 participation in project scientific teams and management structures);
3. Fostering **gender balance in decision-making** (for example, closing the gap in the participation of women in panels or advisory groups).

In 2015, the Council Conclusions on Advancing gender equality in the European Research Area highlighted the need to **promote institutional change on this matter** namely at the R&I and Higher Education institutions. This recommendation stems from strong evidence pointing to how R&I institutions, as in many other areas of society, reproduce social values leading to **gender bias and discrimination**. In this respect, the European Institute of Gender Equality identified various institutional challenges regarding the promotion of **Gender Equality in Academia and Research** that justify the need for this cross-cutting issue.

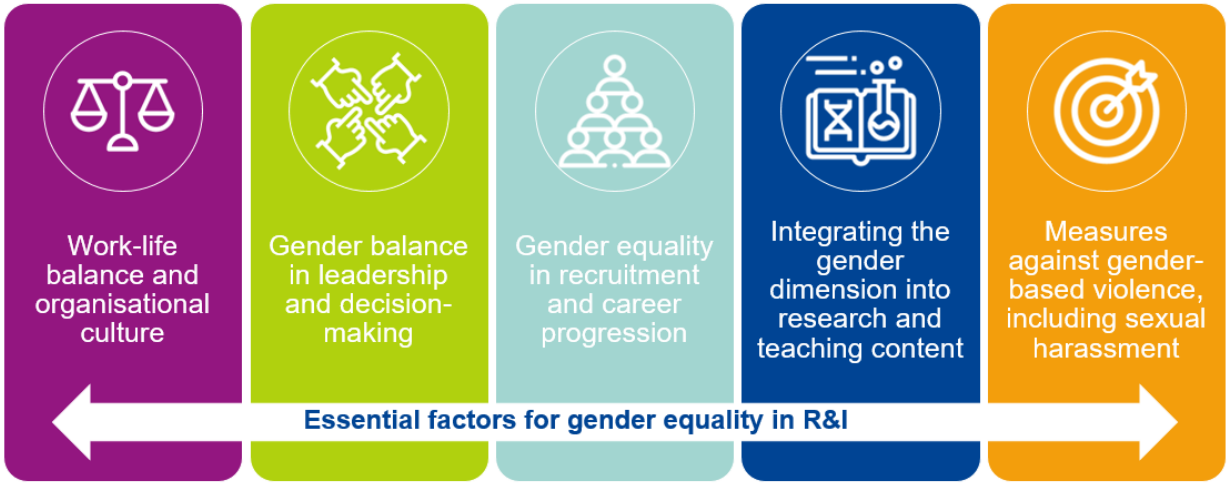

Figure 43 – Gender equality in academia and research
(Source: https://eige.europa.eu/gender-mainstreaming/toolkits/gear/what-gender-equality-plan-gep)

Gender case studies

The Gendered Innovations project, from Stanford University, provides case studies as concrete illustrations of how sex and gender analysis leads to innovation: http://genderedinnovations.stanford.edu/fix-the-knowledge.html

Role of RMAs

RMAs can play an important role in supporting researchers in **the integration of the gender dimension** in their ongoing research activities/projects and in **applying a gender-sensible approach** when conceiving new activities/projects.

- GARCIA project (*Gendering the Academia and Research: combating career instability and asymmetries)* developed a Toolkit for Integrating a Gender-Sensitive Approach into Research and Teaching targeting researchers, teachers and RMAs. It provides a thought-provoking checklist that RMAs can use to promote a reflection about the level of gender sensitivity within the research team and to **guide a gender-sensible planning** of a new research projects. This checklist intends to support researchers through 3 main steps:

- Step 1: How to design gender-sensitive research/course content.
- Step 2: How to apply a gender-sensitive theoretical/methodological structure.
- Step 3: How to produce gender-sensitive outcomes.

Science Education

In the 2014 report *The future of Europe is Science*, the European Commission highlights how **science is a powerful tool for shaping the future of Europe** and showcases how science education has an important role in breeding future scientists. With a decreasing number of young people interested in scientific topics and careers, science education has been on the EU agenda, and that of national science and education authorities, for some years and it is a top priority in the current R&I Framework Programme.

Science education's priority within the RRI scenario is thus related to the need for an **improvement of science and technology literacy** in society, including the urgency of promoting audiences receptive to **STEM disciplines** (Science, Technology, Engineering and Mathematics). To make science more attractive to young people, who could potentially pursue STEM careers, innovation in several areas and involvement of different actors in science education (from formal to informal education, from curriculum to teaching methods), is paramount. To this purpose, the European Commission highlights the need to increase the involvement of the following areas and actors:

- different levels of the education system,
- universities and other higher education establishments,
- research and innovation funding and performing organizations,
- civil society organizations and NGOs,
- industry,
- policymakers,
- professors,
- teachers,
- students and pupils,
- science museums and science centres.

Science education plays an important role not only in shaping future scientists but also in developing the **science literacy tools** for all social actors to participate in the R&I process.

Figure 54 - Infographics: Increasing achievement and motivation in mathematics and science learning in school (Source: https://eurydice.eacea.ec.europa.eu/publications/mathematics-and-science-learning-schools-2022)

Science Education case studies

The 2015 EU report SCIENCE EDUCATION for Responsible Citizenship (Chapter 7) provides a list of interesting practices promoting responsible science education.

Science Governance

Governance is an **umbrella term** for activities, from the individual to the institutional level, aimed at **fostering sustainable change towards Responsible Research and Innovation**, both within institutions or towards other stakeholders. The main goal is to **'open up' policy-making** and institutional practices to make them more inclusive, transparent and accountable.

The 2001 European Commission White Paper on European Governance identifies **five requirements of good governance**:

1) openness,
2) participation,
3) accountability,
4) effectiveness
5) coherence.

In the context of RRI, the EU Project RRI Tools provide the following insights for governance:

- **Collective responsibility** for the impact of R&I,
- **Participatory governance** to cope with new and unexpected challenges,
- **Transparent** and reflective procedures,

- **Accountability** and responsiveness towards society,
- **Anticipation** of unintended consequences from R&I.

Governance case studies

- RRI Tools provide a list of 'inspiring practices' of RRI governance initiatives and projects: https://www.rri-tools.eu/governance
- Regarding Open Science governance, the EU project FIT4RRI produced a set of useful Guidelines on governance settings for responsible and open science targeted to different audiences, including RMAs.

Role of RMAs

Bringing RRI inside institutional practices will also require the involvement of RMAs, as they actively participate in the development, application and evaluation of such practices and policies within their institutions. Often RMAs are involved in the process of decision-making or, indirectly, in providing information to support such decisions.

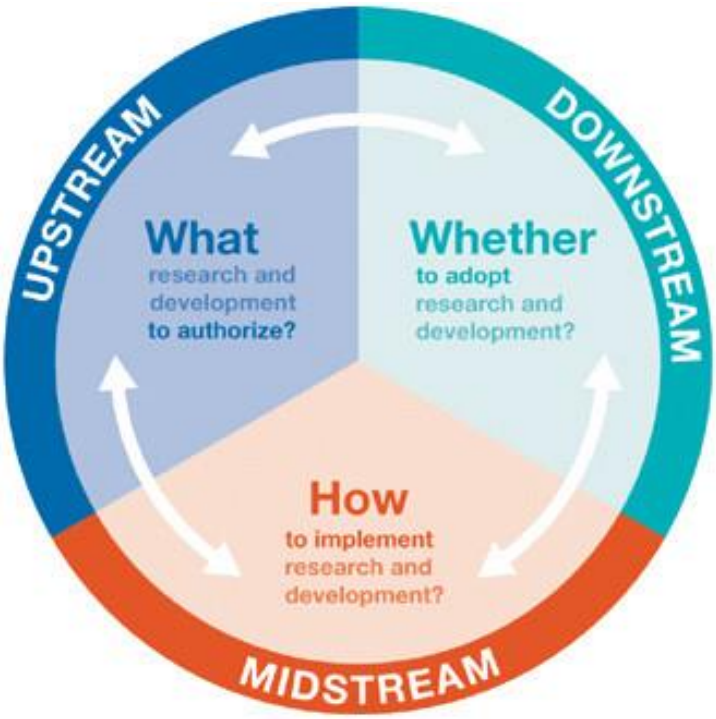

Figure 55 - Stages in the governance of science and technology (Source: https://www.researchgate.net/publication/24401386_Lab-scale_intervention_Science_Society_Series_on_Convergence_Research/figures?lo=1)

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