**Concepts and Practice of Responsible Research and Innovation**

|  |  |
| --- | --- |
| **Audience** | **Higher education students, researchers, HEI staff and other interested actors** |
| **Year of study** | **-** |
| **Number of ECTS credits** | **2.0 ECTS credits (workload of 50 to 60 hours)** |

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Please remember that the resources at hand **can (and should) be adapted** to your specific needs and context. The HEIRRI resources have been **designed to be flexible**, so we encourage you to think about including **local cases**, adjusting the **timings** of the course to your needs, and also adapting some contents to your specific **field or discipline**.

**SYLLABUS**

|  |  |
| --- | --- |
| **Element** | **Description** |
| **Title** | Concepts and Practice of Responsible Research and Innovation |
| **Cycle** | Open online course; not part of a higher education study programme. |
| **Year of study** | Open online course; not part of a study programme. |
| **Number of ECTS credits** | 2.0 ECTS (workload of 50 to 60 hours) |
| **Learning outcomes (LO)** | On completion of this course students will be able to  1. describe the history and idea of Responsible Research and Innovation (RRI);  2. discuss and contrast the different approaches and concepts of RRI;  3. adapt and translate their knowledge of RRI into their own work or studies. |
| **Mode of delivery** | Online course, video, and text material. |
| **Prerequisites and co-requisites** | There are no prerequisites or co-requisites for participating in this course. |
| **Course content** | This Massive Open Online Course introduces the concept of Responsible Research and Innovation (RRI) and the different approaches towards it. It will show inspiring RRI practices and activities and give participants the opportunity to investigate RRI in a role-play exercise. Participants will develop first ideas on how to implement RRI into practice and will be given the chance to exchange their views. |
| **Recommended or required reading and other learning resources/tools** | Recommended literature to be used in the MOOC:   * Angelaki, M. (2016). An Introduction to Responsible Research and Innovation. *PASTEUR4OA*. Retrieved 19 July 2016, from http://www.pasteur4oa.eu/sites/pasteur4oa/files/resource/RRI\_POLICY%20BRIEF.pdf * Kuhlmann, S., Edler, J., Ordónez-Matamoros, G., Randles, S., Walhout, B., Gough, C., & Lindner, R. (2016). Responsibility Navigator. Karlsruhe: Fraunhofer ISI. * Owen, R., Macnaghten, P., & Stilgoe, J. (2012). Responsible research and innovation: From science in society to science for society, with society. *Science and Public Policy, 39*(6), 751–760. DOI:10.1093/scipol/scs093 * Rip, A. (2014). The past and future of RRI. *Life Sciences, Society and Policy, 10*(17). DOI: 10.1186/s40504-014-0017-4 * Stilgoe, J., Owen, R., & Macnaghten, P. (2013). Developing a framework for responsible innovation. *Research Policy, 42*(9), 1568-1580. DOI: 10.1016/j.respol.2013.05.008   Further literature:  *General introduction to RRI:*   * Grunwald, A. (2011). Responsible Innovation: Bringing together Technology Assessment, Applied Ethics, and STS research. *Enterprise and Work Innovation Studies, 7*(7), 9–31. * Iatridis, K., & Schroeder, D. (2016). The Basics of Responsible Research and Innovation. In *Responsible Research and Innovation in Industry. The Case for Corporate Responsibility Tools* (pp. 5–30). Heidelberg/New York, NY/Dordrecht/London: Springer. DOI:10.1007/978-3-319-21693-5\_2 * Van den Hoven, J., Jacob, K., Nielsen, L., Roure, F., Rudze, L., Stilgoe, J., Blind, K., Guske, A.-L., & Riera Martinez, C. (2013). Identifying the Problem. In *Options for Strengthening Responsible Research and Innovation: Report of the Expert Group on the State of Art in Europe on Responsible Research and Innovation* (pp. 11–22). Brussels: European Commission.   *Specific concepts of RRI:*   * Ribeiro, B. E., Smith, R. D. J., & Millar, K. (2016). A Mobilising Concept? Unpacking Academic Representations of Responsible Research and Innovation. *Science and Engineering Ethics*, 1–23. DOI:10.1007/s11948-016-9761-6 * Strand, R., Spaapen, J., Bauer, M. W., Hogan, E., Revuelta, G., Stagl, S., Guimarães Pereira, Â. (2015). *Indicators for promoting and monitoring Responsible Research and Innovation. Report from the Expert Group on Policy Indicators for Responsible Research and Innovation*. Brussels: European Commission. Retrieved 19 July 2016, from http://ec.europa.eu/research/swafs/pdf/pub\_rri/rri\_indicators\_final\_version.pdf * Taebi, B., Correljé, A., Cuppen, E., Dignum, M., & Pesch, U. (2014). Responsible innovation as an endorsement of public values: the need for interdisciplinary research. *Journal of Responsible Innovation, 1*(1), 118–124. DOI:10.1080/23299460.2014.882072 * Von Schomberg, R. (2013). A vision of responsible innovation. In R. Owen, J. Bessant & M. Heintz (Eds.), *Responsible Innovation: Managing the Responsible Emergence of Science and Innovation in Society* (pp. 51–74). West Sussex: John Wiley. DOI:10.1002/9781118551424.ch3   *Instruments and practices to promote RRI:*   * Wickson, F., & Carew, A. L. (2014). Quality criteria and indicators for responsible research and innovation: Learning from transdisciplinarity. *Journal of Responsible Innovation, 1*(3), 254–273. DOI:10.1080/23299460.2014.963004 |
| **Planned learning activities and teaching methods** | * Online learning via text material and videos * Reading of academic articles * Short quizzes for self-assessment * Role-play exercise * Online forum discussions * Peer review and feedback |
| **Assessment methods and criteria** | * Active participation in role-play exercise and open discussion * Overall final exam at the end of the course (online) * Short reflection post of about 500 words: Participants should reflect on what they gained from doing the MOOC and how they will and can incorporate it into their work or studies |

**PROGRAMME STRUCTURE**

**“Concepts and Practice of Responsible Research and Innovation”**

|  |  |
| --- | --- |
| **Week 0** | **Activity** |
|  | Introduction to RRI |
| **Week 1** | **Activity** |
|  | Holistic RRI concepts and RRI framework |
| **Week 2** | **Activity** |
|  | Inspiring RRI cases |
| **Week 3** | **Activity** |
|  | Role-play exercise |
| **Week 4** | **Activity** |
|  | RRI in practice |
| **Week 5** | **Activity** |
|  | Reflection post and open discussion |
|  | **Activity** |
|  | Final exam |

**WEEK 0. INTRODUCTION TO RRI**

|  |  |
| --- | --- |
| **Videos of the week 0** | Video 0. Introduction  Video 1. Course content |
| **Multimedia material** | * “Responsible Research and Innovation: aligning R&I with European society”, produced by the European Union: <https://www.youtube.com/watch?v=bs5A-4j5h-I> * “The Potentials and Barriers of Responsible Research and Innovation (RRI)”, produced by the Res-AGorA project: <https://www.youtube.com/watch?v=nCOsF2U2lsU> * “What is responsibility in Research and Innovation?”, produced by RRI Tools: <https://youtu.be/Qr2KZW4jbow> |
| **Bibliography to read** | * Rip, A. (2014). The past and future of RRI. *Life Sciences, Society and Policy, 10*(17). DOI: 10.1186/s40504-014-0017-4 * Owen, R., Macnaghten, P., & Stilgoe, J. (2012). Responsible research and innovation: From science in society to science for society, with society. *Science and Public Policy, 39*(6), 751–760. DOI:10.1093/scipol/scs093 * Angelaki, M. (2016). An Introduction to Responsible Research and Innovation. *PASTEUR4OA*. Retrieved 19 July 2016, from <http://www.pasteur4oa.eu/sites/pasteur4oa/files/resource/RRI_POLICY%20BRIEF.pdf> |
| **Activities** | Introduction of the MOOC participants |
| Introduction to RRI |
| **Assignment** | Writing a post |
| Quiz 1 |

During week 0 the students are given an overview of the course format, its content and have the chance to introduce themselves. This material will be available to the course participants once they have enrolled.

The students will be provided with a short explanation on the format of the MOOC and what to expect in the coming weeks. This information will be provided in a written text (**MOOC Element 1: Suggestion for welcome note**) and a video (**see video scripts in annex 5**).

**MOOC Element 1: Suggestion for welcome note**

|  |
| --- |
| **Welcome note** |
| Welcome to the massive open online course (MOOC) on *Concepts and Practice of Responsible Research and Innovation* and thank you for signing up!  In this online course you will learn about, reflect on, and discuss what Responsible Research and Innovation (RRI) could mean in general, get to know the emergence of the idea and deal with approaches, which have the potential to make research and innovation (R&I) processes more responsible. You will get to know inspiring examples and cases of RRI and you will see how you can consider R&I processes from different viewpoints by conducting a role-play exercise. You will discuss and reflect on different ways how to introduce concepts of RRI and related issues to your work or study settings. The schedule for the MOOC is as follows:   * Week 0: Introduction * Week 1: Holistic RRI concepts and normative RRI framework – six policy agendas * Week 2: Inspiring RRI cases * Week 3: Role-play exercise * Week 4: RRI in practice * Week 5: Reflection post and open discussion * Final exam   Throughout the course you will find short information texts and videos, primary literature, and further material (and references) to read and work with. After the first three units, you will have to complete small quizzes that test your knowledge. These are only for self-assessment and will not be graded. However, you need to complete the quizzes in order to be able to take the final exam.  In a role-play exercise, you will take different viewpoints of stakeholders involved in and affected by R&I processes. After a unit about how to implement RRI into practice, there will be an open forum discussion where open questions and concerns can be clarified and discussed with the course instructor and your fellow participants. Every participant has to write a short reflection post about that in the forum. Those posts will be assessed by and discussed with your peers in the last session, in which the final exam will also take pace.  For each session of the course there will be a forum to pose open questions and remarks. Active participation in these forums is required for certain tasks and will be indicated accordingly. Please acknowledge the efforts your colleagues put into drafting their contributions and be constructive and respectful in replying to their entries. Once in a while you should come back to the forum and have a look if new entries have been posted. Please also consider the submission deadlines.   * If you have any questions, please post them in the online forum or contact the course instructor. Feel free to raise issues related to RRI or other relevant aspects of the course by creating own threads in the online forum. |

After the welcome and introduction to the MOOC itself, the first task for the participants is to introduce themselves. Depending on the scope of the course, those can be quite international and come from very different contexts. Participants should state their names, locations and affiliations (work or study institution), and why they chose to enrol in this MOOC. The entries can be made directly in the forum, so people can immediately read the other posts.

A short introductory text (**MOOC Element 2: Suggestion for introductory text)** on the general course subject and its importance is also provided. This can strongly be adapted to specific settings. This text will be accompanied by a video, paving the way for initial reflections on the subject of RRI (see video scripts in annex 5).

**MOOC Element 2: Suggestion for introductory text**

|  |
| --- |
| **Introduction to course subject** |
| Research and innovation (R&I) are important cornerstones of past and contemporary societies. Through R&I, societal, economic, cultural, ecological, technical, and other challenges have been addressed, transformed, solved, or produced. R&I developments initiated and promoted the reflection and thinking about many different aspects of our world, environments, societies, and biological and human existence. R&I brought radical change in our coexistence and lives and can be seen as major transformative force of and in society. At the same time, as much as R&I are driving forces of societal transformation, society is forming and defining R&I through societal structures, practices, institutions, values, and norms.  R&I objectives and processes as well as many of the changes caused and promoted by them can be seen both positively and negatively, depending on the perspective you choose, the aspects you consider in your assessment, or the information and knowledge you have. A decision on their positive and negative evaluation is often not possible beyond doubt or has so many facets that an unambiguous answer cannot be provided.  In this complex situation, it is necessary to together decide on the direction of R&I processes and developments. People involved in R&I, politicians, interest groups, different other societal stakeholders, and the broader public have to start to think about and deliberate on how to care about certain R&I developments and related issues or about the way we organise and do R&I in general. In this context, questions such as the following come up: Is this responsible? Is it responsible to deal with these issues in one way or another? Is this responsible in view of the next generation, our environment, our safety, our society, our freedom? In short: How should be dealt with R&I in a responsible manner - how should R&I be done in a responsible manner? |

**Activity. Introduction to RRI**

To allow participants to immerse themselves in the subject before the course begins, they will be provided with a selection of multimedia and written bibliography on RRI. This will serve as introductory material for the course.

**Goal**

*The aim of this activity is to provide the students with a general view of RRI.*

**Learning outcomes**

After this activity, students should be able to:

* Understand the meaning of RRI and its significance
* Construct an RRI definition integrating their own ideas and different perspectives from the reading material
* Identify possible benefits and limitations of RRI

**Materials**

Reading material:

* Strong recommended:
  + Gibbons, M. (1999). Science's new social contract with society. *Nature, 402*, C81-C84. DOI: 10.1038/35011576
  + Rip, A. (2014). The past and future of RRI. *Life Sciences, Society and Policy, 10*(17). DOI: 10.1186/s40504-014-0017-4
* Recommended:
  + Owen, R., Macnaghten, P., & Stilgoe, J. (2012). Responsible research and innovation: From science in society to science for society, with society. *Science and Public Policy, 39*(6), 751–760. DOI:10.1093/scipol/scs093
  + Angelaki, M. (2016). An Introduction to Responsible Research and Innovation. *PASTEUR4OA*. Retrieved 19 July 2016, from <http://www.pasteur4oa.eu/sites/pasteur4oa/files/resource/RRI_POLICY%20BRIEF.pdf>

Multimedia material:

* “Responsible Research and Innovation: aligning R&I with European society”, produced by the European Union: <https://www.youtube.com/watch?v=bs5A-4j5h-I>
* “The Potentials and Barriers of Responsible Research and Innovation (RRI)”, produced by the Res-AGorA project: <https://www.youtube.com/watch?v=nCOsF2U2lsU>
* “What is responsibility in Research and Innovation?”, produced by RRI Tools: <https://youtu.be/Qr2KZW4jbow>

**Description of the activity**

The students will be provided with a selection of articles and videos on the subject of RRI. They should read the articles and watch the videos, and try to abstract the meaning of responsibility and what it could mean in their field of research. Two of the articles are mandatory: “Science's new social contract with society “ by Gibbons (1999), to put students in context, and “The past and future of RRI” by Arie Rip (2014), which shows how the concept of RRI is embedded in a long tradition of dealing with the responsibility and societal embeddedness of R&I processes and actors, focusing on the (changing) relationship between science and society and the changing roles of the different involved and affected actors. The other articles are provided as extra reading material.

Once the students have been introduced to the concept of RRI, they should write a short post in the forum answering the following question:

*What possibilities and limitations can you see regarding RRI?*

The idea is that they reflect on the positive aspects of RRI, such as the benefits it can bring, but also understand its limitations, for example, regarding its challenging application.

Furthermore, the students can participate in a debate activity. This activity follows a pyramid structure where they can be able to read the views of other activity participants, discuss and rate different reasons on the debate topic.

This activity uses the PyramidApp tool. The activity will take some time to finish, as several active participants need to be synchronously available to collaborate. They will receive notifications (emails and also notifications in the pyramidApp window itself) on when/how to continue, as the objective is to create more opportunities for all participants (coming from different timezones) to participate. Activity includes following three levels occurring at different times.

* Level 1: Post in your view, the reasons on the debate topic
* Level 2: Each participant will be distributed in a small group and will be able to see each other’s submissions. They can discuss which submissions, including their own, are more interesting or useful and rate them.
* Level 3: Each participant will be in a larger group with the submissions selected as more interesting in level 2 (in your previous group and in other groups). Discuss why these selected submissions are important, useful or interesting and rate them in this final round.

The proposed topics to debate are:

1. Why RRI is important
2. Challenges associated to RRI

Concluding the first unit, participants have to complete a short quiz (see **Annex 1: MOOC Quizzes-Quiz 1** in the annex). The quiz does not have to be done immediately after the online session, but can also be taken at a later point in time, yet before the next session takes place. It will not be graded, but has to be finished before entering the final exam.

**WEEK 1. HOLISTIC RRI CONCEPTS AND RRI FRAMEWORK**

|  |  |
| --- | --- |
| **Video of the week 1** | Video 2. Week content |
| **Multimedia material** | The videos for the students to watch are:   * Six policy agendas (by RRI Tools) <https://www.youtube.com/playlist?list=PLc7X7gNmtdsFMyowpI8rTZaejfdXce7lG> |
| **Bibliography to read** | * Stilgoe, J., Owen, R., & Macnaghten, P. (2013). Developing a framework for responsible innovation. *Research Policy, 42*(9), 1568-1580. DOI: 10.1016/j.respol.2013.05.008 * Strand, R., Spaapen, J., Bauer, M. W., Hogan, E., Revuelta, G., Stagl, S., … Guimarães Pereira, Â. (2015). *Indicators for promoting and monitoring Responsible Research and Innovation. Report from the Expert Group on Policy Indicators for Responsible Research and Innovation*. Brussels: European Commission. Retrieved 19 July 2016, from http://ec.europa.eu/research/swafs/pdf/pub\_rri/rri\_indicators\_final\_version.pdf * Annex 1: Dimensions and key issues |
| **Activity** | Reflecting on two different approaches of RRI |
| **Assignment** | Writing a post |
| Quiz 2 |

In the second week, holistic and overarching concepts of RRI will be introduced, starting with the so-called competence dimensions of RRI and then moving on to the six RRI policy keys.

Week 1 will be introduced with an explanatory video on what will be covered. This week is mostly theoretical, to provide the participants with a solid base on the concepts of RRI.

**Goal**

*The aim of this activity is to provide the course participants with a holistic view of RRI and the aspects involved, and that they reflect on their variety and differences.*

**Learning outcomes**

After this activity, students should be able to:

* Understand the different concepts involved in RRI
* Create a holistic vision of RRI
* Analyse and discuss the main characteristics of different concepts of RRI and their implications for research practices
* Identify the different aspects of RRI involved in research processes

**Materials**

Reading material:

* Stilgoe, J., Owen, R., & Macnaghten, P. (2013). Developing a framework for responsible innovation. *Research Policy, 42*(9), 1568-1580. DOI: 10.1016/j.respol.2013.05.008
* Strand, R., Spaapen, J., Bauer, M. W., Hogan, E., Revuelta, G., Stagl, S., … Guimarães Pereira, Â. (2015). *Indicators for promoting and monitoring Responsible Research and Innovation. Report from the Expert Group on Policy Indicators for Responsible Research and Innovation*. Brussels: European Commission. Retrieved 19 July 2016, from <http://ec.europa.eu/research/swafs/pdf/pub_rri/rri_indicators_final_version.pdf>
* Annex 2: RRI Dimensions and key issues

Multimedia material:

* <https://www.youtube.com/playlist?list=PLc7X7gNmtdsFMyowpI8rTZaejfdXce7lG>

**Description of the activity**

For this activity, students are provided with material to study on the RRI dimensions and the RRI key issues. They have to reflect on how these two approaches complement each other (or not). Students will have to write a short post (150 words) answering the question:

*Which approach do you agree with? Why?*

They are to read the articles provided and watch the videos related to the key issues of RRI.

Furthermore, the students can participate in a debate activity. This activity follows a pyramid structure where they can be able to read the views of other activity participants, discuss and rate different reasons on the debate topic. This activity uses the PyramidApp tool. The activity will take some time to finish, as several active participants need to be synchronously available to collaborate. They will receive notifications (emails and also notifications in the pyramidApp window itself) on when/how to continue, as the objective is to create more opportunities for all participants (coming from different time zones) to participate. Activity includes following three levels occurring at different times.

* Level 1: Post in your view, the reasons on the debate topic
* Level 2: Each participant will be distributed in a small group and will be able to see each other’s submissions. They can discuss which submissions, including their own, are more interesting or useful and rate them.
* Level 3: Each participant will be in a larger group with the submissions selected as more interesting in level 2 (in your previous group and in other groups). Discuss why these selected submissions are important, useful or interesting and rate them in this final round.

The proposed topics to debate are:

* 1. Which RRI key issue is easier to implement and why.
  2. Which RRI key issue is harder to implement and why.

Concluding the second unit, participants have to complete a short quiz (see **Annex 1: MOOC Quizzes-Quiz 2**). The quiz does not have to be done immediately after the online session, but can also be taken at a later point in time, yet before the next session takes place. It will not be graded, but has to be concluded before entering the final exam.

**WEEK 2. INSPIRING RRI CASES**

|  |  |
| --- | --- |
| **Video of the week 2** | Video 3. Week content |
| **Multimedia material** | - |
| **Bibliography to read** | HEIRRI CASES with answers |
| **Activity** | Analyse a HEIRRI case |
| **Assignment** | Post the analysed case |
| Answer the forum question |

In the third week, inspiring practices and activities of doing Responsible Research and Innovation will be presented and analysed. See **HEIRRI CASES guide**.

**Goal**

*The aim of this session is for the course participants to analyse a specific case in depth and also to engage in fruitful conversations amongst the peers regarding the inspiring cases discussed.*

**Learning outcomes**

After this activity, students should be able to:

* Understand a specific aspect of RRI in depth
* Share views and opinions on a specific aspect of RRI
* Hold an attitude of respect and curiosity towards different perspectives and opinions
* React constructively to the feedback and information received
* Acquire “expertise” in a specific aspect of RRI
* Analyse RRI exemplary cases based on the RRI Key Issues
* Identify good practices that integrate RRI Key Issues into research
* Communicate the acquired knowledge
* Acquire a global vision of all aspects of RRI

**Materials**

* Answered cases. **See HEIRRI CASES with answers.**
* Blank cases. **See HEIRRI CASES guide.**

**Description of the activity**

The students will be provided with a carefully selected choice of cases of inspiring RRI practices. These cases will be classified according to the main key aspects involved and the fields of study they relate to. The key aspects chosen for this activity are:

1. Gender equality
2. Sustainability
3. Ethics
4. Inclusive Science[[1]](#footnote-1)

The instructors of the MOOC will provide each student with one of these cases to work on and analyse. Each case includes a set of guiding questions for the student to answer. Participants should upload their case with the answered questions on the online platform once completed. In this manner, after the exercise, there should be a wide selection of analysed cases that all the participants can read, providing a global view of RRI. There will be a peer review to assess each case. The participants can use this rubric to perform the peer review.

| **Criteria** | **Ratings** | **Points** |
| --- | --- | --- |
| Responsible Research:  *It has been justified and well-argued why the case/project is or is not responsible.* | |  |  |  | | --- | --- | --- | | 3.0 pts  Full Marks | 1.5 pts  Half marks | 0.0 pts  No Marks | | 3.0 pts |
| Key Issues:  *The aspects or key issues of the case have been identified.*  *It has been deeply explained how these aspects have been incorporated in this case/project.* | |  |  |  | | --- | --- | --- | | 4.0 pts  Full Marks | 2.0 pts  Half marks | 0.0 pts  No Marks | | 4.0 pts |
| Contributions and limitations:  *The contributions and limitations of the case/project have been identified.*  *It has been explained in depth which are the possible impacts of the case/project.* | |  |  |  | | --- | --- | --- | | 3.0 pts  Full Marks | 1.5 pts  Half marks | 0.0 pts  No Marks | | 3.0 pts |
| **Total Points:** 10.0 | | |

To facilitate this exercise, the course teacher will provide some cases with the questions already answered, to serve as example for participants. They should read these cases before they proceed with analysing their own.

Once they have analysed a case, answered the question and posted it online, the students should respond the following question on the forum:

*How would you apply the chosen key aspect to your field of study?*

There is no quiz envisaged in this session, because it is more about engagement and inspiration than knowledge production. Participants should be provided with the link to the RRI Tools Toolkit so they can search themselves for more examples.

The exemplary cases are the following:

RRI cases

Architecture/Urbanism

**Gender Equality**

* HOUSING AND NEIGHBOURHOOD DESIGNS

Public Health

Biomedical Research

**Gender Equality**

* HIV MICROBICIDES

Biomedical Research

Public Health

**Gender Equality**

* MALVECBLOK

Public Health

**Sustainability**

**Inclusive Science**

**Gender Equality**

* *CASAS MATERNAS*

Sociology

**Sustainability**

Ecology

**Inclusive Science**

* IMRR

Environmental Sciences

**Inclusive Science**

**Sustainability**

* KLIMA ALLTAG

Marine Biology Research

**Inclusive Science**

**Sustainability**

* PIER

Public Health

Environmental Sciences

**Sustainability**

**Inclusive Science**

* MOSQUITO ALERT

Waste Management

**Inclusive Science**

**Sustainability**

* MARLISCO

Biomedical Research

**Ethics**

* TRREE PROJECT: ADOLESCENTS IN HIV RESEARCH

Biomedical Research

**Inclusive Science**

**Ethics**

* PPI PARKINSON’S

**Sustainability**

Botany

Sociology

**Ethics**

**Inclusive Science**

* THE BUCHU PLANT

Education

**Inclusive Science**

**Ethics**

* UCL CHANGEMAKERS

Technology

**Inclusive Science**

* AMBIACT

Biomedical Research

Science Education

**Inclusive Science**

* DNA LABS

**Sustainability**

Environmental Sciences

**Inclusive Science**

* SUSTAINABILITY IN PRISONS

Sociology

Education

History

**Inclusive Science**

Sociology

* CROSSCULT

**WEEK 3. ROLE-PLAY EXERCISE**

|  |  |
| --- | --- |
| **Video of the week 3** | Video 4. Introduction to role-play exercise |
| **Multimedia material** | - |
| **Bibliography to read** | Role-play bibliography (see HEIRRI Role-play guide) |
| **Activity** | Role-play exercise |
| **Assignment** | Post the analysed case |
| Answer the forum question |

In this week, a role-play exercise will strengthen participants’ understanding of RRI. They will take different perspectives and try to understand the thoughts and motivation of different stakeholders relating to the posed problem.

This week takes on the format of a role-play activity in which all the students participate. Five role plays have been designed. Each teacher can use the role play he/she prefers depending on his/her needs. These scenarios have been designed to incorporate controversies in different fields of research to reach a deeper discussion. The role-play scenarios are attached on the Annex in the **HEIRRI Role-Play Guide.** The teacher can either use these examples or take them as an inspiration for designing a role-play exercise suited for the audience and field. In this case, the HEIRRI project has take them as an inspiration to design another scenario for the role-play activity.

If the teacher chooses to design her/his own exercise, she/he should make sure to include a variety of stakeholders. Do not only think about people involved in the R&I or policy process, but it is also important to include civil society organizations and other societal actors, people or communities that might (prospectively) be affected in different ways by the problem described, or others (i.e.: industry representatives, politicians and policy-makers).

The nature of this role-play exercise is not necessarily to reach a conclusion about the posed problem, but rather to make the different interests and views visible to the participants and to understand that various stakeholders exist also outside the R&I process.

**Goal:**

*The aim of this activity is to promote discussion about different points of view and arguments related to a controversial issue in which the research process involves certain risks for society.*

**Learning outcomes:**

After this activity, the students should be able to:

* Analyse the current situation related to the role-play scenario.
* Construct arguments and an opinion on the role-play scenario.
* Discuss different perspectives related to this issue.
* Apply the RRI perspective to this issue.

**Materials:**

* Articles to read of the selected Role-play (see HEIRRI Role-play guide)
* Role-Play Scenarios (see HEIRRI Role-play guide)
* Characters (see HEIRRI Role-play guide)
* Moderator questions (see HEIRRI Role-play guide)

**Description of the activity:**

To perform this activity, a specific scenario has been proposed. The co-creation of smart environments for active ageing is a project which aims at understanding the needs and requirements of the elderly in order to adapt their houses so as to increase their quality of life, independence and social life.

The activity consists on developing, in groups of five people, a written document on how this project can be responsible. Each participant of the group must choose one of the following stakeholders and has to write, first, how this specific stakeholder can contribute to the project of co-creation of smart environments for elderly to make it responsible in its different phases: the design, the process, the analysis of the results and the resulting product. The final document that the students have to upload to the platform has to be the reflection on how every stakeholder of the group can contribute to do this project responsible in each part of the process. Here we list the different stakeholders to be chosen:

-Researcher on computer science

-Health care worker

-Media communicator

-Social worker

-Product user (elderly person)

-Relative of elderly people

-Care giver

-Social Researcher

-Entrepreneur

-Industry representative

During the role-play session:

* The teacher should present the scenario in the platform. The teacher should explain the question or problem, or the concrete case chosen to be discussed in the exercise. Please provide sufficient background information and see that this problem is defined and outlined clearly
* Each role play character has to be introduced and has to explain their position in relation to role-play debate.
* The moderator can provide questions to generate debate or a forum if necessary
* Final conclusions.

Depending on the number of participants, the teacher might want to form groups where the different “stakeholders” discuss with each other in a forum. If so, one teacher per group should be nominated to steer the debate and make sure everyone expresses their point of view. It is important that students defend their role, despite their personal opinion.

This activity can be performed in real time or if it isn’t possible to conduct this way, it can be adapted. In the same manner, each student will be assigned a character and should read the provided bibliography. Participants then have to write a document from their perspective relating to the problem described, as in the description of the activity.

The characters can be assigned by the course teacher or the students can be allowed to choose a character for themselves. They do not necessarily have to take the role they sympathise with most, but should be encouraged to try to understand diverging or even opposing views.

This activity will be assessed by peer review. Here we attach a rubric to guide the assessment of the activity.

| **Criteria** | **Ratings** | **Points** |
| --- | --- | --- |
| Relevant stakeholders of the project have been identified and justified. | |  |  | | --- | --- | | 3.0 pts  Full Marks | 3.0 pts  Half Marks | | 3.0 pts |
| Responsibility has been included in the different phases: the design, the process, analysis of the result, and the resulting product. | |  |  | | --- | --- | | 4.0 pts  Full Marks | 2.0 pts  Half Marks | | 4.0 pts |
| The final reflection is well justified and argued. | |  |  | | --- | --- | | 3.0 pts  Full Marks | 3.0 pts  No Marks | | 3.0 pts |
| **Total Points: 10.0** | | |

**Teacher’s role: how can the teacher facilitate the activity?**

To direct the activity, it is interesting for the teacher to play the role of the moderator.

Once the role-play activity has been completed, the students should answer the following question regarding to the **HEIRRI Transversal Scenario Video on Ageing** (**ANNEX 9**):

*Which are the benefits and the risks of this situation? Which stakeholders are responsible in this situation? In what regard are they responsible?*

There is no quiz envisaged in this session, because it is more about engagement and inspiration than about knowledge production.

**WEEK 4. RRI IN PRACTICE**

|  |  |
| --- | --- |
| **Video of the week 4** | Video 5. Week content |
| **Multimedia material** | * RRI for Policy Makers: <https://youtu.be/IrLEE2sR_1U> * RRI for the Research Community: <https://youtu.be/J4l1YlPL9AU> * RRI for the Education Community: <https://youtu.be/3kDGaNNC6PE> * RRI for Business and Industry: <https://youtu.be/FZhsvxmq8X4> * RRI for Civil Society Organisations: <https://youtu.be/9g-6nVI6jQU> |
| **Bibliography to read** | * Kuhlmann, S., Edler, J., Ordónez-Matamoros, G., Randles, S., Walhout, B., Gough, C., & Lindner, R. (2016). Responsibility Navigator. Karlsruhe: Fraunhofer ISI. |
| **Activity** | Reflect on how to incorporate RRI in their studies/field |
| **Assignment** | Write a reflection post |
| Answer the forum question |

Integrating everything that was presented so far, this session is devoted to talk about how RRI can be implemented in the participants’ work or study settings. Depending on the audience, this can be done very concretely, tailored to the field they are in, or, if the audience is very diverse, in a more generic way.

**Goal**

*The aim of this activity is for the students to reflect on the acquired knowledge and how they could integrate this knowledge into their own field.*

**Learning outcomes**

After this activity, students should be able to:

* Incorporate the new perspectives and knowledge acquired related to RRI into their work and/or studies

**Material**

Reading material:

* Kuhlmann, S., Edler, J., Ordónez-Matamoros, G., Randles, S., Walhout, B., Gough, C., & Lindner, R. (2016). Responsibility Navigator. Karlsruhe: Fraunhofer ISI.
* Report on quality criteria of good practice standards in RRI adapted from RRI tools (**ANNEX 5**).

Multimedia material:

* + RRI for Policy Makers: <https://youtu.be/IrLEE2sR_1U>
  + RRI for the Research Community: <https://youtu.be/J4l1YlPL9AU>
  + RRI for the Education Community: <https://youtu.be/3kDGaNNC6PE>
  + RRI for Business and Industry: <https://youtu.be/FZhsvxmq8X4>
  + RRI for Civil Society Organisations: <https://youtu.be/9g-6nVI6jQU>

**Description of the activity**

Participants should bear in mind a holistic RRI approach and critically assess their own work, studies, or research based on RRI principles. They should try to identify problematic issues, lacks of consideration, and stakeholders that might be affected or should be involved in certain processes. By doing so, they should find possibilities where RRI could and should be applied in their own work, studies or research.

The students will be provided with bibliography to help with this activity. It is recommended to use the “Responsibility Navigator” of the Res-AGorA project (Kuhlmann et al., 2016) for that purpose. It is conceptualized as a “thinking tool” for actors in the R&I system and in R&I governance by offering ten principles and related questions to deliberate on when dealing with R&I on an individual, organisational, or institutional level. The principles are illustrated giving concrete case examples without going into too much detail and can also be used for people outside the R&I field. It can be a viable tool to make people consider different RRI entry points and possibilities. The teacher can either give the report on quality criteria of good practice standards in RRI **(ANNEX 5).**

For this activity, the students have to write a **short reflection post of about 500 words** introducing their work or studies, and explaining how they will and can incorporate RRI into them. They have to share this reflection in the Forum, so that their fellow course participants can read it. Besides this, each participant will have to read and give feedback on another participant's reflection post. This way, after sharing their post, they will receive feedback about it from a fellow participant.

Once the students have completed the task, they should answer the question:

*Do you think applying an RRI perspective into your work/study would   
affect it positively or negatively?*

**WEEK 5. REFLECTION POST AND OPEN DISCUSSION**

|  |  |
| --- | --- |
| **Video of the week 5** | Video 6. Week content |
| **Multimedia material** | * RRI for Policy Makers: <https://youtu.be/IrLEE2sR_1U> * RRI for the Research Community: <https://youtu.be/J4l1YlPL9AU> * RRI for the Education Community: <https://youtu.be/3kDGaNNC6PE> * RRI for Business and Industry: <https://youtu.be/FZhsvxmq8X4> * RRI for Civil Society Organisations: <https://youtu.be/9g-6nVI6jQU> |
| **Bibliography to read** | * Kuhlmann, S., Edler, J., Ordónez-Matamoros, G., Randles, S., Walhout, B., Gough, C., & Lindner, R. (2016). Responsibility Navigator. Karlsruhe: Fraunhofer ISI. |
| **Activity** | Discuss how to incorporate RRI into their field with fellow peers. |
| **Assignment** | Modify the reflection post. |
| Peer review of the reflection post |

**Goal**

*The aim of this activity is for the participants to discuss how to integrate RRI into their work/studies with their fellow peers.*

**Learning outcomes**

After this activity, students should be able to:

* Hold an attitude of respect and curiosity towards different perspectives and opinions
* React constructively to the feedback and information received
* Acquire a global vision of all aspects of RRI
* Integrate all the perspectives and knowledge acquired into their work/studies

**Description of the activity**

This unit is dedicated to open questions and clarifications. Once all the participants have posted their reflection post from the previous week, participants can and should discuss issues that are crucial to them. The discussion should take place among all participants and with the course teacher, if the group size allows doing so.

The course teacher should moderate the discussion and should set up thematic groups to organise the debates. Such thematic groups could be, for example, research disciplines or fields of work, teaching, the future of RRI, etc. Suggestions for thematic groups or open questions to be discussed can be sent to the teacher beforehand, so that the most popular ones can be selected in advance. This discussion is also a possibility to build networks with other participants.

It is strongly suggested to invite external stakeholders to this discussion. These should be chosen according to the domain and audience the MOOC is aimed for. In doing so, first, the discussion facilitation can be distributed to the stakeholders as well, and second, participants can pose very practical questions and gain interesting insights from practice.

After this session, participants should have the possibility to make small changes and edit their last document in order to correct and/or add more information base on the feedback they have received from a fellow course participant and according to what they have learned and discussed online. They have to rewrite their reflection post (of a length between 500 and 1000 words), introducing the improvements suggested in the feedback received. The teacher can leave a time window for publication, but there should be a fixed submission deadline, as there should be enough time for the peer assessment taking place in the final unit.

Each document will be assessed by peer-review. To assess the post, you can use the **rubric** added below based on the Report on the quality criteria of good practice standards in RRI.

| **Criteria** | **Ratings** | **Pts** |
| --- | --- | --- |
| Diversity and Inclusion  *The post includes a deep reflection on engaging a variety of stakeholders, at what stage are involved, and how they are involved.* | |  |  |  | | --- | --- | --- | | 2.5 pts  Full Marks | 1.25 pts  Half marks | 0.0 pts  No Marks | | 2.5 pts |
| Openness and Transparency  *The post includes a reflection on transparency and openness during the practice, communication of decision making and results.* | |  |  |  | | --- | --- | --- | | 2.5 pts  Full Marks | 1.25 pts  Half marks | 0.0 pts  No Marks | | 2.5 pts |
| Anticipation and Reflection  *The post includes reflecting on the context and envisioning of plausible futures and impacts.* | |  |  |  | | --- | --- | --- | | 2.5 pts  Full Marks | 1.25 pts  Half marks | 0.0 pts  No Marks | | 2.5 pts |
| Responsiveness and Adaptive Change  *The post includes a reflection on flexibility towards different facts, evaluation processes, application of results.* | |  |  |  | | --- | --- | --- | | 2.5 pts  Full Marks | 1.25 pts  Half marks | 0.0 pts  No Marks | | 2.5 pts |
| **Total Points: 10.0** | | |

The concluding part of this session should be a summary and wrap up of the MOOC, including pointing out the final contents to study for the final exam. Additionally, participants are invited to already read the other students’ reflection posts until the next session.

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**WEEK 6. FINAL EXAM**

|  |  |
| --- | --- |
| **Video of the week 6** | - |
| **Multimedia material** | - |
| **Bibliography to read** | - |
| **Activity** | Test and peer assessment |
| **Assignment** | - |

The last session consists of the final assessment activities in this MOOC. First, there will be the final exam. It should test the information given and the understanding of the idea of RRI. The teacher is free to design the exam in a way he/she finds most appropriate for the audience. For bigger audiences, a multiple-choice test might be more suitable. For smaller groups, open questions can be best. One example of final exam based on the materials developed by Hartley, S., Pearce, W., McLeod, C., Gibbs, B., Connelly, S., Couto, J., Moreira, T., Murphy, J., Smith, R., Staykova, M. and Walls, J. (2016). The TERRAIN tool for teaching responsible research and innovation. University of Nottingham is added in ANNEX 7.

**SURVEYS AFTER IMPLEMENTATION**

The HEIRRI project has developed surveys for post-project application of HEIRRI training programmes and materials. These surveys follow the design used for pilot evaluation, with a few additional open-ended questions, based on adaptations, difficulties encountered and opinions on the future of RRI in education.

Please respond to the relevant surveys after using the teaching resource at hand:

1. Survey for **students**: <https://www.surveymonkey.com/r/3PBQYZN>

2. Survey for **teachers**: <https://www.surveymonkey.com/r/3P37NG7>

For public engagement events:

3. Survey for the **public** (museum events): <https://www.surveymonkey.com/r/36L8Z6R>

4. Survey for **facilitators** (museum events): <https://www.surveymonkey.com/r/3P6WY2V>

Please remember that the resources at hand can (and should) be a**dapted to your specific needs and context**. The HEIRRI resources have been designed to be flexible, so we encourage you to think about including **local cases**, adjusting the **timings** of the course to your needs, and also adapting some contents to your specific **field or discipline**.

**ANNEXES**

* ANNEX 1. MOOC quizzes
* ANNEX 2. RRI Dimensions and Key issues
* ANNEX 3. HEIRRI Cases
* ANNEX 4. HEIRRI Cases with answers
* ANNEX 5. HEIRRI Role-Play guide
* ANNEX 6. Tables from “Report on the quality criteria of good practice standards in RRI”
* ANNEX 7. Final Exam
* ANNEX 8. MOOC Video scripts
* ANNEX 9. Transversal Scenario Guide

**ANNEX 1. MOOC QUIZZES**

**QUIZ 1:**

1. **Which ones of the following statements have been used to define what is RRI in the readings and videos (you can mark more than one option):**
   * **A framework to engage all societal actors to the science and technology developments**
   * **A way of addressing complexities**
   * **To reflect about the direction of research and innovation: Where is it going? Where is it taking us?**
   * A reflection amongst the scientific community about how to be more responsible in their professional life
   * **A way to bring solutions that benefits not only the economics, but also society and the environment**
2. **Which ones of the following practices can contribute to RRI?**

* **Include public engagement activities during a research project**
* Consider the impact factor as the main indicator of scientific excellence
* **Give access to science data results**
* **Implement participatory and community-based research**
* **Guarantee an equal participation between women and men**

1. **Do you think that RRI framework can open new opportunities for researchers?**

* Yes, I think is a good opportunity for researchers to collaborate with civil society organizations, policy makers, citizens or educators to identify and address new problems.
* No, I think that it makes research and innovation process more complex and block its development.

**QUIZ 2:**

1. **Which of the next ones are dimensions that came up from the Stilgoe et al. paper?**

a) Anticipation

b) Inclusion

**c) A and B are correct**

d) Ethics

e) All are correct

1. **Which of the next options are correct**:

1. The inclusion dimension express the need of a rise in the inclusion of new voices in the governance of research and innovation.

2. Processes of inclusion never force consideration of questions of power.

3. Responsible innovation requires a capacity to change shape or direction to response to public values and changing circumstances.

4. For responsible innovation to be responsive, it must consider just the process of research.

**a) 1 and 3**

b) 2 and 4

c) 3

d)1,2 and 3

e)1,2,3 and 4

1. **What does mean anticipation in responsible research and innovation?**

a) Anticipation means to think on the negative impacts of a research product.

b) Anticipation means to be able to respond to the changing environment and adapt to it.

c) Anticipation means to involve different voices to a research process to take into account different points of view during the research product development.

**d) Anticipation means to promote the what if questions to consider contingency, what is known, what is likely, what is plausible and what is possible.**

e) Anticipation means to be transparent during a research and innovation process and product.

1. **Which of the following are key issues of Responsible Research and Innovation?**

a) Gender Equality

b) Public Engagement

c) A and B are correct

d) Science Education

**e) All are correct.**

1. **Which of the next options are correct:**

1. Science Education means to educate society in science so they can understand what research is about.

2. Responsible research and innovation means to recognise diversity and incorporate the gender perspective in the content of research.

3. Public Engagement means to explain to society what the researchers do.

4. Governance is all the actions that people take as individuals or as organisations to foster and mainstream responsible research and innovation in organisations or toward stakeholders.

a) 1 and 3

**b) 2 and 4**

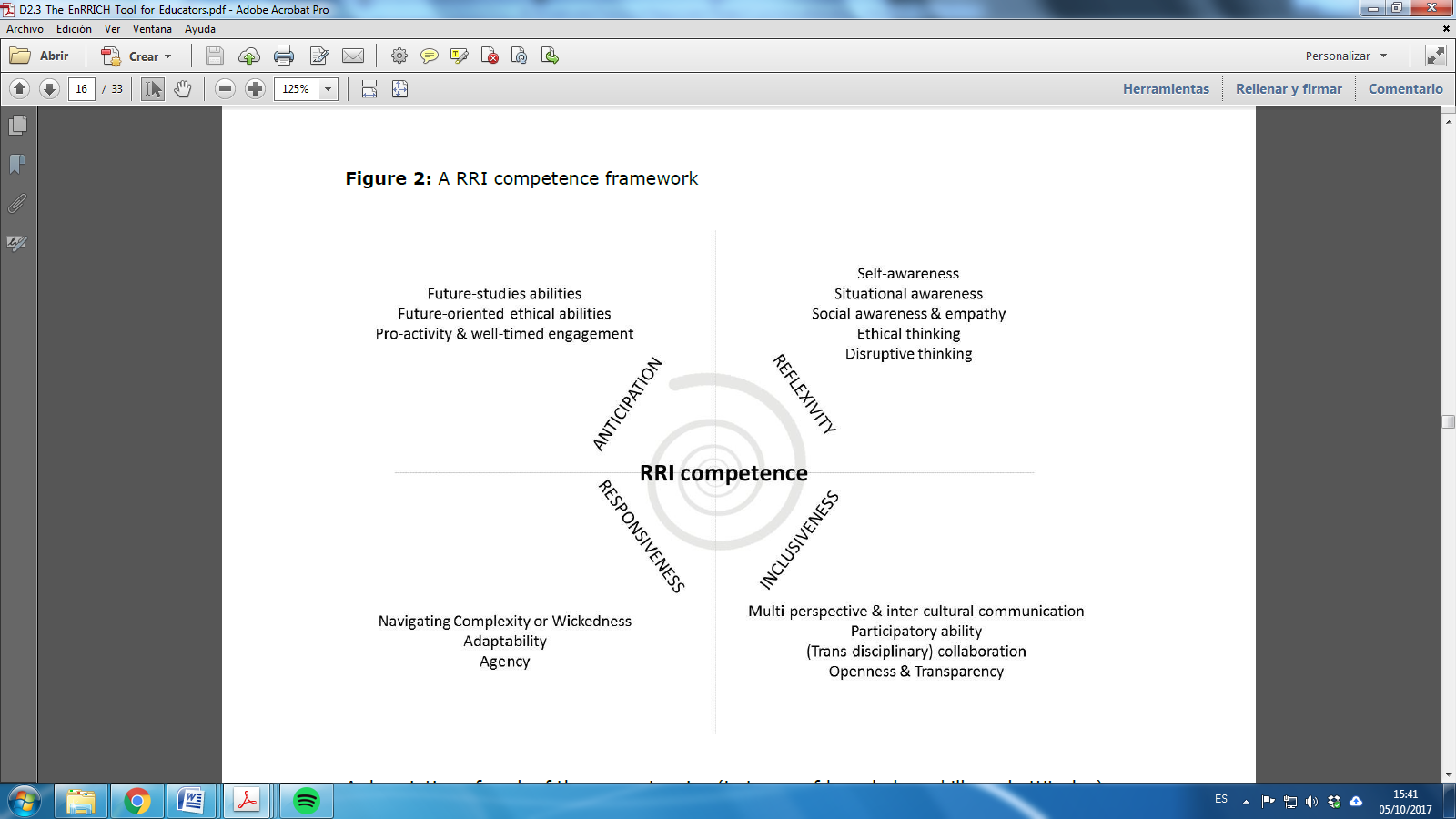
c) 3

d)1, 2 and 3

e)1,2,3 and 4

**ANNEX 2. RRI DIMENSIONS AND KEY ISSUES**

**RRI competence framework**



Source: Tassone, V., & Eppink, H. (2016). *The EnRRICH tool for educators: (Re-)Designing curricula in higher education from a “Responsible Research and Innovation” perspective. EnRRICH Deliverable 2.3.*, p. 16.

**ANTICIPATION**

“It includes competencies in anticipating societal challenges and future implications related to scientific and innovation practices

**Future-studies abilities**

* knowing and understanding concepts, methods and tools for exploring possible development of societal challenges in the future, for imagining possible futures, for exploring possible solutions to societal challenges and possible future implications and impacts of scientific and innovation practices (e.g. scenario analysis, forecasting methods, etc.)
* skill in anticipating possible futures, by applying future-studies concepts and methods
* holding appositive and engaged attitude towards anticipatory efforts, valuing anticipatory abilities

**Future-oriented ethical abilities**

* knowing and understanding ethical principles and resources in the context of short and long-term projects and plans
* skill in engaging with ethical questions about the goodness of possible futures that scientific and innovation practices can bring into the world (e.g. the “to what end” questions) and in applying ethical principles and resources when engaging into anticipatory scientific and innovation practices
* holding a future-oriented ethical attitude, for example having a sense of care towards the future; valuing ethical principles for a just future

**Pro-activity & well-timed engagement**

* knowing and understanding the meaning and practice of pro-activity, barriers and supportive factors
* skill in being pro-active and well-timed when engaging into anticipatory processes and practices, early enough to be constructive but late enough to be meaningful
* holding a receptive attitude towards ones surrounding, and valuing pro-activity”

(Tassone & Eppink, 2016, p. 17)

**REFLEXIVITY**

“It includes competencies in reflecting about context, ways of framing, ways of knowing, ways of doing, and ways of being in relation to the work of science and innovation and societal challenges.

**Self-awareness**

* knowing and understanding oneself, and tools to reflect about own actions, assumptions, norms, values and ways of framing
* skill in reflecting about own actions, assumptions, norms, values and ways of framing
* holding a positive constructive attitude towards self-reflection

**Situational awareness**

* knowing and understanding the context within which one’s scientific and innovation efforts, and related societal challenges, are situated
* skill in reflecting about contextual factors
* holding a receptive attitude towards one’s surroundings and contextual aspects

**Social awareness and empathy**

* knowing and understanding social values, cultures and perspectives, and related tools for reflecting on those values and perspectives
* skill in reflecting about and acknowledging social values, cultures and perspectives
* holding a social and emphatic disposition, respecting social values

**Ethical thinking**

* knowing and understanding tools to ethically evaluate and make judgements about perspectives, assumptions and endeavours for tackling societal challenges
* skill in ethically evaluating and judge perspectives, assumptions and endeavours for tackling societal challenges
* holding a caring and ethical attitude, valuing ethical thinking

**Disruptive thinking**

* knowing and understanding what disruptive thinking entails, and tools for fostering it
* skill in engaging with unconventional ways of thinking that challenge and go beyond current status-quo, ways of knowing and ways of framing.
* holding the courage to think disruptively, and valuing disruption”

(Tassone & Eppink, 2016, p. 17)

**INCLUSIVENESS**

“It includes competencies in including, communicating with, collaborating with diverse stakeholders and the wider public within scientific and innovation practices and in relation to societal challenges.

**Multi-perspective & inter-cultural communication**

* knowing and understanding concepts and tools related to perspective-taking and communication with people holding different perspectives and cultures
* skill in actively listening and communicating with the wider public and diverse stakeholders by being sensitive to different perspectives and cultures
* holding an attitude of respect and curiosity towards different perspectives and cultures, valuing diversity

**Participatory ability**

* knowing and understanding participatory methods for including voices of diverse stakeholders, also the wider public, minorities and silent voices, within science and innovation design and practices
* skill in engaging stakeholders and including their voices within design and practices of science an innovation
* holding a participatory attitude, valuing participation

**(Trans-disciplinary) collaboration**

* knowing and understanding concepts and methods for collaboration across disciplines, actors and various contexts
* skill in bridging disciplines, actors and various contexts, negotiating and co-operating towards collective goals
* holding an attitude of willingness to engage with and to bridge diverse disciplines, actors and contexts, valuing collaborative efforts

**Openness & Transparency**

* knowing and understanding tools and processes for sharing information about findings and practices in science and innovation and in relation to societal challenges, and understanding possible restrictions in sharing
* information (e.g. intellectual property rights, need to limit the circulation of sensitive data)
* skill in sharing information regarding findings and practices, while being mindful of possible restrictions
* holding an attitude of openness in sharing one’s findings and processes, valuing transparency”

(Tassone & Eppink, 2016, p. 18)

**RESPONSIVENESS**

“It includes competencies in coping with and responding to emerging challenges and to new knowledge, perspectives, public values, and norms through scientific and innovation endeavours

**Navigating Complexity or Wickedness**

* knowing and understanding (tools for exploring) complexities, and even wickedness, of emerging societal challenges and research and innovation endeavours
* skill in handling complex, or wicked, problems and make choices in spite of complexities, controversy and uncertainties
* holding a constructive attitude towards complexities or wickedness, overcoming any related possible sense of paralysis or overwhelm, tolerating ambiguity

**Adaptability:**

* knowing and understanding tools and processes for identifying emerging challenges and changes in society, as well as for flexible and adaptable design and practices, in order to meet those changes and challenges
* skill in identifying emerging challenges and changes, and in revising views and adapting the direction and course of action of research and innovation design and practices, in order to respond to those challenges and change
* holding a flexible attitude towards challenges and changes, having the willingness to respond to them when they emerge

**Agency**

* knowing and understanding the concept and practice of agency, including also supportive and hampering factors, in the context of societal challenges and scientific and innovation practices
* skill in initiating change and engaging with exploring new ways of doing
* holding an attitude of courage and commitment towards initiating change, believing in ones’ ability to produce change through one’s action”

(Tassone & Eppink, 2016, p. 18)

**SIX POLICY KEYS AND BEYOND**

An expert group was appointed by the European Commission in 2014 in order to identify indicators according to which RRI could be assessed and monitored. The European Commission defined six policy keys, and two more were added by the expert group:

1. Governance

2. Public Engagement

3. Gender Equality

4. Science Education

5. Open Access/Open Science

6. Ethics

7. Sustainability

8. Social Justice/Inclusion

“[…] the set of criteria is diverse and heterogeneous. At the same time, there is also overlap between criteria, and some (in particular ethics, sustainability and social justice/inclusion) may be thought of as being more overarching and encompassing than certain others (PE, science education and open access). Governance is in part a criterion of its own, in part an aspect of all criteria. […]

Some key indicators of RRI proposed in this report will be experimental in nature. This is a consequence of acknowledging the need for moving beyond command and control towards a more dynamic governance of science in society […].” (Strand et al., 2015, p. 18)

**Governance**

“In the first chapter we noted that the R&I process is characterised by collaborative efforts of a variety of stakeholders who each have a particular interest in this process. Overall goals are usually formulated in general terms and therefore arguably meet consensus among most stakeholders (for example green transport, healthy ageing), policymakers may encounter difficulties in the control and organisation of this process, including intellectual, financial and other material contributions. The question of how to govern such R&I networks from the perspective of funding bodies and/or government (local, national and supranational) is rapidly transforming from policy perspectives based on central control and accountability to a perspective where coordination and stimulation are key concepts.

In the expert report on the global governance of science (European Commission, 2009), governance was described as entailing ‘multiple processes of control and management’ and involving ‘directing or setting goals, selecting means, regulating their operation and verifying results’. However, 3 years later, in the EU report on ethical and regulatory challenges (European Commission, 2012b), the focus of governance shifted to reaching a consensus in a network of relevant stakeholders. In relation to governance in the context of RRI, this development is reflected in the well-known definition of RRI by von Schomberg (2011).

*Responsible Research and Innovation is a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society).*

The question then, of course, is how such an interactive process can be governed, especially because it is based on the assumption of trustworthy relationships among all societal actors. The solution in our view has to be sought in the active participation of all relevant stakeholders in developing an RRI policy. Frameworks in which stakeholders can collaborate to that effect are developing at all hierarchical levels of the science and innovation system. The two aforementioned EU reports regard relations at high aggregation levels (between nations), but also national and local/urban level governments and other organisations see governance more and more from a network perspective.” (Strand et al., 2015, pp. 18–19)

“The last dimension is the umbrella for all the others: it is Governance. Policymakers also have a responsibility to prevent harmful or unethical developments in research and innovation. Through this key we will develop harmonious models for Responsible Research and Innovation that integrate public engagement, gender equality, science education, open access and ethics.” (European Commission, 2012, p. 4)

“[A]rrangements that lead to acceptable and desirable futures have to (1) be robust and adaptable to the unpredictable development of R&I (de facto governance); (2) be familiar enough to align with existing practices in R&I; (3) share responsibility and accountability among all actors; and (4) provide governance instruments to actually foster this shared responsibility.” (RRI Tools, n.d., p. 3)

*References:*

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**Public Engagement**

“The desire to strengthen the relationship between science and society has brought developments of PE over the past decades. From a narrow perspective centred on the need to educate society in order to gain its approval for science and technology developments, to a perspective focused on the quality and benefits of the effective participation of society, one can now find a range of strategies, actions and activities regarding PE. This history is often told in terms of moving from a focus on literacy to a focus on public attitudes, both embedding the idea of worrying deficits on the part of the public, and then to a focus on a public dialogue that is more concerned with a deficit of scientists and innovators and their institutions with regard to their dialogue with society. We consider these shifts of foci less a history of progress, i.e. the new agenda displacing the older one, than one of broadening the remit of science communication and the relationship between science and society with different buzzwords (see Bauer, Allum and Miller, 2007). […]

We might define PE as a societal commitment to provide encouragement, opportunities and competences in order to empower citizens to participate in debates around R&I, with potential feedback and feed-forward for the scientific process. Deeper forms of engagement in science and technology, where citizens are peers in the knowledge production, assessment and governance processes, also deserve attention. This is described through non-equivalent expressions of different degrees of agency — such as citizen science, science in transition, do-it-yourself, fablabs, hacker spaces, maker spaces, etc. — many supported by the digital culture. PE is also a key element in R&I policies in the EU.” (Strand et al., 2015, pp. 21–22)

“The first key is Engagement of all societal actors - researchers, industry, policymakers and civil society – and their joint participation in the research and innovation process, in accordance with the value of inclusiveness, as reflected in the Charter of Fundamental Rights of the European Union. A sound framework for excellence in Research & Innovation entails that the societal challenges are framed on the basis of widely representative social, economic and ethical concerns and common principles. Moreover, mutual learning and agreed practices are needed to develop Responsible Research and Innovation joint solutions to societal problems and opportunities, and to pre-empt possible public value failures of future innovation.” (European Commission, 2012, p. 3)

“Public Engagement: The process of R&I is collaborative and multi actor: ll societal actors (researchers, citizens, policymakers, industry, educators, etc.) work together during the whole research and innovation process in order to align its outcomes to the values, needs and expectations of European society.” (RRI Tools, n.d., p. 3)

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**Gender Equality**

“Gender equality in the context of RRI policy has two dimensions: promoting the equal participation of men and women in research activities (the human capital dimension); and the inclusion and integration of gender perspectives in R&I content. The need to monitor the development of gender equality policy is underpinned by evidence that research performance is limited by direct and indirect sex discrimination, that gender equality at all levels contributes to achieving excellence and efficiency (European Commission, 2012c) and that policy at different levels of the R&I system is slow to develop (Wynne, 1991). The main problems in advancing the gender equality agenda include: a lack of clarity in decision-making (which affects structures and processes within the research system and often reinforces status quo, for example ‘old boys’ networks); informal institutional practices and organisational culture (which often hides unconscious bias against women); unconscious gender bias in the assessment of excellence and the process of peer-review, especially in STEM areas; and the structuring of the workplace and the gender pay gap in academia (including research), which favours men and creates difficulties for women.

Gender bias may also have implications for the content of science itself. The integration of sex and gender analysis can increase the quality and relevance of research and its applicability, especially where gender differences play a major role, such as in the medical sciences.

The overarching goal of the EU policy on gender equality in the context of RRI is gender mainstreaming in R&I, which includes both the equal participation of men and women in R&I and reviewing research content from a gender perspective.” (Strand et al., 2015, p. 26)

“The second key is Gender Equality. Engagement means that all actors – women and men – are on board. The under -representation of women must be addressed. Research institutions, in particular their human resources management, need to be modernized. The gender dimension must be integrated in research and innovation content.” (European Commission, 2012, p. 3)

“The ideal of gender equality in RRI is a society where the representation of masculine and feminine values in research and innovation are balanced. Issues addressed by this policy agenda challenge people to think about the gendered nature of behaviour, discourse, products, technologies, environments, and knowledge.” (RRI Tools, n.d., p. 3)

*References:*

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**Science education**

“The European Commission […] explained the RRI key of science education as follows (our emphasis):

*Europe must not only increase its number of researchers, it also needs to enhance the current education process to better equip future researchers and other societal actors with the necessary knowledge and tools to fully participate and take responsibility in the research and innovation process. There is an urgent need to boost the interest of children and youth in maths, science and technology, so they can become the researchers of tomorrow, and contribute to a science-literate society. Creative thinking calls for science education as a means to make change happen.*

If we analyse the quote, two goals can be identified, as shown below.

1. ‘Enhance’ education so that (a) ‘future researchers’ and (b) ‘other societal actors’ are equipped to become good RRI actors.

2. ‘Boost the interest’ in science among children and young people, with the purpose of either recruiting them to a research career or allowing them to ‘contribute to a science-literate society’, that is, become scientific citizens.” (Strand et al., 2015, p. 29)

“Our third key is Science Education. Europe must not only increase its number of researchers, it also needs to enhance the current education process to better equip future researchers and other societal actors with the necessary knowledge and tools to fully participate and take responsibility in the research and innovation process. There is an urgent need to boost the interest of children and youth in maths, science and technology, so they can become the researchers of tomorrow, and contribute to a science-literate society. Creative thinking calls for science education as a means to make change happen.” (European Commission, 2012, p. 4)

“Science Education: Focuses on (1) enhancing the current education process to better equip citizens with the necessary

knowledge and skills so they can participate in research and innovation debates; and (2) increasing the number of researchers (promote scientific vocations).” (RRI Tools, n.d., p. 3)

*References:*

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**Open Access/Open Science**

“Open science can be defined as follows:

*Open science is a practice in which the scientific process is shared completely and in real time. It offers the potential to support information flow, collaboration and dialogue among professional and non-professional participants.* (Grand et al., 2014)

Another, similar, definition is ‘an emerging approach to the conduct of science, technology and engineering projects, in which information about the whole of an ongoing investigation is made available on and through the internet’ (Grand et al., 2010). Winfield (2014) has distinguished between three levels of open science, as shown below.

* Level 0 open science: maintenance (including frequent updates) of project websites; deposition of papers (i.e. accepted draft) in publicly accessible repositories; inclusion of datasets with publications; publication in open access journals.
* Level 1 open science equals level 0 plus the following: project blogs, and respond to comments or feedback; post project movie clips to a project YouTube or other video channel, with links to project website and blog posts with explanation and commentary.
* Level 2 open science equals level 1 plus the following: routinely upload experimental datasets to project websites, with explanatory notes (i.e. the values in each field) and commentary; daily laboratory notebooks are written online and publicly accessible in real time; regular project dialogue, i.e. discussion between researchers, partners and collaborators through a project wiki, is publicly accessible; employ rich virtual environments for processes of social learning and innovation.

Level 0 open science is essentially what is provided for in current EU open access policies. In the context of RRI, open access is not an end in itself but a means to achieve the goal of better alignment of R & I with societal values, needs and concerns. This goal requires that the openness actually be used and useful. The expert group would therefore like to propose the further development of this RRI topic and propose indicators for level 1 and level 2 open science, where appropriate.” (Strand et al., 2015, p. 32)

“In order to be responsible, research and innovation must be both transparent and accessible. Our fourth key is to make Open Access a reality. This means giving free online access to the results of publicly-funded research (publications and data). This will boost innovation and further increase the use of scientific results by all societal actors.” (European

Commission, 2012, p. 4)

“Open Access: Addresses issues of accessibility to and ownership of scientific information. Free and earlier access to scientific work might improve the quality of scientific research and facilitate fast innovation, constructive collaborations among peers and productive dialogue with civil society.” (RRI Tools, n.d., p. 3)

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**Ethics**

“The European Commission […] introduces ethics as an RRI key in the following way:

*European society is based on shared values. In order to adequately respond to societal challenges, research and innovation must respect fundamental rights and the highest ethical standards. Beyond the mandatory legal aspects, this aims to ensure increased societal relevance and acceptability of research and innovation outcomes. Ethics should not be perceived as a constraint to research and innovation, but rather as a way of ensuring high quality results.*

Ethics in the context of research may be seen as a complex field in which internal norms and values relating to conduct, practice, culture and organisation operate together with the norms, values, practices and structures that society imposes on research through a variety of mechanisms. In the broad RRI context ethics can be divided into the following three subfields.

* Research integrity and good research practice, which is concerned with issues such as scientific misconduct and questionable research practices (e.g. plagiarism, fabrication, fraud, authorship and intellectual property, and citation/acknowledgement practices, scientific neutrality, conflicts of interest in peer review and scientific advice, etc.). There are three main dimensions that can be monitored here: the gap between codified rules and the actual norms and values of scientific communities as expressed in practice; new organisational measures to improve accountability with respect to research integrity (and overlaps to some extent with open access/open science); and neutrality and conflict of interest and bias as an ethical as well as a quality problem.
* Research ethics for the protection of the objects of research is a well-developed dimension with institutions and practices for such protection. The ultimate goal of policy in this field is that human beings, animals and other objects of research are duly protected. The existence and proper functioning of institutional procedures are clearly relevant measures for this goal. Their amount or the intensity of the work, however, is not very informative of proper functioning.
* Societal relevance and ethical acceptability of R & I outcomes. This dimension as an RRI key is the one that is closest to the general policy of RRI as a cross-cutting principle and the one for which the European Union has its most distinct role to play. This field is the one warranting the highest interest in the monitoring of ethics as an RRI key. It is also a field that has experienced an expansion over the latter decades in terms of specific, concrete issues considered, for example in ethics reviews. It seems likely, in particular in light of developments in ethics research and scholarship, that this expansion will continue. Specifically, many scholars would argue that the ‘novel’ topics presented in this report (Sections 2.7 and 2.8 on sustainable development and social justice and inclusion, respectively) both belong to ethics proper. The readers of this report may accordingly consider the recommendations in this section also as relevant for ethics policies, practices and indicators.” (Strand et al., 2015, pp. 33–34)

“Our fifth key is Ethics. European society is based on shared values. In order to adequately respond to societal challenges, research and innovation must respect fundamental rights and the highest ethical standards. Beyond the mandatory legal aspects, this aims to ensure increased societal relevance and acceptability of research and innovation outcomes. Ethics should not be perceived as a constraint to research and innovation, but rather as a way of ensuring high quality results” (European Commission, 2012, p. 4)

“Ethics: Focuses on (1) research integrity: the prevention of unacceptable research and research practices; and (2) science and society: the ethical acceptability of scientific and technological developments.” (RRI Tools, n.d., p. 3)

*References:*

* European Commission (2012). Responsible Research and Innovation: Europe’s ability to respond to societal challenges, DG Research and Innovation. Retrieved 10 October 2016, from http://ec.europa.eu/research/science-society/document\_library/pdf\_06/responsible-research-and-innovation-leaflet\_en.pdf
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**Sustainability**

“The rationale of the Europe 2020 strategy is to address and overcome the shortcomings of the current growth model in order to achieve smart, sustainable and inclusive growth. To this end the strategy includes headline targets in five areas: employment, research and development, climate/energy, social inclusion and poverty reduction. […]

The ‘Science with and for society’ programme, as did its predecessors, sets out to provide research-based knowledge and best practices for more dynamic governance that will align R & I better with societal needs and goals. RRI as a cross-cutting principle throughout Horizon 2020 is intended to contribute to such governance by the actual development of RRI agendas. This important function of RRI should be reflected in RRI indicators and monitoring practices. While many, perhaps all, of the six original RRI keys are to some extent related to aspects of inclusion and sustainability, indicators for these keys cannot answer the following questions: to what extent does a research field, a research programme or an RRI initiative contribute to inclusive and sustainable growth, and how can this be assessed and monitored? Such questions are undoubtedly highly relevant and important and can be asked about all activities and initiatives that are derived from the Europe 2020 strategy, and yet they are difficult to answer. Horizon 2020 being what it is — an EU contribution to the knowledge society — it is a good place to pursue such difficult questions that involve knowledge challenges. Furthermore, there is a substantive body of research-based knowledge that can be applied in the development of novel indicators in this field. In this report, we mainly point out the directions where the knowledge and the indicators may be found; there is also a need for further research and development in order to reduce the recognised knowledge gap in this field.” (Strand et al., 2015, pp. 36–37)

*References:*

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**Social Justice/Inclusion**

“Social justice can be defined as ‘an ideal condition in which all individual citizens have equal rights, equality of opportunity, and equal access to social resources’ (Maschi and Youdin, 2012). National social justice policies focus on investing in achieving inclusion rather than compensating for exclusion. The effectiveness of such policies is measured by monitoring progress in six dimensions: poverty prevention, access to education, labour market inclusion, social cohesion and non-discrimination, health and intergenerational justice (OECD, 2011).

The role of science and technology in promoting social justice is very important. Social justice, although not explicit, is a transversal theme running through most, if not all, societal challenges of the Horizon 2020 framework. However, to date no attempts to measure how social justice is actually addressed through R & I activities have been observed. The connection between science and technology and social justice is recognised through acknowledging the role of science and technology education (Dy, 1994) and technological developments, especially in the area of information and communications technology (ICT), in promoting social justice (Vrasidas, Zembylas and Glass, 2009), as well as the consideration of ethical issues and values in the design, development and implementation of new technologies […].

Social justice directly in the context of research activities can be considered from two perspectives: (a) the relationship between the researchers and the research subjects; and (b) the participation of social groups in benefits arising from research. The first perspective is concerned with researchers unfairly taking advantage of research subjects and imposing unfair burdens on them for their own benefit or the benefit of others. The second involves the potential unfair exclusion of particular groups from either participation in research and/or access to benefits arising from research (European Commission, 2010).” (Strand et al., 2015, pp. 38–39)

*References:*

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**ANNEX 3. HEIRRI CASES**

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* GENDER EQUALITY
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  + HIV MICROBICIDES
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  + IMRR
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**INTRODUCTION TO RRI CASES**

The cases proposed below are used in different Higher Education programmes. These case examples can be useful to promote a reflection on responsibility in R&I issues related to: Gender, Sustainability, Ethics and Inclusive Science. Some of these cases can be used for different aspects (see the previous list). The HEIRRI project has identified and defined these different aspects (Gender, Sustainability, Ethics, Inclusive Science) from the 6 key issues proposed by European Commission just for methodological and pedagogical purposes.

The cases consist of:

-A brief description of the case

-The bibliography of the case

-The learning objectives of the case

-The reflection questions of the case

**How can these cases be used in class?**

To start the activity, the teacher will give the students/participants the brief description of the case. If the teacher considers that the students need more information to generate a good debate/discussion, each case is provided with useful links and bibliography to add more information.

The instructor will have also the learning objectives, what the students/participants are expected to learn during the activity, and some reflection questions. After the students/participants have read the description of the case, the teacher can use the reflection questions that we propose here to generate a robust discussion. These reflection questions are specific for each case and for each issue (Gender, Sustainability, Ethics and Inclusive Science). Furthermore, with the reflecting questions posed by the teacher, the students can analyse the controversies of each aspect to construct a deeper discussion and consolidate knowledge on each one. The instructor can also add more reflection questions if needed or to enrich the debate.

After the discussion, the teacher can end the activity with the conclusions formulated by all the students’ contributions.

**GENDER EQUALITY**

**“Housing and Neighbourhood design: analysing gender”**

*RRI Key issues: gender*

The website Gendered Innovations presents a case study called “Housing and Neighbourhood design: analysing gender”[[2]](#footnote-2) with the aim of providing an example of how urban design may incorporate a gender perspective.

In the website, it is said that “gender roles and divisions of labour result in different needs with respect to built environments”, which sometimes reinforce gender roles or can’t provide equal services to women and men[[3]](#footnote-3). These differences can be visible at many levels, from single buildings to whole neighbourhoods, cities or even regions, and can also be seen within cities through its means of transport, public facilities, housing, open spaces, and so on. This case in Gendered Innovations states that “urban design typically lacked a gender perspective, and was ‘blind’ to differences between groups”. It should be taken into account that the entity UN Women[[4]](#footnote-4) states that, around the world, women carry out at least two and a half times more unpaid household and care work than men[[5]](#footnote-5).

In Vienna, Gendered Innovation writes, the gender analysis integrated in its urban planning has contributed to the city’s quality of life, and as an example of this planning, the project “Frauen-Werk-Stadt I” is described. This initiative designed a whole area of the city[[6]](#footnote-6) that didn’t separate housing from commercial spaces, nor from childcare facilities, medical centres or police stations. This way, according to Gendered Innovations, overall car use was reduced, as well as the stress experienced by those people combining career and house/family care, since “Frauen-Werk-Stadt I” was designed in a way where daily needs could be met within the vicinity of the apartments.

**Learning objectives**

* To identify the gender issues involved in this project
* To describe which gender policies should be implemented: equal opportunities for women and men in this research
* To discuss which gender issues should be taken into account in the research content
* To analyse how the gender issues have been addressed and which stakeholders have been involved in the process

**Reflection questions**

* Do you think the case presented is a good example of research done responsibly? Why?
* Does the case presented reflect on gender roles and tasks typically attributed to men/women?
* Do you think this case presents gender equality in a simplistic way? How could it be improved?
* Can you think of arguments against gender equality in urban planning? Could it reinforce gender stereotypes? Could it neglect other collectives?
* Do you think the urban planners did a public consultation, or rather they based their designs on stereotypes and preconceptions?
* Does this case include enough different perspectives? How could they be complemented or improved?

**“HIV MICROBICIDES: Rethinking Research Priorities and Outcomes”**

*RRI Key issues: gender*

As stated in the Gendered Innovations site of the case on “*HIV microbicides: Rethinking Research Priorities and Outcomes*”[[7]](#footnote-7), in the last years, both the European Union and the U.S. have invested to increase the number of women scientists and engineers[[8]](#footnote-8),[[9]](#footnote-9). However, from Gendered Innovations it is considered that women's participation is low in the STEM fields (i.e., science, technology, engineering, and mathematics), and they conclude that “increasing the number of women requires more than programmes focused on removing subtle gender bias from hiring and promotion practices, stopping tenure clocks, leadership training, and the like; such interventions are necessary but not sufficient”. They also state that, in order to increase the numbers of women in STEM fields, research should be re-conceptualised so that it includes “methods of sex and gender analysis in creative and forward-looking ways”. They say that since the image of engineers and the offering of engineering education “focus narrowly on mathematics and science”, many girls and young women “are dissuades from pursuing engineering careers“[[10]](#footnote-10), and argue that engineering would be more appealing to women “if engineering images and education fore-grounded the social aspects of engineering alongside the technical.[[11]](#footnote-11),[[12]](#footnote-12) "

To prove this point, Gendered Innovations mentions the case of a mechanical engineering lab at the University of California that shifted its research focus from applied physics to biomedical engineering and changed its research goals from “understanding the physics of a problem to developing models that could be used to evaluate devices or treatments for medical conditions”. Over the period of a decade, the lab researchers were a majority of women.

**Context** **information**

More than 36 million people worldwide live with HIV[[13]](#footnote-13). Gendered Innovations writes that most of the infections and related deaths happen in sub-Saharan Africa, where the prevalence of HIV infection among women aged 15-24 is about 8 times higher than that of men of the same age-group.[[14]](#footnote-14) The only woman-controlled HIV prevention option, the site states, is the female condom; however, it is detectable, requires partner consent, and is less available and more expensive than the male version.[[15]](#footnote-15)

According to Gendered Innovations, the lab from the University of California was able to develop a woman-controlled HIV protection because they understood in this context why HIV has a higher incidence in them. The result of the research is a vaginal gel that provides an HIV microbicide.

As a conclusion, the site writes that research priorities “have a profound effect on who will perform research”, as exemplified with the case of HIV microbicides at the mechanical engineering lab from the University of California: in that instance, “research priorities related to improving women's and men's health increased the representation of women in the lab”. The Gendered Innovations site concludes that “it is possible that changing research priorities in engineering could increase the representation of women in the field overall”.

**Learning objectives**

* To identify the gender issues involved in this project
* To describe which gender policies should be implemented: equal opportunities for women and men in this research
* To discuss which gender issues should be taken into account in the research content
* To analyse why the gender balance changed and what effect it had on the project

**Reflection questions**

* Do you think the case presented is a good example of research done responsibly? Why?
* Does this case reflect on gender roles and stereotypes?
* Does this case present gender equality in a biased way?
* Can you think of arguments against gender equality in research? Could there be problems related to imposed quotas or to positive discrimination (aka affirmative action)?
* What ethical problems could arise from the research presented?
* Are there other ways of increasing the number of women in engineering? Are these ways based on gender stereotypes?
* Does this case include enough different perspectives? How could they be complemented or improved?

**“MALVECBLOK Project”**

*RRI Key issues: gender*

As the World Health Organisation (WHO) reports, there were 212 million malaria cases worldwide in 2015, most of which occurred in the WHO African Region (90%)[[16]](#footnote-16),[[17]](#footnote-17). Malaria is caused by the parasite Plasmodium and is transmitted to humans by the mosquito *Anopheles gambiae* s.s. The strategies currently used to control mosquito populations are insecticides and mosquito nets, but the appearance of resistance and the lack of new insecticides hold up its control[[18]](#footnote-18).

The European project MALVECBLOK[[19]](#footnote-19), composed of three European countries and two African teams, wanted to get an integrated view of mosquito immunity and reproduction and to establish the mosquito interaction with the parasite in order to provide a new vision for malaria control.

The project aimed to consider, when studying the reproduction of the malaria mosquitos, the different gender roles in society (for example, that men and women interact differently with water, where the mosquito reproduces). These differences can be relevant because vulnerability to the disease and access to treatment tend to vary between men and women. According to the “Gender and Health” report (Module 2, Field 1) of the “Gender in EU funded research” website[[20]](#footnote-20), “a careful gendered analysis of how the outcomes can be used to actually improve disease control will be necessary. The success of any disease control programme depends on a gender-sensitive approach”.

**Learning objectives**

* To identify the gender issues involved in this project.
* To describe which gender policies should be implemented: equal opportunities for women and men in this research.
* To discuss which gender issues should be taken into account in the research content.

**Reflection questions**

* Do you think the case presented is a good example of responsible research? Why?
* Does this case reflect on gender stereotypes and roles?
* Can you think of arguments against including a gender perspective in research? Is it necessary for all sorts of research projects?
* Could including a gender perspective in research favour bias in its findings?
* How is gender portrayed in the research project presented? Which cultural and social issues are involved in it?

***Casas Maternas* in the Rural Highlands of Guatemala: A Mixed-Methods Case Study of the Introduction and Utilization of Birthing Facilities by an Indigenous Population**

*RRI Key issues: sustainability, inclusive science and gender*

In Guatemala, the NGO “Curamericas” established birthing facilities (or “*casas maternas*”) in an isolated region of the country with the aim to help reduce the high maternal mortality rate of indigenous women living there, who traditionally gave birth at home. This was achieved by providing “local access to community-based, culturally appropriate maternal services for routine deliveries”, according to the website of the [Communication Initiative Network](http://www.comminit.com/global/content/casas-maternas-rural-highlands-guatemala-mixed-methods-case-study-introduction-and-utili).

This website explains that the maternal mortality rate in Guatemala for indigenous women is twice as high as non-indigenous women. These days, after the construction of birthing facilities, “birth attendants are encouraged to bring patients for delivery at *Casas Maternas*, where trained staff are present and access to referral care is facilitated”. A study was conducted with 275 women surveyed and, together with *casas maternas*, volunteers visited homes to encourage the use of the facilities. The website says that various actors were identified as stakeholders, including the women delivering, midwifes and partners.

The [article](http://www.ghspjournal.org/content/ghsp/4/1/114.full.pdf) published in “Global Health: Science and Practice” states that Curamerica’s initiative strengthens maternity care and “has potential to increase health facility utilization in isolated mountainous areas inhabited by an indigenous population where access to government services is limited and where maternal mortality is high”.

According to the [World Health Organisation](http://www.who.int/mediacentre/factsheets/fs348/en/), “maternal mortality is higher in women living in rural areas and among poorer communities”. “Skilled care before, during and after childbirth can save the lives of women and new-born babies”.

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* <http://www.who.int/mediacentre/factsheets/fs348/en/>

**Learning objectives**

* To identify the stakeholders involved and assess the benefits of their inclusion.
* To reflect on the role of inclusion of marginalized communities and its possible impacts.
* To discuss the methods used to involve society in this kind of projects.

**Reflection questions**

* How do you think community engagement impacts a society?
* What are the possible social impacts of this project? And in the demography?
* What aspects of RRI can you see in this case? How are these aspects achieved and worked on?
* Do you think this project is “responsible”? In what way?
* What is the role of stakeholder engagement? How does it contribute to this project?

**SUSTAINABILITY**

**IMRR – “Integrated and sustainable water management of Red-Thai Binh Rivers System in changing climate”**

*RRI Key issues: sustainability and inclusive science*

The Red-Thai Binh Rivers basin is the largest in Vietnam, supplying for a total population of 26 million people[[21]](#footnote-21). This region is growing economically and in population numbers very fast. In this context, and with the aim to develop “strategies for the sustainable management of the Red-Thai Binh rivers system”, the IMRR project[[22]](#footnote-22),[[23]](#footnote-23) has been launched. This project intends to meet “Vietnamese society's long-term needs for water resources while maintaining essential ecological services and improving the economic benefits from hydropower production and agriculture”, so the initiative claims to “combine coordinated decision-making and stakeholder participation, supported by advanced modelling and optimization tools, and capacity building in local institutions”85.

Previously, according to the project’s information, there had been water shortages (and many problems derived from it) due to the “lack of coordination and inefficient operation of the reservoirs” 85. That is why the IMRR states that it wants to promote a participatory approach to include relevant stakeholders from different fields and ensure that Vietnamese institutions are given the tools and capacities to manage the Red River basin.

The IMRR project is funded by the Italian Ministry of Foreign Affairs (cooperation program).

**Learning objectives**

* To identify the stakeholders involved in the project
* To discuss the outcomes and possible use of the project for stakeholders
* To analyse the methodology used to obtain the results
* To understand the importance of public engagement in science and innovation practices
* To assess the sustainability of the project and possible environmental impacts

**Reflection questions**

* Do you think the case presented is a good example of research done responsibly? Why?
* Do you think that the data presented by the IMRR project could be biased?
* What is the role and possible importance of public engagement? How did public engagement contribute to this project? Can you think of negative environmental impacts of this project? And political impacts?
* Why do you think the Italian government funds such a project applied in Vietnam? Could this have negative impacts for the Vietnamese authority?

**The “KlimaAlltag” project**

*RRI Key issues: sustainability and inclusive science*

According to the “KlimaAlltag” project[[24]](#footnote-24), organised by the Institute for Social-Ecological Research (ISOE) in Frankfurt am Main, CO2 emissions come substantially from daily requirements of private households, these being the third source of CO2 (15%) only after the energy industry (25%) and transports (23%), and followed closely by the food industry (14%)[[25]](#footnote-25).

On this line, researchers from the “KlimaAlltag” project studied from 2010 to 2013 how daily behaviours varied in different social strata and tried to promote lifestyles and choices more environmentally sensitive. “KlimaAlltag” main focuses were on “mobility, nutrition, home living and household energy consumption”[[26]](#footnote-26).

The “KlimaAlltag” research did field tests and empirical surveys to households’ members, who also received climate-consultant advice for the following half year. According to the project leader, Immanuel Stieß, “more than half of those surveyed were basically ready to make changes in their behaviour”, and he adds that actions like “choosing green energy, buying seasonal and regional food, and using buses and trains more often” could decrease CO2 emissions by 10-15%.

“KlimaAlltag” explains in its leaflet[[27]](#footnote-27) that “the course and results of the field study were carried out and evaluated under scientific supervision”, and that they checked whether municipal climate protection measure would be possible and effective through a survey of 1000 people.

**Learning objectives**

* To identify the stakeholders involved in the project at all levels
* To understand the importance of public engagement in science and innovation practices
* To discuss the reason and methods used to involve society in this kind of projects
* To discuss the initial objectives and effectiveness of this program
* To assess the sustainability of the project and possible environmental impacts

**Reflection questions**

* Do you think the case presented is a good example of research done responsibly? Why?
* Do you think that the data presented by the “KlimaAlltag” organisers could be biased?
* Is the data presented applicable only in Europe or is a trend around the world?
* What is the role and possible importance of public engagement? How did public engagement contribute to this project?
* What stakeholders were involved in the research? Why have they been selected?
* Can you think of possible negative environmental impacts of this project? Have they been taken into consideration?
* How could the inclusion of more perspectives improve the overall project?

**The PIER project: “Public Involvement with Exhibition on Responsible Research and Innovation”**

*RRI Key issues: sustainability and inclusive science*

The PIER project[[28]](#footnote-28) was a European project of the 7th Framework Programme, which, according to the CORDIS website[[29]](#footnote-29), aimed to engage the public in Responsible Research and Innovation in society. As it is said in their report, the project developed an exhibition on the topic of Marine Research in the Mediterranean Sea. The exhibition was designed through several participatory activities to involve stakeholders, researchers, politicians, and the wider public. The PIER project wanted to enhance the importance of responsibility in research and to highlight the implications research can have on local development and on the quality of life of the citizens.91

As is described in their report, the involvement of the public and the experts started in the early stages of the project, with the realisation of workshops and focus groups. Citizen participation helped researchers decide the main topics of the exhibition, which were: fishery and aquaculture, biodiversity, energy from the sea, preventing disasters, new materials from the sea and safe maritime transportations.

The report mentions that the public was involved in questions related to responsible aspects of the Marine research: “how much personal behaviours can affect marine ecosystems, in terms of food selection, of waste disposal, on tourism activities, but also what people can do to improve the health of the Ocean, how people can have their say on research and policies related to the seas, how personal engagement can be strengthened, and how to get access to reliable scientific information and facts.”92

The project developed an exhibition with a participatory programme to engage the larger public in their achievements, for which it included different communication and participation channels like hands-on exhibits, prototypes, videos and multimedia products.

**Learning objectives**

* To understand the role of public engagement in science and innovation practices.
* To reflect on the role of science education in society and its possible impacts.
* To discuss the methods used to involve society in this kind of projects.
* To assess the possible environmental impacts of the project.

**Reflection questions**

* Do you think the case presented is a good example of research done responsibly? Why?
* What aspects of RRI can you see in this case? How are these aspects achieved and worked on?
* What is the role and possible importance of public engagement? How does public engagement contribute to this project?
* What is the role and possible importance of science education in this project?
* How can you promote reflection on R&I and its impacts in science education projects?
* Can you think of arguments against public engagement in science? What about science education?
* How can you promote reflection on R&I in the exhibition?
* What are the possible environmental impacts of this project?

**“MOSQUITO ALERT”**

*RRI Key issues: sustainability and inclusive science*

According to the European Centre for Disease Prevention and Control[[30]](#footnote-30), the tiger mosquito (Aedes albopictus) is an **invasive species and a** vector of diseases originating in Southeast Asia. Its habitat is mainly in urban areas where it breeds in small vessels or containers of stagnant water. According to the Mosquito Alert website[[31]](#footnote-31), this mosquito was detected in Spain for the first time in 2004, near Barcelona, and now it is present all around the Mediterranean coast.

The **Yellow fever mosquito** (Aedes aegypti) is a species of African origin found in Africa and tropical and subtropical countries, and it is also a vector of diseases. This mosquito has also adapted to urban areas, but currently there are no populations of Aedes aegyptiin Spain. However, as it is stated in the Mosquito Alert website, the increase of the global mean temperature could favour the eventual appearance of this mosquito in Spain.

The diseases transmitted by these mosquitoes are caused by viruses (like the Dengue virus, the Chikungunya virus or the Zika virus) and can result in fever and joint and muscle pain, among other symptoms, and can lead to hospitalization[[32]](#footnote-32).

The Mosquito Alert project wants to fight the invasive species of the tiger mosquito and the yellow fever mosquito. The project claims that: “To prevent transmission of these diseases it is crucial to control the presence of these species, minimize them in areas where they reside and control its expansion. To do this, the cooperation of citizens, along with the work of scientists, governments and managers of vectors and vector-borne diseases is essential.”93

Mosquito Alert describes itself as a **citizen science platform** that aims to unite citizens, **scientists**and**managers** in the fight against mosquito-borne diseases. “With the Mosquito Alert app anyone can report a possible finding of a tiger mosquito and its breeding sites by sending a photo. A team of experts is in charge of reviewing and classifying the photos before making them public on a map. With this information, scientists are studying the distribution of these mosquitoes.”

**Learning objectives**

* The students should be able to:
* Understand the role of public engagement in science and innovation practices
* Analyse the methodology used to involve society and obtain the results
* Discuss the outcomes and possible use for stakeholders
* Identify the potential future impacts, social and environmental, of the project

**Reflection questions**

* Do you think the case presented is a good example of research done responsibly? Why?
* What aspects of RRI can you see in this case? How are these aspects achieved and worked on?
* What is the role and possible importance of public engagement? How does public engagement contribute to this project?
* What is the role and possible importance of citizen science?
* Can you think of arguments against public engagement in science? Could there be problems related to the development of the project and results?
* Is there a wide range of stakeholders involved? How does this affect the project?
* What are the possible social and environmental impacts of the Mosquito Alert project?
* Do you think it’s positive to involve citizens in mosquito detection? What are the possible outcomes of these involvement?

**“The MARLISCO project”**

*RRI Key issues: sustainability and inclusive science*

**The MARLISCO project (from “MARine LItter in European Seas: Social AwarenesS and CO-Responsibility”)[[33]](#footnote-33), is a European initiative of the Seventh Framework Programme that went from June 2012 to the end of May 2015. In its website[[34]](#footnote-34) it is said that the project’s objective was to “raise public awareness, facilitate dialogue and promote co-responsibility among the different actors towards a joint vision for the sustainable management of marine litter across all European seas”.**

**The project’s context was, according to their website, that marine litter was an emerging thread to the environment and human health, a problem that has arisen from our** production systems, consumption patterns, and waste management.

MARLISCO’s website97,[[35]](#footnote-35) states that it wanted to raise awareness about social behaviours and their consequences, to promote co-responsibility among relevant stakeholders, and to achieve collective solutions for the litter impact, among other goals. MARLISCO’s activities took place in the four European seas (North-East Atlantic, Baltic, Mediterranean and Black Sea), and included **a “study**of the sources and trends regarding marine litter in each regional sea”, a best-practices collection from consortium countries, an attitude survey of different actors about marine litter, a European video contest, national debates and tailor-made activities in each partner country.

**Learning objectives**

* To identify the stakeholders involved in the project at all levels
* To understand the importance of public engagement in science and innovation practices
* To discuss the methods used to involve society in this kind of projects
* To analyse the initial objectives and effectiveness of this program
* To assess the sustainability of the project and possible environmental impacts

**Reflection questions**

* Do you think the case presented is a good example of research done responsibly? Why?
* Do you think that the data presented at the MARLISCO website could be biased?
* Do you think this project could be applied to the rest of the world, or is it only relatable to the production, consumption and waste-management patterns of Europe?
* What is the role and possible importance of public engagement? How did public engagement contribute to this project?
* What is the role and possible importance of science education? Is this project a good example?
* What are the stakeholders involved in MARLISCO? Why have they been selected?
* What are the possible environmental impacts? Can you think of possible negative impacts?
* Can you think of ways of improving the project by including more perspectives? Which ones?
* Can you think of ways the MARLISCO project promotes reflection on the impacts (ethical, legal, environmental, social) of marine litter?

**ETHICS**

**“Adolescents in HIV research”**

*RRI Key issues: ethics*

According to the TRREE project[[36]](#footnote-36), HIV is still a huge burden of disease in many settings. Optimal HIV prevention will possibly require a combination of interventions which should be tailored to specific sub-groups.[[37]](#footnote-37) At the moment, there is considerable prevention research agenda and HIV prevention trials are being conducted worldwide.[[38]](#footnote-38)

Up until now, the majority of HIV prevention trials have involved adult participants. Adolescents around the world are considered to be the epicentre of the epidemic, or close to.101 They demonstrate a range of behaviours that increase their risk of acquiring an HIV infection, for example an early sexual debut, overlapping sexual partnerships and inconsistent condom use.4  Because of this high risk, adolescents are one the principal populations for intervening to reduce risk of HIV acquisition.[[39]](#footnote-39) This means that they are important targets for up and coming biomedical approaches for HIV prevention.103 The TRREE project states that “It is imperative that adolescents are able to access safe and effective interventions to address their pressing health problems, including risk of HIV acquisition.”

According to Rudy et al100, changes that occur during adolescence can make it difficult to extrapolate data obtained in adult trials. In this manner, adolescents should be involved in trials to collect specific data about this group and to improve understanding of adolescent responses to biomedical prevention technologies. Some characteristics of adolescence, such as poorer impulse control, can make their participation in trials complicated, especially when it comes to issues such as retention and reporting all of which can impact on the scientific validity of trial results. 100,[[40]](#footnote-40)

The challenge of adolescent populations is to ensure they are adequately represented and protected. Adolescent involvement in research trials for HIV prevention therefore requires attention to ethical challenges so adolescent trials meet high-level legal and ethical standards.

**Learning objectives**

* To discuss the ethical guidelines that should govern such trials
* To assess who should be involved in the design and outcomes of these trials
* To reflect on the ethics of involving adolescents in clinical trials and the possible risks involved, and how they should be prevented

**Reflection questions**

* Do you think the case presented is a good example of research done responsibly? Why?
* What aspects of RRI can you see in this case? How are these aspects achieved and worked on?
* Which cultural and social issues are involved in the execution of this project involving adolescents in HIV research?
* What ethical impacts should be anticipated in involving adolescents in clinical trials?
* What is the role of ethics in this project?
* Are there potentially harmful impacts of the project? How can they be prevented?

**“PPI PARKINSON’S”**

*RRI Key issues: ethics and inclusive science*

Parkinson's disease (PD) is a chronic and progressive movement disorder, meaning that symptoms continue and worsen over time. The cause is unknown, and although there is presently no cure, there are treatment options such as medication and surgery to manage its symptoms. As the World Health Organisation (WHO) states, about 1 in 500 people suffer from Parkinson's disease[[41]](#footnote-41), which means there are an estimated 127,000 people in the UK with the condition. Most people with Parkinson's start to develop symptoms when they're over 50, although around 1 in 20 people with the condition first experience symptoms when they're under 40.104

Parkinson’s UK is a charity that aims to contribute to better care, treatments and quality of life for people with Parkinson’s disease. They want to fund research that is relevant and beneficial to people affected by the condition. Therefore, they encourage researchers to work with patients and carers in designing, delivering and sharing their research. In this exercise, we will discuss some of the activity of this charity as a possible example of a good RRI practice. Specifically, we are interested in a pilot project run by Parkinson’s UK to facilitate involvement.[[42]](#footnote-42)

The main idea of the pilot project was the following: They sent an email to current grant-holders and co-applicants with an invitation to take part in the pilot, as well as advertising it in the Parkinson’s UK researcher e-newsletter. Eight research teams came forward, including a wide range of research projects and researchers. Fifty-two people affected by Parkinson’s were involved at five locations across the UK. These volunteers met with one or two researchers from one of the pilot projects. This allowed the researchers and volunteers to ask each other questions. The researchers were then encouraged to follow-up with the volunteers to seek further input.

According to Parkinson’s UK, there were three main ways in which the volunteers’ contributions made a difference to the research:

* Improving the written information about the research project.
* Improving the practical arrangements to make the research more feasible and acceptable for participants.
* Commenting on the ethical issues raised by the research.[[43]](#footnote-43)

**Learning objectives**

* To analyse the methodology used to obtain the results and involve society in the project
* To discuss the outcomes and possible use for stakeholders
* To identify the potential future impacts of the project
* To understand the role of public engagement in science and innovation practices
* To assess the ethical principles involved in this pilot project

**Reflection questions**

* Do you think the case presented is a good example of research done responsibly? Why?
* What aspects of RRI can you see in this case? How are these aspects achieved and worked on?
* What is the role and possible importance of public engagement? How does public engagement contribute to this project?
* (Which stakeholders are taking part in the public engagement activities and why have they been selected?)
* Can you think of arguments against public engagement in science? Could there be problems related to the involvement of patients in the setting of research agendas?
* Could different methods and techniques for engaging specific stakeholder groups in dialogue have been taken into consideration? Why?
* Are sufficient perspectives and participants included? How could one enrich the perspectives?
* What ethical impacts should be anticipated in this project?
* What is the role of ethics in this project?

**Responsible, Inclusive Innovation: a documentary on the Buchu Plant**

*RRI Key issues: sustainability, inclusive science and ethics*

The [ProGReSS project](http://www.progressproject.eu/) (PROmoting Global REsponsible research and Social and Scientific innovation) wanted to establish a global network on RRI “involving academia, SMEs, international organisations, policy advisors, research funders, NGOs and industry”. The project sought to connect “existing international networks of RRI with relevant societal actors”, to “compare science funding strategies and innovation policies in Europe, the US, China, Japan, India, Australia and South Africa”, to “advocate a European normative model for RRI globally”, and to foster “the convergence of regional innovation systems at the global level”.

The project developed the [documentary “Responsible, Inclusive Innovation - The Buchu Plant](https://www.youtube.com/watch?v=Nk_Tl7dK5O0)”. The film talks about the San people of Southern Africa, a marginalised community with deep knowledge on medicinal plants. The narrative focuses on the Buchu plant and its many uses. The film includes interviews with San people talking about the plant, its history, spirituality, and role in the San community. Other interviews include a pharmaceutical representative, a researcher, a professor from Cape Town University, and a San Legal representative. According to ProGReSS, the film was made to “show how traditional knowledge holders can collaborate with responsible entrepreneurs and scientists to drive inclusive innovation”.

The United Nation’s General Assembly “Report of the Special Rapporteur on the situation of human rights and fundamental freedoms of indigenous people[[44]](#footnote-44)”, focused on the indigenous peoples in Botswana (including the San), states that initiatives to address “marginalisation in political spheres and a history of underdevelopment” are important but “still suffer from a variety of shortcomings and need to be designed and implemented in a manner that recognizes and respects cultural diversity and (…) identities”.

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**Learning objectives**

* To reflect on the role of inclusion of marginalized communities and its possible impacts.
* To discuss the methods used to involve society in this kind of projects.
* To identify the stakeholders involved and assess the benefits of their inclusion.

**Reflection questions**

* What aspects of RRI can you see in this case? How are these aspects achieved and worked on?
* Do you think this project is “responsible”? In what way?
* What is the role of stakeholder engagement? How does it contribute to this project?
* Do you think this film is a good vehicle to promote reflection on R&I?
* Do you think this film helps the marginalised community? In what way?
* What are the possible environmental impacts of this project? And social impacts?

**UCL CHANGEMAKERS: Fostering Multiple Abilities through Sensory Object Engagements**

*RRI Key issues: inclusive science*

[UCL ChangeMakers](http://www.ucl.ac.uk/changemakers) promotes collaboration and innovation to improve the learning experience at UCL (University College London). This programme encourages students to work together with university staff, undertaking projects to benefit the UCL community, by providing funding and support. This method benefits both the students, by allowing them to become more engaged, responsible and pro-active; and the university, which gains the expertise and enthusiasm of the students to contribute to making UCL better.

**Fostering Multiple Abilities through Sensory Object Engagements** was a student-initiated project that took place during 2015-2016. The project parted from the question “What are the potential learning benefits of museum objects for students with specific learning disabilities?” with the aim of improving teaching techniques, especially those oriented towards students with learning disabilities. The idea was that education is very often text heavy, and this can sometimes be an obstacle for those who are visual learners or have more specific learning needs.

The hypothesis was discussed in various group sessions, and the students then held an open workshop, held at an Art Museum at UCL. The workshop was called “making teaching more accessible and learning more engaging”. According to the report, the workshop showed that “Using objects encourages students to think more laterally and actually apply the knowledge they have, forming stronger memories of the material. Using museum objects in seminars also engages student’s natural curiosity – encouraging students to speak up in class and share their ideas.” The participants were asked to offer feedback on the objects provided so the students could “proceed further with integrating tactile and kinaesthetic learning and if, where and how it would be viable to adopt this as a regular practice in teaching.”

The project showed that using museum objects in teaching could significantly improve learning experiences, making them much more enjoyable and accessible to all students, not just those with learning disabilities. The participants expressed that the objects might be especially useful in science and history classes, for example to show how science and technology have evolved over time. The props were seen to help conversation flow and intellectual discussion.

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* <http://www.ucl.ac.uk/changemakers>

**Learning objectives**

* To identify the stakeholders involved and assess the benefits of their inclusion.
* To discuss the outcomes and possible use of the project for stakeholders.
* To assess the possible social and educational impacts.
* To discuss the methods used to involve society in this kind of projects.

**Reflection questions**

* What are the possible social impacts of this project?
* Do you think this project helps the student community? In what way?
* What aspects of RRI can you see in this case? How are these aspects achieved and worked on?
* Do you think this project is “responsible”? In what way?
* What is the role of stakeholder engagement? How does it contribute to this project?

**INCLUSIVE SCIENCE**

**“AMBIACT”**

*RRI Key issues: inclusive science*

According to the case study on Responsible Research and Innovation about Information and Communications Technology for Ageing People, the Ambiact is a smart meter designed to be placed in any power outlet, with an appliance to be plugged in to the Ambiact itself[[45]](#footnote-45). If the appliance is not used for a certain amount of time (generally, for more than 24 hours), the Ambiact will automatically generate an emergency call. This devise would provide elderly people who live alone with improved home safety and quality of life.[[46]](#footnote-46)

The Ambiact project claims that interviews were conducted during the whole product development in order to design the device according the people’s needs. The interviewees included social alarm customers and alarm operators. At the same time, the project also conducted two 13-months field trials involving approximately 100 people, where men and women were equally represented and where people with disabilities were also included. Results from these interactions were made publicly available and were used by the project in lectures, scientific talks and public presentations.[[47]](#footnote-47),[[48]](#footnote-48)

With its results, Ambiact concluded in its report that “the impact achieved by the project was the development of an innovative and patented product which is accepted by both the customer (e.g. care providers) and the end-user. It is currently sold by a start-up company, the Oldntec GmbH, to social alarm operators in Germany”.

**Learning objectives**

* Analyse the methodology used to obtain the results and to involve society in the project
* Discuss the outcomes and possible use for stakeholders
* Identify the potential future impacts of the product development
* Understand the importance of public engagement in science and innovation practices

**Reflection questions**

* Do you think the case presented is a good example of research done responsibly? Why?
* What aspects of RRI can you see in this case? How are these aspects achieved and worked on?
* Can you think of possible negative impacts of this product? If so, which ones?
* Do you think people could feel that Ambiact violates their privacy?
* What is the role and possible importance of public engagement? How does public engagement contribute to this project?
* Which stakeholders are taking part in the public engagement activities and why have they been selected?
* Can you think of arguments against public engagement in science?
* Could different methods and techniques for engaging specific stakeholder groups in dialogue have been taken into consideration? Why?
* Are sufficient perspectives and participants included? How could one enrich the perspectives?

**“Mobile Education DNA Labs”**

*RRI Key issues: inclusive science*

The Article titled “Genomics Education in Practice: Evaluation of a Mobile Lab Design The DNA-Labs” explains that the gap between scientific research and school science is ever wider, and due to the rapid progresses in many fields, school education finds it difficult to keep up with all the new advances.[[49]](#footnote-49)

The initiative “DNA labs on the road” started in 2006 in the Netherlands as an extracurricular development activity to fill this gap between school science and scientific research, and to empower the students, the future citizens, to deal with these personal and societal science decisions. According to the DNA labs project[[50]](#footnote-50), the workshops organised offer students the opportunity to experience scientific research through experiments with equipment that usually is not available in schools, while at the same time, they place scientific research in a relevant societal context.111

In these DNA labs, teacher and student manuals were developed for each activity and given in advance of the introductory lessons, which were taught by teachers at the schools before the “lab” itself. The practical part of the lab was taught by visiting university students, who were previously trained by the institutions involved. The labs were offered free of charge to all secondary schools in the Netherlands. From the start of the project, the article reveals, the five mobile labs reached 54.000 students in 342 different schools.111

The DNA Labs were evaluated on their quality, learning outcomes and effect on the attitude of the students towards genomics applications through questionnaires and some personal interviews (also with teachers).111

**Learning objectives**

* The students should be able to:
* Understand the role of public engagement in science and innovation practices
* Evaluate the role of science education in schools, in science and innovation practices
* Identify the future impacts of this project
* Discuss the methods used to involve society in this project.

**Reflection questions**

* Do you think the case presented is a good example of research done responsibly? Why?
* What aspects of RRI can you see in this case? How are these aspects achieved and worked on?
* What is the role and possible importance of public engagement? How does public engagement contribute to this project?
* Do you think this project could be applicable around Europe? And around the world? If so, how?
* Do you think this project is a good tool to promote scientific careers among youngsters? Why?
* What is the role and possible importance of science education in this project?
* Which stakeholders are taking part in the education activities and why have they been selected?
* How can you promote reflection on R&I and its impacts in science education projects?
* Can you think of arguments against public engagement in science? What about science education?

**Sustainability in Prisons Project (SPP)**

*RRI Key issues: sustainability and inclusive science*

The [Sustainability in Prison Project](http://sustainabilityinprisons.org/) (SPP) is an initiative from the Evergreen State College (Washington) and Washington State Department of Corrections. Their mission is, according to their website, “to bring science, environmental education, and nature into prisons”. They “conduct ecological research and conserve biodiversity by forging collaborations with scientists, inmates, prison staff, students, and community partners”, while at the same time, “help reduce the environmental, economic, and human costs of prisons by inspiring and informing sustainable practices”. Ultimately, the SPP wants to help incarcerated people rebuild their lives.

Currently, the SPP has several programmes involving different actors, such as the “Beekeeping & Pollinator Landscapes” programme, the “Environmental Engagement Workshop Series”, the “Taylor’s Checkerspot Butterfly Rearing” and the “Western Pond Turtle Rehabilitation” programmes. They claim that all their programmes have five components: 1) Partnerships and collaborations with multiple benefits, 2) Bringing nature “inside”, 3) Engagement and education, 4) Safe and sustainable operations, and 5) Evaluation, dissemination and tracking.

As stated in their website, the SPP is funded by different conservation organizations and state and federal agencies, such as the Washington State Department of Corrections, the Centre for Natural Lands Management, or the Institute for Applied Ecology. The SPP publishes a biannual newsletter and has a Facebook page.

**Bibliography:**

* <http://sustainabilityinprisons.org/>
* <http://www.evergreen.edu/>
* <http://www.doc.wa.gov/>
* <https://www.facebook.com/sustainabilityinprisons/>

**Learning objectives**

* To identify the stakeholders involved and assess the benefits of their inclusion
* To discuss the outcomes and possible use of the project for stakeholders
* To assess the sustainability of the project and possible environmental impacts

**Reflection questions**

* In what ways do you think the SPP is “Responsible”? Do you think it is also “Irresponsible” in other ways?
* Do you think the SPP is a good example of research done responsibly? Why?
* What is the role of public engagement in this project? Who is it involving and why?
* Can you think of negative environmental impacts of this project? And political impacts?
* Who is this initiative addressed to?

**CROSSCULT: Where History meets IT**

*RRI Key issues: inclusive science*

**“Nothing in History occurs just because one person causes one event. Everything has to be understood in a wider context. “**

[CrossCult](http://www.crosscult.eu/) is a project that has received funding from the European Union's [Horizon 2020](https://ec.europa.eu/programmes/horizon2020/) research and innovation programme. The aim of CrossCult is to “better understand and reinterpret history and culture”, as they describe in their website. The project describes itself as “empowering reuse of digital cultural heritage in context-aware crosscuts of European history”, to provoke a change in the way citizens of Europe view history.

The idea is that history is a complex web of interrelated events and facts, not a collection of unconnected happenings, which is how it is often taught. The project plans to change people’s views on what they have learnt by providing them with “pieces of cultural heritage, other citizens' viewpoints and physical venues”. In this manner, CrossCult aims to promote reflection amongst citizens, helping them to reinterpret history in a wider and more global way.

CrossCult considers that the way history is taught in school and universities is lacking in certain aspects such as “cross-border cultural aspects and global views”. According to their website, the experiences they have designed aim to: raise consciousness, give an overview of historical events from multiple perspectives, approach history via alternative sources (archaeological remains, iconography, epigraphy, numismatics, architecture, art, etc.) and transmit the fact that there can be many contrasting viewpoints in history.

The project uses technology and mobile apps as a tool to reach citizens across Europe. The project states in their website that the idea is to “connect people to digital and physical historical artefacts and in different places across Europe”. The end products will be a semantic knowledge base that “interrelates an unrestricted set of (existing and future) digital cultural heritage resources and venues across different repositories, on the grounds of common properties or crosscutting, transversal concepts”, and also to “design business models and plans for the exploitation of the project results in collaboration with a new network of researchers, scholars, ICT professionals and specialists of digital heritage.”

**Bibliography:**

* [**http://www.crosscult.eu**](http://www.crosscult.eu)

**Learning objectives**

* To identify the stakeholders involved and assess the benefits of their inclusion
* To assess the possible social and political impacts
* To analyse the methods used to involve society in this kind of projects
* To discuss the outcomes and possible use of the project for stakeholders

**Reflection questions**

* What are the possible social impacts of this project?
* What aspects of RRI can you see in this case? How are these aspects achieved and worked on?
* Do you think this project is “responsible”? In what way?
* What is the role of stakeholder engagement? How does it contribute to this project?

**ANNEX 4. HEIRRI CASES WITH ANSWERS**

**CASE EXAMPLE 1: MOSQUITO ALERT**

*RRI Key issues: sustainability and inclusive science*

According to the European Centre for Disease Prevention and Control[[51]](#footnote-51), the tiger mosquito (Aedes albopictus) is an **invasive species and a** vector of diseases originating in Southeast Asia. Its habitat is mainly in urban areas where it breeds in small vessels or containers of stagnant water. According to the Mosquito Alert website[[52]](#footnote-52), this mosquito was detected in Spain for the first time in 2004, near Barcelona, and now it is present all around the Mediterranean coast.

The **Yellow fever mosquito** (Aedes aegypti) is a species of African origin found in Africa and tropical and subtropical countries, and it is also a vector of diseases. This mosquito has also adapted to urban areas, but currently there are no populations of Aedes aegyptiin Spain. However, as it is stated in the Mosquito Alert website, the increase of the global mean temperature could favour the eventual appearance of this mosquito in Spain.

The diseases transmitted by these mosquitoes are caused by viruses (like the Dengue virus, the Chikungunya virus or the Zika virus) and can result in fever and joint and muscle pain, among other symptoms, and can lead to hospitalization[[53]](#footnote-53).

The Mosquito Alert project wants to fight the invasive species of the tiger mosquito and the yellow fever mosquito. The project claims that: “To prevent transmission of these diseases it is crucial to control the presence of these species, minimize them in areas where they reside and control its expansion. To do this, the cooperation of citizens, along with the work of scientists, governments and managers of vectors and vector-borne diseases is essential.”93

Mosquito Alert describes itself as a **citizen science platform** that aims to unite citizens, **scientists**and**managers** in the fight against mosquito-borne diseases. “With the Mosquito Alert app anyone can report a possible finding of a tiger mosquito and its breeding sites by sending a photo. A team of experts is in charge of reviewing and classifying the photos before making them public on a map. With this information, scientists are studying the distribution of these mosquitoes.”

**Learning objectives**

* The students should be able to:
* Understand the role of public engagement in science and innovation practices
* Analyse the methodology used to involve society and obtain the results
* Discuss the outcomes and possible use for stakeholders
* Identify the potential future impacts, social and environmental, of the project

**Reflection questions**

Do you think the case presented is a good example of research done responsibly? Why?

Yes, because it explains how science can incorporate society in its projects in an inclusive way for the benefit of all.

What aspects of RRI can you see in this case? How are these aspects achieved and worked on?

Dimensions: Inclusive, Openness, Adaptability

This case clearly involves society in a very wide way (Inclusive), the only requisite is to have a smartphone. It is also a very open access since results are published online (Openness) and the research is an ongoing process, advancing according to the inputs received from the territory (Adaptability).

Key issues: Public engagement, Science education, Open access

The citizen science approach is a clear example of Public engagement. It has a clear component of Science education, as explained in the text, because those who get involved also get informed and usually become advocates for the cause. It is also in favour of open access for the nature of the data received.

What is the role and possible importance of public engagement? How does public engagement contribute to this project?

Public Engagement can be understood in one of the following ways:

* **Engagement to increase the interest, understanding and science literacy of a society**. Dissemination of results, outreach activities, expositions and media communication (including social media), are activities under this kind of PE. This perspective is one-directional, by which the scientific community shares its knowledge with society to help everyone be better informed and familiarised with the R+D+I system, and more engaged with science and its applications.
* **Engagement to favour active participation and responsibility redistribution.** Activities under this kind of PE would include the Mobilisation and Mutual Learning (MML) exercises, dialogue activities such as science cafés, formal participation formats like consensus conferences and referendums, Community-based research, Living Labs, Citizen science activities, etc. In all these activities, communication is bi-directional or multidimensional, a dialogue is established and, in some cases, responsibility is redistributed. Their aim is to actively involve society or specific stakeholders in the some or all phases of the R+D+I process.

In the case of the Mosquito Alert project, the engagement achieved works in both ways because society gets informed and more interested in a particular science topic, but society also contributes actively to the data gathering of the research.

Can you think of arguments against public engagement in science? Could there be problems related to the development of the project and results?

There could be problems related to this particular case, for example, if people did not collect the data correctly and it caused contradictions or fake results (for instance, if the pictures were not properly geolocated).

Is there a wide range of stakeholders involved? How does this affect the project?

The main stakeholder involved is the society as a whole. This affects the project in the sense that it can rely on individuals for collecting data on the location of mosquitos. The project could also involve hospitals, research centres, botanist…

What are the possible impacts of the Mosquito Alert project?

A possible impact is that society becomes more aware of the presence of mosquitos and develops an environmentally conscious approach to their surroundings. If people are more conscious about the nesting mechanisms of mosquitos, maybe they can prevent the creation of new water puddles or ponds.

**CASE EXAMPLE 2: AMBIACT**

**“AMBIACT”**

*RRI Key issues: inclusive science*

According to the case study on Responsible Research and Innovation about Information and Communications Technology for Ageing People, the Ambiact is a smart meter designed to be placed in any power outlet, with an appliance to be plugged in to the Ambiact itself[[54]](#footnote-54). If the appliance is not used for a certain amount of time (generally, for more than 24 hours), the Ambiact will automatically generate an emergency call. This devise would provide elderly people who live alone with improved home safety and quality of life.[[55]](#footnote-55)

The Ambiact project claims that interviews were conducted during the whole product development in order to design the device according the people’s needs. The interviewees included social alarm customers and alarm operators. At the same time, the project also conducted two 13-months field trials involving approximately 100 people, where men and women were equally represented and where people with disabilities were also included. Results from these interactions were made publicly available and were used by the project in lectures, scientific talks and public presentations.[[56]](#footnote-56),[[57]](#footnote-57)

With its results, Ambiact concluded in its report that “the impact achieved by the project was the development of an innovative and patented product which is accepted by both the customer (e.g. care providers) and the end-user. It is currently sold by a start-up company, the Oldntec GmbH, to social alarm operators in Germany”.

**Learning objectives**

* Analyse the methodology used to obtain the results and to involve society in the project
* Discuss the outcomes and possible use for stakeholders
* Identify the potential future impacts of the product development
* Understand the importance of public engagement in science and innovation practices

**Reflection questions**

Do you think the case presented is a good example of research done responsibly? Why?

Yes, because it shows how an innovation considers end-users and involved stakeholders from the very start of the development process. Those behind Ambiact seem to understand that including relevant actors in an innovation process is beneficial, not only economically, but also for those addressed by the technology itself. Ambiact is a good example of research done responsibly.

What aspects of RRI can you see in this case? How are these aspects achieved and worked on?

Dimensions: Inclusivity, Reflection, Adaptability

These dimensions are achieved by, first, reflecting on how to make a good new piece of technology in a responsible way (Reflection). Then also by including different stakeholders (inclusivity) and taking into account and integrating into the technology what these actors give back (Adaptability).

Key issues: Ethics, Gender, Public engagement

Ambiact is managed considering the several stakeholders affected by the technology and making them participate in the process (Public engagement), also considering their gender diversity (Gender). In the process of testing the technology, it is most likely that guidelines for an ethical approach where followed.

Can you think of possible negative impacts of this product? If so, which ones?

Yes. Maybe some people would feel their privacy under threat. Or an error in the monitoring that would result in the alarm being sent off, which would cause distress to all actors involved.

What is the role and possible importance of public engagement? How does public engagement contribute to this project?

Public Engagement can be understood in one of the following ways:

* **Engagement to increase the interest, understanding and science literacy of a society**. Dissemination of results, outreach activities, expositions and media communication (including social media), are activities under this kind of PE. This perspective is one-directional, by which the scientific community shares its knowledge with society to help everyone be better informed and familiarised with the R+D+I system, and more engaged with science and its applications.
* **Engagement to favour active participation and responsibility redistribution.** Activities under this kind of PE would be the Mobilisation and Mutual Learning (MML) exercises, dialogue activities such as science cafés, formal participation formats like consensus conferences and referendums, Community-based research, Living Labs, Citizen science activities, etc. In all these activities, communication is bi-directional or multidimensional, a dialogue is established and, in some cases, responsibility is redistributed. Their aim is to actively involve society or specific stakeholders in the some or all phases of the R+D+I process.

In the case of Ambiact, we would be talking of the second kind of engagement. The public contributes to the development of the technology in an active and thoughtful way, consciously providing with feedback. The final product of Ambiact is, therefore, more robust and socially accepted because potential stakeholders have been included in its development.

Which stakeholders are taking part in the public engagement activities and why have they been selected?

Stakeholders involved: social alarm customers, alarm operators, potential users (men and women), people with disabilities.

They have been selected because they will be directly affected by the implementation of this technology (potential users, social alarm customers) or because their expertise can be a good asset for the technological development of the product (alarm operators).

Can you think of arguments against public engagement in science?

Could different methods and techniques for engaging specific stakeholder groups in dialogue have been taken into consideration? Why?

Yes. They conducted interviews and trials, but other good methods would be focus groups, science cafés for local communities, and general community-based research. Different types of public engagement work best for different things, so using other methodologies would be beneficial to discover other perspectives.

Are sufficient perspectives and participants included? How could one enrich the perspectives?

Participants that are not mentioned in the description of Ambiact but that could be of great interest for the development of the product would be the family members or closest friends of the end-users. That is, those who would receive the emergency call if an accident happened.

**CASE EXAMPLE 3: PPI PARKINSON’S**

*RRI Key issues: ethics and inclusive science*

Parkinson's disease (PD) is a chronic and progressive movement disorder, meaning that symptoms continue and worsen over time. The cause is unknown, and although there is presently no cure, there are treatment options such as medication and surgery to manage its symptoms. As the World Health Organisation (WHO) states, about 1 in 500 people suffer from Parkinson's disease[[58]](#footnote-58), which means there are an estimated 127,000 people in the UK with the condition. Most people with Parkinson's start to develop symptoms when they're over 50, although around 1 in 20 people with the condition first experience symptoms when they're under 40.104

Parkinson’s UK is a charity that aims to contribute to better care, treatments and quality of life for people with Parkinson’s disease. They want to fund research that is relevant and beneficial to people affected by the condition. Therefore, they encourage researchers to work with patients and carers in designing, delivering and sharing their research. In this exercise, we will discuss some of the activity of this charity as a possible example of a good RRI practice. Specifically, we are interested in a pilot project run by Parkinson’s UK to facilitate involvement.[[59]](#footnote-59)

The main idea of the pilot project was the following: They sent an email to current grant-holders and co-applicants with an invitation to take part in the pilot, as well as advertising it in the Parkinson’s UK researcher e-newsletter. Eight research teams came forward, including a wide range of research projects and researchers. Fifty-two people affected by Parkinson’s were involved at five locations across the UK. These volunteers met with one or two researchers from one of the pilot projects. This allowed the researchers and volunteers to ask each other questions. The researchers were then encouraged to follow-up with the volunteers to seek further input.

According to Parkinson’s UK, there were three main ways in which the volunteers’ contributions made a difference to the research:

* Improving the written information about the research project.
* Improving the practical arrangements to make the research more feasible and acceptable for participants.
* Commenting on the ethical issues raised by the research.[[60]](#footnote-60)

**Learning objectives**

* To analyse the methodology used to obtain the results and involve society in the project
* To discuss the outcomes and possible use for stakeholders
* To identify the potential future impacts of the project
* To understand the role of public engagement in science and innovation practices
* To assess the ethical principles involved in this pilot project

**Reflection questions**

Do you think the case presented is a good example of research done responsibly? Why?

Yes, because it presents an active approach to a more direct participation of the main stakeholders of a specific field – that is, the people affected by the Parkinson’s disease in Parkinson’s disease research. It is responsible because it engages with the patients to understand better their needs and expectations and properly respond to these. Also, to share the current lines of research and see how they are accepted by the ultimate recipients.

What aspects of RRI can you see in this case? How are these aspects achieved and worked on?

Dimensions: Inclusion, Adaptiveness

The project clearly includes different stakeholders (Inclusion) and consults with them in order to better shape/reshape its research lines (Adaptiveness).

Key issues: Public engagement, Ethics, Science Education

The project counts with the benefits of Public engagement. It also contributes to Science education, since in the process of consulting and engaging, the participating subjects learn about the research field and particularities. Ethics is a clear aspect of this initiatives, since all research done with human individuals is subjected to a strong Ethic framework and standards.

Which stakeholders are taking part in the public engagement activities and why have they been selected?

According to the text provided, the initiative engaged current grant-holders and co-applicants, research teams, people affected by Parkinson’s and carers. They have been selected because they are key actors in the field of Parkinson’s disease, either because they are affected by it (patients), because they work with people affected by it (carers), or because they work on the research developments and possible cures (researchers).

Can you think of arguments against public engagement in science? Could there be problems related to the involvement of patients in the setting of research agendas?

If we agree that biomedical research should be ultimately addressed to patients, then we can say that engaging the public in the progress of research is only beneficial, since it allows researchers and funding agencies to better understand the needs and expectations of patients and tackle them accordingly.

Some might say that involving patients in the setting of research agendas might be negative because they not necessarily understand the nature of science projects and might ask for unrealistic goals. However, this can be compensated with science education and by only adapting the science research to patients’ requests from a realistic understanding of what is and what isn’t feasible -by taking into account what patients want and need, without being tied to it.

Could different methods and techniques for engaging specific stakeholder groups in dialogue have been taken into consideration? Why?

Yes. The project could have also included other Public engagement methods like focus groups, science cafés or public consultations. These methods are good for obtaining other perspectives and maybe including more people, and therefore would have contributed to gaining a broader and more complete picture of what the patients of Parkinson’s disease and their carers want and expect from research.

Are sufficient perspectives and participants included? How could one enrich the perspectives?

The people included are of course crucial, but the overall engagement would have been richer if other stakeholders had been included. For example, close relatives of patients, funding agencies, doctors, nurses and psychologist working with people affected by the Parkinson’s disease, or managers of nursing centres.

**ANNEX 5. HEIRRI ROLE-PLAY GUIDE**

**TABLE OF CONTENTS:**

* ROLEPLAY TUTOR GUIDE
* GOF EXPERIMENTS
* SUSTAINABLE FASHION
* BIOMASS
* NANOTECHNOLOGY IN AGRICULTURE
* DECEPTION

**ROLE-PLAY TUTOR GUIDE**

**Goal:**

*The aim of this activity is to promote discussion regarding different points of view and arguments related to a controversial issue in which the research process involves certain risks for society.*

**Learning outcomes:**

After this activity, the students should be able to:

* Analyse the current situation related to the role-play scenario.
* Construct arguments and an opinion on the role-play scenario.
* Discuss different perspectives related to this issue.
* Apply the RRI perspective to this issue.

**Materials:**

* Articles to read
* Role-Play Scenarios
* Characters
* Moderator questions

**Description of the activity:**

This activity is designed for 30 students, more or less. The students should be divided up into the number of roles in the chosen scenario in groups of 4-5 participants. Before the activity, each group of students will be assigned a character. Then, each group should study a role, by reading the selected articles before the role-play session. Also, the students have to read which kind of character they have. Each group will choose an spokesman to play the character.

Another option to carry out this activity is for the students to read the selected articles, without specific roles having been assigned. In this manner, the students themselves should decide on which roles are involved in the role-play session once they have analysed the scenario in depth.

During the role-play session:

1. Presentation of the scenario (10 minutes)
2. Preparation of the characters’ arguments (20 minutes)
3. Role-play (1 hour).

* Each role play character has to be introduced by each group spokesman and has to explain their position in relation to role-play debate (15 minutes).
* After that, there will be 30 minutes of questions directed by the moderator to generate debate.
* Finally, there will be 15 minutes of final conclusions.

It is important that the groups of students defend their role during the debate, despite their personal opinion. After that, in the final conclusions, the students can free themselves of their role and give their personal opinion/arguments about this issue, if they want.

**Total duration of the activity:**1 hour 30 minutes/ 2 hours

**Teacher’s role: how can the teacher facilitate the activity?**

To direct the activity it is interesting for the instructor/teacher to play the role of the moderator. To perform a more interactive debate the instructor can use the “theatre of the oppressed” dynamic, formulated by Augusto Boal, concretely the forum theatre technique. In this technique Boal looked to provide different structures which could be adapted according to the groups he was working with, developing a method by which the theatre process could be transferred from actors to the audience, also called spec-actors, through enabling discussion and debate without hierarchy and respecting everybody’s knowledge. This technique has been applied in the educational community, and basically it is based on engaging the participants through creating opportunities to engage in active discussion around a specific issue with the aim of considering different perspectives. In this case, the dynamic to guide the activity is the following:112

**Facilitator:** the instructor has to play the role of the facilitator, there has to be a neutral party at the centre of the proceedings and to guide the debate.

**Actors:** some of the participants have to play the different characters of the role-play and defend their arguments related to the debate’s issue.

**Spec-actor:** during the debate, the public or the other participants are engaged in the forum theatre. The spec-actors can participate and discuss their own ideas, they are not passive public anymore.

The dynamic starts with the moderator at the centre of the stage and the different characters’ representatives. Each character/spokesman exposes their arguments and then the moderator starts with the questions to generate debate. The public (the other members of the groups that are not acting as spokesman) or spec-actors can intervene with the debate, so, when a public participant doesn’t agree with something that one of the actors has exposed, the participant has to clap and they switch roles: the actor becomes part of the public and the public participant gets on the stage and becomes an actor.

Furthermore, to guide this activity, the instructor can choose the characters he or she thinks are convenient. Here there are eight characters to be chosen, however, it is recommended to choose at least six of them.[[61]](#footnote-61)

**GAIN OF FUNCTION EXPERIMENTS**

**Scenario:**

Gain-of-function (GOF) experiments are an experimental tool that is routinely used in biomedical research. What GOF means is that an entity has gained a new property, for example, GOF in the influenza virus has been associated with the acquisition of a new function, such as mammalian transmissibility, increased virulence for humans or evasion of existing host immunity[[62]](#footnote-62). In recent years, some members of the scientific community have been involved in a vigorous debate over GOF experiments involving pathogens with pandemic potential (PPP), such as the influenza virus. This controversy has become a State issue; in fact, in October 2014 the U.S. government announced a pause in research involving GOF experiments with three respiratory viruses: influenza virus, MERS and SARS. Furthermore, the National Science Advisory Board for Biosecurity (NSABB) met to discuss another added controversy, GOF papers publications.[[63]](#footnote-63)

GOF experiments have become a current debate issue which worries the scientific community. After several months of discussion, a meeting has been proposed, involving all the actors of this debate, to discuss the many issues involved in the risks-benefits analysis of GOF experiments future work and this developing situation.[[64]](#footnote-64)

**Characters:**

**Yoshi Kinamata**

Yoshi Kinamata is a recognised virologist, researcher and professor at the University of Wisconsin, Madison. He works in the department of biopathological sciences. His research focuses on the molecular mechanism of interspecies transmission of the influenza virus that triggers human influenza pandemics, as well as the molecular pathogenesis of the influenza virus in birds and mammals. He has published the main articles involving the topic of GOF experiments.

“Our research could bring lots of benefits to biomedical research: we could identify mutationts that could influence the viruses’ effects on the immune system and their resistance to antiviral drugs. We have been transparent with our work and we are trying to upfront what needs to be done, how it could be done and how we could do it safely.”

**Bob Smith**

Bob Smith, a biotechnologist, is the vice president of the pharmaceutical company BioCryst Pharmaceutics. He has participated in the development and launching of different pharmaceutical treatments. He is currently focusing on the direction of the research on new antiviral drugs and vaccines carried out in this pharmaceutical company.

“If Gain of Function research is not allowed to proceed, our company research on antiviral drugs and vaccines will grind to a halt because drug development is financially risky, but we don’t want to.”

**Tina Truman**

Tina Truman is a biosafety and biosecurity consultant from Maryland, USA. She works on the promotion of good biosecurity practices to safeguard the population from potential risks. She worked for many years with the UK government in the disarmament of biological weapons.

“Nobody will support an experiment that attempted to make HIV or Ebola transmissible by air, there are lines we wouldn’t cross. If the virus escape, nobody could predict the trajectory. And even worse, what will happen if GOF are used for bioterrorism.”

**Francesca Colleman**

Francesca Colleman, a biochemist, is the director of the National Institutes of Health (NIH) of the United States. Her institution works with the government to finance, via public money, part of the biomedical and biotechnological research projects. For a few years, Francesca authorized the funding of GOF experiments.

“Researchers on contract with the NIH might be affected, some of our several scientists have received orders to stop work this week. Between 20 to 24 NIH-funded projects are directly affected. The pause comes a cost, but will provide robust deliberation.”

**Samuel Webbe**

Samuel Webbe is a virologist, professor and researcher at the Pasteur Institute. He works in the Molecular Retrovirology department. For years he has worked with AIDS and HIV and has published more than 200 papers. He is currently a member of the European Molecular Biology Organization and Chairman of the Board of Directors of the Foundation for Vaccine Research. He has been involved in the debate of the GOF and has been very critical with Kinamata’s work.

“The only impact of this work is the creation, in a lab, of a new, non-natural risk. What's more, the research of Dr. Kinamata could be done in other kind of experiments without the need of putting them in an infectious virus.”

**Julia Stills**

Julia Stills, a biologist, has worked for several years in a Molecular Virology research group. Some time ago, she left her professional career in basic research to pursue biohacking. She currently works in a DIY biology laboratory as a biohacker. She has participated in the writing of the ethical code for the network of DIY laboratories in Europe and the United States.

“The community has not to worry about biohackers, we are working to include GOF experiments in our ethical code. However, this issue must be debated to reach an agreement.”

**Rita Donald**

Rita, who did a bachelor in Life Science, is the current Editorial Director of Nature. Her tasks at the science journal include overseeing the editorial content and management of biological science. She has been involved in the publication of Dr. Kinamata’s studies in 2013.

“Journal Editors have a difficult role in this debate. We want to be transparent and publish all the data, but our concern is that publishing it will allow labs around the world, which won’t adhere to the same safety requirements or the same purpose, to do the same.”

**Richard Green**

Richard, an activist and expert in ecology, works in the Third World Network (TWN), an alternative policy group that produces and disseminates analyses, proposals and information tools related to ecological sustainability. He has participated in the movement of collecting signatures, promoted by scientists in the field, who have stridently opposed to GOF experiments.

“The risks are too high. We are talking about a possible epidemic. I don’t know why there is still debate here. ”[[65]](#footnote-65),[[66]](#footnote-66),[[67]](#footnote-67)

**Reflection questions**

**Moderator questions during the debate:**

* Which are the benefits and risks of using Gain of function experiments?
* To what extent is there agreement about the general balance between risk avoidance and innovation/research support?
* Which powers are traditionally used to prohibit the research?
* How should regulation or prohibition be managed in cases of research collaborations that cross borders?
* One of the main concerns are biosafety and biosecurity. Even so, research with pathogens has been carried out for many years and it seems quite safe. Do we have enough reasons to believe that the current requirements of biocontainment are insufficient for GOF experiments?
* The USA government has paused the funding of GOF experiments and studies. What do you think about it?
* How and when should the results of these experiments be reported? How should scientific journals deal with this topic? How should this information be published? Do all the details of the experiment have to be given, or just the surface information or does anything have to be published at all?
* The press has published this information on the debate of the GOF. Is it beneficial that the debate has reached the general public and the entire population? Or is it just a provocation of alarmism?
* Are there any alternatives to GOF experiments?[[68]](#footnote-68)

**Moderator questions for the conclusions and closing of the activity:**

Goal: To search a theoretical position about GOF experiments and agree on a regulation.

 -Do these experiments have to be allowed?

- To what extent should they be regulated?

- Which is the current situation in EEUU and Europe? Is there an International agreement of regulation?

**Selected Articles to read:**

* Wain-Hobson, S. (2013). Pandemic influenza viruses: time to recognize our inability to predict the unpredictable and stop dangerous gain-of-function experiments. *EMBO Molecular Medicine,* 5, 1637-1641.
* Reardon, S. (2014). Viral-research moratorium called too broad. *Nature News*.
* Casadevall, A., Imperiale, M.J. (2014). Risks and Benefits of Gain-of-function experiments with Pathogens of Pandemic Potential, such as Influenza Virus: a call for a Science-Based Discussion. *mBio Editorial,* 5 (4), 1-5.

**SUSTAINABLE FASHION**

**Inspired by a case study from the UPC ERASMUS intensive programme in sustainable technology development:**

**Clara Mallart*:* A local booming sustainable clothing market**

**Scenario**

After China, the EU is the world’s second largest exporter of textile products. Europe dominates the global markets for high quality textiles and clothing. According to the European Commission, the textile and clothing sector plays a crucial role on the economy and social well-being in numerous regions of the EU and based on the latest structural data available, in 2013, there were 185 000 companies in the industry employing 1.7 million people and generating a turnover of €166 billion. The textile and clothing sector accounts for 3% of total manufacturing value added in Europe.[[69]](#footnote-69)

The EU created the European Fashion Council in 2007, a representative, nongovernmental organization whose aim is to bring fashion into the EU agenda. The global economy and the globalization of so many fashion brands is viewed as a challenge for investigating new ways of trade and the development of different kinds of sustainable processes. The EU is offering financing to European research projects related to sustainability, and there are many proposals related to the fashion industry. All proposals related to the clothing industry are to be presented to the Fashion Council, who will then decide which ones should receive funding.

The proposals are related to:

* Water consumption
* Industrial water pollution
* Textile waste
* Use of pesticides and fertilizers
* Upcycling/recycling clothes
* Gender equality in the industry

**Characters**

**Sandra Noel, Vice President of the European Fashion Council**

The European Fashion Council is a non-governmental organization authorized to represent the European Union in fashion and fashion design worldwide. It is a union of 20 countries that are primarily located in Europe.

“New initiatives are needed to deal with the problems related to the ever growing global fashion industry. In the last decades, we have seen the appearance of fast fashion, more consumerism and throwaway lifestyles, more prevalent in richer countries. The clothing industry puts a big strain on natural resources and has a huge carbon footprint even before reaching the end user. This is because of the large amount of water, chemicals and energy used up in the manufacturing and transportation phases.”

**Laia Santiago, Saffo Spokesperson**

Saffo is a German multinational corporation, headquartered in Munich, that designs and manufactures shoes, clothing and accessories. It is the largest sportswear manufacturer in Europe, and the second biggest in the world. They are a good example of a company that dedicates a lot of resources to sustainability purposes, and are at the meeting to give advice.

“Sustainability forms the basis of all our decisions. You can see its presence in all our processes, inspired by our commitment to selling ethical, safe and community- and environmentally-friendly products.”

**Carol Drake – Water consumption project**

Carol Drake works for The Environmental Justice Foundation (EJF). The Environmental Justice Foundation is a UK-based non-profit organization working internationally to protect the environment and defend human rights. Carol Drake specializes in fresh water research, and the effect of agriculture on water resources.

“Over 53% of cotton fields in the world require water irrigation, and the majority of these are in regions where water is scarce. During the decades of 1960-2000, the Aral Sea lost approximately 70% of its water volume due to the process of diverting water so as to be able to grow cotton in the desert. We need to find a way to reduce water consumption. “

**Leonard Kanye - Dye technology project**

Leonard Kanyeis a chemist specialised in waterless dyeing techniques. He works for ColouredZen, a company that has created a treatment for cotton that makes the dyeing process more environmentally friendly.

“Approximately 17 to 20% of industrial water pollution comes from textile dyeing and treatment and an estimated 8,000 types of synthetic chemicals are used around the world (with the purpose of turning raw materials into textiles). A lot of these chemicals are then released into fresh water sources. The wet processing of clothing, such as wash­ing and dyeing, is also very water-intensive. It is essential to come up with new techniques for dyeing clothes that are more environmentally friendly. “

**Rick Blanco - Textile waste Project**

Rick Blanco is a professor in Textile Technology and an expert on sustainable processes for Textile Recycling at the Paris Sorbonne University. He is currently researching different methods for recycling textile waste.

“In the European Union it’s estimated that each person generates between 7 and 16 kilos of textile waste in a year. The average use of one garment is only 6 times. There is an obvious mismatch between the consumerism speeds, the usability rhythm, the production rhythm, the production of fabrics rhythm and above all, the natural growing rhythm of the resources. Much of the discarded clothing is made from plastic (such as polyester, nylon, spandex...). These plastic fibres can take up to 200 years to degrade and have an invisible, but deadly, effect on our oceans. We are trying to figure out ways of avoiding and/or dealing with all this waste. “

**Melody Miller – Organic Production project**

Melody Miller researches the use of pesticides and their effect on the environment and human health. She has done work for the WWF on the unsafe use of agricultural chemicals.

“22.5% of the world’s insecticides and 10% of all pesticides are used for the production of cotton, on 2.5% of agricultural land. A specific pesticide, which is used in West African cotton, causes brain and fetal damage, impotence and sterility. Something has to be done to improve this situation, as it is having a serious affect on the environment and the people who work in this part of the production chain. “

**Alejandro Cenzano - Awareness campaign**

Alejandro Cenzano has created the small scale campaign Love your Wardrobe, to make people more aware of the effect the textile industry has on the environment. The campaign centres on changing the way consumers buy and dispose of their clothing.

“Our campaign aims to improve the sustainability of clothing across its lifecycle, and we believe that the attitudes of end users are a major part of that. The most significant opportunity for reducing the environmental impact of clothing lies in increasing the active life of the clothes we wear.”

**Emilie Harrison, Fashion revolution project**

Emilie Harrison is an MS graduate in Development Studies, and she is working on a project called Fashion Strike which aims to help improve worker’s rights and conditions in the clothing industry, the work is especially centred on women.

“More than 70% of garment workers in China are women, in Bangladesh the number is 85%, and in Cambodia it is as high as 90%. For these women, development is closely linked to their conditions at work. The working conditions need to be improved.”

**Reflecting questions**

**Moderator questions during the debate:**

* + What are the possible risks posed by the fashion industry for the environment?
  + How is the fashion industry socially unsustainable?
  + Are these impacts taken into account?
  + How can this industry improve the environmental impact?
  + How can the industry improve its social impact?

**Moderator questions for the conclusions and closing of the activity**

* Should the need for a more sustainable fashion industry be considered a priority? Which are the main problems to be addressed?
* To what extent can this industry be regulated, and by whom?
* What is the current situation, in the EU and globally?

**Selected Articles to read:**

* Goworek, H*. Social and environmental sustainability in the clothing industry: a case study of a fair trade retailer*, SOCIAL RESPONSIBILITY JOURNAL VOL. 7 NO. 1 2011
* Niinimäki, K . *Ethical foundations in sustainable fashion* Textiles and Clothing Sustainability (2015) 1:3

**BIOMASS**

**Inspired by a case study from the UPC ERASMUS intensive programme in sustainable technology development:**

**The development of the Association of forestry owners (APF) of el Massís del Garraf for the energetic exploitation of forest biomass.**

**Scenario**

Biomass refers to the wood and other organic matter that is burned to obtain energy. Burning biomass releases carbon emissions, which are around a quarter higher than when burning coal. Even so, biomass has been classed as a "renewable" energy source in the EU and UN legal frameworks, because the plants that are used can be re-grown.

Due to scarce forest management in the last few decades in the Garraf region, and in a large part of Catalonia (Spain), a significant amount of biomass has accumulated in forests, increasing the forest surface area. This is a direct consequence of the poor economic profitability of forestry exploitation and of the reduced commercial interest in wood. The result is that the forests are under exploited.

This situation causes an increased risk of fires, more so for large forest fires, which have already strongly affected the Garraf region.

Biomass can be used directly via combustion to produce heat as an energy source, or indirectly after converting it to different forms of bio-fuel. Progress in the general thermal use of biomass is being halted by the lack of consumers in the area given that currently there is little demand. Using biomass as a fuel produces air pollution in the form of carbon monoxide, carbon dioxide, particulates and other pollutants at significant levels. These have been measured to be above those from coal or natural gas in some cases, traditional fuel sources.

On combustion, the carbon from biomass is released into the atmosphere as carbon dioxide (CO2).[[70]](#footnote-70) The amount of carbon stored in dry wood is approximately 50% by weight.[[71]](#footnote-71) However, according to the Food and Agriculture Organization of the United Nations, plant matter used as a fuel can be replaced by planting for new growth. If trees harvested as biomass are replanted as fast as the wood is burned, new trees take up the carbon produced by the combustion, the carbon cycle theoretically remains in balance, and no extra carbon is added to the atmospheric balance sheet—so biomass is considered “carbon neutral.”[[72]](#footnote-72) When the biomass is from forests, the time to recapture the carbon stored is generally longer, and the carbon storage capacity of the forest may be reduced overall if destructive forestry techniques are employed.

A group of land owners from the Garraf region is interested in creating an association, so as to promote collective biomass extraction. Before proceeding with the plan, they have organized a meeting with international experts on subjects related to the use of biomass as a fuel, due to controversial points of view on the subject.

**Characters:**

**Josep Pelach, Forest land owner/manager**

Josep Pelach owns a large piece of land with a large expanse of forest.

“Forests have been harvested for bioenergy long before it became a controversy, they benefit from thinning, and they are healthier because there is less competition for water and nutrients.”

**Don McKenna, Research ecologist –expert on Forest Fires**

Don McKenzie is a Research ecologist, specialized in Forest Fires and Forest Ecology. He works at the U.S. Forest Service, Pacific Northwest Research Station; and is a professor of environmental and forest sciences. His topics of expertise are: Forest ecology, fire ecology, landscape ecology and climate change.

“The combination of a warming climate, overcrowding and accumulation of dry forest residue contribute to the recent increase in forest fires. These fires release large amounts of carbon with no energy benefit whatsoever, at great costs and loss of property and lives. Carbon emissions from forest fires are estimated to range from 1-2 percent to roughly 25 percent of total emissions.”

**Evan DeLuca, Research ecologist – expert on Forest Ecology**

Evan DeLuca is a Professor of Biology at the University of Iowa; he served as the Head of the Department of Plant Biology. He was named Director for the new Institute for Sustainability, Energy and Environment in 2011.

“Forest biomass has enormous potential, if sources such as forests are managed properly, we don’t have the right technology yet – but we’re close.”

**Kevin Bind, Environmentalist - Centre for Biological Diversity**

**Kevin Bind is the Climate Legal Director and Senior Attorney of the Center for Biological Diversity and** works with the Climate Law Institute. He spent several years advocating for ancient forests and endangered species on California’s North Coast.

“We have some serious concerns about the use of this energy source. We’re putting excessive demands on the forest, with damage to wildlife habitat; with damage to water quality … we might also be making the climate problem worse in the name of making it better.”

**Antonio Farchione, FAO representative**

Antonio Farchione has a degree in Biological Sciences and a PhD in Plant Sciences. He has a background in Plant Ecophysiology, Forestry, and Carbon Cycle, particularly with regard to terrestrial ecosystems response to stress, including climate change.

“Biomass creates a carbon debt, it is far from being carbon neutral, both by removing trees that recycle CO2, and then burning (which releases CO2 stored in the biomass). When the biomass is from forests, the time to recapture the carbon stored is generally longer, and the carbon storage capacity of the forest may be reduced overall if destructive forestry techniques are employed.”

**Heather Young, Energy Bioscientist**

Heather Young is a scientist with the Energy Biosciences Institute at NYU. She is the Editor of the publication Bioenergy Connect and a former professor of plant and fungal biochemistry.

“It’s true that old biomass boilers are much less efficient than the current coal plants. The difference is that the carbon from fossil fuels adds to the atmospheric load. Biomass gives us a chance to recover energy from the natural carbon cycle, if we manage things well and keep the long-term life cycle in mind.”

### David Grohl, WoodChem representative

### David Grohl is the Vice President of TreeChem, a company that transforms biomass into ethanol, to be used as fuel. TreeChem’s technology is a sugar conversion via bacteria.

### “TreeChem uses a combination of enzymes and heat to break down the cellulose from trees grown on a nearby plantation as well as other plant waste. These sugars are then fermented in a process that releases no carbon dioxide. The company is currently building a new plant that will process 10 tons of biomass every day and produce 25 million gallons of ethanol every year.”

**Rose Water, Researcher on carbon footprint**

Rose Water is a Researcher specialized in the carbon footprint. She received the Executive Education Certificate in Conservation and Sustainability from the Earth Institute Center for Environmental Sustainability.

“Biomass can reduce carbon dioxide if fast growing crops are grown on unproductive land that is not being used; in this case, the re-growth of the plants offsets the carbon produced by the combustion of the crops. But cutting or clearing forests for energy, either to burn trees or to plant energy crops, releases carbon into the atmosphere that would have been sequestered had the trees remained untouched, and the re-growing and recapture of carbon can take decades or even a century. Moreover, carbon is emitted in the combustion process, resulting in a net increase of CO2.”

**Reflection questions**

**Moderator questions during the debate:**

* What are the benefits and risks of using Forestry Biomass as an energy source?
* What are the benefits and risks of using Forestry Biomass for the environment?
* What is the balance between these benefits and risks?
* Who should govern and regulate the use of Forestry Biomass as an energy source?
* To what extent is the use of Forestry Biomass a renewable energy? What are the arguments used for and against this statement?
* What are the possible alternatives to the use of Forestry Biomass as an energy source?
* Are the possible social and environmental impacts of the use of this energy source taken into account?

**Moderator questions for the conclusions and closing of the activity**

* Should Forestry Biomass be used as a renewable energy source?
* To what extent, and who by, should the use of this energy source be regulated?
* What is the current situation in the USA and Europe?

**Selected articles to read:**

* Horstman, J.*Turning to forests for energy*, Bioenergy Connection v 2.3
* de Jong J., Akselsson C., Egnell G, Löfgren S., Olsson B.A., *Realizing the energy potential of forest biomass in Sweden – How muchis environmentally sustainable?* Forest Ecology and Management 383 (2017) 3–16

**NANOTECHNOLOGY IN AGRICULTURE**

**Adapted from original author: Andrew Moore, Manager, EMBO Science & Society Programme: Trouble in Mawatubiki – Nanotech to the rescue of tropical island state?**

**Scenario**

As a result of climate change, in 2010 the tropical island state of Mawatubiki suffered a greater number and greater intensity of tropical storms than ever before in its recorded history. The agricultural economy depends on at least two annual harvests of the fast-growing bio-diesel producing variety of Tappi-tappi plant. Mawatubiki farmers have to deal with mountainous terrain, much of which is laid out as fragile terraces. Traditionally these are planted with a variety of crops, some of which are harvested only once a year. Twice-yearly harvesting of the shallow-rooted Tappi-tappi plants makes the soil especially vulnerable to erosion by heavy rain-fall. Much agricultural land was destroyed – literally washed down the hillside in tropical storms.

The Mawatubiki government called on international advisory agencies including the FAO (Food and Agriculture Organisation), but while the FAO was preparing a study of the situation, a US company "Agrosol" came forward with a possible solution. This involves a new, as yet untested, nanotechnology product that claims to be able to bind the surface of fragile soil into a semi-solid crust. SurfaceSave is a nanoparticulate combination of an organic moiety that binds to humus (decaying organic matter) and silicate particles in the soil. It thus forms an amorphous structure that is relatively water insoluble but easily broken up by physical means (such as ploughing or tilling the earth). Sprayed onto the surface of the soil as a mildly alkaline emulsion, SurfaceSave penetrates to a depth of only 1 cm, and upon moistening with rainwater catalytically binds the surface into a crust, hence reducing erosion. It has since emerged also that the Mawatubiki application of SurfaceSave might act as a pilot project for a larger scale use in California, USA, where hillsides are regularly made vulnerable to erosion as a result of deforestation by fires. Environmental protection agencies, notably NGOs Greenpeace and Friends of the Earth, have reacted with horror at the news of the experimental use of a nanotechnology product in Mawatubiki. Residents of California are also "concerned" to say the least, after hearing of the "secret" plan to use their neighbourhood as a beta-testing ground for the product. Mawatubiki farmers are desperate to save their land, and are keen to try any solution, but as the NGOs point out, a short-term gain could be accompanied by a long-term environmental disaster. The Mawatubiki government says it is prepared to discuss the "aid" from Agrosol, which would be provided free of charge according to a company spokesman.

Whatever the situation in Mawatubiki, a public challenge (mainly in the developed world) to the use of SurfaceSave, and even to nanotechnology itself, is growing. Basic researchers and technologists alike are becoming concerned at what this could mean for the public image and hence funding of their work at a time when it already arouses fear and mistrust. Indeed, Agrosol funds certain research projects that are ongoing at the University of California San Francisco – academic laboratories that rely on such funding to keep their heads above water.

**Characters:**

**Taika Waikiti, Minister for agriculture of the Mawatubiki government**

Taika Waikiti is a politician and minister for agriculture in Mawatubiki. He has studied agricultural engineering and has been minister for two legislatures.

“Agriculture is our economy on Mawatubiki's. If we do not act soon, we may not be able to grow anything, let alone Tappi-tappi. That said, we do not want to become slaves to western technology, and must try to find long-term solutions to the problem ourselves."

**Nicola Alvares, Friends of Earth representative**

Nicola Alvares is one of the Friends of Earth NGO representative. She is ecologist and has worked in the academia during 10 years, but after an exhausting career at university she has decided to affiliate to this NGO.

"If this is some kind of catalyst, that means that it can carry on reacting with the soil for as long as it survives, and we don't know how long that is, or where it might end up over that time span. We don't even know much about its toxicity to humans and other organisms, especially in the Mawatubiki ecosystem. This is yet another example of unnatural interference with the environment – we have to stop the cycle somewhere and say 'enough is enough'.”

**Dr. Franz Knausider, Chief Scientific Officer of Agrosol**

Dr. Franz Knausider is a chemist and the current Chief Scientific officer of Agrosol. He has worked as a group leader at University of California, Berkeley for twenty years. He started his current job five years ago. He is the responsible of devising Agrosol research proposals and programmes.

“We have done trials in our lab installations and Surfacesave has passed all the controls and safety requirements. Of course, this collaboration is beneficial for our enterprise, but we think that our product will help Mawatubiki’s farmers. This project is not just for making money, there is solid and rigorous science behind it.”

**Shivendu Ranjan, Eminent independent scientist**

Shivendu Ranjan is an academic professor working in the Biomedical Sciences Department at Harvard University. She has been doing research in nanoscience for eight years and has given more than fifty conferences about nanoscience controversies.

“In my opinion, and taking into account my expertise in the nanoscience field, I can assure that Surfacesave is an incredible product with a great potential. I cannot regret anything from the inside-lab process. However, this product has never been tried at large scale and ecologic effects are unknown and could be, in the worst case, devastating for the Mawatubiki inhabitants.”

**Miranda Velasco, FAO representative**

Miranda Velasco is the FAO representative and she is working with agricultural aid. She has been involved in the Mawatubiki situation since the beginning and she has organised the debate to reach a solution to Mawatubikis’ farmers.

“I’m not sure if this product is the safer solution to Mawatubiki’s inhabitants. It seems a revolutionary product that could solve their situation, but I’m afraid of the potential risks of this technology. Maybe we should look for an alternative”

**Other characters that can be included in this Role-play: critical journalists from different newspapers, like e.g. The Mawatubiki Evening Standard, The Economist, Christian Science Monitor, The Sun, Der Spiegel, Farmers International Herald, The Proletarian, Voice of the Third World, etc.**

**Reflection questions**

**Moderator questions during the debate:**

* Which are the benefits and risks of using Surfacesave?
* To what extent is there agreement on the general balance between risk avoidance and innovation/research support?
* Which impacts can be anticipated of using Surfacesave?
* Surfacesave implementation will be provided for free. What do you think about this kind of agreement? Is it transparent?
* The press has published Mawatubiki’s case. Is it beneficial that the debate has reached the general public and the entire population?
* Are there any alternatives to Surfacesave technology?

**Moderator questions for the conclusions and closing of the activity**

* -Does the implementation of Surfacesave have to be allowed?
* Do the technology alternatives to Surfacesave reach a better situation?
* Have all the relevant stakeholders been involved in the decision-making process? Why?

**Selected articles to read:**

* Fraceto L.F., Grillo R., deMedeiro G.A., Scognamiglio V., Rea G. and Bartolucci C. *Nanotechnology in Agriculture: Which Innovation Potential Does It Have?**Front. Environ. Sci. 4:20. doi: 10.3389/fenvs.2016.00020*
* Parisi C., Vigani M., Rodríguez-Cerezo E., Agricultural *Nanotechnologies: What are the current possibilities?,* Nano Today(2015) 10, 124—127

**DECEPTION**

**Adapted from the book: Essentials of Research Methods in Psychology by**[**John J. Shaughnessy**](https://www.thriftbooks.com/a/john-j-shaughnessy/216307/)**,**[**Jeanne S. Zechmeister**](https://www.thriftbooks.com/a/jeanne-s-zechmeister/216306/)**,**[**Eugene B. Zechmeister**](https://www.thriftbooks.com/a/eugene-b-zechmeister/216308/)**, McGraw-Hill Education, 9th edition, 2012**

**Scenario**

A meeting of the Institutional review board has been called, to discuss a research proposal that has been submitted to review. Once the summary of this proposal has been analysed, the members of the committee respond to each of the five steps for ethical decision making:

**1.** Find out all the facts of the situation.

**2.** Identify ethical issues that are relevant.

**3.** Decide what is at stake for all parties involved (participants, researchers, institutions, society).

**4.** Identify alternative methods or procedures, discussing the consequences of each alternative, including their ethical implications.

**5.** Decide on the action to be taken (approve the proposal, request modifications, or fail to approve the proposal).

Research proposal: The research is on the topic of psychological conformity. Psychological conformity is the tendency to modify your attitude, beliefs or behaviour according to the people that surround you. People accept the opinions of others without there being significant reasons to do so, or even in the face of evidence to the contrary. Research has shown that the conformity is more likely to occur when it the situation involves anticipation of unpleasant events. Also, there are more chances of there being conformity when the pressure comes from individuals with whom the subject can easily identify.

**Method**

The research project will involve 60 students, from the ages of 16 to 20. These students are volunteers who have signed up to participate in a research project that is investigating “attitudes of today’s teenagers”.

These students will be assigned to different discussion groups. There will be four people in each discussion group. They will be given a set of 20 questions to answer, and they will be instructed to discuss each question with their group before writing down the answer.

Among these questions, a section will be related to the consumption of alcohol in teenagers. Some of the questions will be about prevention methods and how to avoid teenage drinking and driving. In each group, there will be a debate moderator, appointed by the investigator, to guide the discussion.

Unknown to the students, some of the participants in the discussions are not volunteers. These participants are working for the investigators; they will be referred to as confederates. Thus, the students will be randomly assigned to different groups:

* groups with zero confederates
* groups with one confederate
* groups with two confederates

These confederates have previously received instructions on what to say and how to act during the debate on the questions related to alcohol consumption. They have been provided with a script to follow.

This script revolves around the argument that people who are of a legal driving age (16 or 18), and also people who are old enough to vote (18) should be considered old enough to make their own decisions when it comes to drinking. Also, they should say that it is up to each individual to decide if they want to drink or not, and therefore it is not fair to intervene if a person under the legal drinking age decides to consume alcohol. The confederates should also admit to drinking alcohol at least three times, one of them recently.

In this manner, depending on the number of confederates in the group, the experimental manipulation involves either zero, one or two people declaring that they don’t think students should be responsible for avoiding situations in which alcohol is available to minors or even to intervene when a fellow student makes the decision to drive after having consumed alcohol.

The evaluation of the experiment will be assessed by analysing the written answers given by the volunteers. At the same time, these group discussions will be recorded without the knowledge of the participants, and also analysed.

Once the experiment has been concluded the investigators will disclose the nature of the deception and the reasons for the tape recordings to all those involved in the research.

**Characters**

The characters in this role-play exercise are all members of an Institutional Review Board. The committee includes:

**Ralph Dorne, a clinical psychologist**

Ralph is a senior clinical psychologist who works for the NHS in London

“Deception is a necessary evil, often required to provide the necessary ‘technical illusions’ and increase the impact of a laboratory or field setting, such that the experimental situation becomes more realistic and reduces the effects of participants’ motives and role-playing behavior.”

**Alexandra Boss, a social psychologist**

Alexandra is a researcher at the University of New South Wales in the social psychology of deception.

“Deception is not a problem in itself as long as it is not malicious, as long as people have a reasonable expectation that it might occur, and the opportunity to avoid it if they choose.”

**Paula Hall, social worker**

Paula is a social worker who works with struggling teenagers

“The issue critical to the deception research concerns informed consent because, by definition, participants cannot consent to something that they do not know.”

**Maria Sanchez, philosopher**

Maria is a professor at Oxford University, specialized on the topic of Lying and Deception

“Any deception in research is inappropriate and takes advantage of the implicit trust and obedience given by the participants to the researcher. When the participant volunteers to participate, their dignity must be preserved and should not be taken for granted. Deception can strongly affect the reputation of the individual laboratories and the scientific profession, thus contaminating the pool of participants.”

**Martin Hammer, protestant minister**

Martin works for the Christian Research Institute, and is especially interested in the topic of Psychology and the Church.

“The use of deception includes actual threat to the dignity, privacy, and self-determination of participants, but may also include potential bodily or economic harm.”

**Dominic De Bois, history professor**

Dominic also works at Oxford University, and is a professor in the history of psychology

“There is something deeply problematic about employing deception in the search for truth. Yet deception has played a prominent -- and many would say integral -- role is psychological research for well over a century. Over the first two-thirds of the 20th century, deception became a staple of psychological research.”

**Bella Neill, respected business executive**

Bella is an expert in the field of marketing and business psychology

“In order to acquire reliable and unbiased research results, especially in psychological experiments, the less that the subject knows, the better.”

**Reflecting questions**

**Moderator questions during the debate:**

* Why is deception used in psychology?
* What are the possible risks of using deception in a psychological experiment?
* Are there alternatives to the use of deception?

**Articles to read:**

* Won Oak Kim, Institutional review board (IRB) and ethical issues in clinical Research, Korean J Anesthesiol 2012 January 62(1): 3-12<http://dx.doi.org/10.4097/kjae.2012.62.1.3>
* Chapter 3. Ethical Issues in the Conduct of Psychological Research, Research Methods in Psychology by [John J. Shaughnessy](https://www.thriftbooks.com/a/john-j-shaughnessy/216307/), [Jeanne S. Zechmeister](https://www.thriftbooks.com/a/jeanne-s-zechmeister/216306/), [Eugene B. Zechmeister](https://www.thriftbooks.com/a/eugene-b-zechmeister/216308/), McGraw-Hill Education, 9th edition, 2012
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**ANNEX 6. TABLES FROM “REPORT ON THE QUALITY CRITERIA OF GOOD PRACTICE STANDARDS IN RRI”**

From the “Report on the quality criteria of Good Practice Standards in RRI”, by RRI Tools, these tables can help the teacher in the discussion on the quality criteria for the different dimensions of RRI.

<https://www.rritools.eu/documents/10184/107098/D1.3_QualityCriteriaGoodPracticeStandards.pdf/ca4efe26-6fb2-4990-8dde-fe3b4aed1676>

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **1. Diversity and Inclusion** | | | | |
| **Criteria** | **Specification** | | **PA** | **Outc.** |
| *Indicators/sub- criteria* | *Questions that invite thinking about indicators and criteria* |  | *1ab 2ac* |
| Engaging a variety of stakeholder groups | Wide range | Is there a wide range of stakeholders involved, such that there is a diversity of values and a diversity of types of knowledge/expertise (i.e., experiential knowledge, scientific knowledge) represented and/or generated? (Rowe and Frewer, 2000) |  | 2ac |
| Relevant voices | Is there diversity in the stakeholders engaged such that all relevant voices are heard – silent as well as loud *(i.e., stakeholder groups that might not feel immediately empowered to let their view know and stakeholder groups that do)*? |  | 2ac |
| Demographic diversity | Is there diversity within the stakeholder groups involved in terms of gender, ethnicity, class, age and other demographics? |  | 2ac |
| Sufficient amount | Are sufficiently many perspectives and participants included, such that eventual outcomes are robust? (ScienceWise, 2013) |  | 2ac |
| Variety of means of stakeholder engagement | Early involvement | Are relevant stakeholders involved from early stages of the R&I trajectory onwards? |  | 2c |
| Engagement methods | Are different methods and techniques for engaging specific stakeholder groups in dialogue taken into consideration? *(e.g., is terminology adjusted to interlocutors; is the method for deliberation - interviews, focus groups etc.- tailored to the target stakeholder?)* |  | 1b |
| Commitment | Are all stakeholders committed to the practice throughout all stages of the R&I trajectory and do they feel empowered to challenge directions of research and innovation? |  | 1b |

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| Engagement of public(s) | Facilitating deliberation | Are there (new) deliberative forums on issues involving science and innovation, moving beyond engagement with stakeholders to include members of the wider public? (Stilgoe et al., 2013) |  | 1a |
| Pertinent engagement | Are the right publics involved in the right phases of the R&I trajectory? |  | 1a |
| Development of capabilities | Are different possibilities explored or activities undertaken to facilitate the development of capabilities of publics to contribute to a science- literate society *(i.e., become scientific citizens)*? |  | 1a |
| Institutional diversity | Internal social differences | Is there attention and respect for group/social differences within the R&I practice *(e.g., gender, race/ethnicity, class, sexual orientation, country of origin, and ability as well as cultural, political, religious, or other affiliations)*? |  | 2c |
| Minority recruitment strategies | Are there minority recruitment strategies in place to increase, within the practice itself, a balance in race/ethnicity, class, gender, sexual orientation, country of origin, and ability, as well as cultural, political, religious, or other affiliations? |  | 2c |
| Attention for appropriate R&I models and methods | Diversity of methods | Are methods for research and innovation being developed or discussed with different stakeholders such that they respond to the needs and expectations of the different stakeholders? *(i.e., considering a wide range of methods and employing an inter- or transdisciplinary process)* (Wickson and Carew, 2014) |  |  |
| Research objects | Is there diversity within the objects of research, in terms of gender and other demographics? *(e.g., are not only male animal models used?)* |  |  |

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| **2. Openness and Transparency** | | | | |
| **Criteria** | **Specification** | | **PAs** | **Outc.** |
| *Indicators/sub- criteria* | *Questions that invite thinking about indicators and criteria* |  | *1abc 2a* |
| Honest and clear (re)presentation of the practice details | Objectives | Are all objectives, aims and goals honestly and clearly represented? |  | 1bc |
| Finances | Is there a transparent overview of financial means/expenditure? |  | 1bc |
| Interests | Is there a declaration of interests and affiliations of all actors? |  | 1bc 2a |
| Methods | Are all methods honestly and clearly represented? |  | 1bc |
| Communication policies | Are there policies on open access and information sharing and are they accessible to stakeholders? (Wickson and Carew, 2014) |  | 1bc |
| Open and clear communication about the processes of deliberation and decision-making | Actor roles | Is there an explanation of the exact role of actors in both the deliberative and decision-making process? *(i.e., is there a description and explanation of all the actors involved and at which phase of the trajectory they are involved? Is there clarity about the extent to which actors will be able to influence decisions?)* (ScienceWise, 2013) |  | 1abc 2a |
| Use of input | Is there feedback on how the input of different actors is used or what the impact of their input was in the practice? |  | 1abc |
| Open and clear communication about the results of the practice | Results | Are preliminary, intermediate and final results shared with all actors involved and/or affected? (RRI Tools) |  | 1abc |
| Limitations | Are uncertainties in and limitations of the practice identified and shared? (Wickson and Carew, 2014) |  | 1bc  2a |
| Ownership and accountability | Is there clarity about ownership and accountability, not only of positive, but also of negative outcomes and impacts? (Wickson and Carew, 2014) |  | 1bc 2a |

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| Appropriate means and content of communication and education per actor | Means of communication and education | Are alternative ways of communicating or educating appropriate to the diversity of actors involved and affected, being taken into consideration? *(for instance, sharing raw data without interpretation is often inappropriate when communicating to non-scientists, as is the use of jargon; or exploring possibilities and means to contribute to education programmes not only to disseminate results of research, but also to spread RRI competencies)* |  | 1abc |
| Content | Has it been considered what information can and should be shared with whom? *(for instance, sometimes not all data can be shared with all actors due to intellectual property rights. In such contexts openness is only meaningful within so-called safe havens -i.e., communication is open and transparent only within a restricted community-)* |  | 1bc |
| Openness to critical scrutiny from all stakeholders (Wickson and Carew, 2014) | Scepticism | Is the value of organized and disorganized scepticism acknowledged and are conditions created to put it into practice? *(e.g., does the practice facilitate provision of feedback by stakeholders on the practice, and is there transparency about what happens with feedback?)* |  | 1abc |

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| **3. Anticipation and Reflection** | | | | |
| **Criteria** | **Specification** | | **PAs** | **Outc.** |
| *Indicators/sub- criteria* | *Questions that invite thinking about indicators and criteria* |  | *1abc*  *2abc* |
| Analysis of the background, current situation and context of the (planned) research or innovation. (Nordmann, 2014) | Up-to-date information | Has content research been done on relevant background knowledge and up-to-date information? |  |  |
| Influence other R&I | Has the influence of other innovations/research on the course of this practice been taken into consideration *(e.g., alternative and complementary R&I)*? |  | 1bc  2b |
| Actor analysis | Did an actor analysis take place, identifying all whom the practice might impact on, might have an interest in, and might have relevant expertise for the practice, and identifying how these actors relate to each other? |  | 2ac |
| Diverging problem definitions | Have efforts been put in the practice into addressing potentially diverging definitions of the problem at stake? |  | 2ac |
| Societal role in problem definition and course of practice | Have efforts been put into giving a role to societal values, perceptions and interests in defining the problem addressed in the practice and the further course of the practice? |  | 2ac |
| Envisioning of plausible futures (Nordmann, 2014) | Variety of future parameters and impacts | Is there active identification and consideration of immediate, mid-term and long-term social, environmental and economic impacts and consequences of the practice –intended and unintended– identified? |  | 2ab 3 |
| Variety of established methods | Did a well-considered selection and implementation of the methods for anticipation take place (based on previous experience)? *(e.g., scenario development, real- time technology assessment, etc.)* |  | 3 |
| Variety of R&I trajectories | Have alternative research and innovation trajectories been considered? *(process of R&I)* |  | 3 |
| Variety of impacts | Ethics | Are ethical aspects and impacts of the practice sufficiently addressed? *(e.g., are research ethics honoured, by protecting objects of research, approval from an ethical committee, and documented compliance with research ethics and voluntary codes of conduct –in which, for example, fraud and plagiarism are prohibited? (Wickson and Carew, 2014))* |  | 1bc 2a |
| Legislation | Are legal aspects and impacts of the practice sufficiently addressed? *(e.g., is there documented compliance with highest-level governance requirements (Wickson and Carew, 2014))* |  | 1bc 2a |

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| Variety of impacts | Society | Are societal aspects and impacts of the practice sufficiently addressed? |  | 2c |
| Environment | Are environmental aspects and impacts of the practice sufficiently addressed? |  | 2b |
| Grand Challenges | Are one or more of the Grand Challenges set by the European Commission addressed in the practice? |  | 3 |
| Facilitating deliberation on values, perceptions, needs, interests, choices and definition of the problem at issue in the practice | Integrated reflection and deliberation | Has room for reflection and deliberation on, e.g., impacts, alternatives, possibly changing societal values, perceptions, needs, interests and choices made during the practice, been built-in? (Stilgoe et al., 2013) |  | 1abc 2abc |
| Deliberating values | Do the actors involved regularly engage in a critical analysis of the values, perceptions, needs, interests, choices and definition of the problem at issue underlying their practice? |  | 1abc 2abc |
| Addressing roles in RI trajectories | Awareness of differences | Do the actors involved develop an awareness of their own assumptions, values and purposes in relation to the perspectives of others? |  | 1b |
| Awareness of responsibilities | Are actors involved aware of and open for reflection on their role responsibilities and accountability? (Stilgoe et al., 2013) |  | 1bc |

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| **4. Responsiveness and Adaptive Change** | | | | |
| **Criteria** | **Specification** | | **PAs** | **Outc.** |
| *Indicators/sub- criteria* | *Questions that invite thinking about indicators and criteria* |  | *1abc 2abc* |
| Structure for seeking and incorporating feedback | Appreciation | Is critical input, feedback and feed-forward from a range of stakeholders actively being sought? |  | 1abc  2c |
| Methods | Are methods for incorporating feedback being explored and implemented? |  | 1abc  2c |
| Flexible process management | Stakeholder needs | Is it possible to change the course of the research and innovation practice in response to changing stakeholder’s needs / interests / values / perceptions? |  | 1bc  2abc |
| Results | Is it possible to change the course of the research and innovation practice in response to interim results or conflicting data? |  |  |
| Context | Is it possible to change the course of the research and innovation practice in response to contextual changes? *(e.g., results by competing R&I groups; judicial changes, etc.)* |  | 2abc |
| Methods | Is it possible to change methods in the course of the research and innovation practice in response to needs and expectations of stakeholders? |  | 1bc |
| Development and implementation of evaluation strategies (Regeer et al., 2009) | Evaluation framework | Are objectives concrete enough to develop an internal evaluation framework? |  |  |
| Performance indicators | Are (preliminary) critical performance indicators identified? |  |  |
| Strategy | Are evaluation strategies or frameworks actively being developed and implemented? |  |  |
| Deliberation | Are the evaluation strategies or frameworks developed through interaction and engagement with all participants? |  | 2c |
| Open-endedness | Are indicators used in evaluations sufficiently dynamic and context dependent to deal with all sorts of changing circumstances (ranging from changing stakeholder perspectives, unanticipated (interim) results, or changes in contextual factors)? |  | 2abc |

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| Flexible attitudes to revise views and actions | Individuals | Are the individuals involved willing and able to revise their views and actions? |  | 1b |
| Organizations | Do the organizations involved offer adaptive space to respond flexibly to changing circumstances, changing needs and values of other stakeholders and organizations involved? *(e.g., are research organizations open to rewarding their staff for non-scientific output, such as popular media appearances?)* |  | 1c |
| Changing responsibilities | Role responsibilities | Are actors involved prepared to take, enlarge and/or redefine their role responsibilities? (Stilgoe et al., 2013) |  | 1bc |
| Acceptance of accountability | Are actors prepared to accept, through processes of dialogue, accountability fitting their role for potential positive and negative impacts, choices and processes? (Wickson and Carew, 2014) |  | 1bc |
| Application of results | Stakeholders | Are (affected) stakeholders willing and equipped to apply new knowledge, values/norms and competencies? *(e.g., the use of results of a research practice for educational purposes)* |  | 1bc |
| Organizations and systems | Do the organizations and systems involved offer adaptive space to respond flexibly to changing knowledge, values/norms and learned competencies? |  |  |

**ANNEX 7. FINAL EXAM**

This exam is based on the materials developed by Hartley, S., Pearce, W., McLeod, C., Gibbs, B., Connelly, S., Couto, J., Moreira, T., Murphy, J., Smith, R., Staykova, M. and Walls, J. (2016). The TERRAIN tool for teaching responsible research and innovation. University of Nottingham.

The exam is a fictitious scenario and the task is the following:

You will be provided with two different submission forms made by two different groups(A & B). You will have to decide which group, A or B, is the winner of the fictitious competition. The winner of the competition has to be the submission which includes in a better way RRI and the decision has to be justified.

**INSTRUCTIONS FOR STUDENTS FINAL EXAM**

***Introduction to the scenario:***

As part of an expert panel, you are asked to judge a STEM competition called: ‘Excellence in RRI’. The competition call invited applicants to submit an outline of their project showing how they have contributed to RRI excellence through their research. The submissions have been shortlisted down to two projects, and you will need to determine which project gets first prize.

***Background:***

*COMPETITION CALL:* (NOTE: this is a fictitious competition)

The EPSRC/BBSRC invites STEM and social science researchers who are integrating RRI into their research, to submit their project to the ‘Excellence in RRI Competition’. Two prizes will be awarded (Winner and Runner-Up). These prestigious awards will be presented after a very careful and detailed review of the shortlisted submissions by a panel of highly-qualified judges. The First Place Award receives a prize of £1000 and the Runner Up Award receives a prize of £200. The judges will be looking for projects that integrate activities into their research which promote excellence in RRI, using the EPSRC AREA framework.

***Your Exam Task:***

You will be provided with the competition submission made by both of the finalists (A & B). You will have to decide which finalist, A or B, is the winner of the competition. The winner of the competition has to be the submission which includes in a better way RRI and the decision has to be justified.

The evaluation sheet and can help you to justify your decision, scoring and justifying each part of the submission.

**EVALUATION SHEET**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **How to analyse RRI inclusion in the submission** | **Anticipate:** What kind of activities has the project proposed to explore the future impacts of the research (e.g. economic, social, environmental)?  **Reflect:** What opportunities are planned which support the exploration of motivations, assumptions and uncertainties in the research process?  **Engage:** Who is involved in the research and what roles do they play over the lifecycle of the research programme?  **Act:** What is the potential for the activities listed in the proposals to impact on the research? | | | |
| **Submission** | ***Outreach*** | ***Interdisciplinary integration*** | ***Stakeholder engagement*** | ***Training*** |
| **A** |  |  |  |  |
| **B** |  |  |  |  |

**SUBMISSION A**

***Disclaimer: Please note this is a fictitious competition and the information in this ‘submission’ is collated from various sources and does not represent any actual research project or researchers.***

**Excellence in RRI Competition - Application form**

|  |  |  |
| --- | --- | --- |
| **Project Title** | | |
| Taking the headache out of wine: Modifying yeasts to reduce production of allergens in wine fermentation | | |
| **Core Project team Academic Specialism Role** | | |
| Prof. J. McGraft | Biochemistry | PI |
| Prof. M. Lacey | Human Nutrition | CoI |
| Dr. S. Yan | Microbiology | CoI |
| Dr. J. Langston | Viticulture and Enology | CoI |
| Ms. K. Manheim | Neurologist | Consultant |
| **Other Research Affiliates** | | |
| Local winemakers  Social scientist  Science education specialist | | |
| **Describe the science programme using non-technical language (approx.150 words)** | | |
| Many individuals who enjoy drinking red wines and Chardonnay are negatively affected by chemicals, known as biogenic amines, which can trigger headaches, hypertension and migraines. By genetically modifying the yeast used in the wine fermenting process, the production of amines can be reduced. This research will take malolactic bacteria (associated with amines production) and splice it into the DNA of wine yeast so the resulting yeast completes the alcoholic fermentation and the malolactic fermentation simultaneously. This new yeast will eliminate the need for commercial wine makers to add malolactic bacteria to the fermentation process thus reducing the risk of toxic chemicals forming in the wine, which act as allergens in many people. | | |
|  | | |
| **Describe your RRI project and how it relates to the scientific work (approx.500 words)** | | |
| Our project is an example of RRI excellence because of the importance we place on science education and engagement. Throughout the lifecycle of the research we will provide a range of activities involving the public. We also have a social scientist who is a research affiliate on this project who will help to identify areas where the public need more information to understand the science being used in this project. The planned activities are:   * *‘Fun Fermentation Days’:* We will provide fun and engaging science education events which will provide member of the public with information about the science of winemaking. This will include opportunities for ‘hands on’ experiences with the fermentation process and will include information about how this current research will reduce toxins in wine. * *‘Taking the fear out of GM’ expert panel events:* There are still wide misunderstandings about the science behind genetic modification, with fears that it is ‘unnatural’ and that scientists are ‘playing God’ when they employ GM techniques. We will stage two public lectures with expert panels who will discuss in clear and non-technical terms how GM is important to their work. This will include scientists from our project. * *Café Scientifique events:* Several café scientifique events will be organised, presented by scientists and local wine growers. These events will discuss the science and the art behind winemaking, from vineyard to glass. These events will also involve small wine tasting sessions. * *Social Media:* We plan to use a range of social media to communicate the exciting developments of the research as it proceeds. This will include regular tweeting and blogs from the researchers. We also plan to coordinate with local wine growers to produce short films for YouTube which will illustrate how wine fermentation sits within the broader process of wine production. * *Social Media Training:* We will organise several sessions with an external trainer to aid scientists working on the project to disseminate and promote their research activities and improve their communication skills with the public. * *Stakeholder engagement:* We will facilitate three sessions with relevant stakeholders (e.g. local winemakers, liquor distributors, consumer representative organisations) to regularly inform them of developments in the research process, and to discuss logistics of getting the wine to market once the production and sale of the yeast has been licensed and approved. * *Meetings with regulators:* Regular meetings with regulatory organisations (e.g. FDA) will be arranged to ensure that the research is meeting all necessary legal requirements and that proper risk assessments have been carried out. This will also help to reassure the public that the research is safe and being carried out in a responsible way. | | |
| **What is a key strength in your approach to RRI excellence? (approx.50 words)** | | |
| The key strength of our project is the commitment to public engagement. This will ensure that members of the public are provided with critical information about the scientific goals of this project, and provide reassurance that the scientists doing the work are trustworthy, and that research is being carried out responsibly. | | |
|  | | |

**SUBMISSION B**

***Disclaimer: Please note this is a fictitious competition and the information in this ‘submission’ is collated from various sources and does not represent any actual research project or researchers.***

**Excellence in RRI Competition - Application form**

|  |  |  |
| --- | --- | --- |
| **Project Title** | | |
| Cleaning up Water Responsibly: A Synthetic Biology Approach | | |
| **Core Project team Academic Specialism Role** | | |
| Prof. J. Mill | Sustainable Chemistry | Programme Director (PI) |
| Dr. S. Johnson | Microbiology | Research Lead (CoI) |
| Dr. B. Kelly | Environmental Engineering | Research Leader (CoI) |
| Dr. J. Michaels | Sociology | Research Lead (CoI) |
| Prof. C. McVicar | Computational Mechanics | Research Lead (CoI) |
| **Other Research Affiliates** | | |
| Local Councils  Water Industry | | |
| **Describe the science programme using non-technical language (approx.150 words)** | | |
| Clean and safe drinking water is an increasingly scarce resource. A recent policy paper from DEFRA (May 2015) reported that only 27% of water-bodies in England can be classified as being of ‘good status’. Across the UK, outdated water supply infrastructure in many places is also no longer fit for purpose. New technological solutions are required to ensure the reliable supply of water into the future. This programme of work will use synthetic biology to engineer non-hazardous strains of bacteria which will ‘eat’ pollutants in waste water, a process known as bioremediation. The technologies in this research will involve anaerobic microbial processes in which waste water will be cleaned using modified bacterial microbes, which will also result in useful bi-products such as biogas and microbial fuel cells. The research process will involve interdisciplinary work across Chemistry, Microbiology and Engineering. Experimental work will be carried out within laboratory settings and trials carried out before the bacteria are utilised on a larger scale. | | |
|  | | |
| **Describe your RRI project and how it relates to the scientific work (approx.500 words)** | | |
| We aim to demonstrate excellence in RRI throughout the lifecycle of the entire project, drawing on the four principles of Anticipation, Reflection, Engagement and Action outlined by the EPSRC. We will do this by carrying out the following activities:   * *Desk study research* drawing on a range of sources (media, policy papers etc.) will be used to capture an overview of the wider issues that arise when synthetic biology techniques are used in relation to water. * *Short briefing papers* will be produced which summarise desk research and report results from other activities. This will include issues that emerge from interviews and workshops and other activities. The briefings will be roughly 4 pages in length to be distributed to all members of the team. These will examine key issues and summarise findings to enable colleagues to reflect. The aim will be to foster mutual learning where emerging social and ethical aspects of the scientific research can be explored. * *Laboratory engagement* will be instigated from the start of the project with a social scientist employed in a full-time capacity to work alongside the scientists carrying out research in the laboratory. The social scientist will have an overview of the research as it develops and assist in identifying potential social and ethical issues connected to the scientific work. * *Multidisciplinary training* will be developed through an education package around responsible innovation which will be delivered to researchers working across the project in order to support the implementation of the RRI principles. We will explore what support, training and mentoring needs to be put in place and a number of training sessions will be facilitated to this end. * *Stakeholder workshops* will be organised involving a range of stakeholders at several times throughout the lifecycle of the project. The first workshop will be with key stakeholders (e.g. business, NGOs, policy) and will focus on their initial perceptions of the scientific work being done on the project. Later workshops will revolve around key issues that have emerged. * *Focus groups with the public* will be arranged after the first year of research, in order to assess public perceptions and reactions to the innovations that are evolving through the laboratory work. We plan to run ‘reconvened’ focus groups which are focus groups that meet over a period of usually 1-2 weeks. On the first occasion participants will be asked about perceptions of synthetic biology and given background material to take away with them to read and research. The groups will meet again a week later to discuss the material in order to assess how they react to different technologies and potential technological trajectories. * *Social media interactions* will be established*,* e.g. setting up blogs and interactive websites. In addition we will create a YouTube page, with short videos uploaded of brief interviews with researchers talking about their research. * *Interdisciplinary team meetings* will be regularly convened, which will prioritise inter-disciplinary communication and collaborative discussions in order to evaluate and respond to ethical and social issues that related to the research as it develops. | | |
| **What is a key strength in your approach to RRI excellence? (approx.50 words)** | | |
| We think the key strength of our project is the close involvement of researchers from across a range of scientific and engineering disciplines, and also involving a sociologist as a member of the core project team. This emphasis on interdisciplinarity across the natural and social sciences will help ensure that the potential impacts of the technological applications of this research on society and the environment are identified and addressed at the earliest opportunity. | | |

**ANNEX 8. MOOC VIDEO SCRIPTS**

**VIDEO 0 – INTRODUCTION**[**https://youtu.be/EZrLRUibHcM**](https://youtu.be/EZrLRUibHcM)

Welcome to the massive open online course (MOOC) on Concepts and Practice of Responsible Research and Innovation and thank you for signing up!

In this online course you will learn about, reflect on, and discuss what Responsible Research and Innovation, RRI, can mean. You will also get to know where the idea of RRI came from and deal with different approaches addressed to make research and innovation processes more responsible. Moreover, you will work with inspiring examples and cases of RRI and you will see how you can take into account different viewpoints by participating in a role-play exercise. Finally, you will discuss and reflect on different ways to introduce an RRI perspective into your work or study.

The schedule for the MOOC is as follows:

* On week 0, we will present the course and its contents
* On week 1, we will work on holistic RRI concepts and normative RRI framework
* On week 2, we will explore inspiring RRI cases
* On week 3, we will participate in a role-play exercise
* On week 4, we will put RRI into practice
* And on week 5, we will write a reflection post and take part in an open discussion

After these week, you will do the Final exam.

Throughout the course, you will be given articles, videos, literature and further materials. For each session, there will be open questions and remarks posed in the course Forum, which is the online platform of communication for this course. Active participation in this Forum is required for certain tasks and will be indicated accordingly.

Introduce yourself to the other participants and participate in the forum during the course, starting debates and engaging in existing discussions.

We hope you find this MOOC very useful and enrichening, and that you can see its practical application into your professional career. See you soon!

**Script VIDEO 1**[**https://youtu.be/MNpiZoKkvlI**](https://youtu.be/MNpiZoKkvlI)

Research and innovation (R&I) are important cornerstones of past and contemporary societies. Through R&I, societal, economic, cultural, ecological, technical, and other challenges have been addressed, transformed, solved, or produced. R&I developments initiated and promoted the reflection and thinking about many different aspects of our world, environments, societies, and biological and human existence. R&I brought radical change to our coexistence and lives and can be seen as a major transformative force of and in society. At the same time, as much as R&I are driving forces of societal transformation, society is forming and defining R&I through societal structures, practices, institutions, values, and norms.

R&I objectives and processes as well as many of the changes caused and promoted by them can be seen both positively and negatively, depending on the perspective you choose, the aspects you consider in your assessment, or the information and knowledge you have. A decision on their positive and negative evaluation is often not possible beyond doubt or has so many facets that an unambiguous answer cannot be provided.

In this complex situation, it is necessary to together decide on the direction of R&I processes and developments. People involved in R&I, politicians, interest groups, other different societal stakeholders, and the broader public must start to think about, and deliberate on, how to care about certain R&I developments and related issues or about the way we organise and do R&I in general.

In this context, questions such as the following come up:

* Is this responsible?
* Is it responsible to deal with these issues in one way or another?
* Is this responsible in view of the next generation, our environment, our safety, our society, our freedom?
* In short: How should research and innovation processes be dealt with responsibly?

**Script VIDEO 2**[**https://youtu.be/Tu21PN2DpPo**](https://youtu.be/Tu21PN2DpPo)

Welcome back to the massive open online course (MOOC) on Concepts and Practice of Responsible Research and Innovation. We hope you found the first week useful and engaging, thanks for staying with us.

In this second session, you will be introduced to a holistic concept of RRI. We will start with the so-called four “dimensions” of RRI identified by a group of authors led by Jack Stilgoe. These dimensions are “Anticipation”, “Reflexivity”, “Inclusion” and “Responsiveness”. You will be asked to read about them, and watch some videos to comprehend what they entail.

Then we will move on to the RRI “keys”as defined by the European Commission. They are “Public engagement”, “Gender equality”, “Ethics”, “Science education”, “Open access” and “Governance”. Other important keys to consider are “Sustainability” and “Social Justice/Inclusion”. You will be provided with reading material to understand each of the keys and how they relate to RRI.

Please participate in the forum sharing any reflections on the RRI dimensions or the six key issues of RRI. Or if you see a peer starting an interesting thread, comment on it or add to the debate. We hope you learn a lot during this week. See you soon!

**Script VIDEO 3**[**https://youtu.be/ifm0Dubh0lE**](https://youtu.be/ifm0Dubh0lE)

Welcome back to the massive open online course (MOOC) on Concepts and Practice of Responsible Research and Innovation. We hope you found last week’s content useful and interesting. Now that we have seen the theoretical framework of RRI, let’s get a bit deeper.

During this week, you will be presented with inspiring practices and activities that implement a RRI approach. These examples have been chosen because they apply a holistic and integrated RRI perspective. There is no quiz for this session, but instead the objective is that you analyse a specific case example of your choice in detail and engage in fruitful conversations with your peers regarding the inspiring cases discussed. An example of how to analyse a case will be provided to guide you.

As you know, the forum is the platform where you can engage and discuss on the RRI practices presented. Participate in the forum sharing any reflections on the issues of the week. Pose questions, start a debate, and if a peer opens an interesting thread, comment on it with your point of view and contribute to the common discussion. We hope you learn a lot with this week’s work. See you next week!

**Script VIDEO 4**[**https://youtu.be/DOgWJJa\_uIc**](https://youtu.be/DOgWJJa_uIc)

Welcome back to the massive open online course (MOOC) on Concepts and Practice of Responsible Research and Innovation. We hope last week was fruitful for you and your understanding of RRI.

In this week’s session, you will take part in a role-play exercise. This will help you strengthen your understanding of RRI and what it entails for research and innovation. Also, it will help you take a step back and explore a case from the distance, not listening for a while to our own interests and limitations. This exercise will help you to relate with other groups of stakeholders, understanding better their expectations, value and perspectives.

This role-play exercise will happen in real time through the forum. This means that all the course participants will be doing the exercise together at the same time. The session will start with an explanation of a specific scenario and a description of the different stakeholders involved in or affected by it. These will be the characters to be played in the role-play. The background and standpoint of these stakeholders will be explained. Then, you will take one of these roles and write forum posts relating to the situation described and defending your position in relation to the presented scenario. You do not necessarily have to take the role you sympathise with most, but should try to understand diverging or even opposing views.

The exercise will be moderated by the course instructor, who will also answer questions, clarify doubts, and coordinate the discussion among you and your fellow participants.

After the session, you will have to write a short reflection post about the experience. Texts will be posted in the forum and later assessed by and discussed with peers.

The goal of the exercise is not to reach a specific conclusion, but rather to understand the motivations, interests and views of different actors relating to a research and innovation process. We hope you find this week’s work useful, inspiring and that it helps you reflect. See you next week!

**Script VIDEO 5**[**https://youtu.be/IqF4wNVKCOQ**](https://youtu.be/IqF4wNVKCOQ)

Welcome back to the massive open online course (MOOC) on Concepts and Practice of Responsible Research and Innovation. We hope you found last week’s role play exercise interesting and useful for your own practice. Now that we have reflected on RRI with a case scenario, let’s bring it closer to your everyday practice.

This week we will talk about how RRI can be implemented in your work or study settings. For that end, you will be given texts to read and videos to watch so that you become capable of critically assessing your own work, studies, or research under the RRI principles. You can try to identify challenges, aspects that are not being properly addressed, or stakeholders that are not being considered. By doing so, you should find possibilities where RRI could be applied.

Building on the information and insights gained in this session, you will write a short text of about 500 words reflecting on what you have learnt so far in the course and explaining how could you incorporate the lessons into your field. The text has to be prepared until the next session, and then published in the forum to be considered for assessment. We hope you find this session enriching and that it helps you link your work with RRI. See you next week!

**Script VIDEO 6**[**https://youtu.be/oAo-LfvHZVw**](https://youtu.be/oAo-LfvHZVw)

Welcome back to the massive open online course (MOOC) on Concepts and Practice of Responsible Research and Innovation. We hope you found last week’s task useful and engaging. This week, we will take the reflection one step further.

This session is dedicated to open questions and clarifications. You should discuss issues with your peers using the forum, and talk about any matter that has come up during the course that you consider important. The course instructor will answer your questions, moderate the online conversations and, if necessary, set up thematic groups to better organise the debates.

After this session, you will have the possibility to make small changes in the reflection post you wrote last week by integrating what you have learned and discussed online. The submission deadline for the final version of your text will be set by your course instructor.

The concluding part of this session will be a common wrap up of the course, sharing your impressions and pointing out the contents to study for the final exam. All participants are invited to read the other students’ reflection posts until the next session. We hope this week’s work is useful and helps you clarify concepts about RRI before the exam.

**Script VIDEO 7**[**https://youtu.be/UJJJzBxK5oE**](https://youtu.be/UJJJzBxK5oE)

Welcome back to the massive open online course (MOOC) on Concepts and Practice of Responsible Research and Innovation.

This last session consists of the final assessment of the course. You will start with the final exam, which will test your understanding of the information received during these weeks. After the exam, you will take part in the peer assessment of the reflection posts. For this, you will answer your peers’ posts in the forum directly. You should give each other feedback, voice your opinion, or pose questions related to peers’ posts.

And with this, we conclude the course! We hope you have enjoyed this course, and are looking forward to receiving your feedback. Please don’t forget to fill in the evaluation forms that the course instructor will facilitate.

Thank you very much for your participation! We hope you have found this course useful and that it has helped you learn about RRI and about how to integrate it into your professional activity, today and in the future.

**ANNEX 9. TRANSVERSAL SCENARIO GUIDE**

This is a guide to assist teachers in using the transversal scenario video “On ageing” in a higher education institution context. The video is to be used to teach and learn about the concept of Responsible Research and Innovation (RRI).

**Transversal Scenario – AGEING**

**Topics:**

* Biomedical Research
* Politics and Gender Studies
* Psychology
* Environmental Sciences
* Economics and Socio-demography
* Technology
* Cultural Studies
* Public Health and Public Health Policies

**Learning Outcomes:**

* To discuss what Responsible Research and Innovation (RRI) is
* To relate research processes in their own field of study with the scenario
* To gain insight on how RRI can be applied to practical research
* To understand the role of responsibility in research processes
* To identify the potential impact of research on individuals, groups or society

**Reflection questions (to formulate after watching the video):**

* How can Biomedical research contribute to fighting the ageing process?
* Which would be the biological consequences of an extended life expectancy? How would that effect chronic diseases and their treatment?
* If life expectancy was extended, how would that effect the economy? Which model of public health policies would be implanted to support the growing population?
* How would technology contribute to this scenario? What new technological devices would appear in the market?
* How would this scenario impact urban planning?
* Would this scenario be environmentally sustainable?
* How would different countries and economies (developed vs. developing countries) approach the treatment for ageing? Could it result in new social inequalities?
* How would different cultures react to this new treatment for ageing? Would there be differences?
* What would be the risks and the benefits of this scenario? Are there nowadays alternatives to this kind of research?

**How can an RRI approach be implemented to research and innovation on ageing?**

**A real case example:**

*HackWithPeople[[73]](#footnote-73)* is an initiative that wants to rethink the way in which assistive technology is created and increase the quality of life of the ageing population. They want to achieve that by breaking economical, technological and specialization barriers.

This initiative has created a set of technological tools to co-create, together with the involved stakeholders, assistive solutions. With this initiative and this system of co-creation, the team has already successfully developed a fall detector and a prototype to recognise situations, among others.

More information about this initiative here:

<http://grasia.fdi.ucm.es/hackwithpeople/about.php>

**Script of transversal scenario video – “On Ageing”**

<https://youtu.be/geM3uCh4qYM>

SUSAN

I am going to retire soon. At least from this job, it’s been a long time. I have 2 kids, which is a lot nowadays, and 2 grandchildren. Family is an important part of my life. I want to spend more time with them. It is not common to have a united family nowadays. Well, I have many passions, I was thinking of becoming a musician but I will always be an expert in the field of health maintenance I guess. My name is Susan, I am still president of the Health Research Institute in the UK and I am going to retire soon. I do think about taking some time for a more creative approach to life, without the pressure I have now. It is not that I don’t like pressure but it is something that I’ve been doing for a long time. Well, in general terms, health maintenance is keeping your body at its optimal performance rate. Keeping it young and preventing it from ageing. The revolutionary idea was to attack ageing as a sickness. Metabolism is extremely complex, as are the number of pathologies derived from aging. We stopped attacking pathologies and we started solving these intermediate damages caused by metabolism. For instance, as we get older, many different types of errant and unwanted proteins, the chemical by-products of metabolism, build up and accumulate between our cells. Collectively these are known as forms of amyloid, a term that might be familiar to you in connection with Alzheimer's disease. We learned how to stimulate the immune system to attack these compounds. Some of the compounds were very difficult to digest for the immune system cells, but we solved the problem by using enzymes discovered in bacteria.

INTERVIEWER

And this is preventing people from ageing?

SUSAN

Well, not entirely, no. But it is slowing it down dramatically.

INTERVIEWER

Can you tell us how old you are?

SUSAN

I am 110 years old, and my life expectancy nowadays is 150, so I have 40 more years to go.

*Video CUT (TedTalks, news pieces, etc.)*

INTERVIEWER

Tell us: at the time aging therapies appeared, how did they affect the world?

SUSAN

They changed the world. Of course, for the good in my opinion. In a general sense, extended youth, new business opportunities emerged… Imagine for a moment, back in 2016, people were at the top of their strength for just 10 years, between their 20s-30s. I mean, we were not useful in evolutionary terms after our 30s, but now we are fertile for longer periods. This is a dramatic change in biological, philosophical and anthropological terms. The sense of hurry, of rush in our society... sickness related to aging was delayed. Of course, everyone needed psychological attention associated to the treatments to withstand this change.

INTERVIEWER

Were there also problems related with that change? Don’t you think that the economic situation nowadays, with poverty indicators rising, is a consequence of this change? Human rights associations are also addressing the need for some laws to regulate this unbalance. The wealthier and more powerful people are the ones who live longer. And nowadays there are still almost 1 billion people in the world that are poor and cannot access the treatment.

SUSAN

Yes, research is private and expensive, so there are many social differences. But this is starting to change and the technology is democratizing. The UN and the World Bank are trying to stipulate some common laws. And there are other issues that concern the governments. Governments were interested in increasing the “productive” life of their citizens by investing in public health, but it was a long-term bet, which is not popular with politicians. And elders stopped being elders anymore. We can take care of ourselves, take care of our children, grandchildren. And we have the wisdom of 110 years and a healthy body. We are of very big asset for our society.

INTERVIEWER

One of the main problems nowadays is the availability of natural resources to feed the growing population. This scientific advancement has taken its toll on the environment.

SUSAN

Yes, but also new businesses have emerged to solve that, and there have been recent advancements, for example, underground farming to allow large areas for crops in countries with no more usable land, high efficiency seeds and also the imprint of protein that is replacing cattle raising in developed countries is decreasing CO2 emissions and making meat completely affordable.

INTERVIEWER

And on the human side, what has been the most difficult part?

SUSAN

For me, the most difficult part of this huge change was in the success rate of the therapies between different individuals. This meant that I lost a husband and also a son. There is still a large gap between the age expectancy of men and women and death is a very dramatic event in the western world now. Even more than it was before. Maybe we need more spiritual guidance now.

INTERVIEWER

What about the people who want to stay out of the therapy?

SUSAN

Well, if you think about aging as a disease, who wants to be sick? It is not part of a natural process. It is like defending not intervening in complicated births because dying in childbirth is natural. We are creating our own path on what’s natural.

INTERVIEWER:

Well, that is not my point, I was thinking about freedom of choice and maybe, the need to understand ourselves as humans, maybe from a philosophical point of view. I would like you to listen to the words of a philosopher from de XX century, if it is ok for you.

SUSAN

Of course, go ahead.

([Alan Watts words](https://www.youtube.com/watch?v=qK1BJkBJdtY))

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