**“Considering Responsible Research and Innovation by Design”**

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| --- | --- |
| **Audience** | **Master’s and PhD students, R&I actors and other stakeholders** |
| **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**

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| --- | --- |
| **Element** | **Description** |
| **Title** | Considering Responsible Research and Innovation by Design |
| **Cycle** | EHEA: Second and third cycle  EQF level: 7 and 8  Degree level: Master, PhD |
| **Year of study** | - |
| **Number of ECTS credits** | 2.0 ECTS credits (workload of 50 to 60 hours) |
| **Learning outcomes (LO)** | On completion of this summer school participants will be able to   1. apply key dimensions of Responsible Research and Innovation (RRI) considering concrete research activities; 2. design a multidisciplinary research project incorporating ideas of RRI; 3. share and discuss ideas on the implementation of RRI with others in a distended context; 4. and to present project proposals in an easily comprehensible and creative manner. |
| **Mode of delivery** | This interdisciplinary summer school is an interactive workshop based on ideas of inquiry-based learning. Continuous attendance and active participation in the different parts of this blocked five-day course is necessary as well as independent study of provided texts. |
| **Prerequisites and co-requisites** | Participants should know how research projects can be designed and organised within their scientific field.  A bachelor’s degree or equivalent is a prerequisite for this course. However, in cases participants have work experience with relation to R&I, exceptions are possible.  The summer school is recommended for advanced master’s students, PhD students, active researchers, and others working in R&I-related positions. |
| **Course content** | The summer school deals with questions of how to make research projects as well as their processes and outcomes more responsible. Participants have the opportunity to first explore their own understandings of what constitutes responsible research and then deal with specific concepts and aspects of Responsible Research and Innovation (RRI) as well as concrete case examples. Their own deliberations as well as the concepts of RRI will then give orientation in their own independent group work on a research proposal that incorporates ideas of RRI.  The summer school participants are free to define the concrete topic of their research proposal within the setting of the course. Thus, the course content depends to a great extent on the participants’ own deliberations and discussions. |
| **Recommended or required reading and other learning resources/tools** | Participants have to read introductory literature on concepts of RRI in advance of the summer school in order to have some knowledge about basic ideas and principles of RRI. They should prepare at least one of these introductory texts:   * Grunwald, A. (2011). Responsible Innovation: Bringing together Technology Assessment, Applied Ethics, and STS research. *Enterprise and Work Innovation Studies, 7*, 9–31. * Rip, A. (2014). The past and future of RRI. *Life Sciences, Society and Policy, 10*(17). DOI:10.1186/s40504-014-0017-4 * 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.   Further reading material is provided during the course. |
| **Planned learning activities and teaching methods** | In this summer school, participants will experience different teaching and learning methods and settings. They will take part in moderated plenary discussions and exercises, reflecting on the responsibility of R&I processes and deliberating on concepts of RRI. Furthermore, they will discuss different aspects of RRI in changing small groups.  In working groups, participants will develop research project proposals that consider aspects of RRI. They will use their insights from guided RRI reflection and from appropriate literature on RRI and different RRI aspects. In a so-called “walkshop” field trip, participants will share and reflect on their proposals in a distended context and open up to societal influences. |
| **Assessment methods and criteria** | The assessment of the participants’ performance will be based on the realisation and quality of   * their continuous and active participation in the different learning activities; * the creative group presentation on their research project incorporating RRI aspects; * and the project proposal and especially its inclusion of ideas and principles of RRI. |

“Considering Responsible Research and Innovation by Design”

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| --- | --- | --- |
| Day 1 | **Activity** | **Duration** |
| **Brainstorming** | Video presentation & Project Brainstorming | 2 h |
| RRI Dimensions | 2 h 15’ |
| Day 2 | **Activity** | **Duration** |
| **Jigsaw activity** | Expert group case discussion | 2 h 15’ |
| Base group | 2 h 15’ |
| Day 3 | **Activity** | **Duration** |
| **Walkshop** | Inspirational talk | 30’ |
| Walkshop | 2 h30’ |
| Reflection and discussion | 1h |
| Day 4 | **Activity** | **Duration** |
| **Museum activity** | Public engagement activity | 2h |
| Preparation of final presentation | 2h 30’ |
| Day 5 | **Activity** | **Duration** |
| **Project presentation** | Presentations | 4 h 30’ |
| Discussion and evaluation |

**DAY 1. BRAINSTORMING**

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| --- | --- | --- | --- |
| Day 1 | **Activity** | **Objectives** | **Duration** |
| **Brainstorming** | Video presentation & Project Brainstorming  Selecting a research proposal  Methodology approach | To design a multidisciplinary research project and incorporate the basic RRI dimensions. | 2 h 15’  2 h 15’ |

**Activity 1. video presentation and project brainstorming**

**Goal:**

*The aim of this activity is to generate quality ideas to propose a first draft for a multidisciplinary research project related to the scenario Ageing.*

**Learning outcomes:**

After this activity, the students should be able to:

* Generate a large number of ideas related to the presented scenario.
* Relate content scenario ideas with personal experiences.
* Add and relate stakeholders’ experiences to the generation of ideas.
* Analyse and assess the quality of the ideas generated during the activity.
* Discuss and select the best ideas generated.
* Design a first research project hypothesis proposal with the idea generation.
* Design a draft of the methodology to be carried out for the decided project.

**Materials and others:**

* Transversal scenario video
* Multiple coloured post-its.
* Stakeholders related to the scenario: ageing. **See video HEIRRI AGEING**
* Research proposal voting guide.

**Description of the activity:**

Part 1. Video presentation and project brainstorming

The transversal scenario video on the topic of Ageing used in the Summer School is meant to induce debate around ageing on young trained audiences. This debate will be used to introduce RRI as a framework to solve several issues related to societal/public engagement, gender equality, open access, science education, ethics and governance in R&I.

Around the ageing reality, there will be several issues that will be covered like:

* Technology and medicine
* Molecular biology
* Gender
* Public health and public health policies
* Psychology
* Socio demographics
* Economics

After the video presentation, there is a project Brainstorming. This technique is used to generate a large number of ideas in a short period of time and can be applied in different scenarios to reach a solution. For this activity and during the summer school it is necessary to form small groups (between 4-6 participants, depending on the number of people attending the summer school).

* Generation of ideas:  Each participant has two or three minutes to think about the scenario. Then, each one must write a minimum of five ideas, concepts or projects related to the scenario, each one on a different post it. The participants can include the feedback or the ideas provided by the stakeholders on these post-its. All the post-its must then be stuck on the wall.
* Post-it revision: The group must revise the post-its, see if everyone understands all of them and clarify the concepts or the ideas which are not understood.
* Analysis and selection of ideas: The group has to discuss the concepts, ideas and experiences that are stuck on the wall. Then, the participants have to categorize the ideas, select the good ones and discard the impracticable ones.
* Organizing the ideas: The group has to prioritize the best ideas for a research proposal and look for relations between them.

**Duration:** 1hour

Part 2. Select a Research Proposal:

To select the research proposals use the research hypothesis voting. This technique is useful to indicate the quality of the ideas and proposals. The participants should mark their proposals according to:

* Originality: is the proposal new, different and unusual?
* Relevance: does the proposal have value, significance and importance for society?
* Impact: does the proposal have an effect on someone (scientific community, general population)?

The participants have to choose a research question hypothesis after finishing this activity.

**Duration:** 30 minutes

Part 3. Methodology approach

The groups will design a first draft of the methodology that could be used for the chosen research project.

**Duration:** 30 minutes

**Total duration of the activity: 2h**

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

To guide this activity some of these tips are useful:

* When the teacher explains the dynamic, it is important to emphasize that every idea or proposal is acceptable; judgment and criticism should be avoided.
* It is also important to highlight that in this kind of dynamic quantity is more important than quality. The quantity helps to find quality.
* One of the participants of each group can play the role of guiding his/her group and the activity.
* The teacher can walk around the room and ask the participants which ideas or proposals have emerged and promote the discussion.

**Activity 2. RRI dimensions**

**Goal:**

*The aim of this activity is to incorporate the different RRI dimensions into the research project hypothesis. Main RRI dimensions have been grouped into:*

*Diversity and inclusion*

*Openness and transparency*

*Anticipation and reflection*

*Responsiveness and adaptive change.*

**Learning outcomes:**

After this activity, the students should be able to:

* Analyse the issues of the four dimensions of RRI
* Discuss the four dimensions of RRI
* Assess the research project hypothesis
* Apply these issues and dimensions to their research project hypothesis and improve it

**Materials:**

* **RRI dimensions worksheet.**
* **RRI presentation** (short or long version).

**Description of the activity:**

In this activity, the participants have to discuss the questions in the **RRI dimension worksheet** (at the end of this document, see **Annex**). They have to fill in the gaps and reflect on the different questions. They have to discuss if these issues are included in their proposal and if not how they can apply them. After this discussion, the teacher has to present the RRI presentation, and finally the participants have to discuss and rewrite their research project hypothesis.

**Duration of the activity:**

* RRI Dimensions worksheet (1h)
* RRI presentation (30’)
* Rewrite the research proposal and add lacking RRI dimensions (45’)

**Total duration:** 2h 15 minutes

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

In this activity, the teacher has to use the **RRI dimensions guide** (at the end of this document, see **Annex**). This guide has some questions related to the RRI dimensions to make the participants think about their project with an RRI perspective. To guide the activity, the teacher can facilitate discussion between participants. There are some answers and reflecting questions in the RRI dimensions guide questions.

**DAY 2. JIGSAW ACTIVITY**

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| Day 2 | **Activity** | **Duration** |
| **Jigsaw activity** | Expert group case discussion | 2 h 15’ |
| Base group | 2 h 15’ |

The Jigsaw classroom is a research-based cooperative learning technique invented and developed in the early 1970s by Elliot Aronson and his students at the University of Texas and the University of California. Since 1971, thousands of classrooms have used jigsaw with great success.

The “Jigsaw Method” is a **teaching strategy** of organizing student group work that helps students collaborate and rely on one another. This **teaching strategy** is effective for accomplishing multiple tasks at once and for giving students a greater sense of individual responsibility. The Jigsaw strategy places great emphasis on cooperation and shared responsibility within groups.

The method allows the teacher to break students into groups and assignments into smaller pieces, all for accomplishing tasks with more detail and collaboration. “Jigsaw” draws a direct image to a jigsaw puzzle. It breaks classes into groups and breaks assignments into pieces that the group assembles to complete the (jigsaw) puzzle. Just as the final image of a puzzle is constructed from many separate pieces fitting together, so too are academic tasks completed when members of the team offer unique, jigsaw-cut efforts to the group.[[1]](#footnote-1)

In addition to having shared responsibility to the group setting, students gain the benefit of learning from those different from themselves. While individual students could be required to do the entirety of a project on their own, the fact that they have the opportunity to listen to the perspectives of others enhances the quality of their education. “Jigsawing” requires students to listen and learn, and the group is rewarded when each individual contributes their skills and knowledge to the whole. This aspect is especially interesting when the group includes people from different disciplines, as perspectives and opinions may differ considerably.

The jigsaw process encourages listening, engagement, and empathy by giving each member of the group an essential part to play in the academic activity. This "cooperation by design" facilitates interaction among all students in the class, leading them to value each other as contributors to their common task. Just as in a jigsaw puzzle, each piece — each student's part — is essential for the completion and full understanding of the final product.

“If each student's part is essential, then each student is essential; and that is precisely what makes this strategy so effective.” – The Jigsaw Classroom[[2]](#footnote-2)

**Goal**

*The aim is for the students to able to learn about a specific RRI aspect in depth and to share their views on this aspect. The students should then be able to transmit this acquired knowledge to their project group and integrate the information into their project proposal.*

**Learning outcomes**

After this activity, the 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
* Integrate all the perspectives and knowledge acquired in a project proposal

**Materials and other resources**

* Cases. **See HEIRRI CASES.**
* Apart from the teacher coordinating the course, for this part of the activity other experts on the issues to be discussed are required

**Description of the activity:**

The principle of the Jigsaw method is that each person in a group specializes in a specific topic, so that when this group is united, all the pieces fit together and the jigsaw is complete.

At the end of day 1, each person in the project group (or base group) should be assigned a specific RRI aspect. There should be at least one person for each aspect. These RRI aspects are based on the RRI Key Issues:

* Inclusive Science
* Gender Equality
* Ethics
* Sustainability

Each RRI aspect corresponds to an expert group. Students will be given bibliography related to their specific aspect to read before the second day, when they will work with their expert group. The students should have time to learn and process their assigned aspect. Each student should read 2 provided articles on a specific RRI aspect, these articles will be provided by the teacher.

Part 1. Expert group case discussion

On day 2, the day of the **Jigsaw activity**, students will be divided into their expert groups. In this first half of the activity, the students will discuss a selection of exemplary cases related to the RRI aspect they have been assigned. Before discussing the cases, the teacher should make sure that all participants have understood the assigned bibliography. This could be achieved by asking a relevant question related to each article. They should then share their views and opinions on the subject at hand and how RRI is represented in the case studies. In total, the students should discuss 3 cases related to each RRI aspect. The bibliography they have been provided with should help them understand the cases.

The students should be able to extract certain conclusions from the case studies, such as how to integrate a specific RRI aspect into their RRI process and new ways to approach a specific RRI aspect. There is a section in this guide that corresponds to each specific aspect and the case studies.

Part 2. Base group discussion and information assimilation

In the second half of the activity, the students will then regroup back into their base group. In their base group, each student should explain to the others the findings and knowledge they have acquired on a specific RRI aspect. This should be done for each RRI aspect. The team should connect the various pieces generated by the individual expert members, address new problems and evaluate the group product. The project groups should then discuss how they can integrate these aspects into their project proposal.

**Total duration of the activity:** 4h30’

* Part 1. Expert group case discussion (2h15’)
* Part 2. Base group discussion and information assimilation (2h15’)

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

Each of the expert groups will have an assigned tutor to guide and help the participants through the process of discussing the bibliography and the cases. If possible, this person should be an expert or have certain knowledge on the subject. The **“Jigsaw Tutor Guide”** (at the end of this document, see **Annex**) is designed to assist the tutor in the development of the activity both practically and in content.

Recommendations:

* Control the time during the activity, as this aspect is very important during the dynamic.
* Make sure the students have understood the provided bibliography for the session, the teacher can ask them questions relevant to each RRI aspect or article.
* Provide each expert group with 3 case studies, so as to allow them to compare different situations and fields of research.
* Facilitate the participants’ reflection in relation to the case studies. There is a selection of reflection questions provided for each case, and for the final discussion. Tutors are encouraged to add or modify the questions if necessary.
* Encourage participation on behalf of the students.
* Help the students by making a final summary of the conclusions reached after answering the corresponding reflection questions.
* It is important for the tutors to guide the expert groups in their reflection and discussion but never to provide the participants with the answers.
* At the end of the session it could be interesting for the teacher to sum up the group’s conclusions, to help them figure out how to integrate all the RRI aspects in their project and possibly suggest new ways to approach each RRI aspect.

**Reflection questions**

The reflection questions for this activity are divided into two parts. The first half of the reflection questions correspond to the specific RRI aspects, and therefore should be answered in the expert groups. These questions can be found at the end of each expert guide. The information needed to answer these questions is provided for each section.

The second half of the questions relate to how the information acquired in the expert groups can be integrated into the project proposals:

* *How can you integrate Open Science in your project?*
* *With whom do you share the results of your work?*
* *How do you involve the public and stakeholders in your work?*
* *At which stage in your work is it most effective to engage stakeholders, and why?*
* *How do you tailor R&I processes to include stakeholders with different genders, ethnicities, classes, ages, routines, experience, or levels of power?*
* *How is Gender equality addressed in your R&I practice?*
* *How can you achieve Gender Equality in your project?*
* *Does your project require specific ethical considerations? If so, how do you address them?*
* *How do you ensure the integrity of your R&I practices?*
* *What are possible ethical considerations for your R&I practice?*
* *How may your work benefit from incorporating an ethical reflection?*
* *How can you approach your project from an environmentally responsible perspective?*
* *How do you prevent potentially harmful impacts on the environment?*

**DAY 3. WALKSHOP**

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| Day 3 | **Activity** | **Duration** |
| **Walkshop** | Inspirational talk | 30’ |
| Walkshop | 2 h30’ |
| Reflection and discussion | 1h |

**Goal**

*The aim is for the students to be able to discuss and reflect upon the subject and the concept of RRI in a more relaxed environment. Also, for the students to relate the subject their project is based on to the real world.*

During this activity, the subject that is being studied and the concept of RRI are discussed in a more distended context. This is achieved by leaving the closed environment of a classroom behind and taking the students on a walk related to the main subject. This activity is called a walkshop, in which we change the traditional settings in which we work, leaving behind the laboratories, classrooms and offices. Walking naturally encourages a more reflective and explorative style of conversation. A recent study by Stanford University states that a person's creative output increased by an average of 60 percent when walking[[3]](#footnote-3).

The intention is for the students to openly discuss and reflect upon the subject and how to involve the main aspects of RRI in the project they are working on. Conversation flows more freely in open spaces and in a more dynamic and organic manner. According to Strand et el, Walkshops actively engage with and use landscapes as stimuli for discussion and reflection. The chosen route should influence, inform and stimulate conversation[[4]](#footnote-4).

Also, spending time together outside of a classroom allows the participants to get to know each other better and on levels that aren’t strictly academic. The change in social dynamics and conversations that go beyond the set theme may allow new ideas or points of view to form.

Walkshops can be conducted in the countryside or in an urban setting; they can be adapted according to the subject that is going to be discussed and the spaces available. The important thing is to provide a landscape that will make the group reflect upon the topic at hand.

**Learning outcomes**

After this activity, the students should be able to:

* Discuss the subject at hand with different members of the class and subgroups
* Share information and thoughts with fellow classmates
* Analyse the problems and changes in society related to the subject
* Reflect upon the real life application of the project
* Observe or interact with those stakeholders encountered on the walkshop who may have insight for the projects and to include this information in the project design
* Apply the experience gained to their project
* Adapt the project according to the experience gained during the walkshop

**Materials:**

* Provocative cards

Before starting the walkshop, the students will each receive a laminated card related to the main topic, to help focus the line of conversation during the activity. These cards can be discussion questions, scientific facts, literary quotes or any other ideas related to the subject at hand. The aim of the cards is to prompt the students into thinking about the subject and creating starting points for discussion. These cards can be reflected upon in silence or exchanged with other members of the group when desired2. The cards can be handed out before setting out or during the first phase of the walk.

•    Examples for the cards for the topic of ageing:

–   *When is someone old?*

–    *“Age is an issue of mind over matter. If you don’t mind, it doesn’t matter.” Mark Twain*

–    *By 2020, the number of people aged 60 years and older will outnumber children younger than 5 years. WHO*

–   *"You can live to be a hundred if you give up all the things that make you want to live to be a hundred."  Woody Allen*

–   *"Old age hath yet his honour and his toil." Alfred Lord Tennyson*

* *“By using different strategies for Engineered Negligible Senescence it will be possible to slow down or even stop the process of ageing in the future”.*
* *“Given the ageing population in our societies, robots will be necessary to provide care for elderly in the future.”*
* Stakeholders and landscape

Along the walk, the participants will encounter many stakeholders related to the scenario (in this case, elderly people), with whom they can interact or observe. The participants may want to talk to these people along the walk or simply watch them. They are a source of inspiration.

Also, the landscape in which the walkshop takes places should be a similar source of reflection, chosen carefully so as to make the students think about the subject in different ways.

**Activity 1**. **Inspirational talk**

The process of reflection is kicked off by the first activity of the day. This activity consists of an inspirational talk from an expert on the subject. In this case, it may be anyone from a scientific researcher who is studying a topic related to ageing to an elderly person or a philosopher. The speaker and format of the talk can be adapted to each scenario, although it is interesting to leave some open-ended questions or reflection points at the end so as to give the participants a starting point. In this way, the participants are prompted to begin thinking about the main subject right at the beginning of the day.

The talk is followed by the handing out of a set of laminated cards with varied quotes related to the topic, which will be explained in the materials section, to provide further source for reflection and to create a few more discussion points.

Duration: 30 minutes

**Activity 2**. **Walkshop**

**Description of the activity:**

The idea of the walkshop is to choose a location or a selection of locations that will immerse the attendees into the subject they are considering for their project. This may be achieved in a direct or more abstract manner. So, the walkshop might include places directly related to the topic at hand or travel through a landscape that subtly reminds the participants of the subject they are studying. Either way, the route must induce the students to reflect and discuss the main topic and the concept of RRI. The walkshop can either be in an urban or more rural setting, according to what is available to the organisers.

To provide an example, here are two possible walkshop routes designed for the city of Barcelona (Spain):

Route 1:

•    *We leave the location of the Summer School and take a bus to the district of El Carmel district and then walk up to the bunkers, an important historical site related with the Spanish Civil War, to enjoy the view of Barcelona. The trip takes approximately an hour. The bus is a good opportunity for discussions on the topic of elderly people and ageing to spring up.*

•    *We walk down from the bunkers into the heart of the Carmel district, a 10 minute walk. We go to the restaurant “Las Delicias” where there are usually some elderly people having a coffee or a beer and soaking up the sun. Here we can have a beverage surrounded by the locals before continuing our route.*

•    *We then walk through the district of El Carmel to the Petanca club, a 15 minute walk. Petanca is a form of boules where the goal is to toss or roll hollow steel balls as close as possible to a small wooden ball while standing inside a circle with both feet on the ground. This sport is typically played by elderly people in parks and public spaces around Barcelona.*

•    *We then walk down through the Parc del Guinardó to take the metro down to the district of Poble Nou. The trip takes approximately 45 minutes. Again, public transport is a good way for people to mingle.*

•    *Once in Poblenou we will walk down the Rambla towards an emblematic building, the Aliança del Poble Nou Casino. The bars along the Rambla are normally full of people from the area. It is a 10 minute walk.*

•    *From the heart of Poble Nou we will walk down towards the beach for 10-15 minutes. There is an open air public sports complex on this area of the beach where the elderly often go to get some exercise or take part in classes.*

•    *We will walk back along the beach for about half an hour to our starting point. Here we will discuss what we have seen and talked about during our walkshop.*

This walkshop takes approximately three hours to complete.

Route 2:

•    *We leave the Summer School location and take the D20 bus to Drassanes (25 minutes), where we will start our walk. The bus is a good opportunity for discussions on the topic of ageing to spring up.*

•    *We walk from Drassanes up towards the area of Montjuic, stopping at a park called the Parc del Mirador de Poble Sec. Montjuic provides excellent views of the city. Elderly people come to this park on Tuesdays and Thursdays to do exercise classes. It is a short 10 minute walk.*

•    *We then walk up Montjuic through some gardens to the Castle. The castle is an old military fortress with roots dating back from 1640, a symbol of the history of Barcelona. This is a good place to stop for a rest.*

•    *From here, we have two options to continue our route. Our first option is to take the Montjuic Cable Car down the hill, to Paral·lel. The cable car stop is a 2 min walk away from the castle. From Paral·lel we would walk back to the starting point, along the beach walk and Barceloneta neighbourhood. A 45 minute walk.*

•    *The second option is to walk down Montjuic through a different route in the gardens and then along the beach walk and Barceloneta neighbourhood until the starting point. This is approximately an hour long walk. The Barceloneta neighbourhood and the beach are a popular place for the elderly in Barcelona, where they often come to sunbathe, do some exercise or go for a walk.*

•    *On our way back, there is a petanca court very near to the starting point that we can visit. Petanca is a form of boules where the goal is to toss or roll hollow steel balls as close as possible to a small wooden ball while standing inside a circle with both feet on the ground. This sport is typically played by elderly people in parks and public spaces around Barcelona.*

This walkshop takes approximately two and a half hours to complete.

**Activity 3**. **Workshop: Reflection and Discussion**

After the walk, it is a good idea to gather the group together to share insights and ideas that have been discussed during the day. As the conversations on a walkshop often take place in small groups or some ideas come to people during silent reflection, it is useful to share these thoughts at the end of the walk as a group. This feedback can help guide the students on how to apply what they have learnt during the day to their ongoing project.

The students can then discuss these new ideas with their project groups. It is important for them to talk about how they are going to introduce RRI into their project ideas, and to apply what they have learnt during the day.

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

We recommend that this activity could be done by two teachers, however, it is also possible to perform it with just one of them. The teacher plays an important role in a walkshop. While the activity must be carefully planned so as to direct conversation towards the topic of interest, it is also very important that the activity is not too structured2, according to Strand et al. It is essential that the route the walkshop takes must make the students reflect upon the subject at hand. This may be in a more objective or subjective way. For example, for the subject of ageing, the walkshop may involve visiting an old people’s home or a hospital ward, or it may be a walk through an ancient forest. Either way, the landscape should direct the thought process as much as the teachers themselves.

The quotes that are handed out at the beginning of the day are a useful tool to help the flow of conversation. The quotes that are used should be chosen carefully. It is a good idea to have a mix of styles, for example, the quotes can be anything from a scientific fact to a poetry verse. The diversity will prompt different lines of conversation, from the more practical to the philosophical.

If the route involves public transport, this is a good opportunity for larger conversation groups to form. While walking, it is more normal for people to talk in smaller groups of two or three persons, due to the nature of the paths or sidewalks or even to walk alone in silent reflection. The teacher must decide when the group will stop to rest, as this is a good opportunity for the participants to reassemble and change conversational partners. The planned route should provide for both larger and smaller groups to form.

During the walk, it is important that the conversation flows freely. By ¨thinking outside of the box¨, interesting ideas often come up. This means that although the conversation should generally revolve around the main topic, it is also beneficial for the participants to get to know each other and discuss other subjects. The discussion can be redirected to the main topic at any point during the walk by mentioning one of the quotes or questions on the laminated cards or by pointing out something along the route that is related to the subject.

It is a good idea for there to be two teachers present during the walkshop, one at the front of the group and one at the back of the group. This makes it easier to direct the conversation when necessary. These positions should be exchanged during the walk so that the leaders can engage in conversation with both the slower and faster walkers2.

**Reflection questions:**

These example reflection questions can be useful to the teacher to help guide the participants towards discussions on RRI and to help them extract conclusions during the day. The answers to these questions will help them figure out how to apply RRI to their project.

What are possible ethical considerations for your R&I practices?

How do you prevent potentially harmful impacts on the public or the environment?

What are your gender equality practices regarding staff and working conditions?

How are views from other research or societal groups included in your R&I practice?

How do you ensure your R&I practices can adapt to unforeseen results or societal changes?

How are open access policies integrated in your organization?

With whom do you share the results of your work?

How are your communication activities made accessible to diverse stakeholders?

How do you involve stakeholders and the public in your work?

What channels do you use to enable stakeholder participation in the R&I process?

**DAY 4. PUBLIC ENGAGEMENT ACTIVITY**

|  |  |  |
| --- | --- | --- |
| Day 4 | **Activity** | **Duration** |
| **Museum activity** | Public engagement activity | 2h |
| Preparation of final presentation | 2h 30’ |

*"Public engagement describes the myriad of ways in which the activity and benefits of higher education and research can be shared with the public. Engagement is by definition a two-way process, involving interaction and listening, with the goal of generating mutual benefit."-[[5]](#footnote-5) National Co-ordinating Centre for Public Engagement*

*Public engagement is a process that brings people together to address issues of common importance, solve shared problems and bring about positive social change. It invites average citizens to get involved in deliberation, dialogue and action on public issues. It also helps leaders and decision makers better understand the perspectives, opinions and concerns of citizens and stakeholders.9*

*Public engagement with science describes intentional, meaningful interactions that provide opportunities for mutual learning between scientists and members of the public. Mutual learning refers not just to the acquisition of knowledge, but also to increased familiarity with a breadth of perspectives, frames, and worldviews.[[6]](#footnote-6)*

*Goals for public engagement with science, in addition to mutual learning, include civic engagement skills and empowerment, increased awareness of the cultural relevance of science, and recognition of the importance of multiple perspectives and domains of knowledge to scientific endeavours.10*

*Science is prevalent in all facets of our lives, and the science-society relationship is complex. Interaction between interested stakeholders is critical to finding common ground on scientific issues affecting society. Public engagement can provide a constructive platform for public views to be combined with scientific expertise in decision-making contexts.10*

**Goal**

*The objective of this session is for the participants of the summer school to actively take part in a public engagement activity, to interact with the stakeholders present and to then incorporate the insights and information gained into their ongoing project.*

**Learning outcomes:**

After successful completion of this module students are expected to be able to:

* Describe emerging challenges in society related to the topic at hand
* Discuss the topic with fellow classmates and stakeholders
* Communicate with different stakeholders to uncover their wants and needs
* Actively listen and communicate with the wider public and diverse stakeholders by being sensitive to different perspectives and cultures
* Hold an attitude of respect and curiosity towards different perspectives and cultures, valuing diversity
* Reflect upon the real-life application of the project
* Adapt the project according to the insight and experience gained, including the voices of the stakeholders in the project design
* React constructively to the feedback and information received during the activity
* Reflect upon how public engagement activities can be useful and productive to scientific and technological research
* Evaluate which public engagement techniques would better adapt to each project design

**Description of the activity:**

This public engagement activity is previously organized by the summer school. The recommended format for the activity is a Science Café, although other formats can be used according to the resources available. More formats and ideas can be found in the Engage2020 Action Catalogue.13

The Science Café concept originates in the 19th century salons of Europe. Small groups of people gathered over drinks to discuss science and philosophy topics of the day. Science Cafés are a good method because they can be used to discuss any kind of subject and can be adapted according to the situation. They are especially useful for discussing scientific developments that have major impact on people’s life or create ethical dilemmas and topics currently being discussed in the news.[[7]](#footnote-7)

A Science Café is an event organized in an informal setting as a place of dialogue with participants. An expert presents a subject in a concise and open manner after which the floor is open for a discussion. The moderator facilitates the sharing of a wide range of views on the subject at hand. In this case, the recommended setting is a Science museum or similar venue.[[8]](#footnote-8)

A typical science café is approximately 90 minutes long and involves both expert speakers and a moderator. The topic that the instructor choose will be presented by a stakeholder, someone related to the subject. Usually speakers give short presentations without visual aids, aiding connection with the audience. During the duration of the activity, the students will act as participants and will interact with the presenters of the science café. 11

With the Science Café activity, the participants of the Summer School will interact with the stakeholders and will incorporate to their projects design all the information they have received during this activity. At the end of the activity there are some reflection questions useful to incorporate new ideas and perspectives emerged during the activity.

**Total duration of the activity**

This activity will last a total of 2 hours.

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

The teacher will have to organize the public engagement event and also take part in it as the moderator. The setting should be as informal as possible, outside of the regular research institutional setting. For example, for the summer school taking place in Barcelona, the public engagement activity will take place in the science museum.

The venue should be large enough to accommodate 30-50 people, to include the summer school participants, stakeholders and general public. It should also be small enough to allow participants to hear each other and the presenters.

It is important for there to be drinks, and possibly food, available during the duration of the Café. This will contribute to the relaxed and informal atmosphere.

There should be an initial speaker to introduce the topic who will give a presentation with a brief overview of the subject as a conversation starter. This should take a maximum of ten minutes. It is a good idea to leave some open-ended questions so as to provoke the audience into talking. The use of PowerPoint presentations is not recommended for the speakers, as it can give the feeling of a lecture more than an open discussion.

The moderator can guide the conversations that take place during the duration of the Café, and encourage people to move around and join different conversations and groups. Also, it is very important that the conversation isn’t dominated by a single person, especially if that person is a scientist. Another important job for the moderator is to make sure that the conversation doesn’t become too technical or inaccessible.[[9]](#footnote-9)

**Reflection questions**

* What are the social challenges and for your project?
* What are the current context and possible future implications for your project?
* What possible ethical aspects are involved in your project?
* How can you communicate your project?
* What type of public engagement activities are the stakeholders interested in?
* What are the social values, cultures and perspectives related to the topic?
* Is your project design flexible and adaptable to societal needs?

**DAY 5. DESIGNING AN INSTRUMENT TO EVALUATE RRI PROPOSALS**

|  |  |  |
| --- | --- | --- |
| Day 5 | **Activity** | **Duration** |
| **Project presentation** | Presentations | 4 hours 30 minutes  4h 30’ |
| Discussion and Evaluation |

**Goal:**

*After having discussed various aspects of RRI for four days, the aim is for the participants to be able to identify which should be the criteria to evaluate the incorporation of RRI in the project proposals. To this end, students will carry out an activity in which they design the evaluation instrument for their proposals themselves. This activity will be useful to the participants to appropriate the concept of RRI and to orient them for their proposal presentations.*

**Learning outcomes:**

After this activity, the students should be able to:

* Identify the RRI criteria to evaluate a project proposal
* Design an evaluation instrument for RRI
* Reflect on the incorporation of the RRI dimensions into a project proposal
* Incorporate the feedback into their future project proposals

**Materials**

* RRI Dimensions guidelines
* Cardboard
* Coloured pens
* (Mind map software)

**Description of the activity:**

The evaluation instrument will be structured upon the four dimensions of RRI:

1) Diversity and inclusion

2) Openness and transparency

3) Anticipation and Reflection

4) Responsiveness and adaptive change.

The course participants should divide into 4 groups, different to those that worked on the project proposals. Each group should define evaluation criteria for each dimension, and indicators for each of the criteria they come up with. To help them, the teacher will show the students an example for each case. Each group will have 30’ to describe their evaluation criteria and indicators. After, these will be shared with the rest of the groups. Each group should present their work and then the class should reach an agreement. An estimated 15’ should be dedicated to each dimension.

To help the participants in defining their evaluation criteria and the indicators, the teacher can hand out the **Guidelines to define evaluation criteria and indicators,** added at the Annex.

**How can the teacher facilitate the activity?**

The role of the teacher during the sharing of ideas is essential to the process. The teacher should facilitate the construction of the evaluation instrument on behalf of the student groups. The teacher’s contributions should encourage reflection on the aspects to be considered in each dimension, but without manipulating the students.

To assist the discussion on the quality criteria for the different dimensions of RRI, the teacher can seek inspiration from the “**Report on the quality criteria of Good Practice Standards in RRI”**. **See Annex at the end of the document**

**Research proposals presentations**

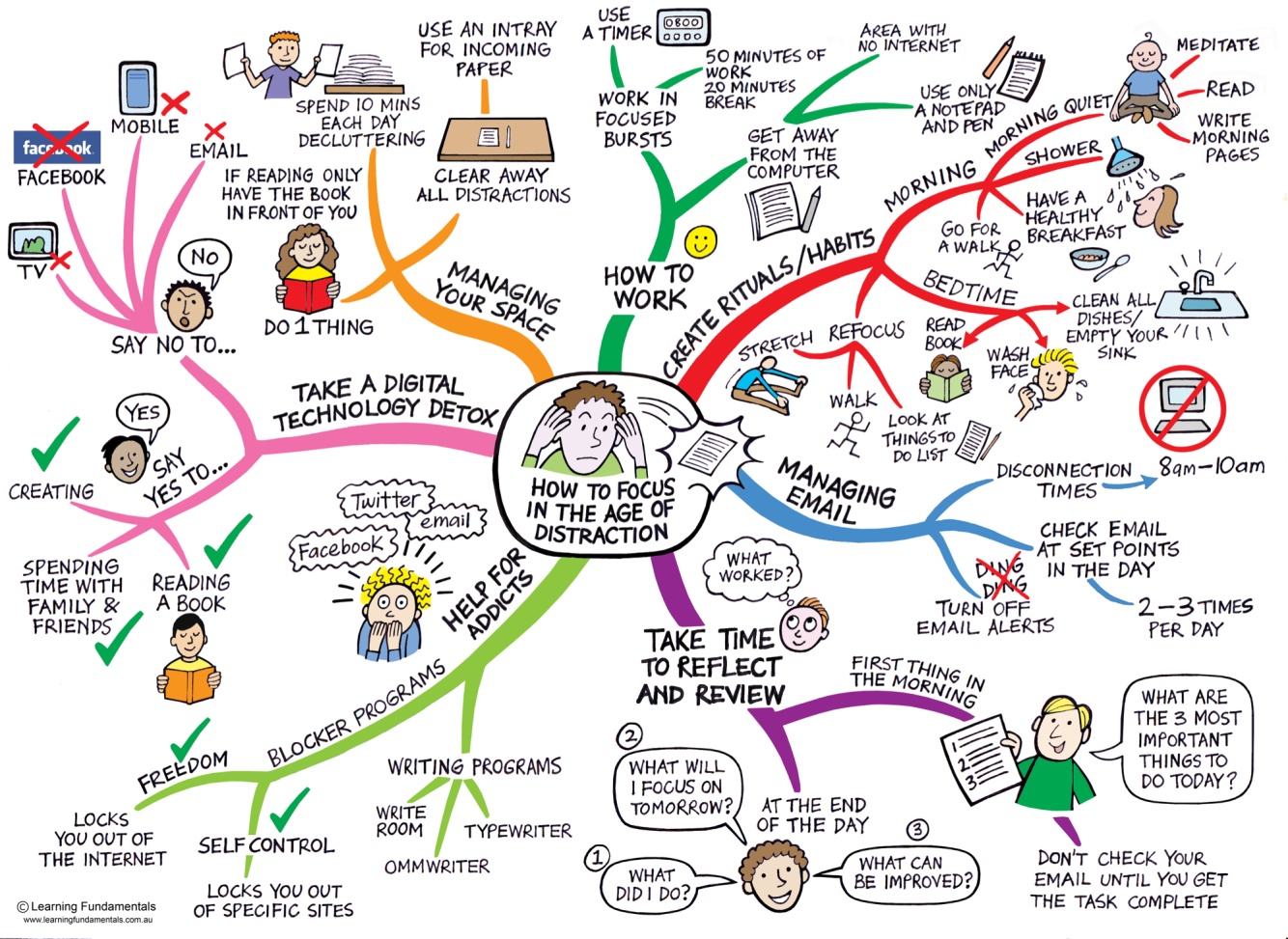
The research proposal’s the course participants have been working on will be presented in the shape of a mind map. In the first part of the session, the participants will have 1h30’ to work on the mind map. They can create a mind map by drawing it by hand or using free software.

**Mind Maps**

**Concept:** this technique is used to explore a general idea, to obtain a holistic vision of RRI and also obtain a visual analysis so as to identify areas for improvement. The ideas in this methodology can be represented by words or by images.

**Methodology:**

1. Draw the main idea in the centre of the page.
2. The key points related to RRI come out of the central image, like branches. From these key point branches, key images grow, representing the components of each key point. Each branch must have a word that associates the key image/images with the main idea in the middle. These are the associations.

Here is an example of a Mind Map:

In the second part of the session, the different project proposals will be shared with the rest of the participants. The attendees should use the collectively designed evaluation instrument to evaluate all the proposals equally and to encourage a discussion on each of the proposals.

In finalizing the presentations, there will be an open question via the *mentimeter*:

* How has your vision on responsibility in R&I changed after this course?

The participants’ answers will serve as a closing activity for the course.

**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 **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**.

**ANNEXES**

* ANNEX 1. Research proposal voting guide
* ANNEX 2. RRI Dimensions Worksheet
* ANNEX 3. RRI Dimensions Guide
* ANNEX 4. Jigsaw Tutor Guide
* ANNEX 5. HEIRRI Cases
* ANNEX 6. Guidelines to define evaluation criteria and indicators
* ANNEX 7. Table from “Report on the quality criteria of good practice standards in RRI
* ANNEX 8. Transversal scenario guide

**ANNEX 1. Research proposal voting guide**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *Ideas* | *Originality*  *(1-3)* | *Relevance*  *(1-3)* | *Impact*  *(1-3)* | *Total score (Ranking)* |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |
| 5 |  |  |  |  |
| 6 |  |  |  |  |
| 7 |  |  |  |  |
| 8 |  |  |  |  |
| 9 |  |  |  |  |
| 10 |  |  |  |  |

**ANNEX 2. RRI Dimensions worksheet**

Write your **research question/initial hypothesis**:

|  |
| --- |
| What is the main motivation for developing this research? Who will benefit from it? What are they going to gain? What are the alternatives? |
|  |

|  |
| --- |
| Which are the stakeholders (involved, affected…) of your project? How can they contribute to your project? How can you involve these stakeholders in this research? Is your project inclusive? |
|  |

|  |
| --- |
| Imagine how your project will have evolved in 30 years. How will the risks and benefits be distributed? What other impacts can you anticipate? What don’t you know about? What might you never know about? |
|  |

|  |
| --- |
| Is there any issue that could affect the transparency of your project? Are there any mechanisms to ensure transparency? What can limit the transparency of your project (conflict of interests, patients’ anonymity, selection processes, open access funding…)? How will you deal with it? Who will take responsibility if things go wrong? |
|  |

|  |
| --- |
| Why is your project different? What adaptability does your project have to change with the evolving environment? Which mechanisms can you incorporate to adapt your project to reality? |
|  |

Rewrite your **research question/initial hypothesis**:

**ANNEX 3. RRI DIMENSIONS GUIDE**

**Which are the stakeholders (involved, affected…) of your project? How can they contribute to your project? How can you involve these stakeholders in this research? Is your project inclusive?**

These questions are related to the Diversity and Inclusion dimension. This dimension reflects on involving a wide range of actors and publics early on in R&I practice, deliberation, and decision-making to yield more useful and higher quality knowledge. This dimension is useful to strengthen democracy and expands the sources of knowledge, disciplines and perspectives. Here there are some reflecting questions that the instructor can use to facilitate discussion in this part of the guide:

Reflection questions:

* How many people can contribute to your project?
* Who are all the actors involved in your research project?
* Who are the affected actors?
* In which fields do the involved actors participate?
* How could the stakeholders be part of your research?
* Have you thought about participatory methods for including the voices of diverse stakeholders?
* How could you engage them to include their voices within the design of your projects?
* Which tasks can the stakeholders do in this project?
* Does your project include tools related to perspective-taking and communication with people holding different perspectives and cultures?
* How is gender equality addressed in the context of your project? What about cultural diversity?[[10]](#footnote-10)

**Could you imagine any application for your project? Within 30 years, how will the project have evolved?**

These questions are related to the Anticipation and Reflection dimension. This dimension envisions impacts and reflects on the underlying assumptions, values, and purposes to better understand how R&I shapes the future. This results in valuable information and increases our ability to act on what we know. Here are some reflecting questions that the instructor can use to facilitate discussion in this part of the guide:

Reflection questions:

* Have you taken into account the possible development of societal challenges in the future in the design of your project?
* Have you applied future-studies concepts and methods in your research proposal?
* Have you analysed your research proposal in a long-term point of view?
* Do you think your research project can contribute to benefit future society? In which way?10

**Is there any issue that could affect the transparency of your project? Are there any mechanisms to ensure transparency? What can limit the transparency of your project (conflict of interests, patients’ anonymity, selection processes, open access funding…)? How will you deal with it?**

These questions are related to the Openness and Transparency dimension. This dimension outlines the need to communicate in a balanced and meaningful way methods, results, conclusions, and implications to enable public scrutiny and dialogue. This benefits the visibility and understanding of R&I. Here are some reflecting questions that the instructor can use to facilitate discussion in this part of the guide:

Reflection questions:

* With whom do you share the results of your work?
* How are open access policies integrated in your research proposal?
* Have you thought about the possible restrictions in sharing information (intellectual property rights, need to limit the circulation of sensitive data…)?
* What are possible ethical considerations for your research proposal regarding openness and transparency?10

**Why is your project different? What adaptability does your project have in a changing/evolving environment? Which mechanisms can you incorporate to adapt your project to reality?**

These questions are related to the Responsiveness and Adaptive change dimension. This dimension outlines being able to modify modes of thought and behaviour, overarching organizational structures, in response to changing circumstances, knowledge and perspectives. This harmonizes the measures taken with the needs expressed by the stakeholders and the public. Here are some reflecting questions that the instructor can use to facilitate discussion in this part of the guide:

Reflection questions:

* Have you identified emerging challenges and changes in society to design a flexible and adaptive research proposal?
* How do you prevent potentially harmful impacts on the public or the environment?
* How do you ensure your R&I practices can adapt to unforeseen results or societal changes?10

**ANNEX 4. JIGSAW TUTOR GUIDE**

**INCLUSIVE SCIENCE**

In this section, different uses of the term “Inclusive science” are considered. On one hand, it’s more common use referencing to the need to guarantee that the Research, Development and Innovation (R&D+I) process takes into account all population groups and that no groups are excluded (even those that could be forgotten if the process was only driven by market laws o power circles). Thus, the term “inclusive science” generally leads us to think on the concern to design strategies to include population groups that are less represented in science, such as people with special needs (physical or mental), groups with linguistic or cultural particularities, etc.

Another use of the concept “inclusive science” that is also included in this section refer to the Public Engagement of science. That is, the strategies to guarantee that decisions that have to do with the R&D+I process integrate the points of view, opinions and values of the different stakeholder groups (end users, businesses, administration, civil society organisations, etc.) and that, together with the scientific community, these stakeholder groups are co-participants of the scientific responsibility and its derived products (achievements, uses, societal and environmental impacts). This definition is not only related to the concept of Public Engagement, but also to the concept of Open Access (to publications, data, science, knowledge) and has also a lot to do with the four dimensions of RR (particularly, with the one on diversity and inclusion, and also openness and transparency). [[11]](#footnote-11)

Finally, it has been included in this section the matter of Science Education (of society and of the youngsters in particular), because it is also an aspect that can be considered part of “Inclusive science”.

It should be clarified here that there is another concept that could have been included under “Inclusive science” but that finally it has been given its own section: this concept is the one related to the strategies to reduce the gender gap in science. It is treated as an independent issue not only because it is important to fight against the infra-representation of women in science and technology, but also because it is necessary to incorporate gender and sex perspectives in research content, as will be seen in the section dedicated to this matter.

Therefore, although Public Engagement, Open Access and Science Education are treated together in this activity, we will proceed now to address these concepts separately, so as to clearly define their meaning, the importance of each, and how each can be applied. Also, specific references to exemplary cases will be made to facilitate understanding.

PUBLIC ENGAGEMENT

According to the RRI Tools project ([https://www.rri-tools.eu/en](https://www.dropbox.com/referrer_cleansing_redirect?hmac=HOlUxvSw4uVCnrX4Sxn%2FdOMsygY0%2Ft8G88OvmIyjC5k%3D&url=https%3A%2F%2Fwww.rri-tools.eu%2Fen)), Public Engagement in RRI means: [[12]](#footnote-12)

* Enhancing and widening participation at all R&I stages
* Leading to new and profitable partnerships
* Guaranteeing a transdisciplinary approach
* Advancing towards collaborative decision making and shared responsibility
* Promoting Citizen Science and Open Innovation

OPEN ACCESS

Open Access is about breaking barriers to knowledge and improving science collaboration for a better transparency. With Open Access, peer-reviewed scientific content is available online, free of charge, and with limited copyright restrictions.

According to the European Comission11, Modern research builds on extensive scientific dialogue and advances by improving earlier work. Fuller and wider access to scientific publications and data will therefore help to:

– accelerate innovation (faster to market = faster growth);

– foster collaboration and avoid duplication of effort (greater efficiency);

– build on previous research results (improved quality of results);

– involve citizens and society (improved transparency of the scientific process).

According to the RRI Tools project ([https://www.rri-tools.eu/en](https://www.dropbox.com/referrer_cleansing_redirect?hmac=HOlUxvSw4uVCnrX4Sxn%2FdOMsygY0%2Ft8G88OvmIyjC5k%3D&url=https%3A%2F%2Fwww.rri-tools.eu%2Fen)), Open Access in RRI means:12

* Free access, no more limits
* Access to peer-reviewed literature
* Access to publications, access to data
* Shaking up the current publication system and opening new horizons
* Transparency and accountability
* Full re-use rights

SCIENCE EDUCATION

Science education plays a very critical role in RRI: it provides competences for learners to become the responsible citizens that society needs.

“Emphasis should be placed on connecting innovation and science education strategies (…), taking into account societal needs and global developments” - Quote from the *Science Education for Responsible Citizenship* Report to the European Commission11

Science education is vital for promoting a culture of scientific thinking and inspiring citizens to use evidence-based reasoning for decision making. It also ensures citizens have the confidence, knowledge and skills to participate actively in an increasingly complex scientific and technological world. It helps develop the competencies for problem-solving and innovation, as well as analytical and critical thinking that are necessary to empower citizens to lead personally fulfilling, socially responsible and professionally-engaged lives.

Science education in schools is important for inspiring children and students of all ages and talents to aspire to careers in science and other occupations and professions that underpin our knowledge and innovation-intensive societies and economies, in which they can be creative and accomplished.[[13]](#footnote-13)

It enables public, private and third-sector organisations to find appropriately skilled and knowledgeable people and to promote and nurture an innovative environment where stakeholders from around the world want to live, work and invest.

Science Education empowers responsible participation in public science conversations, debates and decision-making as active engagement of citizens in the big challenges facing humanity today. It is important for citizens to be able to understand the current scientific and technological research, and be able to participate in decisions being made related to such.

According to the RRI Tools project ([https://www.rri-tools.eu/en](https://www.dropbox.com/referrer_cleansing_redirect?hmac=HOlUxvSw4uVCnrX4Sxn%2FdOMsygY0%2Ft8G88OvmIyjC5k%3D&url=https%3A%2F%2Fwww.rri-tools.eu%2Fen)), Science Education in RRI means:12

* Promoting innovative problem-solving and critical thinking
* Embedding social, economic and ethical principles
* Promoting engagement and an entrepreneurial mind-set
* **Empowering citizens** to participate in science policy making
* Sharing responsibility while solving social challenges
* Facilitating a strong **interdisciplinary approach,** **and stakeholders' involvement**

EXAMPLE CASES

Many different methods for public engagement exist, each one to be used according to the resources and time available, also depending on who is to be involved and the desired outreach. In the cases provided, there are some examples of different methods that can be used. Also, there are different ways to implement Science Education. As previously mentioned, these are often related.

**MARLISCO** is a project whose whole aim is public engagement. It involves the public on many levels, from a video competition for young people, to debates and exhibitions and workshops.

Different public engagement methodologies can be used for the same projects, or repeated at different stages of the project. Different methods can provide varied information or support for the same project, and they can be aimed at different publics.

**Focus groups**

A focus group is a qualitative method used widely in commercial market research and increasingly in academic social research. Typically, a group of eight to ten people, broadly representative of the population being studied, is invited to discuss the issue under review, usually guided by a trained facilitator working to a designed protocol. The group is not required to reach any conclusions, but the contents of the discussion are studied for what they may reveal about shared understandings, attitudes and values. Focus groups may also help to identify the factors (which large-scale surveys rarely do) that shape attitudes and responses, including trust or mistrust. They also help in the design and interpretation of quantitative public opinion surveys.[[14]](#footnote-14)

In the **PIER project**, both the public and experts on the subject were involved since the early stages of the project to decide the main topics of an exhibition. These decisions were mostly made via focus groups. This project was created via public engagement with science education as its main goal.

Focus groups were also used in developing **My Brain Book,** a web-based tool for people with dementia and their carers.

**Citizen science**

Citizen science typically refers to research collaborations between scientists and volunteers, particularly (but not exclusively) to expand opportunities for scientific data collection and to provide access to scientific information for community members.[[15]](#footnote-15)

The **Mosquito Alert** case is a perfect example of an effective Citizen Science case. Without the information provided by citizens, the research project would be impossible.

**Field studies**

A field study is a general method for collecting data about users, user needs, and product requirements that involves observation and interviewing. Investigators in field studies observe users as they work, taking notes on particular activities and often asking questions of the users. Observation may be either direct, where the investigator is actually present during the task, or indirect, where the task is viewed by some other means like a video recorder set up in an office.

In the case of the project called **KLIMA ALLTAG**, a very large number of citizens were involved in the research for the project. The research team did a field study involving more than 80 households and then conducted a further survey of 1000 interviews.

For the development of **AMBIACT**, continuous interviews were performed during the development of the product and two field trials with over 100 participants, so the observation took place once the product was already in place. These results were made publicly available on demand and were presented at many public events.

**Workshops**

A workshop is a meeting at which a group of people engage in intensive discussion and activity on a particular subject or project.

In some projects that are health related, researchers are encouraged to work with the patients and carers, involving the people affected at many stages of the process in different workshops. This is the case of **PPI Parkinson’s.**

**Web-based tools**

Web Based Tools are online applications that anyone can access.

In the case of the **IMRR Project,** an open-source decision making platform was created that stakeholders and the general public could interact with throughout the development of the project.

**Participation in political agendas**

**VOICES** is a large scale example of a public engagement project, as it is an overall EU report based on a high number of focus groups in 27 countries, gathering opinions and ideas from citizens, that were then taken into consideration by the European Commission. These ideas directly affected European Research Agenda.

**Exhibitions**

An exhibition, in the most general sense, is an organized presentation and display of a selection of items. It is an excellent way to communicate with the public, and they are often very interactive and easily accessible for citizens.

The final product of the **PIER project** was an exhibition on Marine Research in the Mediterranean Sea. The **PULSE project** also developed an exhibition, involving families with small children in the planning, helping to develop new types of innovative exhibition concepts.

**Education in schools**

In the case of the **Mobile Education DNA Labs,** the final result of the project itself was to educate secondary school students. This was achieved by taking real scientific research to the schools, so the pupils could experience it first-hand.

REFLECTION QUESTIONS

* How would you define Public Engagement?
* Do you think Public Engagement is important? Why?
* What are the possible advantages of the public engagement methods that are mentioned?
* What are the possible limitations?
* Can you think of any other public engagement methods that can be used?
* How would you define Open Access?
* Do you think Open Access is important? Why?
* What are the advantages of Open Access?
* What are the possible limitations?
* Why is Open Access often a controversial issue?
* How would you define Science Education?
* Do you think Science Education is important? Why?
* Can you think of different ways to implement Science Education in a research project?

**Selected Articles to read for the expert group:**

* Wilsdon, James and Willis, Rebecca (2004): *See-through Science: Why public engagement needs to move upstream*. London: Demos.
* European Commission. Towards better access to scientific information: Boosting the benefits of public investments in research. COM(2012) 401 final.
* THOMAS, GEOFFREY and DURANT, JOHN (1987): *Why Should we Promote the Public Understanding of Science?* Scientific Literary Papers: A Journal of Research in Science, Education and Research.

**GENDER EQUALITY**

Differences between women and men are not limits, but opportunities: we need balanced research and innovation teams. Gender equality is the situation where individuals are free to develop their abilities and make choices without the limitations imposed by gender roles.

This is not trivial: still today, only 28% of the world’s researchers are women, and they remain the minority in the fields of science, technology, engineering and mathematics (STEM). Gender segregation in science is changing but at a very slow pace, and disparities only increase the higher we are in the organizational ladder. In fact, it is important to move into the institutional level and encourage research organizations and universities to implement action plans to address institutional barriers such as recruitment, promotion, retention policies and practices, management and research assessment standards, and policies for dual-career couples and career breaks.[[16]](#footnote-16) Overcoming these barriers will bring also benefits, actually some studies support that gender-heterogeneous problem-solving teams generally produce higher quality journal articles than teams comprised of highly performing individuals of the same gender.[[17]](#footnote-17)

Even so, gender equality also means incorporating gender analysis into basic and applied research. Western science is known for producing objective knowledge; however, respect to gender science has not been neutral. Some studies have demonstrated how gender inequalities build into society and institutions have influenced science. An example occurred between 1997 and 2000 when 10 drugs had been withdrawn from the US market because of life-threatening effects were more dangerous to women (the preclinical research uses primarily male animals). That is the reason why, one of the goals of gender equality is to include the gender dimension in research and take into account whether and in what sense sex and gender are relevant in the objectives and the methodology of scientific projects. 16

According to the RRI Tools project ([https://www.rri-tools.eu/en](https://www.dropbox.com/referrer_cleansing_redirect?hmac=HOlUxvSw4uVCnrX4Sxn%2FdOMsygY0%2Ft8G88OvmIyjC5k%3D&url=https%3A%2F%2Fwww.rri-tools.eu%2Fen)), Gender Equality in RRI means [[18]](#footnote-18):

* Promoting **gender balanced** **research teams**
* **Breaking down** gender stereotypes
* **Raising awareness**towards for gender-sensitive investment & funding
* Ensuring **gender-friendly** **workplace** cultures
* Considering the **gender** **dimension** in research and innovation
* Gender balance in **decision making**

EXAMPLE CASES

Many different methods for implementing the gender dimension exist. In the cases provided, there are some examples of different gender equality implementation in scientific projects.

**HIV MICROBICIDES: RETHINKING RESEARCH PRIORITIES AND OUTCOMES** is a Gendered Innovations project carried out by an engineering lab which has shifted the research focus from applied physics to biomedical engineering to increase the number of women and to introduce the gender dimension in the research itself, in fact, the lab is particularly interested in contributing to the development of woman-controlled HIV microbicides.

The **HOUSING AND NEIGHBOURHOOD DESIGN: ANALYSING GENDER** is a Gendered Innovations project carried out in Vienna in which there is an analysis of the gender roles and divisions of labour to create and built environments taking into account the different needs with respect to gender. In this project, gender analysis of space has identified the ways in which urban environments may enforce gender norms to serve women and men equally.

The **MALVECBLOK Project** studies the mosquito biology, vector-parasite interactions and immunity to provide a new vision for malaria control. This project is an exemplary case because it provides a good opportunity to create a diversified team, gender and ethnically balanced. Also, it is included the gender dimension into the research content of the project, MALVECBLOCK takes into account gender roles in malaria zones to study the vulnerability to the disease and access to treatment to be equal for men and women.

REFLECTION QUESTIONS

* How would you define Gender Equality in research?
* Do you think Gender Equality in research is important? Why?
* How could you include the gender perspective into a research project? What are the possible advantages of including the gender perspective into science?
* What are the possible limitations? And how could they be overcome?
* Can Gender equality be a controversial issue? If so, why?

**Selected Articles to read for the expert group:**

* Schiebinger, Londa & Schraudner, Martina (2011), Interdisciplinary Approaches to Achieving Gendered Innovations in Science, Medicine, and Engineering, Interdisciplinary Science Review, Vol. 36, No. 2, 154–67.
* Lesley G. Campbell, Siya Mehtani, Mary E. Dozier, Janice Rinehart (2013) Gender Heterogeneous Working Groups Produce Higher Quality Science

**ETHICS**

“Ethical reflection is not new, but the transformative power that science and technology make possible requires us to engage in new ethical reflection, taking into account the values and the ways of thinking that guide us” - Édith Deleury, President of the Québec's Commission for Ethics in Science and Technology (Canada)

Ethics requires that research and innovation respects fundamental rights and the highest ethical standards in order to ensure increased societal relevance and acceptability of research and innovation outcomes. During the last decades, ethical issues related to scientific and technologic advances have gained highly importance and have been determined as normative. Over the last 10 years – partly as a response to prior difficulties with the introduction of technologies into society – various governmental agencies and corporate entities in the USA and Europe began an ambitious effort to “embed” ethicists, philosophers, and other humanists and social scientists within sites of technology production. The aims of this effort are varied but include: encouraging responsible research and innovation; bringing about an awareness of possible ethical issues to help shape (rather than react to) resultant technologies; investigating the ethical, legal, and social issues (ELSI) introduced by these technologies; and creating desirable, ethical futures.

Ethics is an integral part of research from the beginning to the end. It is only by getting the ethics right that research excellence can be achieved. To fulfil the goals of RRI, moral deliberation needs to take place continuously and is a responsibility shared by all actors involved.19 When it comes to Responsible Research and Innovation (RRI), the core ethical endeavour is to achieve its integration across the entire research and innovation (R&I) process.  Improving the reliability and efficiency of scientific research will increase the credibility of the published scientific literature and accelerate discovery.[[19]](#footnote-19)

Ethical research conduct implies the application of fundamental ethical principles and legislation to scientific research in all possible domains of research – for example biomedical research, nature sciences, social sciences and humanities.

The most common ethical issues include[[20]](#footnote-20):

* the involvement of children, patients, vulnerable populations
* the use of human embryonic stem cells
* privacy and data protection issues
* research on animals and non-human primates

“Science is not neutral. It can have both positive and negative consequences. Scientists increasingly have to face the ethical dilemma of the consequences of their research. And, thus, their responsibility in science governance“- René von Schomberg, Directorate General for Research, European Commission

According to the RRI Tools project ([https://www.rri-tools.eu/en](https://www.dropbox.com/referrer_cleansing_redirect?hmac=HOlUxvSw4uVCnrX4Sxn%2FdOMsygY0%2Ft8G88OvmIyjC5k%3D&url=https%3A%2F%2Fwww.rri-tools.eu%2Fen)), Ethics in RRI means[[21]](#footnote-21):

* Incorporating Research Integrity
* Sharing responsibility for the impacts of science
* Reflecting on people’s ideas and concerns about R&I
* Aligning research to social values
* Deliberating on the moral issues of R&I with a diversity of actors

EXAMPLE CASES

**PPI Parkinson’s** is a project carried out by a charity called Parkinson’s UK. This organization encourages researchers to work with patients and carers to design, deliver and share their research. The charity wants to fund research that is relevant and beneficial to people affected by the condition. The project consisted in organizing meetings between the researchers and volunteers with Parkinson’s, so as to improve the research being done.

### Research for TREE: Adolescent Participation in Trials of Biomedical HIV Prevention Products consisted in investigating the involvement of adolescents in clinical trials for biomedical HIV prevention products and the ethical challenges involved. Adolescents should be properly represented and protected when it comes to HIV but being under age, their participation in clinical trials is a challenging topic.

REFLECTION QUESTIONS

* How would you define ethics?
* How would you define research integrity?
* Do you think integrating ethics in research projects is important? Why?
* What are the advantages of integrating ethical practices into research?
* What are the possible limitations?
* What kind of research will mostly benefit from taking into account the ethical questions it raises? Why?
* Can you think of ways to make your research more ethical?

**Selected Articles to read for the expert group:**

* Munafò, M. R. *et al.* A manifesto for reproducible science. *Nat. Hum. Behav.* 1, 0021 (2017).
* Schicktanz S., Schweda, M., Wynne, B (2012) The ethics of ‘public understanding of ethics’—why and how bioethics expertise should include public and patients’ voices, Med Health Care and Philos, 15:129–139

**SUSTAINABILITY**

Sustainability can be defined in many ways. It is the identification of the environmental aspects of business operations. It is also the smart use of natural resources and investment in eco-efficient production processes. The term sustainability includes many different aspects. Sustainability focuses on achieving smart, sustainable and inclusive development and includes five target areas: employment, research and development, climate and energy, social inclusion and poverty reduction.[[22]](#footnote-22) The selection of case studies included in the Jigsaw Activity are centred on climate and energy.

Sustainability and innovation are two interrelated challenges for R&D. Research can develop technical solutions to tackle environmental or societal challenges (e.g. technologies to reduce CO2 emissions, to be more energy-efficient, to replace scarce raw materials), but to be environmentally effective, technologies must be successfully commercialised2 and accepted by the general public.

Moving towards sustainability is a social challenge that entails international and national law, urban planning and transport, local and individual lifestyles and ethical consumerism. According to the European Environment Agency, total use of natural resources and production of waste increased by 34% between 2000 and 2007 and these increases are related to economic growth and increasing welfare. These increases have a considerable economic and ecological impact.[[23]](#footnote-23)

It is essential for research to be more sustainable, both in the research subject and in the way research is done. This can only be achieved with public awareness of the meaning of being sustainable and what this entails. Sustainable development will only be feasible in the case that industrial and industrialising economies drastically reduce their use and consumption of natural resources, nations are prepared to a fair distribution of their welfare, both nationally and internationally, and citizens develop a new vision on human and planetary well-being.23

Ways of living more sustainably can take many forms; from reorganizing living conditions (for example eco-villages and sustainable cities), reappraising economic sectors (green building or sustainable agriculture) or work practices (sustainable architecture), using science to develop new technologies (green technologies or renewable energy) or designing systems in a flexible and reversible manner, and adjusting individual lifestyles that conserve natural resources.

‘The concept of a green economy requires us to reformulate fundamentally the way we produce, consume and live in a way so that our economic activities do not harm human health and the environment’ Hans Bruyninckx, director of the European Environment Agency23.

EXAMPLE CASES

There are many exemplary cases related to sustainability. The selected cases focus on different subjects related to the environment.

The **KLIMA ALLTAG project** examined how people’s everyday activities affected carbon emissions, and how to change these routines and encourage climate-friendly lifestyles. The research was done via a field study of 80 households, who received advice for 6 months, and over 1000 interviews. The subjects studied seem to be on a small scale, but if you should multiply the number of households, the effect would be on a much larger scale.

**MOSQUITO ALERT** is a citizen science platform created to fight against mosquito-borne diseases. The general public can provide information related to the location of mosquitoes and their breeding sites, which scientists then use to study the distribution of the insects. Citizen participation is essential due to the fact that mosquitoes very often reproduce on private property.

The goal of the **IMRR Project** was to improve water management practice in a Vietnamese river basin; with the purpose of meeting society’s needs for water resources while maintaining essential ecological services and improving economic benefits from hydropower and agriculture. All stages and activities of the project involved participation of stakeholders.

The project **MARLISCO** focuses on the topic of Marine Litter. The main purpose of the project is to raise public awareness on the subject, promoting sustainable management of marine litter across all European Seas. To involve the widest possible audience, the project’s activities included perception surveys, a video contest, national debates, exhibitions and clean ups amongst others.

**PIER** is a project aiming to engage the public on RRI in society. It focuses on Marine Research in the Mediterranean Sea. The exhibition has been created with the involvement of both experts and the general public, who have chosen the main topics.

**VOICES** is a large scale example project related to sustainability, as it is an in depth consultation on the topic of “Urban waste as a resource” and the concept of a “zero waste society”. European citizens came up with new ways to strengthen current research on these topics, such as improving education related to waste. These ideas directly affected European Research Agenda.

REFLECTION QUESTIONS

* How would you define sustainability?
* Do you think integrating sustainability in research projects is important? Why?
* What are the advantages of integrating sustainable practices into research?
* What are the possible limitations?
* Can you think of ways to make your research more sustainable?

**Selected Articles to read for the expert group:**

* Marian Deblonde (2015) Responsible research and innovation: building knowledge arenas for glocal sustainability research, Journal of Responsible Innovation, 2:1, 20-38
* Jesús Alquézar Sabadie (2013) Technological innovation, human capital and social change for sustainability. Lessons learnt from the Industrial Technologies Theme of the EU's Research Framework Programme

**ANNEX 5. HEIRRI CASES**

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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”[[24]](#footnote-24) 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[[25]](#footnote-25). 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[[26]](#footnote-26) states that, around the world, women carry out at least two and a half times more unpaid household and care work than men[[27]](#footnote-27).

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[[28]](#footnote-28) 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*”[[29]](#footnote-29), in the last years, both the European Union and the U.S. have invested to increase the number of women scientists and engineers[[30]](#footnote-30),[[31]](#footnote-31). 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“[[32]](#footnote-32), 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.[[33]](#footnote-33),[[34]](#footnote-34) "

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[[35]](#footnote-35). 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.[[36]](#footnote-36) 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.[[37]](#footnote-37)

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%)[[38]](#footnote-38),[[39]](#footnote-39). 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[[40]](#footnote-40).

The European project MALVECBLOK[[41]](#footnote-41), 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[[42]](#footnote-42), “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”.

**Bibliography:**

* <http://www.ghspjournal.org/content/4/1/114.full>
* <http://www.comminit.com/global/content/casas-maternas-rural-highlands-guatemala-mixed-methods-case-study-introduction-and-utili>
* <http://curamericasguatemala.blogspot.com.au/>
* <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[[43]](#footnote-43). 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[[44]](#footnote-44),[[45]](#footnote-45) 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[[46]](#footnote-46), 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%)[[47]](#footnote-47).

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”[[48]](#footnote-48).

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[[49]](#footnote-49) 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[[50]](#footnote-50) was a European project of the 7th Framework Programme, which, according to the CORDIS website[[51]](#footnote-51), 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[[52]](#footnote-52), 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[[53]](#footnote-53), 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[[54]](#footnote-54).

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”)[[55]](#footnote-55), is a European initiative of the Seventh Framework Programme that went from June 2012 to the end of May 2015. In its website[[56]](#footnote-56) 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,[[57]](#footnote-57) 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[[58]](#footnote-58), 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.[[59]](#footnote-59) At the moment, there is considerable prevention research agenda and HIV prevention trials are being conducted worldwide.[[60]](#footnote-60)

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.[[61]](#footnote-61) 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,[[62]](#footnote-62)

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[[63]](#footnote-63), 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.[[64]](#footnote-64)

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.[[65]](#footnote-65)

**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[[66]](#footnote-66)”, 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”.

**Bibliography:**

* <http://www.progressproject.eu/news/2044-responsible-inclusive-innovation-a-documentary-on-the-buchu-plant/>
* <http://www.progressproject.eu/>
* <http://unsr.jamesanaya.org/docs/countries/2010_report_botswana_en.pdf>

**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.

**Bibliography**

* 2015/16 UCL ChangeMakers Report: <https://www.ucl.ac.uk/changemakers/docs/UCL_ChangeMakers_Report_2015-16.pdf>
* <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[[67]](#footnote-67). 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.[[68]](#footnote-68)

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.[[69]](#footnote-69),[[70]](#footnote-70)

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.[[71]](#footnote-71)

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[[72]](#footnote-72), 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 6. GUIDELINES TO DEFINE EVALUATION CRITERIA AND INDICATORS**

|  |  |
| --- | --- |
| 1. **Diversity and Inclusion** | |
| **Criteria** | **Indicators** |
| ***Example: Engaging a variety of stakeholder groups*** | * ***There is a wide range of stakeholders involved*** |
|  |  |
|  |  |
|  |  |

|  |  |
| --- | --- |
| 1. **Openness and transparency** | |
| **Criteria** | **Indicators** |
| **Example: *Honest and clear representation of the practice details*** | * ***All the objectives, aims and goals are clearly represented*** |
|  |  |
|  |  |
|  |  |

|  |  |
| --- | --- |
| 1. **Anticipation and reflection** | |
| **Criteria** | **Indicators** |
| **Example: *Analysis of the background, current situation and context of the planned research or innovation*** | * ***societal values, perceptions and interest have been considered in defining the problem addressed*** |
|  |  |
|  |  |
|  |  |

|  |  |
| --- | --- |
| 1. **Responsiveness and adaptive change** | |
| **Criteria** | **Indicators** |
| **Example: *Flexible process management*** | * ***It is possible to change the course of the research and innovation practice in response to changing stakeholders needs*** |
|  |  |
|  |  |
|  |  |

**ANNEX 7. 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 8. TRANSVERSAL SCENARIO GUIDE**

This is a guide to assist teachers in using the transversal scenario videos (“On ageing” and “On food”), in a higher education institution context. The videos are 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))

**Transversal Scenario – FOOD**

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

<https://youtu.be/te9qffJPgHE>

*Fermentation is an ancestral technology that has been present in all cultures and civilizations around the world. It has been essential for the preservation of food in seasons of scarcity. Historically it had a huge impact on the gastronomic culture and the flavour palette in different areas around the globe depending on food substrates, climatic conditions, and microorganisms present in a specific place. People developed skills to use microorganisms to convert food and established a close relationship with them.*

BERNAT

I am very interested on fermentation since I believe that it is a process with a huge potential from a gastronomical point of view. Lately I’ve been working on legumes and on finding innovative ways to transform them through this fermentation processes. My name is Bernat Guixer, I hold a PhD in organic chemistry and I work in a restaurant applying my scientific knowledge on the development innovative ingredients.

*Legumes are a significant source of**protein,**dietary fibre,**carbohydrates and**dietary minerals; and like other plant-based foods, contain no**cholesterol and little fat or sodium. But, even though their qualities seem so beneficial, in developed countries, this consumption is decreasing dramatically. In some places like Spain, the consumption has dropped 75% in 40 years.*

BERNAT

Why? Is it a matter of fashion? the market reality? the lack of time to cook legumes? We applied the process of producing tempeh through fermentation to local legumes and check if the output was interesting. The challenge was to apply the process of fermentation to white hocked beans that are cultivated in our region.

*Fermentation has always been linked to climatic conditions, especially when humans were not able to control them in a laboratory. Temperature, humidity and substrates of a region determined the varieties that naturally grew and the microorganisms available in the environment. On the other hand, every region has its cultural features and this two facts, for centuries, have linked culture and food.*

BERNAT

The fermentation process of tempeh is driven by a fungus that needs certain conditions of temperature and humidity. When these conditions are met, the fungus generates a mycelium that compacts the beans and starts transforming them. This is our starting point for the innovation. I am working in a scientific organization, but this does not mean that I can’t work with a scientific approach. I am applying my scientific knowledge to navigate in the process of developing new products that need to taste delicious but that can also be used in other fields. Also, this process started as an open source project in the Nordic Food Lab and has been published in a peer-review journal and shared in different conferences, so the information is available.

*There are serendipitous findings in culinary research. When low temperature cooking techniques are applied to tempeh, some interesting modifications happen. After a couple of days of low temperature cooking, the colour of the tempeh shifts from pale to orange, and the taste becomes sweet and with umami notes.*

BERNAT

We realised, that the shift of the product was significant and we coined a new name to avoid misleading the consumer. I’m finding imaginative ways to deliver interesting products to the kitchen, but also providing possible research topics that can be explored in collaboration with researchers in the academy. This product might have many other commercial uses that could affect many different stakeholders. The use of proximity crops instead of global ones like soy, would affect local producers. Restaurants, companies of processed food, private consumers... But beyond that it could affect the preservation of crop diversity. By maintaining the use of local seeds, using our ancestral varieties, we favour the survival of this seeds and we preserve the diversity of legumes.

*When think about soybean products, a global product in opposition to proximity seeds, the first thing that comes to mind are healthy food staples like tofu, edamame or soy milk. But in reality, a typical soybean is more likely to end up in a ham-and-cheese sandwich or a chicken nugget than a block of tofu. 70–75 percent of the world’s soy ends up as feed for chickens, pigs, cows and farmed fish. The remainder is used in a variety of industrial applications, including biodiesel production, or for direct human consumption.* Growth in demand is largely attributable to the increasing preference for meat among the growing middle class in emerging economies, which has brought with it higher demand for animal feed.

BERNAT

The product won’t be the cheapest of all if it is commercialized. This is for sure. I work in a company with commercial interests of course, but the restaurant is willing of spending money and time to develop technologies that will be later applied to consumer products or technologies. Thickening agents, for instance, is a culinary tool that has been used in hospitals to help people with difficult swallowing. I don’t know if these crop fields can affect other crops. And also, any fermentation process involving microorganisms has to be deeply analysed concerning safety to discard histamines or other harmful toxins. Maillard reactions in the cooking (that give browned food its distinctive flavour) can bring also carcinogenic by-products, as in many other cooked products in our everyday life. The cultural relationship that humanity has with cooking in not balanced in terms of gender. While women have been attributed the role of cooking in the majority of households, high cuisine is still a man’s world.

*In the field of food, professionals are concert not only about nutritional value but also about the appreciation of the product by society. There could be a synthetic meal perfect from the nutritional point of view that nobody liked. As human beings, there is a need to make meals enjoyable.*

BERNAT

We don’t have any information on the opinion of the public about our products but chefs are the ones concerned about what the consumers like. But not only that, they are stimulating the consumers with new flavours, new proposals and experiences. Do we need to take always into account the nutritional values of food? Or the enjoyment of food? Or maybe both? That’s were variety offers versatility.

The Roca brothers: the chef, the sommelier and the pastry chef of the restaurant, usually state that: “Traditions are legitimated avant-garde”, meaning that any present tradition was necessarily an innovation in the past, which people legitimated over time.

*Culinary avant-garde is challenging the gastronomy of today pushing its boundaries. Somehow it is a way to point topics that might need an update, as well as proposing ways and suggesting alternatives to improve the gastronomical world of tomorrow. And this may be really broad, from plating to considering approaches for food sustainability.*

1. <https://www.jigsaw.org/pdf/JigsawBasics.pdf> [↑](#footnote-ref-1)
2. <http://www.teachhub.com/jigsaw-method-teaching-strategy> [↑](#footnote-ref-2)
3. Oppezzo M., Schwartz D., Stanford University (2014) *Give Your Ideas Some Legs: The Positive Effect of Walking on Creative Thinking,* Journal of Experimental Psychology: Learning, Memory, and Cognition 2014, Vol. 40, No. 4, 1142–1152 [↑](#footnote-ref-3)
4. Wickson F., Strand R., Lein Kjølberg K. (2014) *The Walkshop Approach to Science and Technology Ethics*, Sci Eng Ethics (2015) 21:241–264 [↑](#footnote-ref-4)
5. National Co-ordinating Centre for Public Engagement,

   <https://www.publicengagement.ac.uk/explore-it/what-public-engagement> [↑](#footnote-ref-5)
6. American Association for the Advancement of Science cafés, <http://sciencecafes.org/for-organizers/> [↑](#footnote-ref-6)
7. Erin L. Navid, Edna F. Einsiedel (2012) *Synthetic biology in the Science Café: what have we learned about public engagement?* Journal of science communication [↑](#footnote-ref-7)
8. Nanoscale Informal Science Education, <http://www.nisenet.org/sites/default/files/HowToHoldAScienceCafe_Guide_May10.pdf> [↑](#footnote-ref-8)
9. Engage2020 Action Catalogue http://actioncatalogue.eu/ [↑](#footnote-ref-9)
10. RRI tools https://www.rri-tools.eu/ [↑](#footnote-ref-10)
11. European Commission. Towards better access to scientific information: Boosting the benefits of public investments in research. COM(2012) 401 final. [↑](#footnote-ref-11)
12. RRI Tools: <https://www.rri-tools.eu/>

    <https://youtu.be/5pxQP1AJPvc> (Public Engagement)

    <https://youtu.be/F13EEdlg7WY> (Open Access)

    <https://youtu.be/ySnAuCQJJCI> (Science Education) [↑](#footnote-ref-12)
13. THOMAS, GEOFFREY and DURANT, JOHN (1987): *Why Should we Promote the Public Understanding of Science?* Scientific Literary Papers: A Journal of Research in Science, Education and Research [↑](#footnote-ref-13)
14. Wilsdon, James and Willis, Rebecca (2004): *See-through Science: Why public engagement needs to move upstream*. London: Demos. [↑](#footnote-ref-14)
15. The Cornell Lab of Ornithology: <http://www.birds.cornell.edu> [↑](#footnote-ref-15)
16. Schiebinger, Londa & Schraudner, Martina (2011), Interdisciplinary Approaches to Achieving Gendered Innovations in Science, Medicine, and Engineering, Interdisciplinary Science Review, Vol. 36, No. 2, 154–67. [↑](#footnote-ref-16)
17. Lesley G. Campbell, Siya Mehtani, Mary E. Dozier, Janice Rinehart (2013) Gender Heterogeneous Working Groups Produce Higher Quality Science [↑](#footnote-ref-17)
18. RRI Tools: <https://www.rri-tools.eu/>, <https://youtu.be/lWz4qqATmbU> [↑](#footnote-ref-18)
19. Munafò, M. R. *et al.* A manifesto for reproducible science. *Nat. Hum. Behav.* **1,** 0021 (2017). [↑](#footnote-ref-19)
20. European Commission <http://ec.europa.eu/programmes/horizon2020/en/h2020-section/ethics> [↑](#footnote-ref-20)
21. RRI Tools <https://www.rri-tools.eu/>

    <https://youtu.be/ptuOvzGk7dg> [↑](#footnote-ref-21)
22. The EnRRICH tool for educators: *(Re-)Designing curricula in higher education from a “Responsible Research and Innovation” perspective* (2016)Valentina Tassone and Hansje Eppink ,Wageningen University [↑](#footnote-ref-22)
23. Marian Deblonde (2015) Responsible research and innovation: building knowledge arenas for glocal sustainability research, Journal of Responsible Innovation, 2:1, 20-38 [↑](#footnote-ref-23)
24. <http://genderedinnovations.stanford.edu/case-studies/urban.html#tabs-2> [↑](#footnote-ref-24)
25. Hayden, D. (2005). What Would A Non-Sexist City Be Like? Speculations on Housing, Urban Design, and Human Work. In Fainstein, S., & Servon, L. (Eds.), Gender and Planning: A Reader, pp. 47-64. New Brunswick: Rutgers University Press. [↑](#footnote-ref-25)
26. <http://www.unwomen.org/en> [↑](#footnote-ref-26)
27. <http://interactive.unwomen.org/multimedia/infographic/changingworldofwork/img/data/unpaidwork.png> [↑](#footnote-ref-27)
28. map: <https://goo.gl/maps/s95YuPMoLzN2> [↑](#footnote-ref-28)
29. <https://genderedinnovations.stanford.edu/case-studies/hiv.html#tabs-2> [↑](#footnote-ref-29)
30. Marchetti, M. & Raudma, T. (Eds). (2010). Stocktaking: 10 Years of “Women in Science” Policy by the European Commission, 1999-2009. Luxembourg: Publications Office of the European Union. [↑](#footnote-ref-30)
31. Rosser, S. (2008) Building Two-Way Streets to Implement Policies that Work for Gender and Science. In Schiebinger, L. (Ed.), Gendered Innovations in Science and Engineering, pp. 182-197. Stanford: Stanford University Press. [↑](#footnote-ref-31)
32. Faulkner, W. (2000). The Power and the Pleasure? A Research Agenda for Making Gender Stick to Engineers. *Science, Technology, and Human Values*, *25 (1),* 87-119 [↑](#footnote-ref-32)
33. Faulkner, W. (2007). Nuts and Bolts and People: Gender-Troubled Engineering Identities. *Social Studies of Science*, *37 (3)*, 331-356. [↑](#footnote-ref-33)
34. Sagebiel, F., Dahmen, J., Davidsson, B., Godfroy-Jenin, A., Rommes, E., Thaler, A., & Urbancikova, N. (2008). *Motivations of Young People for Studying Science, Engineering, and Technology (SET): The Gender Perspective*. Wuppertal: University of Wuppertal Press. [↑](#footnote-ref-34)
35. <http://www.who.int/hiv/en/> [↑](#footnote-ref-35)
36. http://files.unaids.org/en/media/unaids/contentassets/documents/factsheet/2014/20140716\_FactSheet\_en.pdf [↑](#footnote-ref-36)
37. http://www.unaids.org/sites/default/files/media\_asset/global-AIDS-update-2016\_en.pdf [↑](#footnote-ref-37)
38. World Health Organisation (WHO), Malaria site (http://www.who.int/malaria/en/) [↑](#footnote-ref-38)
39. World Health Organisation (WHO), Malaria site: <http://www.who.int/malaria/en/> and <http://www.who.int/malaria/publications/world-malaria-report-2016/WMR-2016-key-points.pdf?ua=1> [↑](#footnote-ref-39)
40. Gender in EU funded research – Toolkit and Training – Module 2, Field 1: Gender and Health (https://yellowwindow.com/genderinresearch/downloads/YW2009\_GenderToolKit\_field1\_Health\_001.pdf) [↑](#footnote-ref-40)
41. Cordis – MALVEBLOK project: http://cordis.europa.eu/project/rcn/90124\_en.html [↑](#footnote-ref-41)
42. Gender in EU funded research – Toolkit and Training – Module 2, Field 1: Gender and Health: <https://yellowwindow.com/genderinresearch/downloads/YW2009_GenderToolKit_field1_Health_001.pdf> [↑](#footnote-ref-42)
43. http://baobab.elet.polimi.it/twoleweb/projects/imrr/ [↑](#footnote-ref-43)
44. http://xake.elet.polimi.it/imrr/ [↑](#footnote-ref-44)
45. European Foundations Award for Responsible Research & Innovation - Youtube video: <https://www.youtube.com/watch?time_continue=59&v=L1ibR7oylQU> [↑](#footnote-ref-45)
46. “KlimaAlltag” website: <http://www.klima-alltag.de/Forschungsansatz.3.0.html> [↑](#footnote-ref-46)
47. EuroStat: “Greenhouse gas emissions by economic activity and by pollutant, EU-28, 2014 (thousand tonnes of CO2 equivalents)”: <http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Greenhouse_gas_emissions_by_economic_activity_and_by_pollutant,_EU-28,_2014_(thousand_tonnes_of_CO2_equivalents)_YB17.png> [↑](#footnote-ref-47)
48. “KlimaAlltag section at the ”Institute for Social-Ecological Research“ (ISOE) website: <http://www.isoe.de/en/projects/completed-projects/energie-und-klimaschutz-im-alltag/klimaalltag/> [↑](#footnote-ref-48)
49. “KlimaAlltag” leaflet: <http://www.klima-alltag.de/uploads/media/Reducing-Carbon-Emissions_Schuldt-Baumgart_Stiess-2014.pdf> [↑](#footnote-ref-49)
50. <http://cordis.europa.eu/result/rcn/165387_en.pdf>

    <http://cordis.europa.eu/result/rcn/165387_en.html> [↑](#footnote-ref-50)
51. <http://cordis.europa.eu/project/rcn/111478_en.html> [↑](#footnote-ref-51)
52. European Centre for Disease Prevention and Control: <http://ecdc.europa.eu/en/healthtopics/vectors/surveillance-invasive-mosquitoes/pages/disease-risk.aspx> [↑](#footnote-ref-52)
53. Mosquito Alert website: <http://www.mosquitoalert.com/en/> [↑](#footnote-ref-53)
54. <http://www.mosquitoalert.com/en/about-mosquitos/biology/> [↑](#footnote-ref-54)
55. CORDIS page on MARLISCO: http://cordis.europa.eu/project/rcn/103611\_en.html [↑](#footnote-ref-55)
56. http://www.marlisco.eu/about-project.en.html [↑](#footnote-ref-56)
57. MARLISCO Twitter: <https://twitter.com/MarliscoProject> [↑](#footnote-ref-57)
58. <http://elearning.trree.org/> [↑](#footnote-ref-58)
59. Rudy, B.J. Kapogiannis, B.G., Lally, M.A., Gray, G.E., Bekker, L., Krogstad, P., & McGowan, I. (2010). Youth-specific considerations in the development of Pre-Exposure Prophylaxis, Microbicide, and Vaccine research trials. Journal of Acquired Immune Deficiency Syndromes, 54(1), S31–S42. [↑](#footnote-ref-59)
60. Nelson, R.M., Lewis, L.L., Struble, K., & Wood, S.F. (2010). Ethical and regulatory considerations for the inclusion of adolescents in HIV biomedical prevention research. Journal of Acquired Immune Deficiency Syndromes, 54(1), S18–S24. [↑](#footnote-ref-60)
61. Wilson, C.M., Wright, P.F., Safrit, J.T., & Rudy, B. (2010). Epidemiology of HIV infection and risk in adolescents and youth. Journal of Acquired Immune Deficiency Syndromes, 54(1), S5–S6. [↑](#footnote-ref-61)
62. Hosek, S.G., & Zimet, G.D. (2010). Behavioural considerations for engaging youth in HIV clinical research. Journal of Acquired Immune Deficiency Syndromes, 54(1), S25–S30. [↑](#footnote-ref-62)
63. World Health Organisation (WHO), Neurological Disorders: Public Health Challenges <http://www.who.int/mental_health/publications/neurological_disorders_ph_challenges/en/> [↑](#footnote-ref-63)
64. <https://www.parkinsons.org.uk/content/patient-and-public-involvement-ppi-your-study> [↑](#footnote-ref-64)
65. <https://www.parkinsons.org.uk/sites/default/files/cs2442_ppi_evaluation_pilot.pdf> [↑](#footnote-ref-65)
66. <http://unsr.jamesanaya.org/docs/countries/2010_report_botswana_en.pdf> [↑](#footnote-ref-66)
67. Ambiact – product description: <http://www.oldntec.eu/wp-content/downloads/ambiact_Hausnotruf.pdf> [↑](#footnote-ref-67)
68. Ambiact website: <http://www.oldntec.eu/en/> [↑](#footnote-ref-68)
69. <http://www.responsible-industry.eu/activities/bu-casestudies-results> [↑](#footnote-ref-69)
70. Project Report: <http://bit.ly/2qD5fb6> [↑](#footnote-ref-70)
71. Marc H.W. Van Mil, Dirk Jan Boerwinkel, Jacobine E. Buizer-Voskamp, Annelies Speksnijder,and Arend Jan Waarlo *Genomics Education in Practice: Evaluation of a Mobile Lab Design,* BIOCHEMISTRY AND MOLECULAR BIOLOGY EDUCATION, Vol. 38, No. 4, pp. 224–229, 2010  
    http://onlinelibrary.wiley.com/doi/10.1002/bmb.20397/epdf [↑](#footnote-ref-71)
72. <http://www.dnalabs.nl/english/> [↑](#footnote-ref-72)
73. <http://grasia.fdi.ucm.es/hackwithpeople/> [↑](#footnote-ref-73)