D6.1: Report on the mapping of EU-funded projects and networks

[WP6 – **Horizontal cooperation with other projects and networks**]

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Abstract

In this deliverable, we report on the results of irecs task 6.1. The aim of this task has been to identify EU-funded projects, both past and ongoing, as well as networks, that address issues related to research ethics and research integrity and map their relationship to irecs. The report includes the publicly available relevant results (deliverables, tools or other documents) of the selected projects and networks that provide input regarding guidelines, codes of conduct, recommendations, training material, competence profiles, and ethical /comparative analysis. These relevant results are considered to be useful for the next steps of irecs, and, in particular, in the mapping of existing needs raised by new technologies and their consequent impact on the research ethics processes, as well as in the development of training material for research ethics communities. This mapping will, also, provide the basis for developing synergies and establishing the irecs research ethics cluster, while aligning irecs to existing initiatives.

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Information in this report that may influence other tasks within the project

Linked task	Points of relevance
Task 2.1	Selection of technologies, ethical and legal analysis
Task 2.2	Ethical analysis, recommendations
Task 2.3	Ethical analysis, recommendations
Task 2.4	Ethical analysis, recommendations, ethics review processes
Task 4.1	Training material, competence profiles, analyses of research cultures
Task 4.2	Training material, competence profiles, analyses of research cultures
Task 4.3	Training material, competence profiles, analyses of research cultures
Task 5.1	Training material, competence profiles, analyses of research cultures
Task 5.2	Training material, competence profiles, analyses of research cultures
Task 6.2 (and task 3.2)	Creation of cluster

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Executive summary

In this deliverable, we report on the results of irecs task 6.1 "*Identify and map relevant EU-funded projects and networks*", as part of WP6 "*Horizontal cooperation with other projects and networks*". The aim of this task has been to identify EU-funded projects, both past and ongoing, as well as networks, that address issues related to research ethics and research integrity and map their relationship to irecs. The report includes the publicly available relevant results (deliverables, tools or other documents) of 29 projects and 4 networks that provide input regarding guidelines, codes of conduct, recommendations, training material, competence profiles, and ethical /comparative analysis. These relevant results are considered to be useful for the next steps of irecs, and, in particular, in the mapping of existing needs raised by new technologies and their consequent impact on the research ethics processes, as well as in the development of training material for research ethics communities. This mapping will, also, provide the basis for developing synergies and establishing the irecs research ethics cluster, while aligning irecs to existing initiatives. In that sense, the information aggregated in this report will provide input for the three major phases of irecs (analysis, development, implementation).

The report includes a comprehensive review of the selected projects and networks, as well as two tables (one for the projects and one for the networks) with the results of the scanning/mapping "at a glance". It can be used as a "guide" for creating a thorough overview of the projects, networks and initiatives in Europe focusing on the ethical challenges of new/emerging technologies, as well as the needs and gaps on the ethics review systems and processes. The input provided can be helpful for the partners involved in other work packages and tasks of irecs, as well as other readers/researchers who are interested in an aggregated type of information regarding work conducted within projects and networks focusing on research ethics and research integrity issues, and want to have a broader overview.

List of acronyms/abbreviations

Abbreviation	Explanation
AI	Artificial Intelligence
DoA	Description of Action
ECoC	The European Code of Conduct for Research Integrity
ERI	Ethics and Research Integrity
FAIR	Findability, Accessibility, Interoperability, and Reusability
GDPR	General Data Protection Regulation
ICT	Information and communication technology
PMT	Predictive Modeling Tool
RCR	Responsible Conduct of Research
RE	Research Ethics
REC	Research Ethics Committee
RI	Research Integrity
RIO	Research Integrity Office
RFO	Research Funding Organisation
RPO	Research Performing Organisation
RRI	Responsible Research and Innovation
S&T	Science & Technology
WP	Work Package

Table 1: List of acronyms/ abbreviations

1. Introduction

The Horizon Europe project irecs (**i**mproving **R**esearch **E**thics Expertise and **C**ompetencies to Ensure Reliability and Trust in **S**cience) is based on the foundational assumption that ethical research is key to high quality research and a prerequisite for achieving public trust and innovation in Europe and beyond. More particularly, the project is based on the following acceptances: the research ethics process is facing increasing challenges at a global level as new technologies present challenges to ethics reviewers who may be unskilled in the relevant fields; increased internationalisation of research has led to fears of ethics dumping; and there is a lack of standardisation across Europe and the world. Given the impact of research on society, in terms of potential to generate innovative solutions to problems, and yet with the associated risk of harm, rigorous ethical research conduct is essential to ensure public trust in the scientific endeavour. irecs will address these problems in four ways: First, it will scan and map existing needs raised by new technologies in European and global research ethics communities. Second, it will produce and implement training materials for European and global audiences in research ethics communities. Third, it will conduct and permanently establish training programmes. Fourth, it will propose adaptations to the research ethics process in Europe.

irecs consists of three phases (analysis, development, implementation) and a sustainability and impact strategy. The analysis phase considers challenges to ethics review processes arising from new technologies and relating to international issues (e.g. ethics dumping, bilateral technology research). Scanning and mapping of ethics and legal issues will feed into later phases through highlighting challenges and methods to best address these challenges as described by stakeholders. The development phase will create multi-tool training materials and awareness actions for the target audience of research ethics experts, (early career) researchers and students. This phase will also lead to proposals for the adaptation of ethics review processes across Europe and globally. The implementation phase involves three pilot universities at which the trainings and awareness actions will be trialled and evaluated on an

ongoing basis, providing iterative feedback and allowing for improvements to be made. The three phases and the strategy are underpinned by stakeholder engagement and cooperation with Horizon2020 and Horizon Europe projects and networks of bodies associated with research ethics, as well as international interaction.

1.1 About D6.1

In this deliverable, we report on the results of irecs task 6.1 "*Identify and map relevant EU-funded projects and networks*", as part of WP6 "*Horizontal cooperation with other projects and networks*". The aim of this task has been to identify EU-funded projects, both past and ongoing, as well as networks, that address issues related to research ethics and research integrity and map their relationship to irecs. The work conducted within task 6.1 will contribute to the assessment and prioritisation of potential synergies and reinforce impact.

The report includes the publicly available relevant results (deliverables, tools or other documents) of the selected projects and networks that provide input regarding guidelines, codes of conduct, recommendations, training material, competence profiles, and ethical /comparative analysis. These relevant results are considered to be useful for the next steps of irecs, and, in particular, in the mapping of existing needs raised by new technologies and their consequent impact on the research ethics processes, as well as in the development of training material for research ethics communities. This mapping will, also, provide the basis for developing synergies and establishing the irecs research ethics cluster, while aligning irecs to existing initiatives. In that sense, the information aggregated in this report will provide input for the three major phases of irecs (analysis, development, implementation).

1.2 Method

Projects and networks were selected based on their focus on research ethics and research integrity, with priority given to those which particularly focus on new and emerging technologies. Some of the scanned projects were already defined in the call text such as

SIENNA, PANELFIT, SHERPA, ENERI, TRUST, SOPs4RI, VIRT2UE, TechEthos, HYBRIDA and ROSiE. The rest of the projects and networks included in the list have been pinpointed by the irecs partners involved in task 6.1, based on their past and ongoing involvement in other relevant projects, as well as on their participation in cluster and stakeholder engagement activities initiated by other projects and networks which focus on research ethics and research integrity issues. The selected projects and networks will, also, be the first invitees to the irecs research ethics cluster, the formulation and planning of which is reported in D6.2 as part of the horizontal cooperation activities.

Projects that are still running and have already publicly available results on their website were scanned as well as projects that were closed in the timeframe from 2018-2022. We found 29 relevant EU-funded RE and RI projects, as well as 4 networks, and scanned all of them. The relevant projects had to be scanned in terms of their relevance to the work irecs wants to do in the different WPs and tasks, taking into consideration, also, the potentiality of creating synergies and developing cooperation activities. Therefore, we searched specifically for deliverables, tools and policy briefs that give information on one of the following topics:

- Guidelines
- Codes of conduct
- Ethical analysis of emerging technology research (relevant for irecs WP2 ans WP4)
- Training material (including the use of scenarios and case studies (relevant for irecs task T2.1 and WP4)
- Competence profiles (relevant for irecs WP4 and WP5)
- Recommendations on ethics assessment (relevant for irecs WP2 and WP4)
- Other tools
- Project results on the role of Research Ethics Committees (RECs) and other ethics bodies within research with emerging technologies (relevant for irecs task WP2 and WP4)

- Projects results on the need for a revision of the European Code of Conduct (EcoC[1]) and/or other RI information that could be helpful for the development of a code of conduct.
- Reported engagement activities with different types of stakeholders, which can provide a source of potential members for the irecs research ethics cluster.

1.2 Scope

The initial compilation of the list of projects and networks to be reviewed did not focus on particular technologies, but took into consideration the scope of ethical analysis and the identification of ethical challenges, as well as the development of training material, which the selected projects and networks have been conducting. However, in parallel with the works of task 6.1., we had the progress of irecs task 2.1 "*Scoping, screening and mapping data*" with the aim to narrow down the area of irecs focus and to select specific technologies. After different types of research/analysis and reflection, including an online survey, the selected technologies/areas of focus for irecs were concluded to be the following:

- AI in healthcare and healthcare applications
- Extended Reality (in general)
- Gene-editing, including human and non-human applications
- Biobanking

Following the selection of the four technologies/areas of focus, the list of the projects and networks that were reviewed for the purposes of task 6.1 was slightly expanded in order to

[1] ALLEA (2017) *The European Code of Conduct for Research Integrity. Revised Edition.* Available at:https://www.allea.org/wp-content/uploads/2017/05/ALLEA-European-Code-of-Conduct-for-Research-Integrity-2017.pdf (Accessed 03/04/2023)

include a few more projects focusing on the four selected technologies/areas of focus. It was decided that the list should continue to include those projects and networks as well that focus on other technologies, as the work conducted by these projects and networks is still relevant and useful for irecs in a broader sense, providing input on methods of ethical analysis, recommendations, guidelines and training material. Moreover, a list of available trainings for ethics reviewers has been included herein, as it was considered as contributing to the completeness of this report and it will also be useful for the development of the irecs training material.

Furthermore, as it has already been mentioned, the list of projects scanned offers the basis for the development of the irecs research ethics cluster. The purpose and, consequently, the vision of this cluster is dual:

1. An internal, irecs-focused purpose: to aggregate the experiences from the partners of the involved projects regarding the production of outputs and the conduct of activities within these projects, as well as from other experts, networks and initiatives which will be invited as both the project and the cluster mature. This compilation of experiences and lessons learned from past and ongoing initiatives will provide irecs with fruitful input, useful throughout the three phases of the project. The aim of the irecs cluster is to keep raising the number of projects and people involved by inviting additional participants, taking also into consideration the thematic focus of the meetings and any emerging needs deriving from the work of other irecs work packages. Although other projects focussed on analysing the respective technologies and their challenges, irecs concentrates on the research ethics perspective. For this reason, irecs benefits from the findings and analyses of the other projects and can then expand them to include a research ethics perspective. To that aim, the collaboration with the Asian and the African irecs partners will also be utilised.
2. An external, irecs' outreach-focused vision: to be established as a "cluster of clusters", serving as a forum for similar initiatives, a meeting or connecting point of past, on-

going and future projects which share the same or similar purposes and are concerned with the challenges of sustainability and valorisation of the projects' results and outputs in the long run. The issues of sustainability and valorisation of the manifold work conducted within the projects, during the lifetime of the projects and after their completion, is a recurring concern and point of contemplation for all stakeholders involved in the related cluster activities. The irecs research ethics cluster has the ambition to propose a meaningful and pragmatic strategy for the fulfilment of this purpose. This strategy will be one of the core results of the interaction within the irecs cluster activities. In addition, irecs uses the insights from these cluster meetings to integrate them into the training materials. To ensure that the materials have a lasting impact even after the end of the project, they will be implemented both in the ENERI Classroom and in the Embassy of Good Science. Irecs also benefits from the ENERI e-community, to whom the results of the project and the materials are passed on and thus disseminated.

2. Scan results: projects

This chapter includes a comprehensive overview of the results of the 29 projects that were scanned and reviewed by the irecs partners involved in task 6.1. The projects are listed in alphabetical order.

2.1 B1MG

The Beyond 1 Million Genomes (B1MG) project is helping to create a network of genetic and clinical data across Europe. The project provides coordination and support to the 1+ Million Genomes Initiative (1+MG). This initiative is a commitment of 24 EU countries, the UK and Norway to give cross-border access to one million sequenced genomes by 2022. B1MG will go 'beyond' the 1+MG Initiative by creating long-term means of sharing data beyond 2022, and enabling access to beyond 1 million genomes.

The following deliverables can be considered as relevant to the purposes of irecs:

- D2.1 “Policy document for a genome data sharing initiative (due in May 2023).
- D2.3 “Report on legal set-up including DPIA” (due in May 2023).
- D2.4 “Report on data access and governance framework” (due in May 2023).
- D3.7 “Documented best practices in sharing and linking phenotypic and genetic data”: This is a publication of an iterative document on available best practices in sharing and linking phenotypic and genetic data.
- D5.2 “Roadmap and guidance tool for countries” (due in May 2023).
- D6.8 “Policy briefs”, which include a mapping of programmes and initiatives relevant to the 1+MG initiative.

2.2 ENERI

The ENERI decision tree (https://eneri.eu/decision-tree/) is an online tool intended to help researchers, members of research ethics committees (RECs) and research integrity officers (RIOs) to think about ethical questions and challenges that might arise before, during or after a research project. This tool aims to facilitate responsible conduct of research throughout all phases of the research process, and it can be relevant for both researchers that are totally new in the field and researchers that already have some ethical knowledge and an awareness of the ethical considerations. Moreover, it seeks to support the work of RECs and RIOs by providing guidance on how to respond to research ethics and research integrity challenges. ENERI decision tree provides not only the most important ethical questions and aspects to consider, but also the relevant codes, guidelines, policy papers and other literature.

The structural elements of the ENERI decision tree (e.g., distinguishing ethical issues into different phases of research) could be considered when analyzing ethics issues related to new technologies (irecs task 2.2) international challenges (irecs task 2.3), ethics process and producing the proposal for their adaptation (irecs task 2.4). (The ENERI decision tree is already mentioned in the DoA next to the irecs task 2.4 bearing in mind that the results of this task

will have to feed the decision tree). The format of ENERI decision tree (perhaps with more visual aids and interactive elements) could also be considered for irecs training (WP4).

The ENERI Classroom (https://eneri.eu/eneri-classroom/) is an online training and capacity-building platform for research integrity and ethics. The Classroom provides open access to training materials for new and experienced research integrity and research ethics experts, such as members of research integrity offices and research ethics committees. Most training materials (core parts of the learning pathways are based on case studies) are suitable for online self-learning as well as online or onsite group-learning guided by a facilitator. The ENERI Classroom addresses four main topics: research integrity, research ethics, overlapping issues and developing infrastructures.

Since according to DoA irecs training should enlarge the ENERI classroom, it may again be important to pay attention to the structural elements of the classroom. In terms of irecs-related content for analysis and training, some sections can be reviewed more thoroughly like "research ethics committees: main tasks and challenges", "Biobanks", "Ethical review in non-medical fields", "Conflict of interest", "Data protection".

"**Criteria for expertise in research ethics and research integrity"** (https://eneri.eu/criteria-for-expertise-in-reri/) might also be relevant for irecs training, as this deliverable developed indicators that are widely accepted in the heterogeneous field of research ethics and integrity which represent expertise in these two areas.

The ENERI E-community (https://eneri.eu/e-community/) is a database integrated in SINAPSE, a free public service of the European Commission. The e-Community should be used to invite experts to contribute to irecs project though participation in surveys (irecs task 2.4), to disseminate training and other project updates and results, to expand ENERI e-community with the young researchers aspiring to become experts (irecs tasks 5.4 and 7.3).

2.3 ENTIRE

The goal of the ENTIRE project was the development of a wikibased platform. The Embassy of Good Science (https://embassy.science/wiki/Main_Page) has been created as a platform to gather information about content of responsible conduct of research; initiatives and training materials. Content on this platform is publicly available. As described in the DoA, irecs will also use the Embassy as a platform to publicise training, and make materials accessible to anyone interested.

2.4 EUSTANDS4PM

EUSTANDS4PM aims at the creation of a European standardization framework for data integration and data driven in silico models for personalised medicine.

D3.1 "legal and ethical review of in silico modelling" is relevant for irecs as it includes surveys on the ethical and legal landscape for health data integration with a focus on informed consent and consent under GDPR as well as patients' rights. It focuses more on personalised medicine, but could still be relevant for irecs, especially for the selected new technologies of biobanking and genome editing.

D3.2 "Harmonization and integration of big data of relevance for personalized medicine into in silico modelling? – Recommendations for technically feasible, and ethico-legal sustainable avenues" is relevant for irecs as it explores solutions to the analysed ethical challenges from D3.1 with and without adaptations of EU law, is the logical conclusion of D3.1. If D3.1 is relevant, D3.2 is also (as well as the updated version available in D3.3).

2.5 GEST

The project revolved around the ethical debates that inform the policy decisions that drive innovation in the European Union as well as China and India, the two biggest emerging economies It included a collaboration among key S&T policy advisory institutes in China,

Europe and India, focusing on effectively incorporating ethics into S&T policy and developed a roadmap for global policies governing ethics in science and technology. The scientific focus was on interdependent developments in nanotechnologies, food technologies and synthetic biology. Researchers explored the social determinants of policymaking in the three regions with respect to perceived risks and benefits and public stances on morality. GEST also delivered an Ethical Framework Analytic Tool for analysing S&T debates within the context of ethics that can be equally well applied in all three regions. The tool was tested on governance of the three scientific areas, to identify areas of similarities and differences, individual strengths and weaknesses.

In terms of the irecs needs, GEST offers insights in analysing and comparing ethics at a global level. Of particular interest are:

- D1.1 "State of EU Debate" which provides an overview of the dominant values system governing S&T in Europe, along with an analysis of the ethics advisory structures in main European countries and lay/civil society participation in decision making.
- D1.2 "State of Debate in the Three Regions" which provides an overview of values systems in EU, China and India, along with analysis of advisory, decision making structures and public participation in S&T ethics.
- The book S&T Governance and Ethics (https://link.springer.com/book/10.1007/978-3-319-14693-5), which includes the main results of the project. Relevant chapters deal with comparisons of values, institutionalisation of ethics in decision making structures, public perceptions of S&T, and public engagement. Relevant might also be the suggested methodology for ethics comparisons at global level.

2.6 GRIPP

The GRRIP project was dedicated to promoting Responsible Research and Innovation (RRI) practices in the marine and maritime sector. Part of this effort included the development of training materials on RRI. As ethics is one of the pillars of RRI, this material could be of

relevance to irecs; however, the corresponding deliverables do not seem to be directly applicable to irecs.

The possibly relevant project deliverables are the following:

- D4.3 "Stakeholder engagement workshop methods and training materials", which provides training material on RRI. While useful in general, this material does not seem to be directly applicable to irecs: its main objective is to introduce RRI and co-creation practices.
- D6.1 "Action plans", which offers a template Action Plan to support the research performing/ research funding organizations in their planning, implementation, and monitoring of RRI interventions. This template suggests a few high- level interventions to cater for the ethics pillar but offers no specific support in implementing them.

2.7 HealthyCloud

The objective of HealthyCloud is to generate a number of guidelines, recommendations and specifications that will enable distributed health research across Europe in the form of a Ready-to-implement Roadmap. The guidelines aim to the establishment of an ethically sound and legal compliant health data research ecosystem. This roadmap together with the feedback gathered from a broad range of stakeholders will be the basis to produce the final HealthyCloud Strategic Agenda for the European Health Research and Innovation Cloud (HRIC). The HealthyCloud Roadmap includes the specifications for a FAIR health data portal with a meta-catalogue. The meta-catalogue definition will serve to capture and present relevant health and health-related resources available across different data hubs in Europe.

Relevant to irecs purposes are the following deliverables:

- D2.1 "First draft on legal framework for technical safeguards with a focus on cloud usage Version 0.3" which focuses on identifying legal requirements for privacy and security safeguards that apply while sharing health data for research through a FAIR Data Portal, with a focus on the use of cloud services. The document contains:

- Review of the applicable GDPR principles that must be respected across the data
- Lifecycle
- Discussion of the importance of data security in cloud environments
- Best practices examples of data governance and security frameworks for the cloud
- List of basic data security requirements including those to be applied while using cloud services.

- D2.2 "Framework of modular contract clauses for HRICs" which provides a list of modular contractual clauses that can be integrated into data sharing agreements that support the implementation of a Healthy Research and Innovation Cloud (HRIC) in the EU.
- D3.1 "Landscape analysis of FAIRness levels of health-related data using catalogue matrix" which contains a landscape analysis and collection of information about the data aspects of the available health data infrastructures and their adherence to the FAIR principles. It presents the administrative information about each data infrastructure, information about the data they provide, such as the level of aggregation, whether it is anonymised or pseudonymised, about data quality aspects, coverage and standards used to structure the data and regarding the compliance with the FAIR principles. At the same time it provides a publication for reproducing the FAIRness evaluation and the general analysis of the data infrastructures performed during this project. This HealthyCloud FAIRness self-assessment tool is a 2-in-1 tool allowing the publication of the HealthyCloud FAIRness evaluation survey and the production of a report including pie charts demonstrating the percentage scores for each FAIR principle as well as an overall score of the data infrastructures. (see, also, the related publication "HealthyCloud FAIRness self-assessment" https://zenodo.org/record/7038397#.ZCgBRHZByUl).
- D4.1 "Recommendations for integration in HealthyCloud, including an analysis of data hub patterns of governance" which aims to capture the different governance and auditing models behind data hubs across Europe managing health data to analyse the

existing regional and national initiatives, as well as European projects related to domain-specific data hubs. It contains an analysis of the survey responses, through the stratification of the results. As results of this deliverable, patterns of data hub governance are represented. Finally, the document provides recommendations for integration in HealthyCloud.

- D5.2 "Analysis of existing orchestration mechanisms for distributed computational analyses including a general overview to facilitate new developments" which aims at surveying the existing orchestration mechanisms, e.g workflows managers, that enable distributed data-centric analysis for health research. The task has performed a general revision of the different aspects in distributed health applications, such as data and computation distribution, management of sensitive data, and how are they approached in the orchestration mechanisms. An important aspect that has also been considered in the task is how to handle properly data provenance as data transformation is an essential part of analysis reproducibility.
- D6.1 "Expected users' interactions" as part of HealthyCloud's WP6 which is focused on defining the reference architecture for a FAIR health data portal. This portal is conceived as an access gateway for existing resources and a place for providing references to different users. The first step to reach this goal is to define the different user profiles that will interact with the portal. This deliverable seeks to define the needs and objectives of the user profiles in order to later on detect the functionalities that the portal should have based on their needs. This effort will support the designing of the reference architecture for the FAIR health data portal. Such a portal is aimed at facilitating the interoperability of existing resources by defining the minimal information needed to interconnect them.
- D7.1-2 "Functional requirement analysis report of A trial Fibrillation Use Case Version 0.1" which presents a use case that allows a more early and precise atrial fibrillation diagnosis as well as a better personalised treatment for each patient. The use case presents how this work will help to have a better understanding of the complex cardiac

structure and remodelling taking advantages of combining features of different modalities in an integrative hierarchical model. Apart from the clinical part, the project identifies all the issues that need to be dealt with from the initial stage of the study until it reaches the technical part, starting from the discovery of potential data and fulfilment of the requirements for the ethical and legal regulations, up to the harmonization of the data from the different cohorts and creation of the models.

2.8 HYBRIDA

The project HYBRIDA (*Embedding a comprehensive ethical dimension to organoid-based research and related technologies*) has as its main objective is to develop a comprehensive regulatory framework for organoid research and organoid-related technologies. The project will provide operational guidelines for the field, a Code of Responsible Conduct for researchers, enhancement of existing ethics and normative frameworks, and a supplement to the ECoC.

The following deliverables can provide useful input to irecs, particularly regarding the selected technologies/areas of focus of gene editing and biobanking:

- D3.1 “Map report of Normative, Research Ethics and Research Integrity frameworks”.
- D3.2 “Comparative analysis”.
- D4.3 “Public attitudes, understandings and perspectives on organoid research”.
- D5.1“Operational guidelines for the field of organoids and organoid-related technologies” (the final version of the guidelines will be available at the end of the project in January 2024).
- D6.1 “Regulating organoid and organoid-related activities: An analysis of the regulatory gaps and areas of over-regulation”.

2.9 INTEGRITY

The Horizon 2020 Integrity project aims to empower students and early career researchers through education for Responsible Conduct of Research (RCR). It does so in an evidence-based

way, and by using a scaffolded approach. This means that education for RCR will be tailored 1) to their educational level and discipline, and 2) to the specific needs that student groups may have to enable them to responsibly navigate issues of research integrity – current and new (i.e. in a way that is 'future proof').

Relevant deliverables are available at The Embassy of Good science, Deliverables - INTEGRITY / Repository - The Embassy of Good Science

D3.1 Manuscript with literature review

Katsarov, J., Andorno, R., Krom, A., & van den Hoven, M. (2022). Effective strategies for research integrity training—a meta-analysis. Educational Psychology Review, 34(2), 935-955. Effective Strategies for Research Integrity Training—a Meta-analysis | SpringerLink

This article reviews educational efforts to promote a responsible conduct of research (RCR) [..] this review aimed to test eleven hypotheses on effective training strategies. The achievement of different learning outcomes was analyzed independently using moderator analysis and meta-regression, whereby 75 effect sizes from 30 studies were considered. The analysis shows that the achievement of different learning outcomes ought to be investigated separately. The attainment of knowledge strongly benefited from individualized learning, as well as from the discussion and practical application of ethical standards. Contrarily, not covering ethical standards tended to be a feature of successful courses, when looking at other learning outcomes. Overall, experiential learning approaches where learners were emotionally involved in thinking about how to deal with problems were most effective. Primarily intellectual deliberation about ethical problems, often considered the "gold standard" of ethics education, was significantly less effective. Several findings from previous reviews, e.g., the preferability of mono-disciplinary groups, could not be replicated with multivariate analysis. Several avenues for future research efforts are suggested to advance knowledge on the effectiveness of research integrity training.'

This deliverable can be useful for irecs to understand what learning outcomes to focus on, to decide what is most effective. In analogy of RI training, RE trainings could use a similar model/method.

D3.3 Process for developing a checklist to assess education for the Responsible Conduct of Research

D3.4a Report on developing a Quality Checklist for RCR education (prototype tool)

D3.4b Quality Checklist for Responsible Conduct of Research (RCR) Education

Krom, A., & van den Hoven, M. (2022). A quality checklist for responsible conduct of research (RCR) education: A proposal to complement the predictive modeling tool. Accountability in Research, 29(1), 26-44.

Full article: A Quality Checklist for Responsible Conduct of Research (RCR) Education: A proposal to complement the Predictive Modeling Tool (tandfonline.com)

This article presents a Quality Checklist for Responsible Conduct of Research (RCR) education. The Checklist is a tool for teachers and educational developers in RCR education containing the results of eleven reviews on the impact of RCR education. It makes these data accessible in a layered way, such that users can quickly find the information that they are interested in. The tool can complement the Predictive Modeling Tool, which allows users to fill out information about a course and provides recommendations on how the course's efficacy can be improved. We present our approach to developing the Quality Checklist prototype tool, the tool itself and how it can be used. We compare it to the PMT and discuss the added value of the Quality Checklist prototype tool, as well as its limitations. Finally, we indicate some of the ways in which the prototype tool could be further improved.'

The (development of the) quality checklist could provide some useful information about how to improve efficacy of training. However, it is mainly focused on responsible conduct of research in a broad sense, not on research ethics.

D4.1 Standard

This deliverable describes the teaching philosophy and development of building a competency profile for INTEGRITY.

'The aim of the task is to develop a document that can function as a standard for the consortium partners during the lifetime of the project and has the ambition to function outside of the consortium as a guiding tool to help design and develop tailor-made educational tools in RCR education.

Drawing on results from previous WPs, this D defines a standard identifying the relevant aspects that shape the teaching philosophy of RCR. This standard includes a competence profile that distinguishes learning aims in different phases of study (high school, undergraduate phase and early career researchers) and offers a taxonomy of topics that are relevant and meaningful for each phase. The framework covers a wide range of research areas (including often-neglected fields), clarifies where innovative tools are most urgently needed, and identifies fields.

The framework will also distinguish the relevant phases of the educational 'journey'. In addition, it gives insight into the views and expectations that students have with regards to education in research integrity and highlights the (knowledge) deficiencies they experience. The competence profile establishes how high standards of attention to research integrity can be stimulated amongst students.

The competence profile (4.1a) and the taxonomy (4.1b) are appendices to this deliverable. First, the various concepts that are used to develop a standard are described, and how insights from the literature have helped to determine characteristics of concepts like RCR and empowerment education. Next, Delphi method is described as tool for input from our consortium partners to arrive at a competence profile.'

Deliverable 4.1 is relevant to irecs; it describes the development of the competence profile for this project. It also clarifies some crucial concepts in developing educational materials; the

development of a particular view and teaching philosophy of empowerment is described, as well as the development of a competence profile.

The INTEGRITY project developed several **tools** relevant for different target groups:

- Diner Pensant - H2020 INTEGRITY
- Tools for Phd Students - H2020 INTEGRITY
- Tools for Researchers and Supervisors - H2020 INTEGRITY
- Integrity Games - H2020 INTEGRITY
- Teachers Guide for Secondary School - H2020 INTEGRITY

The INTEGRITY project also developed courses related to specific topics, and targeted at different target groups; high school students; early career researchers and supervisors.
TRAININGS and COURSES - INTEGRITY / Repository - The Embassy of Good Science

- For PhD students
  - A MOOC for PhD researchers Coursera MOOC - H2020 INTEGRITY

    3 SPOCs:
  - Responsible research through supervision, mentoring and working together - H2020 INTEGRITY
  - Data in responsible conduct of research - H2020 INTEGRITY
  - Integrity in academic publication: authorship and peer review - H2020 INTEGRITY
- A SPOC for **supervisors** Supervisor SPOC - H2020 INTEGRITY

2.10 INTERVENE

INTERVENE is an international consortium that seeks to advance AI-facilitated analyses of complex medical data to develop genetic risk scores for improved understanding of diseases and treatment options tailored to individuals. Utilising unique data resources of genomic and other health information in international large-scale, multi-ethnic biobank projects,

INTERVENE seeks to test and produce risk scores with improved predictive value for complex and rare diseases, applicability for disease screening, and comprehensibility for clinicians and citizens. The risk scores are developed using sophisticated computational algorithms that condense information from genetic variants and other health data into a number that reflects a person's inherited susceptibility toward a disease.

INTERVENE has begun testing existing and developing novel algorithms for polygenic score calculation and comparison across different biobanks. Specifically, they have devised a pipeline to compare seven methods for genetic score generation and are currently testing this pipeline across four INTERVENE biobanks. These results will inform downstream methods development and analytical applications. In parallel, INTERVENE has developed novel and scalable software to generate synthetic genomic data. The project has generated pilot synthetic data for 50,000 individuals, which has been used by the Data Coordination Centre to test data security processes. Finally, they have started to apply algorithms for polygenic score calculation to 39 priority diseases with significant burden on the European healthcare system. The synthetic data and developed polygenic scores will also be used as source material for a competition between method developers that is hosted by the INTERVENE IGS4EU platform providing automated genetic score calculation and interpretation for the research community and other end users.

To assess the utility of polygenic scores in clinical practice, INTERVENE will carry out two clinical multi-year studies. The aim is to determine to what extent awareness of one's genetic risk can catalyse behavioural change. One will explore the health impact of awareness of high polygenic risk for heart disease among young overweight Estonian adults. Another study will explore the impact of polygenic risk on breast cancer stage and prognosis in newly diagnosed patients in Italy and Finland and pilot a procedure for risk-score-based genetic counselling of relatives of breast cancer patients. Study protocols have been developed for ethical review and approval, and the first study participants were recruited in early 2022.

Application of sophisticated tools and methodologies to the vast collections of biological and health data in biobanks can help us understand how our genetic makeup, together with

lifestyle choices and environmental factors can make us prone or resistant to the development of disease. Over the coming years, INTERVENE will spearhead the development of risk scores that integrate genomic information, health records, and other data types to drastically increase the predictive value, interpretability, and diagnostic capacity of risk scores over the current state-of-the-art.

The harmonization of data from over 1.7 million individuals in INTERVENE's network of biobanks will, for the first time, provide a critical sample size to powerfully train these scores. It will also extend the predictive ability to include underexplored dimensions of risk prediction, such as risk over time, risk subgroups (such as those dependent on ethic or social status) or overall disease prognosis. INTERVENE's open-source IGS4EU platform will set new standard methods for integrative genetic prediction and allow other scientists to continuously refine and perfect risk scores across multiple diseases for societal benefit.

The ultimate goal of INTERVENE is harness the power of AI and large-scale health data to enable clinical decision making and better treatment options informed by the genetic makeup of patients, thereby relieving the economic pressure on health care systems, and empowering persons at risk for developing a disease to proactively take measures to reduce the risk of getting sick.

2.11 PANELFIT

PANELFIT Guidelines (https://guidelines.panelfit.eu/) aims at serving as a handbook for information and communication technology (ICT) researchers and developers to help them understand the ethical and legal issues of data protection when developing or deploying ICT systems. Although the Guidelines are mostly focused on explaining the regulatory framework, some elements of these Guidelines (like the analysis of AI technology) may contribute to part of the irecs analysis in WP2.

PANELFIT Critical Analysis (not yet publicly available) is intended to describe the ethical and legal issues (mostly related to data protection) that have not been addressed adequately by the regulatory framework and suggest regulatory measures to improve the current situation. In terms of irecs-related content for analysis and training, some sections can be reviewed more thoroughly like “AI and security” or “AI for predictive policing”.

PANELFIT Governance Report (not yet publicly available) analyses the governance of data protection in ICT research and innovation in the EU. In particular, the report takes a close look at ethical and legal issues that potentially decrease governance effectiveness and pose data protection risks. For the irecs project (perhaps mostly for the analysis and training parts), it may be relevant to take into account what challenges RECs and researchers make deal with when it comes to data protection in ICT research and innovation (e.g., the report identifies the issue of the unclear role of RECs in data protection, and challenges arising from the interaction of data protection bodies and RECs, it also emphasises the non-equivalent stringency of ethics reviews in health and non-health contexts and the lack of awareness among researchers for data protection requirements.

2.12 PATH2INTEGRITY

The following deliverables can be considered relevant for the irecs purposes:

- D2.2 “Path2Integrity Campaign” is relevant as it provided an overview over different target groups and their involvement in research and campaign materials that could be interesting.
- D3.1 “Path2integrity Roadmap” is relevant for irecs as it lists comics and films on research integrity and research ethics.
- D3.2 “Handbooks” contains the handbooks for the trainers and learners, and it could be relevant for the irecs development of training materials.

- D4.2 "Training Curricula" lists theoretical underpinning for the training programme as well as reflections on the contents and structure of the curriculum developed by path2integrity. This could be helpful for developing irecs training materials.

2.13 POIESIS

POIESIS strives to tackle societal mistrust in science by understanding how, and to what extent, societal trust in science, research, and innovation is affected by the aligning of research practices with principles of research integrity and by the integration of citizens and societal stakeholders in different phases of the research cycle. The project will concentrate on three core concepts: integrity, integration, and trust. It will examine the interrelatedness of these concepts as well as the conditioning of these interrelations by institutions. The conceptual model, which is called the 'integrity, integration, and institutions for trust' (3i4t) model, is graphically presented below. POIESIS considers integrity and integration as broad concepts facilitated by institutions, which through chains of mediation affect public trust in science. The project started in September 2022 and, hence, there are no publicly available results yet.

2.14 PREPARED

The overall goal of the PREPARED project is to develop an operational ethics and integrity framework, which safeguards key ethical values, supports a rapid and effective research response to crises and improves overall pandemic preparedness. The project is underscored by three pillars:

- **Recognise the broader perspective of a crisis**

  Global crises affect all aspects of humanity. We therefore cannot ignore human, social, economic and political contexts in our research ethics and integrity framework. A crisis reaching all of humanity needs everyone to tackle it.

- **Motivate to action with values**

  Rules alone do not motivate to action, but values do, which is why we develop a values-based framework for global crises.

- **Keep values understandable**

  Clear and simple values in an organization are proven to improve the motivation for ethical conduct at work, which is why we aim to align our framework with common sense moral values.

The project started in September 2022 and, hence, there are no publicly available results yet.

2.15 PRINTEGER

The PRINTEGER project was dedicated to promoting research integrity by focusing on its organisational aspects. The project included a didactic component and developed an educational tool for ethical training and reflection. Research integrity is a topic of interest within irecs, so (educational) material developed by PRINTEGER could be of use. Note that PRINTEGER emphasises that research integrity is not a purely individual matter; this approach can be instructive for irecs and research ethics too. Nevertheless, irecs has strong links to research integrity communities and expertise (via its consortium members, advisory board, and extended network) which may constitute the PRINTEGER project and network of low priority.

The following deliverables can be considered relevant for irecs:

- A web-based virtual learning environment which is an educational tool for early career researchers. The interactive version of the tool includes online discussions and polls and must be hosted on a server. The training materials (video, etc.) can be viewed via a static version at the project's website. The tool is available to view and download at: https://printeger.eu/upright/ .
- The Bonn PRINTEGER Consensus Statement. "*The Bonn PRINTEGER Consensus Statement: Working with Research Integrity—Guidance for research performing*

organisations" provides concrete advice on organizational measures to strengthen integrity. Focus is on institutional responsibility, a (collective, organisational) dimension of research integrity with may be of interest to irecs. This publication documents the project's conclusions in a more usable format than the project deliverables.

- Printeger individual case study report which includes 13 case studies of misconducts were analysed for common patterns. Includes recommendations.
- Codes and legislation which provides overviews several key codes of conduct for scientific integrity
- Tools for research leaders and managers: addressing and stimulating integrity in research organisations which provides an overview of existing tools that can be used by research leaders and managers, as part of an organizational approach to research integrity. Two categories of tools: process tools (integrity café; value visioning workshop; integrity workshop) and content tools (local integrity officer role; employee appraisal conversations; managerial assessments of performance criteria; ethics guidelines; work environment mapping; quality assurance system).
- Policy brief for science policy makers and research managers with recommendations on how to achieve conceptual clarity and how to promote integrity.

2.16 PRISMA

The PRISMA (Piloting RRI in Industry: a roadmap for tranSforMAtive technologies) project carried out eight RRI pilot projects in a real-world industry context. Technological fields included in pilot studies were synthetic biology, nanotechnology, self-driving vehicles, and the internet of things. These are all transformative technologies that have the potential to transform existing modes of production and to change the relation of the company with users, suppliers or other stakeholders.

The pilots aimed at integrating RRI in the CSR (Corporate Social Responsibility) policies of the participating companies. Some pilots took place in private companies and some in public-private partnerships (PPPs).

To establish the added value of the RRI approach and the gender dimension in and for industry, the pilot projects were assessed on a number of products and processes regarding RRI dimensions which scores were compared to the score of similar projects in the same companies in which the RRI approach was not followed.

The PRISMA project has collected good practices to help companies integrate responsible research and innovation (RRI) in their businesses. Supported by extensive stakeholder consultations and dialogues, the outcome of the project was a RRI-CSR roadmap for transformative technologies, a pre-standard document (CEN Workshop Agreement [CWA]) "Responsibility-by-design - Guidelines to develop long-term strategies (roadmaps) to innovate responsibly", a MOOC (Massive Open Online Course) on RRI in industry and several videos.

In terms of the irecs needs, PRISMA offers insights for addressing ethical considerations in companies' daily practices. Of particular interest are:

- The pre-standard document (CEN Workshop Agreement [CWA]) "Responsibility-by-design - Guidelines to develop long-term strategies (roadmaps) to innovate responsibly", available at: www.cen.eu/News/Workshops/Pages/WS-2019-010.aspx
  This document provides guidelines to develop long-term strategies (roadmaps) for innovating responsibly, thereby helping organizations to achieve socially desirable outcomes from their innovation processes. These roadmaps encourage a "responsibility-by-design" approach that integrates considerations of technical, ethical, social, environmental, and economic aspects all along the research, development, and design process leading to an innovation.
- Deliverable 5.2: PRISMA_RRI_Exemplar_Roadmap_June-_2019.pdf (rri-prisma.eu)
  This document provides a framework to develop long-term strategies (roadmaps) to innovate responsibly, integrating technical, ethical, social, environmental, and

economic issues into research and innovation practices, to improve the ethical and social impacts of final marketable outcomes.

  - The Road-map: Road map & KPIs - PRISMA (rri-prisma.eu)

- The MOOC: https://www.edx.org/course/Innovation-strategies-for-socially-responsible-firms (overview MOOC on RRI - PRISMA)
- Videos: some videos have a specific focus on ethics: Overview-Videos_Prisma-1.pdf (rri-prisma.eu)
- PRISMA Responsible R&I Toolkit: RRI Toolkit - PRISMA (rri-prisma.eu).

2.17 PRO-RES

The PRO-RES project aimed to produce a guidance framework regarding the delivery of Responsible Research and Innovation (RRI), which is required from researchers and research funding and performing organizations (RFPO), in order to balance political, institutional and professional contradictions and constraints. This framework aimed to:

- cover the spectrum of non-medical sciences and
- offer practical solutions for all stakeholders, that will comply with the highest standards of research ethics and integrity.

In terms of post-2020 European strategic funding policy this offers a strong and sustainable contribution to RRI via a comprehensive ethics and integrity framework similar to Oviedo/ Helsinki which is being constructed in negotiation with relevant stakeholders.

The following publications and deliverables can be considered as relevant to irecs:

- ***Ethical evidence and policymaking: Interdisciplinary and International Research***: This book offers practical advice for using evidence and research in policymaking. The book has two aims. First, it builds a case for ethics and global values in research and knowledge exchange, and second, it examines specific policy areas and how evidence can guide practice.

- ***Ethics, Integrity and Policymaking: The Value of the Case Study***: This book addresses the importance of policymaking based on evidence that is high in quality and integrity. It, also, facilitates direct engagement with compelling issues and identifies clear recommendations for policymaking. The book uses the case-study method that encourages careful reflection and the learning of lessons from earlier policymaking.
- *Before and after enforcement of GDPR: Personal data protection requests received by Croatian Personal Data Protection Agency from academic and research institutions*: https://www.biochemia-medica.com/en/journal/30/3/10.11613/BM.2020.030201
- *Ethics appraisal procedure in 79,670 Marie Skłodowska-Curie proposals from the entire European HORIZON 2020 research and innovation program (2014–2020): A retrospective analysis*: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0259582
- *Post-GDPR survey of data protection officers in research and non-research institutions in Croatia: a cross-sectional study*: https://www.biochemia-medica.com/en/journal/31/3/10.11613/BM.2021.030703
- D1.1 "Reporting on existing Codes and Guidelines"
- D3.1 "Framework Recommendations"
- D5.1 "Report on the interview outcomes with experts from science, policy making and from Research Ethics Committees"
- D5.2 "Report on future ethical requirements"
- The PRO-RES toolbox for assessing the ethical quality of research evidence is available here: https://prores-project.eu/toolbox-2/

2.18 RESBIOS

ResBios embedded Responsible Research and Innovation (RRI) practices within four universities and research institutions in the field of Biosciences in 4 European countries, through the implementation of RRI Grounding Actions, to achieve sustainable institutional changes. The Grounding Actions related to RRI keys were dialogued with the MoRRI indicators

and aligned with Sustainable Development Goals. The project was focused on the biosciences sector which is one of the crossroads in the relations between science and society and it is building upon the EU project StarBios2, which ran between 2016 and 2020, setting the scene for transformative practices and tested interventions aligned with these new science policy frameworks.

Regarding its methodology, ResBios set a mutual learning environment including the four partners (Ivan Franko University of Lviv, Democritus - University of Thrace, Institut de Ciències del Mar, Spanish National Research Council, University of Zagreb) implementing Grounding Actions as "RRI beginners", supported and fostered by "RRI mentors".

The following deliverable can be considered as relevant to irecs purposes:

- D6.1.: This deliverable has two main focuses: it describes through 23 Success Stories (SSs) some of the main institutional changes produced by the implementation of Grounding Actions (Gas) within the framework of ResBios, in four research organizations in the field of **biosciences;** it presents the Support and Sustainability Plans (SSPs) defined by the four research organisations aimed at ensuring that the changes promoted through the GAs are maintained over the future and further changes are also promoted. The deliverable also contains a description of the activities carried out to define the SSPs as well as the approach followed during ResBios to promote institutional change.

The Grounding Actions (GAs) implemented were related to RRI keys (Public Engagement, Gender, Education, Open Access, and Ethics, considering that a further key – "Governance" – has a transverse character) and have taken into consideration the MoRRI indicators while being aligned with the Sustainable Development Goals. The GAs have had as their objects: experimenting and establishing informal education activities; promoting lifelong learning programmes; building capacity on RRI for university students and researchers; establishing cooperation and networks with schools; setting up a system of support for ethical principles in the biological investigation; developing open access and open innovation policies; setting up

a system for fighting plagiarism and promoting ethical publishing behaviours; redefining research ethics, procedures and codes on biosciences emerging needs; assessing the current situation about gender at the university level; enhancing gender equality commitment within the research organisation; promoting citizens engagement programs and citizen's empowerment in neighbourhoods.

The general framework of these activities was characterised by a mutual learning approach (under WP7), which provided for its specific exchange, reflection, and support actions for the four implementing partners, exercised by some mentors who had already had RRI implementation experiences. In this sense, ResBios has created a mutual learning (ML) environment (a set of actors and their formal and informal interactions) to foster a continuous process of "co-creating exchanges" of knowledge, information and experiences, and to elaborate and formalise knowledge and learning useful for implementing the other activities of the project.

- What are the tools and how they have been organised:

During the implementation of the project, the awareness emerged that it was important to adopt a broad interpretation of what a "tool for the dialogue with society" is. In this sense, it was decided to take some typical "functions" for RRI Grounding Actions as a reference (at least in the way these actions have been experienced in ResBios) and to identify and formalise, based on the work carried out, a series of useful tools to implement these functions. Starting from this, 30 tools were produced, or adapted from existing documents, divided into 3 functions or categories:

- Tools developed for planning and monitoring GAs and their sustainability
- Tools used during GAs implementation
- Mentoring and mutual learning tools.

The first mentioned tools have been developed by K&I, for the benefit of the 4 implementing partners involved, to facilitate and harmonise both the planning activities of the GAs and the

monitoring activities of the actions aimed at the sustainability of the results of the GAs themselves. The latter are tools developed by the implementing partners themselves during their activities and include:

- Tools for analysis (e.g., questionnaires about the issues related to a given RRI key)
- Tools to facilitate the stakeholders' involvement (templates for agreements, invitations and acknowledgement, e.g., certifications for different kinds of participants)
- Guidelines and other tools about RRI content
- Communication/dissemination tools.

2.19 ROSiE

ROSiE is a three-year SwafS project funded by HORIZON2020. The project will end on 31 March 2024. The first results of the project are presented on the ROSiE website under "Insights" and in the section 'Deliverables'. ROSiE analyses ethical, integrity, social, legal challenges, and policy gaps in the field of Open Science and aims to guide stakeholders with operational guidelines, a supplement to the ECoC, and a critical assessment of existing technologies and platforms for responsible open science. In addition, ROSiE will equip stakeholders with novel practical tools, a knowledge Hub, and training material for the research ethics and integrity aspects of open science.

The methodology for the development of training materials is described in D7.1. There, the modules are listed, learning objectives and teaching strategies are summarized. The training material was developed by using the results of the literature review and the mapping of ethical, social, and legal challenges of OS performed in the ROSiE project and by consultation with stakeholder representatives. The ROSiE training materials will be aimed at the following groups of trainees: (i) students, (ii) early career researchers, (iii) experienced researchers and (iv) citizen scientists. For each group of trainees in each field of science - natural sciences, social sciences, humanities, health and life sciences – we will develop customized training materials for a 2-day training course. The topics included in training materials are:

- Ethical and societal foundations of open science, its purpose
- The quality of the research outputs and data sets
- Protection of research participants' rights in open science
- Prevention of research malpractices in the context of open science
- Responsible sharing and use of open data
- Responsible dissemination/publication practices
- Protection of intellectual property in the context of open science
- Ethical aspects of citizen science in the context of open science

Information about **Knowledge Hub** (KH) can be found in section 'Insights' on the ROSiE website. The ROSiE KH will be a platform that is being designed and optimized to openly funnel the project's results and outputs in a user-friendly way. The ROSiE KH contains different thematic sections focusing on various issues related to open science. Each thematic section will be structured in three levels: 1) **Level 1** contains basic information on the aims, objectives and highlights on the methodology used to produce the content of the ROSiE KH; 2) **Level 2** contains the "building blocks" of information that will be displayed in a way that the end-user can easily grasp their content; and 3) **Level 3** includes the content of these building blocks. This report describes the development and the structure of the beta version of the ROSiE KH. The beta version is going to be tested by a multitude of stakeholders, through the application of a structured beta testing plan also described in this report.

2.20 Responsible Research and Innovation (RRI) in Practice

The RRI-Practice project brought together a group of international experts in RRI to understand the barriers and drivers to the successful implementation of RRI both in European and global contexts; to promote reflection on organisational structures and cultures of research conducting and research funding organisations; and to identify and support best practices to facilitate the uptake of RRI in organisations and research programmes. The project reviewed RRI related work in 22 research conducting and research funding organisations and

developed RRI Outlooks outlining RRI objectives, targets and indicators for each organisation. It undertook comparative analysis of the five keys of RRI locating these within broader, evolving discourses on RRI. Within each identified RRI dimension the project analysed how the topic has developed in particular social and institutional contexts, how the RRI concept and configuration meshes, overlaps and challenges existing organisational practices and cultures, leading to an analysis of the barriers and drivers associated with operationalising and implementing RRI in 12 national case studies.

In terms of the irecs needs, RRI-Practice included an analysis of the incorporation of ethics in S&T organisations. Of particular interest are:

- D.2.2-D14.2: Reports from each national case study

There are 12 national cases studies on RRI that include a section on ethics. This can be useful for international comparisons of ethics uptake in research funding and research conducting organisations. It can also form the background information on ethics uptake in public institutions, in countries that are not represented in irecs.

- D15.1: Report on the analysis of RRI aspects

This is a summary report of the national case studies with an extensive section on ethics.
The section compares ethics activities of national institutions with a focus on scalable best practices. It includes a comparative analysis of a) research activities in ethics of science and technologies; b) deliberative methodologies and ethical debate in research institutions; c) ethics boards, committees, or panel, their role and the use of their recommendations.

2.21 RRING

The RRING project aimed at establishing a global Responsible Research and Innovation (RRI) community. The network resulting from this effort (https://rring.eu/members/) may be of relevance to irecs; however, it is unclear if this network is presently active. Furthermore, the RRING project accumulated RRI know-how from multiple areas around the globe. These insights could provide some input to irecs in relation to RRI practices in non-European

contexts. Unfortunately, the corresponding deliverables appear to be of limited practical use while the supposed RRI knowledge base (https://rring.eu/rri-library/) is unavailable.

The relevant deliverables are the following:

- D2.4 "Training materials for stakeholders to use RRING deliverables and outputs, join RRING network", which offers an overview of RRING outputs of potential use to the community of RRING. This includes the following: school materials (including a debating card); findings from a global survey; comparative analyses; recommendations for the development of a competitive advantage based on RRI; a playbook for hosting community consultations; policy briefs; brochures and infographics. Still, it is doubtful whether any of this material is of use to irecs.

  See also "Training material" at: https://rring.eu/deliverables/
- D4.1 "Report on RRI practices and learning opportunities" which includes comparative analyses of RRI understandings and implementations across 5 five UNESCO world regions. While exhaustive, this deliverable offers little in the form of practical guidelines.
- The infographic "UNESCO Recommendation on Science and Scientific Researchers- 10 KEY PRIORITY AREAS FOR GLOBAL MONITORING" may be of interest. Available at: https://rring.eu/wp-content/uploads/2021/07/UNESCO-Recommendation-on-Science-and-Scientific-Researchers_.pdf

2.22 SHERPA

The SHERPA project investigated, analysed and synthesised our understanding of the ways in which smart information systems (SIS; the combination of artificial intelligence and big data analytics) impact ethics and human rights issues. It developed novel ways of understanding and addressing SIS challenges, evaluated with stakeholders, and aimed at advocating the most desirable and sustainable solutions. The relevant deliverables for irecs are the following:

- **D1.4** "Report on Ethical Tensions and Social Impacts":

  Summary: The Deliverable examines ethical tensions in the use of SIS (Smart Information System) in a pragmatic and comprehensive way, beginning with ethical issues related to the actual design of the technologies themselves. Whether or not there are inherent issues with their functioning, capacities, and programming (sections 2 and 5). The document then identifies the main ethical issues within the debate for the use of SIS in practice, outlining 24 of the key ethical concerns found within the literature (section 4). While the technologies themselves, and their use, raise important concerns that need to be addressed, it is important to not overlook specific domain applications and fields of practice, which is reviewed in section 6 of this report.

  The Deliverable will also give a thorough analysis of the main ethical issues related to research & innovation aspects of SIS development (section 7). The report will subsequently finish with a detailed analysis of the main ethical issues and possible solutions within the report (section 8), in an attempt to identify, allocate, and group such a wide body of information into the most prevalent concerns for society today.

- **D3.2** "Guidelines for the development and use of SIS":

  This report contains two sets of ethical guidelines – one for the technological *development* and one for the *use* – of artificial intelligence and big data systems, a glossary, two annexes, and a list of references. It is a deliverable of the SHERPA project, an EU Horizon 2020 project on the ethical and human rights implications of AI and big data. The guidelines differ from other existing guidelines in that they are directly related to design and development practices. They are intended to be actionable guidelines for systems and software development and use respectively, rather than abstract principles that have no direct application in practice. We call such guidelines *operational*, meaning ready for use.

- **Guidelines for the Ethical Development of AI and Big Data Systems: An Ethics by Design** approach:

  This report contains ethical guidelines for the technological development of artificial intelligence (AI) and big data systems. The guidelines differ from others in that they are directly related to design and development practices. They are intended to be actionable guidelines for systems and software development, rather than abstract principles that have no direct application in practice. We call such guidelines operational, meaning ready for use. Applying these guidelines in development practices would result in more ethical AI and big data products.

- **D5.7** "Ethics by Design and Research Ethics for AI":

  In this report, we outline the Ethics by Design approach, especially as developed in the SIENNA project. We then offer some approaches to teaching this methodology so as to support researchers in their practice. The report can also be used to embed Ethics by Design, and as a toolkit for researchers and research ethics assessors, including for research ethics for artificial intelligence. The report begins with a review of Ethics by Design, followed by an outline of some challenges and proposed solutions. Then we offer a foundation for applying this content in an educational context, first in academia and then as training materials that can be used in a business or company setting. In the annexes, we provide sample syllabi and course outlines. These materials have been piloted in a number of contexts, including as delivered in training sessions for researchers and employees within the European Commission's H2020 funding programme, and as offered to those who intend to bid for Horizon Europe funding. The report builds on existing SHERPA work to develop guidelines for developers of AI as well as guidelines for users of AI. In these ways the task feeds into the EC's guidance for ethics review of Horizon Europe projects.

- D5.8 “Artificial Intelligence Impact Assessment – A Systematic Review”:

  Artificial intelligence (AI) is expected to produced impacts that are highly beneficial, but it also raises concerns about undesirable ethical and social consequences. There is an array of activities that aim to address these undesirable consequences, ranging from proposals for regulation such as the EU AI Act to ethics guidelines to design methodologies, professional guidance or standardisation. One option that is increasingly explored is to develop impact assessments specifically geared for the needs of AI. A number of such AI impact assessments (AI-IAs) have already been proposed. This document undertakes a systematic review of these AI-IAs with the aim of identifying whether there are common themes and approaches. This research is important to establish a baseline for AI-IAs that can help organisations identify AI-IAs that are most relevant to their needs and that can serve as a measure for legislators and regulators to determine the role that AI-IAs can play in the governance of the broader AI ecosystem.

2.23 SIENNA

The SIENNA project has many deliverables of interest to the irecs projects. The SIENNA projected focused on 3 different technologies: 1) AI and robotics, 2) human enhancement, 3) human genomics. Hence, outputs related to these 3 technologies are relevant to the project. Because of the high number of relevant deliverables, we provide here an overview of these rather than provide a descriptive paragraph on each of these.

For each of the 3 technologies, SIENNA carried out a series of analyses that each were reported on in a deliverable. These analyses included:

- State of the art of the technology: Deliverables X.1
- Legal analysis: Deliverables X.2
- Survey of research ethics committee approaches and codes: Deliverables X.3

- Ethical analysis: Deliverables X.4

- Ethical frameworks: Deliverables X.5

This series of analyses carried out on each technology then led to ethics proposals targeted at each technology: D5.1, D5.2, D5.3, D5.4, D5.5. All the relevant deliverables are listed below. Each deliverable starts with an executive summary that makes it easy to get a quick overview of what it contains.

State-of-the-art Reviews

- Heidi Howard, Emilia Niemiec, & Alexandra Soulier. (2019). SIENNA D2.1: State of the art review of human genomic technologies (Version V0.4). Zenodo. DOI: 10.5281/zenodo.4067912
- Sean R. Jensen, Saskia Nagel, Philip Brey, Tanne Ditzel, Rowena Rodrigues, Stearns Broadhead, & David Wright. (2018). SIENNA D3.1: State-of-the-art Review: Human Enhancement (Version V1.1). Zenodo. DOI: 10.5281/zenodo.4066557
- Philip Jansen, Stearns Broadhead, Rowena Rodrigues, David Wright, Philip Brey, Alice Fox, & Ning Wang. (2019). SIENNA D4.1: State-of-the-art Review: Artificial Intelligence and robotics (Version V.04). Zenodo. DOI: 10.5281/zenodo.4066571

Legal analysis

- Santa Slokenberga, Konrad Siemaszko, Zuzanna Warso, & Heidi C Howard. (2019). SIENNA D2.2 Analysis of the legal and human rights requirements for genomics in and outside the EU (Version V2.0). Zenodo. DOI: 10.5281/zenodo.4066659
- Zuzanna Warso, & Sarah Gaskell. (2019). SIENNA D3.2: Analysis of the legal and human rights requirements for Human Enhancement Technologies in and outside the EU (Version V2.0). Zenodo. DOI: 10.5281/zenodo.4066617
- Rowena Rodrigues, Konrad Siemaszko, & Zuzanna Warso. (2019). SIENNA D4.2: Analysis of the legal and human rights requirements for AI and robotics in and outside the EU(Version V2.0). Zenodo. DOI: 10.5281/zenodo.4066812

Surveys of research ethics committee approaches and codes

- Heidi Howard, Emilia Niemiec, Lisa Tambornino, & Dirk Lanzerath. (2019). SIENNA D2.3: Survey of REC approaches and codes for genomics (Version V0.5). Zenodo. DOI: 10.5281/zenodo.4066865
- Lisa Tambornino, & Dirk Lanzerath. (2019). SIENNA D3.3: Survey of REC approaches and codes for human enhancement (Version V3.0). Zenodo. DOI: 10.5281/zenodo.4066874

- Lisa Tambornino, Dirk Lanzerath, Rowena Rodrigues, & David Wright. (2019). SIENNA D4.3: Survey of REC approaches and codes for Artificial Intelligence & Robotics (Version V1.0). Zenodo. DOI: 10.5281/zenodo.4067990

Ethical analysis

- Alexandra Soulier, Emilia Niemiec, & Heidi Carmen Howard. (2019). SIENNA D2.4: Ethical Analysis of Human Genetics and Genomics (Version V0.3). Zenodo. DOI: 10.5281/zenodo.4068016
- Sean R. Jensen. (2020). SIENNA D3.4: Ethical Analysis of Human Enhancement Technologies (Version V1.1). Zenodo. DOI: 10.5281/zenodo.4068071
- Philip Jansen, Philip Brey, Alice Fox, Jonne Maas, Bradley Hillas, Nils Wagner, … David Douglas. (2020). SIENNA D4.4: Ethical Analysis of AI and Robotics Technologies (Version V1.1). Zenodo. DOI: 10.5281/zenodo.4068083

Ethical frameworks

- Mats Hansson, & Solveig Fenet-Chantereau. (2020). SIENNA D2.7: Proposal for an ethical framework for the assessment of genomics technologies and for research in genetics and genomics (V1.3). Zenodo. https://doi.org/10.5281/zenodo.7266806
- Michael Kühler, Nils-Frederic Wagner, & Philip Brey. (2020). SIENNA D3.7: Proposal for an ethical framework for human enhancement (Version V1.0). Zenodo. DOI: 10.5281/zenodo.4275579
- Philip Brey, Philip Jansen, Jonne Maas, Björn Lundgren, & Anaïs Resseguier. (2021). SIENNA D4.7: An Ethical framework for the development and use of AI and robotics technologies (1.1). Zenodo. https://doi.org/10.5281/zenodo.7266848

SIENNA ethics proposals

- Lisa Tambornino, Dirk Lanzerath, Philipp Hoevel, & Tom Lindemann. (2021). SIENNA D5.1: Report documenting elements to open and complement operational guidelines for research ethics committees (Version V2.0). Zenodo. DOI: 10.5281/zenodo.5541599
- Amal Matar. (2021). SIENNA D5.2: An international code of conduct for data sharing in genomics: A proposal (Version V0.4). Zenodo. DOI:10.5281/zenodo.5519177
- Yasemin J. Erden, & Philip Brey. (2021). SIENNA D5.3: Methods for promoting ethics for human enhancement (Version 2). Zenodo. https://doi.org/10.5281/zenodo.7266868
- Anais Resseguier, Philip Brey, Brandt Dainow, & Anna Drozdzewska. (2021). SIENNA D5.4: Multi-stakeholder Strategy and Practical Tools for Ethical AI and Robotics (Version V4.0). Zenodo. DOI: 10.5281/zenodo.5536176

2.24 SOPs4RI

SOPs4RI (Standard Operating Procedures for Research Integrity) is a four-year (2019-2022), multi-partner project which aimed to stimulate transformational processes across European Research Performing Organisations and Research Funding Organisations (RPOs and RFOs). The project delivered an online, freely accessible and easy-to-use 'toolbox' that can help RPOs and RFOs cultivate research integrity and reduce detrimental practice. It, also, established an inventory of relevant Standard Operating Procedures (SOPs) and Guidelines that RPOs and RFOs can draw on when developing governance arrangements promoting strong research integrity cultures.

The following deliverables are relevant to irecs:

- D3.2 "Scoping reviews including multi-level model of research cultures and research conduct" which provides reports on the following studies: 1) A multi-level model of research culture systems, 2) Scoping review on 'Factors influencing the implementation of practices for research integrity promotion in research performing organisations and research funding organisations'; 3) Scoping review on 'Best practices for research integrity promotion in research performing and research funding organisations'.

- D3.3 "Report on the results of explorative interviews" whichpresents the results of the explorative interviews with research integrity experts. The interviews provided more in-depth knowledge of existing practices, innovative practices, and practices that should be developed in the future. Moreover, the conducted interviews recorded the experience about the implementation of research integrity policies within organisations, as well as their relation to other policies, such as research funding structures, career perspectives and research culture in general.

- D4.7 "Final toolbox with SOPs and guidelines (version 5.0)"

- D6.2 “final report and recomemmendations – International Research Integrity Survey (IRIS)
- Toolbox: The SOPs4RI Toolbox is a structured collection of easy-to-use Standard Operating Procedures and Guidelines that Research Performing and Research Funding Organisations can use to develop their own Research Integrity Promotion Plans.

The following publications are relevant to irecs: https://sops4ri.eu/publications/

- Rea Ščepanović, Krishma Labib, Ivan Buljan, Joeri Tijdink, Ana Marušić, “Practices for Research Integrity Promotion in Research Performing Organisations and Research Funding Organisations: A Scoping Review”, *Science and Engineering Ethics* **27** (2021). https://doi.org/10.1007/s11948-021-00281-1
- Krishma Labib, Rea Roje, Lex Bouter, Guy Widdershoven, Natalie Evans, Ana Marušić, Lidwine Mokkink, Joeri Tijdink, “Important Topics for Fostering Research Integrity by Research Performing and Research Funding Organizations: A Delphi Consensus Study”, *Science and Engineering Ethics* **27** (2021): 47. doi: 10.1007/s11948-021-00322-9
- Krishma Labib, Natalie Evans, Rea Roje, Panagiotis Kavouras, Andrea Reyes Elizondo, Wolfgang Kaltenbrunner, Ivan Buljan, Tine Ravn, Guy Widdershoven, Lex Bouter, Costas Charitidis, Mads P. Sørensen, Joeri Tijdink, “Education and training policies for research integrity: Insights from a focus group study”, *Science and Public Policy*, Volume 49, Issue 2, April 2022, Pages 246–266. https://doi.org/10.1093/scipol/scab077
- Rea Roje, Vicko Tomić, Ivan Buljan, Ana Marušić, “Development and implementation of research integrity guidance documents: Explorative interviews with research integrity experts”, *Accountability in Research* (2021). https://doi.org/10.1080/08989621.2021.1989676

2.25 supermoRRI

D5.1 “Case Study co-creation methodology report” can be considered relevant for irecs, as they developed a case study named “Coding of ethics and values into autonomous systems” which is related to AI and the ethical challenges associated with it.

2.26 TechEthos

The TechEthos project deals with the ethics for technologies with high socio-economic impact, and in particular with regards to climate engineering, digital extended reality and neurotechnologies. Within the activities/work of the projects, there are various which could be considered as relevant to the purposes of irecs:

- Horizontal cooperation in TechEthos (WP6) - D6.1 “Scan of publicly available results of other EU funded projects”: Results of 23 EU funded research ethics and research integrity projects were scanned regarding their relevance for the work in TechEthos. Projects were selected based on their focus on ethics of new and emerging technologies. Some of the scanned projects were already defined in the call text such as SHERPA, SIENNA, PANELFIT and SATORI. Since the deliverable report D6.1 was due before the TechEthos technology fields were defined a focus on emerging technology research in general and not on specific technologies was necessary.
- TechEthos Cluster of EU funded projects: TechEthos has established a cluster of EU-funded projects. For the cluster, projects were invited that are funded by the EU and work either in the field of research ethics or responsible research and innovation (RRI) or work in some way on ethical and/or the societal challenges in one of the three TechEthos technologies. To focus the work of the cluster, only projects that strongly engage with ethical and social challenges related to the technologies, rather than a mere focus on the technology itself, were approached.

Other TechEthos deliverables that might be useful for irecs are the following:

- D2.2 "Identification and specification of potential ethical issues and impacts and analysis of ethical issues": Since extended Reality is in focus of the irecs project, section 2 of D2.2 is relevant. Digital eXtended Reality, including the techniques of visually eXtended Reality (XR) and the techniques of Natural Language Processing (NLP) are analysed on pp. 29-74. The report describes:
  - various technologies belonging to the technology family
  - key applications and use cases
  - core ethical dilemmas
  - ethical values and principles
  - arguments for possible mitigation strategies with regard to each value or principle
  - operational checks and balances with regard to each value or principle, in the form of questions to be asked by designers, policy makers, and users of particular technologies.

  In particular, the use case of chatbots in healthcare (e.g. psychiatric care) is discussed in 2.7.2 that is relevant to the irecs AI in Health technology family. A specific section 2.3.2 is dedicated to XR in Health and the patient's autonomy.

  In addition to XR and NLP, there are sections in Neurotechnology family that lead to Medical AI use cases. For example, section 3.2.3 discusses the technology of fMRI together with Machine Learning, which is currently applied in the medical field. Section 3.2.2 discusses optogenetics that relies on genetic modification of neuron cells. Section 3.3.2 discusses some impacts of the predictive neurotechnology that involves AI on the understanding of future self.
- D4.1 Analysis of international and EU law and policy Part III: Digital Extended Reality: Since one of the objectives of WP2 in irecs is to identify legal challenges this TechEthos

deliverable might be interesting for the irecs project. "Digital Extended Reality (XR) Part III of Deliverable 4.1 discusses the ways in which digital extended reality (XR) is or may be governed by international and EU law and policy within the legal frameworks for human rights, privacy and data protection, consumer rights, artificial intelligence, and digital services. While no international or EU law directly addresses or explicitly mentions XR, many aspects are subject to domain-specific international and EU law frameworks. Further legislative measures with application to XR are also expected, particularly at the EU level. In the meantime, a key advantage of the existing rights-based legal frameworks is the built-in flexibility to adapt to the challenges posed by new and emerging technologies, including XR, in order to better protect the rights of individuals against interference." (Deliverable summary). Part III of TechEthos Deliverable 4.1 explores and analyses relevant international and EU laws and policies in relation to XR. Parts I and II focus on climate engineering and neurotechnologies, respectively. In particular, the section 6.1.6 Right to health in XR has a relevant discussion on XR's potential to both enhance and undermine the right to health.

- D3.3 Results of media analysis: This report presents the results of the **media scan and analysis** of the TechEthos project. This study sought to gain insights on the **media discourse** on TechEthos' three families of technologies: Climate Engineering, Digital Extended Reality, and Neurotechnologies. The media both reflect and shape **public perceptions** on technologies and, as such, give important indications of these perceptions.

Through an exploration of media discourse, this study contributes to TechEthos' analysis of **public awareness** and **acceptance** of the three families of technology. The task was led by Trilateral Research and carried out with the support of TechEthos' partners and the science centers and museums associated with the project. The task explored the media discourse in **13 countries** – this included ten EU countries: Austria, Czech Republic, France, Germany, Ireland, Italy, Netherlands, Romania, Spain, and

Sweden and three non-EU countries: Serbia, UK, and USA. The news stories covered by the study were published in 2020 and 2021. For example, section 5.2.3 on XR in Czech Republic mentions reports in the report of XR's use in medical care.

Upcoming TechEthos outputs with potential relevance for irecs:

- D5.1 "Enhancement of ethical frameworks and outline of detailed ethics framework" [due in June 2023]: Exploration of ways to enhance specific existing ethical frameworks for the selected technologies, using one or more existing ethical frameworks (generic or specific to the identified technology) as a case study and outlining of a detailed framework that supports the effective ethics governance of new technologies.
- D5.2 "Enhancement of legal frameworks" [due in June 2023]: Proposition of ways to enhance or adjust existing legal frameworks for the selected technologies with a focus on the wider international and national context.
- D5.3 "Operational guidelines or codes for selected technologies" [due in August 2023]: Exploring the needs and gaps in current operational guidelines and codes of conduct and development/refinement of operational guidelines or codes for the selected technologies using ethics by design and taking into account the expectations of different stakeholder groups.
- D5.4 "Criteria for ethical review by RECs in the identified techs" [due in August 2023]: Development of criteria for ethical review by RECs in the selected emerging technologies and recommendations on how to complement/revise already existing operational guidelines for RECs to make them useable for emerging technologies.

2.27 TRUST

The TRUST project was dedicated to preventing ethics dumping and double standards in research. Given that irecs aspires to understand challenges at a global scale as well as to cater for the needs of ethics professionals worldwide, the outputs of the TRUST project are of direct relevance. Moreover, reducing ethics dumping is an explicitly mentioned goal of irecs, so

learning from and reaching out to the community of the TRUST project would be advisable. The TRUST project was completed in December 2018, but the project efforts continue via https://www.globalcodeofconduct.org/

The following deliverables are relevant to irecs:

- D1.2 "Generic Risks of Exporting Non-Ethical Practices": This report includes an overview of exploitation risks in the context of North South research collaborations. Risks are categorized per affected actor (persons, institutions, local communities, countries, animals, environment) and per value (fairness, respect, care, honesty). While an informative table, the final code of conduct is likely to have adequately incorporated the identified issues.
- D1.4 "Report on Paradigmatic Case Studies": A set of paradigmatic cases initially developed to support work on other project outputs. Existing cases can provide some inspiration for the development of the irecs case studies and training materials.

  NB: The corresponding deliverable may be slightly obsolete; the cases were further developed into a Springer e-book: https://link.springer.com/book/10.1007/978-3-319-64731-9 . The book includes 14 cases of ethics dumping, 3 of which involve genetic research.
- 3.3 "Final Global Code of Conduct": A code of conduct is a concrete output for irecs to build upon. The code consists of 23 articles, grouped under the values of Fairness, Respect, Care and Honesty. The code was developed to be applicable to any research discipline.

  NB: The corresponding deliverable may be slightly obsolete; for the most up-to-date version of the code, see: https://www.globalcodeofconduct.org/. This website also hosts accompanying learning materials, including videos and case studies (cf. Resource Hub)
- FRC (Fair research Contracting) Online Tool: The Fair Research Contracting (FRC) resource is an online toolkit offering practical guidance to vulnerable actors entering into research partnerships with high-power partners. Examples of users mentioned are

researchers, investigators, research organisations, research managers, legal services, technology transfer offices, ethics committee members and community stakeholders. The toolkit addresses 6 key themes in research partnerships, namely negotiation strategies, research contracting, data rights, intellectual property rights, technology transfer, and research costing. Keywords, key questions, tips, case studies and additional resources are provided per theme. The toolkit was based upon an existing framework by TRUST project partner COHRED; this framework was expanded to address areas other than medical research.

NB: The corresponding deliverable may be slightly obsolete; for the most up-to-date version of the toolkit, see: http://frcweb.cohred.org/

- D4.3 "Proposals for strategic approaches to compliance with research ethics requirements in low and middle-income countries": The deliverable builds upon earlier deliverables (National and International Compliance Tools; Compliance failures) and proposes self-appraisal as complementary to the existing mechanisms of complaints procedures and ethic reviews. A template to support self-appraisal is provided in the form of a table. As the TRUST project was also meant to develop a Compliance and Ethics Follow-up Tool, this deliverable is the closest to such a tool.
- D5.2 "Policy briefs": Recommendations to ethics committees could provide useful input for irecs. Nonetheless, the domains addressed in this deliverable (medical; agriculture) are of no direct relevance to irecs.

2.28 VIRT²UE

The VIRT²UE project recognises that researchers not only need to have knowledge of the European Code of Conduct (ECoC), but also to be able to truly uphold and internalise the principles underpinning the code. They need to learn how to integrate them into their everyday practice and understand how to act in concrete situations. VIRT²UE will address this challenge by providing Ethics and Research Integrity (ERI) trainers and researchers with an

innovative blended (i.e. combined online and off-line approaches) learning programme that draws on a toolbox of educational resources and incorporates an e-learning course (including a YouTube channel) and face-to-face sessions designed to foster moral virtues. The VIRT^{2}UE programme is based on three pillars: 1) a virtue ethics approach to research integrity, 2) a blended learning format, and 3) a toolbox approach that facilitates adaptability to different contexts. Instead of teaching about rules and norms, the training focuses primarily on promoting reflection on personal attitudes and behaviors. Participants learn how to train others to reflect on concrete cases and moral dilemmas in research, and to use tools to foster reflection in others.

Relevant deliverables

All deliverables for VIRT^{2}UE can be found on the Embassy of Good Science, Deliverables - VIRT2UE / Repository - The Embassy of Good Science. For irecs, deliverables 2.1; 5.1; 5.4; and 6.4 may be relevant.

- D2.1 "Review of the existing ERI training literature and practices review": this is a report on the results of the ERI literature and practices review. It presents an overview of collected educational material on the topic of research integrity (RI). For the development of training and educational materials, irecs could use this deliverable to understand which courses already exist, the deliverable provides inspiration for what educational sources could be used, and it provides an overview of topics discussed in existing courses.

  Different types of **educational sources** are used in these courses: 1) Online training program 2) Card games 3) Role-play scenarios and role-play scenario collections 4) Videos and video collections 5) Movies and interactive movies 6) Case studies and case studies collections 7) Infographics and flowcharts and collections 8) Podcasts and podcast collections 9) Textbooks 10) Guidance 11) Reports 12) Visual art 13) Flash cards collections 14) Checklists 15) PPT presentations 16) Glossaries 17) Codes collections 18) Instructor material.

Six **target groups** are distinguished: 1. Biomedical science 2. Humanities 3. Social sciences 4. Engineering 5. Natural sciences and physics 6. Administrative sector. In these courses, **30 different topics** can be distinguished: 1) Research misconduct 2) Questionable research practices 3) Falsification 4) Fabrication 5) Plagiarism 6) Authorship 7) Peer review 8) Publication ethics 9) Mentor/trainee relationship 10) Collaborative research 11) Research with humans 12) Research with animals 13) Data management 14) Conflict of interest 15) patenting 16) Reproducibility 17) Financial responsibilities 18) Social responsibilities 19) Safety or lab safety 20) Work environment 21) Grant application 22) Allegation of misconduct 23) Open access 24) Whistleblowing 25) Intellectual property 26) Environmental responsibilities 27) Image manipulation 28) Moral reasoning 29) Biosecurity 30) Responsible research.

- D5.1 "List of ERI trainers": This deliverable describes a list of Ethics and research integrity (ERI) trainers, a living document. This list could be useful in defining potential stakeholders for the irecs project, and to contact possible trainers in the implementation phase of irecs.
- D5.4 "Capacity building roadmap": This deliverable is a capacity building roadmap that outlines how the VIRT2UE project can contribute to capacity building efforts and thereby ultimately help improve research systems. The major result of the deliverable is a decision chart that can help policymakers design capacity building policies. This deliverable can be useful to irecs for development of trainings and for implementation of the trainings.
- The description of blended learning and adaptability could be inspiring for irecs:

  2.2 Blended learning: The VIRT2UE train-the-trainer program combines online and face-to-face components. Online materials are designed for individual learning and reflection and provide an introduction to the main topics and philosophical concepts related to research integrity. The face-to-face training develops participants' teaching skills and provides opportunities for interactive, reflective and case-based group activities. The online and face-to-face parts of the program courses are

complementary. Online preparation is required for the face-to-face exercises, and the online exercises need to be supported by experiences provided in the face-to-face meetings.

2.3 Adaptability: To enable contextualised research integrity teaching across Europe, the VIRT2UE train-the-trainer program provides adaptable course material. The exercises represent a toolbox from which trainers can build their own courses tailored to the needs of their students. Trainers are encouraged to adapt the materials and modules, as long as the underlying virtue ethics approach and learner-centeredness are maintained. The VIRT2UE toolbox is open source and available on the Embassy of Good Science, an online wikiplatform which serves as a hub for 'good science'. The platform's wiki functionalities allow for a high level of flexibility because trainers can access materials directly online, suggest changes, and build new modules and share them with a community of trainers.

- D6.1 "Pilot version of the e-learning platform is online": In this deliverable, the objective is to develop the online training platform and user interface, which will be instrumental in evaluation of trainers' and researchers' needs and project sustainability. As for irecs the goal is to develop an online training platform, this deliverable might provide useful input for the process of developing an online training platform connected to the Embassy of Good Science.

-There are, also, specific training materials for VIRT2UE, with exercises that could provide inspiration for irecs: Training materials - VIRT2UE / Repository - The Embassy of Good Science.

2.29 XR4HUMAN

The project focuses on the new ethical, and associated safety, privacy, security challenges and interoperability issues arising with the consumerization of XR (extended reality) technologies. The project's main objective is to co-create living guidance on ethical and related policy,

regulatory, governance, and interoperability issues of XR technologies within a European community of practice.

The project begun in November 2022 and there no results publicly available yet. However, the expected outcomes within the framework of the project are the following:

1. Ethical issues and related regulatory and governance issues will be explored.
2. Guidelines for companies and regulators will be provided (through (i) an Interoperability Guidance Document; (ii) a European Code of Conduct for Equitable, Inclusive, and Human-Centered XR Technologies; (iii) recording and demonstrating the practical application of the XR Code of Conduct)
3. Companies and regulators will be equipped with an online repository of test cases to allow developers to demonstrate evidence of adherence to best practices
4. Users will be equipped and guided through a rating system and educational materials
5. Companies and other stakeholders will be engaged (i) to enhance the uptake of the XR Code of Conduct, the Guidance for Interoperability, and the empowerment of end-users; and (ii) to establish a permanent digital European Forum to facilitate stakeholder dialogue on issues of ethics and interoperability

The relevant types of the aforementioned outcomes are the following:

- Ethical/comparative analysis (1)
- Guidelines (2)
- Code of conduct (2, 5)
- Recommendations (3)
- Training material (4)
- Outputs related to other irecs tasks (3, 5)
- Competence profiles (5)

3. Scan results: networks

This chapter includes a comprehensive overview of the results of the 4 networks that were scanned and reviewed by the irecs partners involved in task 6.1. The networks are listed in alphabetical order.

3.1 AI HLEG

AI HLEG (High-level expert group on artificial intelligence) was formed since the European Commission appointed a group of experts to provide advice on its artificial intelligence strategy. The group worked towards developing guidelines for a human-centric approach on AI, requirements that AI systems should meet in order to be trustworthy, recommendations to guide trustworthy AI. Finally, it developed a practical tool for self-assessment based on the ethical guidelines as well as it provided an exploration of the possible implementation of the recommendations.

The following deliverables are relevant to the focus of irecs:

- D1 “Ethics Guidelines for Trustworthy AI”: The deliverable presents ethics guidelines for trustworthy AI drafted by the AI high-level expert group. The guidelines identify seven key requirements that AI applications should respect to be considered trustworthy and they also include an assessment list to help check whether these requirements are fulfilled.
- D2 “Policy and Investment Recommendations for Trustworthy AI”: The group put forward 33 recommendations to guide trustworthy AI towards sustainability, growth, competitiveness, and inclusion. The document provides policy and investment recommendations on how Trustworthy AI can actually be developed, deployed, fostered and scaled in Europe, all the while maximising its benefits whilst minimising and preventing its risks.
- D3 “The final Assessment List for Trustworthy AI (ALTAI)”: The groups developed a practical tool that translates the Ethics Guidelines into an accessible and dynamic self-

assessment checklist. The Assessment list can be used by developers and deployers to help assess whether the AI system that is being developed, deployed, procured or used, adheres to the seven requirements of Trustworthy Artificial Intelligence (AI).

- D4 "Sectoral Considerations on the Policy and Investment Recommendations": The document explores the possible implementation of the recommendations, previously published by the group, in three specific areas of application that the group considers to be of utmost importance for the sustained well-being of society as well as for enhancing Europe's sustainable growth thanks to AI development, deployment and uptake. The sectors chosen are: (i) the Public Sector; (ii) Healthcare; and (iii) Manufacturing and Industrial Internet of Things (IoT).

3.2 EGE

The European Group on Ethics in Science and New Technologies (EGE) is an independent advisory body appointed by the President of the European Commission, which provides the Commission with high quality, independent advice on all aspects of EU legislation and policies, where ethical, societal and fundamental rights issues intersect with the development of science and new technologies. EGE publishes various reports/opinions and statements which can be useful for the work to be conducted by irecs:

- Ethical aspects of human tissue banking**,** which deals with the ethical problems of human tissue banking and, therefore, relates to the selected by irecs technology of biobanking.
- Ethics of genome editing, which deals deals with the ethics of genome editing in both human and non-human applications and gives recommendations on how to deal with these applications. It can therefore be relevant for irecs because irecs has selected genome editing as a technology of focus.

- Statement on gene editing, which is is a very short statement why there should be a moratorium on germline gene editing in humans (2 pages). It could be relevant because irecs has gene editing as a technology of focus.
- Ethical aspects of umbilical cord blood banking, which contains background information, ethical issues and the situations in different EU member states related to biobanking.

3.3 NERQ

The Network for Education in Research Quality (NERQ) is an initiative to connect researchers and educators from different universities across Europe. No deliverables will be available, but the network could provide opportunities for implementation of the training, finding possible trainees, and evaluation of the training. In addition to the projects assigned to the network, they, also, present some courses/trainings for different target audiences that might be relevant to irecs.

3.4 UNESCO IBC

The International Bioethics Committee (IBC) is a body of 36 independent experts that follows progress in the life sciences and its applications in order to ensure respect for human dignity and freedom. It was created in 1993.
Committee tasks:

1. To promote reflection on the ethical and legal issues raised by research in the life sciences and their applications.
2. To encourage the exchange of ideas and information.
3. To encourage action to heighten awareness among the general public, specialized groups and public and private decision-makers involved in bioethics.

4. To co-operate with the international governmental and non-governmental organizations concerned by the issues raised in the field of bioethics, as well as with the national and regional bioethics committees and similar bodies.

5. To contribute to the dissemination of the principles set out in the UNESCO Declarations in the field of bioethics, and to the further examination of issues raised by their applications and by the evolution of the technologies in question.

Most relevant for the work that will be carried out by irecs is a report dedicated to genome editing and future generations:

Report of the International Bioethics Committee (IBC) on the principle of protecting future generations: https://unesdoc.unesco.org/ark:/48223/pf0000378723.

In this report, the IBC examined current genome technologies and their possible effects on future generations, the social determinants of health and the UN Sustainable Development Goals, health equity and how to ensure the rights of future generations within an ethical framework. This framework includes responsibility, the precautionary principle, intergenerational justice and equity, and the interdependence of generations. The IBC then examined the existing regulatory framework with regard to civil society, rights and the protection of future generations; the notion of rights; international law instruments on future generations; and guiding principles relevant to genome information. On the principle of protecting future generations, this IBC Report puts forward:

a) Recommendations derived from the Precautionary Principle
b) Recommendations on governance for States and international agencies
c) Recommendations for societies at large and the international community
d) Recommendations for institutions and researchers, and
e) Recommendations for National Bioethics Bodies.

4. Results at a glance

The following tables summarise the results of the projects and networks that were scanned and reviewed within task 6.1. They include the name of the project/network, the type of the input that is relevant to irecs and the area of focus.

No.	Name of project	Type of input relevant to irecs	Area(s) of focus
1	BIMG	Gap analysis, ethical analysis, legal analysis, recommendations, policy briefs	Genome editing, use of genetic and clinical data.
2	ENERI	Tools	Research Ethics, Research Integrity
3	ENTIRE	Platform (*The Embassy of Good Science*)	Training material and information for RCR
4	EUSTANDS4PM	Framework	Data integration for personalised medicine
5	GEST	Ethical debates	Informing policy decision on nanotechnologies, food technologies, synthetic biology
6	GRIPP	Training material, action plan for RFOs	RRI in marine and maritime sector
7	HealthyCloud	Guidelines, recommendations, specifications	Health data research
8	HYBRIDA	Ethical analysis, guidelines, code of conduct, recommendations	Organoid and organoid related research
9	INTEGRITY	Training material, competence profiles, tools	Education for RCR
10	INTERVENE	Ethical and legal framework, training material	Genomics-based disease prediction (AI and genetics), biobanking

No.	Name of project	Type of input relevant to irecs	Area(s) of focus
11	PANELFIT	Guidelines, ethical and legal analysis, governance report	Data protection for ICT systems, AI and security, AI for predictive policing
12	PATH2INTEGRITY	Training material	Formal and informal learning methods on RI and establishment of an RI culture
13	POIESIS	Policy recommendations	Tackling societal mistrust in science by aligning research practices with RI principles
14	PREPARED	Values-based framework for research ethics and integrity, policy recommendations	Operational ethics and integrity framework responding to crises, such as a pandemic.
15	PRINTEGER	Educational tools and material, case studies, codes of conduct	Organisational aspects in the promotion of RI
16	PRISMA	Guidelines, training material	RRI in Industry
17	PRO-RES	Framework including an accord, a toolbox and resources	Promoting ethics and integrity in non-medical research. Promoting the use of results from ethically conducted research in policy making.
18	RESBIOS	Tools and guidelines for RRI	Responsible Research and Innovation in Biosciences
19	ROSiE	Training material, knowledge hub, recommendations	Responsible Open Science
20	RRI-PRACTICE	National case studies, ethical/comparative analysis	Implementation of RRI in European and global contexts
21	RRING	Training material, comparative analyses, and recommendations.	RRI in the global perspective.
22	SHERPA	Ethical analysis (including the Ethics by Design approach), guidelines.	The impact of smart information systems (AI and big data analytics)

No.	Name of project	Type of input relevant to irecs	Area(s) of focus
			on ethics and human rights issues.
23	SIENNA	Research ethics protocols, professional ethical codes, legal frameworks, research ethics committee approaches and codes	Human genomics, human enhancement, AI and robotics.
24	SOPs4RI	Scoping reviews on research cultures and best practices, toolbox, recommendations.	Standard Operating Procedures for the promotion of Research Integrity in RPOs and RPOs.
25	SUMERMORRI	Case study	Ethical challenges in AI
26	TECHETHOS	Scan of publicly available results of EU-funded project, ethical analysis, legal analysis, media analysis, guidelines, criteria for ethical review by RECs, cluster activities	Ethics for technologies with high socio-economic impact (climate engineering, digital extended reality and neurotechnologies).
27	TRUST	Risk analysis, case studies, Code of Conduct, online tool, recommendations	Ethics dumping, global challenges for research ethics
28	VIRT2UE	Training material, competence profiles, online tools	ERI training
29	XR4HUMAN	Ethical/comparative analysis, guidelines, code of conduct, recommendations, training material, competence profiles	Extended reality technologies

Table 2: Scanned projects

	Name of network	Type of input relevant to irecs	Area(s) of focus
1	AI HLEG	Guidelines, Recommendations, tools	AI
2	EGE	Ethical analysis, statement	Gene editing, biobanking
3	NERQ	Cluster activities, training	Education in Research Quality
4	UNESCO IBC	Recommendations	Genome technologies

Table 3: Scanned networks

5. Courses for ethics reviewers

In this chapter there is a list with available courses/training material for ethics reviewers. This input will be useful for the development of the irecs training material.

- EUREC - Training materials (eurecnet.org) (only English training described below)
- **TRREE** ***Training & Resources in Research Ethics evaluation***

Type of training/training methods: TRREE is a free and open access online training program on research ethics and regulation. TRREE's learning material is currently available in English, French, German, Polish and Portuguese. It also provides access to the national regulation in the participating countries. The training is modular. It includes an introduction to research ethics (module 1), a module on the role and responsibilities of Research Ethics Committees (module 2.1), several modules on the national regulation in given countries from the North and the South (module 3) and a detailed module on informed consent (module 4). TRREE has been recognized as continuing program by the Swiss Medical Association (FMH) and the Swiss Pharmacists Association (FPH).

Target audience and charges: While some modules may focus on more specific training needs of research ethics committee members, or research teams including investigators,

nurses, or study coordinators, the training is open to all and may be of interest to health authorities, funding agencies and universities, as well as to political authorities, patients and the media. Free of charges.
http://elearning.trree.org http://www.trree.org

- ***The Vienna School of Clinical Research (Austria)***

Type of training/training methods: Training courses (lectures, workshops) on different topics related to clinical research. ("The course modules have been designed to offer as broad a range of subjects within clinical research to as many different disciplines working within this field as possible").

Target audience and charges: Investigative Staff - Physicians, Nurses and Support Staff ; Industry Personnel - Clinical Research Associates, Industry Physicians; Ethics Committee Members Healthcare Decision. http://www.vscr.at/educational-programme

- ***Family Health International, USA***

Type of training/training methods: On-line tutorial. 4 hours.

Covers cases on:

- Respect for Persons
- Beneficence and Justice
- Informed Consent
- Ethics Committee Considerations
- Research with Minors
- Principles of Research Ethics
- Community participation
- Inducement / Compensation

- Social risks
- Individual versus Community Consent (All cases are available on the web)
- Target audience and charges
- Researchers and all other interested parties. Free of charge.

http://www.fhi.org/training/en/RETC2/RETCTraditional/intro.html

- ***University of Maryland School of Medicine MERETI program***

Type of training/training methods: On-site training (lectures, workshops, practical assignments) 2 months of on-site studies (4 hours a day) and 10 months performance of a project in research ethics in trainee's home country. Covers cases on practical experiences in the ethical review of research protocols.

Target audience and charges: Physicians, nurses, scientists, members of research ethics committees, social scientists, philosophers, and other individuals with appropriate backgrounds and interests in health research or ethics, Research investigators, IRB/Ethics Committee members and research staff. Free access to the contents and description of the course. Scholarships are available to fund travel, living expenses, and course fees, but are limited.

http://medschool.umaryland.edu/mereti/cert.asp

- ***CITI program***

Type of training/training methods: On-line course (more than 20 thematic modules; includes self-test quiz). 1 hour to read one module and answer the quiz questions. Each module includes cases. Target audience and charges: Investigators and all other interested parties. Paid participation.

https://www.citiprogram.org/default.asp?language=english

- ***National Institute of Health (NIH) Department of Bioethics***

Type of training/training methods: On-site training (Lectures, discussions, readings, CD) 7 sessions of 3 hours. Several presentations include case analysis.

Target audience and charges: The course is offered to anyone interested or involved in clinical research involving human subjects. Free access to the contents and description of the course and to the presentation slides, free participation.

http://www.bioethics.nih.gov/hsrc/index.shtml

- ***Practical Ethics Center at the University of Montana***

Type of training/training methods: On-line training (readings, case histories, self-assessment). 3-4,5 hours in total. At least one case study for each section.

Target audience and charges: Institutions that are working to promote Responsible Conduct of Research. Free participation.

http://ori.dhhs.gov/education/products/montana_round1/research_ethics.html

- ***Québec health and social services network, Canada***

Type of training/training methods: On-line tutorial (lectures, case studies, normative texts, tools for decision making). Each module takes approx. 20 minutes. Each course module includes cases adapted to the topic.

Target audience and charges: Research ethics board (REB) members and support staff who work in the institutions of the Québec health and social services network as well as the institutions, administrators, government who are involved research ethics review for the purpose of ensuring the protection of research participants and promoting ethical conduct that demonstrates respect for individuals. Free participation.

http://ethique.msss.gouv.qc.ca/didacticiel/index.php?lang=en

- ***Eupati***

Course: Ethics (eupati.eu)

- After completing this course, you will be able to:
- Describe the history of ethics in clinical research and the concepts and values of ethics for research involving humans.
- Explain how ethics evaluations are conducted internationally, nationally and locally.
- Describe the potential roles of patients at each level.
- Ethical review and approval | EMBL-EBI Train online
- Technology, Ethics, and Regulations | CITI Program
- Research Ethics Online Training • Global Health Training Centre (tghn.org) (University of Oxford)
- ***BROK toets***

EMWO | Examenbureau Medisch-Wetenschappelijk Onderzoeker » BROK® examen

- Training in the Netherlands for clinical researchers.
- ***Training for students***

The Centre for Biomedical Ethics and Law at the University of Leuven (Belgium) is pleased to announce the launch of a new Massive Open Online Course (MOOC) covering the ethical issues in research with human subjects. The course is part of the new initiative by KU Leuven to offer MOOCs for credits, giving students from across the world the opportunity to earn a KU Leuven credit certificate upon its successful completion. The course is part of the Master of Bioethics program and is 3 ECTS points.

6. Conclusion

The results of the mapping activities we conducted within task 6.1 can provide a lot of useful information on which next stages of the irecs tasks and activities can build, including the creation of a 'rich' ethics cluster. The report includes input related not only to the four selected technologies/ areas of focus by irecs (AI in healthcare and healthcare applications, Extended Reality, Gene-editing including human and non-human applications, Biobanking), but also on other new technologies, which have some similarities in terms of ethical challenges, such as organoid research, or broader research challenges, such as Open Science. It, also, includes input related to training material for RE and RI, and analysis on gaps and needs of RECs for ethics evaluations. The selected guidelines, codes of conduct, recommendations, ethical/legal/comparative analyses, tools and training material can be fruitfully consulted by irecs in order the project to contribute to the improvement of research ethics expertise and the enhancement of trust in science effectively and sustainably.

Annex 1

The following tables include the projects and networks reviewed, including their website and their duration.

No	Project Acronym	Project Website	Project Duration
1	B1MG -Beyond 1 Million Genomes	https://b1mg-project.eu/	2020 - 2023
2	ENERI	https://eneri.eu/	2016 –2019 (completed)
3	EnTIRE	https://cordis.europa.eu/project/id/741782	2017 - 2021 (completed)
4	EU-STANDS4PM - A European standardization framework for data integration and data-driven in silico models for personalised medicine	https://www.eu-stands4pm.eu/	2019 – 2022 (completed)
5	GEST	https://gestproject.eu/	2011 –2014 (completed)
6	GRRIP	https://grrip.eu/	2019 – 2022
7	HealthyCloud – Health Research & Innovation Cloud	https://healthycloud.eu/	2021 –2023
8	HYBRIDA	https://hybrida-project.eu/	2021- 2024
9	INTEGRITY	https://integrityproject.org/	2019 –2022 (completed)
10	INTERVENE - Transforming genomics-based disease prediction	https://www.intervene project.eu/	2021 –2025
11	PANELFIT	https://www.panelfit.eu/	2018 –2022 (completed)
12	Path2integrity	https://www.path2integrity.eu/	2019 – 30 June 2022 (completed)
13	POIESIS	https://poiesis-project.eu/	2022 –2025
14	PREPARED EU	https://prepared-project.eu/	2022 –2025
15	PRINTEGER- Promoting Integrity as an Integral Dimension of Excellence in Research	https://printeger.eu/	2015- 2018 (completed)
16	PRISMA	https://www.rri-prisma.eu/	2016 –2019 (completed)

17	PRO-RES	https://prores-project.eu/	2018 –2021 (completed)
18	ResBios	https://resbios.eu/	2020 –2022 (completed)
19	ROSiE	https://rosie-project.eu/	2021 –2024
20	RRI Practice		2016 –2019 (completed)
21	RRING Responsible Research and Innovation Networked Globally	https://rring.eu/	2018- 30 April 2021 (completed)
22	SHERPA	https://www.project-sherpa.eu/	2018 –2021 (completed)
23	SIENNA	https://www.sienna-project.eu/	2017 –2021 (completed)
24	SOPs4RI	https://sops4ri.eu/	2019- 2022 (completed)
25	SuperMoRRI	https://super-morri.eu/	2019 –2023
26	TechEthos	https://www.techethos.eu/	2021- 2023
27	TRUST- Equitable research partnerships	https://trust-project.eu/	2015- 2018 (completed)
28	VIRT2UE	https://cordis.europa.eu/project/id/787580	2018 –2021 (completed)
29	XR4HUMAN	https://xr4human.eu/	2022 –2025

No	Network/Initiative Acronym	Network/Initiative description and Website	Duration
1	AI HLEG	https://digital-strategy.ec.europa.eu/en/policies/expert-group-ai	2018 -
2	EGE	EGE	Founded in 1991
3	NERQ - Network for education & research quality	NERQ network (nrin.nl)	March 3, 2023: Kick-off
4	UNESCO IBC	https://en.unesco.org/themes/ethics-science-and-technology/ibc	Founded in 1993