# *Implementing RRI in EBRAINS: website, RRI toolkit and capacity building activities (D9.5 – SGA3)*

**Figure 1: Responsible research and innovation in the Human Brain Project**

**Figure 1 illustrates the four interconnected phases of the AREA framework that guided the work on Responsible Research and Innovation (RRI) in the Human Brain Project (HBP). The four phases are: Reflection, anticipation, engagement and action.**

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| Description in GA: | This deliverable will contain an EBRAINS RRI toolkit, an implementation handbook and outcomes of the EBRAINS RRI development. The deliverable will contain agreed upon principles and practices that EBRAINS and other projects and infrastructures can implement. |
| Abstract: | This deliverable presents an implementation handbook, the EBRAINS RRI toolkit, and the outcomes and resulting future recommendations of developing RRI practices in EBRAINS. |
| Keywords: | Ethics, RRI, responsible innovation, public engagement, data governance, gender, equality, citizen participation |
| Target Users/Readers: | Consortium members, general public, neuroscientific community, neuroscientists, EBRAINS users, researchers, scientific community, students. |

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# 1. Introduction

The present report introduces some of our work with the responsible research and innovation (RRI) approach in the emerging European research infrastructure EBRAINS. Formally corresponding to the Project Objective 7 *"Ensure an ethically and legally compliant infrastructure and promote embedding of Responsible Research and Innovation, and of neuro- and data ethics in EBRAINS"*, this Deliverable builds on several elements. Theoretically, it brings together research on responsible research and innovation philosophy, neuroethics, computer ethics, governance of emerging technologies, and ethical compliance. Practically, it spans diverse activities from working groups, ethics support and compliance, advisory boards -and roles, to training and awareness raising, foresight, societal engagement and dialogue, and academic interdisciplinary collaboration on philosophical -and neuroethical reflection.

In the final phase of the Human Brain Project (HBP), our goal was to transform our insights and approaches from doing RRI-work in the Human Brain Project into principles and practices for EBRAINS to ensure a unique World-Class European research infrastructure, that has human needs and values at its centre and promotes a proactive approach to societal and ethical issues. The principles and practices we present contribute to HBP's envisioned Outcome 6 "*Thanks to the HBP's contributions and leading role envisaged in PO7, the International Brain Initiative will deliver solid neuroethics guidance to neuroscience projects in the world; in particular, regarding the ethics of large neuroscience research infrastructures.*" Furthermore, together with HBP SGA3 Deliverable D9.4 *"Ethics Strategy for international collaboration on the integration of neuroethics sand neuroscience"*, the current Deliverable collects and presents work and activities towards achieving this important outcome.

The work we present here is interesting for several audiences. First, it is of interest for academic peers working on responsible research and innovation practices, as few have had the unique opportunity to be an integrated part of a long-term high-level research project. Second, it is of interest for other (large) research infrastructures and consortia to get inspiration on future developments for their ethics activities towards comprehensive frameworks that go beyond compliance and to enable proactively designing and developing innovation and research with societal values, needs and benefit at the centre. Finally, it can be of interest for policymakers, who might find inspiration towards future forms of organising research and innovation projects.

## 1.1 Developing responsible research and innovation for EBRAINS

Three Work Package objectives (WPOs) have guided our work:

- WPO9.1: To consolidate HBP international collaboration in the development of an ethics strategy for identifying, addressing, and managing the ethical and social issues that neuro-ICT faces at both the local and global level by the end of SGA3.[1]
- WPO9.2: To strengthen the ethical and social acceptability and desirability, and to increase understanding of legal compliance of HBP research and EBRAINS infrastructure to ensure societal benefit.
- WPO9.3: To enhance the proportional representation of genders at all career levels, the collaboration in a diverse workforce as well as gender and diversity as research topics.[2]

[1] This Deliverable covers the policies, training and practice-support tools we developed for implementing RRI in EBRAINS. Work on the international collaboration for an ethics strategy is described in HBP SGA3 D9.4 Ethics Strategy for international collaboration on the integration of neuroethics sand neuroscience.
[2] Likewise, for WPO9.3, this Deliverable does not focus on WPO9.3. The report does include reference to the Equality, Diversity, Inclusion toolkit (EDI toolkit)", as part of the EBRAINS RRI toolkit, but it does not as such refer to overall package of work we undertook to achieve WPO9.3.

Our ambition for developing responsible research and innovation for EBRAINS is described in detail elsewhere[3]. Here, we provide a summary from the article, as the key lessons we developed in that article guided our work with transforming insights and activities of "Ethics and Society" and RRI work into EBRAINS following the end of the HBP. We built on the following key lessons:

- Public engagement can inform the research and innovation process: In the Human Brain Project, the outcome of extensive public engagement activities has informed the Ethics and Society Opinions. The Opinions led to changes to organisational structures, like the creation of the Dual Use Working group (DUWG). Space for improvement include efforts of communicating clearly and honestly with the public and showing in a transparent manner how public values and recommendations inform Project activities.
- Compliance issues are part of responsible research and innovation: Once issues such as data protection become a matter of legal compliance, it is easy to gain attention and raise awareness on the need to address the issue. Research ethics, and ethics compliance are also well-established topics within the scientific community, and so they offer themselves more readily to the kind of inter –and transdisciplinary work that RRI requires. There is an ongoing need to highlight that RRI goes well beyond legal and ethical compliance.
- Interdisciplinary collaborations are challenging: RRI requires collaboration across scientific disciplines and with societal stakeholders, including lay citizens. The breadth of collaboration partners, contexts, power, and knowledge differences, together with a lack of incentives, recognition, and educational structures for inter- and transdisciplinary work are a challenge for the development and integration of RRI practices and principles.
- RRI is a subject of debate: how to approach, develop and prioritise RRI is still a topic of debate in the academic community as well as in interdisciplinary collaborations.
- Lack of knowledge on certain issues: issues where more knowledge is needed include diversity and its operationalisation in brain research, data collection and data-sharing practices and what is acceptable, culture and its implications for neuroscientific research and brain-inspired technology development.
- Difficulties in proving successful implementation: at its core, RRI aims to bring about an organisational and cultural change in how research and innovation takes place. Finding measures for this type of long-term impact is difficult to do.

Building on the insights above, we formulated five priorities for our work on implementing RRI in the EBRAINS Research Infrastructure[4]:

- Organise our activities according to the concept of "Responsibility by Design (RbD)". EBRAINS is a different organisational structure than the research project HBP. There is little written in the literature on how to envision and develop RRI practices and principles in the context of a research infrastructure driven by national funding and priorities.
- Explore and evaluate options for organisational embedding of RRI practices and principles. In the final phase of the HBP, we have created embedded interdisciplinary groups and collaborative activities as well as more outreach and community building activities in the scientific Work-Packages. One of the aims to his has been to test diverse ways to enhance the ethical soundness of the research and thus to inform our recommendations for EBRAINS research and organisation. Further assessment of the usefulness of embedding, and on what type of possible embedding is pending.
- Work on community and capacity building. A key lesson from RRI is that for a technological development to be useful and socially desirable, its users should be involved in defining needs and uses from the very beginning. Inclusive community building, including expert and lay public

[3] P2893: Bernd Carsten Stahl, Simisola Akintoye, Lise Bitsch, Berit Bringedal, Damian Eke, Michele Farisco, Karin Grasenick, Manuel Guerrero, William Knight, Tonii Leach, Sven Nyholm, George Ogoh, Achim Rosemann, Arleen Salles, Julia Trattnig & Inga Ulnicane (2021) From Responsible Research and Innovation to responsibility by design, *Journal of Responsible Innovation*,8:2,175-198,DOI: 10.1080/23299460.2021.1955613
[4] Ibid.

engagement, formed a major part of our effort to both support EBRAINS research infrastructure formation through the creation of a user community, but also to give shape to that community to reflect RRI values and principles and to develop training and capacity building programmes and resources for the EBRAINS community in RRI.

- Develop a better understanding of responsible commercialisation and exploitation. Research in the HBP and the EBRAINS research infrastructure are producing new insights and technologies for commercial exploitation and use in other contexts. Therefore, understanding the ethical, social, and cultural issues related to responsible exploitation and commercialisation become crucial topics for realising a responsible research infrastructure.
- Engage in international collaboration, including, but not limited to, the existing international brain projects to share our experiences, but also to learn from international perspectives on (neuro)ethical and societal issues of joint concern.

The handbook and EBRAINS toolkit for responsible research and innovation (EBRAINS RRI Toolkit), are the two central means for the conceptualisation and presentation of principles and practices of RRI for the EBRAINS research infrastructure. They collect educational material and practical exercises, as well as policy guidelines and descriptions of how to work proactively on issues of gender, diversity, inclusion, data protection, foresight, and public engagement (Public: citizens, research, policy, business, and civil society).

## 1.2 Background for developing RRI for EBRAINS

The Human Brain Project (HBP) started in October 2013. From its inception the Project committed itself to including a research programme that would work to explore social, ethical, and philosophical implications of HBP research, and promote engagement with experts and lay citizens, raise awareness of ethical and social issues within the HBP, and support the Project governance in complying with relevant legal and ethical norms – all to foster practices of responsible research and innovation. The "Ethics & Society" group (also referred to in project communication as sub-project 12, or SP12) was born.

In 2013 RRI, was a relatively new concept. In developing a basis for the work of the Ethics & Society sub-project, we drew on the AREA framework for responsible research and innovation that the UK Engineering and Physical Sciences Research Council [5] developed in collaboration with social scientists. The AREA framework outlines four interlinked phases of activity that together form a process approach to RRI. The first is to proactively anticipate on possible future developments and implications of emerging science and technology. The second to reflect on these developments, and create an overview of possible implications, motivations, and uncertainties related to a development. The third activity to engage with citizens, civil society, business, research (fostering interdisciplinary reflection to increase awareness and knowledge on ethical, social, legal, and economic implications) and policy. Finally, the fourth activity asks for undertaking action to steer development, as much as possible towards desirable, sustainable, and acceptable outcomes.

In SP12, activities were organised according to the AREA framework, and comprised the Human Brain Project' Foresight Lab, Philosophical and ethical reflective and conceptual work, Activities of citizen and stakeholder engagement on ethical and societal issues and raising of awareness on ethical and societal issues.

In addition to research and engagement activities, the group also developed organisational structures for responsible governance of research and innovation in the HBP[6]. Organisational means for integrating RRI include: the Ethics Director, the Ombudsperson, the external advisory body Ethical Advisory Board (EAB), the Ethics Rapporteur Programme, Point of Registration (PORE), the

[5] https://www.ukri.org/about-us/epsrc/our-policies-and-standards/framework-for-responsible-innovation/
[6] For an overview of current Ethics coordination structures: https://www.humanbrainproject.eu/en/science-development/ethics-and-society/ethics-coordination/ For the Ethics Support-related experience see: P1857: Stahl BC, Akintoye S, Fothergill BT, Guerrero M, Knight W and Ulnicane I (2019) Beyond Research Ethics: Dialogues in Neuro-ICT Research. Front. Hum. Neurosci. 13:105. doi: 10.3389/fnhum.2019.00105

Data Governance Officer (DPO), the Data Governance Working Group (DGWG), the Dual Use Working Group (DUWG). Additionally, a Gender Advisory Board was first established in SGA2, first as part of a managerial task. It was further developed to the Diversity and Equal Opportunities Committee (DEOC), the related HBP Task became part of the RRI Work Package in SGA3.

Additional key joint outcomes include:

- Opinion and Action Plan on Data Protection and Privacy[7]
- Opinion on 'Responsible Dual Use' Political, Security, Intelligence and Military Research of Concern in Neuroscience and Neurotechnology [8]
- Opinion on Trust and Transparency in Artificial Intelligence[9]

In the final three years of the HBP, the work focused on transforming the insight and activities of ethics and society work into structures, research, and policy agenda for the EBRAINS research infrastructure.

## 1.3 Methodology for implementing Responsible Research and Innovation

In the final three years of the HBP, the Project was re-structured, going from 12 sub-projects to 9 Work Packages. For Ethics & Society, that meant a re-conceptualisation as an overarching Work Package, underlining its central importance for both the science -and infrastructure Work Packages. In addition, several activities were embedded directly as Tasks into the science -and infrastructure Work Packages (Figure 2).

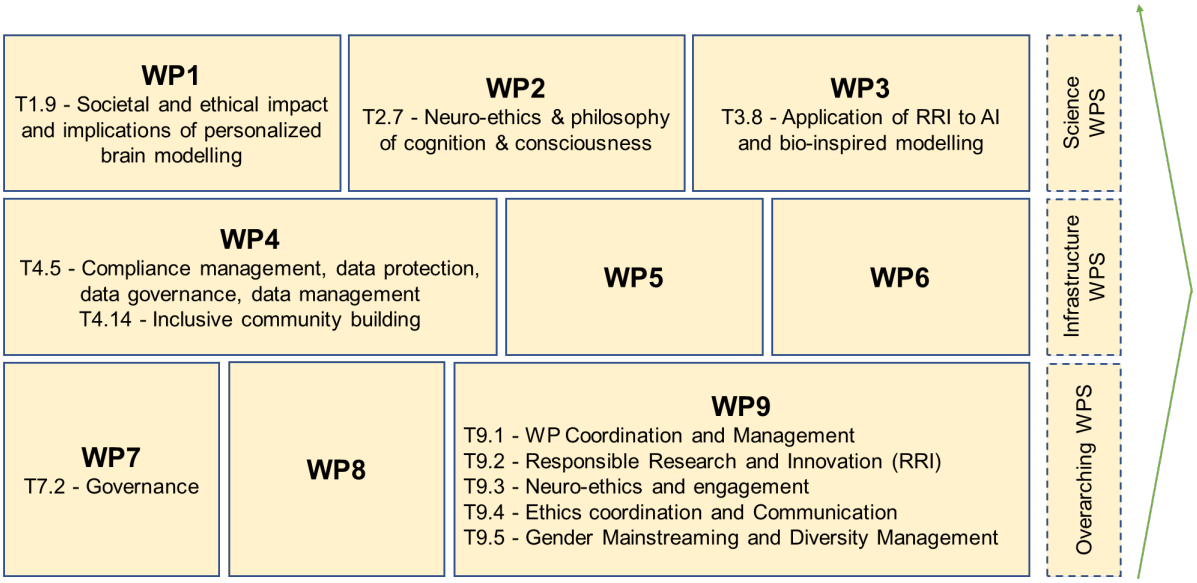


Figure 2: Overview of organisation of RRI-related work in SGA3 across the HBP

[7] P3992 - Salles, Arleen, Stahl, Bernd, Bjaalie, Jan, Domingo-Ferrer, Josep, Rose, Nikolas, Rainey, Stephen, & Spranger, Tade. (2021). *Opinion and Action Plan on Data Protection and Privacy* - Ethics&Society, Human Brain Project. Zenodo. https://doi.org/10.5281/zenodo.4588467

[8] P3991 - Aicardi, Christine, Bitsch, Lise, Bang Bådum, Nicklas, Datta, Saheli, Evers, Kathinka, Farisco, Michele, Fothergill, Tyr, Giordano, James, Harris, Emma, Jørgensen, Marie Louise, Klüver, Lars, Mahfoud, Tara, Rainey, Stephen, Riisgaard, Karen, Rose, Nikolas, Salles, Arleen, Stahl, Bernd, & Ulnicane, Inga. (2021). *Opinion on 'Responsible Dual Use' Political, Security, Intelligence and Military Research of Concern in Neuroscience and Neurotechnology*. Zenodo. https://doi.org/10.5281/zenodo.4588601

[9] P3056 - Aicardi, Christine, Bitsch, Lise, Datta Burton, Saheli, Evers, Kathinka, Farisco, Michele, Mahfoud, Tara, Rose, Nikolas, Rosemann, Achim, Salles, Arleen, Stahl, Bernd, & Ulnicane, Inga. (2021). *Opinion on Trust and Transparency in Artificial Intelligence* - Ethics&Society, The Human Brain Project. Zenodo. https://doi.org/10.5281/zenodo.4588648

As in previous years, integration of RRI in the HBP was supported by organisational structures and participation in project-level governance boards. Figure 3 gives the complete picture of the organisational structures and governance boards, where we worked to create awareness of ethical and societal issues to identify and address them, integrating RRI principles and practices in the HBP.

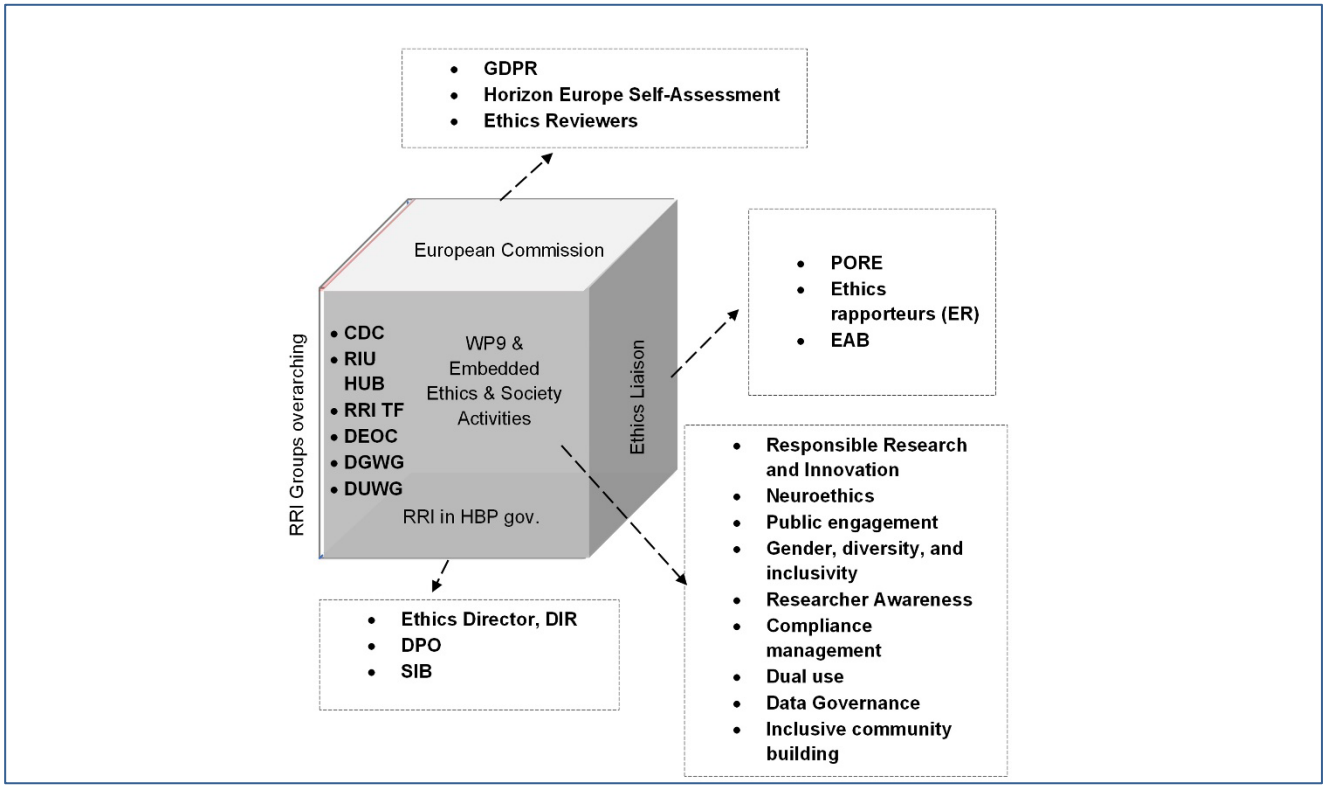


**Figure 3: Overview of activities and organisational structures in the HBP**

Shorthand in the figure refers to:

- GDPR: General Data Protection Regulation (https://gdpr.eu/)
- CDC: Capacity Development Committee (Internal HBP committee coordination capacity training and development)
- RIU-HUB: Responsible Research and Innovation Hub (Coordination of collaboration on ethics and society across the HBP)
- RRI TF: Responsible Research and Innovation Task Force (https://ebrains.eu/ethics-and-society-vision/)
- DEOC: Diversity and Equal Opportunities Committee (https://www.humanbrainproject.eu/en/about-hbp/diversity-and-equal-opportunities/diversity-and-equal-opportunities-committee/)
- DGWG: Data Governance Working Group (https://www.humanbrainproject.eu/en/science-development/ethics-and-society/data-governance/)
- DUWG: Dual Use Working Group (https://www.humanbrainproject.eu/en/science-development/ethics-and-society/dual-use/)
- DPO: Data Protection Officer
- SIB: Science Infrastructure Board (https://www.humanbrainproject.eu/en/about-hbp/project-structure/governance/science-and-infrastructure-board/)
- PORE: Point of Registration of Ethical concerns (https://www.humanbrainproject.eu/en/science-development/ethics-and-society/register-ethical-concern/)

- EAB: Ethics Advisory Board (https://www.humanbrainproject.eu/en/about-hbp/project-structure/governance/ethics-advisory-board/)

## 1.4 Introduction to the content

This Deliverable presents the Handbook for Responsible Research and Innovation in Neuroscience and the EBRAINS RRI Toolkit. They are developed as websites, video, and other online resources for exploitation by the EBRAINS research infrastructure and other research infrastructures. Within this Deliverable, we describe the Handbook and the Toolkit, and we describe our motivation for developing them. We also provide a perspective on how they contribute to achieving the objectives of our work. Importantly, this report is not a compilation of all the work we did over the last three years, and therefore it does not offer an exhaustive evaluation of that work. Where possible and relevant, we have tried to provide links to additional work within this Deliverable, as it also supports our final section on recommendations for the EBRAINS research infrastructure to continue the integration of RRI and other related activities on ethical, societal and legal issues.

# 2. Handbook for responsible research and innovation in neuroscience

The concept of a handbook was introduced in the SGA3 Grant Agreement as shorthand for the collection of all substantive insights on how to implement or realise the aims of RRI in the HBP and how to transfer these insights to the EBRAINS research infrastructure. To put it differently, the handbook aimed to answer the questions what constitutes RRI and why it is important for the EBRAINS research infrastructure. As the SGA3 period progressed, it became clear that the activities that would fall within the remit of such a handbook are substantial and they are distributed across different WPs (see Figure 2 and Figure 3 in Section 1.3). We therefore use the term “handbook” to refer to the totality of these insights across the HBP, keeping in mind that the creation of a single document that could be called a handbook would be neither practicable nor useful in achieving the aim of describing the RRI-related insights that need to be transferred from the HBP to the EBRAINS AISBL as well as the emerging research infrastructure. In short, the activities collected in the handbook aim to answer to what RRI is, and why it is important for the EBRAINS research infrastructure.

This section introduces the activities that were undertaken with a view to structuring and meeting the RRI-related needs of the EBRAINS research infrastructure and its users. The substantive content of the handbook must be available to EBRAINS users and therefore takes a dynamic content that can be found on various websites referenced below. This section outlines the processes used to identify, develop, and implement this content, an overview of the content areas and links to the substantive content where relevant. The section starts with key processes that were launched with a view to ensuring the transition of RRI-related activities in the EBRAINS research infrastructure, namely the EBRAINS task force on responsible research and innovation (EBRAINS RRI task force) and the Capacity development Committee (CDC) for developing training and capacity building on responsible research and innovation.

## 2.1 The RRI Task Force

As work got under way in SGA3, a need emerged for coordination on RRI with the emerging EBRAINS research infrastructure. The RRI activities developed during the lifetime of the HBP would not simply be continued post-project in the EBRAINS infrastructure. This was mostly due to the changing funding structure but also to likely changes of membership between HBP and EBRAINS. This meant that the first task in planning for this transition was to find ways to identify and prioritise those tasks that would be needed in the RI and consider how they could transition from the HBP structure to the EBRAINS research infrastructure. To this effect, WP9 developed a list of RRI activities, their justification, and possible instantiation in the infrastructure. While WP9 was well equipped to

undertake this stock-taking exercise, it did not have the remit of using it to set priorities and plan EBRAINS activities.

The EBRAINS Task Force on Responsible Research and Innovation (EBRAINS RRI task force) [10] was created to facilitate the transition of HBP RRI-related activities to EBRAINS AISBL and ensure that responsible practices are integrated into the new research infrastructure. The TF's mandate was to "develop detailed practical steps to implement RRI in EBRAINS, including the identification of suitable structures, procedures instruments, and activities and the integration of responsibility beyond ethical and legal compliance. The RRI task force is composed of members of neuroscience, neuroethics, diversity and inclusion and RRI experts.

The task force on RRI was established based on a document with five starting recommendations:

"To have an EBRAINS infrastructure that is socially acceptable, morally desirable, and sustainable, we recommend that:

1) Compliance with relevant legislation and regulations (including GDPR, animal protection, dual use, diversity equality and inclusion) be embedded in an appropriate manner in the central node.
2) The EBRAINS infrastructure includes the following scientific and operational topics of strategic relevance:
    a) Anticipation and public engagement on present day, emerging and future ethical and societal issues related to ICT enabled brain research
    b) Neuroethics research including neuroethics service
    c) Diversity as a research topic
3) Inclusion of those issues (in 2) could materialise in the following structure:
    a) Creation of a network dedicated to coordinating research and anticipatory and engagement activities across EBRAINS
    b) The network should be in direct contact with the AISBL Board, who will coordinate issues of strategic importance to EBRAINS
4) Secure funding to implement these recommendations using appropriate sources including EBRAINS national contributions, national and European research funds
5) Detailed plans to achieve these aims be developed by a task force to be put in place with immediate effect, to ensure that these measures are in place on completion of the HBP's EC funding."

As it became clear that such prioritisation was called for with input from across the Project, it was proposed to establish a task force on RRI. The task force included members of various individuals from the directorate and Project Coordination Office. The task force was chaired by the EBRAINS Director General, Paweł Świeboda.

The task force met at least once a month since its creation. The first meeting was held on April 19th, 2021. Often there were two meetings each month to accommodate pressing issues. The full board met 17 times, however, there were sub-group meetings, where some members would also meet to discuss or organise specific tasks. The full board was composed of 12 members, who came from different disciplinary and WP backgrounds.

The RRI task force discussed procedural and substantive questions. When exploring the question of priorities for RRI implementation in the research infrastructure, it became clear that any process of prioritisation would need to be based on a set of clear and transparent principles. In addition, there was consensus in that EBRAINS Research Infrastructure would benefit from clarifying its own position with regards to RRI and questions of ethics and society. This led to a decision to draft an Ethics & Society Vision (E&S vision) for EBRAINS Research Infrastructure which was the product of close collaboration with and built on the insights of multiple relevant stakeholders. An early version was

[10] Please find a description of the task force on the EBRAINS website: https://ebrains.eu/ethics-and-society-vision/

introduced internally (to the HBP community) at the 2021 HBP Summit. A revised version received input from a panel of international experts including representatives from academia (neuroscientists and RRI), civil society, policy, and philanthropic organisations (OECD, Dana Foundation), international organisations (WHO, IBI) and gender studies as well as different geographical regions (Canada, USA, the EU, South Korea, and Japan).

The second task of the task force was the creation of Terms of Reference (ToR) for EBRAINS Ethics & Society Committee (EESC). Task Force members drafted the initial ToR which underwent several revisions before a final version was deemed accepted and was later reviewed by the EAB and the Board of Directors at HBP and approved in September 2022. The ToR clarifies the different roles and processes to select members of the EESC. Following the adoption of the ToR, the EBRAINS nodes were asked to appoint individuals to join the EESC. All nominations were assessed against a set of criteria that aimed to ensure demographic balance and appropriate expertise in the committee. After members were invited to join the EESC, the committee met for the first time on 19.04.2023.

The EESC is primarily an advisory committee, but it holds a central role in the future of RRI-related activities in EBRAINS, as it can comment on practices, review policies, and keep the agenda at the forefront of management activities. E&S Vision and EESC together will thus shape the trajectory of RRI at least during the early stages of the EBRAINS research infrastructure.

## 2.2 Developing capacities on responsible brain research and innovation for HBP and the EBRAINS research infrastructure

The development of training and building capacities on responsible research and innovation, was the second central activity for structuring and meeting the RRI-related needs of the EBRAINS research infrastructure and its users. This was carried out with a view to broadening the knowledge base of HBP researchers, EBRAINS users, data and infrastructure providers, as well as EBRAINS leadership and management. The programme takes into consideration the prevailing idea that to integrate and embed within innovation, the capacities for anticipation, inclusive deliberation, and dialogue with stakeholders, reflexivity, and responsiveness[11] must be developed. Thus, the RRI capacity-building programme set out to enable the institutionalisation of responsible practices in the development and use of the EBRAINS research infrastructure[12].

The structured delivery of the RRI training began shortly after the piloting phase April 2021. Although the initial plan was to have mostly face-to-face training, the entire training programme was moved online because of travel restrictions brought about by the Covid-19 pandemic[13]. Also, the original plan was to have up to full-day deliveries for each module but with everything moving to an online format, this plan was also revised including the content and delivery structure.

The RRI capacity development programme began with 18 fully developed modules (see Deliverable D9.1 and Milestone MS9.3). Some modules were revised and restructured resulting in a reduced offering of 17 modules. One of the four modules affected was an entirely new module developed from scratch within the final year of SGA3 – Science Communication. The other three modules revised were the modules previously referred to as “Introduction to EBRAINS Data Governance”, “Ethics Compliance for EBRAINS Data” and “Data Protection in EBRAINS”. These modules were merged and restructured as two separate modules instead of three. The new modules that came out of the review

[11] Owen, R. et al. (2021) Organisational institutionalisation of responsible innovation. Research Policy, 50(1), p. 104132.
[12] P2893: Stahl, B.C. et al. (2021) From Responsible Research and Innovation to responsibility by design. Journal of Responsible Innovation, 8(2), pp. 175–198.
[13] P2564: Grasenick, K. & Guerrero, M. (2020) Responsible Research and Innovation & Digital Inclusiveness during Covid-19 Crisis in the Human Brain Project (HBP). Journal of Responsible Technology, vol. 1. 1. https://doi.org/10.1016/j.jrt.2020.06.001

are “Animal Data in EBRAINS - Governance and Compliance” and “Human Data in EBRAINS - Governance and Compliance”.

All module leaders of the RRI capacity development programme committed to delivering training for each module at least two times. In some cases, module leaders went beyond this commitment to host up to 5 separate training events. It has resulted in over 40 separate training events and more than 300 people have participated in the training programme. This number has considerably exceeded the target number of 200 set out at the beginning of the programme. In considering the sustainability of the resources developed for the RRI capacity building beyond the SGA3 funding period and to make them widely available to the broader brain research community, the resources developed have been curated online on the HBP website[14].

Also, to enable the evaluation of the training programme and gauge participants progress toward learning outcomes, a standard survey was developed by the capacity building team and given to each participant at training events to complete. Among other things, participants were asked how well the module met their expectations; what the most important thing they learned was; their level of satisfaction with the content of the module and the overall format of training delivery. Participants could respond to questions like these using a 5-point scale - extremely satisfied, very satisfied, somewhat satisfied, not so satisfied, or not at all satisfied. Participants were also given an opportunity to provide further feedback and comments in a section on the feedback form for additional comments. Only about 15% of the total participants used these forms - with some preferring to send emails or provide verbal feedback instead.

Interestingly, for those who provided responses in the feedback forms, the feedback indicated that only 4.5% of participants of the total feedback responses indicated some level of dissatisfaction with the content of the training. Most responses (96%) fell within the ranges of extremely satisfied to satisfied. Also, when asked whether the module met their expectations, only one participant out of those who responded to the feedback suggested some level of dissatisfaction while the response of the majority (80%) was within the range of very satisfied to extremely satisfied with the others (18%) being somewhat satisfied. An indication of the reason why despite the positive feedback, a considerable proportion felt that their expectations were not met can be seen in the additional comments left by the participants. Most comments suggested the way the cases were discussed or the amount of time available for discussing the cases was insufficient and would have preferred more time for discussions. Likewise, when asked about their satisfaction with the overall format of the module, 1 participant said they were not satisfied while a total of 91% were either satisfied, very satisfied or extremely satisfied. See Table 1 for a fuller breakdown of the feedback received.

**Table 1: feedback capacity and training modules**

| Level of Satisfaction | Did the module meet your expectations? (%) | How satisfied are you with the content of this module? (%) | How satisfied are you with the overall format of this module? (%) |
|---|---|---|---|
| Dissatisfied | 0 | 2 | 0 |
| Not so satisfied | 2 | 2 | 2 |
| Somewhat satisfied | 18 | 4 | 2 |
| Satisfied | 0 | 22 | 20 |
| Very satisfied | 31 | 42 | 40 |
| Extremely satisfied | 49 | 28 | 36 |

In summary, Table 1 shows that most participants were very satisfied with the training provided and the overall format, and that it met their expectations. Thus, this section gives some indication of the level of success and some of the challenges of the RRI capacity development programme.

[14] https://www.humanbrainproject.eu/en/science-development/ethics-and-society/ethics-society-training-resources/

# 3. A toolkit for responsible research and innovation in brain research

While the handbook for responsible research and innovation in neuroscience aimed to answer what RRI is and why it is important for the EBRAINS infrastructure, the EBRAINS RRI toolkit collects training materials and tools for EBRAINS researchers to use in reflecting on the (neuro)ethical, philosophical, social, gender and diversity implications of their work, along with guides for engaging stakeholders and publics, engaging in foresight exercises on possible future implications of their work, and examples of ways to take action to address such issues.

The focus of the toolkit is therefore to engage EBRAINS research infrastructure users in a reflection process about RRI in their own practices and it does so by supplying tools for how to engage with RRI. Therefore, the toolkit has an interactive approach. The information available in the toolkit will focus on their reflection process and link to the handbook for in-depth information on RRI policies and procedures for the EBRAINS research infrastructure.

## 3.1 The EBRAINS RRI toolkit: aim and approach

One key part of Deliverable D9.5. is the Ethics and Society toolkit, which is provided as an online resource, a webpage. The toolkit was titled “Ethics and Society” rather than “RRI” to provide a clear title to users. The overall aim of the toolkit is to offer a possibility for researchers within cross-disciplinary brain research to engage with Ethical and Societal issues within brain health and brain disease. The toolkit presents tools for furthering reflection on the (neuro)ethical, philosophical, social, and diversity implications of their work.

The toolkit webpage can be found online here: https://ebrainsethicsandsociety.tekno.dk/

The toolkit has been built with a responsive web development approach that creates dynamic changes to the appearance of a website, depending on the screen size and orientation of the device being used to view it. It therefore works well both on computers and mobile devices.

The approach to communicating the information in the toolkit is three-dimensional:

1) First, the toolkit has a **multimedia approach** to communicating the information in the toolkit. It presents short texts, scenario-based dilemmas, audio-visuals, quizzes, and links to further material. The aim is thereby to give information in ways that speak to a wider audience and to keep the user engaged by enabling multiple ways of interaction.
2) Secondly, the toolkit is **reflection oriented**. The focus of the toolkit is therefore to engage users in a reflection process about how to engage with topics within Ethics and Society and to inspire users to incorporate these reflections in their own practices. The toolkit will therefore have an interactive approach for engaging with the dilemmas and in facilitating self-reflection.
3) Thirdly, the toolkit is **expandable**. Each tool presented in the toolkit can be expanded by utilising links for relevant publications, for teaching modules and for the EBRAINS Community Space. We are making a long story short, with the possibility to have the whole the story as well. The information available in the toolkit will focus on being approachable and applicable for reflection processes and still link to in-depth information in relevant academic literature and teaching modules developed in WP9.

Likewise, the toolkit also has a three-dimensional approach to audience:

1) First, we focus on attracting a **new** audience: those who might have not been in contact with Ethics and Society topics in their research. Here, we are especially hoping to get younger researchers interested and possibly engaged with these themes. This is also why we focus on online, interactive, and partly video-based communicational approach.
2) Secondly, we hope to **broaden** the audience and views of those already engaged in some issues within Ethics and Society. By presenting new perspectives on known topics, we intend to get

users interested in a greater variety of topics with Ethics and Society, as well as broadening their perspectives on the topics they are already familiar with.

3) Thirdly, we aim at being **social media friendly**. By having a three-dimension approach to the communication, with shorter texts and audio-visual material, we simultaneously produce content that can easily be transmitted on social media channels. Thereby we aim at having a smooth transition from followers on social media to engaged users in the toolkit.

## 3.2 The EBRAINS RRI toolkit: design and tools

The Ethics and Society toolkit is designed with the intention to be an expansion of the work done in HBP WP9. Therefore, the tools in the toolkit are based on the main topics generated in WP9 and in the HBP RIU-Hub. The toolkit consists of topic-based tools, an Ethics and Society glossary and an audio-visual book on foresight. Each of these elements will be presented in the following paragraphs.

When entering the toolkit, the user is presented with a landing page clearly stating that the user is welcomed in the Ethics and Society Toolkit, also featuring the HBP Ethics & Society logo. The user is then presented with a text introducing the toolkit and how to engage with it. This then leads to the main body of the toolkit: the topic-based tools (see Section 3.2.1). In the header of the landing page, the user can also find an overview of the topic-based tools, a link to relevant academic publications, a direct link to the Ethics & Society Glossary and contact information. At the bottom of the page, the official information about the toolkit is listed as well as links to all the topic-based tools, HBP and the EBRAINS research infrastructure. By clicking the Ethics & Society logo in the top banner, the user can always be redirected to the landing page.

### *3.2.1 The topic-based tools*

The tools in the Ethics & Society toolkit are based on WP9 topics and the RIU-Hub. The final toolkit contains four topic-based tools which cover the main work of WP9:

- Public Engagement: https://ebrainsethicsandsociety.tekno.dk/tools/public-engagement/
- Neuroethics: https://ebrainsethicsandsociety.tekno.dk/tools/neuroethics/
- Equality, Diversity and Inclusion: https://ebrainsethicsandsociety.tekno.dk/tools/equality-diversity-and-inclusion/
- Data Governance: https://ebrainsethicsandsociety.tekno.dk/tools/data-governance/

To give the user an experience of a coherent toolkit, each of the tools has the same framework and consists of the same elements. The user is first presented with a short introductory text about the topic, short to get them informed about the topic, while maintaining their attention with text suited for an online resource.

To initiate the reflections and engagement aspects of the toolkit, the user is then presented with an audio-visual book (please see Section 3.3) chapter about the topic and a relevant foresight dilemma.

Using the audio-visual tool, a user can engage in a self-reflection exercise presented as a quiz with relevant reflection questions and possible answers. Each of the answers is plausible and none of them are correct or incorrect. The aim is to start a reflection on how to approach a similar question in one's own practices. The quiz is not only about a relevant situation, but gets a user engaged by having them answer a question; by posing questions and giving answers a user gets inspired in reflecting on their own values, choices, and practices.

To encourage a user to keep Ethics and Society in their mindset and network, each tool is linked to relevant resources within the HBP and the EBRAINS research infrastructure: 1) relevant teaching material produced as the CDC modules in HBP WP9, 2) the EBRAINS Community Space where the user can network further and 3) relevant academic publications by the HBP. The tool on Equity, Diversity and Inclusion links directly to the EDI toolkit (https://www.edi-toolkit.org/).

### 3.2.2 Ethics and Society glossary

We aim to engage a broad variety of users, and are aware that working with the toolkit and the phrases embedded within Ethics and Society, might be new to many users. Therefore, we have embedded an Ethics and Society dictionary to improve engagement with the toolkit. Equally important, the inclusion of a relevant glossary could also enable users to incorporate Ethical and Societal issues more easily in their own practices.

The glossary is based on the HBP RRI Glossary developed by DMU. To make it more useful for the users of the Ethics and Society toolkit, it was edited and revised by adding more relevant words. We added all relevant words used in the toolkit to the glossary.

The glossary works in two ways: 1) the header links to the glossary where all the words and their explanation are listed; and 2) each of the words in the glossary is lightly marked with a dotted line underneath and mousing over will show the explanation for the word, as such providing easily a short explanation of a given word.

## 3.3 The EBRAINS RRI toolkit Audio-Visual Book on foresight (OP9.7)

This part of the toolkit covers HBP WP9 Output 9.7: Audio-visual book or video on the long-term implications of understanding the brain for EBRAINS.

The audio-visual book is embedded in the toolkit as elements in each of the tools. They are short (maximum 150 seconds), animated videos presenting a future dilemma scenario. The framework and scripts were presented and discussed within WP9 and HBP RIU-Hub in the fall of 2022. The frame of the scripts follows a structure of:

*"In a future to come, the human brain is now better understood than ever. [Main character: researcher / research team /PhD student / staff (think diversity)] are leading researchers within the field of [insert relevant research field]. The team hope that [future positive aim] and has just [new event]. However, [insert turn of events with relevance for the topic]. Now [main character] is considering how to best [incorporate topic relevant reflections]. [Insert dilemma and reflection questions]. What would you do if you were [main character]? Learn more about how these questions can be met by interacting with the tools about [topic] on this page."*

Each of the partners completed the information in the script, which was edited to ensure diversity in characters and in overall wording of the different topic-based scripts. Animations for the videos follow the general visual identity of the HBP and EBRAINS, using colours related to the EBRAINS blue-green colour scheme, to ensure coherence between HBP/EBRAINS and the Ethics and Society toolkit, especially for users familiar with HBP/EBRAINS but new to the toolkit. Each of the videos ends with reflective questions for the user, focusing on a dilemma and on how this might impact their own practices.

Each of the audio-visual book chapters can be found in the middle of each of the topic-based tool pages:

- Public Engagement: https://ebrainsethicsandsociety.tekno.dk/tools/public-engagement/
- Neuroethics: https://ebrainsethicsandsociety.tekno.dk/tools/neuroethics/
- Equality, Diversity and Inclusion: https://ebrainsethicsandsociety.tekno.dk/tools/equality-diversity-and-inclusion/
- Data Governance: https://ebrainsethicsandsociety.tekno.dk/tools/data-governance/

Moreover, all videos are accessible and visible on the HBP YouTube channel here:

- Data Governance: https://youtu.be/VvxNC2BbJI8
- Equality, Diversity & Inclusion: https://youtu.be/vGEPHnIJBq4

- Neuroethics: https://youtu.be/Z1LP649v1X4
- Public Engagement: https://youtu.be/ZmWPXVcyoIc

A playlist can be found here:

- https://www.youtube.com/playlist?list=PLHyCyen_OSENHPMJBfCf54n7d9pJrqoTH

The audio-visual book is partly framed around the AREA (Anticipation, Reflection, Engagement and Action) framework of RRI, especially focusing on "Reflection" and "Anticipation" by applying dilemmas to increase reflection on potential future implications and situations in users' own research practices. Moreover, the audio-visual book incorporates foresight into the dilemmas presented. The foresight aspects are not understood as a practice of predicting the future but a way of presenting and anticipating possible future outcomes of research within multidisciplinary brain health. From a methodological perspective, each of the chapters evolves around a possible future scenario, as a well-established method for working with foresight in practice.

The videos are animated, and the scripts are presented both as voice-over to the animation and as subtitles in the videos to give the best and most informative experiences for a variety of users, thereby reinforcing the web accessibility of the toolkit and topics.

# 4. Recommendations for future development of practices and principles of responsible research and innovation in EBRAINS

Setting out on our journey for SGA3, our main ambition was to work towards the integration of RRI principles and practices in EBRAINS. The Deliverable presents the EBRAINS RRI handbook, and the EBRAINS RRI toolkit. Two key results that were developed for achieving WPO9.2 "To strengthen the ethical and social acceptability and desirability, and to increase understanding of legal compliance of HBP research and EBRAINS infrastructure to ensure societal benefit".

In this section, we lay out additional outcomes from our work developing implementation guidelines and agreed upon practices and principles of RRI. These outcomes take the form of recommendations for future work that would continue the task of integrating RRI in the EBRAINS AISBL and research infrastructure.

**Table 2: Recommendations on RRI for EBRAINS from the RRI-related activities across the HBP**

| Topic | Short Summary | References |
|---|---|---|
| General recommendation | Continue to pursue ethical and social reflection post-HBP | https://ebrains.eu/ethics-and-society-vision/ |
| Neuroethics and international collaboration | Continue to play an active role in international discussions on neuroethics and responsible neuroscience research and neurotech development and application, collaborating with international colleagues in the development of relevant neuroethics guidance and application tools. | HBP SGA3 Deliverable D9.4 Ethics Strategy for international collaboration on the integration of neuroethics and neuroscience (Submitted to EC)<br>A Joint article neuroethics engagement<br>P3785 https://doi.org/10.3389/fcomm.2022.909964 |
| Public engagement (citizens and experts) | Citizen participation has great potential for building inclusive brain research that includes attention to diversity and equality in research and application.<br>Citizen participation can give insight into unconscious bias, unlock new knowledge, and | 2nd Report SP12-SGA2:<br>Lessons from stakeholder engagement and dialogue<br>(Deliverable D12.3.2 – SGA2)<br>https://sos-ch-dk-2.exo.io/public-website- |

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| | helps generate new ideas and priorities for research and its application in practice.<br>Public engagement, that includes citizens and other stakeholders can help steer future brain research towards societal benefit.<br>Public engagement as dialogue and learning should be part of EBRAINS proactive governance strategy. | production/filer_public/69/bb/69bb6b41-23dd-42b1-addc-3d73eacb5703/d1232_d772_d113_sga2_m23_accepted_201006.pdf<br>OP9.7<br>https://ebrainsethicsandsociety.tekno.dk/ |
| Dual use | EBRAINS should define clear position towards civilian and military research. It should be defined in inclusive and transparent manner.<br>EBRAINS should consider broader set of potential uses of concern including political, security, intelligence and economic. It should provide opportunities for anyone to raise and discuss any potential concerning uses and offer support to address them.<br>EBRAINS should consider issues of foreign interference in research and innovation and have mechanisms to identify and address them. | Dual Use webpage https://www.humanbrainproject.eu/en/science-development/ethics-and-society/dual-use/<br>Dual Use Opinion P3991 - https://zenodo.org/record/4588601<br>Ulnicane, Inga, Tara Mahfoud and Arleen Salles. 2022. "Experimentation, learning, and dialogue: an RRI-inspired approach to dual-use of concern." *Journal of Responsible Innovation*. https://doi.org/10.1080/23299460.2022.2094071 (P3319) |
| Diversity and equal opportunity | EBRAINS research infrastructure will become an infrastructure with a variety of partner institutions and diverse user communities who will collaborate mainly online. for the network of partner institutions agreed on standards for the setup of board and committees, for contracts, procedures and events that may become part of EBRAINS will be crucial. The data and instructions provided for the user community can actively encourage to consider diversity as research content. For collaboration raising awareness and overcoming biases and power games, implementing inclusive measures could demonstrate an EDI approach of EBRAINS | Toolkit on Equality, Diversity, Inclusion in Governance and Research www.edi-toolkit.org<br>P3837 - Grasenick, K., Beranek, S., Godfroy, A. S., Reidl, S., Romero, P. F., Schiffbänker, H., ... & Waechter, C. (2022, December). The Gendered Analog-Digital Divide in Virtual Academia. In Conference Proceedings of the STS Conference Graz 2022: Critical Issues in Science, Technology ,and Society Studies 2-4 May 2022 (pp. 93-110). Verlag der Technischen Universität Graz. https://doi.org/10.3217/978-3-85125-932-2 |
| Ethics rapporteur programme | It's crucial to continue raising awareness about the issue of research integrity and open-access data on EBRAINS<br>Patient involvement should be and remain a constant activity of EBRAINS community-building work. | Researcher Awareness & Research Integrity Training Module<br>https://www.humanbrainproject.eu/en/science-development/ethics-and-society/ethics-society-training-resources/researcher-awareness-research-integrity/ |
| RRI capacity development | EBRAINS should consider good ways for promoting the training/ capacity building resources developed on RRI on the EBRAINS website. For example, by adding RRI capacity building activities to the EBRAINS services. The level of interest shown so far and the potential for RRI to contribute towards the institutionalisation and continuous responsible development and use of the infrastructure provides a good basis for such a service. | Deliverable D9.1 (EBRAINS RRI Capacity Development Plan) https://sos-ch-dk-2.exo.io/public-website-production/filer_public/3a/97/3a97bd8d-9b23-484e-a272-7dc92ba5fc58/d91_d75_sga3_m7_accepted_210303.pdf<br>Training programme and support on RRI policies and procedures as well as training resources<br>https://www.humanbrainproject.eu/en/social-ethical-reflective/about/capacity-development/ |

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|---|---|---|
| | | https://www.humanbrainproject.eu/en/science-development/ethics-and-society/ethics-society-training-resources/ |
| Ethics Compliance | The EBRAINS infrastructure must ensure the data which are shared through its platforms and services meets ethical and legal requirements, but that process should not be limited to a simple administrative exercise. EBRAINS should build upon the lessons learned in the HBP and ensure that appropriate resources are allocated to continue the focus on ethics dialogues as an important foundation upon which to build a responsible ethics compliance process. | Deliverable D4.10 "EBRAINS Compliance Management and Data Management Handbook" (submitted to the EC) |
| Data Governance | EBRAINS AISBL and RI must consider Data Governance mechanisms set up by the HBP including an administrative committee/taskforce or committee similar to the DGWG. This will allow EBRAINS to consistently identify data governance challenges and develop structured and harmonised approaches for addressing these issues. Ethically responsible and legally compliant data processing activities in EBRAINS will depend on this | Deliverable 4.10 "EBRAINS Compliance Management and Data Management Handbook" |
| Technology transfer | Develop a coherent approach and ethical governance framework for the exploitation, transfer and commercialisation of research outputs and technologies in EBRAINS AISBL (e.g., computation devices, software tools, code, algorithm, etc.), including in the context of international tech transfer to RPOs, companies and other entities overseas. | Deliverable D3.7 "Handbook for RRI for adaptive networks for cognitive architectures" (submitted to the EC)<br>Output OP3.22 "Actionable guidance, informing AI-related developments, in relation to conceptual, social, and ethical issues."<br>https://drive.ebrains.eu/f/62777c397d6d4f0a8a31/ |
| Responsible science communication | EBRAINS AISBL can use strategic communications to support impact. By building researcher's own capacity to communicate both research questions and results. they can help frame, explain, and call different stakeholders to action, in channels and formats that align with the stakeholder values and expectations. | Human Brain Projects Ethics & Society web resources https://www.humanbrainproject.eu/en/science-development/ethics-and-society/<br>The Ethics Dialogues blog https://www.ethicsdialogues.eu/<br>HBP & Society on Twitter https://twitter.com/HBPSociety |
| Community building | EBRAINS AISBL and RI should prioritise keeping the scientific community that uses, benefits, and/or contributes to the EBRAINS tools and services engaged. This can be done in various ways and on different levels. Keeping a lively environment online through a community-focused platform can secure and encourage cross-border collaboration and facilitating co-creation workshops with a focus on user/member involvement, can be seen as an important investment for the development and use of the infrastructure in the future. | HBP SGA3, D4.11, Sustained Community Building after 2023 (submitted to the EC)<br><br>EBRAINS Community space https://community.ebrains.eu/<br><br>Report from EBRAINS Community CoCreate: Research and innovation roadmaps on Digital Brain Health<br>https://ebrains.eu/news/new-report-ebrains-community-cocreate<br>P3993 |

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|---|---|---|
| | | https://strapi-prod.sos-ch-dk-2.exo.io/Final_Report_EBRAINS_Co_Create_0231287c49.pdf |

# 5. Perspective towards EBRAINS and future of responsible research and innovation in the research infrastructure

In this final section we provide a few reflections on the legacy and impact of our work beyond the HBP. Beginning with the EBRAINS research infrastructure, short term impact achieved during the SGA3 project period includes the Ethics and Society Vision and the EBRAINS Ethics and Society Committee (EESC). Both impacts that were achieved during the SGA3 project period but have the potential of guiding EBRAINS AISBL in years to come towards societal benefit. The EBRAINS Ethics and Society Vision, as a high-level commitment on ethics and society, is notably a vision that goes beyond ethics compliance and takes on board a commitment to human rights, integration of neuroethics, philosophy, gender equality, diversity and cultural sensitivity, engagement, and dialogue with society, the fulfilment of which will importantly be guided by the EESC. The capacity building and training programme, together with the RRI toolkit, forms another result of the RIU-HUB work which has created both awareness among HBP researchers and given them tools to operationalise their newly learned lessons, and they present an important legacy resource for EBRAINS AISBL and RI. Taken together, these resources could also support the work of the EESC and the further achievement of the Ethics and Society Vision.

In addition to influencing the HBP and the EBRAINS research infrastructure, our work has been used in several other collaborations (see also Figure 4).

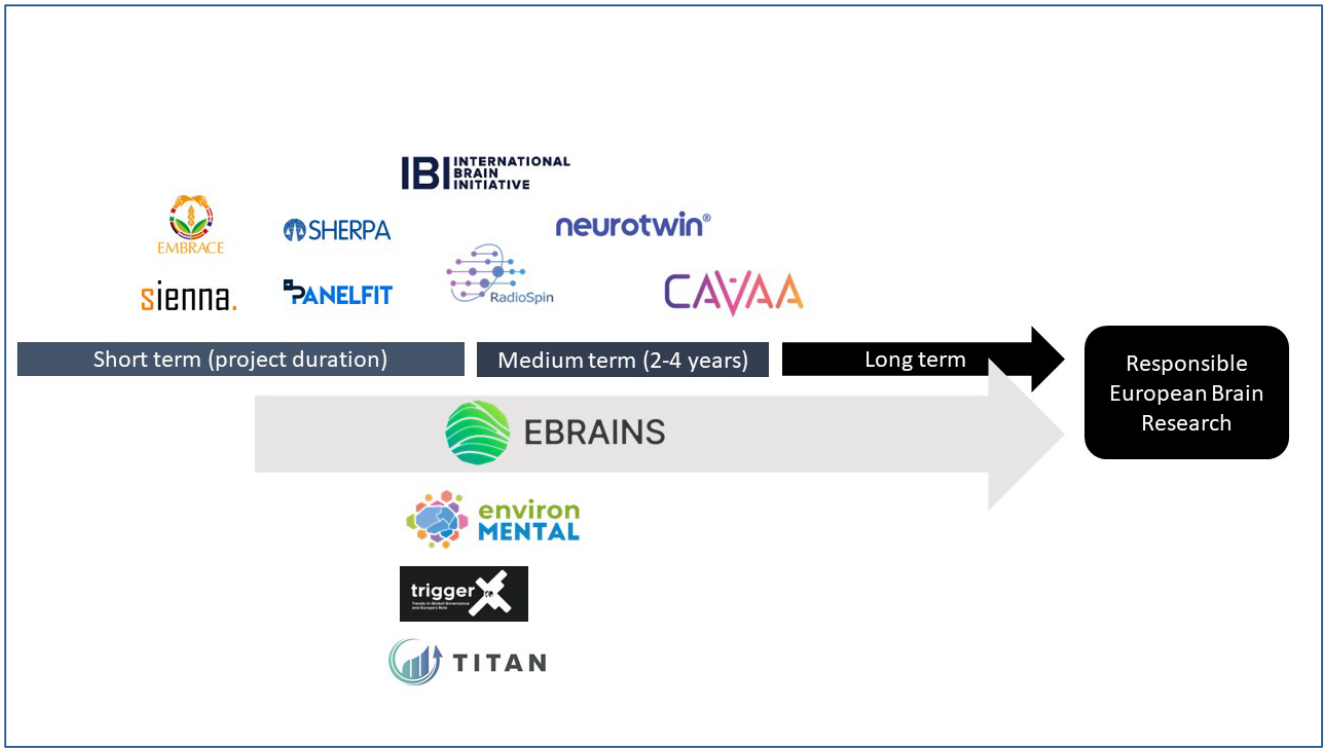


**Figure 4: Overview of project collaborations based on HBP RRI work.**

- International Brain Initiative (IBI): The HBP approach to addressing ethical and societal considerations has contributed to the international discussions on how to carry out neuroethical reflection and public engagement. It has led to a productive international collaboration with the different existing Brain Initiatives. The HBP has been part of the IBI Global Neuroethics Working Group since the creation of the International Brain Initiative, organising and participating in

multiple activities and producing joint academic publications and reports that address neuroethical issues relevant to IBI members and to the public.

- EMBRACE: Drawing from the broad range of activities related to RRI in the HBP, the EMBRACE project has developed commercially viable services that can enable the integration of RRI principles and practices into FET projects research. The successful and internationally recognised work on RRI in the HBP provided the basis on which the EMBRACE services were tailored for FET-related work.
- The Horizon 2020 SHERPA, SIENNA and PANELFIT projects are part of a cluster of projects working on the ethical, human rights and legal issues relating to AI, big data and data sharing. Members of the HBP Ethics & Society team have been active in all three projects, resulting in joint publications, and an online event on 30 March 2021, organised by WP9, SIENNA and SHERPA together, to present and discuss the HBP Opinion on Trust and Transparency in Artificial Intelligence.
    - The SIENNA project (Stakeholder-Informed Ethics for New technologies with high socio-ecoNomic and human rights impAct) developed ethical frameworks, recommendations for better regulation and operational tools for the ethical management of human genomics, human enhancement and AI & robotics.
    - The SHERPA project was a H2020 project working on the ethical and human rights aspects of AI and big data. It contributed to the HBP by providing a case study of such issues, using the HBP as a case study. It was a HBP Partnering Project that used synergies of HBP and SHERPA to promote activities of mutual interest, e.g. by holding joint activities and highlighting research outcomes.
    - The PANELFIT project developed participatory approaches to a new ethical and legal framework for ICT (information and communications technology), taking advantage of the technological opportunities of these processes without compromising the citizens' security and fundamental rights.
- NEUROTWIN is an H2020 FET project (ID: 101017716) that borrows the concept of digital twins to develop personalised hybrid brain models. With research intersecting the frontier of nonlinear dynamics, network theory, biophysics, engineering, neuroscience, clinical research and ethics, it aims to deliver model-driven breakthroughs in basic and clinical neuroscience, with patients benefiting from safe and individualised therapy solutions. HBP´s Ethics and Society experts are taking part in the ethical and philosophical components of the project.
- CAVAA: The project *Counterfactual Assessment and Valuation for Awareness Architecture* (**CAVAA**) has been funded under the call HORIZON-EIC-2021-PATHFINDERCHALLENGES-01 for a duration of four years (October 2022-September 2026). The consortium is composed of 10 institutions, coordinated by the Radboud University in the Netherlands. The goal of CAVAA is "to realise a theory of awareness instantiated as an integrated computational architecture […], to explain awareness in biological systems and engineer it in technological ones".
- EnvironMENTAL is a 5-year EU-funded project studying the impact of climate, pollution, urbanicity, regional socioeconomic conditions, as well as the Covid19 pandemic on brain health, and characterising the underlying biological mechanisms. With a dedicated WP, RRI forms an important part of the environMENTAL project and builds on insights from related work in the HBP in the development of strategies for engaging with stakeholders and activities to ensure a social licence to operate.
- RADIOSPIN, this FET project contacted the HBP to learn about the approach to dual use of concern developed by the HBP Ethics and Society team. The chair and co-chair of the DUWG provided dual use training to RADIOSPIN, using the approach developed in the HBP.
- TITAN, EU project with the aim of developing and AI-based tool that help spot misinformation. The project includes public engagement activities.
- TRIGGER, EU project with an aim to deepen the current understanding of the complex linkage between climate change, human health, and ecosystems to ultimately use this knowledge for society to advance.

- EBRAINS National Node Denmark, service on RRI, including the possibility to support responsible research and innovation activities in EBRAINS on public engagement and community building.

The work has likewise been disseminated widely through publications, invited talks and our communication and dissemination channels and events. A booklet with abstracts of all publications on the social, ethical and reflective work in the Human Brain Project[15] is published on the Zenodo Platform. We have also disseminated our activities on the Ethics Dialogues blog[16], where a report and recordings from our conference on the future of responsible brain research[17] is available. A dedicated Human Brain Project hashtag on the Uppsala University Ethics Blog has allowed us to extend our reach to 8,600 e-mail subscribers, and our @HBPSociety Twitter handle reached 1,000 followers in October 2022. Reflections on the process of implementing RRI in the HBP is published in an Anthology[18] available on Zenodo. By June 2023, we had 39 scientific outputs from WP9 in SGA3, with 124 Web of Science citations and a 41 average Altmetric attention score, indicating both interest in our work, and the effectiveness of our communication and dissemination strategy. Looking towards the future, integration of ethics and society in EBRAINS and the continued beneficial collaboration and integration of social science, humanities, engineering and natural sciences hinges on opportunities for funding as well as actions of powerful and pioneering actors in the field of brain research. The US Dana Foundation is e.g. setting an interesting and powerful example through its programme on "Neuroscience and Society" (https://dana.org/explore-neuroscience/society/), and actors such as the OECD has developed legal requirements for nations to ratify in the responsible development of neuroscience (https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0457). Opportunities for Ethics and Society in EBRAINS will be shaped by the opportunities emerging in EU collaborations on Brain Science and Brain Health in Europe.

[15] https://zenodo.org/record/7763281
[16] https://www.ethicsdialogues.eu/
[17] https://www.ethicsdialogues.eu/2023/03/21/the-future-of-responsible-brain-research/
[18] https://zenodo.org/record/7736402f