CETAF FRAMEWORK
FOR RESPONSIBLE RESEARCH AND INNOVATION

5 PRINCIPLES TO GUIDE 5 DOMAINS:

RRI is "the ongoing process of aligning research and innovation to the values, needs and expectations of society" *(Rome declaration on RRI, 2014)*

Responsible Research and Innovation (RRI) is an approach to ensure that scientific advances and innovation meet the expectations of society while taking into account their implications. As an ever-growing part of the European research landscape, this multi-actor framework brings researchers, citizens, policy-makers, and businesses together to better align the research process and its outcomes with the values and needs of society and to jointly contribute to tackle urgent challenges of our world. The aim of this framework is to provide a valuable umbrella for all societal actors to work together and produce integrative, inclusive and sustainable solutions.

Through the lenses of its five dimensions, RRI stands as a key action for the EU Horizon 2020 objective of "Science with and for Society" (SwafS) and thus becomes a relevant tool to attain excellence in science, and involve society in its future development. These five dimensions are:

- Public engagement
- Open science
- Gender
- Ethics
- Science education

Natural science institutions are already engaged in these domains as RRI principles steadily underpin their numerous and varied activities, from exhibitions and educational programmes, to collections curation and scientific discoveries. In the light of such an exemplary status, the community of CETAF is positioned at the forefront of RRI implementation across all its Member institutions and throughout the scientists involved in the collections based research. To give a common understanding and provide guidance on progressing and deepening in the RRI concept, CETAF has defined a set of five basic principles in each of the five RRI domains. Those values are inherent to the everyday work of our research performing organisations and anchor their pursuit of excellent science while upholding high standards for conducting responsible research.

DOMAIN 1 - PUBLIC ENGAGEMENT

Public engagement implies the establishment of participatory, multi-actor dialogues and exchanges, to foster mutual understanding, to establish a common language, to learn from each other, to explore controversies, and to contribute to the co-creation of ideas, knowledge and solutions. It entails the creation of a space where scientists, citizens and decision makers can get together to deliberate on matters involving science and technology.

1. Natural History collections-based institutions engage society **in supporting** research goals and endeavours, thus aligning societal values, needs and expectations with scientific progress.

   Citizens become more aware of scientific knowledge and especially their long-term benefits for society by having access to research results – e.g. in health, food security, agriculture, fisheries, education, conservation, climate change, disaster risk reduction, soil and air quality – which enables them to increase their level of engagement with science in a responsive and iterative process.

   Example: Educational programmes jointly developed and undertaken by scientists and the education community.

2. Natural History collections-based institutions contribute with their outcomes to increasing **societal scientific literacy**.

   Scientifically literate citizens contribute to efforts to address societal challenges in an equitable and sustainable way, and from a long-term perspective.

   Example: Celebration of Science festivals, open doors events and special events at museums or botanic gardens, to popularise the work and findings of researchers among the general public.

3. Natural History collections-based research engages citizens in a **participatory scientific process** that generates a better understanding of science.

   Citizens may participate in the different stages of a research project, solely or collectively, in different ways and under diverse mechanisms of collaboration.

   Example: Amateur participation in the transcription of herbarium specimen labels or involving amateurs in field-work.

4. Natural History collections-based research institutions work towards **creating a space for dialogue where scientists and citizens can discuss issues openly and constructively** to promote the co-creation of knowledge based on collaboration and mutual respect.

   Research performing institutions, such as museums and botanic gardens, seek to provide the adequate and necessary space where the general public and researchers may meet, discuss and jointly create innovative ideas, and thus co-participate in the development of projects.

   Example: Citizen Science projects are increasingly undertaken by institutions that engage in facilitating the participation of the general public in scientific projects.

5. Natural History collections-based research institutions are recognized as a **hub for documenting scientific needs and achievements** to help policy makers become sound supporters of research policies and goals.

   Research institutions are aware of their potential for channelling scientific requests to policy makers but also for collaborating with policy makers in better understanding scientific issues when producing regulations and taking decisions that affect the preservation of our biodiversity, the environment and the welfare of society at large.

   Example: Institutions coordinate with other key actors to create “centres of natural history expertise”, e.g. natural history institutions work with local authorities in the development of urban conservation and education projects that reflect the implementation of local environmental policies based on a scientific foundation.

DOMAIN 2 - OPEN SCIENCE

Open science includes research outcomes and data being made accessible to all levels of society. It represents a valuable tool to empower the collective and collaborative work of scientists, pushing efforts beyond frontiers that may constrain both the research subject and the researcher.

It encompasses the conducting of the scientific process transparently, from start to end, by using practices such as publishing research without access restrictions (with any being thoroughly explained, if necessary), campaigning for open access, encouraging scientists to practice open notebook science, and generally making it easier to publish and communicate scientific knowledge.

1. Natural History collections-based research is generally made publicly available, thus facilitating and promoting the **circulation of knowledge** to achieve a globalized concept of science.

   Open access to research results facilitates the use of domain-specific data by other parties (such as academia, the private sector, policy makers, engaged citizens) in the value chain of the process of development and innovation, thus creating a technological push and enabling a transversal, multidisciplinary and holistic approach to innovative services for society. Over time this will more than offset the short-term costs of open access – which plays an increasing larger role in all European funding mechanisms

   Example: Information on newly described species is instantly accessible to scientists and policy makers around the world.

2. Natural History collections-based researchers diffuse their **research outcomes** and data via open access for the benefit of society whenever possible and provided their intellectual property rights are respected.

   The scientific community and other interested parties may use scientific results to boost both innovations as well as to procure faster and more efficient advanced solutions to societal problems, such as biodiversity loss or climate change.

   Example: Emerging technologies applied to the long term preservation of DNA.

3. Natural History collections-based institutions commit themselves to seeking solutions to the potential conflict between their **non-profit objectives**, and the **commercial interests** of others.

   The institutions, individually and as a community, need to find a balance between the sharing of knowledge, their status as publicly funded bodies and the desire of other entities to profit from using their discoveries or resources. Moreover, institutions will promote the publication of research outcomes in scientific journals that comply with the open access mandate while avoiding damage to publishers.

   Example: Scientific careers are still founded on publications and their subsequent citations, with no other profit being derived from the knowledge being shared or from the subsequent use of the data contained within.

4. Natural History collections-based research follows internationally recognised **standards and common protocols** that facilitate the interoperability of data so that it can be shared and gathered from diverse sources.

   The standardization of identifiers and stable references for data, such as biological specimens and research outcomes, provides a reliable foundation from which data can be tracked, referenced and shared.

   Example: The *Bouchout Declaration on Open Access* (2014) considers the institutional commitment towards a global open access policy.

5. Natural History collections-based researchers and their institutions integrate the **principles of FAIR data**.

   It is in the best interest of science and scientific progress, in its broadest sense, if research results are findable, accessible, interoperable and re-usable, but always cited.

   Example: Research infrastructures (including e-Infrastructures) are included in the Horizon 2020 Pilot on Open Research Data, which aims to improve and maximise access to and the re-use of research data generated by EU funded projects.

DOMAIN 3 - SCIENCE EDUCATION

Inclusive, innovative and reflective societies are anchored in curiosity, a critical understanding, and reflection of knowledge and its application to finding innovative solutions to problems. New generations of young scientists should be encouraged to analyse and evaluate information, while improving their creative and critical thinking. These capacities, intellectual, critical and creative, facilitate the creation of a society of thinkers and problem-solvers that contribute to its development.

1. Natural History collections-based research institutions are committed to **promoting curiosity, creativity, critical thinking via learning opportunities.**

   Exhibitions and communication on research all have education at their core. Natural history institutions aim to stimulate curiosity by implementing creative thinking and critical learning methodologies.

   Example: Exhibitions are a tool that can be used to make visitors such as students or school children question, explore and (re)think any given issue, instead of just providing them with final and fixed responses.

2. Natural History collections-based institutions engage in increasing **the attractiveness of scientific careers**.

   Institutions need to foster the exchange of experiences with the general public, involve them in their scientific community, and make them aware of the added value of their work. Natural History Museums are ideal promoters for this as they represent the perfect environment for the public to engage and interact with objects, research challenges and scientists, as equals as well as role models.

   Example: The use of science cases that are relevant for meeting societal needs, and the development of our capacity to contribute to finding innovative solutions to societal problems, provide new directions from which to approach a young generation of scientists. Successful examples are the short-term internships offered by museums to Secondary school students and the conferences given to students on scientific jobs at job fairs.

3. Natural History collections-based researchers underline the need to integrate the **scientific method and scientific principles within the entire educational curriculum and life-long learning** to achieve science literacy and awareness.

   To ensure a feasible and smooth generational transition, especially in the light of the technological progress being made, researchers consider it crucial to implement a transversal and multidisciplinary approach to natural sciences that is implemented from primary school right through to the higher education levels, both via formal and informal learning.

   Example: Outdoor classrooms for children constitute a significant tool that can be used to improve the involvement of both students and educators in the natural sciences.

4. Natural History collections-based researchers underline the need to **integrate educational programmes being offered at museums into academic curricula**.

   The use of the facilities and assets (collections) available within natural history institutions largely contributes to the practical, reflective analysis of academic contents taught by the formal education system and strengthens these qualifications. Real contact with specimens and research settings tends to be highly motivating for students or interested citizens, whether they come into contact with the research through school or outside of school.

   Example: Workshops can make connections with other scientific domains or even everyday life, for example workshops on edible species can introduce knowledge of species and their links to the gastronomic world.

5. Natural History collections-based research institutions **actively contribute to the continuous updating of educational resources** by disseminating discoveries and the latest scientific developments among teachers and educators.

   The organization of long-term training courses for the education community provides key educators with the most up to date tools and resources to use in their classrooms. Moreover, this process contributes to increasing the affinity and engagement of younger generations with the outcomes of scientific research.

   Example: Training courses organized in collaboration with schools to educate teachers about the latest developments in the natural history sciences.

DOMAIN 4 - ETHICS

Ethical behaviour goes beyond moral or societal norms. Research is intrinsically anchored in the search for truth as well as in the avoidance of errors. Moreover, in the search for global knowledge, research practices developed at publicly funded institutions strive to be ethical.

1. Natural History collections-based institutions and researchers follow ethical codes in relation to the **utilization of biodiversity resources**.

   All kinds of biodiversity resources (including new accessions, specimen loans and purchases or donations) as well as existing collections of specimens are treated properly and ethically, and researchers follow the regulations related to their utilization for scientific and research purposes.

   Example: Directive 2010/63/EU of the European Parliament and of the Council of 22 September 2010 on the protection of animals used for scientific purposes and Regulation 511/2014 on Access and Benefit Sharing. The CETAF Code of Conduct and Best Practices on ABS has been adopted by all CETAF Members.

2. Natural History collections-based institutions commit to providing support to other researchers in under-developed countries with exchanges and **training and capacity building programmes**.

   Researchers commit themselves, when applicable, to facilitating access to resources (e.g. data availability, training and capacity building programmes) in the countries and for those institutions with which they collaborate in scientific research. Specifically, in the light of the CETAF Code of Conduct on ABS as part of the non-monetary benefit sharing means.

   Example: GTI programmes for training in African countries and institutional mentoring programmes for developing countries.

3. Natural History collections-based researchers support the principle of **neutrality in both the recognition and interpretation** of the objects contained in their collections.

   Institutions and researchers defend scientific integrity (good conduct) and neutrality by avoiding political, economic or other influences that may affect or influence due processes. Similarly, researchers are fully committed to reporting facts while minimizing the error.

   Example: Practices of falsifying, misrepresenting or fabricating data or knowledge are unacceptable to researchers.

4. Natural History collections-based researchers commit to safeguarding **values that are essential for collaborative work**, such as trust, accountability, mutual respect, and fairness.

   Researchers are committed to the protection of intellectual property interests, thus respecting the standards related to authorship, copyright and patenting policies as well as for data sharing and maintaining confidentiality in peer review.

   Example: Publishing and citation are the heart of scientific careers.

5. Natural History collections-based research institutions pledge to **uphold European ethics standards** and to not engage in “ethics dumping”. In the same way, institutions endeavour to be vigilant about compliance with ethical standards.

   Institutions do not support measures that allow methods and projects that are forbidden or considered unethical in Europe to be carried out in states or countries with different legal circumstances.

   Example: Contracts made with third parties follow strict rules in terms of publicity and transparency. The same applies with respect to ethical behaviour of subcontractors and their respect of the environment.

DOMAIN 5 - GENDER

The Gender domain integrates a two-faceted issue: firstly, the **equality of women** in relation to men (at all levels and under all circumstances) and secondly, the gender **balance of participation** of women and men in society. Neither of these two elements is a social reality yet, although the research community has already committed itself to taking the necessary steps to achieve gender equality and balance.

1. Natural History collections-based research institutions guarantee **equal opportunities** and equal **participation of women and men**, at all institutional levels and in all institutional bodies.

   No gender is mentioned in any grant call, position opening and/or career development within the research institution. With the same resolve, institutions strive to remove institutionalised sexism and subtle gender discrimination that – up until today – may hinder the advancement of women in scientific careers.

   Example: Clauses in position open calls explicitly avoid any mention of gender.

2. Natural History collections-based institutions seek **equal representation in panels, assessment committees, juries, councils and/or on boards**.

   Institutions advocate balanced assessments and outcomes that are unbiased by gender issues.

   Example: Recruitment panels, assessment committees, juries, councils and boards are, wherever possible, filled with a balanced distribution of male and female members.

3. Natural History collections-based institutions strive to prevent any abuse based on gender and strive for ending gender **stereotyping**.

   Institutions ensure men and women are equally represented in their texts, exhibitions, publicity and/or communication materials. The same principle is transmitted to the guides and staff who are in direct contact with visitors, as well as being extended to educational and dissemination programmes.

   Examples: Flyers of new (temporary) exhibitions, job announcements and official documents consider a neutral genre/gender in their wording, wherever possible and applicable.

4. Natural History collections-based research institutions work on identifying and, as much as possible, **removing barriers** in relation to the representation of women and to **fill existing gaps in the upper** management levels.

   Researchers consider it crucial to achieve gender equality as well as gender balance within the research teams. It is important to focus on raising awareness on potential biases in the evaluation of merits that may exist based on gender.

   Example: Composition of management and research teams reflect, when taking into consideration the existing gender composition, the most balanced distribution feasible.

5. Natural History collections-based research institutions support **family friendly measures** to facilitate and contribute to women’s and men’s active participation in the labour force.

   Institutions are engaged in family-friendly policies that allow parents to reconcile family responsibilities with their professional commitments, and enable them to continue enhancing their careers whilst raising a family.

   Example: Possibility of teleworking or nurseries offered by institutions to their personnel.