



Standards, tools and best practices for guiding, assessing and supporting ethical professional behaviour by scientists and innovators

Authors:

Rok Benčin and Gregor Strle (ZRC SAZU)

Sudeep Rangi (UNESCO)

Dubravka Vejnović (CPN)

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Annex 3

A reasoned proposal for a set of shared ethical values, principles and approaches for ethics assessment in the European context

Deliverable 4.1

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1 INTRODUCTION

The aim of this report is to make recommendations regarding standards for guiding, assessing and supporting ethical professional behaviour by scientists and innovators. Ethical professional behaviour is defined as a part of research ethics, specifically aimed at ethical principles, applicable to the conduct of individual scientists and innovators. The report examines the practices of guidance of ethical professional behaviour, as performed by professional associations, science academies, universities, and other organisations, as well as the practices of assessment of ethical behaviour, as done by integrity boards and other organisations, whose aim is to investigate the allegations of research misconduct.

The report is structured as follows. Chapter 2 explains what is meant by professional ethics for scientists and innovators, and makes a distinction between professional research ethics and engineering ethics – the subjects of the following two chapters. Chapter 3 reviews the literature on ethical standards in research, whereas Chapter 4 reviews the literature on ethical standards in engineering. A brief proposal is then made on what constitutes general ethical standards and principles for professional researchers and engineers, respectively.

Chapter 5 focuses on practices of guidance and assessment of professional ethical behaviour. Following an overview of existing practices, recommendations are made for good standards of guidance and assessment. Chapter 6 discusses the kinds of expertise that is needed for ethics guidance and assessment the recommended composition of ethics units engaging in such guidance and/or assessment. Chapter 7 discusses the kinds of procedures involved in good ethical guidance and assessment. It tackles the question of what steps do committees need to take and what kind of institutional and regulatory structures and support is needed in order to ensure that good and effective guidance and assessment is given.

2 PROFESSIONAL ETHICS FOR SCIENTISTS AND INNOVATORS

Professional ethics for scientists and innovators refers to those principles that are intended to define the rights and responsibilities of scientists and innovators in their relationship with each other and with other parties including employers, research participants, funders, students, etc.¹ We consider professional ethics of scientists and innovators to be an integral part of research and innovation ethics.

We define “research ethics” as the application of ethical principles and professional codes of conduct to the activity of doing scientific research and the practice of investigating and reflecting upon these principles and codes and their application. Application areas include the design and implementation of research involving human experimentation, animal experimentation, various aspects of academic scandal, including scientific misconduct (such as fraud, fabrication of data and plagiarism), regulation of research, etc. Research ethics emerged as a means of addressing ethical issues in clinical research in the 20th century. It is most developed as a concept in medical research. The key agreement here is the 1964 Declaration of Helsinki,² although more specific guidelines for other fields and disciplines have been developed in recent decades.

There are two dimensions to research ethics that go hand in hand: they are (1) research practices (and corresponding proposals, protocols, and results) and (2) the conduct of individual researchers, i.e. professional ethics. The primary focus of research ethics is to ensure that research practices, whether undertaken by individual researchers, groups of researchers, or research organisations, conform to ethical standards. But research ethics also concerns itself with professional ethics and standards of professional conduct for researchers. Terms such as “research integrity” and “good research practice” are also used to refer to the ideals of professional research ethics. Since the research endeavour is usually based on previous research results, trust within the scientific community and honesty in reporting results are crucial to the quality of research practices. Preventing misconduct scandals is also crucial for maintaining the reputation and credibility of science in society.

While science is concerned with understanding phenomena and finding truth, innovation is concerned with creating goods or services that have value and meet needs. Innovation results in the creation of products, processes, methods or ideas that have use value and that can serve markets, governments or society at large. Due to the conceptually different aims of scientific research and innovation, the ethics of innovation has evolved largely separately from research ethics. In research ethics, the driving field has been medicine, in the ethics of innovation, it has been engineering. The ethics of innovation owes a large part of its heritage to engineering ethics, an area of professional ethics that has, itself, its early roots in the late 19th and early 20th century but gained shape in the 1960s and 1970s. Engineering ethics has developed as a response to health, safety and environmental hazards resulting from engineered products and systems, and resulting from disasters such as collapsing bridges, exploding automobiles, and environmental catastrophes. In the 20th century, engineering societies developed codes of ethics that prescribed, most centrally, that engineers should hold paramount the safety, health and welfare of the public and strive for environmentally sound practices. Professional ethics of innovators consists in adhering to the principles and standards expressed in these codes.

¹ Chalk, Rosemary, Mark S. Frankel and S.B. Chafer (eds), *AAAS Professional Ethics Project: Professional Ethics Activities in the Scientific and Engineering Societies*, AAAS, Washington DC, 1980.

² *Declaration of Helsinki - Ethical Principles for Medical Research Involving Human Subjects*, World Medical Association, 1964 (2013), <http://www.wma.net/en/30publications/10policies/b3/index.html>.

3 ETHICAL STANDARDS FOR PROFESSIONAL RESEARCHERS

This chapter presents an overview of ethical standards for professional researchers. Based on a literature review of topics dealing with ethics in professional research, and a review of international, national and field-specific policies, guidelines, proposals, and codes of ethics, a brief proposal is made on what ethical standards are expected of professional researchers in general. The focus is on *research integrity*, *responsible conduct of research* (RCR) and *good research practice*, which cover most of the activities of professional researcher in regard to ethics.^{3,4} These areas overlap and different definitions exist both in scope and terminology.

In what follows, ethical principles and standards set by selected professional associations, national and international bodies are presented with the aim to show the conceptual overlap as well as differences on what constitutes a common set of ethical principles and standards for professional researchers. The chapter concludes with a brief proposal, summarizing universal ethical standards for professional researchers.

The growing number of ethical codes, guidelines, recommendations, and standards for professional researchers – for example, Kaiser reported over 115 already in 2002⁵ – reflects both the complexity of conceptualizing ethical issues and differences in interpretation of what constitutes an appropriate set of ethical standards in professional research. The need for uniform set of core principles and standards is pressing. For example, the conceptualisation of scientific misconduct, one of fundamental breaches in professional research, is still rather ambiguous.⁶ Multiple definitions exist, mostly based on the core FFP set: *falsification*, *fabrication*, and *plagiarism*, but these do not and cannot effectively cover all areas of research misconduct. It might be the case that the conceptualization of misconduct can only be defined in broad terms and that “precise definitions are deemed neither desirable nor feasible.”^{7,8,9}

For example, The European code of conduct for research integrity issued by The European Science Foundation (ESF) and All European Academies (ALLEA) warns scientific misconduct “can appear in many guises” and points to other forms of misconduct beyond

³ Drenth, Pieter J. D., “Responsible Conduct in Research”, *Science and Engineering Ethics*, Vol. 12, No. 1, March 2006, pp. 13-21.

⁴ Macrina, Francis L., “Scientific Societies and Promotion of the Responsible Conduct of Research: Codes, Policies, and Education”, *Academic Medicine*, Vol. 82, No. 9, September 2007, pp. 865-869.

⁵ Kaiser, Mathias and the Standing Committee for Responsibility and Ethics in Science (SCRES), *Standards for Ethics and Responsibility in Science – An Empirical Study*, 2002. <http://www.icsu.org/publications/reports-and-reviews/standards-responsibility-science/SCRES-Standards-Report-pdf>

⁶ Cf. Collste, Göran, Principles and Approaches in Ethics Assessment: Research integrity. Deliverable 1.1, Annex 1.b, SATORI, 2015. satoriproject.eu/media/1.b-Research-integrity.pdf; Council of Science Editors, *White Paper on Publication Ethics: CSE’s White Paper on Promoting Integrity in Scientific Journal Publications*, 2012 Update, “Section 3.2 International Models for Responding to Research Misconduct”, <http://www.councilscienceeditors.org/resource-library/editorial-policies/white-paper-on-publication-ethics/3-2-international-models-for-responding-to-research-misconduct/>.

⁷ Council of Science Editors, *White Paper on Publication Ethics: CSE’s White Paper on Promoting Integrity in Scientific Journal Publications*, op. cit., “Section 3.2 International Models for Responding to Research Misconduct”.

⁸ Cf. The Organisation for Economic Co-operation and Development (OECD), *Best Practices for Ensuring Scientific Integrity and Preventing Misconduct*, 2007. www.oecd.org/sti/sci-tech/40188303.pdf

⁹ Cf. The Office of Research Integrity (ORI), *Integrity and Misconduct in Research*, 1995. http://ori.hhs.gov/sites/default/files/report_commission.pdf

FFP¹⁰. A broad definition of scientific misconduct can also be found in the Nordic countries¹¹. The Danish DCSD states:

The term ‘scientific dishonesty’ is defined as: falsification, fabrication, plagiarism and other serious violations of good scientific practice committed intentionally or due to gross negligence during the planning, implementation or reporting of research results.¹²

In Norway, research misconduct is investigated by The National Commission for the Investigation of Research Misconduct (Granskingsutvalget).¹³ The Norwegian law has almost identical definition of scientific misconduct to DCSD, defined as

falsification, fabrication, plagiarism and other serious breaches of good scientific practice that have been committed wilfully or through gross negligence when planning, carrying out or reporting on research.¹⁴

The international Committee on Publication Ethics (COPE) also issues a broader definition of scientific misconduct as the “intention to cause others to regard as true that which is not true.”¹⁵

The U.S. Office of Research Integrity (ORI), on the other hand, has a more narrow definition of research misconduct as *FFP*:

Fabrication, falsification, or plagiarism, in proposing, performing, or reviewing research, or in reporting research results.

- (a) Fabrication is making up data or results and recording or reporting them.
- (b) Falsification is manipulating research materials, equipment, or processes, or changing or omitting data or results such that the research is not accurately represented in the research record.
- (c) Plagiarism is the appropriation of another person’s ideas, processes, results, or words without giving appropriate credit.
- (d) Research misconduct does not include honest error or differences of opinion.¹⁶

¹⁰ The European Science Foundation (ESF) and All European Academies (ALLEA), *The European Code of Conduct for Research Integrity*, 2011, p. 6.

http://www.esf.org/fileadmin/Public_documents/Publications/Code_Conduct_ResearchIntegrity.pdf

¹¹ Nylenna, M., D. Andersen, G. Dahlquist, M. Sarvas, and A. Aakvaag, “Handling of scientific dishonesty in the Nordic countries”, *The Lancet*, Vol. 354, Issue 9172, July 1999, pp. 57-61.

¹² Ministry of Higher Education and Science and the organisation Danish Universities, *Danish Code of Conduct for Research Integrity*, 2014, p. 21. <http://ufm.dk/en/publications/2014/files-2014-1/the-danish-code-of-conduct-for-research-integrity.pdf>

¹³ Cf. <https://www.etikkom.no/hvem-er-vi-og-hva-gjor-vi/hvem-er-vi/granskingsutvalget>

¹⁴ The National Commission for the Investigation of Research Misconduct. Act of 30 June 2006 No. 56 on ethics and integrity in research. <https://www.etikkom.no/en/In-English/Act-on-ethics-and-integrity-in-research/>

¹⁵ Committee on Publication Ethics (COPE), *Guidelines on good publication practice*, 1999, p. 46. <http://publicationethics.org/files/u7141/COPE2000pdfcomplete.pdf>

¹⁶ The Office of Research Integrity (ORI), “Definition of Research Misconduct”. <http://ori.hhs.gov/definition-misconduct>

The review of guidelines and codes of ethics showed that terms ‘principle’ and ‘standard’ are often being used interchangeably even though the former is generally defined as setting forth the rules for professional conduct and the latter as a set of ideals, the building blocks of responsible conduct of research each researcher should strive towards. Such distinction is typically being made at the institutional level or at the level of individual scientific or professional associations that deal with issues specific to particular professions. For example, the American Psychological Association (APA) defines “general principles” as aspirational ideals that “in contrast to Ethical Standards, do not represent obligations and should not form the basis for imposing sanctions”.¹⁷

While standards are occasionally issued along with general ethical principles, most international codes do not differentiate between standards and principles. Organisations that take on roles of harmonizing bodies (e.g. ALLEA, ESF, COPE) aim towards more general definitions to summarize the universal aspects of ethical standards in research, such as scientific integrity, good research practice, and responsible conduct of research. The following section presents a selection of ethical standards, guidelines and codes of ethics for professional researchers, with the aim to help us develop the proposal of ethical standards for professional researchers, presented at the end.

3.1 AN OVERVIEW OF ETHICAL STANDARDS FOR PROFESSIONAL RESEARCHERS

The most formalized systems providing ethical standards in research exist in the EU and U.S., and on national level notably in the Nordic countries (e.g. Danish Committee on Scientific Dishonesty (DCSD¹⁸)) and the Netherlands (VSNU¹⁹).²⁰ In the U.S., the Office of Scientific Integrity (OSI), the Office of Scientific Integrity Review (OSIR), and The National Science Foundation (NSF) address scientific misconduct cases. In the EU, two most prominent examples are The European Science Foundation (ESF) and All European Academies (ALLEA), along with various institutional, national, as well as international bodies that aim to harmonize and coordinate numerous codes of ethics on research integrity and RCR.^{21,22,23} These are discussed in detail below.

The European Science Foundation (ESF) and All European Academies (ALLEA) issued jointly the *European Code of Conduct for Research Integrity (ECoC)*, emphasizing principles

¹⁷ American Psychological Association, *Ethical principles of psychologists and code of conduct*, 2002.

<http://www.apa.org/ethics/code/index.aspx>

¹⁸ Cf. the Annual Reports of the Danish Agency for Science, Technology, and Innovation.

<http://en.fi.dk/councils-commissions/the-danish-committees-on-scientific-dishonesty/publications>

¹⁹ Association of Universities in the Netherlands (VSNU), *The Netherlands Code of Conduct for Scientific Practice*, 2004 (2014).

<http://www.vsnul.nl/files/documenten/Domeinen/Onderzoek/The%20Netherlands%20Code%20of%20Conduct%20for%20Academic%20Practice%202004%20%28version%202014%29.pdf>.

²⁰ For a detailed overview, see Council of Science Editors, *White Paper on Publication Ethics: CSE's White Paper on Promoting Integrity in Scientific Journal Publications*, 2012 Update, “Section 3.2 International Models for Responding to Research Misconduct”. <http://www.councilscienceeditors.org/resource-library/editorial-policies/white-paper-on-publication-ethics/3-2-international-models-for-responding-to-research-misconduct/>

²¹ European Network of Research Integrity Offices (ENRIO) has a vast archive of European Codes and Guidelines, cf. <http://www.enrio.eu/codes-guidelines-3>.

²² Godecharle, S., B. Nemery, and K. Dierickx, “Guidance on Research Integrity: No Union in Europe”, *The Lancet*, Vol. 381, Issue 9872, March 2013, pp. 1097-98.

²³ Resnik, David B., “International Standards for Research Integrity: An Idea Whose Time Has Come?”, *Accountability in Research*, Vol.16, No. 4, July 2009, pp. 218-28.

of integrity in scientific and scholarly research, types of research misconduct, international guidelines for good research practice, and text suggested by the OECD Global Science Forum Coordinating Committee for international agreements in conducting international misconduct investigations²⁴. In the foreword to the joint document, the authors state:

The Code addresses the proper conduct and principled practice of systematic research in the medical, natural and social sciences and the humanities. It stands as a canon for self-regulation with clear recommendations, and is now on the way to being taken as a reference template for implementation throughout Europe. It is not intended to replace existing national or academic guidelines, but to represent a Europe-wide agreement on a set of principles and priorities for the research community.²⁵

The ECoC defines general principles and types of misconduct:

- *Principles of integrity:*
 - *Honesty in communication* (in presenting goals and intentions, in reporting methods and procedures and in conveying interpretations)
 - *Reliability in performing research*
 - *Objectivity* (requires facts capable of proof, and transparency in the handling of data)
 - *Impartiality and independence* (and communication with other researchers and with the public should be open and honest)
 - *Openness and accessibility;*
 - *Duty of care* (for the humans, animals, the environment or the objects that they study)
 - *Fairness in providing references and giving credit*
 - *Responsibility for the scientists and researchers of the future*
- *Types of misconduct:*
 - *Fabrication* involves making up results and recording them as if they were real;
 - *Falsification* involves manipulating research processes or changing or omitting data;
 - *Plagiarism* is the appropriation of other people's material without giving proper credit;
 - Other forms of misconduct include *failure to meet clear ethical and legal requirements* such as misrepresentation of interests, breach of confidentiality, lack of informed consent and abuse of research subjects or materials. Misconduct also includes *improper dealing* with infringements, such as attempts to cover up misconduct and reprisals on whistleblowers;
 - *Minor misdemeanours* may not lead to formal investigations, but are just as damaging given their probable frequency, and should be corrected by teachers and mentors.²⁶

An important point made in the ECoC is that some rules for good research practice cannot be universal:

While principles of integrity, and the violation thereof, have a universal character, some rules for good practice may be subject to cultural differences, and should be part of a set of national

²⁴ OECD's *Best Practices for Ensuring Scientific Integrity and Preventing Misconduct*, op. cit., gathered from the interviews with experts, further discuss types of misconduct, beyond core set of Fabrication, Falsification and Plagiarism (FFP) and point to various definitions of these terms.

²⁵ ESF and ALLEA, *The European code of conduct for research integrity*, op. cit., p. 3.

²⁶ *Ibid.* pp. 5-6.

or institutional guidelines. These cannot easily be incorporated into a universal code of conduct.²⁷

The ECoC further proposes areas that institutional or national guidelines for good research practice should consider:

1. *Data*: ... should be stored in secure and accessible form, documented and archived for a substantial period.
2. *Procedures*: All research should be designed and conducted in ways that avoid negligence, haste, carelessness and inattention.
3. *Responsibility*: All research subjects – human, animal or non-living – should be handled with respect and care. ... Animals should be used in research only after alternative approaches have proved inadequate. The expected benefits of such research must outweigh the harm or distress inflicted on an animal.
4. *Publication*: Results should be published in an open, transparent and accurate manner, at the earliest possible time, unless intellectual property considerations justify delay. ... Honesty and accuracy should be maintained in communication with the public and the popular media. Financial and other support for research should be acknowledged.
5. *Editorial responsibility*: An editor or reviewer with a potential conflict of interest should withdraw from involvement with a given publication or disclose the conflict to the readership. Reviewers should provide accurate, objective, substantiated and justifiable assessments, and maintain confidentiality.

[*On international collaboration*:]

Researchers involved in international collaboration should agree to standards of research integrity as developed in this document and, where appropriate, adopt a formal collaboration protocol either *ab initio* or by using one drafted by the OECD Global Science Forum.²⁸

In this section, the ESF and ALLEA's ECoC is taken as a reference point on which other core standards of professional research are being compared. The goal is to show the conceptual overlap among various codes, point out the differences in terms of scope and level of abstraction, and later draft a proposal for a set of universal standards for professional researchers.

The European Charter for Researchers and *The Code of Conduct for the Recruitment of Researchers*²⁹, adopted by the European Commission, issued best practice guidelines designed to “address all European research organisations and universities, both public and private.”³⁰ The Charter and Code guidelines define good practice in research and recruitment, professional responsibility, supervision and managerial duties, contractual and legal obligations, public engagement, research freedom and professional development. The guidelines point out researchers “should adhere to the recognised ethical practices and

²⁷ Ibid. p. 6.

²⁸ Ibid., pp. 6-7.

²⁹ European Commission, *The European Charter for Researchers and a Code of Conduct for the Recruitment of Researchers*, 2005. <http://ec.europa.eu/euraxess/index.cfm/rights/europeanCharter>

³⁰ <http://www.esf.org/working-at-esf/european-charter-of-researchers-and-code-of-conduct-for-the-recruitment-of-researchers.html>

fundamental ethical principles appropriate to their discipline(s) as well as to ethical standards as documented in the different national, sectoral or institutional Codes of Ethics.”³¹

At the level of universities and academies, the IAU (International University Association)-MCO (Magna Charta Observatorium) *Guidelines for an Institutional Code of Ethics in Higher Education* emphasize “solidarity with and fair treatment of international partners”³², while the InterAcademy Council (IAC) and the IAP - the global network of science academies include *scepticism* among seven fundamental values of *honesty, fairness, objectivity, reliability, accountability* and *openness*.³³ The VSNU – Association of universities in the Netherlands issued *The Netherlands Code of Conduct for Scientific Practice*, which emphasizes an over-arching principle of *transparency* over a set of five principles (*scrupulousness, reliability, verifiability, impartiality, and independence*), accompanied by best practice examples.³⁴ The Code states “every scientific practitioner must (be able to) demonstrate how he puts these principles into practice.”³⁵

Usually backed by organisations or networks hosting considerable scholarly expertise, the journal editor is well positioned to investigate misconduct.³⁶ The Committee on Publication Ethics (COPE), established in 1997 and today with over 10.000 members worldwide from all academic fields, represents editors of academic journals³⁷ and others interested in publication ethics. Besides general duties and responsibilities of editors, COPE’s *Code of Conduct and Best Practice Guidelines for Journal Editors* defines specific roles of editors in dealing with misconduct.³⁸

In the U.S., the Office of Research Integrity (ORI) defines general ethical principles of professional research. Conceptually, ORI’s guidelines are very similar to the ESF&ALLEA’s ECoC, with additional reference to the legal documentation and procedures. ORI’s code identifies nine major areas of RCR:

- *Responsible conduct of research/Research Misconduct*
- *The Protection of Human Subjects*
- *The Welfare of Laboratory Animals*
- *Conflicts of Interest*
- *Data Management Practices*
- *Mentor and Trainee Responsibilities*

³¹ Ibid.

³² International University Association (IAU) and Magna Charta Observatorium (MCO), *Guidelines for an Institutional Code of Ethics in Higher Education*, 2012, p. 2. http://www.iau-aiu.net/sites/all/files/Ethics_Guidelines_FinalDef_08.02.13.pdf

³³ InterAcademy Council and IAP – The Global Network of Science Academies, *Responsible Conduct in the Global Research Enterprise: A Policy Report*, 2002, p. 7. <http://www.interacademies.net/File.aspx?id=19789>

³⁴ Association of Universities in the Netherlands (VSNU), *The Netherlands Code of Conduct for Scientific Practice*, op. cit.

³⁵ Ibid., p. 3

³⁶ Cf. Collste, Göran, Principles and Approaches in Ethics Assessment: Research integrity. Deliverable 1.1, Annex 1.b, op. cit.; cf. Marusic, A., V. Katavis, M. Marusic, “Role of editors and journals in detecting and preventing scientific misconduct: strengths, weaknesses, opportunities ad threats”, *Medicine and Law*, Vol. 26, No. 3, September 2007, pp. 545-566.

³⁷ COPE membership includes editors of 175 journals from throughout Europe, as well as some in Asia and Australasia, whose editors and publishers have adopted the COPE code of conduct.

³⁸ COPE, *Guidelines on good publication practice*, op. cit., paragraph 11. http://publicationethics.org/files/Code%20of%20Conduct_2.pdf,

- *Collaborative Research*³⁹
- *Authorship and Publication*
- *Peer Review*⁴⁰

International collaboration is the focus of the *Montreal Statement on Research Integrity in Cross-Boundary Research Collaborations*, which defines *Responsibilities of Individual and Institutional Partners in Cross-Boundary Research Collaborations*.⁴¹ The Montreal Statement provides specific “guidance on the conduct of research collaborations between different institutions, disciplines, sectors, and countries.”⁴² To date, such efforts are not yet aligned with ESF&ALLEA work on international cooperation, or with the OECD Global Science Forum (GSF), which issues “action recommendations on high-priority science policy issues requiring international co-operation”⁴³.

A global effort towards harmonisation of ethical principles in research is documented in the *Singapore Statement on Research Integrity*⁴⁴; another important contribution, published only a year earlier, is a well-known set of universal ethical principles by Shamoo and Resnik (2009)⁴⁵. Like Shamoo and Resnik’s proposal⁴⁶, the aim of the Singapore Statement was to define ethical principles and responsibilities that are universal. As stated in the preamble to the Statement, the principles and responsibilities are

... fundamental to the integrity of research wherever it is undertaken. ... [and] represent the first international effort to encourage the development of unified policies, guidelines and codes of conduct, with the long-range goal of fostering greater integrity in research worldwide.⁴⁷

The Singapore Statement outlines the following principles and responsibilities:

- *Principles:*
 - Honesty in all aspects of research
 - Accountability in the conduct of research
 - Professional courtesy and fairness in working with others
 - Good stewardship of research on behalf of others
- *Responsibilities:*
 1. Integrity: Researchers should take responsibility for the trustworthiness of their research.
 2. Adherence to Regulations: Researchers should be aware of and adhere to regulations and policies related to research.

³⁹ Additional responsibilities arise from the added burdens of a) the increasingly complex roles and relationships, b) common, but not necessarily identical, interests, c) management requirements and d) cultural differences inherent in any large project but especially in collaborative projects.

⁴⁰ Steneck, Nicholas H. *ORI: Introduction to the responsible conduct of research*. Government Printing Office, 2007. <https://ori.hhs.gov/sites/default/files/rcrintro.pdf>

⁴¹ <http://www.icsu.org/icsu-asia/news-centre/news/montreal-statement-on-research-integrity>

⁴² http://www.wcri2013.org/Montreal_Statement_e.shtml

⁴³ <http://www.oecd.org/sti/sci-tech/oecdglobalscienceforum.htm>

⁴⁴ *The Singapore Statement on Research Integrity*, 2010. <http://www.singaporestatement.org/statement.html>

⁴⁵ Shamoo A and D. Resnik, *Responsible Conduct of Research*, 2nd ed., Oxford University Press, New York, 2009.

⁴⁶ Resnik, David B., and Adil E. Shamoo, “The Singapore Statement on Research Integrity”, *Accountability in Research*, Vol. 18, No. 2, March 2011), pp. 71-75.

⁴⁷ *The Singapore Statement on Research Integrity*, 2010. <http://www.singaporestatement.org/statement.html>

3. **Research Methods:** Researchers should employ appropriate research methods, base conclusions on critical analysis of the evidence and report findings and interpretations fully and objectively.
4. **Research Records:** Researchers should keep clear, accurate records of all research in ways that will allow verification and replication of their work by others.
5. **Research Findings:** Researchers should share data and findings openly and promptly, as soon as they have had an opportunity to establish priority and ownership claims.
6. **Authorship:** Researchers should take responsibility for their contributions to all publications, funding applications, reports and other representations of their research. Lists of authors should include all those and only those who meet applicable authorship criteria.
7. **Publication Acknowledgement:** Researchers should acknowledge in publications the names and roles of those who made significant contributions to the research, including writers, funders, sponsors, and others, but do not meet authorship criteria.
8. **Peer Review:** Researchers should provide fair, prompt and rigorous evaluations and respect confidentiality when reviewing others' work.
9. **Conflict of Interest:** Researchers should disclose financial and other conflicts of interest that could compromise the trustworthiness of their work in research proposals, publications and public communications as well as in all review activities.
10. **Public Communication:** Researchers should limit professional comments to their recognized expertise when engaged in public discussions about the application and importance of research findings and clearly distinguish professional comments from opinions based on personal views.
11. **Reporting Irresponsible Research Practices:** Researchers should report to the appropriate authorities any suspected research misconduct, including fabrication, falsification or plagiarism, and other irresponsible research practices that undermine the trustworthiness of research, such as carelessness, improperly listing authors, failing to report conflicting data, or the use of misleading analytical methods.
12. **Responding to Irresponsible Research Practices:** Research institutions, as well as journals, professional organizations and agencies that have commitments to research, should have procedures for responding to allegations of misconduct and other irresponsible research practices and for protecting those who report such behavior in good faith. When misconduct or other irresponsible research practice is confirmed, appropriate actions should be taken promptly, including correcting the research record.
13. **Research Environments:** Research institutions should create and sustain environments that encourage integrity through education, clear policies, and reasonable standards for advancement, while fostering work environments that support research integrity.
14. **Societal Considerations:** Researchers and research institutions should recognize that they have an ethical obligation to weigh societal benefits against risks inherent in their work.⁴⁸

In its final article, the *Singapore Statement* broadens the field of research integrity to social considerations. In ECoC, this dimension is referred to as the “socio-ethical *context* of research”, comprising questions on the choice of research objects, possibility of harm, independence of research etc. These questions are distinguished from “standards when *conducting* research” and thus not included in the *Code*.⁴⁹ In many ways, ethics in professional research is indeed highly contextualized - it plays an important role in the

⁴⁸ Ibid.

⁴⁹ European Science Foundation (ESF), *Fostering Research Integrity in Europe*, 2010, pp. 15-16.

professional work of a researcher, but it also affects decisions at political and economic levels, and has considerable impact on society and environment. The principle of social responsibility thus applies to research ethics as a whole and can only partially be included in provisions on ethical professional behaviour.

Nevertheless, it is a responsibility of an individual researcher to reflect on the societal impacts of his or her research. The scope of social responsibility should, however, not only be defined by the potential societal harm research may cause, but also with the view to benefit the society.⁵⁰ Care should be applied when defining such benefit, as a lot of social factors must be considered (e.g. a potentially beneficial technology can have harmful effects on social structures) and there are also considerable differences between disciplines (while medical science can provide new cures and industrial innovations can boost the economy, social science and humanities can provide new critical insight into the functioning of our societies).

3.2 A PROPOSAL: ETHICAL STANDARDS FOR PROFESSIONAL RESEARCHERS

Based on the literature review and codes of ethics discussed in this chapter, a proposal is made, outlining universal ethical standards for professional researchers. The proposal is based on the Part II: reasoned proposal for shared ethical issues and principles of SATORI Deliverable D4.1 Roadmap for a common EU ethics assessment framework, the ESF and ALLEA's European Code of Conduct, the EC's European Charter for Researchers and a Code of Conduct for the Recruitment of Researchers, Shamoo and Resnik (2009), the Montreal Statement, and the Singapore Statement. The proposal extends existing general standards for professional researchers by extending the scope of social responsibility. Social responsibility has its traditional place within RCR and the prevention of research misconduct. With growing impact of science and technology on society and environment, it is necessary to address these challenges in a wider context, beyond the environment of professional researcher.

1. *Objectivity & impartiality*: research findings should be based on data and scientific methods, independent from ideological, political and financial interests.
2. *Truthfulness & transparency* regarding collection and analysis of data, methods and reasoning and referencing work of others.
3. *Honesty & openness*: research goals and findings should be presented to the scientific community and general public in an accurate, honest, and open way.
4. *Respect & Fairness*: towards the scientific community (care of advancement of science, future generations of researchers, fairness in peer-review), colleagues and students and research participants (individuals, communities, animals and cultural heritage).

⁵⁰ For a more in-depth discussion on social responsibility with regard to research ethics, cf. Benčin, Rok, Gregor Strle and Agata Gurzawska, Principles and Approaches in Ethics Assessment Social Responsibility in Science and Engineering. Deliverable 1.1, Annex 1.c., SATORI, 2015. <http://satoriproject.eu/media/1.c-Social-responsibility.pdf>.

5. *Conformity to regulation, guidelines and good practices* regarding research participants, use of animals, data collection and storage etc., valid in a specific scientific field.
6. *International cooperation*: researchers should foster the integrity of collaborative research, and address potential issues in regard to differences in research cultures, regulatory and legal systems, organizational and funding structures, and approaches to training.
7. *Social responsibility*: researchers should reflect on the societal impacts of their research and make the effort to prevent harm to society and the environment, as well as to strive for beneficial impacts of their research (leading to beneficial innovations or new critical insight into the structures of societies).

4 ETHICAL STANDARDS FOR PROFESSIONAL ENGINEERS

4.1 AN OVERVIEW OF ETHICAL STANDARDS FOR ENGINEERS

The decisions and actions of engineers have a large impact on the environment and on society. The engineering profession thus has an obligation to ensure that it works in the public interest and with the regard for health, safety and sustainability.

Engineering is the design and development, using scientific and mathematical principles, of structures, machines, materials, devices and processes for practical ends, as well as the construction, operation, maintenance or improvement of such structures, or the modelling, diagnosis and prediction of their behaviour based on knowledge of the principles of engineering design. Engineering is an extremely broad field but it is generally recognised that there are four major branches of engineering: chemical engineering, civil engineering, electrical engineering and mechanical engineering.

There are many types of ethical issues in the field of engineering. Ethical issues in engineering research may involve scientific integrity, institutional integrity, social responsibility, human subjects' research and animal welfare. Engineering innovation may give rise to the same issues, as well as issues relating to social responsibility and responsibility to clients and issues concerning the impacts of technology that may relate to: the environment, health, safety, justice, access and equality, rights and liberties, individual rights and liberties, autonomy, authenticity and identity, human dignity, bodily integrity, dual use, hubris.⁵¹

Engineering ethics is a subset of professional ethics: it is professional ethics of and for engineers. It focuses on assisting engineers in shaping their professional responsibility through the formulation of general ethical principles and professional codes and by providing methods and techniques for tackling the moral issues and dilemmas that engineers encounter in their work.

The focus of engineering ethics is on the roles and responsibilities of engineers. The ethical principles of engineering ethics have been created by professional engineering organisations. Most engineering ethics codes do not contain explicit reference to values, but rather describe a number of virtues that engineers ought to have and more importantly, a number of professional duties and responsibilities. Codes identify a specific precedence with respect to the engineer's consideration for the public, clients, the employer, and the profession.

Ethical codes typically specify that professional conduct by engineers is bound by virtues such as honesty, integrity, competence, dignity and objectivity. An example of a code listing such virtues is the World Federation of Engineering Organizations Code of Ethics.⁵² This document was designed to assist member organisations in guiding ethical behaviour by formulating their own codes of ethics. It typically specifies that engineers have a paramount responsibility for the health, safety and welfare of the public. The purpose of the Code is to provide guidance on the values professional engineers must adhere to in professional practice and principles that should be followed in applying those values. The Code states that professional engineers should:

⁵¹ Cf. Philip Brey and Philip Jansen, Ethics Assessment in Different Fields: Engineering Sciences. Deliverable 1.1, Annex 2.b, SATORI, 2015. <http://satoriproject.eu/media/2.b-Engineering.pdf>

⁵² World Federation of Engineering Organizations, *Model Code of Ethics*. http://www.wfeo.org/wp-content/uploads/WFEO_MODEL_CODE_OF_ETHICS_Final.pdf

1. Demonstrate integrity

Professional engineers should refrain from fraudulent, corrupt or criminal practices, be objective and truthful and practice fairly and with good faith towards clients, colleagues and others.

2. Practise competently

Professional engineers should practise in a careful and diligent manner in accordance with their areas of competence, accepted engineering practices, standards and codes and maintain and strive to enhance the body of knowledge.

3. Exercise leadership

All professional engineers will practise so as to enhance the quality of life in society and strive to foster the public's understanding of technical issues and the role of engineering.

4. Protect the natural and built environment

It is expected from professional engineers to create and implement engineering solutions for a sustainable future, be mindful of the economic, societal and environmental consequences of actions or projects and promote and protect the health, safety and well-being of the community and the environment.

European Federation of National Engineering Associations (FEANI) has approved the *Code of Conduct: Ethics and Conduct of Professional Engineers* in 2006.⁵³ According to this document, individual engineers have a personal obligation to act with integrity, in the public interest, and to exercise all reasonable skill and care in carrying out their work. This pan-European statement on engineering ethics and conduct is best-implemented through the codes issued by national engineering associations.

The *Code of Conduct* gives the following recommendations: engineers should maintain their relevant competences at the necessary level and only undertake tasks for which they are competent, they should not misrepresent their educational qualifications or professional titles, they should provide impartial analysis and judgement to employer or clients, avoid conflict of interests and observe proper duties of confidentiality. All their tasks should be carried out so as to prevent avoidable danger to health and safety and adverse impact on the environment. Furthermore, professional engineers should accept appropriate responsibility for their work and the work carried out under their supervision, should respect the personal rights of people with whom they work and the legal and cultural values of the societies in which they carry out assignments and be prepared to contribute to public debate on matters of technical understanding in fields in which they are competent to comment.

Another document, *The revolt of the Engineers*, written by Edwin Layton, adopted by the National Society of Professional Engineers (NSPE, USA),⁵⁴ also deals with the responsibilities of engineers. It emphasizes professionalism, social responsibility, and ethics. It explains how some engineers have attempted to express a concern for the social effects of technology and to forge codes of ethics which could articulate the profession's fundamental obligation to the public. The document suggests an engineer should recognize work as the greatest merit and exercise his profession with commitment to serving society, attending to

⁵³ European Federation of National Engineering Associations (FEANI), *FEANI position paper on Code of Conduct: Ethics and Conduct of Professional Engineers*, 2006.

⁵⁴ Layton, Edwin T., Jr., *The Revolt of the Engineers. Social Responsibility and the American Engineering Profession*, Johns Hopkins University Press, Baltimore, 1986.

the welfare and progress of the majority. By transforming nature for the benefit of mankind, an engineer must increase his awareness of the world as the abode of man, his interest in the universe as a guarantee of overcoming his spirit, and knowledge of reality to make the world fairer and happier. The engineer should reject any document or activity that is intended to harm the general interest, thus avoiding a situation that might be hazardous or threatening to the environment, life, health, or other rights of human beings. It is an inescapable duty of the engineer to uphold the prestige of the profession, to ensure its proper discharge, and to maintain a professional demeanour rooted in ability, honesty, fortitude, temperance, magnanimity, modesty, honesty, and justice; with the consciousness of individual well-being subordinate to the social good. The engineer and his employer must ensure the continuous improvement of his knowledge, particularly of his profession, disseminate his knowledge, share his experience, provide opportunities for education and training of workers, provide recognition, moral and material support to the school where he studied, thus returning the benefits and opportunities he and his employer have received. It is the responsibility of the engineer to carry out his work efficiently, and to support the law. In particular, he must ensure compliance with the standards of worker protection as provided by the law. As a professional, the engineer is expected to commit himself to high standards of conduct.

4.2 A PROPOSAL: ETHICAL STANDARDS FOR PROFESSIONAL ENGINEERS

Based on the literature overview we have made a proposal that summarises universal ethical standards for professional engineers by integrity and professional conduct criteria.

1. *Honesty & Integrity*: professional engineers should be alert to the ways in which their work might affect others and duly respect the rights and reputation of other parties, avoid deceptive acts, take steps to prevent corrupt practices or professional misconduct and declare conflicts of interest, reject bribery or improper influence and act for each employer or client in a reliable and trustworthy manner.
2. *Accuracy & Rigour*: professional engineers have a duty to ensure they acquire and use wisely and faithfully the knowledge that is relevant to the engineering skills. They should always act with care and competence, perform services only in areas of competence and not knowingly mislead or allow others to be misled about engineering matters. Furthermore, they should present and review engineering evidence, theory and interpretation honestly, accurately and without bias.
3. *Holding paramount safety, health and welfare of the public*: professional engineers should always be ready to identify, evaluate risks, minimise and justify any adverse effects on society or the natural environment for their own and succeeding generations, take due account of the limited availability of natural and human resources. This includes the act of whistleblowing meaning the duty of an engineer to report to the appropriate authority a possible risk to others from a client or employer failing to follow the engineer's directions and this duty overrides the duty to a client and/or employer.
4. *Objectivity, impartiality and verifiability*: decisions and actions of professional engineers should be based on scientifically proven and verifiable methods and data, independent from ideological, financial and any personal interests. They should be objective and truthful in any statement made in their professional capacity.

5. *Transparency & fairness*: collecting and analysing data should be a transparent process and done with respect towards scientific community, colleagues, research participants and public. They should ensure that all work is lawful and justified.
6. *Promoting collaboration*: professional engineers should foster the integrity of collaborative research, on institutional, local, national and international level.
7. *Promoting public engagement and social responsibility*: they should reflect on the needs of society and social impacts of their research and put an effort in preventing harm to society and environment. Moreover, they should actively promote public awareness and understanding of the impact and benefits of engineering achievements and be aware of the issues that engineering and technology raise for society and listen to the aspirations and concerns of others.
8. *Continuing learning and professional development*: professional engineers should maintain and expand their knowledge and skills.
9. *Conformity to regulations and good practices* regarding research process, participants and data management (e.g. nondisclosure of confidential information of clients)

5 STANDARDS FOR ETHICAL GUIDANCE AND ASSESSMENT OF ETHICAL PROFESSIONAL BEHAVIOUR FOR SCIENTISTS AND INNOVATORS

This section briefly reviews international guidelines for ethical professional behaviour and various types of institutional structures for assessment of ethical professional behaviour of scientists and innovators. On the basis of this review, it then provides recommendations for good guidance and assessment of ethical guidance of professional behaviour of researchers and innovators.

5.1 AN OVERVIEW OF STANDARDS FOR ETHICAL GUIDANCE AND ASSESSMENT OF ETHICAL PROFESSIONAL BEHAVIOUR OF RESEARCHERS AND INNOVATORS

A forum for global discussion on research integrity was established in 2007, when the European Science Foundation (ESF) and the US Office of Research Integrity (ORI) launched *The World Conference on Research Integrity (WCRI)*. The aim of the conference has been “to provide researchers, research administrators, research sponsors, journal editors, representatives from professional societies, policymakers, and others an opportunity to discuss strategies for harmonizing research misconduct policies and fostering responsible conduct in research”.⁵⁵ To ensure the discussion would take a place among the widest array of stakeholders, “all sectors of the research system had been sought”.⁵⁶

In 2010, the second WCRI produced the *Singapore Statement on Research Integrity*. The focus of the third conference in 2013 was research integrity in international research collaborations. The discussion resulted in the publication of the *Montreal Statement on Research Integrity in Cross-Boundary Research Collaborations*.

At the European level, the ESF has taken several actions to promote research integrity, issuing documents on good practice (policy briefing *Good Scientific practice in Research and Scholarship*, 2000), conducting research on institutional approaches to research integrity throughout Europe (*Stewards of Integrity. Institutional Approaches to Promote and Safeguard Good Research Practice in Europe*, 2008) and cooperating with ALLEA (All European Academies) to produce *The European Code of Conduct for Research Integrity* (2011) and guidelines for its implementation. Similar high-level guidance and best practice documents were issued, among others, by the InterAcademy Council, OECD, the International University Association, Science Europe (an association of European research funding and performing organisations) and COPE: The Committee on Publication Ethics.

Institutional approaches to ethical guidance and assessment of professional behaviour range from local ad-hoc committees to national offices developing national guidelines and assessment procedure. Sharing knowledge and experience is the key to further improve the quality of guidance and assessment. ENRIO – European Network of Research Integrity Offices has been established with the aim to offer a platform for such an exchange.⁵⁷

Below is a shortlist of documents to consider as standards for ethical guidance for the professional behaviour of researchers and innovators is proposed:

- *Singapore Statement on Research Integrity*, <http://www.singaporestatement.org/statement.html>.
- ESF, *Good Scientific Practice in Research and Scholarship*, 2000.

⁵⁵ <http://www.esf.org/index.php?id=4479>

⁵⁶ Ibid.

⁵⁷ Cf. www.enrio.eu

- ESF, *Fostering Research Integrity in Europe*, 2010.
- European Commission, *The European Charter for Researchers & The Code of Conduct for the Recruitment of Researchers*
- IAC - InterAcademy Council & IAP - The Global Network of Science Academies: *Responsible Conduct in the Global Research Enterprise*, 2012.
- IAU (International University Association)-MCO (Magna Charta Observatorium): *Guidelines for an Institutional Code of Ethics in Higher Education*, 2012.
- OECD Global Science Forum, *Best Practices for Ensuring Scientific Integrity and Preventing Misconduct*, 2007.
- Science Europe, *Briefing Paper: Research Integrity: What it Means, Why it Is Important and How we Might Protect it*, 2015.
- COPE: Committee on Publication Ethics, *Code of Conduct and Best Practice Guidelines for Journal Editors*, 2011.

Based on an overview of these documents we later make recommendations for good ethical guidance and assessment for professional behaviour of researchers and innovators.

All these initiatives testify to a growing need to address ethical professional behaviour at the systemic level. Many researchers believe misconduct cases are rare and that the peer review system eventually uncovers them.⁵⁸ The need for extensive ethics guidance and assessment framework is therefore still not apparent to all. Therefore, stakeholders have the task to raise awareness from an early, educational stage as well as consider the structural factors that increase the factors which increase the rates of misconduct (e.g. evaluation systems that encourage quantity of publication).

5.2 AN OVERVIEW OF INSTITUTIONAL STRUCTURES FOR ETHICAL GUIDANCE AND ASSESSMENT OF ETHICAL PROFESSIONAL BEHAVIOUR OF RESEARCHERS AND INNOVATORS

Developing ethical guidance as well as transparent and clearly defined assessment procedures is essential to increasing the level of ethical professional behaviour. Both the ESF's *European Code* and the *Singapore Statement* emphasise that guidance and assessment should be well balanced in order to provide an environment that will encourage research integrity on all levels the research and innovation process. A variety of stakeholders should acknowledge their responsibility in this process: universities, research institutes, private companies and other institutions that employ researchers, research funding organisations, academic journals, governmental organisations responsible for research policies, integrity boards, science academies and professional organisations all have their role to play in creating this environment, which “involves clear policies and procedures, training and mentoring of researchers, and robust management methods that ensure awareness and application of high standards as well as early identification and, wherever possible, prevention of any transgression”.⁵⁹

Ethical guidance of ethical professional behaviour is often provided by national or international professional associations, science academies and university associations. Such institutions establish specialised bodies (e. g. working groups) and organise discussion forums with the aim of developing ethical guidelines.

⁵⁸ ESF, *Fostering Research Integrity in Europe*, op. cit., p. 6.

⁵⁹ Ibid., p. 7. The Singapore Statement adds: “Research institutions should create and sustain environments that encourage integrity through education, clear policies, and reasonable standards for advancement, while fostering work environments that support research integrity.” (<http://www.singaporestatement.org/statement.html>.)

At many individual research institutions, mainly universities, ethical offices are being set up to offer guidance and advice. Ethical courses or trainings may also be offered to students and employees. Ethical offices can provide an integral approach to ethical professional behaviour at an individual research institution.

As for the assessment of ethical professional behaviour, there are several institutional frameworks in which assessment can take place. The following overview is based on documents, issued by OECD Global Science Forum and the discuss advantages of advantages and disadvantages of each in detail.⁶⁰ The arguments found in these documents were confirmed by SATORI discussions with identified stakeholders.

Ad hoc committees at individual institutions are often set up to deal with misconduct cases. Without properly defined guidelines and procedures, such committees cannot provide consistency and uniformity to treatment of individual cases. Lack of experience in expertise among appointed members can also prove to be a difficulty.

A standing committee at an institution can solve many of these problems by developing uniform procedures for assessment, uniformly applied to misconduct allegations. Standing committee members can gain experience in following these procedures as well as gaining credibility and trust from researchers and innovators, employed by the institution. However, internal investigations may face problems with conflicts of interest: since the reputation of an institution can be endangered by a proven case of misconduct, institutions may be tempted to cover up cases within their ranks.

National and international institutions such as science academies, funding organisations or professional associations can provide common guidelines, procedures and advice from an independent and respected standpoint.

A national institutional structure with national-level assessment committees can provide an independent assessment process, external to the institution where the alleged misconduct took place. Impartiality and consistency are among the advantages of a national system. Also, a standing national assessment committee is well placed to develop specialised expertise in dealing with misconduct allegations.

5.3 RECOMMENDATIONS FOR GOOD ETHICAL GUIDANCE OF PROFESSIONAL BEHAVIOUR OF RESEARCHERS

The following recommendations are based on an overview of the ethical standards overviewed in Section 5.1 as well as discussions with stakeholders, identified by SATORI. As affirmed in Section 5.2, a variety of organisations is responsible for achieving a research environment, favourable to ethical research behaviour. These recommendations are therefore addressed at individual institutions with a stake in improving this environment, which can only be done with a collaborative effort.

Recommendations for the research community:

1. The responsibility for ethical professional behaviour should be acknowledged by individual institutions that conduct research and employ researchers (universities, research institutes, companies), but also other stakeholders in the research process, such as research funding organisations, academic journals, governmental

⁶⁰ OECD, *Best Practices for Ensuring Scientific Integrity and Preventing Misconduct*, op. cit., p. 6; ESF, *Fostering Research Integrity in Europe*, op. cit., pp. 25-28.

organisations responsible for research policies, integrity boards, science academies and professional organisations, etc.

2. Stakeholders should strive to cooperate to achieve a research environment that encourages ethical professional behaviour on all levels (national-international; scientific fields; funding-research process-publishing) by creating international guidelines, national governance systems, forums for discussion and exchange of information, etc.
3. The initiative to raise awareness on ethical professional behaviour and develop guidelines in a particular country or scientific field should be taken up by independent and representative institutions, such as science academies, professional associations, university associations, science foundations, etc.
4. In order to embed ethical professional behaviour in the research cultures, institutions should review the ways in which they evaluate researchers' work, e. g. preferring quality over quantity, etc.

Recommendations for individual institutions:

5. Individual institutions should establish a body (e. g. committee, office) with a mandate and resources to:
 - a) develop a coherent and integral institutional research integrity policy, including the development of guidance and assessment procedures and strategies,
 - b) provide information service, awareness raising and other activities, aimed at encouraging the acceptance of developed guidelines and procedures and their integration into the research culture.

If this is not possible due to the size of the institution or limited resources, institutions may refer to frameworks by professional associations, science academies or other institutions with developed ethical guidance frameworks.

6. In order to encourage ethical professional behaviour and prevent misconduct, universities should include ethics in curriculums and offer ethics classes and trainings. Research institutions should offer training and organise workshops and conferences to raise awareness and discuss research integrity issues.

Recommendations for developing guidelines:

7. Ethical guidance should consider common values and principles, advocated in global discussions among a variety of stakeholders and formulated by national and international organisations with the mandate to promote research integrity in general and in a specific field of research. (See Sections 3.2 and 4.2 for a SATORI proposal.)
8. Ethical guidance and assessment procedures within an individual institution should be developed in a participatory way with representation from concerned parties (researchers, students, etc.).
9. Guidelines should identify all relevant actors and their responsibilities (institutions, individual researchers, students etc.).
10. A document of ethical guidance should include:

- a) explanation of the importance of research integrity for the advancement of the scientific endeavour,
 - b) clear descriptions of values and principles of ethical behaviour,
 - c) clarifications of applications of these principles to research and innovation practices, such as:
 - i) conducting research, analysing data and presenting results
 - ii) respect for human participants, animals and cultural materials of research
 - iii) publication practices
 - iv) handling of data
 - v) education and appointing practices
 - d) unambiguous definitions of various kinds of misconduct,
 - e) outlines of the procedures for assessing ethical professional behaviour (dealing with misconduct allegations, investigating allegations, issuing sanctions, appeal processes etc.).
11. Guidelines should be framed so that they can easily be incorporated into professional practices.
 12. To ensure ethical guidance is functional, institutions should develop mechanisms to monitor ethical behaviour awareness levels and compliance with the guidelines.
 13. Ethical guidance should be regularly revised according to new technological challenges, best practice experience, societal expectations and new research findings on scientific integrity.

5.4 Recommendations for good ethical assessment of professional behaviour of researchers

Recommendations for the research community:

1. A national system of assessment of professional behaviour is advisable since it reduces the risks of internal institutional assessments (e.g. conflict of interest, misconduct cover up) and allows for the development of more efficient assessment procedures and practices.

Recommendations for individual institutions:

2. Institutions that conduct research should establish fair and transparent procedures for assessment of ethical behaviour of scientists and innovators. (See Section 7.)
3. Research institutions should take measures so that researchers and innovators are aware of what constitutes misconduct and are well informed of the assessment procedures.
4. In international research collaborations, agreements on how to deal with misconduct allegations should be in place.

Recommendations for assessment units:

5. Procedures for accepting misconduct allegations and assessing ethical behaviour should be clearly defined so that allegations are addressed in a uniform way, regardless of the power relations within the institution.
6. The assessing committee should ensure confidentiality for the accuser, the accused and witnesses, while the assessment is taking place. Procedures for protection of whistle-blowers should be in place.
7. Assessment procedures should be in conformity with national law.
8. Assessment procedures should be efficient and expedite. Academic journals should take swift action to quickly retract publications, where misconduct was established.
9. Each research institution should have a contact person for professional research behaviour, whose contact details would be easily publically available and who could be contacted concerning any suspicions of misconduct (e.g. when findings from a journal article published by institutions' researchers could not be reproduced).
10. A range of sanctions should be defined in proportion to the committed misconduct.
11. Procedures of dealing with malicious false allegations should be in place. Researchers and innovators, accused of misconduct, should be presumed innocent, informed of the allegations, given a chance to defend themselves and have the possibility appeal the decisions. The assessment process should be done in a transparent way so it can be reviewed upon request.
12. Members of the assessing committee should be chosen according to their expertise and integrity (see Section 6) and should disclose any conflict of interest in a particular case.
13. Sharing information on cases of misconduct is beneficial in dealing with future cases and preventing misconduct. Institutions should strive to exchange experience.
14. Assessment procedures should be regularly revised according to new challenges, best practice experience and new research findings on scientific integrity.

6 EXPERTISE FOR ETHICAL GUIDANCE AND ASSESSMENT OF SCIENTISTS AND INNOVATORS

This section discusses the kinds of expertise that is needed for ethical guidance and assessment of scientists and innovators and the recommended composition of committees engaging in such guidance and assessment.

6.1 AN OVERVIEW OF EXPERTISE AND COMPOSITION FOR ETHICAL GUIDANCE AND ASSESSMENT OF SCIENTISTS AND INNOVATORS

This section applies the results of the SATORI deliverable 4.1.3 *Ethics Assessment Procedures* as they relate to expertise in ethical guidance and assessment of scientists and innovators combined with an overview of existing structures for ethical guidance and assessment of scientists and innovators. The unit considering the ethics guidance or assessment is referred to as the Ethics Assessment Unit (EAU). “An effective EAU requires members who are able to recognise the ethical concerns raised by a research project before it commences, during its’ operation, and after its’ completion.”⁶¹ The style of the EAU may vary depending upon the nature of the guidance or assessment being provided. As noted in section 5.2, as related to the professional and ethical standards for scientists and innovators, the unit may take the shape of an in house ethics office, an ad-hoc committee, or a standing committee. Additionally, the unit could be a national advisory or adjudicative committee, such as the case of Norway. Other units for consideration include individual or organisational participation in collaborative group forums such as the OECD Global Science forum but can also extend to branches of judiciary in cases where the breaches are not only of professional standards but of legal misconduct, as well.

In all EAU units, expertise should be a preeminent criterion in the selection of an individual to an EAU. However lack of expertise is not discounting in and of itself. There are various forms of expertise and the relevant types are considered here, namely professional, judicial, and procedural expertise. Subject expertise is critical and considered part of professional expertise. Expertise when discussed here is understood as the knowledge or skills of an individual, except where noted.

Balancing a variety of expertise also helps contribute the composition considerations of an EAU and familiarity with the broader context, such as national legal structures, is necessary for comprehensive assessment. In cases where institutions are conducting a review, institutional affiliation is to be considered as well in order to appropriately consider potential conflicts of interest that may arise either from competitiveness within members of a community or in protecting the reputational interests of the implicated institution.

In instances where public funds are involved, public officials should be considered for inclusion, as they are the shepherds of the public’s interest.

In certain areas, the membership expertise of an EAU is subject to national regulations and guidelines, such as the guidelines for human research ethics committees that are highly developed. Other considerations, such as entity representatives, affect the composition of committees and contribute to the overall expertise of the EAU.

The expertise of EAU members is best determined by considering the intended purpose of the EAU, and then reflecting on the skills, experience, and background of people that best fulfils

⁶¹ SATORI Deliverable D4.3.1, Ethics Assessment Procedures

that purpose. The members of an EAU should be qualified to evaluate the relevant professional and ethical principles, and should understand the perspectives and concerns of both the researchers and society about how (and what) research should be conducted. The expertise of EAU members should be selected with these goals in mind.

The concerns of researchers and the broader community can be addressed by seeking to fulfil three requirements in selecting EAU members: relevance, representation, and impartiality. These requirements should be understood as ideal goals, and it may not always be possible to fulfil them completely given the resource constraints that an EAU operates under. Individuals are also unlikely to meet all of the requirements themselves. What is important is that the membership of an EAU as a whole meets these requirements as well as possible, given the resources available to it.

Relevance means that the expertise of members should be sufficient to allow them to understand the standards under consideration and to make a defensible judgment as to its professional and ethical merits. Relevant expertise for the work of any EAU is research, professional, ethical, and legal expertise. Those working in the same field as the research under review are the best placed to understand the professional standards. Similarly, those with expertise in identifying and evaluating moral issues have relevant skills and knowledge. Legal expertise is also helpful for recognizing the legal implications of research and the legislation that imposes requirements and limitations on the work under review.

Representation means that the perspectives of the members should as much as possible accurately reflect those of the community to which the EAU belongs. This requirement is in tension with that of relevance as experts in research fields are often unrepresentative of their broader community. Their status as privileged elites means that their perspective on appropriate research methods may not be shared by less privileged members of society. This is a particular concern for research involving human participants, as there may be concerns about exploiting research participants. Including lay persons and patient or participant advocates within the EAU is a method of countering this perception. Experts from other fields may also help to fulfil the requirement of representation if their expertise gives them a perspective on the research and its potential impact that would otherwise be missed by restricting membership only to those with relevant expertise. This reflects the justifications for including lay persons in the composition of the EAU's membership.

Impartiality requires the members to show objectivity (and importantly, to appear objective) in their evaluation of research proposals. In this context impartiality has two dimensions: impartiality towards the researchers and their work, and impartiality towards the organisation performing it. A clear way of achieving this is for members of the EAU to be independent of both the researchers and the organisation conducting the research. While having an EAU composed entirely of individuals with no connection to the relevant institution may be impossible, having at least half of the members as independent of the institution should be sufficient to protect the EAU from the risk of being portrayed as biased towards the associated institution.

As with the composition of an EAU, avoiding potential conflicts of interest should be an important factor in deciding the appropriate expertise EAU composition. Impartiality may conflict with expertise if there is a perception (justified or not) that experts within a particular field favour their own research field regardless of the interests and concerns of others.

6.2 A PROPOSAL: RECOMMENDATIONS FOR EXPERTISE FOR ETHICAL GUIDANCE AND ASSESSMENT OF SCIENTISTS AND INNOVATORS

- The number of members in an EAU may depend on any legislative requirements for the size of an EAU, the available resources, and the need to include a diverse number of perspectives on research while maintaining a manageable size to allow for fruitful discussion and deliberation.
- The membership of an EAU should be arranged so that it encourages rigorous discussion and evaluation. This is best achieved by a membership that is independent of the researchers and the institutions involved, diverse in backgrounds and expertise, and representative of the communities that will be affected by its decisions.
- Those with expertise relevant to the research being reviewed should be included among the members of an EAU. However, persons without directly relevant expertise should be an equally important section of the membership.
- Lay persons (persons without expertise relevant to the research, including members of the general public) should be included in the membership of an EAU, and should be equal in number to members with directly relevant expertise to ensure that their views cannot be ignored. Lay persons should only be permitted to serve as an EAU member for a limited time so that such members continue to provide an ‘outside’ perspective on research in order to avoid attaining institutional affiliation.
- Expert and non-expert members should be open-minded and impartial in considering research proposals, and be willing to discuss their views and consider alternative perspectives in making their decisions.
- Ethical and legal expertise should be included among members of an EAU.
- Apparent and potential conflicts of interests should be avoided among EAU members. Members who have an impartial conflict of interest in a research proposal under review should remove themselves from discussions of such proposals.

7 PROCEDURES FOR ETHICAL GUIDANCE AND ASSESSMENT OF PROFESSIONAL SCIENTISTS AND INNOVATORS

This section discusses the procedural considerations are needed for judicious ethical guidance and assessment of scientists and innovators and the recommended practices of units engaging in such guidance and assessment. In keeping with aim of the document, the focus here is on *research integrity*, *responsible conduct of research* (RCR) and *good research practice*. It considers the questions of what steps do committees need to take and what kind of institutional and regulatory structures and support is needed in order to ensure that good and effective guidance and assessment is given. To do so, the recommendations from section 5 are considered in how to procedurally implement them.

7.1 RECOMMENDATIONS FOR PROCEDURES FOR GOOD ETHICAL GUIDANCE OF PROFESSIONAL BEHAVIOUR OF RESEARCHERS ETHICAL GUIDANCE AND ASSESSMENT OF SCIENTISTS AND INNOVATORS

Recommendations for the research community:

1. The responsibility for ethical professional behaviour should be acknowledged by individual institutions that conduct research and employ researchers (universities, research institutes, companies), but also other stakeholders in the research process, such as research funding organisations, academic journals, governmental organisations responsible for research policies, integrity boards, science academies and professional organisations, etc.

Procedural Recommendations:

Acknowledgment can be achieved by visible publication of the acknowledgements in forums such as the by-laws, individual contracts, statement of purposes, or code of conducts of the relevant institutions. They can be further acknowledged through trainings in the cases of institutions which conduct and employ researchers. Acknowledgment also entails providing mechanisms for recourse in case of breaches of ethical professional behaviour by either individuals or the institutions themselves.

2. Stakeholders should strive to cooperate to achieve a research environment that encourages ethical professional behaviour on all levels (national-international; scientific fields; funding-research process-publishing) by creating international guidelines, national governance systems, forums for discussion and exchange of information, etc.

Procedural Recommendations:

In order to facilitate the appropriate research environment, stakeholders should participate in the development of the guidelines, governance systems, or forums by either having direct representation of individuals at the relevant levels or by participating in structures that facilitate their representation, such as maintaining an affiliation with an association partaking in the deliberation process. Stakeholders should stay up to date on developments and

3. The initiative to raise awareness on ethical professional behaviour and develop guidelines in a particular country or scientific field should be taken up by independent

and representative institutions, such as science academies, professional associations, university associations, science foundations, etc.

Procedural Recommendations:

National academies, organizations, associations and foundations should be funded and membership on behalf of institutions should be according to accreditation standards which uphold the best practices and principles in professional research and innovation guidelines and ethics.

4. In order to embed ethical professional behaviour in the research cultures, institutions should review the ways in which they evaluate researchers' work, e. g. preferring quality over quantity, etc.

Procedural Recommendations:

To achieve this aim, institutions should re-evaluate the criteria used in hiring and promotion practises, as well as in institutional setup. For example, this may mean a collaborative effort to reward investigators based upon the amount of funding they bring to an institution and by actively moving beyond a "publish-or-perish" mentality where only novel, positive results in publications are considered in hiring and promotions.

Recommendations for individual institutions:

5. Individual institutions should establish a body (e. g. committee, office) with a mandate and resources to:
 - c) develop a coherent and integral institutional research integrity policy, including the development of guidance and assessment procedures and strategies,
 - d) provide information service, awareness raising and other activities, aimed at encouraging the acceptance of developed guidelines and procedures and their integration into the research culture.

If this is not possible due to the size of the institution or limited resources, institutions may refer to frameworks by professional associations, science academies or other institutions with developed ethical guidance frameworks.

Procedural Recommendations:

Clearly communicated procedures for reporting instances of misconduct should be produced. This includes sharing the methods of reporting and to whom reports should be made. Alongside this, the rights of both the accused and the reporting party must be clearly understood by all parties involved. It is incumbent upon institutions to have policies considering *sensitivity*, *confidentiality*, *objectivity*, and *fairness*. Further, institutions should consider elements of anonymity and statues of limitations, as well as how to address false allegations.

6. In order to encourage ethical professional behaviour and prevent misconduct, universities should include ethics in curriculums and offer ethics classes and trainings. Research institutions should offer training and organise workshops and conferences to raise awareness and discuss research integrity issues.

Procedural Recommendations:

Awareness and integrity issues integrated into the culture of the institutions should consider frequency, certification, as well as responsibilities of individuals associated with the institutions.

Recommendations for developing guidelines:

7. Ethical guidance should consider common values and principles, advocated in global discussions among a variety of stakeholders and formulated by national and international organisations with the mandate to promote research integrity in general and in a specific field of research. (See Sections 3.2 and 4.2 for a SATORI proposal.)

Procedural Recommendations:

Models for specific fields of research or institutions should be developed that can be adapted to the particular institutional needs. Global discussions should not only list the principles to be upheld, but also provide tools for facilitations stakeholders creating guidelines.

8. Ethical guidance and assessment procedures within an individual institution should be developed in a participatory way with representation from concerned parties (researchers, students, etc.).

Procedural Recommendations:

Participatory models should be discussed in the implementation as to the relevant mechanisms for achieving representation and resolution. This includes considering voting vs consensus vs public debates, etc as vehicles for participation and representation. The frequency of updating the procedures should be included as well.

9. Guidelines should identify all relevant actors and their responsibilities (institutions, individual researchers, students etc.).

Procedural Recommendations:

Once established, the guidelines should be shared with all relevant actors.

10. A document of ethical guidance should include:
 - a) explanation of the importance of research integrity for the advancement of the scientific endeavour,
 - b) clear descriptions of values and principles of ethical behaviour,
 - c) clarifications of applications of these principles to research and innovation practices, such as:
 - vi) conducting research, analysing data and presenting results
 - vii) respect for human participants, animals and cultural materials of research
 - viii) publication practices
 - ix) handling of data
 - x) education and appointing practices
 - d) unambiguous definitions of various kinds of misconduct,

- e) outlines of the procedures for assessing ethical professional behaviour (dealing with misconduct allegations, investigating allegations, issuing sanctions, appeal processes etc.).
11. Guidelines should be framed so that they can easily be incorporated into professional practices.

Procedural Recommendations:

Guidelines must serve more than as a reference point and be adaptable to practical considerations. This means that the guidelines should serve as points of discussion and not simply reference materials.

12. To ensure ethical guidance is functional, institutions should develop mechanisms to monitor ethical behaviour awareness levels and compliance with the guidelines.
13. Ethical guidance should be regularly revised according to new technological challenges, best practice experience, societal expectations and new research findings on scientific integrity.

Procedural Recommendations:

Those responsible for providing ethical guidance thus have a responsibility to be informed of the developments in their fields as well as within research ethics.

7.2 RECOMMENDATIONS FOR GOOD ETHICAL ASSESSMENT OF PROFESSIONAL BEHAVIOUR OF RESEARCHERS

The following recommendations from Section 5 are reproduced with the appropriate procedural recommendations concluding.

Recommendations for the research community:

15. A national system of assessment of professional behaviour is advisable since it reduces the risks of internal institutional assessments (e.g. conflict of interest, misconduct cover up) and allows for the development of more efficient assessment procedures and practices.

Recommendations for individual institutions:

16. Institutions that conduct research should establish fair and transparent procedures for assessment of ethical behaviour of scientists and innovators.
17. Research institutions should take measures so that researchers and innovators are aware of what constitutes misconduct and are well informed of the assessment procedures.
18. In international research collaborations, agreements on how to deal with misconduct allegations should be in place.

Recommendations for assessment units:

19. Procedures for accepting misconduct allegations and assessing ethical behaviour should be clearly defined so that allegations are addressed in a uniform way, regardless of the power relations within the institution.

20. The assessing committee should ensure confidentiality for the accuser, the accused and witnesses, while the assessment is taking place. Procedures for protection of whistle-blowers should be in place.
21. Assessment procedures should be in conformity with national law.
22. Assessment procedures should be efficient and expedite. Academic journals should take swift action to quickly retract publications, where misconduct was established.
23. Each research institution should have a contact person for professional research behaviour, whose contact details would be easily publically available and who could be contacted concerning any suspicions of misconduct (e.g. when findings from a journal article published by institutions' researchers could not be reproduced).
24. A range of sanctions should be defined in proportion to the committed misconduct.
25. Procedures of dealing with malicious false allegations should be in place. Researchers and innovators, accused of misconduct, should be presumed innocent, informed of the allegations, given a chance to defend themselves and have the possibility appeal the decisions. The assessment process should be done in a transparent way so it can be reviewed upon request.
26. Members of the assessing committee should be chosen according to their expertise and integrity and should disclose any conflict of interest in a particular case.
27. Sharing information on cases of misconduct is beneficial in dealing with future cases and preventing misconduct. Institutions should strive to exchange experience.
28. Assessment procedures should be regularly revised according to new challenges, best practice experience and new research findings on scientific integrity.

Procedural Recommendations:

The size of a country or specific research communities may affect the ability to develop a national system. The system can either be in the adjudicatory model or by providing a guidance system on how institutions and the community can develop localized systems within the national context.

Institutions should have clear policies on the roles of those involved in the assessment procedure and on the following procedural considerations:

Composition;

Areas of Expertise;

Conflicts of Interest, including institutional reputation;

Cooperation and compelling of data/behavioural disclosures;

Multi-institutional arrangements in multi-party research agreements;

Limits of the assessing body;

Funding Sources for assessment;

Standards of proof;

Statutes of limitations;

Rights to appeal;

Fairness/confidentiality;

Representation of the accused;

Public disclosure of assessments;

Proportionality of corrective measures;

The protection of those involved but not implicated in the misconduct;

The adjudicating deliberation procedure, such as voting on guilt.