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Executive Summary

This document constitutes Deliverable D2.4 of the HYDROPTICS project, funded by the European Union's Horizon Europe research and innovation programme under grant agreement No.871529. An initial version of this deliverable is available as Deliverable D2.1 (M24). The purpose of this document is to demonstrate the completion of a structured and methodological Ethical Impact Assessment (EIA), which reflects both the existing literature and the Research and Innovation (R&I) practice, tailoring it to the way R&I projects are organised. The methodology was both structured, by laying down clear steps and criteria, by providing options for structuring EIAs for different scales of R&I projects and for different contexts of these projects (e.g. both for publicly funded and privately funded projects).

In addition, the deliverable presents a conducted Gender Equality Plan (GEP) which was defined based on the guidelines presented by the European Commission (EC) in the context of the new Horizon Europe program. This action plan was finalised by setting out organisational priorities for addressing gender equality which guided the identification of the activities and the monitoring of the plans. GEP was devised according to national and European laws and aligned with national initiatives and actions focusing on equality of women and men, rights, discrimination banning, equality treatment, harassment in workplace, social responsibility of organisations etc. This deliverable also sets out the data that were collected, generated and/or processed by the consortium within the remit of the HYDROPTICS project and especially the way such data and other research outputs were expected to be handled in terms of, inter alia, storage, security, and availability, while also laid down considerations related to the FAIR Guiding Principles.

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1. Analysis of the final ethical framework of HYDROPTICS

Fundamental ethical principles apply to all scientific research and ethical issues may arise in all possible domains of scientific research. Ethics is strongly related to research, and researchers often face Ethics as a barrier in the progress of scientific research. Nonetheless, the boundaries set in research by ethical restrictions are there to safeguard the rigidity of research activities and strengthen the willingness of subjects to participate in a research protocol. The European Commission interprets research ethics into a collaborative and constructive process. Specifically for Horizon projects, researchers are asked to consider ethics at the conceptual stage of the proposal, resulting to the enhancement of the research quality.

Research ethics is of crucial importance in all scientific domains. Based on these basic principles, research ethics are constantly being adapted to specificities of various research domains by professional or academic associations (e.g., ESF INTERNAL CODE OF CONDUCT).

Amongst the Golden Rules of Ethical Research Conduct relevant to the project research domain, the following must be ensured:

- Respect the integrity and dignity of persons.
- Follow the “Do no harm” principle. Any risks must be clearly communicated to the subjects involved.
- Recognise the rights of individuals to privacy, personal data protection and freedom of movement.
- Honour the requirement for informed consent and continuous dialogue with research subjects.
- Respect the principle of proportionality: not imposing more than is necessary on your subjects or going beyond stated objectives.
- Respect biodiversity and do not impose irreversible changes that threaten the environment or ecological balance.
- Build on the understanding that any benefits are for the good of society, and any widely shared expressions of concern about threats from your research must be considered.

As mentioned earlier ethics is a high priority in EU funded research and all activities implemented in the Horizon framework must comply with ethical principles, as well as relevant national, EU and international legislation. The Lisbon Treaty (forming the constitutional basis of the EU) makes explicit reference to the Charter of Fundamental Rights of the European Union. The Charter focuses on the right to the integrity of a person, protection of personal data and family life, as well as rights in the field of bioethics, academic freedom, and freedom of scientific research:

Article 3: Right to the integrity of the person

1. Everyone has the right to respect for his or her physical and mental integrity.
2. In the fields of medicine and biology, the following must be respected in particular.
 - a. The free and informed consent of the person concerned, according to the persons.
 - b. The prohibition of eugenic practices, in particular those aiming at the selection of persons.
 - c. The prohibition on making the human body and its parts as such a source of financial gain.
 - d. The prohibition of the reproductive cloning of human beings.

Article 7 Respect for private and family life

Everyone has the right to respect for his or her private and family life, home and communications.

Article 8: Protection of personal data

1. Everyone has the right to the protection of personal data concerning him or her.
2. Such data must be processed fairly for specified purposes and on the basis of law. Everyone has the right of access to data which has been collected concerning him or her, and the right to have it rectified.
3. Compliance with these rules shall be subject to control by an independent authority.

Article 13: Freedom of the arts and sciences

The arts and scientific research shall be free of constraint. Academic freedom shall be respected.

The legislation regulating Horizon 2020, focuses on two types of ethics requirements relevant to the phases of:

- grant preparation
- the ongoing project

At the grant preparation phase the Regulation establishing Horizon 2020 (Regulation 1291/11-12-2013) defines the Ethical principles in Article 19:

Article 19 Ethical principles

1. All the research and innovation activities carried out under Horizon 2020 shall comply with ethical principles and relevant national, Union and international legislation, including the Charter of Fundamental Rights of the European Union and the European Convention on Human Rights and its Supplementary Protocols. Particular attention shall be paid to the principle of proportionality, the right to privacy, the right to the protection of personal data, the right to the physical and mental integrity of a person, the right to non-discrimination and the need to ensure high levels of human health protection.
2. Research and innovation activities carried out under Horizon 2020 shall have an exclusive focus on civil applications.
3. The following fields of research shall not be financed: (a) research activity aiming at human cloning for reproductive purposes; (b) research activity intended to modify the genetic heritage of human beings which could make such changes heritable; (c) research activities intended to create human embryos solely for the purpose of research or for the purpose of stem cell procurement, including by means of somatic cell nuclear transfer.
4. Research on human stem cells, both adult and embryonic, may be financed, depending both on the contents of the scientific proposal and the legal framework of the Member States involved. No funding shall be granted for research activities that are prohibited in all the Member States. No activity shall be funded in a Member State where such activity is forbidden.
5. The fields of research set out in paragraph 3 of this Article may be reviewed within the context of the interim evaluation set out in Article 32(3) in the light of scientific advances.

All ethics requirements due after the project start are automatically included in the grant agreement in the form of deliverables. These deliverables are known as 'ethics deliverables' and are placed in an automatically generated work package called 'ethics requirements'.

Ethics fundamental principles of research integrity in H2020 projects

- **reliability** in ensuring the quality of research reflected in the design, the methodology, the analysis and the use of resources;
- **honesty** in developing, undertaking, reviewing, reporting and communicating research in a transparent, fair and unbiased way;
- **respect** for colleagues, research participants, society, ecosystems, cultural heritage and the environment;
- **accountability** for the research from idea to publication, for its management and organisation, for training, supervision and mentoring, and for its wider impacts and means that beneficiaries must ensure that persons carrying out research tasks follow the good research practices and refrain from the research integrity violations described in this Code.

In addition to the applicable legislation, there are also several guidance documents related to ethics in EU research that should be followed by Horizon 2020 consortia and beneficiaries, such as the “European Code of Conduct for Research Integrity”, the “Ethics for researchers - Facilitating Research Excellence in FP7”⁴ or “Horizon 2020 Guidance — How to complete your ethics self-assessment”, as well as domain-specific guidance.

To support the significance of ethics within the HYDROPTICS project the Executive Board has assigned the role of the Ethics Manager (EM) to DBC, who will ensure that all activities such as the engagement of citizens and local actors, as well as the use of data, are conducted in an ethical manner, and consider sex and gender.

1.1 Ethics framework in Hydroptics

The data that will be handled within the project can be categorized into two basic domains: heterogeneous types of available data (historical on-field check data, etc.) and Personal Data.

Open Data

The Open Data Directive’ (Directive (EU) 2019/1024) entered into force on 16 July 2019. It is built around two main pillars, transparency, and fair competition. The goal of this Directive is to:

- stimulate the publishing of dynamic data and the uptake of Application Programme Interfaces (APIs).
- reduce the exceptions which allow public bodies to charge more than the marginal costs of dissemination for the re-use of their data.
- broaden the Directive’s scope to:
 - data held by public undertakings, under a specific set of rules. The Directive will apply to data which the undertakings make available for re-use;
 - research data resulting from public funding – Member States will be asked to develop policies for open access to publicly funded research data. New rules will also facilitate the re-usability of research data that is already contained in open repositories.
- strengthen the transparency requirements for public–private agreements involving public sector information, avoiding exclusive arrangements.

Member States must transpose Directive (EU) 2019/1024 by 16 July 2021. Now the EU Member States have implemented the rules of the Public Sector Information (PSI) directive (Directive 2003/98/EC) that was amended by the Directive 2013/37/EU.

Personal Data

The EU Legislation on the protection of Personal Data is governed by the following legislative documents:

- Regulation (EU) 2016/679 - General Data Protection Regulation (GDPR)
- Directive (EU) 2016/680 on the protection of natural persons regarding processing of personal data connected with criminal offences or the execution of criminal penalties, and on the free movement of such data
- Regulation (EU) 2018/1725 on the protection of natural persons regarding the processing of personal data by the EU institutions, bodies, offices, and agencies
- Guidelines on Transparency under Regulation 2016/679 (wp260rev.01)
- Guidelines on Automated individual decision-making and Profiling for the purposes of Regulation 2016/679 (wp251rev.01)
- Guidelines on Personal data breach notification under Regulation 2016/679 (wp250rev.01)
- Guidelines on Consent under Regulation 2016/679 (wp259rev.01)
- Guidelines on the application and setting of administrative fines (wp253).
- Guidelines on the Lead Supervisory Authority (wp244rev.01)
- Guidelines on Data Protection Officers ('DPOs') (wp243rev.01)
- Guidelines on the right to "data portability" (wp242rev.01)
- Guidelines on Data Protection Impact Assessment (DPIA) (wp248rev.01)

1.2 Ethics and morals regarding the use of human subjects in project activities

There is a strong connection between research ethics and human rights. Both fields influence each other and there are significant overlaps. Data protection poses a central role in research ethics in Europe, and it is at the same time a fundamental human right. Data privacy is linked to autonomy and human dignity. In today's information society, data privacy must be thoroughly protected by the research community.

A major area of concern in this area is gender equality.

Regarding the human subjects participating in project activities (i.e., Paying Authorities, Certification Bodies, farmers) informed consent is the cornerstone of research ethics. Research participants should analytically be informed on the research methodology and objectives. Additionally, specifics on their participation and any risks that may be involved are to be presented to them. Once the aforementioned are clear to the participants, the researchers should seek participants' consent to take part in the project (Articles 4(11) and 7 GDPR).

Finally, ethics and morals in research practices are based on fundamental principles of research integrity and are provided by relative Codes of Conduct. Codes of Conduct guide researchers in their work as well as in their engagement with the practical, ethical, and intellectual challenges arising in research projects. According to the European Code of Conduct for Research Integrity these principles are:

- Reliability in ensuring the quality of research reflected in the design, the methodology, the analysis, and the use of resources.
- Honesty in developing, undertaking, reviewing, reporting, and communicating research in a transparent, fair, full and unbiased way.
- Respect for colleagues, research participants, society, ecosystems, cultural heritage, and the environment.

- Accountability for the research from idea to publication, for its management and organisation, for training, supervision and mentoring, and its wider impacts.

2. Ethics governance model in HYDROPTICS

To properly address the ethical and social issues that have been described above, the HYDROPTICS consortium has identified a dedicated work package within the project. While HYDROPTICS researchers and developers notice ethical and social aspects in each of the projects' work packages and tasks, special attention is paid attention to work package WP2. The ethical governance model (based on systematic guidance, monitoring and reporting on the implementation of ethical requirements and guidelines), is embedded in the structure of WP2. From the viewpoint of ethics management, the key actors are the Ethics Manager (EM), Data Protection Manger (DPM) and the internal Ethics Team (ET) as part of WP2. The role of the internal ethics team is to review deliverables from the ethics point of view, as well as provide ad hoc consultancy on ethical issues that emerge during the HYDROPTICS project.

All the HYDROPTICS project partners commit to upholding ethical research standards, including the European Code of Conduct for research integrity. They are committed to delivering high-quality scientific outputs and to be transparent, ensuring deliverables' reliability and impact. These features of deliverables are validated as part of the quality management procedures.

The principles of maximizing benefit and minimizing harm, social responsibility, dignity of persons, fundamental human rights and other issues mentioned in the Horizon 2020 ethical self-assessment are supported during the R&D work by taking into use ethical self-assessment procedure as part of the HYDROPTICS governance structure. This ethical self-assessment is based on the Horizon 2020 template, but it is further modified for the specific purposes of the HYDROPTICS ethics governance. The process is as follows:

- Each WP leader provides ethical self-assessment (with necessary documents) of her/his WP and delivers it to the EM and uploads it to the repository.
- If problems occur, they are to be discussed with the EM and in the EAB.
- The EM will record the activities in the ethics paper trail and include it in the ethical progress report.

The ethical requirements for the HYDROPTICS solution will be defined in Ethical Framework for HYDROPTICS solution.

To ensure that the ethical requirements are mutually understood, carefully prioritized and successfully implemented, the following activities are needed:

1. First, WP leaders and task leaders familiarise themselves with the requirements by going through the list of ethical requirements defined.
2. It is important to perceive whether we can accept differences (and mitigations) in the implementation of the requirements in the pilot version of the HYDROPTICS solution, compared with the final version.
3. If clarification is needed, the EM and DPM are tasked with providing technical notes on the translation and implementation of the ethical requirements so that they can be taken into account in various tasks and deliverables. This work is carried out by providing needed documents and specifications and/or organising zoom-meetings.
4. Task leaders are expected to conduct an ethical compliance check of their deliverables as part of the research work. In case clarification is needed about the requirements or if other ethical viewpoints emerge, the EM and DPM may be requested to provide help in the implementation of the ethical requirements.
5. The ethical compliance checks provided as an addendum to each deliverable are further reported in the ethics paper trail and ethical progress reports by the EM.

The minimum ethical requirements to be met by the pilot version of HYDROPTICS itself concern legislation, namely data protection, IPRs and local data information sharing regulation, including use of secondary data sources.

The classical ethical principles introduced below serve as a basis for the selection of the HYDROPTICS project’s ethical principles and construction of the ethical statements guiding the research, development and innovation during the entire HYDROPTICS project. These principles were selected for reviewing the morally sustainable progress in co- creation of outcomes and findings during the entire project. The principles and statements are binding to all stakeholders, even the most important roles such as managers, administrators, methodologists and reporters working in the HYDROPTICS - project supported by the project coordinator, work package leaders and the external and internal ethical experts (Newman & Brown 1996, 5).

Research integrity and ethical issues are determining factors for the successful implementation of a project that involves users, such as HYDROPTICS. When it comes to technology and data sharing in general, where personal data obtain a special meaning (ETSI TR 2005), a series of public issues may arise: the difficulty of ensuring privacy and confidentiality when third parties are interested in gaining access to stored personal health data, or the difficulty in assuring the security of shared personal data. On the other hand, some of these issues may arouse controversy; more specifically, effectiveness versus confidentiality: access and sharing of patients’ personal health data in order to provide efficient and high-quality care may lead to shared secrecy, which may challenge confidentiality. A further consideration is that of privacy versus common good: privacy may be undermined for the sake of common interests (research, administration, planning and prevention) that benefit the community or population on a great scale.

In the following table, we present the regulation regarding the research integrity and ethical requirements in the context of the HYDROPTICS network involving human participants and the protection of participant data.

ALLEA (2017)	
Reliability	“Reliability in ensuring the quality of research, which is reflected in the design, methodology, analysis and use of resources.”
Honesty	“Honesty in developing, undertaking, reviewing, reporting and communicating research in a transparent, fair, full and unbiased way.”
Respect	“Respect for colleagues, research participants, society, ecosystems, cultural heritage and the environment.”

Accountability	“Accountability for the research from ideation to publication, for its management and organisation, for training, supervision and mentoring, and for its wider impacts.”
Beauchamp and Childress (2013)	
Respect for autonomy	The right for an individual to make his or her own choices. Integrity of its members, confidentiality, rights of deceased people
Beneficence	The principle of acting with the best interest of the other.
Non-maleficence	The principle to “above all, do no harm”.
Justice	Fairness and equality among individuals.
Belmont Report (1978) on research integrity and applications	
Informed consent	Respecting persons requires that subjects are capable to choose what shall or shall not happen to them. The consent process contains three elements: information, comprehension and voluntariness.
Risk-benefit analysis	It is an opportunity and a responsibility to gather information about proposed research: for the researcher it is a means to examine whether the proposed research is properly designed; for the reviewer it is a method for determining whether the risks presented to subjects are justified; for prospective subjects the assessment will assist them in determining whether or not to participate.
Selection of participants	Fair procedures and outcomes in the selection of research subjects must be applied.
EU Commission (2010), Newman & Brown (1996) and others	
Cultural identity	Respect of cultural identity of the informants.
Sustainability	Responsible use of resources in research.
Diversity	Biodiversity and diversity in management.

The coronavirus (COVID-19) pandemic of 2020 has affected the entire world, including HYDROPTICS participants' countries. Fundamental rights are being restricted in some countries (like the freedom of movement). Duty of care is the guiding principle when collaborating with older persons and other citizens. Each participant country will follow the national guidelines regarding possible restrictions related to COVID-19, meaning:

- Pilots might have to be rescheduled.
- Project meetings will be organised online until the situation has improved.
- All activities with informants, students, participants etc. during the pandemic will be approached with extra caution.
- Everyone must obey local and global regulations and laws and special arrangements and emergency laws.
- Extra attention will be paid to possible effects of COVID-19 in relation to solutions and processes. This will primarily be evaluated afterwards. For example, many older individuals will stay home even more than during "normal times". For instance, in Finland people over 70 are advised not to go out for groceries but instead to avoid stores and interaction. The possible resulting loneliness and mental health issues and perhaps capability to use different devices and applications may increase. The need for solutions might be especially interesting in relation to COVID-19 restrictions.

All research will be carried out in a voluntary manner, respecting the autonomy of research participants (Belmont Report 1978; Helsinki Declaration 1964; ALLEA 2017). The rights of all human beings involved in the project will be respected. The freedom of every stakeholder will be guaranteed (Helsinki Declaration 1964; Article 4 of the Additional Protocol; ALLEA 2017).

The research performed within HYDROPTICS will not involve risks and burdens to participants that are not justified in terms of the potential harms and benefits of the research (Article 6 of the Additional Protocol). All research activities carried out within HYDROPTICS will respect the private lives of research participants, and the confidentiality regarding the data collected about them must be guaranteed (Article 25 of the Additional Protocol; ALLEA 2017).

If compensation is offered to HYDROPTICS research participants, it shall not be an incentive to participate in research (Article 12 of the Additional Protocol; ALLEA 2017).

The HYDROPTICS developers and researchers protect, by all necessary means, the safety of participant and minimise all potential risks and burdens that participants may undergo (Article 21 of the Additional Protocol).

The persons participating in HYDROPTICS research will receive full disclosure about the procedure and description of the planned interventions and their implications in comprehensible language before they give or refuse their Informed Consent (Helsinki Declaration 1964; Article 13 of the Additional Protocol; ALLEA 2017).

No research on a person will be conducted without voluntary, freely expressed, specific and documented "Informed Consent" (Helsinki Declaration 1964; Article 14 of the Additional Protocol; ALLEA 2017). Persons participating in HYDROPTICS research may freely withdraw their consent at any stage. This statement is valid for adults and children whom legally have the capacity to consent (Helsinki Declaration 1964).

Persons regarded by law as lacking the capacity to consent will benefit from special protection. Within HYDROPTICS, research cannot be conducted on these persons without permission of legal representatives. Such persons may be, for example, an adult suffering from a mental or cognitive disorder or a mentally disabled person, and permission is required from legal representatives (Helsinki Declaration 1964; Article 15 of the Additional Protocol).

In summary: all researchers and developers must follow local guidelines and laws, including research permits and special arrangements caused by the COVID-19 pandemic.

Consent

In the HYDROPTICS project, we must collect consent for several purposes as part of the research activities, dissemination activities and when end-users use the HYDROPTICS platform. Research in which consent will be collected include Ethnography, Focus Groups and Interviews. Dissemination requires consent if personal data will be collected and processed. This is the case, e.g., with newsletter email lists and photography.

The consent document is the basis for communication with the end-users and other stakeholders participating in the project. It consists of the information sheet on the project and the actual consent form. In addition, the information sheet given to potential participants will offer a clear statement of all aspects relevant to their decision about whether or not to participate. Appropriate efforts will be taken to ensure fully informed understanding of the implications of participation. Dissent will be respected.

When it comes to other development activities (e.g., brainstorming sessions and discussions with experts) consent is not needed in general (e.g., when brainstorming with students or having informal discussions). The guidelines of each institution need to be respected; separate permission from the institution may be required if information is gathered about students or staff or about the institution itself. Students are not allowed to pass on information from hospitals or care homes; they are under obligation of confidentiality.

Regarding the research activities, each researcher is responsible for the collection and safekeeping of the templates until the project's conclusion.

3. Ethical Impact Assessment in HYDROPTICS

The impacts of technology that raise ethical concerns include so-called hard impacts (physical impacts on environment, health, and safety) and soft impacts (impacts on social realities and ideals such as justice, equality, individual rights, identity, etc.). Environmental, health and safety impacts are often assessed together as so-called EHS impacts. When the impacts of a technology are uncertain, the language used to discuss these impacts is that of technological risks. Ethical concerns have been raised in relation to the following impacts:

- **Environment:** these are ethical concerns regarding the question whether the environmental impacts of a technology can be justified.
- **Health:** these are ethical concerns with the impact of technologies on physical and mental health.
- **Safety:** these are ethical concerns about the safety of technologies and the potential damage they could do, e.g. injury and death, economic damage, social and political damage, damage to national security, etc.
- **Justice, access and equality:** these cover ethical concerns regarding the distribution of goods and risks for harm that result from the use of new technologies (justice issues), the question of whether everyone has adequate access to important new technologies (access issues, which are also a kind of justice issue) and whether or not technologies help increase or decrease equality and equal opportunity of human beings in society.
- **Individual rights and liberties:** these cover ethical concerns about whether and how the impacts of technologies may reduce or violate individual rights and liberties, such as the right to privacy, right to freedom of information, right to freedom of movement, property rights, etc.
- **Autonomy, authenticity and identity:** these cover ethical concerns regarding the impact of technology on free will, the ability to have one's own thoughts, to make one's own decisions, to be an authentic person, and to form and to develop one's own biographic and social identity. Some technologies that have been controversial in this regard include neurotechnologies, human enhancement technologies, reproductive technologies, and artificial intelligence.
- **Human dignity:** This covers ethical concerns regarding the impact of technologies on human dignity for instance, by human cloning, reengineering of humans, and human enhancement.

- **Bodily integrity:** This covers ethical concerns concerning technologies that infringe the inviolability of the physical body and take away self-determination of human beings over their own bodies.
- **Dual use:** This covers the possibility that a new technology or technological product can be used in ways other than its intended use, and that this alternative way of using it is morally controversial. Thus there is a “good” and an “evil” way of using the technology, hence the term “dual use”. Dual use issues arise with regard to civilian technologies that can be used for military purposes, as well as benign technologies that can be used for harmful purposes such as terrorism, substance abuse, or other abuse. Dual use issues often occur in relation to chemical, biological and nuclear technologies.
- **Hubris:** This is a concern that for some technologies we overestimate our ability to predict their consequences as well as our ability to mitigate consequences that are undesirable. This particularly applies to complex and dynamic technologies that have potential impacts on biological and ecological systems. These include geo-engineering to combat climate change, the release of genetically modified organisms, reproductive cloning, human enhancement, and others.

Introductions to computer ethics show considerable agreement on what the central issues for computer ethics are. They include ethical issues of privacy, security, computer crime, intellectual property, free expression, and equity and access, and issues of responsibility and professional ethics. The question of whether IT poses unique ethical challenges is itself a point of debate within the field, often referred to as the uniqueness debate. It has been argued that unique features of IT, such as logical malleability, superhuman complexity and the ability to make exact copies, raise unique ethical issues to which no non-IT analogues exist. Others remain unconvinced that any computer ethics issue is genuinely unique, and that they involve traditional ethical concepts and principles such as privacy, responsibility, harm and ownership.

3.1 Privacy

Privacy is a topic that has received much attention in computer ethics from early on. Information technology is often used to record, store and transmit personal information, and it may happen that this information is accessed or used by third parties without the consent of the corresponding persons, thus violating their privacy. Privacy is the right of persons to control access to their personal affairs, such as their body, thoughts, private places, private conduct, and personal information about themselves. The most attention in computer ethics has gone to information privacy, which is the right to control the disclosure of personal data.

Privacy issues come into play on the Internet, where cookies, spyware, browser tracking and access to the records of internet providers may be used to study the Internet behaviour of individuals or to get access to their PCs. They also come into play in the construction of databases with personal information by corporations and government organisations, and the merging of such databases to create complex records about persons or to find matches across databases. This becomes particularly problematic when the purpose is to use such private information for commercial purposes. Other topics of major concern include the privacy implications of video surveillance and biometric technologies, and the ethics of medical privacy and privacy in the workplace. It has also been studied whether people have a legitimate expectation to privacy in public areas, whether they can be freely recorded, screened and tracked whenever they appear in public and how the notion of “public” itself has changed in light of information technology. The questions discussed typically differ depending on whether the domain in question is of a commercial or governmental nature. The first tends to focus on issues such as consumer exploitation, behavior-steering and what many defend as a right to go about one’s daily life without having to share private information in exchange for commercial benefits. The second area focuses more on governmental surveillance, and has received a tremendous amount of attention since the so-called Snowden revelations.

3.2 Security and crime

Security has become a major issue in computer ethics, because of rampant computer crime and fraud, the spread of computer viruses, malware and spam, and national security concerns about the status of computer networks as breeding grounds for terrorist activity and as vulnerable targets for terrorist attacks. Computer security is the protection of computer systems against the unauthorised disclosure, manipulation, or deletion of information and against denial of service attacks. Breaches of computer security may cause harms and rights violations, including economic losses, personal injury and death, which may occur in so-called safety-critical systems. It is also a field that connects closely with many of the other ethical issues, such as violations of privacy and intellectual property rights. For instance, with regard to privacy, this is not only an issue of exchanging personal information with another party, but also whether that party has the ability to properly safeguard that information. This recently became a point of much attention in the recent “Heartbleed” controversy, where a security bug allowing theft of server’s private keys and users’ session cookies and passwords affected many of the biggest Internet actors, including Google, Dropbox, Facebook and YouTube.

Furthermore, issues related to security include the moral and social evaluation of computer crime and other forms of disruptive behavior, including hacking (non-malicious break-ins into systems and networks), cracking (malicious break-ins), cyber vandalism (disrupting the operations of computer networks or corrupting data), software piracy (the illegal reproduction or dissemination of proprietary software), and computer fraud (the deception for personal gain in online business transactions by assuming a false online identity or by altering or misrepresenting data). Another recently important security-related issue is to what degree state interests in monitoring and controlling information infrastructures to better protect against terrorist attacks needs to be balanced against the right to privacy and other civil rights. This also means that information technology is playing an increasingly important role in cyberwarfare, whether for the purpose of spying on potential enemies, spreading propaganda, or attacking critical infrastructure. A recent point of controversy in this regard is the extent to which traditional principles of just war apply to cyberwarfare, especially regarding issues of proportionality and the distinction between combatants and non-combatants.

3.3 Free expression and content control

The Internet has become a very important medium for the expression of information and ideas. This has raised questions about whether there should be content control or censorship of Internet information, for example, by governments or service providers. Censorship could thwart the right to free expression, which is held to be a basic right in many nations. Free expression includes both freedom of speech (the freedom to express oneself through publication and dissemination) and freedom of access to information.

Several types of speech have been proposed as candidates for censorship. These include pornography and other obscene forms of speech, hate speech such as websites of fascist and racist organisations, speech that can cause harm or undermine the state, such as information as to how to build bombs, speech that violates privacy or confidentiality, and libelous and defamatory speech. The field of computer ethics focuses on the permissibility of these types of speech, and on the ethical aspects of different censorship methods, such as legal prohibitions and software filters.

3.4 Equity and access

The information revolution has been claimed to exacerbate inequalities in society, such as racial, class and gender inequalities, and to create a new, digital divide, in which those that have the skills and opportunities to use information technology effectively reap the benefits while others are left behind. In computer ethics, one studies how both the design of information technologies and their embedding in society could increase inequalities, and how ethical policies may be developed that result in a fairer and more just distribution of their benefits and

disadvantages. This research includes ethical analyses of the accessibility of computer systems and services for various social groups, studies of social biases in software and systems design, normative studies of education in the use of computers, and ethical studies of the digital gap between industrialised and developing countries. There seems to be a consensus that the more important the service, the more important equity becomes. Hence, basic services such as ATMs, online banking, health services and so forth are designed with various disabilities in mind.

3.5 Intellectual property

Intellectual property is the name for information, ideas, works of art and other creations of the mind for which the creator has an established proprietary right of use. Intellectual property laws exist to protect creative works by ensuring that only the creators benefit from marketing them or making them available, be they individuals or corporations. Intellectual property rights for software and digital information have generated much controversy. There are those who want to ensure strict control of creators over their digital products, whereas others emphasise the importance of maintaining a strong public domain in cyberspace, and argue for unrestricted access to electronic information and for the permissibility of copying proprietary software. In computer ethics, the ethical and philosophical aspects of these disputes are analysed, and policy proposals are made for the regulation of digital intellectual property in its different forms.

3.6 IT and responsibility

Society strongly relies on computers. It relies on them for correct information, for collaboration and social interaction, for aid in decision-making, and for the monitoring and execution of tasks. When computer systems malfunction or make mistakes, harm can be done, in terms of loss of time, money, property, opportunities, or even life and limb. Who is responsible for such harms? Computer professionals, end-users, employers, policy makers and others could all be held responsible for particular harms. Due to the logical malleability, modularity and digital nature of IT, the difficulty of assigning blame to any one party becomes particularly challenging to the field – a problem often referred to as ‘the problem of many hands’.

It has even been debated whether intelligent computer systems can bear moral responsibility themselves, whether we act less responsibly when placing too much trust in the IT system, and what kinds of decisions should be delegated to computers to begin with. In such situations, we need to study how a proper assignment of responsibility can minimise harm and allow for attributions of accountability and liability.

3.7 Autonomy, sociality and authenticity

A common characterisation of IT users is that they often lack the social skills necessary to be successful in the physical world, and seek for social media and virtual worlds instead where this handicap is easier to overcome. Several researchers argue that there are certain virtues inherent in embodied, face-to-face communication that cannot be replicated in social media and virtual worlds. Closely related, it has been argued that we can neither learn nor exercise several important virtues (e.g., patience or empathy) with these technologies, nor a sense of context, commitment or shared risk-taking. A central point of discussion in recent years has concerned virtual friendships, where several authors argue that virtual friendships are inferior to actual friendships because they do not allow for non-voluntary self-disclosure. Internet addiction has also been a central ethical concern. This is clearly related to loss of social skills, but goes further by reducing other basic needs and capabilities that could be important to one’s well-being, including the loss of job or education, health problems and mental disorders. This is often discussed in the context of IT dramatically altering our behavioural dispositions – especially violent video games supposedly fostering aggressive and anti-social behaviour in children and adolescents.

Experts have also argued that different types of IT have contributed towards scattered attention and lack of concentration, as well as a reduced understanding of the consequences of our actions.⁶ Anyone familiar with virtual

worlds and social media will have encountered “flaming” and “trolling”, i.e. deliberate verbal attacks on someone or outrageous claims, often worded to cause as much offense as possible. Undoubtedly, part of the reason for the prevalence of such statements is the anonymity and corresponding lack of consequences offered by the Internet. The lack of consequences in virtual worlds is related to the fact that virtual events do not enter into mechanico-causal relations with physical events and usually cannot elicit the same chemical and biological reactions as physical entities can.

3.8 Embedded values

It has come to be recognised that the systems themselves are not morally neutral but contain values and biases in their design, often referred to as ‘embedded values’ and discussed within the context of values in design approaches. The central discussion is whether IT can be morally evaluated partially or wholly independently of actual uses of them; whether they can be said to embody values in the sense that they have a tendency to promote or sustain particular values when used.

This can happen in three ways. Pre-existing bias emerges from the practices and attitudes of designers and the social institutions in which they function. Technical bias arises from technical constraints. Emergent bias arises after the design of the system, when a context of use emerges that is different from the one anticipated.

3.9 Other topics

There are many other social and ethical issues that are studied in computer ethics in addition to these central ones. Some of these include the implications of IT for community, identity, the quality of work, and the quality of life, the relation between information technology and democracy, the ethics of Internet governance and electronic commerce, and the ethics of trust online. Recently, much attention has been devoted to ethical aspects of social networking sites such as Facebook, MySpace and YouTube, to ubiquitous computing and ambient intelligence, and to robotics and artificial agents. The constant addition of new products and services in information technology and the emergence of new uses and correlated social and cultural consequences ensures that the field keeps meeting new challenges.

3.10 Ethics impacts assessment

Below, both a schematic overview of the main procedural steps of the EIA1 can be found as well as a table that explicated what the procedural steps entailed in more detail. The figure bellow depicts the order of the different steps of the EIA that were followed:

¹ Wright, D. Ethical Impact Assessment. Ethics, science, technology and engineering (2nd ed.). Gengage Learning. 2014.

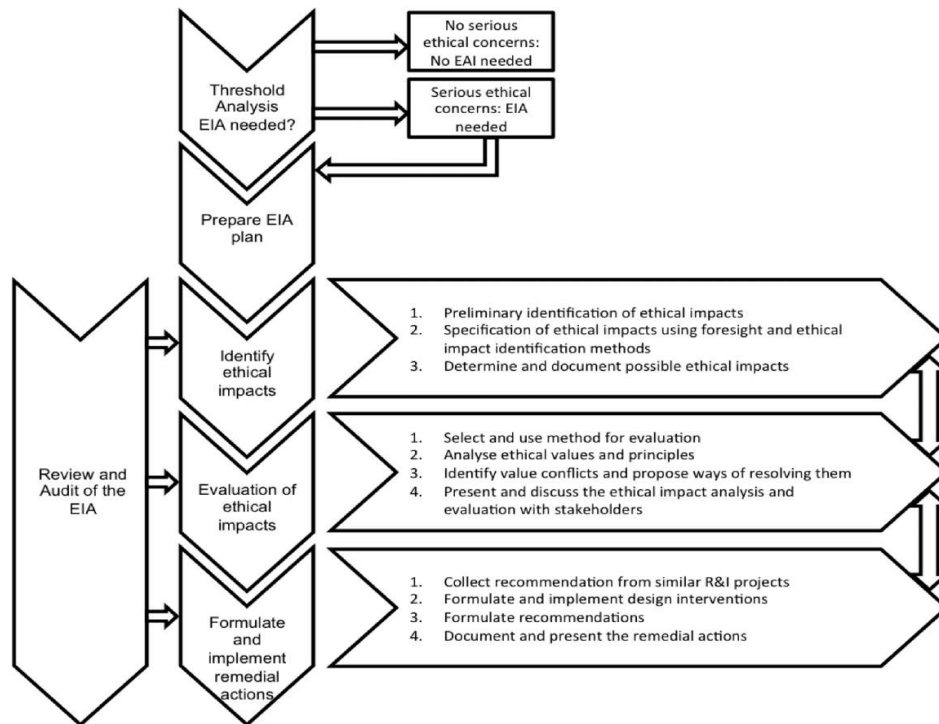


Figure 1. The six steps of the Ethical Impact Assessment (EIA)

Below we summarised the concrete steps of each of the stages of the EIA that were followed for the completion of the EIA.

- 💧 1. Conducted an EIA threshold analysis
 - 💧 Completed the EIA questionnaire.
 - 💧 Sent the finished documentation to the ethics assessor.
 - 💧 The threshold analysis was accepted,
- 💧 2. Prepared and EIA plan
 - 💧 Assessed the scale of the EIA.
 - 💧 Allocated a budget to the EIA.
 - 💧 Composed a team for the EIA.
 - 💧 Reviewed and approved the EIA plan.
- 💧 3. Set up and executed an ethical impact identification assessment
 - 💧 Assessed the Technology Readiness Level (TRL) of the R&I project's outcomes.
 - 💧 Reviewed existing work in the relevant R&I field.
 - 💧 Selected appropriate methods for conducting the ethical impact identification based on the TRL and the threshold analysis.
 - 💧 Gathered relevant data (evidence based, by consulting experts, by interacting with stakeholders, based on creativity).
 - 💧 Determined possible, probable and/or preferable ethical impacts.

- 💧 Documented and presented the ethical impacts.
- 💧 4. Evaluated the ethical impacts
 - 💧 Decided which methods should be used (desk research, expert consultation or participatory method).
 - 💧 Conducted a contingency analysis to evaluate the likelihood of ethical impacts to occur.
 - 💧 Assessed the relative importance of ethical impacts.
 - 💧 Identified potential or actual value conflicts and resolved these.
 - 💧 Formulated workable conceptualizations of the relevant ethical impacts.
 - 💧 Documented and presented the ethical impacts evaluation.
- 💧 5. Formulated and implemented remedial actions
 - 💧 Gathered relevant information about remedial actions proposed by other R&I projects.
 - 💧 Formulated and implemented design interventions.
 - 💧 Formulated different types of recommendations.
 - 💧 Documented and presented the remedial actions.
- 💧 6. Reviewed and audited the EIA outcomes
 - 💧 At the beginning of the EIA: set the milestones and criteria for the reviewed and audited process.
 - 💧 During the EIA: evaluated the EIA documentation and the agreed upon criteria and milestones.
 - 💧 At the end of the EIA: ensured proper documentation, followed-up and signed off the EIA.
 - 💧 Documented and presented the review and audit outcomes.

4. Final Ethical and Societal Concerns in HYDROPTICS

As the result of the EIA, we identified Ethical concerns based on the data collected and the input to the questions presented below:

1. According to you, what will be the claimed benefit for the user of the technology and the society? Please update the description from the Project Proposal if necessary.
2. Are there possible safety risks for the users related to the use of the technology?
3. Do you think using this technology might lead to stigmatization or discrimination of any kind?
4. What technical and organizational measures can be taken to ensure and increase safety of the technology for end-users?
5. What technical measures might be implemented to assist end-users in better and faster familiarization with technology?
6. What measures can be taken to ensure the right and efficient use of the technology?
7. What other technical and organizational measures can be taken to increase trust of the society and individuals in the use of the technology?
8. Do you foresee any ethical issues related to the use of the technology? If yes, please describe them.

Ethical concerns in HYDROPTICS could arise out of different factors and their combinations: use of new technologies, their acceptance by the society and trust; the necessity to balance between different fundamental rights and vital interests of different groups of people.

In what follows bellow we describe ethical and societal concerns that might arise in HYDROPTICS out of the mentioned factors. The core of HYDROPTICS project is making use of novel advances in photonics, to provide a set of such devices and tools, which allow the reliable, accurate and cost-effective monitoring of produced water quality involved in up- and downstream processing in the oil industry. An important precondition for the adoption of new technologies is a trust. HYDROPTICS consortium recognized that the need to consider ethical issues is crucial, especially during the development and deployment of new technologies. It's an accepted fact that Ethics is an unchanging principle in any activity, but technology can change, and as a result, the consortium implemented all the necessary measures in order to ensure that ethical issues may not arise.

Although it is difficult for technologists to take ethical concerns into account, however, adopting an ethical approach can help HYDROPTICS partners increase confidence that they are 'doing the right things' with technology. Ethics translates moral philosophy into practical principles so it can help businesses to focus on the good they can do with technology, as well as avoid potential harms or unintended consequences. Ethical issues in technology need to be outlined and controlled with consideration of all the parties involved in HYDROPTICS project as both people and the environment must be considered in any technological advancement.

Some ethical and societal risks that might arise out of the HYDROPTICS project were presented on deliverable 2.1 and the measures to mitigate them were described in the table below. **As a consortium, we have implemented the necessary measures in order to avoid any of the forementioned on deliverable 2.1 or any other, not foreseen up to that point, issues arising, thus ensuring ethical compliance of the project.**

The probability of risk to occur had been rated using a three-grade scale:²

Remote - Risk nature is known but no known occurrences of the risk happened in similar activities. Depending on the nature of the risk, the risk can be ignored, although a preventive action may still be proposed.

Possible - Risks of similar nature have happened in similar activities or the situation may be conducive to the occurrence of the risk. A response plan should be suggested in case the risk manifests.

Probable - There is a significantly high chance that risk will occur, or the situation is favourable to occurrence of risks. Mitigating actions should be discussed and monitored.³

The identified risks may have an impact with respect to social, legal, ethical and privacy issues. The scale used to rate the impact is the following:⁴

Minimal - In case of occurrence, the risk does not hinder on any relevant interests, e.g., safety, or the rights and freedoms of the individual, thus no modification or adaption is needed. It is also possible that the occurrence of the risk only requires minor adaptations.

Significant - In case of occurrence, interests, rights and freedoms of the individual are affected, thus hindering the goals of the project. Significant revision and reorientation may be necessary.

Severe - In case of occurrence, interests, rights and freedoms of the individual are severely affected, meaning that the project will not achieve one or more goals. The activity or the functionality may be unlawful or contrary to ethical principles. This warrants for substantial revision and re-orientation of the project.⁵

² https://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/ethics_en.htm

³ Ibid.

⁴ Ibid.

⁵ Ibid.

ETHICAL AND SOCIETAL RISKS

Risk ID	Name	Description	Probability of occurrence	Impact	Risk response plan	Responsible partner
1.	Lack of trust in the use of new technologies from the side of volunteers	Being trained and used to apply the defined scope of tools in their activities, end users might avoid using novel technologies developed in HYDROPTICS	Remote	Significant	End users involved in the HYDROPTICS project currently working in large oil industries within the EU. They have a solid informational background and skills. These end users have been actively involved in the project since the start of the project, giving feedback on the development of the tools. In this way, they ensure they help to create tools that are actually useful within their organizations. As full partners, they understand the project aims to increase efficiency, through the use of new technologies. They are motivated to participate and contribute to achieving the project's goals. Additionally, all end users were trained on the use of new technologies during the development and final stages of the project.	End users
2.	Lack of trust in the technologies by the society	Lack of trust in new technologies is the common issue as people do not fully understand how the technologies work and what might be the side effects.	Remote	Significant	It is unlikely that wide groups of population will be affected during the project's lifespan. HYDROPTICS engaged limited amounts of volunteers who were informed on the aims of the project and the means to achieve these goals. This enabled volunteers (representing the society) to understand the importance of the use of new technologies in the oil industry.	End users
3.	Affecting the fundamental rights of people	Disasters in oil industry involve different groups of people which can have different negative impacts (health, life, dignity, privacy, autonomy)	Remote	Severe	During HYDROPTICS activities, fundamental rights were not affected as all pilots were well prepared in advance ensuring lack of dangerous situations for the people involved.	DBC+all

4. Gender Equality Plan in HYDROPTICS (GEP)

This section provides guidelines to address and prevent potential gender biases that could occur within the project in all gender sensitive activities. These guidelines should ensure that the needs of people of all gender identities that may suffer from discrimination are taken into account when developing solutions and interacting with stakeholders or any other activities of the HYDROPTICS project. A secondary objective is to support capacity building of consortium members on gender mainstreaming and gender equality, so that the guidelines presented in this document are adopted by the widest possible audience.

The European Commission (EC) supports gender equality in both research and innovation framework programs Horizon 2020 and Horizon Europe. The EC calls for gender equality in project teams and among the leading roles. Furthermore, at the evaluation stage, gender balance is one of the evaluation criteria assessed by evaluators to prioritise and rank proposals which are above the threshold. Gender dimensions should also be considered during project implementation. It is proven that the integration of these dimensions into research activities contribute to added value to the project results. It helps researchers rethink standards and question norms, behaviours and attitudes and develop solutions that are best suited to the needs of target groups. Thus, the goods and services produced have a greater societal relevance and are more likely to be adopted when brought to the market.

The gender dimension uses a specific nomenclature to differentiate its aspects. Those key concepts are important to understand the gender dimension. Some of the key concepts discussed in the gender literature are presented in the table below:

Table - Key concept used in gender literature.

Key concept	Definition
Sex	Sex refers to biological or genetic differences between males and females.
Gender	Gender refers to the social differences between men and women as opposed to biological ones. These differences are learnt over time, can change with time and may vary from culture to culture.
Gender role	Role a person is expected to play by virtue of being a woman or a man. These roles are shaped and defined by several factors including socioeconomic, political and cultural ones.
Gender bias	Gender bias is the often unintentional and implicit differentiation between men and women by placing one gender in a hierarchical position relative to the other in a certain context, as a result of stereotypical images of masculinity and femininity.
Gender mainstreaming	A gender equality strategy, which means that project objectives and results are defined in such a way that wishes and needs of men and women are equally valued and favored through the project activities.
Gender sensitivity	A gender sensitive policy, activity or project that ensures a balanced gender relationship through equal distribution and sharing of power between women and men in the project.
Gender identity	Gender identity is the personal sense of one's own gender. Gender identity can correlate with a person's assigned sex at birth or can differ from it. Gender expression typically reflects a person's gender identity, but this is not always the case. While a person may express behaviors, attitudes, and appearances consistent with a particular gender role,

The European Institute for Gender Equality (EIGE) was established by the European Union to create a knowledge centre on gender equality issues. The activities and topics of the EIGE give a broad overview of the main challenges and barriers towards gender equality. The activities of EIGE are presented in the following to raise awareness and strengthen understanding for all aspects of the gender dimension.

The European institute for Gender Equality (EIGE) was established in 2006 as an autonomous body to raise awareness of gender equality, contribute and strengthen the promotion of gender equality, gender mainstreaming in all EU policies and fight against discrimination based on sex. EIGE was assigned the central role of addressing the challenges of and promoting equality between women and men by the European Parliament and the Council of the European Union. The vision of EIGE is 'Making equality between women and men a reality for all Europeans and beyond' and their mission is to become the European knowledge centre on gender equality issues.

EIGE's three key strategic objectives and priorities of 2019 to 2021 are as follows:

- To provide high quality research and data to support better informed and evidence- based decision-making by policymakers and other key stakeholders working to achieve gender equality;
- To manage all knowledge produced by EIGE to enable timely and innovative communication that meets the targeted needs of key stakeholders;
- To meet the highest administrative and financial standards while supporting the needs of EIGE's personnel.

The EIGE divides their research and support activities in five topics, which are:

- Gender Mainstreaming,
- Gender based violence,
- Gender Equality Index,
- Gender Statistics Database and
- Beijing Platform for Action.

Below are the detailed descriptions of these topics:

Gender Mainstreaming

Gender mainstreaming, as already described above, is a strategy towards realising gender equality. As written on EIGE's official webpage, "it involves the integration of a gender perspective into the preparation, design, implementation, monitoring and evaluation of policies, regulatory measures and spending programmes, with a view to promoting equality between women and men and combating discrimination". Besides in-depth written information and videos on the integration of a gender perspective, the EIGE offers various freely available toolkits, methods, tools and good practices, to enable Gender Mainstreaming for anybody.

Gender-based violence

Gender-based violence is rooted in gender inequality and continues to be one of the most notable human rights violations within all societies. Per definition, gender-based violence is violence directed against a person because of their gender. Both women and men experience gender-based violence but the majority of victims are women and girls. The gender-based definition is important as it highlights that many forms of violence against women are rooted in power inequalities. Gender-based violence and violence against women are often used interchangeably to reflect the disproportionate number of these particular crimes against women. Gender-based violence can have different forms and ranges from intimate partner violence, to acts of violence carried out in online spaces. These different forms are not mutually exclusive, and inequalities experienced by a person related to their race, (dis)ability, age, social class, religion, sexuality can also drive acts of violence. The Istanbul Convention (Council of Europe, Convention on preventing and combating violence against women and domestic violence), defines four key forms of violence against women: physical, sexual, psychological, and economic. EIGE has adopted this concept and has developed uniform definitions to enable comprehensive understanding of what falls under the scope of gender-based violence. Additionally, EIGE also states that gender-based violence may be normalized and reproduced due to structural inequalities, such as societal norms, attitudes, and stereotypes around gender generally, and violence against women specifically. In effect, they suggest acknowledging a fifth form of violence, structural or institutional violence.

Gender Equality Index

The Gender Equality Index is a tool developed by EIGE to measure the progress of gender equality in the EU. It highlights areas that need improvement and supports policy makers to drive more effective gender equality measures. Measuring gender equality is, therefore, very important for effective policymaking in the EU. The index has been tracking and reporting progress since 2013, revealing both progress and setbacks to explore what can be done better.

The Gender Equality Index consists of six core domains: work, money, knowledge, time, power, and health. Additionally, violence against women and intersecting inequalities are included, but not utilized in the calculation of the index. In total, 31 indicators have been used to evaluate 28 EU countries in the years 2005, 2013, 2015, 2017, 2019 and 2020. In 2020, the EU has achieved a Gender Equality Index of 67.9, while a score of 100 would indicate perfect equality.

Best performance is related to the health, especially in access to health services and the money. Gender inequalities are most pronounced in the domain of power, especially in economic decision-making or knowledge. A main obstacle is the gender segregation in tertiary education. A step backwards since 2010 is the domain of time, which

measures the distribution of housework and caring responsibilities and could widen in the face of the COVID-19 pandemic.

The key finding of the Gender Equality Index is that with 67.9 out of 100 points, the EU has a long way to go before reaching gender equality. Since 2010 the Gender Equality Index score has increased by only 4.1 points and 0.5 points since 2017. It will take more than 60 years to achieve gender equality at this pace of progress of 1 point every 2 years. All detailed results and reports can be found on the website of EIGE.

Gender Statistics Database

EIGE's Gender Statistics Database is a knowledge center for gender statistics and information on various aspects of (in)equality between women and men. The added value of this database is, that it is a one-stop source for gender statistics of member states of the European Union, which is easy to access and up to date. The majority of the data is collected from Eurostat, the statistical office of the European Union. The main purpose of EIGE's database is, as stated on their website:

- To build a broad overview of statistics on gender, highlighting differences and inequalities between both sexes.
- To support the measurement of whether, or to what extent, gender equality is de facto being achieved.
- To act as a reliable resource in formulation and monitoring of policies that are beneficial for both women and men and will facilitate making appropriate decisions towards the advancement of gender equality.

Beijing Platform for Action

Once a year the Presidency of the Council of the EU may select one of twelve areas to initiate a closer examination in this field. EIGE supports better informed policymaking in the EU by delivering high-quality reports on the progress of gender equality following the selected area of the critical areas of concern of the Beijing Platform for Action (BPfA). The BPfA is the outcome of the fourth World Conference on Women in September 1995 in Beijing. It is a defining framework for change, which made comprehensive commitments under twelve critical areas of concern. Even 20 years later, it remains a powerful source of guidance and inspiration. The twelve critical areas of concern are:

- Women and the environment,
- Women in power and decision-making,
- The girl child,
- Women and the economy,
- Women and poverty,
- Violence against women,
- Human rights of women,
- Education and training of women,
- Institutional mechanisms for the advancement of women,
- Women and health,
- Women and the media and
- Women and armed conflict.

Since then, the BPfA has been reviewed every five to ten years by the UN.¹⁰ In 2019 UN Women¹¹ launched the Generation Equality Campaign and Generation Equality Forum (also called Beijing +25), which was organised in

collaboration with civil society, and the 64th Session of the UN's Commission on the Status of Women (CSW64) to facilitate the review of BPfA. In March 2020, the CSW adopted a political declaration on the occasion of the 25th anniversary of the Fourth World Conference on Women. Therein, Member States declare their ongoing commitment to implementing the BPfA.

Simultaneously, the Feminist and Women's Movement Action Plan was created as an inclusive network of governments, civil society and private sector participants whose purpose is to create alliances, promote innovation and mobilise resources.

Intersectionality

Gender or the gender dimension should not be considered in isolation. It is not limited to the differences and inequalities between genders but also other social attributes. Since the early 2000s, intersectionality and intersectional approaches have gained significant importance within gender studies. Intersectional approaches acknowledge that individuals have different identities, needs and priorities changing over time, which affects their ability to cope with and respond to challenges. Intersectional factors are, for example, race, ethnic origin, age, socioeconomic status, sexual orientation, or disability, combined with sex and gender to shape a person's or a group's experience and social opportunities.

This new way of understanding individual identities is supported by analysis of different factors such as age, gender and ethnicity. In return this helps to develop solutions best adapted to people's needs through a better awareness of people's experiences and interests. Furthermore, intersectional approaches help to uncover dynamics shaping attitudes towards the use of energy solutions and services. This may bring a more nuanced picture on public opinion on future innovations and lead to better policy decisions and designs in the long term.

Gendered innovation

Evaluation of Horizon 2020 showed that less proposals than expected included the gender dimension. It was concluded that, in addition to the lack of knowledge on the topic itself this originates from the lack of knowledge about the practical implementation of the gender perspective. Therefore, the European Commission formed an expert group in 2011 to strengthen the integration of the gender dimension into EU research and innovation under the framework programme Horizon Europe. In 2013 the Gender Expert Group produced a first report called "How gender analysis contributes to research". This report has been recently updated and it highlights that the integration of "sex and gender analysis into research and innovation (R & I) adds value to research and is therefore crucial to secure Europe's leadership in science and technology, and to support its inclusive growth". The new report includes 15 case studies from several different fields of research as well as policy recommendations and methods for implementation of gendered innovation. Inclusion of gendered innovation in the innovation process does add significant value since multiple perspectives are added to the process. The expert group describes the added value as follows, "Integrating sex and/or gender analysis into research and innovation":

- adds value to research in terms of excellence, creativity and business opportunities;
- helps researchers and innovators question gender norms and stereotypes, and rethink standards and reference models;
- leads to an in-depth understanding of diverse gender needs, behaviours and attitudes;
- addresses the diverse needs of citizens of the European Union and thereby enhances the societal relevance of the knowledge, technologies and innovations produced;
- contributes to the production of goods and services better suited to new markets.

Including the diversity of perspectives into research and innovation also aids in generating new opportunities and ideas and avoiding pitfalls. This can be realized by inclusion of sex and gender analysis into research and innovation from the beginning. However, there is no simple recipe that can be used, and it is up to the creativity of the research team on how gendered innovation is implemented. Therefore, all methods should be considered to enhance the

research and innovation process. The methods have been developed by the expert group. The detailed methodology can be found in Annex B of the policy review "Gendered Innovations 2: How inclusive analysis contributes to research and innovation" by the European Commission. In general, the methodology consist of the following steps:

- Analysing sex,
- Analysing gender,
- Intersectional approaches,
- Co-creation and participatory research and
- Asking about gender and sex in surveys.

EU initiatives promoting gender inclusivity in research

In the following, some examples of EU initiatives supporting gender diversity in the energy sector are presented.

Women4Energy

The network has the goal to connect women from all backgrounds and working cultures in the energy related sectors to enhance knowledge transfer and market access for new products and services needed to answer the energy challenges of our society. It was established in the frame of Innoenergy and is coordinated by Steinbeis 2i GmbH. Every year the International Women4Energy Conference takes place (the last edition was cancelled due to the COVID19 outbreak). It serves as a platform for women of the W4E network to connect.

Women in Green Hydrogen

Women in Green Hydrogen is a network aiming at increasing the visibility of women in the green energy sector through a platform to connect and empower professionals. The platform organises networking events and set up an international expert database to foster knowledge exchange and create professional opportunities. The launch of the platform was supported by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety and the German Corporation for International Cooperation GmbH (GIZ).

Special issue of scientific journals

Some scientific journals have special issues dedicated to the promotion of gender diverse research team in the energy sector and to fostering a research environment that values diversity.

In the action plan already presented in D2.1, specific organizational priorities for addressing gender equality in the activities and the monitoring plans were set out. Equality of opportunity was a core part of the HYDROPTICS mission and gender balance was a critical component for the project to ensure fair access and equity for our research, managerial and support staff. In HYDROPTICS, partners were committed to follow international, community and internal standards, to the promotion of equality of opportunities between women and men in its principles and priorities.

The GEP was devised according to national and European laws and aligned with national initiatives and actions, focusing on equality of women and men, rights, discrimination banning, equality treatment, harassment in workplace, social responsibility of organizations etc. All the aforementioned constitute the line along which the activities of the HYDROPTICS project were developed and especially the main goal which was the active embodiment and actual interaction of females in the project activities assuring the gender equality and the elimination of the inequalities pursuant to international standards. We managed to shift traditional perceptions improving the quality of the project by having heterogeneous research groups. Thus, we managed making decision-making more inclusive by inviting women in the process thus ensuring diversification of views. Last but not least, strengthening links with industry by encouraging females to work in businesses and translate their research into tangible products, becoming an attractive research project for female digital experts and talents and contributing

to the European needs for female digital experts, complete the GEP milestones that highlight the activity plans of the HYDROPTICS project.

4.2. Objectives

The HYDROPTICS GEP had eight objectives, which it managed to reach towards:

- 💧 Embedding a gender aware culture in the project by shifting traditional perceptions.
- 💧 Improving the research quality of the project by having heterogeneous research groups.
- 💧 Practicing excellence through female staff (researchers, managers, and support) career development and training.
- 💧 Making decision-making more inclusive by inviting women in the process thus ensuring diversification of views.
- 💧 Strengthening links with industry by encouraging females to work in businesses and translate their research into tangible products.
- 💧 Becoming an attractive research project for female digital experts and talents.
- 💧 Contributing to the European needs for female digital experts.

Focusing on six key areas, following the guidelines of the European Institute for Gender Equality (EIGE) aiming to "identify and implement innovative strategies to promote cultural change and equal opportunities in Universities and Research Centers" (EIGE, <http://eige.europa.eu>), where the key factors that helped us achieve those goals. These areas are:

- 💧 **Key Area 1:** *Governance and decision making*
- 💧 **Key Area 2:** Recruitment, Selection procedures, and Career Progression
- 💧 **Key Area 3:** *Flexible and Agile Working*
- 💧 **Key Area 4:** *Gender Strategy in Research*
- 💧 **Key Area 5:** *Gender in events and activities*
- 💧 **Key Area 6:** *Gender in Organisation Culture*

The selected Key Areas, comprise sets of objectives, measures, targets and KPIs, where the gender dimension was studied and monitored, the respective timeline, the personnel responsible for each action. Through these Key Areas, HYDROPTICS aimed to contribute to reducing the Digital Gender Divide at a project level.

5. Data protection principles and rights

This document (Deliverable D2.4) also describes another really important issue of the HYDROPTICS project which relates to the data management and the processing operations related to the personal data. The lawfulness of the data processing activities is another crucial issue that should be taken into consideration since compliance with data protection norms is also a part of the compliance with ethical concerns. For the HYDROPTICS project, the GDPR is the main source of obligations related to data protection, presenting the basic principles relating to processing of personal data and the rights of the data subjects.

The general rule in data processing is that any data processing operation is deemed unlawful unless the conditions laid down on the GDPR provisions are being met. A necessary condition in principle to achieve the lawfulness of the processing of a data subject's personal data is the cumulative fulfillment of the following fundamental principles relating to the processing of personal data, according to Article 5 GDPR. These are mandatory provisions which are necessary to be applied cumulatively and compliance to them must be examined

at each individual stage of the processing operations. Throughout the progress of the HYDROPTICS project, the partners must assure that the personal data is:

- i. processed lawfully, fairly and in a transparent manner in relation to the data subject (“principles of **lawfulness, fairness and transparency**”),
 - ii. collected for specified, explicit and legitimate purposes and not further processed in a manner that is incompatible with those purposes; further processing for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes shall not be incompatible with the initial purposes (“principle of **purpose limitation**”),
 - iii. adequate, relevant, and limited to what is necessary in relation to the purposes for which they are processed (“principle of **data minimization**”),
 - iv. accurate and, where necessary, kept up to date; every reasonable step must be taken to ensure that personal data that are inaccurate, having regard to the purposes for which they are processed, are erased, or rectified without delay (“principle of **accuracy**”),
 - v. kept in a form which permits identification of data subjects for no longer than is necessary for the purposes for which the personal data are processed (“principle of **storage limitation**”)
 - vi. processed in a manner that ensures appropriate security of the personal data, including protection against unauthorized or unlawful processing and against accidental loss, destruction, or damage, using appropriate technical or organizational measures (“principle of **integrity and confidentiality**”).
- the controller shall be responsible for and be able to demonstrate compliance with all the principles (“principle of **accountability**”).

Furthermore, according to article 6 of GDPR, processing shall be lawful only if and to the extent that at least one of the following applies:

- i. the data subject has given consent to the processing of his or her personal data for one or more specific purposes,
- ii. processing is necessary for the performance of a contract to which the data subject is party or to take steps at the request of the data subject prior to entering into a contract,
- iii. processing is necessary for compliance with a legal obligation to which the controller is subject,
- iv. processing is necessary to protect the vital interests of the data subject or of another natural person,
- v. processing is necessary for the performance of a task carried out in the public interest or in the exercise of official authority vested in the controller,
- vi. processing is necessary for the purposes of the legitimate interests pursued by the controller or by a third party, except where such interests are overridden by the interests or fundamental rights and freedoms of the data subject which require protection of personal data, especially where the data subject is a child.

During the activities and the processing operations of the HYDROPTICS project, we have made sure that the legal basis for the processing of personal data has been taken into consideration. As mentioned, any data processing activity must rely on a legal basis. In HYDROPTICS, confirming the users control over their data, consent was the main basis for the data processing activities. Every new user of HYDROPTICS functionalities was presented with a consent form with various options and purposes of the technology, allowing the subject to choose to which purposes they want their data to be used for.

As a starting point, the participants shall provide their consent related to the processing of their personal data. For the purposes of assuring that the consent was provided freely, and was a specific, informed and unambiguous indication of the data subject’s wishes, the participants – data subjects were thoroughly informed regarding:

- i. the planned processing activities and the purpose of conducting them according to the project’s needs,
- ii. the personal data that will be processed,
- iii. any data transfers that may take place to entities located either in or outside EU,
- iv. the exercise of their rights, foreseen on articles 12-23 of the GDPR and their right to seek for protection on the competent supervisory authority,

- v.the way they could withdraw from their consent without any additional and unnecessary effort and
- vi.the contact details of the data controller(s), their respective data processors and their DPO or the authorized legal partners.

In terms of both legal - GDPR related framework and ethics regulations, it is deemed highly possible that the data subject may not provide their consent properly. This may be a result of not a proper understanding or provision of information regarding the purposes of the data processing operations, their purpose and the personal data that will be processed. This may end up to further consequences which may lead to the withdrawal of the data subject's consent and/or legal implications (for example, reports the competent supervisor authorities), thus compromising any progress of the project up to this point since the violation of the data protection related framework is a major issue on EU funded projects.

The measures implemented and the context of the consent forms has been presented on deliverable 2.5 also. Following an assessment described, we were able to acknowledge that all the necessary provisions were met in terms of the provision of consent from the data subject, relating both to their participation in the project activities and the processing of their personal data. Moreover, no vulnerable data subjects (patients, children etc.) participated in any way in any of the activities of the project since this was not relative to the project related purposes.

Moreover, the respect for the rights of the data subjects is also of paramount importance. Those are presented on Articles 12-22 of the GDPR and refer to the:

- i.**Right to be informed** regarding anything that is related to the processing of personal data (arts. 12-14 GDPR),
- ii.**Right of access** to the personal data and any other information related to the data processing activities (art. 15 GDPR),
- iii.**Right to rectification** of inaccurate personal data or completion of incomplete personal data (art. 16 GDPR),
- iv.**Right to erasure** (“right to be forgotten”), according to which the data subject could achieve the deletion of their personal data under certain conditions (article 17 GDPR),
- v.**Right to restriction of processing** of the personal data under certain conditions (art.18 GDPR),
- vi.**Right to data portability**, according to which the data subject can receive the personal data concerning them, which had been provided to a controller, in a structured, commonly used and machine-readable format, and transmit them to another controller without hindrance from the controller to which the personal data had been previously provided (art. 20 GDPR),
- vii.**Right to object** at any time to processing of personal data concerning them (art. 21 GDPR),
- viii.**Right to object to the automated individual decision-making, including profiling** (art. 22 GDPR) and
- ix.**Right to seek for protection from the competent supervisory authority.**

It is important to note that no sensitive data were processed in the processing operations of the HYDROPTICS project, so no extra reference to the particularities of the processing of these kinds of data due to their nature was essential. A separate deliverable (D2.5) has been drafted, presenting a specific plan both for responding in general to subject's requests regarding their rights in the spectrum of the processing of personal data and especially for the right to erasure upon request (“right to be forgotten”) and the means to exercise it.

6. Conclusion

The deliverable presented the methodology that was followed for the conduction of an Ethical Impact Assessment (EIA), the outcome of the EIA, the final ethical plan, and the results from the application of the proposed Gender Equality Plan with deliverable 2.1. Ethical/societal concerns/issues, with emphasis on the HYDROPTICS Gender Equality Plan were also presented, the way they could potentially affect the technical developments of the HYDROPTICS solution, and the measures implemented to anticipate them and ensure ethical compliance. Finally, a report regarding the personal data and their correlation with the ethics matters, the rights of the subjects and the

legal basis for the legitimate processing of them were presented with a disclaimer of further information following at Deliverable D2.5 of the HYDROPTICS project.

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ANNEX Ethics forms

DECLARATION ON ETHICS COMPLIANCE

(Page 1/4)

Note. If you answer yes to any of the question in Part A with yes, according to H2020 funding rules to receive any funding you must provide a more detailed ethics self-assessment which:

1. -Describes how the proposal meets the national legal and ethical requirements of the country or countries where the tasks raising ethical issues are to be carried out
2. -Explains in detail how you intend to address the issues in the ethical issues table, in particular as regards:
 - research objectives (e.g. study of vulnerable populations, dual use, etc.)
 - research methodology (e.g. clinical trials, involvement of children and related consent procedures, protection of any data collected, etc.)
 - the potential impact of the research (e.g. dual use issues, environmental damage, stigmatisation of particular social groups, political or financial retaliation, benefit-sharing, misuse , etc.).

H2020 funding rules require you to provide evidence to prove compliant behaviour. Further, you must have the documents that you need under national law (if you already have them), e.g.: an ethics committee opinion; the document notifying activities raising ethical issues or authorising such activities. If these documents are not in English, prepare an English summary of them (containing, if available, the conclusions of the committee or authority concerned). If you plan to request these documents specifically for the project you are proposing, your request must contain an explicit reference to the project title.

For more guidance on which documents you specifically will need, see the related section in the document "How to complete your ethics self-assessment".

(http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/ethics/h2020_hi_ethics-self-assess_en.pdf)

Part A

Further Uncollapse if "Yes"

If "Yes": Information to be provided (page 3)

If "Yes": Documents to be provided (page 4)

1. Human embryos, fetuses	
Does your research involve Human Embryonic Stem Cells (hESCs)?	[Yes or No]
Does your research involve the use of human embryos?	[Yes or No]
Does your research involve the use of human foetal tissues / cells?	[Yes or No]
2. Humans	
Does your research involve human participants?	[Yes or No]
Does your research involve physical interventions on the study participants?	[Yes or No]
3. Human cells/tissues	
Does your research involve human cells or tissues? (other than from Human Embryos/Foetuses, i.e.	[Yes or No]
4. Animals	
Does your research involve animals?	[Yes or No]
5. Personal data	
Does your research involve personal data collection and/or processing?	[Yes or No]
Does your research involve further processing of previously collected personal data (secondary use, also after anonymization)?	[Yes or No]
6. Non-European Union (EU) countries	
In which non-EU countries will the research take place?	[List non-EU countries involved in
7. Environment & Health and Safety	
Does your research involve the use of elements that may cause harm to the environment, to animals or plants?	[Yes or No]
Does your research deal with endangered fauna and/or flora and/or protected areas?	[Yes or No]
Does your research involve the use of elements that may cause harm to humans, including research staff?	[Yes or No]
8. Dual use	
Does your research involve dual-use items in the sense of Regulations 428/2009, or other items for which an authorisation is required?	[Yes or No]
9. Exclusive focus on civil applications	
Could your research raise concerns regarding the exclusive focus on civil applications?	[Yes or No]
10. Misuse	
Does your research have the potential for misuse of research results?	[Yes or No]
11. Other ethics issues	
Are there any other ethics issues that should be taken into consideration (see also page 2)? Please specify in the ethics self-assessment attachment	[Yes or No]

Risks related to data sets

(page 2/4)

Those 12 questions should help you identify potential ethical issues related to the datasets and the application AI. For a more complete check see also <https://altai.insight-centre.org/> https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=68342. They are not part of the experiment selection review, but will help you achieving compliance and trust within your experiment.

Question/Dataset by number in proposal	Dataset 1	Dataset 2	Dataset 3	Dataset 4	Dataset 5	Dataset 6	Dataset 7
1 Is the dataset publically available?	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]
2 How much insight do you already have on the quality and content of the dataset? (1: not yet analyzed, 10: already analyzed it in detail)	[1 - 10]	[1 - 10]	[1 - 10]	[1 - 10]	[1 - 10]	[1 - 10]	[1 - 10]
3 Are you using information that can be linked to individuals (also pseudonym ids, or via additional information like shift plans)?	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]
4 Does the dataset contain anonymized data or will dataset be anonymized for the experiment?	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]
If yes: If someone had a interest in recovering personal data, how easy would it be to deanonymize data today also using external data sources? (1: easy, 10: impossible)	[1 - 10]	[1 - 10]	[1 - 10]	[1 - 10]	[1 - 10]	[1 - 10]	[1 - 10]
If yes: In the case of successful deanonymization, how harmful would this be? (1: serious harm - 10: no effect)	[1 - 10]	[1 - 10]	[1 - 10]	[1 - 10]	[1 - 10]	[1 - 10]	[1 - 10]
5 Can the data derived from the dataset within the experiment be used to profile/classify any individuals outside of the dataset automatically?	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]
6 Could there be data included in the dataset where individuals did not have the chance to explicitly consent to the specific processing purpose (including anonymized use) of their data (legitimate use, research/statistical use)?	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]
7 How likely are relevant biases (when using you would get different results if you would look at a subgroups) in the dataset regarding ethnic, religious, sexual groups or people with disabilities (1. likely, 10: unlikely)	[1 - 10]	[1 - 10]	[1 - 10]	[1 - 10]	[1 - 10]	[1 - 10]	[1 - 10]
8 Is the dataset and/or the planned processing so complex that human oversight and sanity checking of the content is not possible?	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]
9 How high is the risk that errors in the dataset or in the processing cause harm to other businesses or humans when used in a productive system? (1: high, 10:low)	[1 - 10]	[1 - 10]	[1 - 10]	[1 - 10]	[1 - 10]	[1 - 10]	[1 - 10]
10 How much detail of what processing is done to the dataset can be made know to all stakeholders? (1: 0% - 10: 100%)	[1 - 10]	[1 - 10]	[1 - 10]	[1 - 10]	[1 - 10]	[1 - 10]	[1 - 10]
11 Could the (incorrect) use of the data or erroneous results directly or indirectly lead to harm to societal and environmental well-being ?	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]
12 Have you already discussed the use of this dataset with your responsible Data Protection Officer (independent if it is necessary or not)?	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]	[Yes or No]

You should explain non-obvious aspects in more detail in your ethics self assessment (page 4/4). Particularly, how you make sure that no ethical conflict might arise from the facts above.

DETAILED ETHICS SELF ASSESSMENT

1. General Ethical Compliance

If you identified some potential ethical issues, describe how the proposal meets the EU H2020 requirements and the national legal and ethical requirements of the country or countries where the tasks raising ethical issues (see page 1) are to be carried out.

2. Detailed Explanation and Information to be provided

In case you checked "YES" on page 1 see Explain in detail how you intend to address the potential issues in the ethical issues table on page 1 and the data set related risk assessment on page 2, in particular as regards:

- research objectives (e.g. study of vulnerable populations, dual use, etc.)
- research methodology (e.g. clinical trials, involvement of children and related consent procedures, protection of any data collected, etc.)
- the potential impact of the research (e.g. dual use issues, environmental damage, stigmatisation of particular social groups, political or financial retaliation, benefit-sharing, misuse , etc.).
- technical and organizational measures to mitigate risk

You can be as concise as possible and link to external documentation (see next page)

DETAILED ETHICS SELF ASSESSMENT

(page 4/4)

All documents listed here need to be made available on request to the EC and the Coordinator or a person designated by them for auditing purposes after being selected for funding (also min. 5 years after completion)

Document (as defined on page 1)	If applicable related compliance section on page 1	If applicable, related dataset no	Link or Availability Status	Comments