



AI Platform for Integrated Sustainable and Circular Manufacturing

Deliverable

DI.4 - Ethical Analysis, Governance and Guidelines – 2<sup>nd</sup> Version

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#### D1.4 Ethical Analysis, Governance and Guidelines – 2<sup>nd</sup> version

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**Lead partner:** EAI

**Author(s):** Marina Cugurra (EAI)

**Reviewers:** Sotiris Kousouris (Suite5), Federico Cucchi (RAEEMAN)

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1.0	19/01/2024	ENG	Final coordinator review before submission

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## Definitions and acronyms

<i>A/IS</i>	<i>Ethics of Autonomous and Intelligent Systems</i>
<i>AI</i>	<i>Artificial Intelligence</i>
<i>ALLEA</i>	<i>All European Academies</i>
<i>ALTAI</i>	<i>Assessment List for Trustworthy Artificial Intelligence</i>
<i>CA</i>	<i>Consortium Agreement</i>
<i>CCTV</i>	<i>Closed-Circuit Television</i>
<i>CI</i>	<i>Collaborative Intelligence</i>
<i>DPO</i>	<i>Data Protection Officer</i>
<i>EAB</i>	<i>Ethics Advisory Board</i>
<i>EC</i>	<i>European Commission</i>
<i>EDPIA</i>	<i>Ethics and Data Protection Impact Assessment</i>
<i>EFFRA</i>	<i>European Factories of the Future Research Association</i>
<i>ELSEC</i>	<i>Ethical, Legal, Socio-Economic and Cultural</i>
<i>EM</i>	<i>Ethics Mentor</i>
<i>EP</i>	<i>Ethical Policy</i>
<i>EPM</i>	<i>Ethics Pilot Manager</i>
<i>EU</i>	<i>European Union</i>
<i>GA</i>	<i>Grant Agreement</i>
<i>GDPR</i>	<i>General Data Protection Regulation (Regulation EU 2016/679)</i>
<i>HLEG</i>	<i>High Level Expert Group on AI</i>
<i>HRIA</i>	<i>Human Rights Impact Assessment</i>
<i>IEEE</i>	<i>Institute of Electrical and Electronics Engineers</i>
<i>OSAI</i>	<i>Observatory on Society and Artificial Intelligence</i>
<i>PC</i>	<i>Project Coordinator</i>
<i>SME</i>	<i>Small Medium Enterprise</i>
<i>TBC</i>	<i>To be confirmed</i>
<i>TC</i>	<i>Technical Coordinator</i>
<i>WP</i>	<i>Work Package</i>

## Disclaimer

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## Executive Summary

This deliverable provides the findings of the ethics assessment and analysis of the project activities and first outcomes by M18, monitoring their alignment with the Circular TwAIIn Ethical Policy defined at the beginning of the project in order to ensure that the design, development and deployment of the project’s technological breakthroughs and piloting activities are legally compliant and ethically-sound, and thereby contribute to trustworthiness. The document comprises, on the one hand, the Ethics and Data Protection Impact Assessments conducted by Circular TwAIIn Industrial Pilots, following the methodology previously elaborated in D1.2 “Ethical Analysis, Governance and Guidelines – 1st version” [1] and taking into account the different technological solutions and their applicability in the project’s use cases; and on the other hand, the description of the ethics-related work performed by the Consortium in the different work-packages and tasks, considering the transversal nature of the legal and ethical activities and the holistic approach adopted in this regard.



## I Introduction

### 1.1 Objectives of the deliverable

This deliverable is directed to provide the findings of the ethics assessment and analysis of the project activities and first outcomes, monitoring their alignment with the Circular TwAIIn Ethical Policy defined in D1.2 “Ethical Analysis, Governance and Guidelines – 1st version”. Its functional objective is to ensure that the design, development and deployment of the project’s technological breakthroughs and piloting activities are legally compliant and ethically-sound, and thereby contribute to trustworthiness, as well as adhering to the chosen ethics-by-design-and-by default paradigm. In this direction, this deliverable describes the Ethics and Data Protection Impact Assessments conducted by the Industrial Pilots of the project, following the methodology provided in Section 2.6 of the mentioned D1.2[1].

### 1.2 Interplays with other tasks

The legal and ethics-related activities and dimensions have a pivotal role in Circular TwAIIn Workplan. The work performed in T1.4 “Ethics Assessment and Governance” and the related outputs described in this deliverable, and in particular the Industrial Pilots’ Ethics Impact Assessment, are strongly interrelated with:

- WP2 “User Scenarios, Requirements and socio-economic Assessment” and especially T2.4 Socio-technological-business-ethical continuous assessment and 6Ps Transformation”. The Trial Handbook was very useful for gathering the information by the pilot partners on the legal and ethical sources applicable in relation to the technology involved in the pilot itself, on the conditions and legal boundaries related to the pilot’s operations and technologies to be employed, as well as on the ethical procedures and experiment specific features for each pilot case, with a focus on EU values and human rights.
- WP6 “Industrial Pilots & Circular Manufacturing Experimentations”, considering that the Circular TwAIIn Ethical Policy, including its Ethics and Data Protection Impact Assessment Methodology, has to be fine-tuned and implemented in each of the industrial pilots’ context. T6.5 Industrial Pilots Socio-Business-Ethics Assessment / Validation is also related and complementary to the EDPIA.
- T7.3 Legal & Ethical issues, Standardisation and Regulatory Sandboxes, since this task regards the legal, regulatory, ethical and standardization issues and challenges for the trustworthy and human-centric sustainable manufacturing design, development and adoption of the CI-inspired human-AI tools for maximizing the full potential of human-machine collaboration within the circular economy-based manufacturing value-chain. Furthermore, the EDPIA is also aligned with the human rights impact assessment (HRIA), being both based on the ALTAI model in relation to the AI solutions.

### 1.3 Document structure

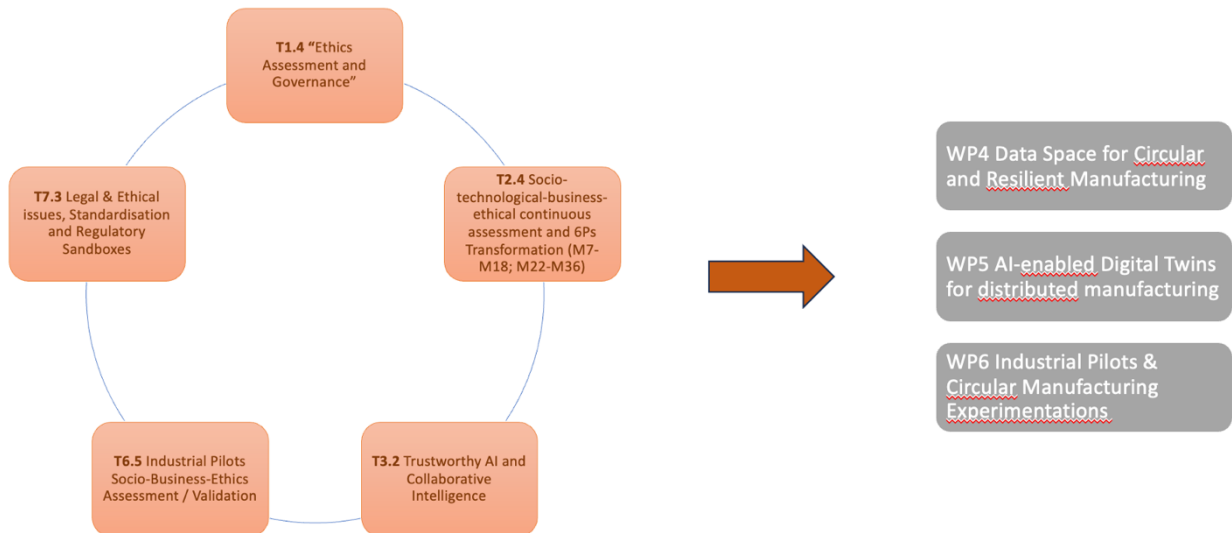
The deliverable is structured as follows:

- Section 2 comprises of the description of the ethics-related work performed by the Consortium in the different work-packages and tasks, considering the transversal nature of the legal and ethical activities and the holistic approach adopted in this regard;

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- Section 3 provides a snapshot of the Ethics Impact Assessment Methodology and contains the experiments' EAs, taking into account the different solutions and use cases;
  - Section 4 draws the conclusions and the roadmap for the future ethics-related work.

## 2 Report of the ethics-related activities performed

Due to the cross-cutting nature of the legal and ethical dimensions within the Circular TwAI workplan, the corresponding activities have been performed in different work-packages, as shown in the following figure:



**Figure 1 Cross-cutting nature of the legal and ethical activities in Circular TwAI**

In particular:

- In **T1.4 "Ethics Assessment and Governance"** the efforts were mainly directed to support the Circular TwAI partners in performing their research activities and experiments in an ethical way and in compliance with the current applicable regulatory framework, following responsible research ethics guidelines. This also included addressing of the legal, regulatory and ethical issues and challenges for the full adoption of human-centric sustainable manufacturing, to maximize the full potential of the circular economy, leveraging on trust building and societal acceptance by all stakeholders of the manufacturing value chain (Circular TwAI Trustworthy Framework & Implementation Policy for mutualistic human-AI symbiosis). The Ethical Policy of the project was described in D1.2 «Ethical Analysis, Governance and Guidelines – First Version» [1] and implemented in the following months. It comprises the Ethics & Privacy-by-Design-and-by-Default Approach, the commitment to prioritize the human well-being in Circular TwAI developments and operations, the elaboration and plans for implementing the ethical procedures, including also the preparation and fine-tuning of the ethical templates (Informed Consent Form and Information Sheet), the gender-sensitive approach, Inclusiveness & Research Integrity and the Ethics and Data Protection Impact Assessment Methodology. In addition, the ethics-related roles were defined, appointed and involved in the project's activities. The following figure shows such roles and the individuals covering them:

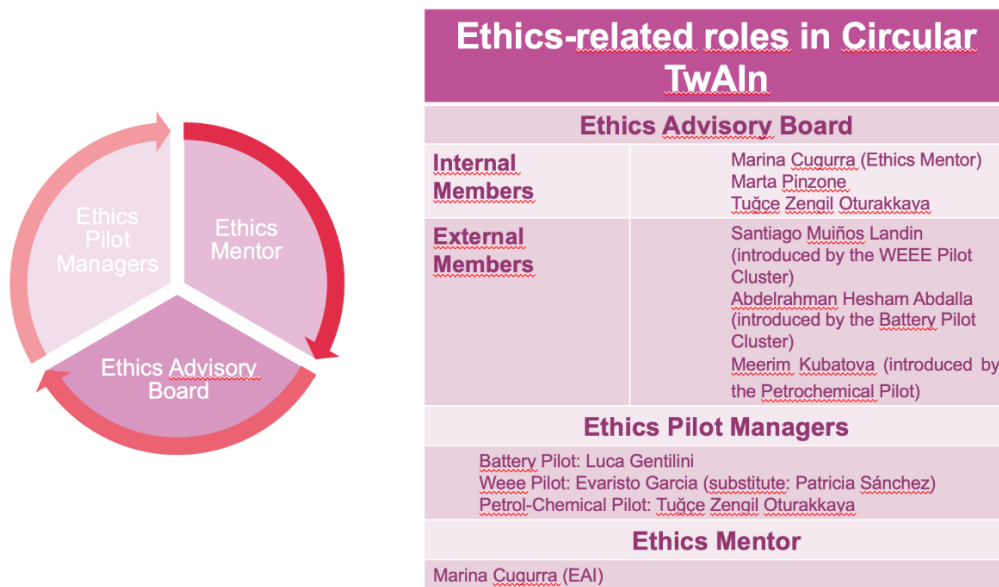


Figure 2 Ethics-related roles in Circular TwAI

- **WP2 “User Scenarios, Requirements and socio-economic Assessment”** the industrial pilot, with the support of the Ethics Mentor of the project, identified the relevant regulatory sources at national level or at sector-specific level, to which their operations have to conform and elicited the legal and ethical requirements for such operations. This regarded the procedures for the involvement of volunteers and the collection and/or processing of personal data. The partners filled in the legal and ethical parts of the Trial Handbook, including:
  - o The Legal and Ethical Framework (§ 1.9.3), reporting the legal and ethical sources applicable in relation to the technology involved in the pilot itself;
  - o Legal and Ethical Requirements (§ 2.2.3), setting the conditions and legal boundaries related to the pilot’s operations and technologies to be employed, including the indication of their nature (ethical or legal) and priority level (critical, preferred or optional);
  - o Ethical Procedures and experiment specific features (§ 2.2.4), which is the Ethics and Data Protection Impact Assessment of the pilot, with a focus on EU values and human rights.

Furthermore, the 6P Methodology was enriched with the consideration of the ethical implications, focusing on the Circular Economy Ethics and its surrounding value principle of sustainable development.

- In **T3.2 “Trustworthy AI and Collaborative Intelligence”**, which regards the methods and solutions to support the development of trustworthy and explainable AI and collaborative Systems, the work was mainly aimed at contributing to ensure the transparency, trustworthiness and explainability of the AI tools and collaborative systems’ operations in Circular TwAI pilots. The attention was also directed to identify possible high-risk systems according to the AI Act and to plan and implement the adequate mitigations and measures to be compliant with the AI Act requirements and mandate, as well as to comply with the Ethics Guidelines for Trustworthy AI and ALTAI, strictly adhering to the Ethics & Privacy-by-Design-and-by-Default Approach adopted by the Consortium. These efforts are reflected in the content of D3.1 Conceptual Framework and Reference Architecture - 1st version [2], D3.2 Data Space and Digital TwAIs Design - 1<sup>st</sup> version [3] and D3.3 Data Space and AI Toolkit Reference Implementations - 1st version [4]
- In **WP6 “Industrial Pilots & Circular Manufacturing Experimentations”** the industrial pilot partners are taking the steps necessary to concretely implement the ethical procedures, protocols conditions and measures defined in WP1, WP2 and

WP7 in relation to the human involvement, personal data collection and processing and ethical mandates for AI. This also includes the work on the Human Rights Impact Assessments (WP7) and the Ethics and Data Protection Impact Assessments (WP1). The industrial pilots' EDPIAs are reported in chapter 3 of this deliverable and will be updated, enriched, revised at the end of the project, if necessary, and reported in D7.8 "Liaison with AI4MAN Ecosystem, Didactic Factories Network, Legal and Ethical issues - 2nd version" (M36)

- In **T7.3 "Legal & Ethical issues, Standardization and Regulatory Sandboxes"** the key legal, regulatory and ethical issues and challenges for the trustworthy AI and human-centric sustainable manufacturing design, development and adoption were identified and deepened. The main aim was to exploit the full potential of human-machine collaboration within the circular economy-based manufacturing value-chain, leveraging on trust building and societal acceptance by all stakeholders involved and contributing to a fully privacy-preserving, legal compliant and ethically sound technological development, capable of upholding EU ethical values. In this direction, the Consortium carried out the following activities:
  - legal and ethical survey on the relevant European and national legislation and relevant ethics sources;
  - legal and ethical requirements for Circular TwAI technology and piloting operations;
  - ALTAI-driven human rights impact assessment (HRIA) functional to identify and mitigate any possible negative expected impact of Circular TwAI tools on fundamental rights ensuring citizen-respectful results;
  - the first consultation with stakeholders was conducted. Such survey was aimed at capturing the stakeholders' needs and expectations in relation to Circular TwAI approach and trajectories, focusing on human-centricity and trustworthiness, as well as regulatory and ethical implications. It was launched online in June 2023 and remained open till mid-October 2023. The survey was directed to stakeholders of the manufacturing value chain, such as Regional Authorities/Agencies, other Public Authorities, Civil Society Organisations, Innovation Agencies, Vanguard Initiatives representatives, representatives from the workers, technology and/or service providers, etc. The topics addressed by the survey included "Artificial Intelligence and Data Spaces for Circular and Resilient Manufacturing", "AI-enabled Human Digital Twins", "Trustworthy Artificial Intelligence" and "The evolving regulatory framework".
  - active participation to key standardization initiatives, like ISO SC41 IoT&Digital Twin and ISO SC42, with aimed impact on operational SMART standards (Standards that are Machine Applicable, Readable, and Transferable).

The outcomes and findings of this work, as depicted in D7.3 "Liaison with AI4MAN Ecosystem, Didactic Factories Network, Legal and Ethical issues – 1st version" [5] (M18), will guide the technical team in the design, development and/or adaptation and extension of technological components and tools, including the overall Project reference framework and platform architecture, as well as the industrial pilots' operations.

## 3 Experiments' Ethics Impact Assessments

### 3.1 Overview

This section contains the Ethics and Data Protection Impact Assessments (EDPIA) for Circular TwAIn pilot cases. The EDPIAs were elaborated following the methodology described in section 2.6 of D1.2 “Ethics Analysis, Governance and Guidelines – First Version” [1], aimed at effectively supporting accountability and allowing the pilot partners to demonstrate due diligence in taking adequate actions to ensure full compliance on an ongoing basis in each use case scenarios. The EDPIA are functional to assess the risks for individuals’ rights, freedoms and wellbeing, for ensuring compliance with the data protection law (GDPR and national regimes), and ethical mandates for the research with humans, the protection of personal data and the design and/or use of Artificial Intelligence solutions. As highlighted in D1.2, the building blocks of the Ethics and Data Protection Impact Assessment are as follows:

- I. **Human Involvement**, which refers to the participation in the piloting operations of individuals, volunteers and stakeholders external to the research staff, such as in the usability tests, validation workshops, experiments with volunteers, focus groups, questionnaires, interviews, standardized tests and direct observation. In other words, it refers to the involvement in the experiment operations of human beings, different from the Circular TwAIn team (with subsequent privacy and ethical implications). In case of research with humans, the pilot leader/ ethics pilot manager provides more information about the informed consent and recruitment procedures, such as how these individuals/participants are identified and selected, which are the inclusion and exclusion criteria for this recruitment, which methods are used to recruit them (for instance face-to-face personalized e-mails, telephone, social media, website, etc.).
- II. **Personal data collection and/or processing**, which concerns the privacy, regulatory compliance and ethical implications regarding the collection and/or processing of personal data in the pilot concerned. Several aspects are investigated, such as the expected use of specific and “sensitive” tools and techniques like the use of the video-surveillance (CCTV and intelligent visual surveillances), the use of the technologies for access control (authentication, authorization), the use of biometric identification. This part of the EDPIA also regards the ethics procedures and organizational aspects regarding the personal data, for instance on the appointment of a Data Protection Officer (DPO), the respect of adequate informed consent procedures in regard to data collection and processing, as well as how the data minimization principle is followed (anonymization/pseudonymization techniques and other technical/organizational measures, security safeguards, etc.).
- III. **Artificial Intelligence**, which concerns the check on the applicability of the Ethics guidelines for trustworthy AI developed by the High-Level Expert Group on AI and the classification or not of the AI system to be used in the pilot as a high-risk solution according to the AI Act classification<sup>1</sup>. The pilot partners referred

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<sup>1</sup> AI systems identified as high-risk include AI technology used in: critical infrastructures (e.g. transport), that could put the life and health of citizens at risk; educational or vocational training, that may determine the access to education and professional course of someone’s life (e.g. scoring of exams); safety components of products (e.g. AI application in robot-assisted surgery); employment, management of workers and access to self-employment (e.g. CV-sorting software for recruitment procedures); essential private and public services (e.g. credit scoring denying citizens opportunity to obtain a loan); law enforcement that may interfere with people’s fundamental rights (e.g. evaluation of the reliability of evidence); migration, asylum and border control management (e.g. verification of authenticity of travel documents); administration of justice and democratic processes (e.g. applying the law to a concrete set of facts)

in a flexible and dynamic manner to the “Assessment List for Trustworthy Artificial Intelligence” (ALTAI) for self-assessment. Additional aspects relevant from the ethical viewpoint in relation to the use of AI will be investigated in the Human Right Impact Assessment in T7.3.

The following paragraphs contain the findings of the Ethics and Data Protection Impact Assessment conducted for each of the Circular TwAI Pilots.

## 3.2 WEEE Pilot

### 3.2.1 Use Cases 1a, 1b and 1c

Table 1 WEEE Pilot– Use cases 1a, 1b, 1c EDPIA

<b>Ethics and Data Protection Impact Assessment</b>				
#	Name	Criterion info	YES/NO	Notes
1	<b>EXTERNAL HUMANS</b>	<i>Involvement and participation of individuals, volunteers and stakeholders external to the research staff</i>	<b>NO</b>	
2	<b>PERSONAL DATA COLLECTION AND/OR PROCESSING</b>	<i>Collection and/or processing of personal data</i>	<b>NO</b>	No data for “Age, Sex, Experience, Work Related Injuries history, etc.” required. Personnel data will not be shared.
3	<b>ARTIFICIAL INTELLIGENCE</b>	<i>Check the applicability of the Ethics guidelines for trustworthy AI developed by the High-Level Expert Group on AI and of the related Assessment List for Trustworthy AI (ALTAI)</i>	<b>YES</b>	<p><a href="#"><u>Requirement 1: Human Agency and Oversight</u></a></p> <p>1. <u>Tool 1 (Robotic disassembly tool)</u></p> <p>The system is designed to interact and guide a human worker. The tool can generate confusion in the user with its decisions, but they will be totally aware that it is an AI tool. The tool cannot generate over-reliance given its limitations and the scope of the problem faced. The tool cannot interfere the autonomy of the user. The tool doesn’t simulate social interaction and cannot generate human attachment.</p> <p>The system is overseen by a human-in-the-loop. The humans will receive proper training to use the tool. The system has a built-in detection and response mechanisms as well as a stop button to avoid improper behaviours. We don’t control the self-learning nature of the system (not applicable)</p>



		<p style="text-align: center;"><u>2. Tool 2 (Market decision support system)</u></p> <p>The system is designed to interact and guide a human worker. The tool can generate confusion in the user with its decisions, but they will be totally aware that it is an AI tools. The tool can generate over-reliance by the end-user but is designed to only inform it about the best outcome, not to take decisions. The tool cannot interfere the autonomy of the user. The tool doesn't simulate social interaction and cannot generate human attachment.</p> <p>The system is overseen by a human-on-the-loop. The humans will receive proper training to use the tool. The system has a built-in detection and response mechanisms to avoid improper behaviours. (not applicable)</p> <p><b><u>Requirement 2: Technical Robustness and Safety</u></b></p> <p style="text-align: center;"><u>1. Tool 1 (Robotic disassembly tool)</u></p> <p>The system could have damaging effects in humans if misused. The system will be used in a closed environment, cybersecurity is not required.</p> <p>The risks of the system have been assessed and measured. The system is designed to be stable and reliable. No duplicate system is contemplated nor necessary. A system to automatically check the integrity of the system is not contemplated.</p> <p>The accuracy of the system doesn't result in a critical consequence. The data used in the training process is controlled to ensure its quality, and the accuracy of the model is measured before integrating it in the system. The system operation cannot invalidate the data used in to train the model.</p> <p>The system can cause critical damage due to low reliability. Well defined processes and tests have been defined to ensure the reliability and reproducibility of the system for the sake of the safety of the workers. The tool doesn't implement an online continual learning that can provoke negative consequences.</p> <p style="text-align: center;"><u>2. Tool 2 (Market decision support system)</u></p> <p>The system couldn't have damaging effects in humans if misused. The system will meet the cybersecurity standards. The AI will be exposed to corrupted data that may lead to its malfunction. The system will have measures to secure the integrity of the data.</p>
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		<p>The risks of the system have been assessed and measured. The system is designed to be stable and reliable. No duplicate system is contemplated nor necessary. A system to automatically check the integrity of the system is not contemplated.</p> <p>The accuracy of the system doesn't result in a critical consequence. The data used in the training process is controlled to ensure its quality, and the accuracy of the model is measured before integrating it in the system. The system operation cannot invalidate the data used in to train the model.</p> <p>The system can't cause critical damage due to low reliability. The tool doesn't implement an online continual learning that can provoke negative consequences.</p> <p><b><u>Requirement 3: Privacy and Data Governance</u></b></p> <ol style="list-style-type: none"> <li><u>Tool 1 (Robotic disassembly tool)</u></li> </ol> <p>The system doesn't need nor require private information in any aspects of its lifecycle.</p> <ol style="list-style-type: none"> <li><u>Tool 2 (Market decision support system)</u></li> </ol> <p>The system doesn't need nor require private information in any aspects of its lifecycle.</p> <p><b><u>Requirement 4: Transparency</u></b></p> <ol style="list-style-type: none"> <li><u>Tool 1 (Robotic disassembly tool)</u></li> </ol> <p>Traceability of the decisions is assured by the technologies of the AI model. The quality of the model can be easily quantified, and its decisions monitored.</p> <p>By the nature of the model used, the explainability of the decisions is assured.</p> <p>Users are aware that they are working with an AI system, and they are aware about its benefits and limitations.</p> <ol style="list-style-type: none"> <li><u>Tool 2 (Market decision support system)</u></li> </ol> <p>Traceability of the decisions is assured by the technologies of the AI model. The quality of the model can be easily quantified, and its decisions monitored.</p> <p>By the nature of the model used, the explainability of the decisions is assured.</p>
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		<p>Users are aware that they are working with an AI system, and they are aware about its benefits and limitations.</p> <p><b><u>Requirement 5: Diversity, Non-discrimination and Fairness</u></b></p> <ol style="list-style-type: none"> <li><u>Tool 1 (Robotic disassembly tool)</u></li> </ol> <p>Given the nature of the tool and the data used to train it, no bias can be included that can discriminate anyone.</p> <ol style="list-style-type: none"> <li><u>Tool 2 (Market decision support system)</u></li> </ol> <p>Given the nature of the tool and the data used to train it, no bias can be included that can discriminate anyone.</p> <p><b><u>Requirement 6: Diversity, Non-discrimination and Fairness</u></b></p> <ol style="list-style-type: none"> <li><u>Tool 1 (Robotic disassembly tool)</u></li> </ol> <p>Due to the narrow scope of application of the tool, it was designed only with the workers that are going to use it in mind.</p> <p>Stakeholders are contemplated in the design and development of the tool.</p> <ol style="list-style-type: none"> <li><u>Tool 2 (Market decision support system)</u></li> </ol> <p>Due to the narrow scope of application of the tool, it was designed only with the workers that are going to use it in mind.</p> <p>Stakeholders are contemplated in the design and development of the tool.</p> <p><b><u>Requirement 7: Societal and Environmental Well-being</u></b></p> <ol style="list-style-type: none"> <li><u>Tool 1 (Robotic disassembly tool)</u></li> </ol> <p>There's no negative environmental impact of the system, but given the nature of the project, mechanisms to measure the impact of the tools in the environment has been designed.</p>
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			<p>The tool will impact the human work. Workers have been informed about the benefits of the tools and how is going to affect them. The tool is not going to de-skill the workers as is a support tool. The tool will require new digital skills to operate.</p> <p>The tool will have no impact in society at large or democracy.</p> <p>2. <u>Tool 2 (Market decision support system)</u></p> <p>There's no negative environmental impact of the system, but given the nature of the project, mechanisms to measure the impact of the tools in the environment has been designed.</p> <p>The tool will impact the human work. Workers have been informed about the benefits of the tools and how is going to affect them. The tool is not going to de-skill the workers as it is a support tool. The tool will require new digital skills to operate.</p> <p>The tool will have no impact in society at large or democracy.</p> <p><b><u>Requirement 8: Accountability</u></b></p> <p>1. <u>Tool 1 (Robotic disassembly tool)</u></p> <p>The whole process of developing and designing has been recorded to traceback and audit the system. We foresee the external guidance of the ethics and legal teams of Circular TwAln and its involvement during the development process.</p> <p>2. <u>Tool 2 (Market decision support system)</u></p> <p>The whole process of developing and designing has been recorded to traceback and audit the system. We foresee the external guidance of the ethics and legal teams of Circular TwAln and its involvement during the development process.</p>
	<p><i>High-level risk application according to the proposal for a</i></p>	<p><b>NO</b></p>	

	<i>Regulation on Artificial Intelligence (AI Act)</i>		
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### 3.3 Battery Pilot

#### 3.3.1 Use Case A

Table 2 BATTERY Pilot – Use Case A “Battery Pack Disassembly” EDPIA

<b>Ethics Impact Assessment</b>				
#	Name	Criterion info	YES/NO	Notes
1	<b>EXTERNAL HUMANS</b>	<i>Involvement and participation of individuals, volunteers and stakeholders external to the research staff</i>	<b>NO</b>	
#	Name	Criterion info	YES/NO	Description
2	<b>PERSONAL DATA COLLECTION AND/OR PROCESSING</b>	<i>Confirmation of compliance with GDPR and respective national legal framework(s)</i>	<b>YES</b>	We are compliant with UE regulation 2016/679
		<i>Confirm of appointment of a Data Protection Officer (DPO) and that the contact details of the DPO will be made available to all data subjects involved in the research</i>	<b>YES</b>	
		<i>Processing of sensitive personal data and related justification</i>	<b>YES</b>	

	<p><i>Anonymisation/pseudonymisation techniques and other technical/organisational measures that will be implemented to safeguard the rights and freedoms of the data subjects/research participants</i></p>	<p><b>YES</b></p>	
	<p><i>Security measures that will be implemented to prevent unauthorised access to personal data or the equipment used for processing must be provided</i></p>	<p><b>YES</b></p>	<p>All data will be protected with the most efficient technologies available</p>
	<p><i>Informed consent procedures (consent form and information sheet) in regard to data processing</i></p>	<p><b>YES</b></p>	<p>Any operator will be informed with information sheet</p>
	<p><i>Confirmation of compliance with GDPR and/or with the laws of the country in which the data was collected in case of international transfer of personal data (from the EU to a non-EU country and/or from a non-EU country to the EU)</i></p>	<p><b>YES</b></p>	

	<i>Need to conduct a data protection impact assessment under art.35 General Data Protection Regulation 2016/679</i>	<b>YES</b>	We will conduct an assessment of the risks to the rights and freedoms of data subjects
	<i>In case of profiling, confirmation that adequate information will be provided to the data subjects and that adequate safeguards for his/her rights will be taken</i>	<b>YES</b>	
	<i>In case of further processing of previously collected personal data, confirmation of the lawful basis of it</i>	<b>YES</b>	
	<i>Use of the video-surveillance (CCTV and intelligent visual surveillance)</i>	<b>YES</b>	We use video-surveillance for safety reasons
	<i>Use of access control techniques</i>	<b>YES</b>	We use electronical badges for the access to our facilities
	<i>Use of biometric identification tools</i>	<b>NO</b>	
<b>3</b>	<b>ARTIFICIAL INTELLIGENCE</b> <i>Check the applicability of the Ethics guidelines for trustworthy AI developed by the High-Level Expert Group on AI and of the related</i>	<b>YES</b>	<u>Requirement #1.Human Agency and Oversight</u> The system's purpose is to communicate with and direct a human worker. The user may become confused by the tool's choices, but they will be well aware that it is an artificial intelligence tool. With all of its shortcomings and the size of the issue at hand, the tool cannot encourage over-reliance. The user's autonomy cannot be interfered with by the gadget. The instrument is unable to elicit human attachment or replicate social interaction.

	<p><i>Assessment List for Trustworthy AI (ALTAI)</i></p>	<p>There is a human in the loop supervising the system. To operate the tool, humans will obtain the necessary training. In order to prevent inappropriate behaviour, the system has a stop button in addition to built-in detection and response systems.</p> <p><u>#2. Technical Robustness and Safety</u></p> <p>If the system is abused, people may suffer negative consequences. There is no need for cybersecurity because the system would operate in a closed environment.</p> <p>The system's dangers will be evaluated and quantified. The system is built with dependability and stability in mind. There is no need or intention to implement a duplicate system. It is not planned to provide a method to automatically verify the system's integrity.</p> <p>The correctness of the method has no significant ramifications. Before the model is integrated into the system, its accuracy is measured and the quality of the data used in the training process is regulated. The data used to train the model cannot be invalidated by system operations.</p> <p><u>Requirement #3. Privacy and Data Governance</u></p> <p>We are compliant with UE regulation 2016/679 and all data is protected with the most efficient technologies available. The operators will be informed with information sheet. We will conduct an assessment of the risks to the rights and freedoms of data subjects. Video-surveillance and electronical badges for access to our facilities are improvised for safety reasons.</p> <p><u>Requirement #4. Transparency</u></p> <p>The AI model's technology ensure that decisions can be traced back. It is simple to measure the model's quality and keep an eye on its choices. The decisions are guaranteed to be explainable due to the nature of the applied model.</p> <p><u>Requirement #5. Diversity, Non-discrimination and Fairness</u></p> <p>The nature of the tool and the data used to train doesn't include biased category that can discriminate anyone.</p>
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			<p><u>Requirement #6. Societal and Environmental Well-being</u></p> <p>The system has no adverse effects on the environment, methods have been developed to assess how the tools affect the environment.</p> <p>The instrument will affect what people do by hand. The advantages of the tools and how they will benefit the workers have been explained to them. As a support tool, it won't cause the workers' skills to decline. To use the tool, one must learn new digital skills.</p> <p><u>Requirement #7. Accountability</u></p> <p>The entire process of creating and planning has been documented in order to audit and trace the system.</p>
	<p><i>High-level risk application according to the proposal for a Regulation on Artificial Intelligence (AI Act)</i></p>	<p><b>YES</b></p>	<p>The safeguards and measures to be taken in order to comply with the AI Act are under investigation and any findings will be reported in the updated version of this deliverable.</p>

### 3.3.2 Use Case B

<b>Ethics Impact Assessment</b>				
#	Name	Criterion info	YES/NO	Notes
1	<b>EXTERNAL HUMANS</b>	<i>Involvement and participation of individuals, volunteers and stakeholders external to the research staff</i>	<b>NO</b>	
#	Name	Criterion info	YES/NO	Description
2	<b>PERSONAL DATA COLLECTION</b>	<i>Confirmation of compliance with GDPR and respective national legal framework(s)</i>	<b>YES</b>	We are compliant with UE regulation 2016/679

<b>AND/OR PROCESSING</b>	<i>Confirm of appointment of a Data Protection Officer (DPO) and that the contact details of the DPO will be made available to all data subjects involved in the research</i>	<b>YES</b>	
	<i>Processing of sensitive personal data and related justification</i>	<b>YES</b>	
	<i>Anonymisation/pseudonymisation techniques and other technical/organisational measures that will be implemented to safeguard the rights and freedoms of the data subjects/research participants</i>	<b>YES</b>	
	<i>Security measures that will be implemented to prevent unauthorised access to personal data or the equipment used for processing must be provided</i>	<b>YES</b>	All data will be protected with the most efficient technologies available
	<i>Informed consent procedures (consent form and information sheet) in regard to data processing</i>	<b>YES</b>	Any operator will be informed with information sheet
	<i>Confirmation of compliance with GDPR and/or with the laws of the</i>	<b>YES</b>	

	<i>country in which the data was collected in case of international transfer of personal data (from the EU to a non-EU country and/or from a non-EU country to the EU)</i>		
	<i>Need to conduct a data protection impact assessment under art.35 General Data Protection Regulation 2016/679</i>	<b>YES</b>	We will conduct an assessment of the risks to the rights and freedoms of data subjects
	<i>In case of profiling, confirmation that adequate information will be provided to the data subjects and that adequate safeguards for his/her rights will be taken</i>	<b>YES</b>	
	<i>In case of further processing of previously collected personal data, confirmation of the lawful basis of it</i>	<b>YES</b>	
	<i>Use of the video-surveillance (CCTV and intelligent visual surveillance)</i>	<b>YES</b>	We use video-surveillance for safety reasons
	<i>Use of access control techniques</i>	<b>YES</b>	We use electronical badges for the access to our facilities
	<i>Use of biometric identification tools</i>	<b>NO</b>	

<p>3 <b>ARTIFICIAL INTELLIGENCE</b></p>	<p><i>Check the applicability of the Ethics guidelines for trustworthy AI developed by the High-Level Expert Group on AI and of the related Assessment List for Trustworthy AI (ALTAI)</i></p>	<p><b>YES</b></p>	<p><u>Requirement #1. Human Agency and Oversight</u>                  The system's purpose is to communicate with and direct a human worker. The user may become confused by the tool's choices, but they will be well aware that it is an artificial intelligence tool. With all of its shortcomings and the size of the issue at hand, the tool cannot encourage over-reliance. The user's autonomy cannot be interfered with by the gadget. The instrument is unable to elicit human attachment or replicate social interaction.</p> <p>There is a human in the loop supervising the system. To operate the tool, humans will obtain the necessary training. In order to prevent inappropriate behaviour, the system has a stop button in addition to built-in detection and response systems.</p> <p><u>Requirement #2. Technical Robustness and Safety</u>                  If the system is abused, people may suffer negative consequences. There is no need for cybersecurity because the system would operate in a closed environment.</p> <p>The system's dangers will be evaluated and quantified. The system is built with dependability and stability in mind. There is no need or intention to implement a duplicate system. It is not planned to provide a method to automatically verify the system's integrity.</p> <p>The correctness of the method has no significant ramifications. Before the model is integrated into the system, its accuracy is measured and the quality of the data used in the training process is regulated. The data used to train the model cannot be invalidated by system operations.</p> <p><u>Requirement #3. Privacy and Data Governance</u>                  We are compliant with UE regulation 2016/679 and all data is protected with the most efficient technologies available. The operators will be informed with an information sheet. We will conduct an assessment of the risks to the rights and freedoms of data subjects. Video-surveillance and electronic badges for access to our facilities are improvised for safety reasons.</p> <p><u>Requirement #4. Transparency</u></p>
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			<p>The AI model's technology ensure that decisions can be traced back. It is simple to measure the model's quality and keep an eye on its choices. The decisions are guaranteed to be explainable due to the nature of the applied model.</p> <p><u>Requirement #5. Diversity, Non-discrimination and Fairness</u></p> <p>The nature of the tool and the data used to train doesn't include biased category that can discriminate anyone.</p> <p><u>Requirement #6. Societal and Environmental Well-being</u></p> <p>The system has no adverse effects on the environment, methods have been developed to assess how the tools affect the environment.</p> <p>The instrument will affect what people do by hand. The advantages of the tools and how they will benefit the workers will be explained to them. As a support tool, it won't cause the workers' skills to decline. To use the tool, one must learn new digital skills.</p> <p><u>Requirement #7. Accountability</u></p> <p>The entire process of creating and planning has been documented in order to audit and trace the system.</p>
	<p><i>High-level risk application according to the proposal for a Regulation on Artificial Intelligence (AI Act)</i></p>	<p><b>YES</b></p>	<p>The safeguards and measures to be taken in order to comply with the AI Act are under investigation and any findings will be reported in the updated version of this deliverable.</p>

Table 3 BATTERY Pilot – Use Case B “Battery module Disassembly” EDPIA

### 3.3.3 Use Case C

Table 4 BATTERY Pilot – Use Case C “LIB module Testing and characterization” EDPIA

<b>Ethics Impact Assessment</b>					
#	Name	Criterion info	YES/NO	Notes	
1	<b>EXTERNAL HUMANS</b>	<i>Involvement and participation of individuals, volunteers and stakeholders external to the research staff</i>	<b>YES</b>	Internal operators already associated with POLIMI will be involved for the testing of the battery in module level. Personal data (Age, sex, experience etc.) sharing is restricted.	
		<b>Only If external humans involved</b>		<b>Description</b>	
		<i>External humans' identification and selection</i>	Selection by internal coordinator and pilot leader		
		<i>Inclusion and exclusion criteria for recruitment of external humans</i>	Inclusion criteria: PhD candidate		
		<i>Methods used to recruit external humans</i>			
		<i>Clarify whether vulnerable individuals/groups will be involved</i>	NO		
		<i>Informed Consent Procedures (Informed Consent Form and Information Sheet)</i>	YES		
		<i>Is necessary to obtain an opinions/approvals by ethics committees and/or competent authorities for your planned activities with humans?</i>	NO		
2	<b>PERSONAL DATA COLLECTION</b>	<i>Collection and/or processing of personal data</i>	<b>NO</b>		

	<b>AND/OR PROCESSING</b>			
3	<b>ARTIFICIAL INTELLIGENCE</b>	<i>Check the applicability of the Ethics guidelines for trustworthy AI developed by the High-Level Expert Group on AI and of the related Assessment List for Trustworthy AI (ALTAI)</i>	<b>YES</b>	<p><u>Requirement #1. Human Agency and Oversight</u> The tool is developed to assess and characterize the battery SOH combining testing data and historical data. It will be a support system for the decision making by monitoring test conditions momentarily and comparing it with historical data. Engineers can examine and simulate different operating conditions of the battery desired.</p> <p><u>Requirement #2. Technical Robustness and Safety</u> Robustness of the developed tool depends on the data quality and variety. If the model is trained on data that belongs to the same operating region for a long time, the flexibility of the digital twin would be narrow. Besides, the model cannot constitute any safety threat as it is not in a closed-loop.</p> <p><u>Requirement #3. Privacy and Data Governance</u> The data is processed in local system throughout its creation, application, and storage. It will be shared outside and processed only for the tool development in another server.</p> <p><u>Requirement #4. Transparency</u> The quality of the model can be easily quantified, and its decisions monitored. By the nature of the model used, the explainability of the decisions is assured. The accuracy of the model can be monitored by comparing the operating data and the running process.</p> <p><u>Requirement #5. Diversity, Non-discrimination and Fairness</u> Based on the data obtained from physical real time machine, no discrimination, diversity and fairness has been violated.</p> <p><u>Requirement #6. Societal and Environmental Well-being</u> The model is developed to optimize the extreme working conditions and process, therefore no negative impact of the system will be affected on the environment.</p> <p><u>Requirement #7. Accountability</u></p>

				The data flow can be stored in the local system and can traced back into account.
		<i>High-level risk application according to the proposal for a Regulation on Artificial Intelligence (AI Act)</i>	<b>NO</b>	

**3.3.4 Use Case D**

Table 5 BATTERY Pilot – Use Case D “Mechanical recycling of degraded LIBs” EDPIA

<b>Ethics Impact Assessment</b>				
<b>#</b>	<b>Name</b>	<b>Criterion info</b>	<b>YES/NO</b>	<b>Notes</b>
1	<b>EXTERNAL HUMANS</b>	<i>Involvement and participation of individuals, volunteers and stakeholders external to the research staff</i>	<b>NO</b>	
2	<b>PERSONAL DATA COLLECTION AND/OR PROCESSING</b>	<i>Collection and/or processing of personal data</i>	<b>NO</b>	
3	<b>ARTIFICIAL INTELLIGENCE</b>	<i>Check the applicability of the Ethics guidelines for trustworthy AI developed by the High-Level Expert Group on AI and of the related</i>	<b>YES</b>	<p><u>Requirement #1. Human Agency and Oversight</u>                      The tool is designed for the operability of mechanical recycling technologies with AI driven optimization algorithms to drive selective isolation of material streams, in function of the LIB cells materials composition and architecture and of market quotations of target materials. Engineers can examine and simulate different operating conditions of the battery design and architecture desired.</p> <p><u>Requirement #2. Technical Robustness and Safety</u></p>



		<p><i>Assessment List for Trustworthy AI (ALTAI)</i></p>		<p>Robustness of the developed tool depends on the data quality and variety. If the model is trained on data that belongs to the same LIB design , the flexibility of the digital twin would be narrow. Besides, the model cannot constitute any safety threat as it is not in a closed-loop.</p> <p>Concerned to the cyber safety, the system will meet the cybersecurity standards.</p> <p><u>Requirement #3. Privacy and Data Governance</u></p> <p>The technical data is processed in local system throughout its creation, application, and storage. It will not be shared external.</p> <p><u>Requirement #4. Transparency</u></p> <p>The quality of the model can be easily quantified, and its decisions monitored. By the nature of the model used, the explainability of the decisions is assured. The accuracy of the model can be monitored by comparing the historical data and the running process.</p> <p><u>Requirement #5. Diversity, Non-discrimination and Fairness</u></p> <p>Based on the data obtained from physical real time machine, no act of discrimination, diversity and fairness has been violated.</p> <p><u>Requirement #6. Societal and Environmental Well-being</u></p> <p>The model is developed to optimize the extreme design conditions and process technologies, therefore no negative impact of the system will be affected on the environment.</p> <p><u>Requirement #7. Accountability</u></p> <p>The data can be stored in the local system and can traced back into account and the data flow has been recorded to trackback.</p>
		<p><i>High-level risk application according to the proposal for a Regulation on Artificial Intelligence (AI Act)</i></p>	<p><b>NO</b></p>	

### 3.3.5 Use Case E

Development of knowledge-based and data-driven decision support systems to select and configure second-life battery modules and their Battery Management System (BMS) depending on the specific second-use requirements and the post-use conditions of re-usable cells.

Table 6 BATTERY Pilot – Use Case E “DSS for LIB de and re-manufacturing” EDPIA

<b>Ethics Impact Assessment</b>				
#	Name	Criterion info	YES/NO	Notes
1	<b>EXTERNAL HUMANS</b>	<i>Involvement and participation of individuals, volunteers and stakeholders external to the research staff</i>	<b>YES</b>	
		<b>Only If external humans involved</b>		<b>Description</b>
		<i>External humans' identification and selection</i>		Determined by their managers
		<i>Inclusion and exclusion criteria for recruitment of external humans</i>		
		<i>Methods used to recruit external humans</i>		
		<i>Clarify whether vulnerable individuals/groups will be involved</i>		Not-involved
		<i>Informed Consent Procedures (Informed Consent Form and Information Sheet)</i>		YES
		<i>Is necessary to obtain an opinions/approvals by ethics committees and/or competent authorities for your planned activities with humans?</i>		NO

2	<b>PERSONAL DATA COLLECTION AND/OR PROCESSING</b>	<i>Collection and/or processing of personal data</i>	<b>NO</b>	No data for “Age, Sex, Experience, Work Related Injuries history, etc.” required. Personnel data will not be shared.
3	<b>ARTIFICIAL INTELLIGENCE</b>	<i>Check the applicability of the Ethics guidelines for trustworthy AI developed by the High-Level Expert Group on AI and of the related Assessment List for Trustworthy AI (ALTAI)</i>	<b>YES</b>	<p><u>Requirement #1. Human Agency and Oversight</u> AI tool modules to merge data available on the battery in terms of materials composition and state-of-health with data characterizing the market quotations to obtain a decision support system that guides operational choices in function of the most profitable expected scenario. Decision managers can examine and simulate different block-box modelling environment with passive process management control.</p> <p><u>Requirement #2. Technical robustness and safety</u> Robustness of the developed tool depends on the data quality and variety. If the model is trained on data that belongs to the same LIB design, the flexibility of the digital twin would be narrow. Besides, the model cannot constitute any safety threat as it is not in a closed-loop. Concerned to the cyber safety, the system will meet the cybersecurity standards.</p> <p><u>Requirement #3. Privacy and Data Governance</u> The data is processed in local system throughout its creation, application, and storage. It will be shared outside and processed only for the tool development in another server.</p> <p><u>Requirement #4. Transparency</u> The quality of the model can be easily quantified, and its decisions monitored. By the nature of the model used, the explainability of the decisions is assured. The accuracy of the model can be monitored by comparing the historical data and the running process.</p> <p><u>Requirement 5: Diversity, Non-discrimination and Fairness</u> The nature of the tool and the data used to train doesn't include biased category that can discriminate anyone.</p>

			<p><u>Requirement #6. Societal and Environmental Well-being</u></p> <p>The model is developed for the application of Advanced data analysis, Analytics of the current and future market situation and Re-construction of missing product life-cycle data. Therefore, the tool has got no negative impact on the environment.</p> <p><u>Requirement #7. Accountability</u></p> <p>The data can be stored in the local system and can traced back into account and the data flow has been recorded to trackback.</p>
		<p><i>High-level risk application according to the proposal for a Regulation on Artificial Intelligence (AI Act)</i></p>	<p><b>NO</b></p>

### 3.4 Petrochemical Pilot

#### 3.4.1 Use Case 1

Table 7 PETRO Pilot - Use Case 1 EDPIA

<b>Ethics Impact Assessment</b>				
#	Name	Criterion info	YES/NO	Notes
1	<b>EXTERNAL HUMANS</b>	<i>Involvement and participation of individuals, volunteers and stakeholders external to the research staff</i>	<b>NO</b>	In this use case, SOCAR’s research staff will participate in data acquisition and representation activities.
2	<b>PERSONAL DATA COLLECTION</b>	<i>Collection and/or processing of personal data</i>	<b>NO</b>	No data for “Age, Sex, Experience, Work Related Injuries history, etc.” required. Personnel data will not be shared.

	<b>AND/OR PROCESSING</b>			
3	<b>ARTIFICIAL INTELLIGENCE</b>	<i>Check the applicability of the Ethics guidelines for trustworthy AI developed by the High-Level Expert Group on AI and of the related Assessment List for Trustworthy AI (ALTAI)</i>	<b>N/A</b>	
		<i>High-level risk application according to the proposal for a Regulation on Artificial Intelligence (AI Act)</i>	<b>No</b>	

**3.4.2 Use Case 2**

In this use case, SOCAR’s research staff will contribute modelling of the EO recovery unit via Aspen Engineering Suite.

Table 8 PETRO Pilot - Use Case 2 EDPIA

<b>Ethics Impact Assessment</b>				
#	Name	Criterion info	YES/NO	Notes
1	<b>EXTERNAL HUMANS</b>	<i>Involvement and participation of individuals, volunteers and stakeholders external to the research staff</i>	<b>NO</b>	In this use case, SOCAR’s research staff will participate in data acquisition and representation activities.
2	<b>PERSONAL DATA COLLECTION AND/OR PROCESSING</b>	<i>Collection and/or processing of personal data</i>	<b>NO</b>	No data for “Age, Sex, Experience, Work Related Injuries history, etc.” required. Personnel data will not be shared.

3	<b>ARTIFICIAL INTELLIGENCE</b>	<i>Check the applicability of the Ethics guidelines for trustworthy AI developed by the High-Level Expert Group on AI and of the related Assessment List for Trustworthy AI (ALTAI)</i>	<b>N/A</b>	
		<i>High-level risk application according to the proposal for a Regulation on Artificial Intelligence (AI Act)</i>	<b>NO</b>	

**3.4.3 Use Case 3**

EO/EG Plant operators will participate in this use case. They were determined as a result of a bilateral meeting with their managers. They already work as a process operator in the control room hence, they are responsible for monitoring the process via DCS. They have process and controlling system experience. They are not recruited for CT project only.

No data for “Age, Sex, Experience, Work Related Injuries history, etc.” required. Personnel data will not be shared.

Table 9 PETRO Pilot – Use Case 3 “Anomaly Detection Tool” EDPIA

<b>Ethics Impact Assessment</b>				
#	Name	Criterion info	YES/NO	Notes
1	<b>EXTERNAL HUMANS</b>	<i>Involvement and participation of individuals, volunteers and stakeholders external to the research staff</i>	<b>Yes</b>	EO/EG Plant operators will participate in this use case. They were determined as a result of a bilateral meeting with their managers. They already work as a process operator in the control room hence, they are responsible for monitoring the process via DCS. They have process and controlling system experience. They are not recruited for CT project only.
		<b>Only If external humans involved</b>		<b>Description</b>

	<i>External humans' identification and selection</i>	Operators determined by their managers	
	<i>Inclusion and exclusion criteria for recruitment of external humans</i>	Inclusion criteria: Experienced in DCS and ESD systems	
	<i>Methods used to recruit external humans</i>	-	
	<i>Clarify whether vulnerable individuals/groups will be involved</i>	Not involved	
	<i>Informed Consent Procedures (Informed Consent Form and Information Sheet)</i>	YES	
	<i>Is necessary to obtain an opinions/approvals by ethics committees and/or competent authorities for your planned activities with humans?</i>	NO	
2	<b>PERSONAL DATA COLLECTION AND/OR PROCESSING</b> <i>Collection and/or processing of personal data</i>	<b>NO</b>	No data for "Age, Sex, Experience, Work Related Injuries history, etc." required. Personnel data will not be shared.
3	<b>ARTIFICIAL INTELLIGENCE</b> <i>Check the applicability of the Ethics guidelines for trustworthy AI developed by the High-Level Expert Group on AI and of the related Assessment List for Trustworthy AI (ALTAI)</i>	<b>YES</b>	<u>Requirement 1: Human Agency and Oversight</u>  The tool is developed to detect process failures and abnormal conditions to support plant operators. This will be an early warning system. It will not have full control on the process management. It will be a support system for the decision making by monitoring process conditions and sensors momentarily and comparing it with historical data. If the alarm generated by the anomaly detection tool is not reliable enough for the plant operator, he/she could ignore the alarm based on his/her experience.  <u>Requirement 2: Technical robustness and safety</u>

			<p>The tool can cause economical and physical harms if its recommendations and warnings are accepted as absolute truths. As it is mentioned before, output of the anomaly detection tool must be evaluated by a plant operator who has experience about the process. At the same time, the lower and the upper limits of the process variables in the detection tool are specified by the process engineers. Hence, it is not possible for detection tool to give an unsafe output. Only, there could be undesirable recommendations as chemical and industrial processes tend to shift another operational state due to a variety of reasons like seasonality, fouling in pipes, and catalyst deactivation.</p> <p><u>Requirement 3: Privacy and Data Governance</u></p> <p>The data is processed in local servers throughout its creation, application, and storage. It cannot be shared outside and processed in another server.</p> <p><u>Requirement 4: Transparency</u></p> <p>The accuracy of the model can be monitored by comparing the model output and the running process. Output of the anomaly detection tool is interpretable as anticipated. The output is kind of a binary result about whether there is an anomaly or not.</p> <p><u>Requirement 5: Diversity, Non-discrimination and Fairness</u></p> <p>The data space is around physical properties of an industrial process. Hence, there is no point that can violate diversity and fairness.</p> <p><u>Requirement 7: Societal and Environmental Well-being</u></p> <p>There is no negative impact of the tool on environment. Theoretically, preventing any process failure may decrease the waste energy consumption, feedstock and equipment life. Hence, it can be considered that it has a positive impact on environment as if the tool could recognize any process failure.</p> <p><u>Requirement 8: Accountability</u></p> <p>The flow of data is stored in local servers, and it can be traced back.</p>
	<p><i>High-level risk application according to the proposal for a</i></p>	<p><b>NO</b></p>	



	Regulation on Artificial Intelligence (AI Act)		
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### 3.4.4 Use Case 4

Table 10 PETRO Pilot - Use Case 4 "AutoML module for Process Industry" EDPIA

<b>Ethics Impact Assessment</b>				
#	Name	Criterion info	YES/NO	Notes
<b>1</b>	<b>EXTERNAL HUMANS</b>	<i>Involvement and participation of individuals, volunteers and stakeholders external to the research staff</i>	<b>Yes</b>	EO/EG Plant operators will participate in this use case. They were determined as a result of a bilateral meeting with their managers. They already work as a process operator in the control room hence, they are responsible for monitoring the process via DCS. They have process and controlling system experience. They are not recruited for CT project only.
		<b>Only If external humans involved</b>		<b>Description</b>
		<i>External humans' identification and selection</i>		Operators determined by their managers
		<i>Inclusion and exclusion criteria for recruitment of external humans</i>		Inclusion criteria: Experienced in DCS and ESD systems
		<i>Methods used to recruit external humans</i>		-
		<i>Clarify whether vulnerable individuals/groups will be involved</i>		Not involved
		<i>Informed Consent Procedures (Informed Consent Form and Information Sheet)</i>		YES
		<i>Is necessary to obtain an opinions/approvals by ethics committees and/or competent</i>		NO

		<i>authorities for your planned activities with humans?</i>	
2	<b>PERSONAL DATA COLLECTION AND/OR PROCESSING</b>	Collection and/or processing of personal data	<b>NO</b> No data for “Age, Sex, Experience, Work Related Injuries history, etc.” required. Personnel data will not be shared.
3	<b>ARTIFICIAL INTELLIGENCE</b>	Check the applicability of the Ethics guidelines for trustworthy AI developed by the High-Level Expert Group on AI and of the related Assessment List for Trustworthy AI (ALTAI)	<b>YES</b> <u>Requirement 1: Human Agency and Oversight</u> The tool is developed to choose the most relevant sensors to create best fitting model to support plant operators. This will be a block-box modelling environment. It will not have full control on the process management. Plant operators and engineers can examine and simulate different conditions on this tool. <u>Requirement 2: Technical robustness and safety</u> Robustness of the developed tool depends on the data quality and variety. If the model is trained on data that belongs to the same operating region for a long time, the flexibility of the digital twin would be narrow. Besides, the model cannot constitute any safety threat as it is not in a closed-loop. <u>Requirement 3: Privacy and Data Governance</u> The data is processed in local servers throughout its creation, application, and storage. It cannot be shared outside and processed in another server. <u>Requirement 4: Transparency</u> The accuracy of the model can be monitored by comparing the model output and the running process. Output of the autoML tool is interpretable for an average plant operator. <u>Requirement 5: Diversity, Non-discrimination and Fairness</u> The data space is around physical properties of an industrial process. Hence, there is no point that can violate diversity and fairness. <u>Requirement 7: Societal and Environmental Well-being</u>

			<p>There is no negative impact of the developed tool on environment. This tool will be designed to improve decision making to reduce the energy consumption of the process. With the decrease in energy consumption, CO2 emissions will also decrease, which will have a positive impact on the environment of AutoML tool.</p> <p><u>Requirement 8: Accountability</u></p> <p>The flow of data is stored in local servers, and it can be traced back.</p>
	<p><i>High-level risk application according to the proposal for a Regulation on Artificial Intelligence (AI Act)</i></p>	<b>NO</b>	

### 3.3.5 Use Case 5- Generation of a tool for process optimization

Table 11 PETRO Pilot - Use Case 5 "Generation of a tool for process optimization" EDPIA

<b>Ethics Impact Assessment</b>				
#	Name	Criterion info	YES/NO	Notes
<b>1</b>	<b>EXTERNAL HUMANS</b>	<i>Involvement and participation of individuals, volunteers and stakeholders external to the research staff</i>	<b>YES</b>	EO/EG Plant operators will participate in this use case. They were determined as a result of a bilateral meeting with their managers. They already work as a process operator in the control room hence, they are responsible for monitoring the process via DCS. They have process and controlling system experience. They are not recruited for CT project only.
		<b>Only If external humans involved</b>		<b>Description</b>
		<i>External humans' identification and selection</i>		Operators determined by their managers
		<i>Inclusion and exclusion criteria for recruitment of external humans</i>		Inclusion criteria: Experienced in DCS and ESD systems

		<i>Methods used to recruit external humans</i>		-
		<i>Clarify whether vulnerable individuals/groups will be involved</i>		NO
		<i>Informed Consent Procedures (Informed Consent Form and Information Sheet)</i>		YES
		<i>Is necessary to obtain an opinions/approvals by ethics committees and/or competent authorities for your planned activities with humans?</i>		NO
2	<b>PERSONAL DATA COLLECTION AND/OR PROCESSING</b>	<i>Collection and/or processing of personal data</i>	<b>NO</b>	No data for “Age, Sex, Experience, Work Related Injuries history, etc.” required. Personnel data will not be shared.
3	<b>ARTIFICIAL INTELLIGENCE</b>	<i>Check the applicability of the Ethics guidelines for trustworthy AI developed by the High-Level Expert Group on AI and of the related Assessment List for Trustworthy AI (ALTAI)</i>	<b>YES</b>	<p><u>Requirement 1: Human Agency and Oversight</u></p> <p>The tool is developed to optimize the running plant conditions to support plant operators. It will not have full control on the process management. It will be a support system for the decision making by monitoring process conditions and sensors momentarily and maximizing the profitability of the plant. If the recommendations generated by the optimization tool is not reliable enough for the plant operator, he/she could ignore the recommendation based on his/her experience.</p> <p><u>Requirement 2: Technical robustness and safety</u></p> <p>The tool can cause economical and physical harms if its recommendations and warnings are accepted as absolute truths. As it is mentioned before, output of the optimization tool has to be evaluated by a plant operator who has past experience about the process. At the same time, the lower and the upper limits of the process variables in the optimization tool are specified by the process engineers. Hence, it is not possible for detection tool to give an unsafe output. Only, there could be undesirable</p>

				<p>recommendations as chemical and industrial processes tend to shift another operational state due to a variety of reasons like seasonality, fouling in pipes, and catalyst deactivation.</p> <p><u>Requirement 3: Privacy and Data Governance</u></p> <p>The data is processed in local servers throughout its creation, application, and storage. It cannot be shared outside and processed in another server.</p> <p><u>Requirement 4: Transparency</u></p> <p>The accuracy of the model can be monitored by comparing the model output and the running process. Output of the optimization tool is interpretable as for an average plant operator.</p> <p><u>Requirement 5: Diversity, Non-discrimination and Fairness</u></p> <p>The data space is around physical properties of an industrial process. Hence, there is no point that can violate diversity and fairness.</p> <p><u>Requirement 7: Societal and Environmental Well-being</u></p> <p>There is no negative impact of the tool on environment. This tool will be designed to optimize the energy consumption of the process. With the decrease in energy consumption, CO2 emissions will also decrease, which will have a positive impact on the environment of Optimization tool.</p> <p><u>Requirement 8: Accountability</u></p> <p>The flow of data is stored in local servers, and it can be traced back.</p>
		<p><i>High-level risk application according to the proposal for a Regulation on Artificial Intelligence (AI Act)</i></p>	<p><b>NO</b></p>	

## 4 Conclusion and Future Outlook

In this document, the outcomes of the first iteration of the ethics assessment and analysis of the project activities and initial results are described, thereby monitoring their alignment with the Circular TwAIn Ethical Policy set at the beginning of the project and defined in D1.2 - *Ethics Analysis, Governance and Guidelines – 1st version*. This assessment was aimed at ensuring that the project's technological assets under development and the corresponding piloting operations are legally compliant and ethically-sound, and thereby contribute to trustworthiness

For this purpose, besides describing the ethics-related work performed by the Consortium in the different work-packages and tasks, due to the transversal nature of the legal and ethical activities and the holistic approach adopted in this regard, the deliverable also comprises a snapshot of the Ethics and Data Protection Impact Assessments conducted by the pilot partners, taking into account the different solutions and use cases.

Such EDPIAs were conducted for each of the Circular TwAIn Industrial Pilots, following the methodology described in section 2.6 of D1.2 “Ethics Analysis, Governance and Guidelines – First Version”. Such methodology is aimed at effectively supporting accountability and allowing the pilot partners to demonstrate due diligence in taking adequate actions to ensure full compliance on an ongoing basis, and rotating around three building blocks: the human Involvement in the piloting activities, the personal data collection and/or processing, and the ALTAI-driven check on the applicability of the Ethics guidelines for trustworthy AI and the classification or not of the AI system to be used in the pilot as a high-risk solution according to the AI Act classification. The EDPIA are complementary to the Human Rights Impact Assessment of the AI solutions of the project pilots, which are depicted in D7.3 Liaison with AI4MAN Ecosystem, Didactic Factories Network, Legal and Ethical issues - First Version. The next release of such document, namely D7.8 Liaison with AI4MAN Ecosystem, Didactic Factories Network, Legal and Ethical issues – Second Version, planned at the end of the project, will outline both the final release of the EDPIAs and of the HRIA, giving rise to the comprehensive human-centric and trustworthy framework for the Circular TwAIn Pilots, resulting from the development of the Regulatory Sandboxes for experimenting applied AI scenarios with regulatory and ethical issues especially concerning AI and Human-AI interaction.

## 5 References

- [1] Circular TwAI "D1.2 "Ethical Analysis, Governance and Guidelines – 1st version", 2022.
- [2] Circular TwAI D3.1 "Conceptual Framework and Reference Architecture - 1st version", 2022.
- [3] Circular TwAI D3.2 "Data Space and Digital TwAIs Design - 1st version", 2022.
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- [6] H. L. E. G. o. AI, «Assessment List for Trustworthy Artificial Intelligence (ALTAI) for self-assessment,» 2020.
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