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GREEN-LOOP

Sustainable manufacture systems towards novel bio-based materials

WP8 – Communication, Dissemination and Training

D8.13 – Final report on Health and safety conditions of GREEN-LOOP [M36]

Document information

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GREEN-LOOP Key Facts

Project title	Sustainable manufacture systems towards novel bio-based materials
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Duration in months	36
Call (part) identifier	TWIN GREEN AND DIGITAL TRANSITION 2021 (HORIZON-CL4-2021-TWIN-TRANSITION-01)
Topic	HORIZON-CL4-2021-TWIN-TRANSITION-01-05 Manufacturing technologies for bio-based materials (Made in Europe Partnership) (RIA)
Consortium	17 organizations: 15 from EU Member States + 2 from UK

GREEN-LOOP Consortium Partners

	Partner	Acronym	Country
1	IDENER RESEARCH & DEVELOPMENT	IDE	ES
2	NATIONAL INSTITUTE OF CHEMISTRY	NIC	SI
3	SLOVENIAN NATIONAL BUILDING AND CIVIL E. I.	ZAG	SI
4	FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V	FHF	DE
5	GUALA CLOSURES	GUALA	IT
6	MIXCYCLING	MYX	IT
7	NSBPROJECT SRL	NSB	IT
8	LE TERRE DI ZOE'	TDZ	IT
9	IRIS TECHNOLOGY SOLUTIONS, SOCIEDAD LIMITADA	IRIS	ES
10	GLOWNY INSTYTUT GORNICTWA	GIG	PL
11	AACHEN UNIVERISTY: PROCESS CONTROL ENGINEERING / AACHEN UNIVERISTY: INSTITUTE OF SOCIOLOGY	AAU	DE
12	AUSTRIAN STANDARDS INTERNATIONAL	ASI	AT
13	INSTITUTO DE SOLDADURA E QUALIDADE	ISQ	PT
14	AXIA INNOVATION UG	AXIA	DE
15	ASOCIACIÓN DE INVESTIGACIÓN METALÚRGICA DEL NOROESTE	AIMEN	ES
16	NATIONAL COMPOSITE CENTER	NCC	UK
17	UNIVERSITY OF BRISTOL	UBRIS	UK

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Executive Summary

The GREEN-LOOP project has demonstrated the potential for circular economy principles to drive innovation in the bio-based product sector. To avoid issues related to the exploitation of products, the terms of standard regulations for Occupational Safety & Health (OSH) will be considered from the project's inception. NSB is responsible for conducting a study of current and forthcoming directives affecting manufacturing processes and the expected bio-based materials and products to be developed in GREEN-LOOP.
This study, initiated in month 9 (M9), has continued through to month 36 (M36), integrating technical specifications generated during the activities carried out under Task 1.2.

Deliverable 8.13 “Final report on Health and Safety Conditions of GREEN-LOOP (M36)” updates the Dev8.12 - " Health and Safety Conditions of GREEN-LOOP (M24)", with the most up-to-date information, to identify new risks and anticipate changes that could impact OSH.
The deliverable adheres to the following structure:

- Chapter 1 introduces OSH practices, the EU-OSHA Strategic Lines of Action and the OiRA platform;
- Chapters 2 and 3 outline the main EU and UK regulations for OSH in bio-value chains that remain in force, along with updates from the last 12 months;
- Chapter 4 focuses on the implementation of OSH practices in the manufacturing process, summarizing the regulations and standards applied by project partners;
- Chapters 5, 6, 7, and 8 delve into OSH in the manufacturing processes of the GREEN-LOOP project, specifically analysing the three value chains involved: bio-rubber, bio-plastic, and wood composites;
- Chapter 9 highlights the main challenges identified by partners in implementing OSH measures;
- Chapter 10 presents the actions taken, training recommendations, and best practices shared by GREEN-LOOP partners regarding OSH;
- Chapter 11 presents the results of the follow-up questionnaire on gender and diversity in occupational safety and health (OSH) and sets out recommendations for improving inclusive safety practices across the consortium.

The methodology for the OSH study and the planned actions for the GREEN-LOOP value chains are presented.
A questionnaire has been developed and distributed via Microsoft Forms to all partners in month 32 to analyse any updates over the past 12 months on the level of OSH implemented within their R&D activities.

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The questionnaire specifically regarded:

- European and/or National Directives and Standards for Safety & Health in the workplace of GREEN-LOOP partners;
- Occupational Safety & Health in GREEN-LOOP's value chains;
- OSH checklist implementation and continuous improvement;
- Collecting OSH Final evaluation and Recommendation by partners;
- Gender & Diversity Dimension

Nearly all partners contributed to the questionnaire, providing valuable input on areas for improvement in the implementation of OSH measures, the application of the OSH and Gender Dimension Checklists, and the most significant aspects related to Gender and Diversity.
Partners were invited to either complete the questionnaire themselves or to forward it to staff members with relevant expertise—such as Health, Safety and Environment (HSE) managers, Human Resources managers, or Safety Officers—or to complete it in collaboration with them.
Given the differing relevance of certain topics to each organisation, respondents were able to indicate when a question did not apply to their specific activities or context. For this reason, a 'Not Applicable' (N/A) option was included where appropriate, both for closed-ended and open-ended questions.

Deliverable 8.13 is the final report on Occupational Safety and Health (OSH) for the GREEN-LOOP project. It incorporates the latest legislative framework as of May 2025 and has been prepared in consultation with legal experts and/or relevant regulatory authorities to ensure it aligns with current EU and UK standards and best practices.

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Abbreviations

BE	Bioeconomy
CBE	Circular Bioeconomy
EEC	European Economic Community
CE	Circular Economy
EU	European Union
EU-OSHA	European Union - information agency for occupational safety and health
OiRA	Online interactive Risk Assessment
OSH	Occupational Safety and Health
REACH	EU regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals
SBR	Styrene Butadiene Rubber
IIR	Isobutylene Isoprene Rubber
SCA	Strategic Circular Actions
UK	United Kingdom
GRI	Global Reporting Initiative
ILO	International Labour Organization
GPSR	General Product Safety Regulation
COSHH	Control of Substances Hazardous to Health
HSE	Health and Safety Executive
HSL	Health and Safety Laboratory
ECHA	European Chemical Agency
BPA	Bisphenol A
ISO	International Organization for Standards
OELs	Occupational Exposure Limits
OES	Occupational Exposure Standards
MEL	Maximum Exposure Limits
GMOs	Genetically Modified Organisms
UNI	Ente Italiano di Normazione
PdR	Pratica di Riferimento
PMV	Predicted mean vote
PPD	Predicted percentage of dissatisfied
IEC	International Electrotechnical Commission

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PPE	Personal Protective Equipment
VC	Value Chain
ILO	International Labour Organization
ENSHPO	The European Network of Safety and Health Professional Organizations
NEBOSH	The National Examination Board in Occupational Safety and Health
RRI	Responsible Research and Innovation

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1. Introduction

The transition to a circular economy (CE) is pivotal to the EU's objective of achieving carbon neutrality by 2050, fostering sustainable growth, and generating employment opportunities. However, this shift also carries substantial policy and regulatory implications that will impact future job roles, including their potential consequences for workers' safety and health. For instance, the transformation of hazardous sectors, such as maintenance, repair, disassembly, and recycling, may worsen working conditions. Furthermore, changes in organisational processes or task redesigns could influence job content and employee satisfaction.
A notable example of CE in action is the GREEN-LOOP project, which provides bio-based material solutions through innovative manufacturing techniques such as artificial intelligence, microwave, and ultrasound. The project focuses on three value chains:

- Multifunctional rubber panels with fire resistance and anti-vibrational properties for civil applications
- Bioplastic bottle closures for the packaging, food, and beverage sectors
- Wood composites to produce sliding bearings for the manufacturing sector.

EU-OSHA provides a range of tools to support organisations in monitoring workplace risks. During the General Assembly held in Bristol (UK) in March 2025, the Strategic Lines of Action of EU-OSHA, along with the OiRA platform, were presented to project partners for their consideration.
As part of the related questionnaire, partners were asked whether they were familiar with these initiatives and to what extent they had been implemented within their respective organisations. The following subsections offer an overview of these initiatives and describe how GREEN-LOOP partners are applying them in practice.

1.1 The EU-OSHA Strategic Lines of Action

The EU-OSHA has established three interlinked strategic lines of action to enhance its operational effectiveness in promoting OSH across Europe. These strategic directions serve to guide the agency's work by identifying where its efforts can make the greatest impact, ensuring alignment with its regulatory mandate and the priorities outlined in multi-annual and annual work programmes. Given the broad nature of its mission and the constraints on available resources, EU-OSHA focuses on areas where it can add the most value.

The three strategic pillars strengthen one another, collectively supporting the agency's contribution to overarching European Union objectives such as the EU Strategic Framework on Health and Safety at Work 2021–2027, the twin digital and green transitions, and the principles set out in the European Pillar of Social Rights:

1- **Generating evidence and knowledge for policy and research:** EU-OSHA plays a key role in supporting public policy by conducting research that contributes to better understanding of OSH challenges and trends. This includes collecting new data through workplace surveys, comparing conditions across countries and sectors, and undertaking thematic studies to inform both policy development and implementation. Foresight work is also critical, helping to anticipate emerging risks and support preparedness. To ensure credibility, EU-OSHA follows rigorous methodological standards and shares its findings transparently. Awareness-raising and the promotion of research uptake at national level are facilitated primarily through the agency's Focal Points.

2- Developing tools and resources to support prevention and awareness: Another priority for EU-OSHA is to provide practical solutions that help organisations comply with safety regulations and prevent workplace risks. This involves the creation and promotion of guidelines, good practices, and ready-to-use tools, often developed in collaboration with intermediaries such as sectoral associations and national authorities. These resources are especially valuable in adapting existing knowledge to the specific needs of individual countries or industries. Ensuring that these tools are grounded in research and widely accessible is essential for effective implementation.

3- Strengthening networks to promote a positive OSH culture
Raising awareness and encouraging cultural change in OSH practices complements legal and regulatory enforcement. EU-OSHA engages with its networks to run information campaigns, produce multilingual content, and support dissemination through national and sectoral partners. Focal Points, with their proximity to local stakeholders and communication expertise, are instrumental in ensuring that key messages reach workplaces. The agency also strengthens its presence through digital platforms and international collaborations where relevant.

The GREEN-LOOP project aligns closely with all three of EU-OSHA's strategic areas, demonstrating the consortium's shared commitment to improving occupational safety and health in research and manufacturing environments:
FHF and NCC have underscored the importance of the first strategic line; GUALA embodies the third strategic line; ZAG considers the second line particularly pertinent for its organisation; UBRIS aligns its practices with both the first and third lines; AIMEN recognise the relevance of all three lines of action.
IRIS contributes to the first strategic line through regular participation in EU-funded research projects, scientific publications, and innovation in OSH-related data analytics.
ISQ also aligns with all three lines. As a consultancy firm, it applies OSH principles internally and offers expert advice to other organisations both in Portugal and abroad, helping to mainstream OSH across different contexts.

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GiG finds all three strategic lines relevant to its mission. However, it particularly aligns with the first: as a scientific research institute, it conducts applied studies, risk assessments, and policy-relevant analyses. Moreover, GiG incorporates EU-OSHA tools and campaigns into its operations and fosters international collaboration to promote a robust safety culture.

1.2 EU-OSHA Online interactive Risk Assessment

OiRA (Online interactive Risk Assessment) is a digital platform managed by the EU-OSHA and designed to support the development of tailored risk assessment tools for different sectors. The platform, available in various languages and following a user-friendly, standardised approach, is inspired by a workplace risk assessment method originally developed in the Netherlands.

Initially developed by EU-OSHA to support micro and small enterprises in managing occupational risks, the OiRA platform has proven to be a highly adaptable solution that can also meet the needs of large, complex organisations.

A notable case study involves a multinational car manufacturer that has successfully implemented the tool across its operations, demonstrating the software's flexibility and broader potential. The case study explores how the company tailored OiRA to coordinate risk assessments across multiple sites and countries. Early challenges included aligning the software with internal procedures and ensuring consistency across languages and legal contexts. However, through a systematic adaptation of the tool, the company was able to establish a streamlined process that not only enhanced compliance but also fostered employee participation. This inclusive approach contributed to a stronger culture of prevention and accountability throughout the organisation. Beyond improving occupational safety and health outcomes, the initiative brought tangible benefits such as cost reductions related to workplace accidents and absenteeism. Moreover, by developing a multilingual version of the platform, the company laid the groundwork for wider adoption across its international branches. The experience illustrates how a customisable tool like OiRA can go beyond its original scope, serving as a valuable resource for multinationals aiming to implement consistent, effective risk management strategies at scale. The platform itself is structured around two main components: a generator for developing sector-specific tools, made freely available to public authorities and sectoral partners, and a collection of ready-to-use tools that guide users through a step-by-step risk assessment process.

Co-created with national authorities and social partners, these resources promote a clear, accessible approach to risk management, helping companies meet legal obligations and align with European strategies for safer, healthier, and more resilient workplaces.

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Based on follow up questionnaire's responses, awareness and use of OiRA tools among GREEN-LOOP partners vary.

MYX is aware of the existence of OiRA but has not yet applied it within its operational practices; NCC also acknowledges the platform but considers the existing tools insufficiently tailored to the specifics of its industry; IRIS is aware of OiRA and uses it mainly for documentation and reporting purposes, rather than as a core operational tool.

The remaining partners have not explored OiRA in depth and therefore have not integrated it into their risk management processes.

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2. Main EU regulations for OSH in bio-value chains

The main EU regulations for Occupational Safety and Health (OSH) relevant to bio-value chains include a range of directives and regulations designed to ensure the safety and health of workers across various industries, including those involved in bio-based product manufacturing.
Here are some of the key regulations, already analysed in the Dev8.11 "Report on Occupational safety and health for GREEN-LOOP manufacture systems (M14)" and reported in the Dev8.12 "Health and Safety in GREEN-LOOP" (M24)":

- **Framework Directive 89/391/EEC on the Introduction of Measures to Encourage Improvements in the Safety and Health of Workers at Work**: This is the cornerstone of European OSH legislation, setting out the basic principles for encouraging improvements in the safety and health of workers. It requires employers to evaluate risks, take preventive measures, and ensure the safety and health of workers.
- **Directive 98/24/EC on the Protection of the Health and Safety of Workers from the Risks Related to Chemical Agents at Work**: This directive provides specific requirements for protecting workers from risks related to chemical agents, which is particularly relevant for bio-based industries where chemical processing may occur.
- **Directive 2004/37/EC on the Protection of Workers from the Risks Related to Exposure to Carcinogens or Mutagens at Work**: This directive sets out measures to protect workers from exposure to carcinogens and mutagens, requiring employers to assess risks and implement control measures to minimize exposure.
- **Directive 2000/54/EC on the Protection of Workers from Risks Related to Exposure to Biological Agents at Work**: This directive covers the risks associated with exposure to biological agents, which is highly relevant for bio-based industries. It requires employers to assess and control exposure to biological agents, implement health surveillance, and provide appropriate training and information to workers.
- **Regulation (EC) No 1907/2006 Concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)**: REACH aims to protect human health and the environment from the risks posed by chemicals. It includes provisions for the safe use of chemicals throughout their life cycle, from manufacture to disposal, and is crucial for ensuring the safety of chemical substances used in bio-based products.
- **Directive 2012/18/EU on the Control of Major Accident Hazards Involving Dangerous Substances (Seveso III Directive)**: This directive aims to prevent major accidents involving dangerous substances and limit their

consequences for human health and the environment. It applies to establishments where dangerous substances are used or stored, which may include certain bio-based production facilities.

- **Directive 90/269/EEC on the Minimum Health and Safety Requirements for the Manual Handling of Loads Where There is a Risk Particularly of Back Injury to Workers**: This directive sets out requirements for the safe manual handling of loads, a common activity in many industrial processes, including bio-based manufacturing.
- **Directive 2002/44/EC on the Minimum Health and Safety Requirements Regarding the Exposure of Workers to the Risks Arising from Physical Agents (Vibration)**: This directive establishes minimum requirements to protect workers from risks related to exposure to mechanical vibrations, which can be relevant in certain bio-based processing activities. These regulations collectively aim to ensure a high level of protection for workers in the bio-value chain, addressing a range of hazards from chemical and biological risks to ergonomic and physical agents. Compliance with these directives and regulations is essential for maintaining a safe and healthy working environment in bio-based industries.
- **GRI 403 Standard: Occupational Health and Safety 2018**: The Global Reporting Initiative updated its occupational health and safety reporting standard to focus more on preventative measures and recovery from occupational injuries. This revision aims to improve the management and reporting of workplace safety across different sectors, including adapting to the needs of the gig economy (GRI 403: Occupational Health and Safety).
- **BG.349/INS/8 – Global Strategy on Occupational Safety and Health 2024-2030**: Published on October 2023, the International Labour Organization (ILO) has launched a comprehensive plan of action and its implementation on improving workplace safety and health worldwide. This strategy is part of a broader effort to promote decent work conditions and social justice globally (International Labour Organization).
- **General Product Safety Regulation (GPSR)**: Effective from December 13, 2024, the GPSR replaces the current General Product Safety Directive and the Food Imitating Product Directive. It modernizes the EU product safety framework to address new challenges, particularly those posed by digitalization and online sales. It establishes specific safety obligations for economic operators and providers of online marketplaces, reinforces product traceability requirements, and mandates accident reporting to authorities. The regulation ensures all consumer products in the EU market are safe, regardless of the sales channel (EUR-Lex).
- **Biotechnology and Biomanufacturing Framework**: The EU is focusing on boosting biotechnology and biomanufacturing to address societal and environmental challenges. This includes creating a supportive regulatory

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framework and financing opportunities to enhance the EU's competitive edge and sustainability in the bio-based sector. The framework also emphasizes the development of novel bio-based materials with improved sustainability and functionality (EUR-Lex) (Commission Communication on biotechnology and biomanufacturing).

- **New Standards for Biodegradable Plastics:** The EU has introduced new standards for the sourcing, labelling, and use of biobased, biodegradable, and compostable plastics. These standards aim to clarify the environmental benefits and conditions under which these materials can be used, promoting a unified understanding across the EU. This framework is part of broader initiatives under the European Green Deal and Circular Economy Action Plan (Biobased, biodegradable and compostable plastics) (European Bioplastics e.V.).
- **ISO 45001:2018 Amendment – Occupational health and safety management systems — Requirements with guidance for use Amendment 1: Climate action changes**: In 2024, this standard, which governs occupational health and safety management systems, was amended to include guidelines for addressing climate change impacts. This amendment emphasizes the need for businesses to integrate climate action into their safety management practices (ISO Standards). The standard will be replaced by ISO/AWI 45001 Occupational health and safety management systems — Requirements with guidance for use, still under development.

2.1. Updates of EU regulations and standards

In this section are outlined the most recent updates on EU regulations and standard relevant to OSH in bio-value chains, highlighting the key changes and implications for partners' operations:

- **COMMISSION REGULATION (EU) 2024/3190 of 19 December 2024** on the use of bisphenol A (BPA) and other bisphenols and bisphenol derivatives with harmonised classification for specific hazardous properties in certain materials and articles intended to come into contact with food, amending Regulation (EU) No 10/2011 and repealing Regulation (EU) 2018/213 (Regulation - EU - 2024/3190 - EN - EUR-Lex).
  According to responses gathered in M32, partners such as FHF, ZAG, UBRIS, AIMEN and IRIS were already familiar with this legislation and its requirements. GUALA have applied the Regulation in the last 12 months.
- **ECHA Update the SVHC Substances of Very High Concern** (Candidate List of substances of very high concern for Authorisation - ECHA) **(GUALA)**

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- **Commission Regulation (EU) 2025/351 of 21 February 2025** amending Regulation (EU) No 10/2011 on plastic materials and articles intended to come into contact with food, amending Regulation (EU) 2022/1616 on recycled plastic materials and articles intended to come into contact with foods, and repealing Regulation (EC) No 282/2008, and amending Regulation (EC) No 2023/2006 on good manufacturing practice for materials and articles intended to come into contact with food as regards recycled plastic and other matters related to quality control and manufacturing of plastic materials and articles intended to come into contact with food (Regulation - EU - 2025/351 - EN - EUR-Lex).
  This regulation is especially relevant to organisations such as GUALA and MYX, which handle materials intended for food contact.
- **General Product Safety Regulation (GPSR)**: Based on feedback collected in M32, partners including FHF, ZAG, IRIS, ISQ and GUALA have integrated its provisions into their operations. Most partners are aware of the regulation; however, some clarified that it does not apply to their context, either because their products fall outside its scope or because they operate in the services sector and do not place consumer goods on the EU market.

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3. Main UK regulations for OSH in bio-value chains

The United Kingdom has a robust legal framework to ensure OSH across various industries, including bio-value chains. These regulations aim to protect workers from various hazards associated with biological and chemical agents, ensuring a safe and healthy work environment. Here are some key regulations and directives relevant to OSH in bio-value chains in the UK.

- **Key Regulations and Directives Health and Safety at Work Act 1974**. This foundational law sets out the general duties employers have towards employees and the public, as well as the duties employees have to themselves and to each other. It is the cornerstone of health and safety legislation in the UK (Eisner, 1995).
- **Control of Substances Hazardous to Health (COSHH) Regulations 2002**. COSHH requires employers to control substances that can harm workers' health. This includes conducting risk assessments, implementing control measures, and ensuring proper training and information for employees (Topping, 2001; Harrison, 1991).
- **Biomonitoring and Surveillance**. The UK HSL supports the HSE by conducting research and providing analytical services for biomonitoring, which includes developing biological monitoring guidance values for various substances (Cocker et al., 2007).
- **Pesticides and Chemical Safety**. UK legislation on pesticides, though sometimes less stringent than in other parts of Europe, aims to balance environmental and occupational health through various control standards (Watterson, 1990).
- **Occupational Exposure Limits (OELs)**. The UK sets OELs for chemicals through the COSHH regulations, including OES and MEL. These limits help employers control inhalation exposures and protect workers from harmful substances (Topping, 2001).
- **Biotechnology and Biosafety**. The regulation of biotechnology in the UK includes stringent safety measures for the use of GMOs and other bio-industrial processes. This includes ensuring containment and managing effluents from bio-industrial activities (Hambleton et al., 1994).
- **Occupational Health Services**. Occupational health services in the UK have evolved to focus more on preventing ill-health due to workplace factors rather than just treating medical conditions on-site. This includes complying with health and safety legislation and integrating multidisciplinary approaches (Aw, 2001).

3.1 Updates of UK regulations and standards

Based on the results of the questionnaire submitted to the partners, no significant updates regarding regulations and standards in the UK relevant to GREEN-LOOP project were highlighted.

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4.OSH focusing on manufacturing processes of GREEN-LOOP

The questionnaire developed and distributed to GREEN-LOOP partners involved in the three value chains sought to assess the extent to which OSH measures are embedded within their research and development activities.
According to the data collected at Month 32, partner organisations engaged in the manufacturing of bio-based products have had to adapt to new national regulations and standards pertaining to OSH. These organisations demonstrate a strong commitment to ensuring worker safety and well-being by allocating dedicated resources and personnel, and by fostering worker participation in safety initiatives. The role of the OSH manager is central, with responsibility for maintaining a safe work environment and accountability to senior management. Their competence is continually enhanced through participation in professional training programmes.

In the past year, partners of the GREEN-LOOP project have actively monitored and refined their OSH practices.
NIC has prioritised regular educational initiatives aimed at improving employee awareness and understanding of safety protocols, ensuring a culture of ongoing learning in the workplace. Similarly, NCC has reported a constant evolution of its OSH practices, which are continuously adapted to suit the dynamic nature of its production environment.
GUALA, demonstrating a highly structured approach to occupational safety, has achieved several important certifications, including ISO 45001, ISO 22000, ISO 14001 and UNI/PdR 125, thereby formalising its commitment to health, safety, environmental, and food safety management systems.
ZAG has reviewed and updated obsolete risk assessment procedures and has improved the procurement processes for personal protective equipment, ensuring that employees have access to up-to-date and appropriate tools for safe working conditions.
TDZ has focused on delivering safety training courses and conducting systematic checks on equipment to ensure compliance with relevant OSH standards.
GiG has maintained robust OSH practices through regular risk assessments, protocol updates aligned with technological and legislative developments, and continuous staff training. As a state research institute, it also integrates insights from EU projects into its internal OSH strategies, reinforcing a culture of continuous improvement.
UBRIS has ensured ongoing compliance with UK government directives through continued monitoring of national OSH guidelines and implementing updates

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where necessary. This has contributed to maintaining safe operational conditions, particularly in relation to their manufacturing and testing facilities.

Over the past 12 months, all GREEN-LOOP partners directly involved in or affected by OSH matters have implemented feedback and continuous improvement mechanisms to strengthen their OSH systems.
ASI has ensured the regular inspection of its workplaces, thereby reinforcing compliance and identifying areas for improvement.
NIC has continued to invest in regular educational initiatives aimed at maintaining high levels of awareness and engagement among employees regarding OSH protocols.
NCC has enhanced its internal management processes through the adoption of a SharePoint-based business system, enabling more effective tracking and coordination of OSH-related activities.
TDZ has planned the introduction of dedicated safety training courses and intends to implement monthly checks on equipment conditions, ensuring the timely identification of potential risks.
At GiG, a robust feedback loop has been established involving employees, technical staff, and safety officers. Regular safety meetings, internal audits, and incident reporting are used to collect insights, which are then systematically analysed to update safety protocols, refine training programmes, and introduce corrective or preventive measures. The institute follows a structured cycle of assessment, action, and review to ensure that its OSH management system remains responsive to operational demands and in step with legal and technological developments.
Finally, UBRIS has maintained a structured liaison between its Technical Team, responsible for risk assessment, and the Faculty Health and Safety Officer, fostering coordinated implementation and oversight of OSH practices in line with UK regulations.

These insights reflect the diversity of operational roles within the GREEN-LOOP consortium and confirm the importance of tailoring OSH approaches to the specific functions and responsibilities of each partner. While partners involved in manufacturing processes demonstrate a proactive and structured approach to OSH, those in service-based roles maintain a contextual awareness of its relevance across the broader value chain.

4.1 International occupational safety legislation

To manage risks and continuously improve existing OSH practices in their production facilities, over the last 12 months all partners directly involved in the production processes developed or validated in the GREEN-LOOP project have

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implemented the following legislation or standards for International Occupational Safety.

Standard(s)/Regulation(s) applied	Partner
EN 1363-1:2020 - Y. 2020 - Fire resistance tests - Part 1: General Requirements	GUALA
EN 13501-1:2018 - Y. 2018 - Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests EN 13501-2:2016 - Y. 2016 - Fire classification of construction products and building elements - Part 2: Classification using data from fire resistance tests, excluding ventilation services	ZAG
EN 1363-1:2020 - Y. 2020 - Fire resistance tests - Part 1: General Requirements EN 1363-2:1999 - Y. 1999 - Fire resistance tests - Part 2: Alternative and additional procedures EN 13501-1:2018 - Y. 2018 - Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests EN 13501-2:2016 - Y. 2016 - Fire classification of construction products and building elements - Part 2: Classification using data from fire resistance tests, excluding ventilation services EN 12845:2015+A1:2019 - Y. 2019 - Fixed firefighting systems - Automatic sprinkler systems - Design, installation and maintenance EN 16798-3:2017 - Y. 2017 - Energy performance of buildings - Ventilation for buildings - Part 3: For non-residential buildings - Performance requirements for ventilation and room-conditioning systems (Modules M5-1, M5-4) EN 16798-1:2019 - Y. 2019 - Energy performance of buildings - Ventilation for buildings - Part 1: Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics - Module M1-6 ISO 10551:2019 / EN ISO 10551:2019 - Y. 2019 - Ergonomics of the physical environment — Subjective judgement scales for assessing physical environments ISO 7730:2005 (Expected to be replaced by ISO/FDIS 7730 within the coming months) / EN ISO 7730:2005 - Y. 2005 - Ergonomics of the thermal environment - Analytical determination and	GiG

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interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria (ISO 7730:2005) EN 12464-1:2021 - Y. 2021 - Light and lighting - Lighting of workplaces - Part 1: Indoor workplaces	
EN 1363-1:2020 - Y. 2020 - Fire resistance tests - Part 1: General Requirements EN 13501-1:2018 - Y. 2018 - Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests EN 16798-3:2017 - Y. 2017 - Energy performance of buildings - Ventilation for buildings - Part 3: For non-residential buildings - Performance requirements for ventilation and room-conditioning systems (Modules M5-1, M5-4) EN 16798-1:2019 - Y. 2019 - Energy performance of buildings - Ventilation for buildings - Part 1: Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics - Module M1-6	UBRIS
EN 12433-1:1999 - Y. 1999 - Industrial, commercial and garage doors and gates - Terminology - Part 1: Types of doors EN 12433-2:1999 - Y. 1999 - Industrial, commercial and garage doors and gates - Terminology - Part 2: Parts of doors EN 1363-1:2020 - Y. 2020 - Fire resistance tests - Part 1: General Requirements EN 1363-2:1999 - Y. 1999 - Fire resistance tests - Part 2: Alternative and additional procedures EN 13501-1:2018 - Y. 2018 - Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests EN 13501-2:2016 - Y. 2016 - Fire classification of construction products and building elements - Part 2: Classification using data from fire resistance tests, excluding ventilation services EN 3-7:2004+A1:2007 - Y. 2007 - Portable fire extinguishers - Part 7: Characteristics, performance requirements and test methods EN 12845:2015+A1:2019 - Y. 2019 - Fixed firefighting systems - Automatic sprinkler systems - Design, installation and maintenance	AIMEN

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EN 16798-3:2017 - Y. 2017 - Energy performance of buildings - Ventilation for buildings - Part 3: For non-residential buildings - Performance requirements for ventilation and room-conditioning systems (Modules M5-1, M5-4) EN 16798-1:2019 - Y. 2019 - Energy performance of buildings - Ventilation for buildings - Part 1: Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics - Module M1-6 ISO 10551:2019 / EN ISO 10551:2019 - Y. 2019 - Ergonomics of the physical environment — Subjective judgement scales for assessing physical environments ISO 7730:2005 (Expected to be replaced by ISO/FDIS 7730 within the coming months) / EN ISO 7730:2005 - Y. 2005 - Ergonomics of the thermal environment - Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria (ISO 7730:2005) EN 12464-1:2021 - Y. 2021 - Light and lighting - Lighting of workplaces - Part 1: Indoor workplaces	

4.2 Legislation or standards for machinery

To manage risks and continuously improve existing OSH practices in their production facilities, over the last 12 months all partners directly involved in the production processes developed or validated in the GREEN-LOOP project have implemented the following legislation or standards for Machinery.

Standard(s)/Regulation(s) applied	Partner
ISO 12100: 2010 / EN ISO 12100:2010 - Y. 2010 - Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010) EN IEC 60900:2018/AC:2020-05 IEC 60900:2018/COR2:2020 - Y. 2020 - Live working - Hand tools for use up to 1 000 V AC and 1 500 V DC ISO 13849-1:2015 EN ISO 13849-1:2015 - Y. 2015 - Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1:2015) ISO 14120:2015 / EN ISO 14120:2015 - Y. 2015 - Safety of machinery - Guards - General requirements for the design and construction of fixed and movable guards (ISO 14120:2015)	MYX

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EN 60529:1991 / EN 60529:1991/corrigendum May 1993 / IEC 60529:1989 - Y. 1993 - Degrees of protection provided by enclosures (IP Code) EN ISO 13855:2010 / ISO 13855:2010 - Y. 2010 - Safety of machinery - Positioning of safeguards with respect to the approach speeds of parts of the human body (ISO 13855:2010) EN 60204-1:2018 / IEC 60204-1:2016 - 2018/2016 - Safety of machinery - Electrical equipment of machines - Part 1: General requirements ISO 13732-1:2006 / EN ISO 13732-1:2008 - 2006/2008 - Ergonomics of the thermal environment - Methods for the assessment of human responses to contact with surfaces - Part 1: Hot surfaces (ISO 13732-1:2006) ISO 13732-3:2005 / EN ISO 13732-3:2008 - 2005/2008 - Ergonomics of the thermal environment - Methods for the assessment of human responses to contact with surfaces - Part 3: Cold surfaces (ISO 13732-3:2005) EN 847-1:2017 - Y. 2017 - Tools for woodworking - Safety requirements - Part 1: Milling tools, circular saw blades EN 60204-32:2008 / IEC 60204-32:2008 - Y. 2008 - Safety of machinery - Electrical equipment of machines -- Part 32: Requirements for hoisting machines	
ISO 6385:2016 / EN ISO 6385:2016 - Y. 2016 - Ergonomics principles in the design of work systems (ISO 6385:2016) ISO 12100: 2010 / EN ISO 12100:2010 - Y. 2010 - Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010) ISO 14119:2013(Idéntico) / EN ISO 14119:2013 - Y. 2013 - Safety of machinery - Interlocking devices associated with guards - Principles for design and selection (ISO 14119:2013)	NIC
ISO 12100: 2010 / EN ISO 12100:2010 - Y. 2010 - Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010)	GUALA
EN ISO 19353:2019 / ISO 19353:2019 - Y. 2019 - Safety of machinery - Fire prevention and fire protection (ISO 19353:2019)	ZAG
EN 60529:1991 / EN 60529:1991/corrigendum May 1993 / IEC 60529:1989 - Y. 1993 - Degrees of protection provided by enclosures (IP Code)	TDZ

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EN ISO 13850:2015 / ISO 13850:2015 - Y. 2015 - Safety of machinery - Emergency stop function - Principles for design (ISO 13850:2015) EN 61496-1:2013/AC:2015 IEC 61496-1:2012/COR1:2015 - Y. 2015 - Safety of machinery - Electro-sensitive protective equipment - Part 1: General requirements and tests	
ISO 6385:2016 / EN ISO 6385:2016 - Y. 2016 - Ergonomics principles in the design of work systems (ISO 6385:2016) ISO 12100: 2010 / EN ISO 12100:2010 - Y. 2010 - Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010) ISO 13849-1:2015 EN ISO 13849-1:2015 - Y. 2015 - Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1:2015) ISO 14120:2015 / EN ISO 14120:2015 - Y. 2015 - Safety of machinery - Guards - General requirements for the design and construction of fixed and movable guards (ISO 14120:2015) ISO 14119:2013(Idéntico) / EN ISO 14119:2013 - Y. 2013 - Safety of machinery - Interlocking devices associated with guards - Principles for design and selection (ISO 14119:2013) EN ISO 13850:2015 / ISO 13850:2015 - Y. 2015 - Safety of machinery - Emergency stop function - Principles for design (ISO 13850:2015) EN ISO 13855:2010 / ISO 13855:2010 - Y. 2010 - Safety of machinery - Positioning of safeguards with respect to the approach speeds of parts of the human body (ISO 13855:2010) ISO 13857:2019 / EN ISO 13857:2019 - Y. 2019 - Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2019) EN 61496-1:2013/AC:2015 IEC 61496-1:2012/COR1:2015 - Y. 2015 - Safety of machinery - Electro-sensitive protective equipment - Part 1: General requirements and tests EN 60204-1:2018 / IEC 60204-1:2016 - 2018/2016 - Safety of machinery - Electrical equipment of machines - Part 1: General requirements EN ISO 19353:2019 / ISO 19353:2019 - Y. 2019 - Safety of machinery - Fire prevention and fire protection (ISO 19353:2019) EN 1127-1:2019 - Y. 2019 - Explosive atmospheres - Explosion prevention and protection - Part 1: Basic concepts and methodology EN 12096:1997 - Y. 1997 - MECHANICAL VIBRATION. DECLARATION AND VERIFICATION OF VIBRATION EMISSION VALUES.	GiG

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ISO 12100: 2010 / EN ISO 12100:2010 - Y. 2010 - Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010) EN 60204-1:2018 / IEC 60204-1:2016 - 2018/2016 - Safety of machinery - Electrical equipment of machines - Part 1: General requirements ISO 4413:2010 / EN ISO 4413:2010 2010 Hydraulic fluid power - General rules and safety requirements for systems and their components (ISO 4413:2010) ISO 4414:2010 / EN ISO 4414:2010 - Y. 2010 - Pneumatic fluid power - General rules and safety requirements for systems and their components (ISO 4414:2010) EN ISO 19353:2019 / ISO 19353:2019 - Y. 2019 - Safety of machinery - Fire prevention and fire protection (ISO 19353:2019) ISO/TR 11688-1:1995 EN ISO 11688-1:2009) - 1995/2009 - Acoustics - Recommended practice for the design of low-noise machinery and equipment - Part 1: Planning (ISO/TR 11688-1:1995)	UBRIS
ISO 6385:2016 / EN ISO 6385:2016 - Y. 2016 - Ergonomics principles in the design of work systems (ISO 6385:2016) ISO 12100: 2010 / EN ISO 12100:2010 - Y. 2010 - Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010) ISO 13849-1:2015 EN ISO 13849-1:2015 - Y. 2015 - Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1:2015)	IRIS
ISO 12100: 2010 / EN ISO 12100:2010 - Y. 2010 - Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010) EN IEC 60900:2018/AC:2020-05 IEC 60900:2018/COR2:2020 - Y. 2020 - Live working - Hand tools for use up to 1 000 V AC and 1 500 V DC EN 60745-2-3:2011/A13:2015 - Y. 2015 - Hand-held motor-operated electric tools - Safety - Part 2-3: Particular requirements for grinders, polishers and disk-type sanders EN 60204-1:2018 / IEC 60204-1:2016 - 2018/2016 - Safety of machinery - Electrical equipment of machines - Part 1: General requirements	ISQ

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ISO 4413:2010 / EN ISO 4413:2010 2010 Hydraulic fluid power - General rules and safety requirements for systems and their components (ISO 4413:2010) ISO 4414:2010 / EN ISO 4414:2010 - Y. 2010 - Pneumatic fluid power - General rules and safety requirements for systems and their components (ISO 4414:2010) EN ISO 19353:2019 / ISO 19353:2019 - Y. 2019 - Safety of machinery - Fire prevention and fire protection (ISO 19353:2019) EN 1127-1:2019 - Y. 2019 - Explosive atmospheres - Explosion prevention and protection - Part 1: Basic concepts and methodology EN 15011:2020 - Y. 2020 - Cranes - Bridge and gantry cranes Cranes. Inspections. Part 5: Bridge and gantry cranes	

4.3 Protection equipment legislation

To manage risks and continuously improve existing OSH practices in their production facilities, over the last 12 months all partners directly involved in the production processes developed or validated in the GREEN-LOOP project have implemented the following legislations or standards for Protection equipment.

Standard(s)/Regulation(s) applied	**Partner**
ISO 21420:2020 / EN ISO 21420:2020 - Y. 2020 - Protective gloves - General requirements and test methods (ISO 21420:2020) ISO 374-1:2016 / EN ISO374-1:2016 - Y. 2016 - Protective gloves against dangerous chemicals and micro-organisms - Part1: Terminology and performance requirements for chemical risks ISO 374-2:2019 / EN ISO374-2:2019 - Y. 2019 - Protective gloves against dangerous chemicals and micro-organisms - Part2: Determination of resistance to penetration (ISO 374-2:2019) EN 166:2001 - Y. 2001 - Personal eye- protection ISO 16972:2020 / EN ISO16972:2020 - Y. 2020 - Respiratory protective devices - Vocabulary and graphical symbols (ISO 16972-2020) EN 405:2001+A1:2009 - Y. 2009 - Respiratory protective devices - Valved filtering half masks to protect against gases and particles- Requirements, testing, marking	NIC

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EN 136:1998/AC:1999 / EN 136:1998/AC:2003 - 1999/2003 - Respiratory protective devices - Full face masks - Requirements, testing, marking ISO 13688:2013 / EN ISO 13688:2013 - Y. 2013 - Protecting clothing - General requirements (ISO 13688:2013) ISO 13688:2013/Amd 1:2021 / EN ISO 13688:2013/A1:2021 - Y. 2021 - Protecting clothing - General requirements - Amendment 1 (ISO 13688:2013/Amd1:2021) ISO 20345:2011 / EN ISO 20345:2011 - Y. 2011 - Personal protective equipment - Safety footwear (ISO 20345:2011)	
ISO 21420:2020 / EN ISO 21420:2020 - Y. 2020 - Protective gloves - General requirements and test methods (ISO 21420:2020) EN 388:2016+A1:2018 - Y. 2018 - Protective gloves against mechanical risks ISO 20345:2011 / EN ISO 20345:2011 - Y. 2011 - Personal protective equipment - Safety footwear (ISO 20345:2011)	GUALA
ISO 21420:2020 / EN ISO 21420:2020 - Y. 2020 - Protective gloves - General requirements and test methods (ISO 21420:2020) ISO 374-1:2016 / EN ISO374-1:2016 - Y. 2016 - Protective gloves against dangerous chemicals and micro-organisms - Part1: Terminology and performance requirements for chemical risks ISO 374-2:2019 / EN ISO374-2:2019 - Y. 2019 - Protective gloves against dangerous chemicals and micro-organisms - Part2: Determination of resistance to penetration (ISO 374-2:2019) EN 166:2001 - Y. 2001 - Personal eye- protection ISO 16972:2020 / EN ISO16972:2020 - Y. 2020 - Respiratory protective devices - Vocabulary and graphical symbols (ISO 16972-2020) EN 405:2001+A1:2009 - Y. 2009 - Respiratory protective devices - Valved filtering half masks to protect against gases and particles- Requirements, testing, marking EN 136:1998/AC:1999 / EN 136:1998/AC:2003 - 1999/2003 - Respiratory protective devices - Full face masks - Requirements, testing, marking ISO 13688:2013 / EN ISO 13688:2013 - Y. 2013 - Protecting clothing - General requirements (ISO 13688:2013) ISO 13688:2013/Amd 1:2021 / EN ISO 13688:2013/A1:2021 - Y. 2021 - Protecting clothing - General requirements - Amendment 1 (ISO 13688:2013/Amd1:2021)	ZAG

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ISO 20345:2011 / EN ISO 20345:2011 - Y. 2011 - Personal protective equipment - Safety footwear (ISO 20345:2011) EN 397:2012+A1:2012 - Y. 2012 - Industrial safety helmets	
ISO 21420:2020 / EN ISO 21420:2020 - Y. 2020 - Protective gloves - General requirements and test methods (ISO 21420:2020) EN 166:2001 - Y. 2001 - Personal eye- protection ISO 20345:2011 / EN ISO 20345:2011 - Y. 2011 - Personal protective equipment - Safety footwear (ISO 20345:2011)	TDZ
ISO 21420:2020 / EN ISO 21420:2020 - Y. 2020 - Protective gloves - General requirements and test methods (ISO 21420:2020) EN 388:2016+A1:2018 - Y. 2018 - Protective gloves against mechanical risks ISO 374-1:2016 / EN ISO374-1:2016 - Y. 2016 - Protective gloves against dangerous chemicals and micro-organisms - Part1: Terminology and performance requirements for chemical risks ISO 374-2:2019 / EN ISO374-2:2019 - Y. 2019 - Protective gloves against dangerous chemicals and micro-organisms - Part2: Determination of resistance to penetration (ISO 374-2:2019) EN 166:2001 - Y. 2001 - Personal eye- protection ISO 16972:2020 / EN ISO16972:2020 - Y. 2020 - Respiratory protective devices - Vocabulary and graphical symbols (ISO 16972-2020) EN 405:2001+A1:2009 - Y. 2009 - Respiratory protective devices - Valved filtering half masks to protect against gases and particles- Requirements, testing, marking EN 136:1998/AC:1999 / EN 136:1998/AC:2003 - 1999/2003 - Respiratory protective devices - Full face masks - Requirements, testing, marking ISO 13688:2013 / EN ISO 13688:2013 - Y. 2013 - Protecting clothing - General requirements (ISO 13688:2013) ISO 13688:2013/Amd 1:2021 / EN ISO 13688:2013/A1:2021 - Y. 2021 - Protecting clothing - General requirements - Amendment 1 (ISO 13688:2013/Amd1:2021)	GiG

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ISO 20345:2011 / EN ISO 20345:2011 - Y. 2011 - Personal protective equipment - Safety footwear (ISO 20345:2011) EN 352-1:2020 - Y. 2020 - Hearing protectors - General requirements - Part 1: Earmuffs EN 352-2:2002 - Y. 2002 - Hearing protectors - General requirements - Part 2: Ear - plugs EN 397:2012+A1:2012 - Y. 2012 - Industrial safety helmets EN 361:2002 - Y. 2002 - Personal protective equipment - against falls from a height - Full body harnesses	
ISO 21420:2020 / EN ISO 21420:2020 - Y. 2020 - Protective gloves - General requirements and test methods (ISO 21420:2020) EN 136:1998/AC:1999 / EN 136:1998/AC:2003 - 1999/2003 - Respiratory protective devices - Full face masks - Requirements, testing, marking ISO 13688:2013/Amd 1:2021 / EN ISO 13688:2013/A1:2021 - Y. 2021 - Protecting clothing - General requirements - Amendment 1 (ISO 13688:2013/Amd1:2021) ISO 20345:2011 / EN ISO 20345:2011 - Y. 2011 - Personal protective equipment - Safety footwear (ISO 20345:2011)	UBRIS
ISO 21420:2020 / EN ISO 21420:2020 - Y. 2020 - Protective gloves - General requirements and test methods (ISO 21420:2020) EN 388:2016+A1:2018 - Y. 2018 - Protective gloves against mechanical risks EN 166:2001 - Y. 2001 - Personal eye- protection	IRIS
ISO 21420:2020 / EN ISO 21420:2020 - Y. 2020 - Protective gloves - General requirements and test methods (ISO 21420:2020) EN 388:2016+A1:2018 - Y. 2018 - Protective gloves against mechanical risks ISO 374-1:2016 / EN ISO374-1:2016 - Y. 2016 - Protective gloves against dangerous chemicals and micro-organisms - Part1: Terminology and performance requirements for chemical risks EN 166:2001 - Y. 2001 - Personal eye- protection ISO 16972:2020 / EN ISO16972:2020 - Y. 2020 - Respiratory protective devices - Vocabulary and graphical symbols (ISO 16972-2020)	ISQ

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EN 136:1998/AC:1999 / EN 136:1998/AC:2003 - 1999/2003 - Respiratory protective devices - Full face masks - Requirements, testing, marking ISO 13688:2013 / EN ISO 13688:2013 - Y. 2013 - Protecting clothing - General requirements (ISO 13688:2013) ISO 13688:2013/Amd 1:2021 / EN ISO 13688:2013/A1:2021 - Y. 2021 - Protecting clothing - General requirements - Amendment 1 (ISO 13688:2013/Amd1:2021) ISO 20345:2011 / EN ISO 20345:2011 - Y. 2011 - Personal protective equipment - Safety footwear (ISO 20345:2011) EN 352-1:2020 - Y. 2020 - Hearing protectors - General requirements - Part 1: Earmuffs EN 352-2:2002 - Y. 2002 - Hearing protectors - General requirements - Part 2: Ear - plugs EN 397:2012+A1:2012 - Y. 2012 - Industrial safety helmets EN 361:2002 - Y. 2002 - Personal protective equipment - against falls from a height - Full body harnesses	

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5. OSH in the manufacturing of rubber panels

The manufacturing of rubber panels, in IIR or in SBR, involves various occupational safety and health issues, which can vary depending on the specific processes and materials used. Some common problems and concerns in this manufacturing process include:

Chemical Exposure: Workers may be exposed to various chemicals used in rubber production, such as solvents, accelerators, and vulcanizing agents. Prolonged exposure can lead to skin irritation, respiratory problems, and other health issues.
Dust and Fumes: Rubber manufacturing processes can generate dust and fumes that may contain harmful particulate matter and chemical byproducts. Proper ventilation and respiratory protection are essential to reduce inhalation risks.
Noise Exposure: Machinery used in rubber panel manufacturing can produce high levels of noise, which can lead to hearing loss over time. Hearing protection and noise reduction measures are necessary.
Machine Safety: Workers who operate or maintain manufacturing machinery are at risk of injuries from moving parts, pinch points, and sharp tools. Proper training, machine guarding, and safety protocols are crucial to prevent accidents.
Ergonomics: Poor ergonomics in the workplace can lead to musculoskeletal disorders, particularly for workers involved in repetitive tasks. Proper workstations and ergonomic training are essential to prevent injuries.
Heat and Cold Stress: Depending on the manufacturing process and location, workers may be exposed to extreme temperatures, which can lead to heat or cold stress. Adequate facilities, PPE, and training are required to mitigate these risks.
Fire and Explosion Hazards: Certain rubber manufacturing processes, especially those involving the use of flammable solvents, can pose fire and explosion hazards. Proper storage, handling, and fire safety measures are essential.
Chemical Handling and Storage: Safe handling and storage of raw materials, including rubber compounds and chemicals, are critical to prevent spills, chemical exposures, and accidents.
Material Handling and Lifting: Improper handling and lifting of heavy rubber panels and materials can lead to musculoskeletal injuries. Training and safe lifting practices should be implemented.
Personal Protective Equipment (PPE): Workers should be provided with appropriate PPE, including gloves, goggles, respirators, hearing protection, and other safety gear, to protect them from specific hazards in the manufacturing process.
Emergency Response and First Aid: Adequate training, access to first aid equipment, and emergency response plans are crucial to address injuries and health emergencies promptly.

Worker Fatigue and Stress: Extended work hours and high-pressure work environments can lead to fatigue and stress-related health issues. Employers should monitor work hours, provide adequate breaks, and address stress factors in the workplace.

Over the last 12 months, our internal review has found no notable updates from GREEN-LOOP partners within the Bio-rubber Value Chain.

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6. OSH in the manufacturing of bioplastic bottle closures

For the bioplastic bottle closures manufacturing also, ensuring a safe and healthy work environment is not only a legal requirement but also crucial for the well-being of workers and the quality of the final product. Here are some specific OSH considerations for this manufacturing process:

Chemical Exposure and Handling: Bioplastic manufacturing may involve the use of chemicals, such as polymers and additives. Workers should be trained in the safe handling of these materials, including proper storage and disposal practices.
Dust and Airborne Particles: Manufacturing processes can generate dust and airborne particles. Workers must use appropriate respiratory protection and work in well-ventilated areas to minimize exposure.
Machine Safety: Workers operating machinery and equipment should receive training in machine safety, and machines should have appropriate safeguards to prevent accidents, such as guarding for moving parts.
Personal Protective Equipment (PPE): Workers should wear PPE, including gloves and eye protection, as necessary to protect against potential hazards during the manufacturing process.
Ergonomics: Ensure workstations and processes are designed ergonomically to reduce the risk of musculoskeletal disorders resulting from repetitive or awkward motions.
Heat Stress: Depending on the manufacturing environment, workers may be exposed to high temperatures. Adequate cooling measures and hydration options should be provided to prevent heat stress.
Food Safety regulation and Hygiene: In the context of food and beverage packaging, maintaining strict food safety and hygiene standards is essential. Workers should receive training in food safety practices to prevent contamination. Partners involved in the manufacturing of bioplastic bottle closures have to comply with the requirements of the Framework Regulation (EC) No 1935/2004 (EC, 2004).
Noise Exposure: Noise from manufacturing equipment can be harmful to hearing. Implement hearing protection measures and noise reduction strategies in noisy areas.
Chemical Storage and Spill Control: Proper storage of chemicals and the availability of spill control measures are crucial to prevent accidents and chemical exposure.
Fire Safety: Manufacturing processes may involve flammable materials. Adequate fire safety measures, including fire extinguishers and evacuation plans, should be in place.

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Waste Management: Safe handling and disposal of waste materials should be a priority to prevent environmental contamination and ensure worker safety.
Maintenance and Equipment Inspection: Regular maintenance and inspection of machinery and equipment are necessary to prevent sudden breakdowns and accidents.
Training and Education: Workers should receive training on OSH practices and food safety standards, including handling and storing bioplastic materials.
Emergency Response and First Aid: Adequate first aid equipment, trained personnel, and emergency response plans are essential for addressing workplace injuries and health emergencies.
Psychosocial Well-being: Consider the mental health and well-being of workers, as high-pressure or stressful work environments can lead to mental health issues. Provide support and resources for stress management and conflict resolution.

Over the last 12 months, our internal review has identified relevant updates from partner MYX, involved in the Bioplastic Value Chain: MYX has introduced and improved personal protective systems in accordance with current regulations, including hearing protection earmuffs, protective gloves, head protection caps, and protective suits.
Moreover, MYX has implemented specific certifications for food contact materials dedicated solely to raw materials, in accordance with European regulations (Chapter 2.1).

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7. OSH in the manufacturing of wood composites to produce sliding bearings

OSH could be a critical concern also in the manufacturing of wood composites to produce sliding bearings. Workers involved in this process can be exposed to various hazards, and it's essential to implement safety measures to protect their well-being. Here are some specific OSH considerations for this manufacturing process:

Dust and Airborne Particles: Wood composite manufacturing can generate dust and fine airborne particles. Use local exhaust ventilation, dust collectors, and provide workers with respiratory protection as needed.
Machine Safety: Implement safety guards and emergency shutdown procedures on machinery and equipment to prevent accidents. Provide training to workers on safe machine operation and maintenance.
Personal Protective Equipment: Ensure that workers have access to and are using appropriate PPE, including safety goggles, gloves, dust masks, and hearing protection.
Noise Exposure: Machines used in wood composite manufacturing can generate high levels of noise. Conduct noise assessments, provide hearing protection, and implement noise reduction measures where necessary.
Chemical Exposure: Workers may be exposed to adhesives, resins, or other chemicals used in the wood composite manufacturing process. Store chemicals properly, provide safety data sheets, and ensure workers are trained in safe chemical handling.
Machine Maintenance and Safety Inspections: Regularly inspect and maintain equipment to prevent malfunctions and potential hazards. Establish a schedule for safety inspections.
Handling Heavy Materials: Workers may handle heavy wood materials and composite products. Ensure proper lifting techniques are used to prevent musculoskeletal injuries.
Ergonomics: Design workstations and processes to be ergonomically sound to reduce the risk of musculoskeletal disorders from repetitive or awkward movements.
Fire Safety: Implement fire prevention measures, including the availability of fire extinguishers, clearly marked emergency exits, and employee training in fire response procedures.
Waste Management: Properly store and dispose of waste materials, including hazardous waste, according to regulations. Provide spill containment materials and cleanup procedures for hazardous substances.

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First Aid and Medical Response: Ensure first aid kits are available and regularly checked. Train personnel in first aid and emergency response procedures. Provide access to emergency medical services.
Psychosocial Well-being: Address workplace stress, harassment, and conflict resolution. Promote employee well-being programs and mental health support.
Safety Inspections and Reporting: Conduct regular safety inspections and encourage employees to report safety concerns and incidents. Ensure that a clear reporting mechanism is in place.
Documentation and Records: Maintain up-to-date safety-related documentation, including training records, incident reports, and safety policies.
Legal Compliance: Verify compliance with all relevant OSH regulations and standards, including those specific to wood manufacturing and composite production.

Over the last 12 months, our internal review has found no notable updates from GREEN-LOOP partners within the Wood Composites Value Chain.

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8.The assessment of OSH issues in the GREEN-LOOP value chains

The methodology for assessing OSH issues in the GREEN-LOOP manufacturing processes involves a systematic approach to identify and manage risks.
Here are the main steps for conducting these assessments by the GREEN-LOOP partners:

1. Identify Stakeholders for each value chain: Identify the key stakeholders involved in the different manufacturing process, including workers, management, safety officers, and regulatory authorities.
2. Define Objectives: Clearly define the objectives of the OSH assessment, such as identifying hazards, ensuring compliance with regulations, and improving workplace safety.
3. Data Collection: Collect relevant data, including process documentation, incident reports if relevant, safety records, and information on materials, equipment, and machinery used.
4. Hazard Identification: Identify and assess potential hazards within the manufacturing process, including physical, chemical, biological, ergonomic, and psychosocial hazards. This can be done through observations, walkthroughs, and consultation with workers.
5. Risk Assessment: Evaluate the risks associated with identified hazards by considering factors such as the likelihood of occurrence, severity of consequences, and the number of exposed workers. This can help prioritize risks for mitigation.
6. Regulatory Compliance: Ensure that the manufacturing process complies with all relevant OSH regulations and standards. Review current regulations and verify compliance in all aspects.
7. Safety Measures and Controls: Identify existing safety measures and controls in place and assess their effectiveness. Determine if additional controls are required to mitigate risks.
8. Employee Involvement: Involve employees in the assessment process. Gather their insights, experiences, and feedback regarding OSH issues, as they are often most familiar with workplace hazards.
9. Data Analysis: Analyse the collected data and information to gain insights into trends, recurring incidents, and areas of improvement.
10. Prioritization: Prioritize identified hazards based on the risk assessment and regulatory compliance. Develop an action plan to address these issues, including control measures, timelines, and responsibilities.
11. Implementation of a plan: Execute the action plan and implement control measures, engineering solutions, administrative changes, or PPE to reduce or eliminate identified hazards.

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12. Training and Education: Provide necessary training and education to employees, ensuring they are aware of the risks and know how to work safely.
13. Monitoring and Evaluation: monitor the effectiveness of implemented control measures and evaluate their impact on OSH. Adjust the action plan as needed.
14. Incident Reporting and Investigation: Establish clear incident reporting procedures and conduct thorough investigations to determine the root causes of incidents. Use the findings to improve safety measures.
15. Documentation and Record-Keeping: Maintain accurate records of the assessment process, action plans, training, incidents, and safety measures. Keep these records accessible for regulatory inspections and audits.
16. Communication: Ensure clear communication about OSH issues, safety policies, and incident reporting throughout the organization. This includes regular safety meetings and updates.
17. Review and Continuous Improvement: Periodically review the OSH assessment and action plans, making necessary adjustments based on changing processes, technology, regulations, and feedback from employees.
18. External Audits and Consultation: Seek external audits and consultation, when necessary, especially for complex manufacturing processes. Third-party experts can provide valuable insights and recommendations.
By following this comprehensive methodology, GREEN-LOOP partners will be in the condition to systematically assess and address OSH issues in manufacturing processes to create a safer and healthier workplace for employees while achieving compliance with regulations and improving overall operational efficiency.

To support the relevant GREEN-LOOP partner to verify and address the key OSH areas, a Check List on OSH issues for the GREEN-LOOP Manufacturing processes was delivered at M14 (Annex 2) and at M24 (Annex 2). There are no updates at month 36.

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9.Advancing in applying OSH measures

The implementation of Occupational Safety and Health (OSH) measures within the GREEN-LOOP project presented a range of challenges across the consortium, reflecting the diversity of roles, technologies, and processes involved.

IDENER highlighted significant challenges in adapting conventional safety protocols to novel bio-based and circular manufacturing processes. These included compliance with chemical safety regulations for new materials, integrating ergonomic design into modified production lines, and ensuring machine safety in retrofitted, automated systems. Additionally, maintaining consistent and up-to-date training across multidisciplinary teams and addressing psychosocial risks in dynamic work environments proved complex. The need to align safety practices with both EU and UK regulatory frameworks added further layers of difficulty.

MYX identified training as the primary challenge, particularly in ensuring that all collaborators fully understand and correctly apply safety systems and PPE.

Emphasising that employee protection is essential to business success, MYX underlined the importance of clear and precise safety guidelines to safeguard staff well-being.

TDZ reported difficulties primarily related to the proper management of machinery and production processes, suggesting that operational oversight remains a critical area for maintaining safety.

GiG, having had a more research-oriented role, did not face direct challenges in applying OSH measures. Their activities were largely confined to analysis and knowledge exchange, where only standard institutional safety protocols were required.

IRIS noted that the deployment of advanced monitoring systems generates large volumes of safety-related data. Analysing this data effectively to identify potential hazards, enable timely responses, and support continual improvement in safety practices requires robust data management infrastructure and skilled personnel.

These insights demonstrate that while the degree of OSH-related challenges varied among partners, common themes included the adaptation of existing systems to innovative processes, the critical role of training, and the need for advanced digital and regulatory alignment to ensure the effective protection of workers in evolving environments.

The GREEN-LOOP project has successfully navigated the complexities of integrating robust Occupational Safety and Health (OSH) measures, showcasing a commitment to continuous improvement across its diverse consortium. The innovative nature of bio-based and circular manufacturing processes presented unique opportunities to evolve conventional safety protocols and implement cutting-edge solutions.

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IDENER has effectively adapted and enhanced safety frameworks to align with novel processes. This included proactively addressing chemical safety for new materials, integrating ergonomic principles into modified production lines, and ensuring state-of-the-art machine safety in retrofitted, automated systems. Furthermore, IDENER successfully implemented comprehensive and up-to-date training programs for multidisciplinary teams and developed strategies to mitigate psychosocial risks in dynamic work environments. Their diligent efforts ensured compliance with both EU and UK regulatory frameworks, setting a high standard for OSH integration.

MYX recognized that comprehensive training is paramount for employee protection and business success. They prioritized developing clear and precise safety guidelines, ensuring all collaborators gained a thorough understanding and correct application of safety systems and Personal Protective Equipment (PPE). This proactive approach fostered a strong safety culture, safeguarding staff well-being throughout the project.

TDZ effectively managed machinery for packaging processes by implementing rigorous operational oversight. Their commitment to continuous improvement in these areas has been crucial for maintaining a high level of safety within their operations.

GiG, with its research-oriented role, seamlessly integrated standard institutional safety protocols into its analytical and knowledge exchange activities. Their dedication ensured that even in a research setting, OSH best practices were consistently maintained.

IRIS successfully leveraged advanced monitoring systems to generate significant volumes of safety-related data. By establishing robust data management infrastructure and deploying skilled personnel, IRIS has been able to effectively analyse this data. This capability has been instrumental in proactively identifying potential hazards, enabling timely responses, and supporting continuous improvements in safety practices across the project.

These collective efforts demonstrate that the GREEN-LOOP partners are not just identifying OSH-related challenges but are actively implementing strategic solutions. By focusing on the adaptation of existing systems to innovative processes, prioritizing comprehensive training, and embracing advanced digital and regulatory alignment, the project is effectively safeguarding its workforce and setting a precedent for OSH excellence in evolving industrial environments.

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10. Final Recommendations on Occupational Safety and Health

As of Month 32, the follow-up questionnaire conducted identified key actions, resources, training needs, and best practices essential for improving occupational safety and health (OSH) conditions.
The responses highlight a shared commitment among partners to maintaining high standards of worker protection, particularly in relation to the production processes developed or validated within the project. The feedback also underscores the importance of fostering a proactive safety culture and knowledge exchange across the consortium.

10.1 Actions for enhancing OSH

Building upon the structured assessment methodology outlined in Chapter 8, all GREEN-LOOP partners for whom OSH is particularly relevant have implemented targeted actions to address the OSH issues identified across their respective manufacturing processes. These actions reflect the transition from risk assessment to practical application, ensuring that safety measures are not only identified but also effectively integrated into daily operations.

NIC has introduced regular training programmes for employees, aiming to foster a continuous learning culture in line with the training and education steps highlighted in the assessment framework. To further enhance this approach, additional modules on stress management and work-life balance could strengthen the response to psychosocial risks previously mapped.
NCC emphasises continuous monitoring and performance measurement—key components of the “monitoring and evaluation” phase described in Chapter 8. This approach could benefit from incorporating indicators specifically related to psychosocial hazards, thus aligning better with the broader risk typologies considered during the assessment.
ZAG contributes to the “employee involvement” and “review and continuous improvement” steps by encouraging staff participation and regularly updating safety protocols based on employee feedback and regulatory developments. This ensures a responsive OSH environment that evolves with both internal and external changes.
UBRIS applies OSH policies tailored to its manufacturing and testing facilities, in line with the “regulatory compliance” and “safety measures and controls” phases. The introduction of AI-driven and automated processes for health and safety assessments also supports the “implementation” and “monitoring” stages, offering potential for real-time risk detection and more efficient resource use.

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NSB prioritises awareness-raising campaigns and training activities that support the development of a safety-oriented organisational culture. These initiatives are consistent with the "communication" and "training" phases and could be further expanded to include wellbeing promotion strategies in response to identified risks.
ISQ underlines the importance of raising workers' awareness of the consequences of non-compliance, both for personal safety and environmental impact. This dual perspective reinforces the link between OSH and sustainability goals, as also emphasised in the project's approach to greener safety practices (e.g., waste reduction in PPE usage).
TDZ continues to deliver safety training as standard practice, thereby contributing to the reinforcement of a risk-aware culture aligned with the "training and education" element of the assessment cycle.
IRIS is implementing embedded monitoring systems powered by AI-based decision tools, supporting real-time assessment and rapid response to emerging risks. This aligns with the "incident reporting and investigation" and "monitoring" steps, while also contributing to improved operational efficiency and reduced downtime.
GiG highlights the value of early OSH integration into research and innovation activities, advocating for updated risk assessment methodologies and sustained investment in training. Furthermore, it promotes stronger collaboration among industry, academia, and regulatory bodies—essential for developing sector-specific OSH guidelines for emerging bio-based technologies.
Finally, IDENER proposes a multi-faceted approach including tailored training on bio-based material risks, investment in real-time hazard detection technologies, ergonomic workplace design, and transparent incident reporting. Collaboration with external experts ensures alignment with evolving legal requirements, directly addressing the "external audits and consultation" step of the assessment model.

Through these actions, the GREEN-LOOP partners are effectively translating the outcomes of OSH assessments into tangible measures, reinforcing a proactive and dynamic safety culture across the project's value chains.

10.2 Best Practices

Best practices identified by project partners offer a valuable foundation for enhancing OSH conditions across the consortium. These practices reflect a shared commitment to fostering safer, healthier, and more sustainable working environments, while also highlighting the potential for cross-partner learning and innovation.
IDENER proposes integrating OSH from the earliest design stages, particularly when working with novel materials. The use of shared checklists adapted to local contexts, proactive employee engagement, digital monitoring tools, and joint

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audits between partners can foster consistent and collaborative safety management.
MYX notes the value of exchanging safety systems among partners, recognising that comparative analysis can lead to improved safety solutions through the sharing of diverse approaches.
AIMEN reports limited relevance, with activities mainly desk-based.
IRIS recommends implementing real-time monitoring using sensor technology and digital platforms, supported by predictive analytics for preventative maintenance and hazard mitigation.

To further strengthen these efforts, it is recommended that partners adopt a continuous improvement model, regularly reviewing OSH policies, procedures, and training programmes considering new scientific findings and emerging technologies.
Establishing feedback loops, encouraging open communication, and integrating OSH initiatives into strategic planning processes will help maintain a high standard of workplace health and safety across all activities.

For a more comprehensive overview of ethical considerations and specific recommendations related to occupational safety and health, GREEN-LOOP partners are encouraged to consult the deliverable WP10 – Ethics requirements "Ethics Report – Follow-up no. 03" developed under Task 10.1, which complements the best practices outlined in this section with further guidance and actionable insights.

10.3 Training suggestions

Training needs vary across partners, reflecting differences in direct involvement with the project's production processes.
IDENER confirms the need for specialised training to ensure safe handling of bio-based materials, correct use of PPE, and emergency protocols tailored to specific risks. Training should also cover the operation of retrofitted or automated machinery, ergonomic practices, and psychosocial risk awareness.
MYX highlights that the project has improved safety from the outset and suggests compiling a memorandum of safety experiences and procedures specific to each site.
TDZ indicates that standard safety courses are sufficient.
ZAG reports no additional training needs, given the routine nature of their processes.
GiGsupports the development of targeted training resources for partners dealing with innovative technologies.

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UBRIS has introduced a new controlled ventilation and cooling system to enhance both safety and production efficiency at its facility.
NSB confirms the provision of dedicated training for each new technology or process adopted.
ISQ points out the use of both well-known technologies and some awareness and training needed for facilities less familiar with the application of methods such as microwave and ultrasound in combination with novel materials.

To further strengthen OSH training efforts across the consortium, the following recommendations are proposed:

Joint Training Activities: Building on previous successful experiences, such as the GREEN-LOOP project, it is recommended to promote collaborative training sessions among partners. These may take the form of technical workshops, webinars, or digital training modules, and aim to facilitate knowledge exchange and mutual learning on safety-related issues.

Promotion of OSH Certification: Partners are encouraged to support and incentivise participation in recognised OSH certification programmes. These certifications can help harmonise safety practices across organisations, enhance individual competencies, and contribute to a shared culture of prevention and continuous improvement in health and safety management.
These measures would not only reinforce the safety culture within each organisation but also promote alignment and consistency across the consortium's OSH practices.

Relevant institutions and programmes in Europe include:

- EU-OSHA (European Agency for Safety and Health at Work), which organizes trainings and campaigns to raise awareness about specific OSH topics.
- ITCILO (International Training Centre of the International Labour Organisation), which offers a wide range of courses on OSH and labour inspection, including training on the prevention of occupational diseases and the improvement of workplace conditions.
- ENSHPO (European Network of Safety and Health Professional Organizations), which provides professional OSH certifications, enhancing credibility and standardisation across countries.

Moreover, the British Safety Council and NEBOSH (The National Examination Board in Occupational Safety and Health) offer internationally recognised certificates in OSH, available in multiple languages and provide a variety of training programmes (including courses on mental health and well-being, stress risk assessment, and general risk management, *et alia*).

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GREEN-LOOP Partners, and relevant stakeholders, are invited to consult the websites of the above-mentioned organisations to explore available training opportunities and identify the most appropriate certifications for their specific organisational needs.

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11. Gender & Diversity Dimension

In line with Horizon Europe's cross-cutting objectives and the principles of Responsible Research and Innovation (RRI), the GREEN-LOOP project integrates gender and diversity considerations into its Occupational Safety and Health (OSH) framework.

As part of the GREEN-LOOP project's commitment to inclusive and responsible research and innovation, the follow-up questionnaire included a dedicated section focusing on the gender and diversity dimensions of occupational safety and health (OSH). Respondents were asked to consider how their organisations incorporate gender-sensitive approaches into OSH practices, such as risk assessment procedures and the design of personal protective equipment, as well as the broader workplace culture.
The responses revealed a general awareness of gender-related aspects of OSH, though the extent to which these were implemented varied among partners. Several organisations highlighted their ongoing efforts to ensure that data collection processes are disaggregated by sex and take into account relevant social factors, such as gender roles and socio-economic background. For example, IDENER and Mixcycling stated that they engage Human Resources teams or designated personnel to monitor gender-related indicators in operational settings.

With regard to risk assessment, partners such as NIC and Mixcycling acknowledged gender-based differences and indicated that psychological and ergonomic factors were considered in their evaluation processes. At NIC, having a gender-balanced workforce was cited as a foundation for ensuring fair consideration in OSH planning.
Regarding the design and provision of personal protective equipment (PPE), most partners confirmed that unisex or adjustable equipment is available. Mixcycling emphasised that ergonomic suitability and physical diversity are systematically taken into account, with the support of safety management teams. Other partners, such as NIC, reported using standardised protective gear that is equally accessible to all employees, regardless of gender.
In order to promote inclusive decision-making and participation, organisations such as IDENER are taking practical measures to incorporate gender sensitivity into occupational health and safety (OSH) policies. This includes raising awareness, holding internal discussions and providing training to promote equal opportunities in workplace safety. Some partners also mentioned that they regularly conduct anonymous staff surveys or structured interviews to gather feedback from employees on OSH measures, including gender-related concerns.
The questionnaire also invited organisations to share any recent improvements in this area. Responses indicated incremental yet meaningful progress. For example, Mixcycling reported systematic updates to data collection tools to better capture

diversity dimensions, and NIC and others described internal mechanisms for continuous improvement based on staff input.

Overall, the findings suggest that, although not all partners have yet formalised gender-sensitive OSH frameworks, there is a shared understanding of their importance and an ongoing commitment to making workplace safety measures more inclusive. These efforts are in line with the GREEN-LOOP project's broader goals and the European Union's gender equality strategy, as well as Horizon Europe's emphasis on Responsible Research and Innovation (RRI).
Integrating gender and diversity perspectives in OSH not only contributes to equality but also enhances risk prevention and improves the overall safety, well-being, and effectiveness of workplace practices.

11.1 Recommendations for Strengthening the Gender & Diversity Dimension in OSH

The following recommendations are proposed to further integrate gender and diversity considerations into OSH practices within the GREEN-LOOP project and beyond, based on the responses to the final questionnaire and the identified gaps and strengths across the consortium. The recommendations are based on questionnaire responses and are aligned with the criteria outlined in the GREEN-LOOP checklist for gender and diversity in OSH (Annex 3).

Systematic integration in risk assessment procedures: Partners should consistently incorporate gender-based, biological and social differences into their risk assessments. This includes considering differential exposure to risks, ergonomic needs and psychosocial factors that may affect employees differently based on gender or socio-economic status.

Inclusive design and procurement of PPE: Personal protective equipment (PPE) and working tools should be reviewed to ensure they are suitable for a diverse workforce. Procurement processes should specify requirements for adjustability, comfort and fit across a range of body types and physical characteristics.

Gender-Responsive Data Collection: Data related to workplace safety and health should be collected and analysed with gender and diversity in mind. This includes disaggregating data by sex and other relevant factors to better understand differentiated experiences and outcomes.

Training and awareness-raising: Organisations should develop targeted training modules on gender-sensitive occupational safety and health (OSH), including

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unconscious bias, inclusive communication, and equitable participation in safety-related decision-making. These measures should form part of ongoing professional development.

Participatory feedback mechanisms: Establishing accessible, anonymous feedback systems, such as regular surveys, suggestion boxes or moderated focus groups, enables employees to report safety concerns and make suggestions relating to gender and diversity without fear of reprisal.

Institutional anchoring: Where relevant, organisations should formalise gender-sensitive occupational safety and health (OSH) policies through internal guidelines or integration into quality management systems. Assigning a focal point or working group responsible for gender and diversity in OSH can facilitate accountability and coordination.

Cross-partner knowledge sharing: Encouraging the exchange of best practices in gender-inclusive OSH between partners, for example via workshops, learning sessions or shared tools, can foster collective learning and innovation within the consortium.

Alignment with EU standards and RRI principles: Finally, it is recommended an alignment with relevant EU frameworks, such as the Gender Equality Strategy 2020–2025 and the Horizon Europe guidance on Gender Equality Plans and Responsible Research and Innovation (RRI).

Adopting these recommendations will further strengthen the GREEN-LOOP consortium's commitment to safe, fair and inclusive working environments, contributing to not only regulatory compliance but also improved well-being, performance and innovation across the value chains.

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References and Resources

British Safety Council, Trainings
https://www.britsafe.org/c/training/british-safety-council-courses (last seen in June 2025)

ECHA – Candidate List of Substances of Very High Concern for Authorisation
https://www.echa.europa.eu/candidate-list-table (last seen in May 2025)

EU-OSHA, OiRA, Case study: OiRA for a multinational company | Safety and health at work
https://osha.europa.eu/en/publications/oira-multinational-company (last seen in May 2025)

EU-OSHA Strategy 2025-2034
https://osha.europa.eu/sites/default/files/documents/EU-OSHA-Strategy-2025-2034_EN.pdf (last seen in May 2025)

International Training Centre of the ILO - International Labour Organization
https://www.itcilo.org/

Online interactive Risk Assessment (OiRA)
https://oira.osha.europa.eu/ (last seen in May 2025)

The European Agency for Safety and Health at Work (EU-OSHA)
https://osha.europa.eu/en

The European Network of Safety and Health Professional Organisations (ENSHPO)
https://www.enshpo.eu/

The National Examination Board in Occupational Safety and Health (NEBOSH)
https://www.nebosh.org.uk/home/

Annex 1 – GREEN-LOOP - Follow-Up Questionnaire on OSH

GREEN-LOOP: OSH questionnaire - Dev8.13 "Health and Safety conditions of GREEN-LOOP" [M36]

Apr 24, 2025

The following questionnaire should be reviewed by competent personnel within your organization (e.g., HR Managers, Safety Officers).

Please respond to all questions in English by Friday, 18 April, EoB.

* Required

General informations

1. Name & Surname *

2. Organisation *

3. Email *

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European and/or National Directives and Standards for Health & Safety in the workplace

4. In the last 12 months, have there any recent national regulations or standards relevant to Safety & Health in Bio-based products manufacturing that your organization needs to comply with? *

- ◯ Yes
- ◯ No

If yes (question 4),

5. Please identify them shortly. *

6. Is your organization aware of the new EU General Product Safety Regulation (GPSR) effective from December 13, 2024? *

For your reference: EU's General Product Safety Regulation (GPSR): A New Era of Consumer Protection | Access2Markets | https://trade.ec.europa.eu/access-to-markets/en/news/eus-general-product-safety-regulation-gpsr-new-era-consumer-protection

- ◯ Yes
- ◯ No

If yes (question 6),

7. Is your organization required to comply with it, and is it being applied? *

- ◯ We are aware, and it has been applied.
- ◯ We are aware, but it has not been applied yet.

If not (question 6),

8. Could you specify the reasons why? *

9. Are you familiar with Commission Regulation (EU) 2024/3190 of December 19, 2024, regarding the use of bisphenol A (BPA) prohibited in the manufacture of food-contact plastics, varnishes and coatings, printing inks, adhesives, ion-exchange resins, silicones, and rubber? *

Only for partners involved in the bioplastic value chain.
For your reference: EUR-Lex - C(2024)8885 - EN - EUR-Lex | https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=pi_com%3AC%282024%298885

- ◯ Yes
- ◯ No
- ◯ N/A

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10. Is your organisation aware of the three strategic lines of action of EU-OSHA?

    1. Evidence and knowledge for policy and research
    2. Tool and resources for prevention, awareness-raising
    3. Networking for a positive Occupational Safety and Health culture

    *

    For your reference: osha.europa.eu/sites/default/files/documents/EU-OSHA-Strategy-2025-2034_EN.pdf

    ◯ Yes

    ◯ No

If yes (question 10),

11. Which of these do you consider most relevant to your organization and why? *

12. OiRA, the Online Interactive Risk Assessment tool for safe automation at work provided by EU-OSHA, is a web-based tool that allows you to perform a health and safety risk assessment of your workplace.
    Have you explored its features? *

    For your reference: Online interactive Risk Assessment | https://oira.osha.europa.eu/en

    ◯ Yes

    ◯ No

If yes,

13. Which one have you considered using within your organization? *

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14. With regard to the production processes developed or validated in the GREEN-LOOP project, which of the following legislation or standards for machinery is relevant to your organisation? *

Please select all relevant options.

- [ ] EN 12433-1:1999 - Y. 1999 - Industrial, commercial and garage doors and gates - Terminology - Part 1: Types of doors
- [ ] EN 12433-2:1999 - Y. 1999 - Industrial, commercial and garage doors and gates - Terminology - Part 2: Parts of doors
- [ ] EN 1363-1:2020 - Y. 2020 - Fire resistance tests - Part 1: General Requirements
- [ ] EN 1363-2:1999 - Y. 1999 - Fire resistance tests - Part 2: Alternative and additional procedures
- [ ] EN 13501-1:2018 - Y. 2018 - Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests
- [ ] EN 13501-2:2016 - Y. 2016 - Fire classification of construction products and building elements - Part 2: Classification using data from fire resistance tests, excluding ventilation services
- [ ] EN 3-7:2004+A1:2007 - Y. 2007 - Portable fire extinguishers - Part 7: Characteristics, performance requirements and test methods
- [ ] EN 12845:2015+A1:2019 - Y. 2019 - Fixed firefighting systems - Automatic sprinkler systems - Design, installation and maintenance
- [ ] EN 16798-3:2017 - Y. 2017 - Energy performance of buildings - Ventilation for buildings - Part 3: For non-residential buildings - Performance requirements for ventilation and room-conditioning systems (Modules M5-1, M5-4)
- [ ] EN 16798-1:2019 - Y. 2019 - Energy performance of buildings - Ventilation for buildings - Part 1: Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics - Module M1-6
- [ ] ISO 10551:2019 / EN ISO 10551:2019 - Y. 2019 - Ergonomics of the physical environment — Subjective judgement scales for assessing physical environments
- [ ] ISO 7730:2005 (Expected to be replaced by ISO/FDIS 7730 within the coming months) / EN ISO 7730:2005 - Y. 2005 - Ergonomics of the thermal environment - Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria (ISO 7730:2005)
- [ ] EN 12464-1:2021 - Y. 2021 - Light and lighting - Lighting of workplaces - Part 1: Indoor workplaces
- [ ] N/A

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15. With regard to the production processes developed or validated in the GREEN-LOOP project, which of the following legislation or standards for machinery is relevant to your organisation? *

Please select all relevant options.

- [ ] ISO 6385:2016 / EN ISO 6385:2016 - Y. 2016 - Ergonomics principles in the design of work systems (ISO 6385:2016)
- [ ] ISO 12100: 2010 / EN ISO 12100:2010 - Y. 2010 - Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010)
- [ ] EN IEC 60900:2018/AC:2020-05 IEC 60900:2018/COR2:2020 - Y. 2020 - Live working - Hand tools for use up to 1 000 V AC and 1 500 V DC
- [ ] EN 60745-2-3:2011/A13:2015 - Y. 2015 - Hand-held motor-operated electric tools - Safety - Part 2-3: Particular requirements for grinders, polishers and disk-type sanders
- [ ] ISO 13849-1:2015 EN ISO 13849-1:2015 - Y. 2015 - Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1:2015)
- [ ] ISO 14120:2015 / EN ISO 14120:2015 - Y. 2015 - Safety of machinery - Guards - General requirements for the design and construction of fixed and movable guards (ISO 14120:2015)
- [ ] ISO 14119:2013(Idéntico) / EN ISO 14119:2013 - Y. 2013 - Safety of machinery - Interlocking devices associated with guards - Principles for design and selection (ISO 14119:2013)
- [ ] EN 60529:1991 / EN 60529:1991/corrigendum May 1993 / IEC 60529:1989 - Y. 1993 - Degrees of protection provided by enclosures (IP Code)
- [ ] EN ISO 13850:2015 / ISO 13850:2015 - Y. 2015 - Safety of machinery - Emergency stop function - Principles for design (ISO 13850:2015)
- [ ] EN ISO 13855:2010 / ISO 13855:2010 - Y. 2010 - Safety of machinery - Positioning of safeguards with respect to the approach speeds of parts of the human body (ISO 13855:2010)
- [ ] ISO 13856-1:2013 / EN ISO 13856-1:2013 - Y. 2013 - Seguridad de las máquinas. Dispositivos de protección sensibles a la presión. Parte 1: Principios generales para el diseño y ensayo de alfombras y suelos sensibles a la presión. (ISO 13856-1:2013)
- [ ] ISO 13856-2:2013 / EN ISO 13856-2:2013 - Y. 2013 - Safety of machinery - Pressure-sensitive protective devices - Part 2: General principles for design and testing of pressure-sensitive edges and pressure-sensitive bars (ISO 13856-2:2013)
- [ ] ISO 13857:2019 / EN ISO 13857:2019 - Y. 2019 - Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2019)
- [ ] EN 61496-1:2013/AC:2015 IEC 61496-1:2012/COR1:2015 - Y. 2015 - Safety of machinery - Electro-sensitive protective equipment - Part 1: General requirements and tests
- [ ] ISO 13851:2019 / EN ISO 13851:2019 - Y. 2019 - Safety of machinery - Two-hand control devices - Principles for design and selection (ISO 13851:2019)
- [ ] EN 60204-1:2018 / IEC 60204-1:2016 - 2018/2016 - Safety of machinery - Electrical equipment of machines - Part 1: General requirements
- [ ] EN IEC 60204-11:2019 / IEC 60204-11:2018 - 2019/2018 - Safety of machinery - Electrical equipment of machines - Part 11: Requirements for equipment for voltages above 1 000 V AC or 1 500 V DC and not exceeding 36 Kv
- [ ] ISO 4413:2010 / EN ISO 4413:2010 2010 Hydraulic fluid power - General rules and safety requirements for systems and their components (ISO 4413:2010)
- [ ] ISO 4414:2010 / EN ISO 4414:2010 - Y. 2010 - Pneumatic fluid power - General rules and safety requirements for systems and their components (ISO 4414:2010)
- [ ] ISO 13732-1:2006 / EN ISO 13732-1:2008 - 2006/2008 - Ergonomics of the thermal environment - Methods for the assessment of human responses to contact with surfaces - Part 1: Hot surfaces (ISO 13732-1:2006)
- [ ] ISO 13732-3:2005 / EN ISO 13732-3:2008 - 2005/2008 - Ergonomics of the thermal environment - Methods for the assessment of human responses to contact with surfaces - Part 3: Cold surfaces (ISO 13732-3:2005)
- [ ] EN ISO 19353:2019 / ISO 19353:2019 - Y. 2019 - Safety of machinery - Fire prevention and fire protection (ISO 19353:2019)
- [ ] EN 1127-1:2019 - Y. 2019 - Explosive atmospheres - Explosion prevention and protection - Part 1: Basic concepts and methodology

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- [ ] ISO/TR 11688-1:1995 EN ISO 11688-1:2009) - 1995/2009 - Acoustics - Recommended practice for the design of low-noise machinery and equipment - Part 1: Planning (ISO/TR 11688-1:1995)
- [ ] EN 847-1:2017 - Y. 2017 - Tools for woodworking - Safety requirements - Part 1: Milling tools, circular saw blades
- [ ] EN 12096:1997 - Y. 1997 - MECHANICAL VIBRATION. DECLARATION AND VERIFICATION OF VIBRATION EMISSION VALUES.
- [ ] EN ISO 4871:1996 / ISO 4871:2009 - 1996/2009 - Acoustics - Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)
- [ ] ISO 3691-1:2011/Amd 1:2020 / EN ISO 3691-1:2015/ 1:2020 - Y. 2020 - Industrial trucks - Safety requirements and verification - Part 1: Self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks - Amendment 1 (ISO 3691-1:2011/Amd 1:2020)
- [ ] ISO 6055:2004 - Y. 2004 - Industrial trucks. Overhead guards. Specification and testing. (ISO 6055:2004)
- [ ] ISO 5057:1993 - Y. 1993 - INDUSTRIAL TRUCKS. INSPECTION AND REPAIR OF FORK ARMS IN SERVICE ON FORK-LIFT TRUCKS.
- [ ] EN 1175:2020 - Y. 2020 - Safety of industrial trucks - Electrical/electronic requirements
- [ ] ISO 3691-2:2016 / EN ISO 3691-2/AC::2016 - Y. 2016 - Industrial trucks - Safety requirements and verification - Part 2: Self-propelled variable-reach trucks (ISO 3691-2:2016)
- [ ] ISO 3691-4:2020 / EN ISO 3691-4:2020 - Y. 2020 - Industrial trucks - Safety requirements and verification - Part 4: Driverless industrial trucks and their systems (ISO 3691-4:2020)
- [ ] EN 1755:2015 - Y. 2015 - Industrial Trucks - Safety requirements and verification - Supplementary requirements for operation in potentially explosive atmospheres
- [ ] ISO 5053-1:2015 - Y. 2015 - Powered industrial trucks. Terminology and classification. Part 1: Types of industrial trucks
- [ ] EN 15011:2020 - Y. 2020 - Cranes - Bridge and gantry cranes
- [ ] Cranes. Inspections. Part 5: Bridge and gantry cranes
- [ ] EN 60204-32:2008 / IEC 60204-32:2008 - Y. 2008 - Safety of machinery - Electrical equipment of machines -- Part 32: Requirements for hoisting machines
- [ ] N/A

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16. With regard to the production processes developed or validated in the GREEN-LOOP project, which of the following legislation or standards for protection equipment is relevant to your organisation? *

Please select all relevant options.

- [ ] ISO 21420:2020 / EN ISO 21420:2020 - Y. 2020 - Protective gloves - General requirements and test methods (ISO 21420:2020)
- [ ] EN 388:2016+A1:2018 - Y. 2018 - Protective gloves against mechanical risks
- [ ] ISO 374-1:2016 / EN ISO374-1:2016 - Y. 2016 - Protective gloves against dangerous chemicals and micro-organisms - Part1: Terminology and performance requirements for chemical risks
- [ ] ISO 374-2:2019 / EN ISO374-2:2019 - Y. 2019 - Protective gloves against dangerous chemicals and micro-organisms - Part2: Determination of resistance to penetration (ISO 374-2:2019)
- [ ] EN 166:2001 - Y. 2001 - Personal eye- protection
- [ ] ISO 16972:2020 / EN ISO16972:2020 - Y. 2020 - Respiratory protective devices - Vocabulary and graphical symbols (ISO 16972-2020)
- [ ] EN 405:2001+A1:2009 - Y. 2009 - Respiratory protective devices - Valved filtering half masks to protect against gases and particles- Requirements, testing, marking
- [ ] EN 136:1998/AC:1999 / EN 136:1998/AC:2003 - 1999/2003 - Respiratory protective devices - Full face masks - Requirements, testing, marking
- [ ] ISO 13688:2013 / EN ISO 13688:2013 - Y. 2013 - Protecting clothing - General requirements (ISO 13688:2013)
- [ ] ISO 13688:2013/Amd 1:2021 / EN ISO 13688:2013/A1:2021 - Y. 2021 - Protecting clothing - General requirements - Amendment 1 (ISO 13688:2013/Amd1:2021)
- [ ] ISO 20345:2011 / EN ISO 20345:2011 - Y. 2011 - Personal protective equipment - Safety footwear (ISO 20345:2011)
- [ ] EN 352-1:2020 - Y. 2020 - Hearing protectors - General requirements - Part 1: Earmuffs
- [ ] EN 352-2:2002 - Y. 2002 - Hearing protectors - General requirements - Part 2: Ear - plugs
- [ ] EN 397:2012+A1:2012 - Y. 2012 - Industrial safety helmets
- [ ] EN 361:2002 - Y. 2002 - Personal protective equipment - against falls from a height - Full body harnesses
- [ ] N/A

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Occupational Safety & Health in GREEN-LOOP

Please refer to Dev8.12 - Chapters 5, 6 and 7.

17. Has your organisation introduced any new health and safety measures in the last 12 months in the production of rubber sheets (please refer to Dev8.12, Chapter 5)? *
Only for partners involved in the bio-rubber value chain.

- ◯ Yes
- ◯ No
- ◯ N/A

If yes (question 17),
18. Please describe them. *

19. Has your organisation introduced new health and safety measures in the last 12 months in the production of bioplastic bottle closures for food and beverage packaging (please refer to Dev8.12, Chapter 6)? *
Only for partners involved in the bioplastic value chain.

- ◯ Yes
- ◯ No
- ◯ N/A

If yes (question 19),
20. Please describe them. *

21. Has your organisation introduced new health and safety measures in the production of Wood Composites for sliding bearings (please refer to Dev8.12, Chapter 7) in the last 12 months? *
Only for partners involved in the wood composites value chain.

- ◯ Yes
- ◯ No
- ◯ N/A

If yes (question 21),
22. Please describe them. *

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OSH checklist implementation and continuous improvement

Please refer to Dev8.12, Annex 2.

23. Has the OSH checklist included in Annex 2 of Dev8.12 been reviewed by a competent OSH expert within your organization (e.g., Safety Officer or another responsible person for occupational safety and health)? *

- ◯ Yes
- ◯ No

24. Does your organization utilize the OSH checklist included in Annex 2 of Dev8.12? *

- ◯ Yes
- ◯ No

If yes (question 24),

25. Do you see the need for updates or improvements? We welcome your suggestions to enhance its effectiveness. *

26. Does your organization plan to implement it by the end of the project? *

- ◯ Yes
- ◯ No

27. Does your organisation continuously monitor and update OSH practices in your production facilities? *

- ◯ Yes
- ◯ No

If yes (question 27),

28. Please describe any relevant updates of the last 12 months. *

If not (question 27),

29. Explain why. *

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30. Does your organisation have a feedback and continuous improvement system for OSH practices? *

- ◯ Yes
- ◯ No

If yes (question 30),

31. Please describe the systems currently in place or any relevant updates implemented in the last 12 months. *

If not (question 30),

32. Is there a plan to introduce such a system by the end of the project? *

- ◯ Yes
- ◯ No

OSH Final Evaluation and Recommendations

33. What have been the main challenges encountered in the implementation of occupational safety and health (OSH) measures within the GREEN-LOOP project? *

34. What actions or resources do you consider essential to further enhance OSH conditions? *

35. Do you have any recommendations or best practices that could be shared with other project partners? *

36. With regard to the production processes developed or validated in the GREEN-LOOP project, are there any relevant training needed to ensure a high level of health and safety protection for workers? *

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Gender & Diversity dimension in OSH

Please refer to Dev8.12, Annex 3 – Checklist for Gender & Diversity dimension in OSH

37. **Data collection**: How do you ensure that data collection processes are disaggregated by sex and consider other social factors, such as gender roles or socio-economic status, to accurately assess risks in the workplace? *

38. **Risk Assessment**: In what ways does your risk assessment process account for biological, gender-based, and social differences when evaluating occupational risks, particularly for women or marginalized groups? *

39. **Protective clothing and equipment**: How do you ensure that personal protective equipment (PPE) and working tools are designed to accommodate the specific ergonomic and physical needs of both women and men, as well as other non-standard workers? *

40. **General Measures**: What steps has your organization taken to integrate gender sensitivity into OSH policies, decision-making, and workplace culture, particularly in relation to participation and the prevention of sexual harassment? *

41. **Feedback System**: How does your organization incorporate feedback and continuous improvement regarding gender and diversity dimensions, and can you share any recent changes or improvements made to this system? *

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Annex 2 – Checklist for Occupational Safety and Health (OSH) issues for GREEN-LOOP manufacturing processes

The checklist, initially introduced to project partners in Dev8.11 (Month 14) and reproposed in Dev8.12 (Month 24), outlines the main occupational safety and health (OSH) aspects that should be monitored and addressed. It is designed to be flexible and can be tailored by each organisation to reflect the specific processes and risks inherent in their manufacturing activities.

By Month 32, the checklist underwent a thorough review by a qualified OSH expert with input from ASI, IDENER, MYX, NIC, FHF, GUALA, ZAG, TDZ, CMI, AIMEN, and IRIS. It has already been applied in practice by NIC, FHF, GUALA, TDZ and AIMEN, while IDENER, NSB, IRIS and ISQ intend to implement it by the conclusion of the project.
No major modifications or recommendations for improvement have been reported by the partners at this stage.

Occupational Safety and Health (OSH) Checklist for EU or UK using the GREEN-LOOP manufacturing processes	**Check (and comment if relevant)**
General Safety and Health Measures:	
Verify that there is a designated OSH manager or responsible personnel in charge of safety at the facility.	
Ensure that all employees have received OSH training, and their training records are up to date.	
Confirm the availability and accessibility of safety data sheets (SDS) for all chemicals and materials used in the manufacturing process.	
Chemical and Biological Hazards:	
Verify that all hazardous chemicals and biological agents used in the manufacturing process are properly labelled.	
Ensure proper storage and handling of hazardous chemicals, including compatibility and separation requirements.	

Confirm that workers are using appropriate personal protective equipment (PPE) when handling hazardous substances.	
Check for proper ventilation and control measures to reduce chemical exposure, including fume hoods or local exhaust systems.	
Ensure that employees are trained in emergency response procedures for chemical spills or releases.	
Machine Safety:	
Verify that all machinery and equipment have safety guards and emergency shutdown procedures.	
Check that workers have received training in machine safety and lockout/tagout procedures.	
Confirm that equipment is regularly inspected and maintained to prevent accidents.	
Ensure that equipment installation and setup follow safety guidelines.	
Ergonomics:	
Verify that workstations and tasks are designed ergonomically to reduce the risk of musculoskeletal disorders.	
Confirm that employees receive training in proper lifting and ergonomic practices.	
Address any concerns related to repetitive tasks and make necessary ergonomic adjustments.	
Noise and Vibration:	
Ensure noise levels are within acceptable limits, and if not, provide hearing protection as required.	
Verify that workers have access to noise reduction measures, such as sound barriers or acoustic enclosures.	
Fire Safety:	
Confirm the presence of fire extinguishers and other fire safety equipment.	

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Check that fire exits are clearly marked and unobstructed.	
Ensure that employees are trained in fire evacuation procedures and know how to use fire-fighting equipment.	
Waste Management:	
Verify that waste materials, including hazardous waste, are properly labeled, stored, and disposed of in accordance with regulations.	
Confirm the availability of spill containment and cleanup materials for hazardous materials.	
First Aid and Medical Response:	
Verify that first aid kits are available and regularly checked.	
Ensure that personnel are trained in first aid and emergency response procedures.	
Confirm access to emergency medical services and contact information.	
Psychosocial Well-being:	
Promote a positive workplace culture that addresses stress, harassment, and conflict resolution.	
Encourage employee well-being programs, stress management resources, and mental health support.	
Safety Inspections and Reporting:	
Regularly conduct safety inspections and audits of the facility.	
Establish a clear reporting mechanism for employees to raise safety concerns and incidents.	
Documentation and Records:	
Ensure that all safety-related documentation, including training records, incident reports, and safety policies, are up to date and readily accessible.	
Legal Compliance:	

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Verify compliance with all relevant EU / UK and national OSH regulations and standards.	
Regularly reviewing and updating this checklist is essential to maintaining a safe and healthy working environment in the manufacturing of novel bio-based materials. Additionally, consult with OSH professionals or regulatory authorities to ensure full compliance with current regulations and industry best practices.	

Annex 3 - Checklist for Gender and Diversity Dimensions in OSH

Data	Yes	No
If data collected, is it disaggregated by sex?	○	○
Is the gender dimension included in the data collection (e. g. adjustment for hours of work and differences in the acute occupational exposure)?	○	○
Are possible intersections of different social categories (i.e. sex, gender, age, socio-economic status, etc.) assessed?	○	○
Are women and men equally represented in surveys – as far as possible – to close the gender data gap?	○	○
Is the data collected anonymously to avoid any potential biases?	○	○
Does the data collection assess differences between different occupations/tasks (gender norms/roles)? *What are the risks of male or female dominated occupations? Have all risks been considered?*	○	○
Does the data collection assess differences in the same occupation? *Are certain social groups at higher risk? Are they differently affected by risks due to biological or gender differences?*	○	○
Are there any studies available that relate to your own OSH policy or strategy?	○	○

Risk assessment	Yes	No
Does the risk assessment take into account sex dimensions by considering differences in the immune, pain and hormonal systems, biological and physical characteristics?	○	○
Does the risk assessment take into account differing references values and risk levels for different social groups (not only using the average white male standard for everybody)?	○	○

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Does the risk assessment consider the actual exposure of all affected groups?	○	○
Are all the environments where chemicals occur considered, including mixed toxicity and endocrine disruptors?	○	○
Is pregnancy taken into account? Consider the potential differential effects on pregnant individuals in terms of hormonal and physical changes and on the unborn child.	○	○
Does the risk assessment take gender dimensions into account? *This should include the intersection of several social categories and specific risks that occur for women because of gender roles.*	○	○
To avoid any bias, have you checked your prior assumptions about what the hazards are and who is at risk? *Also check for any (gender) bias in prioritizing risks according to high, medium and low.*	○	○
Have you ensured that instruments and tools used for assessment include issues relevant to both male and female employees?	○	○

Protective clothing and equipment	Yes	No
Is occupational safety and health for women equally included in (male-dominated) occupations and not only as a divergence from the male norm?	○	○
Is the personal protective equipment also designed for women and everybody, who does not match the average white male norm? *This includes not only smaller versions of the equipment of the male standard, but adjustments to the physical, biological and social needs of women and other social groups.*	○	○
Are working tools and devices suitable for the ergonomic needs of women and other people diverging from the male standard?	○	○
Is it ensured, that part-time personnel have sufficient access to training opportunities, especially on OSH issues related to their specific tasks?	○	○

General measures to promote gender-sensitivity in OSH
Reviewing safety policies, specifically including a commitment to gender mainstreaming, and relevant objectives and procedures.
If possible, enable flexible working hours to facilitate the reconciliation of profession and (care) work at home.
Ensure that women also have the opportunity to participate in the company's OSH decision-making processes and implementation of solutions.
Promote a culture of reporting and recording on OSH issues and accidents, so that potential OSH risks are not get overlooked.

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Incorporate sexual harassment reporting into OSH and implement policies to prevent sexual harassment.

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