



RECLAIM

Refurbishment and re-manufacturing
of large industrial equipment

Regulatory & Ethical Helpdesk Report #1

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Technical References

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¹ PU = Public

PP = Restricted to other programme participants (including the Commission Services)

RE = Restricted to a group specified by the consortium (including the Commission Services)

CO = Confidential, only for members of the consortium (including the Commission Services)

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Abbreviations and Acronyms

Abbreviation	
BB	Building Block
csv	Standard text file format (comma-separated values)
DoA	Description of Action
DSF	Decision Support Framework
Dx.y	Number of Deliverable
EC	European Commission
GA	Grant Agreement
IoT	Internet of Things
KPI	Key Performance Indicator
OEE	Overall Equipment Effectiveness
OEM	Original Equipment Manufacturer
pdf	Standard file format of Adobe Acrobat
PHM	Prognostics and Health Management
ppt	Standard file format of Microsoft PowerPoint
Tx.y	Number of Task
WP	Workpackage
xls	Standard file format of Microsoft Excel





Summary

The vision of RECLAIM is to demonstrate the physical and virtual technologies, as well as new paradigms in the framework of the Industrial Internet of Things, IIoT, for the real digitalization of the traditional industries based in the refurbishment and re-manufacturing of large industrial equipment in factories, paving the way to a circular economy. The integration of obsoleted or analogical machines into the modern production line is an urgent need for the re-activation of the current economic situation to increase productivity based in efficiency and prevision, where new inversion will not be accessible at the short term. Simultaneously, the retrofiting of machines and production lines at factories to achieve digital performances will position these industries and factories into the market again with competitive and sustainable skills; without the substantial inversion that industrial machinery and tools means.

RECLAIM solutions will support Europe to maintain a health industrial fabric based in preparedness to the digital change in using a non-expensive, and realistic and way accessible services for all industrial sectors and sizes, from micro-SMEs to macro-industries. Those solutions are based in the physical and digital retrofiting of the industrial facilities using without the minimum invasive approach from the technological point of view. Retrofitting, refurbishment, and re-manufacturing based in smart and heterogeneous IoT sensor, new versatile and functional industrial PC or human interface machine that, combined with the machine learning and data analytic, that could support digital twins and decision support tools to demonstrate the robustness of these high innovative technological solutions.

Task 1.4, “Regulatory, Societal, Ethical and Safety Issues”, deals with all regulatory and ethical issues that arise during the project and with the application of all ethical approvals that are needed for this project. Both the EC and national regulations and legislations will be considered while assessing the ethical impact of RECLAIM pilots. Additionally, this task aims to study the impact of the RECLAIM project in different areas, such as environmental aspects, social issues, or economic impact.





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1 Introduction

RECLAIM intends to demonstrate strategies and technologies that enable the re-use of industrial equipment in old, renewed and new factories. The idea behind this solution is to save valuable resources by recycling equipment and using it in a different application instead of discarding it after one way use.

Task 1.4, “Regulatory, Societal, Ethical and Safety Issues”, deals with all regulatory and ethical issues that arise during the project and with the application of all ethical approvals that are needed for this project. Both the EC and national regulations and legislations will be considered while assessing the ethical impact of RECLAIM pilots. Additionally, this tasks aims to study the impact of the RECLAIM project in different areas, such as environmental aspects, social issues, or economic impact.

1.1 Content and structure of this deliverable

The deliverable D1.5, “Regulatory & Ethical Helpdesk Report #1”, results from the developments of task 1.4. This deliverable approaches as main topics the Data Protection Authorities (DPAs), and the Societal Impact Analysis.

This way, the document includes 2 principal sections:

Section 2 includes the Data Protection Authorities (DPAs) information of the countries hosting the RECLAIM pilots to manage the usage of personal and business data. Additionally, this chapter describes data protection methodologies used in RECLAIM in order to assegrate the General Data Protection Regulation (GDPR). This way, Subsection 2.2 lists, for each task, the respective activities that require sensible data, that goes from refurbishment costs, to photos for dissemination. The definition of data protection principles allows the fulfilment of the GDPR regulation. For that, Subsection 2.3 lists the essential principles to consider in terms of data protection, those principles include, voluntary participation in surveys, data retention policies, data anonimization, among others.

Section 3 describes the Societal Impact Analysis performed in task 1.4. So, this section includes the societal impact analysis of the project and its potential implementation. The impact analysis covers the environmental area, the energy impact, the economic aspects, and the social impact. Each area includes several subareas, for instance the environmental aspects include the resources consumption, waste management or pollution control. Therefore, the second section describes the fundamental aspects of each area, including how the RECLAIM project will address it, which technologies can be used to improve it, among other key aspects.

1.2 Relation to other tasks and deliverables

This deliverable is related to other published and not yet published deliverables of the RECLAIM project. Section 2 uses as sources of information deliverables D10.1 and





D10.2, which contain the organization statements about the data protection authorities. Both Section 2 and Section 3 use also contents from the RECLAIM Grant Agreement.

- (D10.1, 5/2020) Document describing the RECLAIM regulations on the management of personal data.
- (D10.2, 5/2020) Document illustrating the identification and recruiting process for humans involved in the evaluation of the pilot lines demonstrators and it also shows how this human participation is organized.
- (Grant Agreement NUMBER 869884 – RECLAIM, 2018) RECLAIM Project Grant Agreement.





2 Data Protection Authorities (DPAs)

The Data Protection Authorities (DPAs) of the countries hosting the RECLAIM pilots were contacted to review the protocol proposed by the project to manage the usage of personal and business data and provide their consent to the specific validation activities before starting the different pilots.

2.1 RECLAIM general principles

The general principles of ethics with respect to data protection are regulated in the RECLAIM Consortium Agreement within §5.5 “General Data Protection Regulation - GDPR”. It states, that “All Parties warrant they have a Data Protection Policy and that they are compliant with the General Data Protection Regulation (GDPR)” and that “The Parties warrant and represent that any Background, Results, Confidential Information and/or any and all data and/or information that is provided, disclosed, or otherwise made available between the Parties during the implementation of the Action and/or for any Exploitation activities (“Shared Information”), shall not include Personal Data as defined by Article 4 of the GDPR.”.

2.2 RECLAIM tasks and activities in relation to data protection

The RECLAIM project addresses mainly technical aspects. For that, the data collected, stored and processed focuses on technical data coming from machines and their components. A detailed description of these data, its purpose and processing are described in D1.3 “RECLAIM Data Management Plan”. However, there are several tasks in RECLAIM that also deal with personal data. These personal data-related tasks are shown in the table below together with also the activities in which personal data will be collected and processed.

WP	Task	Task purpose	Activity
WP1	T1.1	Project coordination and financial management	Managing of budget and efforts related to the project partners, managing contact data (mailing lists, phone numbers, etc.)
	T1.2	Technical and innovation management	Interaction with other EU projects for the identification of synergy effects; Best practice and knowledge exchange with project-external experts
	T1.4	Regulatory, Societal, Ethical and Safety Issues	Survey on the societal impacts of the project and subsequent survey analysis
WP2	T2.1	End-User and System Requirements	Survey on the general industrial requirements on equipment





			refurbishment and re-manufacturing and subsequent survey analysis
WP4	T4.3	Cost Modelling and Financial Analysis Toolkit	Potential usage of the income employees/workers in order to calculate the costs for refurbishment and re-manufacturing of machines
WP5	T5.2 + T5.5	In-situ repair data analytics + AR-enabled multimodal interaction mechanisms	Usage of shop floor data related to the behaviour of workers; AR setups that are tailored to workers behaviour and their preferences
WP8	T8.3	Roadmap for scale-up, uptake and replication	Roadmap development for integration and scale-up of RECLAIM results. For that, a questionnaire will be developed and spread among industrial stakeholders.
WP9	all	Dissemination and Communication Activities	<p>Some communication and dissemination activities will require personal information and interaction with humans. All necessary steps to respect GDPR and personal preferences will be taken. This may include:</p> <ul style="list-style-type: none"> • Photos, video and interviews prefaced by a disclaimer. • Event registration and information clearly notifying participants of any potential photography, recording, sharing of information or contact details at the event; including an opt-out. • Visitors to the project website, made aware of routine collection of anonymised browsing data <p>It is not expected to acquire personal data as part of social media activities, campaigns and media relations connected to the project; only act as a data processor of indexed data, voluntarily posted with a public status.</p>





2.3 RECLAIM principles in relation to data protection

As shown in the table above, RECLAIM will collect and use personal data for carrying out various activities. These data will be collected for example by questionnaires, by expert interviews as well as workshops and other events. These questionnaires, interviews and other data-gathering exercises will be developed within the specific WPs and a quality check will be performed by appointed consortium members. Personal data will be collected through surveys and interviews by the RECLAIM project partners through questionnaires send accessible via the web-based platform SurveyMonkey, face-to-face or telephone interviews.

The RECLAIM partners are aware that the participants of any activity will be informed about their rights in the usage of their data in language and terms understandable to them. In this respect, participants will have the following rights:

- Every participation is voluntary.
- Understandable answers can be expected on any questions they might have before deciding to participate.
- Information of the purpose of a participation and any potential use of their data.
- Information, how their data will be collected, protected, eventually reused by whom and for how long, a maximum conservation time will be provided.
- Information, that their personal data will be encrypted, and their information will be anonymized such that although respondents will undergo classification for analytical purposes, it will not be possible to infer individual identities.
- RECLAIM will inform any internal or external participants to events about pictures taken as well as video and sound recordings, to get their prior consent to it.
- The right to withdraw themselves and their data at any time.

RECLAIM will implement several measures to prevent unauthorized access to personal data or the equipment used for processing. As an underlying principle of data minimization will be implemented. With this respect, data only will be collected in a reasonable quantity and only for the direct purpose of the project tasks. In addition to that, the following measures will apply for all activities and tasks:

- The access to data will be restricted to the respective project partners and coordinator.
- In the first instance, the project partner who collected the data will also be responsible for data storage.
- Regarding the (commonly accessible) RECLAIM data repository, data will be anonymized and/or pseudonymized by the partner who collected the data before the data will be transferred to the repository





- Data storage will be compliant with EU, national legislation, or organisation's rules whichever are the stricter.
- Personal data will be stored only for the duration of purpose and will be destroyed as soon as possible.
- Retention of the data from individuals will be for the period specified in EU or national legislation or until the end of the project, after which it will be destroyed by complete erasure. Data arising from analytical procedures will be kept for as long as is required by EU or national agencies, whichever is the longer.
- Several technical measures will be implemented:
 - Shared folders, databases, repositories, etc. will be protected by a password.
 - Servers will be protected by firewalls and Antivirus software.
 - Data transfer will be done (whenever possible) via secured channels (e.g., VPN, https, etc.).





3 Societal Impact Analysis

This task will also provide an ongoing assessment of the project’s role and function in society. Specifically, a societal impact analysis of the project and its potential implementation will be carried out. Figure 1 (Morrar, Arman, & Mousa, 2017) indicates the main fields considered on that analysis. Those areas include 1) environmental aspects, involving circular economy concepts, like reuse of old equipment or recycling of wasted material, 2) societal aspects, describing how Industry 4.0 will affect the persons life in terms of jobs and other aspects, and 3) economic aspects, mainly in terms of reducing the manufacturing costs and overtaking the resource shortage and scarcity.

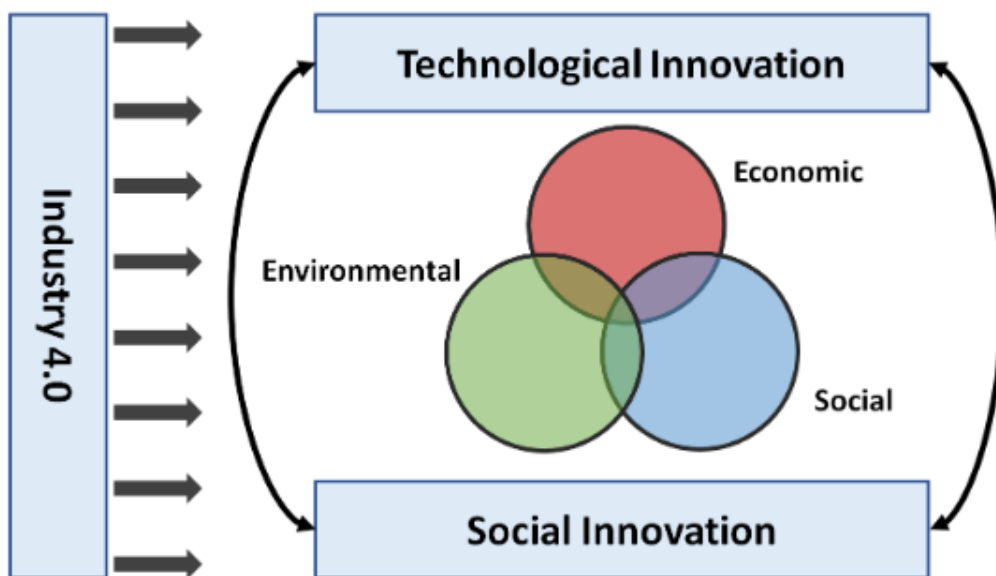


Figure 1 - Industry 4.0 impact areas.

Inside environmental aspects one of the main fields is the energy impact, which influences directly problems like the CO2 emissions and global warming. Those issues can be addressed by reducing energy consumption using for that energy forecasting and optimization models.

Each impact area present different subareas that must be addressed in order to reduce the main issues. Figure 2 (Peng, Kellens, Tang, Chen, & Chen, 2018) presents the subareas existent in impact area (economic, environmental and societal). Among the mentioned subareas, the principal ones are 1) costs and productivity, regarding economic aspects, 2) resource consumption, waste management and pollution control, regarding environmental aspects, and 3) labor development, ethics and copyrights, regarding societal aspects.



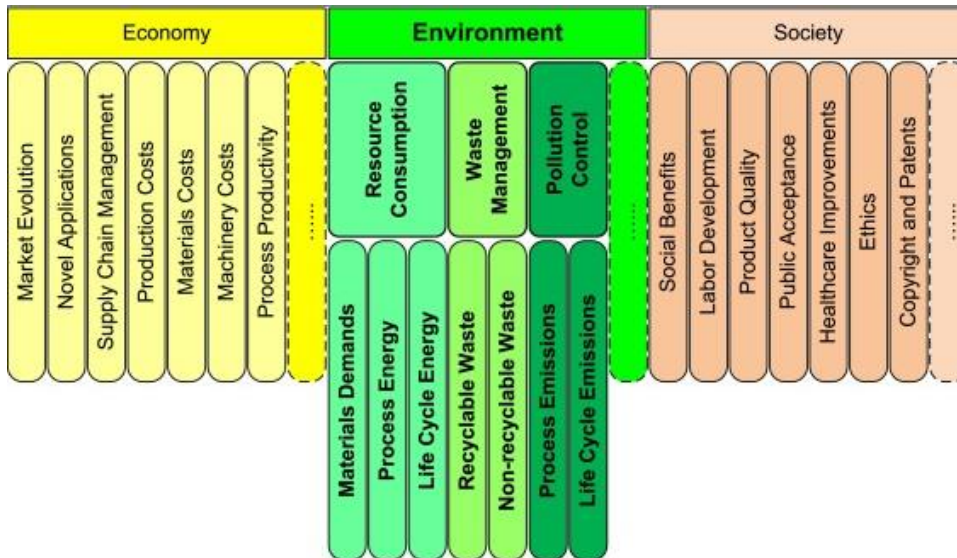


Figure 2 - Economic, environmental and societal aspects subareas.

The Industry 4.0 aims to handle those issues. For that, it introduces many enabler technologies, that improve different indicators. Figure 3 shows some of the principal Industry 4.0 enablers, like big data analytics, internet of things or autonomous robots. RECLAIM aims to adopt, develop and deploy some of those technologies in different pilot scenarios, and improving several KPIs related to those aspects. Some of the essential technologies adopted by RECLAIM are 1) internet of things and system integration, including sensors and communication infrastructure, 2) big data, cloud computing and simulation, providing methods to analyse the data produced by the shop floor equipment and optimizing several indicators, and 3) other technologies, like cybersecurity or augmented reality.

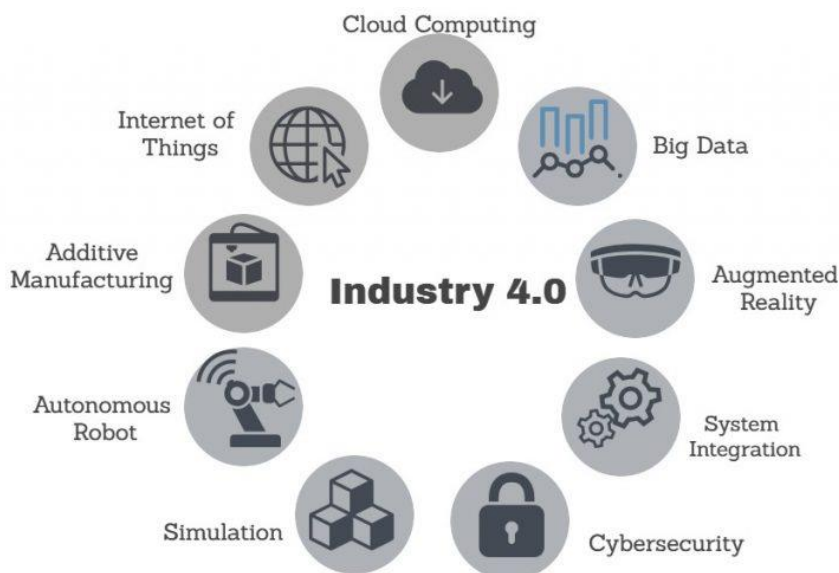


Figure 3 - Industry 4.0 key areas/enablers.





3.1 Environmental Impacts

The environmental impact is one of the main challenges of the 21 century, due to the climate change affecting everyones lifes, in terms of extreme events, like floods, drys or storms. Handling environmental impact and consequently climate change is a dutty for this generation, and all sectors should implement policies to minimize their environmental impact. The manufacturing sector (Thomas, 2020) is not an exception, and Industry 4.0 should consider those aspects when implements its solutions.

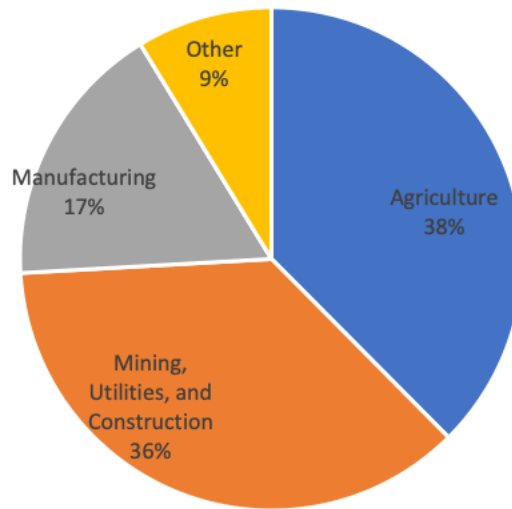


Figure 4 - Environmental impact of the manufacturing industry and its suppliers.

Companies began to adopt new technologies to handle the environmental aspects, mainly to reduce waste and become energy efficient. Additive manufacturing, mainly 3D printing, enables companies to produce prototypes and individual components, with minimal usage of resources and avoiding major dependencies on the suppliers. With advanced manufacture, 3D printing can be used to make small batches of custom products that offer construction advantages, such as lightweight designs. With the evolution of 3D printing, new materials are being produced with greater strength and with a shorter manufacturing time. For instance, aerospace companies are already using 3D printing to apply new designs that reduce aircraft weight by reducing their spending on raw materials such as titanium and the generated waste (Moraes & Lepikson, 2017).

RECLAIM will significantly contribute to environmental sustainability (in Europe and beyond) and increase and improve employment (in Europe). For the former, RECLAIM aligns with the EU and international regulations and guidelines on reuse, refurbishment, and recycling of large industrial equipment, emphasizing refurbishment and re-manufacturing of large machines, as it specifically targets the enhancement Factories of Future in Europe and beyond. The RECLAIM concept will enable to foster more attractive high-tech working places to be more competitive and provide workplaces that offer appealing job opportunities to the next generation of workers, engineers, and researchers.





3.2 Energy Impacts

Energy is an essential pillar for leading Europe to growth and competitiveness. As the demand for goods while resources are scarce, it is vital to make manufacturing activities more efficient and produce “more with less”. Climate change is evident due to the CO2 emissions and greenhouse gases (GHG). The European manufacturing industry is aligned with these goals, and significant effort has been put into achieving the energy requirements and increasing renewables. However, the margins for further improvement are substantial as the manufacturing sector accounts for 13.2% of the CO2 emissions and 11% of the GHG, reducing by 3% and 6%, respectively 78.

Figure 5 (Eurostat, 2018) presents the distribution of energy consumption by sector. This chart has as majority sections the transports area, households, and industry, with similar percentages around 30%. That denotes that industry plays a major role in the energy consumption market and consequently has a relevant impact on CO2 emissions. Industry 4.0 technologies, like simulation or big data analytics, enable the optimization and consequent reduction of energy consumptions, turning the manufacturing industries more efficient and with a reduced impact on CO2 emissions.

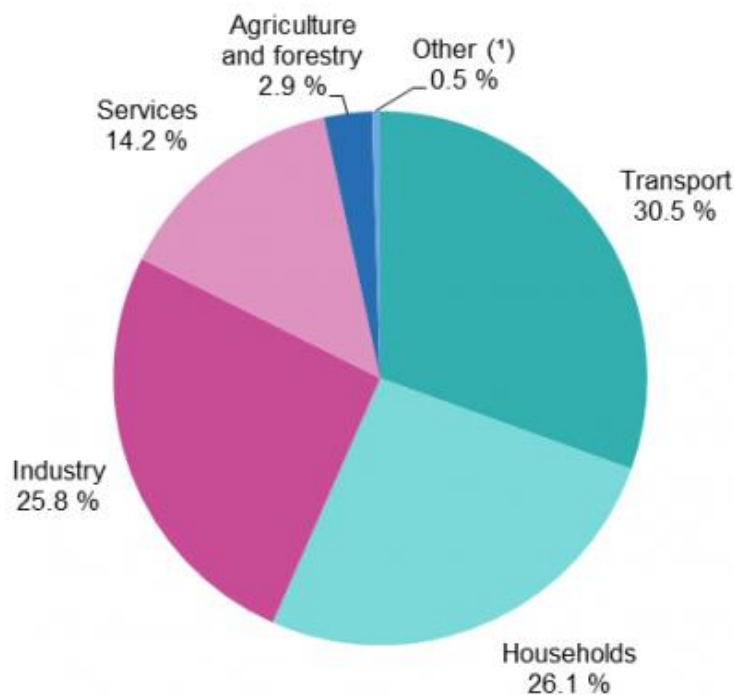


Figure 5 - Energy consumption by sector in 2018, according to Eurostat.

RECLAIM solution will further contribute to achieving the ‘20/20/20’ objectives. RECLAIM will target an environmental recovery efficiency of at least 10% by utilizing the RECLAIM Refurbishment and Re-manufacturing processes concerning the base case scenario that is maintenance limited to what is required to support operation. Maintenance operations are critical in granting machines and processes energy





saving. RECLAIM solution will give them the capability to function optimally thanks to RECLAIM integrated diagnosis and prognosis models. The major challenge for the RECLAIM system is to maximize assets' reliability, availability, maintainability, and efficiency, ensure the environmentally friendly operation and optimize the operation cost in terms of production and energy.

Manufacturing systems malfunctions (normal wear and deterioration, or other failures related to equipment being pushed beyond their design limits and operational failures) may result in equipment downtime and low-quality affecting production efficiency and possible safety hazards and environmental hazards pollutions. Legacy maintenance approaches have poor visualization of the environmental impact of manufacturing. RECLAIM novel maintenance planning system consider maintenance ecological impact and energy costs. RECLAIM will increase components' reusability and maintainability by processing history storing and condition monitoring. The self-description of the components will include circular economy guidelines to ensure that this information is always directly accessible and can therefore be followed by end-users. In addition to that, the process optimization capabilities of the components contribute to environmental-related optimization goals such as minimum energy consumption or minimum pollution generation.

Finally, ICT is recognized by the European Union as playing a “key role in reducing inefficiencies in the use of resources and improve the sustainable competitiveness”. European Commission (Albuquerque, 2009) reported that the energy requirements for ICT-related solutions are much smaller than other sectors. Meaning that solutions like RECLAIM that involve ICT modules and services in the industry could help reduce energy consumption by manufacturing companies.

3.3 Societal Impacts

Industry 4.0, besides bringing fundamental improvements to manufacturing, comes with essential issues to be addressed. The Industry 4.0 concept has been associated with rapid technological breakthroughs that lead to transformations in all aspects of our socio-economic lives. In this view, one of the critical questions is how countries can create the conditions for the fourth industrial revolution and associated emerging technologies to bring new opportunities and benefits to the people and society, to help remedy the damage to the community that the last three revolutions caused.

Figure 6 (Carufel, 2018) shows a survey about the impact and acceptance of Industry 4.0 in the labor development and manufacturing workforce. From the peoples' answers, we can infer that Industry 4.0 has a good acceptance among the public. It's also relevant that most people believe that Industry 4.0 will bring more equality and stability, indicating an extremely positive opinion about Industry 4.0.



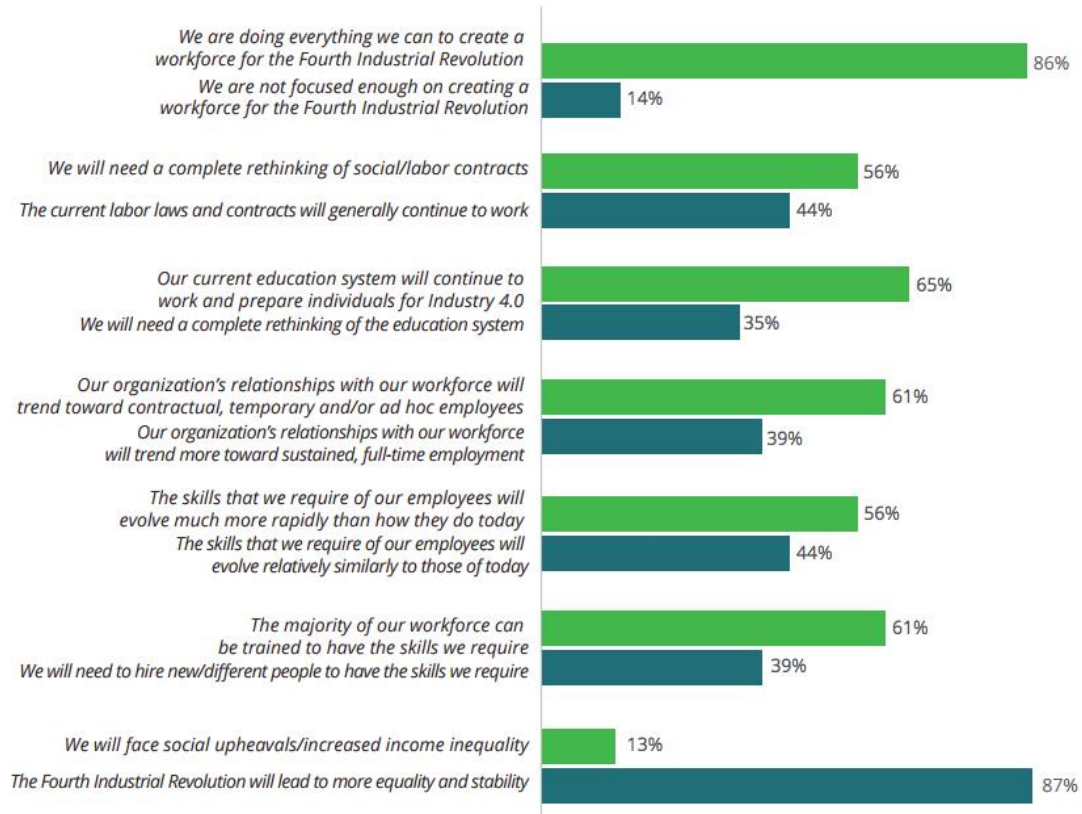


Figure 6 - Survey about the Industry 4.0 impact on the workforce.

The discussion of social innovation in the context of Industry 4.0 is critical to happen at early stages to address the growing concern of any possible negative externalities on individuals and society at large. This discussion is vital due to the increasing possibilities of substituting the human role with new technological innovations in artificial intelligence, robotics, drones, virtual reality, and the IoT. As a result, specific jobs may be made redundant or obsolete through automation and the production process’s digitization. The qualification requirements of new jobs will be stricter, requiring new skills and knowledge.

The societal impact of the FoF H2020 PPP is not only seen in terms of employment, but social sustainability in manufacturing is also one of the headlines of the roadmap from the perspective of the challenges and opportunities. The envisioned impact of the RECLAIM in a societal aspect is:

- Potential of creating jobs in Europe by the employment of the R&D staff.
- Increased human achievements in future European manufacturing systems.
- Sustainable and attractive workplaces for Europe in 2020.
- Establish sustainable care and responsibility for employees and citizens in global supply chains.

The technological breakthroughs that will emerge from the RECLAIM approach will promote the creation of new high-tech workplaces that demand highly skilled staff. Novel paradigms for manufacturing education, such as the ‘Teaching Factory’, will further pursue the integration among research, innovation, and education, and help





prepare the next generation of knowledge-workers that will take over the use of the new technologies within the factories of the future.

RECLAIM will also stimulate the societal cohesion. Manufacturing is the motor for economy all over Europe. World-class manufacturing is the art of integrating white-colour and blue-colour workers more than any other sector. Stimulating the manufacturing sector and providing high-tech, well-paid working places for all will obviously lead to a better social cohesion and mitigate the already existing pay disparity in society better than may (service) sectors that inherently require low-wage jobs. Value added production instead of price competition, demand for higher educated workers that create higher value per hour and thus allow maintaining European wage relations. The RECLAIM concept will enable to foster more attractive high-tech working places to be more competitive and to provide working places that offer attractive job opportunities to the next generation of workers, engineers and researchers. “Intelligent factories” will show new manufacturing environments with multimodal collaboration, advanced human-machine interfaces and new forms of cooperation between human and artificial systems.

3.4 Economic Impact

The economic aspects are one of the primary indicators affecting leaders’ decisions. Manufacturing industries are not an exception, and Industry 4.0 should help companies improve related indicators, like productivity or competitiveness. Figure 7 (Buchholz, 2020) shows the evolution of the portion of GDP generated by the manufacturing sector in the more industrialized countries. This graphic illustrates that the manufacturing industry is decreasing compared to the other sectors in terms of percentage. This drop in the GDP percentage, over the years, has as the main reason the appearance of big companies in different sectors, such as Apple, Facebook, Google, or Amazon.



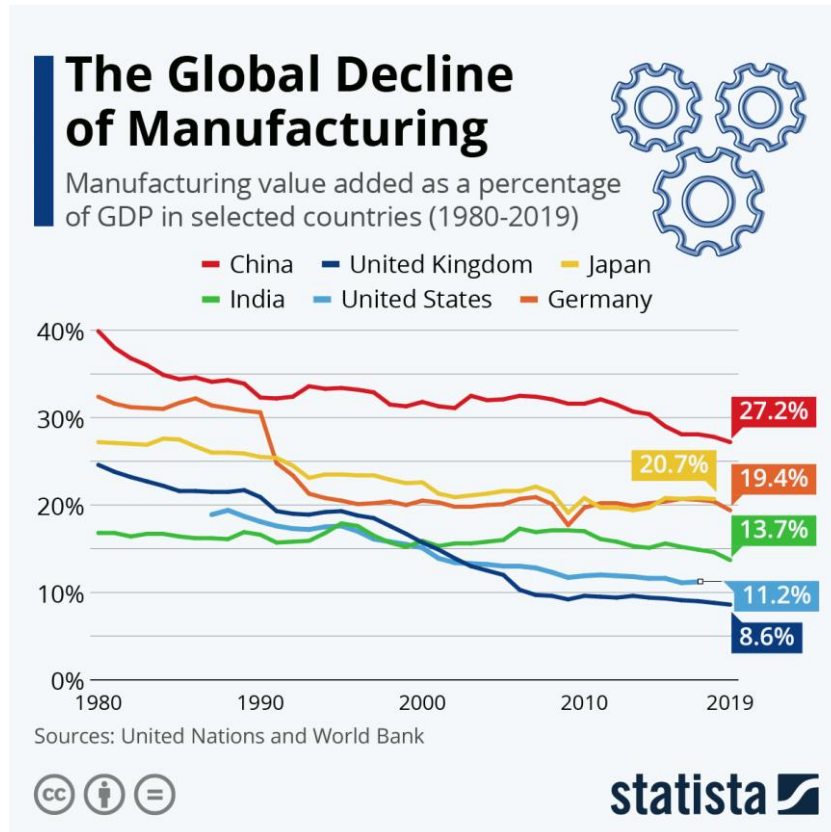


Figure 7 - Evolution of the portion of GDP generated by manufacturing in some world countries.

RECLAIM can help companies to boost their competitiveness. Manufacturers adopting the RECLAIM solution can increase resource efficiency and reduce pressure against resource shortage and scarcity. They will significantly reduce raw material costs, distributing them over several use cycles of their products and creating a strategic cost advantage. Specifically, EU-based companies can deter the entry of low-cost (non-EU-based) competitors by introducing lower-cost re-manufactured products. Adopting the RECLAIM solution will help companies adjust to market changes more quickly than linear models.

Moreover, RECLAIM will also contribute to increasing and improving employment (in Europe). For the former, RECLAIM aligns with the EU and international regulations and guidelines on Circular Economy, emphasizing refurbishment and re-manufacturing, as it specifically targets the enhancement of factories of the future, to make them more efficient through automation and expand the growth of this sector, in Europe and beyond.





4 Conclusion

As overall conclusions, the deliverable D1.5 “Regulatory & Ethical Helpdesk Report #1” includes the resulting contents from task 1.4 “Regulatory, Societal, Ethical and Safety Issues”. Those contents describe the data protection policies and activities and performs an initial revision of the different impact areas. This way, at the end of this first iteration, task 1.4 was able to accomplish the following objectives:

- Definition of tasks and respective activities that involve data protection requirements.
- Establishment of data protection principles in order to ensure data privacy and protection.
- Identification of the major impact areas (environment, energy, economic and social) and respective subareas.
- Definition of the Industry 4.0 technologies capable of improving the impact areas.
- Characterization of each impact area in terms of RECLAIM improvement (after the project) and potential enabler technologies.

Task 1.3 has a second iteration resulting in the deliverable D1.6 “Regulatory & Ethical Helpdesk Report #2”. For that iteration, besides continue the search and identification of key impact aspects, the principal focus will be more centred on the RECLAIM implementation, characterizing the impact of developed solutions in the different areas. For that, it will be interesting to link some of the subareas and enabler technologies to the RECLAIM developments and indicators.





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