Deliverable 2.1

Regulatory bottlenecks and standardisation needs identified by EU projects in the nine focus areas

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ABBREVIATIONS

BBI: BioBased Initiatve

PPP: Public Private Partnership

PARTNERS SHORT NAMES

CIRCE: Fundación CIRCE – Centro de Investigación de Recursos y Consumos Energéticos

CEFIC: Conseil Européen de l'Industrie Chimique

CEMBUREAU: Association Européenne du Ciment

A.SPIRE: SPIRE

DIN: DIN DEUTSCHES INSTITUT FUER NORMUNG E.V.

ECREF: EUROPEAN CENTRE FOR REFRACTORIES gGMBH

ECREF / FGF: Forschungsgemeinschaft Feuerfest e.V.

ECREF / VDFFI: German Refractory Association

FEHS: INSTITUT FUR BAUSTOFF-FORSCHUNG EV

PUBLISHABLE SUMMARY

One of the first activities in HARMONI project consisted in analyzing and compelling the regulatory barriers and other non-technological barriers, as well as standardization needs identified in relevant on-going/recently finished EU projects.

The aim was to collect the maximum possible number of EU-funded projects' information under the Seventh Framework Program as well as Horizon 2020 in related fields to HARMONI. These projects were focused on different topics (environment, circular economy, water, waste, industry, climate change, energy and NMP) which comprised different kind of technologies and TRLs range, all related in one way or another with the intensive industries.

The information collected from the A.SPIRE survey and P4P project survey, launched slightly before and after the start of the HARMONI project respectively, were analyzed. Furthermore, a detailed search in CORDIS Data base was carried out to identify the most relevant projects as an additional source of information. This exercise resulted in selecting 82 EU projects, from the 7 FP and H2020, as very relevant for a direct interview. All those Project coordinators were contacted asking them for an interview. Among them, 26 interviews were conducted (19 EU project coordinators (one of them representing two projects as this person was the same coordinator in both cases), 6 companies participating and 2 industrial associations.

The participants in those interviews claimed the challenges and opportunities they identified in the field of regulation, standardisation and other non-technological barriers. As a result, 62 remarks were identified which will be used and feed into the WP from 3 to 5, dealing respectively with regulation, standardisation and non-technological barriers. Not all the interviews were equally fruitful as not all of the projects and contacted people were involved and/or aware of all the three elements that compose the WP3 to 5. Nevertheless, the interviews revealed very valuable inputs for those WPs of HARMONI. Specially, most of the interviewers suggested ideas and concerns with regard to non-technological barriers. In the case of regulation and standardisation, the comments came from half of the entities interviewed. In some cases, some topics appear frequently, which illustrate that most of the sectors (among the intensive industries) face the same challenges and/or would be in favor of similar future initiatives and recommendations. All in all, the companies underlined the importance of the topics HARMONI project´s tackles as all of them recognize that non-technological barriers seriously affect the deployment of available or very close to the market promising technologies.

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1 INTRODUCTION

1.1 General Context

The manufacturing industry can essentially be classified into two main categories: process industry and discrete product manufacturing. The process industry transforms material resources (raw materials, feedstock) during a (typical) (semi)continuous conversion into a new material that has significant different physical and chemical performance than the starting substance. This material is then usually shaped by discrete manufacturing into an end user product or intermediate component; often it requires combining several different and discrete manufacturing operations to come together into a consumer product. Feedstocks and their source, conversion processes, intermediate and/or end-user needs and certainly also waste streams. It is thereby important that both the separate components as well as especially the integrated holistic view are taken into account, including significant horizontal issues. All the aforementioned elements are part of the SPIRE PPP, composed by 8 sectors, all of them, intensive industries, with a common vision towards more efficient use of resources.

SPIRE distinguishes itself through its visionary cross-sectorial approach in tackling key societal challenges. Novel and drastically improved production processes are key to increase the energy, resource and CO2 efficiency in industrial value chains. Addressing these challenges requires the appropriate technologies, processes and products with intelligent product design as well as smart processes over the value chain to:

1. use energy and resources more efficiently (reduce) within the existing installed base of industrial processes
2. re-use waste streams and energy within and between different sectors, including recovery, recycling and re-use of post-consumer waste
3. replace current feedstock by integrating novel and renewable feedstock (such as bio-based) to reduce fossil feedstock dependency while reducing the CO2 footprint of processes or increase the efficiency of primary feed stock. Replace current inefficient processes for more energy and resource efficient processes when sustainability analysis confirms the benefits.
4. reinvent materials and products to have a significantly increased impact on resource and energy efficiency down the value chain as a result of i.e. integration recycled materials, easy recyclability and re-usability as well as improved material properties such as e.g. light weight (e.g.
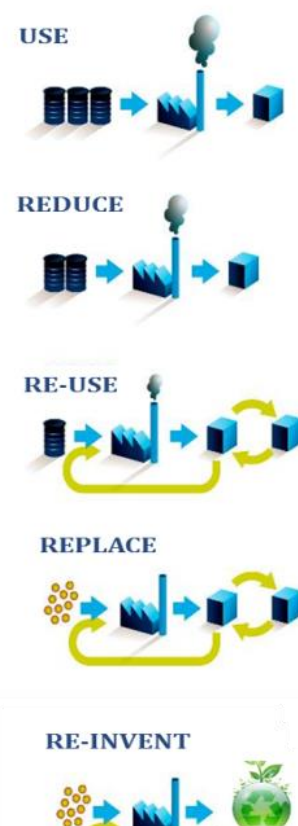

Figure 1: Approach to increase energy, resource and CO2 efficiency in industrial value chains

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for lower consumption vehicles) and improved insulation properties (e.g. for energy efficient buildings).

Nowadays, developing new processes is sometimes too costly and risky for a single company. Sharing costs between companies, value chains and sectors in an open innovation community would allow to develop new processes and to provide the means to succeed in a general way. Sharing of costs would permit many industries, including large numbers of SME, to develop processes that they wouldn't have been able to develop on their own because of a lack of resources. There is a huge potential to promote a cross-sectorial approach of R&D&I through different industries, in order to identify new ideas, the possible transportation of a new technology from one sector to another one and reach critical mass of means for advanced and breakthrough technologies. It is necessary to integrate the development of these enabling technologies with demonstration units to prove their integration capability in the whole product tree. In all activities the aim is also to improve economic feasibility and hence increase adoption.

All aforementioned elements are influenced by non-technological barriers in the development and further use of new technological solutions. Regulation and other elements incentivize in some cases innovation but in other situations, they act as significant bottlenecks. In addition, other elements, non-technological barriers such us lack of suitable financial schemes, regulatory uncertainties, communication or permits could also underpin the implementation of close to the market technologies of benefit to SPIRE companies. Furthermore, standards, as enablers for technology deployment, could also play an important role in conjunction with less impacting non-technological barriers. To sum up, the link between innovation and non-technological barriers are very interdependent and must attract more attention in the future.

The present WP2 as a whole aims at collecting what the challenges the European community face in the intensive industry field. This exercise will result in the identification and prioritization of what the main barriers are, to work upon them in the WP3, 4 and 5, dealing with regulation, standarisation potential and other non-technological barriers respectively.

1.2 Regulation, standardisation potential and other non-technological barriers: a holistic analysis of all the potential improvements

In order to facilitate the transferability of technologies and other non-technical solutions, the proposed good practices and changes should be fully aligned with several actions in parallel. A change in a directive, a new standard or an incentive addressing the use of new processes and/or products might boost new business cases, creating an attractive investment framework and sustainable environment to a larger use of existing technologies. However, in most of the cases, the combination of solutions in all these themes will multiply the effect of the solutions proposed. In general terms, any solution that would reduce the uncertainty of the potential market of a product/process will be extremely useful for the intensive industries. Uncertainty causes a lot of

difficulties in the decision making processes within the companies. Therefore, whatever it could be proposed, and jointly supported by other initiatives aiming at dropping those uncertainties, would also facilitate a larger use of promising available technologies. To this end, a holistic and combined analysis must be undertaken in the SPIRE sectors. Therefore, the solutions proposed in the technical WPs (3, 4 and 5) will be fully aligned with each other.

1.2.1 Regulation

While exogenous conditions cannot be directly changed, framework conditions, be they of regulatory nature or non-regulatory nature, are being in many cases defined by governments. Others like public awareness and communication platforms to facilitate the communication and exchange of views among different stakeholders must be supported by a larger number of profiles with the involvement and support of all of them, not limiting to policy makers.

Back to the the Policy Framework (both EU and Member State level) allows for the design and implementation of regulatory and non-regulatory policies that have a bearing on the framework conditions and to a greater or lesser degree on market and exogenous conditions. At the EU-level, a set of wider policies driven by the Europe 2020 Strategy and policies beyond 2020 are of instrumental importance to the performance of SPIRE sectors, including competition policy, climate policy, consumer policy, trade and international regulation, infrastructure policy, standardisation (both industrial and markets), energy policy, environmental policy and regional policy.

Within the broader Europe 2020 Strategy, the Integrated Industrial Policy (European Commission, COM (2010) 614 final) forms a specific policy response to the needs of EU-industry. It focuses on industrial innovation, the skills base, resource-efficiency and a targeted industrial policy. This integrated industrial policy approach is clearly embedded within the broader Europe 2020 Strategy, and it interacts with a wide range of other policies and Flagships (including, for instance, the Innovation Union and better regulations for innovation-driven investment at EU level (European Commission DG RTD, 2016) and a Resource-efficient Europe (European Commission, 2013). It is equally important for the Integrated industrial policy to be linked to initiatives at national and regional level – for instance, in the area of capacity building, investment, education and training. Coherence, coordination and integration of policies can only take place through involvement of multiple levels of governance.

All framework conditions can affect industries' competitiveness in a positive or negative way. The main forms are:

- Defining the level playing field;
- Guaranteeing minimum societal standards;
- Targeting skills shortage: education and training policies address skills shortages of private companies;
- Influencing transformation and modernisation of industries through innovation:
- Causing administrative costs and limiting flexibility:

To what extent the competitiveness of industries is affected in either way also depends on their response capacity. The operation of SPIRE companies must abide by a set of rules defining standards and form of production, their location and output. EU rules relevant to the industries

can be grouped into a set of themes leading from the extraction of natural resources, to production and use of the product. In addition to this, valorisation and reuse is also included in the elements that affect SPIRE sectors.
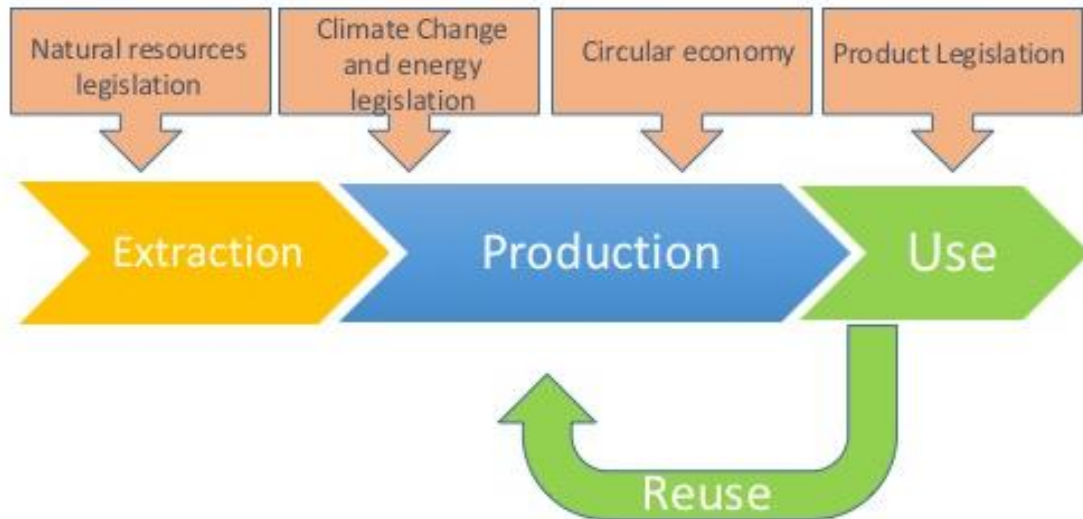

Figure 2: Themes affecting steps in the production processes

The themes are affecting the different steps in the production process in the following way:

- Extraction of natural resources:
    - Natural resources legislation defining the rules on where and how to access natural resources;
- Production:
    - Energy legislation affecting the use of gas, electricity, alternative sources or other energy inputs;
    - Circular economy affecting the handling of waste and energy;
    - Climate and ETS legislation affecting the industries efforts with respect to GHG emissions;
    - Industrial emissions affecting air quality of the local environment of industries;
- Use and reuse:
    - Product legislation affecting the use of products (and hence indirectly the production).

1.2.2 Standardisation

Standardisation acts in a well-defined framework. Next to internal rules for organizing work, this framework is influenced by requirements and drivers of standardisation:

- standards are voluntary by nature to be implemented or not;
- proposals may come from any individual, group, association or any stakeholder. Standardization in Europe is considered to be industry driven, thus addressing industry's needs, not without consulting and including all interested stakeholders in the development process of a standard;
- others dimension is added by standards being referenced in legislation and being a

backbone of the overall quality infrastructure in Europe. The framework is constantly adapted to the needs of industry, needs of users, needs of politics.

When new technologies or new research results and knowledge are available, they are integrated into standardization within the existing framework, which is characterized by a consecutive process that has two parallel strands

Standards can impact research by providing knowledge already verified by a group of relevant stakeholders, i. e. experts in the field. Standards can codify, define and describe recognized methodologies, processes, terminology, etc. assuring that these present the state-of-the-art. This can prevent research from reinventing the wheel.

On the other hand, standardization can enable fast and easier market exploitation of research results, as standards available in the area usually reassure users. Project outcomes can be "tested" with a wide community of stakeholders, raise their awareness of the project results and expand the original network.

Lastly, standards contribute to increasing the intensity of competition and export potentials and powers.

1.2.3 Other non-technological barriers that impact on competitiveness

Next to their primary regulatory targets, regulatory framework conditions should also be aligned to support the overall business environment. It is acknowledged that such a framework contributes to "business conduct cost" of firms while also creating benefits to the industries and particularly societies. Other (non-regulatory) framework conditions (such as skills policy initiatives, support of access to finance, development of infrastructure) are generally perceived by industries mainly as a benefit and its cost are covered by society (through tax contributions). The regulatory framework can trigger both costs and benefits to industries.

Lastly, the deliverable 2.1, and the WP2 as a whole, are addressing the 9 areas indicated in the text of the call for proposals as a guideline. All elements that are tackled in the project, and the WP2 as the main activity to collect information for the overall development of the project, are fully aligned with the following subjects:

- Re-use of different grades of wastewater for industrial purposes.
- Re-use of different types of waste (e.g. through re-classification) as feed for industrial production and/or energy sources.
- Recovery of valuable materials, metals and minerals from waste.
- Lifecycle Assessment methodologies to allow a harmonised comparison between industries and sectors.
- Production of advanced renewable fuels from the use of CO_2 as feedstock.
- General harmonisation of the European Waste, Water and Energy policies.
- Eliminating bottlenecks for the transferability of new technologies across European borders.

- Eliminating bottlenecks that prevent the stimulation of investments in new technologies, e.g. within clean and low carbon technologies.
- New standardisation methodologies that facilitate continuous production.

The 9 areas are covering several areas explained before and in other cases are horizontal. All in all, the topics are fully covered in the assessment of the bottlenecks and the opportunities to be further explored, in the spirit of facilitating the integration of available technologies.

2   METHODOLOGY

At the beginning of the project, the on-going and recently launched questionnaires related to HARMONI were mapped. Questionnaires are rather common in the collection of information at EU level. And in some cases, the outcome of this kind of exercises are rather modest due to the low number of responses. In this regard two related surveys to HARMONI had been conducted or scheduled close to the start date of the HARMONI Project. On the one hand, A. SPIRE circulated a survey as the kind of exercises they carry out on a yearly basis. On the other hand, an extensive survey was planned to be launched by the EC (the P4P survey and its subsequent final report). In both cases, the addressed contacts were the same that HARMONI project envisaged to get in contact with. Furthermore, the information collected from surveys are rather superficial and the HARMONI project needed more elaborated responses not only in quantity (number of responses) but also in quality (length and detailed responses collected). Therefore, and after agreeing with the PO in charge of the HARMONI Project, it was decided not to develop and launch a new survey to aim the same contacts asking rather similar questions. Instead, CIRCE identified the most promising projects as indicated in the GA and proceed with direct interviews. This is a much more time consuming exercise but, in turn, much more fruitful ideas and suggestions were gathered. Those responses will be taken later on as starting point for further work towards the recommendations and suggestions in WP 3, 4 and 5.

2.1 Contact list: Selection of projects to interview

The first step was the identification of most related EU projects, both on-going and recently finished from; 7 FP, H2020 (both non-SPIRE labelled and SPIRE labelled projects). In all the cases, the aim was to identify projects in which any relation to non-technological barriers might have been identified, and specially applied to intensive industries.

Concerning the 7 FP projects, a deep analysis of most related projects through CORDIS database was completed, with the identification of the most related project to HARMONI. To this end, an exhaustive anaysis of the projects funded under FP7 calls was performed. Particularly, those which belonged to the *NMP, Environment* and *Energy from the years 2012 and 2013*. This study included the following two steps:

I.   Read the project's topic at CORDIS to see if they could be related to HARMONI's interests. Lots of projects were discarded here.

II.   If any project went to this second stage, its website was consulted to study a bit more its topic and its relationship with the process industry and the feasibility to find a link between them and the current SPIRE topic. Their public deliverables and papers were reviewed.

This exercise was also enriched by the analysis of the P4P exercise (European Commission DG RTD, 2018). From this list, those projects that mentioned the links with non-technological barriers

and their related relationship with intensive industries were identified. This survey gathered views on how policy could help unlock the potential of research and innovation (R&I) results including references to TRLs development, operation costs decreasing, measures that would help to unlock projects' potential... The Project Coordinators also had the opportunity to claim their concerns, suggestions, experiences, fears and every kind of aspect regarding to regulation, standardisation and other non-technological barriers that may hamper the industry development.

In view to the relation to HARMONI, any remark concerning non-technological barrier and the use of standards and the potential interest to intensive industries, a contact list was elaborated.

Lastly, a special attention was paid to SPIRE labelled projects. Those projects that mentioned any to non-technological barriers and or standardisation as an interesting topics were selected from the survey sent around by A.SPIRE. That survey was developed by A.SPIRE with the little support of CIRCE, who provided some questions related to HARMONI topics. Then, the survey circulated already referred to areas of interest to HARMONI, which facilitated the identification of the most relevant SPIRE labelled projects.

2.2 Interviews with EU Project Coordinators

From the list of projects identified, 82 were selected. The main criteria to select them were on the one hand, to have identified non-technological barriers as hurdles in the development and exploitation of their projects, and on the other hand, the involvement or thematic oriented linked to intensive industries. From the aforementioned selected projects, two different contacting exercises were carried out. Firstly, 52 received an email, kindly inviting them to arrange a phone call (see Figure 3).

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Author:	CIRCE	Version:	1
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Dear Sir/Madam,

*I am writing to you due to your role as EU Project Coordinator. HARMONI is a project funded under the H2020 Framework (https://www.spire2030.eu/harmoni). It aims at proposing solutions to overcome the regulatory and other non-technological **bottlenecks and standardization needs that hamper the innovation processes** and market uptake of EU project results. This project focuses on process industry under the umbrella of SPIRE PPP, which includes Chemical, Steel, Ceramic, Cement, Minerals, Metals, Water and Engineering sectors.*

*With the support of the European Commission (in particular, Unit NMBP of DG RTD), we have **mapped the most interesting projects**, either recently finished or still on-going, that have identified non-technological barriers in the deployment of their solutions. To this end, we are taking the liberty to get in contact with you so as to discuss which the non-technological problems are in your particular case.*

We would be grateful if you could save 30-minutes of your time for an __interview__ to elaborate on it. We assure you that it will not take much longer. Lastly, if you believe this interview should be carried out by or with other person, I would kindly ask you to coordinate with him/her/them.

*The information collected will be of high interest to the EC (in copy of this email). It will **help us identify the challenges** we all face in this field and accordingly, take them into consideration in the spirit of promoting the solutions you developed in your project. It will also be very beneficial to monitor and evaluate the next steps of the projects by the EC, especially with regard to the exploitation of impacts. Of course, all data is treated at the highest level of confidentiality. Thus, company names and exploitable results will not be used to any extent as the interview seeks for barriers, challenges and solutions of non-technological cases regardless of the companies and markets.*

So as to facilitate this exercise, I would be delighted if you could indicate your availability in the following doodle: https://doodle.com/poll/qsp2tctn4tgqkav4

In view to your experience in your EU project, I look forward to briefly talking to you about non-technological barriers in the field of intensive industries.

Kind regards,

Ignacio Martin.
HARMONI Project Coordinator

Figure 3: Email template sent to invite EU project coordinators to interviews

Several reminders were sent around so as to motivate the recipients to participate in the exercise. Out the 50 contacted in the first wave of emails, 19 accepted to arrange an interview. In addition, other telcos were organized so as to interview not only EU project coordinators but also industrial partners from those projects. As a result, the number of interview raise up to 22. After a month and a half after the first email invitation, other 32 projects (less related to HARMONI or already finished) were contacted too. As a result, 4 more EU project coordinators accepted to carry out

a phone interview. In total, 26 representatives have been interviewed by CIRCE from: 19 EU project coordinators (one of them representing two projects as this person was the same coordinator in both cases), 6 companies and 2 industrial associations directly linked to those projects.

1. ALTEREGO & ADREM Projects
2. Bio4Products Project
3. C2CA Project
4. CABRISS Project
5. COCOP Project
6. CONFEDEM Association (Spanish brach of Euromines)
7. CONSENS Project
8. DISIRE Project
9. TOP-REF project (Interview with Dow Chemical Company)
10. EPOS Project
11. FUDIPO Project
12. IMPROOF Project
13. ALTEREGO (Interview with JnJ Company)
14. MAESTRI Project
15. MEMERE Project
16. MOONSON Project
17. COCOP (Interview with OUTOTEC Company)
18. PInE Project
19. REMAGHIC Project
20. COCOP (Interview with SIDENOR Company)
21. ALTEREGO (Interview with Technip Company)
22. STYLE Project
23. ASCER (the Spanish Ceramic Tile Manufacturers'Association)
24. R4R Project
25. ALTEREGO (Interview with AkzoNobel Company)
26. TOP-REF Project

The interviews were conducted in the search of collecting as much information as possible. Three WPs will benefit from this exercise, such as: WP3 Regulation, WP4, Standardisation and WP5 other non-technological barriers. In the interviews, the aim of the project was explained as a starting point for the discussion, with specially emphasis on the reasons to reach them on the phone and their indirect contribution to the HARMONI project. Later on, the main big areas were tackled and then, the interviewee presented their cases and main problems they encountered. The conversation was steered by CIRCE making questions to the interviewee and coming to recommendations and potential solutions to be further explored.

Not all the interviews were equally fruitful. However, it is worth underlining that in all cases, and despite the first impressions at the beginning of the discussions in some cases, some interesting comments were raise in all of the interviews. Lastly, all the interviewees were enthusiastic about the topic HARMONI covers. All of them acknowledge the problems non-technological barriers cause to them in the deployment and large use of their technical solutions. The interviews were guided using the following general areas. Then, the result of those interviews have been summarized using the following template shown in Figure 4. This document aimed at facilitating

the collection of real experiences to feed into the WP from 3 to 5. Then, one fiche per interview was created.

Figure 4: Fiche created for interviews

2.3 Topics to consider in the WP3, 4 and 5

All the interviews include conclusions that should help WP3, 4 and 5 design and develop their activities using this information as inputs to their tasks. The collected information is shown below split in three, one per WP. Below (Table 1, Table 2, Table 3), the main conclusions of the interviews are depicted as potential ideas to be further developed in WP3, 4 and 5.

To review the changes proposed by the EC in the EU's Renewable Energy Directive

Contradictory messages from different interested parties to change the Waste Directive. This makes the situation more complex while at the same time illustrates the power of incentives

Regulation in the field of recycling (to be combined with WP5 activities)

To set up a more transparent procedure in the definition of the targets in EU directives. The track of the information is instrumental to reduce significantly the time devoted to this process and to facilitate the bidirectional channels, private to public and the other way around.

To align messages with REFIT conclusions

Distortions in certain regulations (energy directive transposition into each MS)

To foster communication between regulatory experts and technology developers in companies

To pay attention to SMEs as they are less prepared and able to cope with regulatory issues. A stronger support to those companies is needed.

A new approach to industrial symbiosis concepts and its suitable integration in regulatory framework is urgent.

To integrate regulatory analysis at a very early stage in the development of a new technology

To adapt existing regulation to a broader perspective, towards the circular economy approach. To use this trend as an enabler to speed up the changes needed in the regulation.

To promote understanding of "other sectors" regulatory barriers so as to accelerate legal and technical agreements. This will reduce uncertainty in the decision making process in potential IS initiatives

Too stringent regulations which cause uncertainties and lack of attractive markets to invest

Regulation poses many challenges but also offers new business cases

To improve the communication channels with the policy makers in a more open and transparent way (to set up a dialogue platform towards a more active and richer contribution from a larger number of stakeholders, including academia, industry and policy makers at the same time)

Regulatory distortion which generates unfair competitive conditions per country

Engineering companies are familiar with EU and International regulation as they comply with them in the process of interacting with the final users (Intensive industries). Then, it is worth having them in mind in the definition of procedurals in communication and use of the regulatory frameworks. They have to deal with regulatory issues since the feasibility study phase of a project.

To involve regional/national regulatory policy makers in the development of regulation so as to include expertise and practical knowledge in the development/update of regulation. This will facilitate and speed up regulation acceptance.

To strengthen the communication between regulatory experts and operation staff in companies. There is a gap between innovation and technology development and a better link must be built up in the companies between people from both profiles.

Table 1: Follow up and Topics from interviews to consider in WP3

Potential interest to jointly coordinate with STAIR platform

An example of a project that has launched a TC

Data sharing with the support of potential standardization procedures

To propose a larger participation and involvement of policy makers in TCs

Standarisation faces a lack of homogeneity and an holistic overview of Industrial symbiosis due to its complexity and variability. STAIR platform might be a very powerful tool.

How to develop/align guidelines that could facilitate a larger use of procedures broadly accepted in certain cases (more figure oriented than procedural oriented). E.g. LCA

A new standard regarding the membranes production might be needed to scale up the outcome of the project

To evaluate the benefits of CWA vs a proper standard. In terms of timing, CWA fist better in EU projects. How to promote either the former or the latter? Both?

To review the importance of "product driven" standards vs "process driven" standards. In case of new materials coming from recovered waste, standards are a powerful tool.

They act as a powerful and active participant voice in standarisation Committees. It is encouraged to track them and support their role in conjunction with final users in TCs. They are interesting entities to boost the use of standards as they perceive standards as enablers and a way to predict the future technical trends.

To review the support of the external consulting experts in the development of standards is urgently needed. External experts are less presence in those processes which is delaying many standards.

To explore the applicability of CWA as a useful tool for SPIRE projects and related technologies. Does it worth recommending this exercise on a more proactive way?

Table 2: Follow up and Topics from interviews to consider in WP4

Data sharing good practice, potentially exploitable in other contexts and sectors

To explore joined initiatives towards rationale incentives along with regulatory changes

New eco-tax to incentivize the final market (to be combined with WP3 activities)

Good practice about how to combine technical and social developments at the same time, to be applied not only on process control but in general.

Transferability of solutions developed by EU projects requires special attention. How to scale up technologies so as to guarantee the applicability and their use by final users. The exploitability and business models are a challenge (from low TRL 4-5 to TRL 7-9). Then, what can we suggest better frameworks to this end not linked neither to regulation nor standarisation?

Innovation as a tool. To teach and communicate to and with industrial directors.

Voluntary norms are less powerful, as long as there is no broad support from stakeholders. Better and more communication strategies would be helpful

To set up best practices from companies in management of knowledge and R+D projects

RIA projects, due to its TRL, cannot really be used as a realistic commercial stage. A more realistic approach is recommended in the expectations of this financial schemes under the H2020 framework.

To create an ecosystem that allows industries to test potential technologies in industrial premises. It would reduce uncertainties and facilitate the evaluation of the real potential of a new technology.

It is encouraged also to map industrial infrastructures suitable for this new cooperative industrial driven initiative. In this regard, it is worth exploring what the EC is doing in the area of Bioeconomy through the launch of the "Bioeconomy Knowledge Centre".

To assess potential recommendations in the BREFs procedures (more realistic targets to keep using them as an industrial baseline reference)

Permits and licenses to enlarge facilities and use of them in a more interactive way

Industrial symbiosis needs better data but also an increase of trust in that data. Technical and non-technical solutions should be proposed to come along with new regulation and standarisation approaches so as to maintain and guarantee the exchange of needed technical data.

New business cases for service providers (process control, and engineering as a whole) and intensive industries, while making intensive industries more competitive. For instance, the differences between manufacturing and intensive industries are decreasing. It is a matter of sizes (tons…), while of course, still difference (discrete vs continuous processes) remain. However, those differences will become smaller and smaller in the years to come.

A better understanding of SPIRE sectors is urgent so as to have a wide approach and joining forces strategy also applying to standards and their procedures

Lack of demonstration and follow up tools (mainly financial) after the end of the EU project

To increase communication channels between technology providers-final users

New collaboration and funding schemes so as to share infrastructure, which could help companies test and value how technology is functioning under real production conditions

To increase awareness of Industrial Symbiosis concepts in the industry. How to promote examples and available technical reports and handbooks

To combine public awareness, larger use of available information and learn and teach regulatory bottlenecks from other sectors.

Scale up financial schemes (to reach higher TRLs)

LCA recommendations

Public-private Cooperation framework in the area of new regulations. Good practice from the mining sector to be replicated and further developed and applied in SPIRE sectors

Energy audits and other energy efficiency measures have been financed largely but with no sufficient measurement policies to disseminate and showcase good practices.

It is worth exploring interim incentives to complement the waste directive and circular economy package so as to boost cost effective technologies supporting business cases in the EU

To foster financial schemes (potential PPP formula) which facilitate the transition to a full and quick integration of new regulatory transposition into national laws

It is clear that technology providers are not taking into account all the details for market implementation. A stronger knowledge of the real production conditions required is missing so as to motivate and accelerate decision making in intensive industries.

To integrate the social science as a key factor to be studied in the implementation of new available technologies.

Good example of an association driven initiative in the integration of new technology, which benefits the whole sector

To explore the interest of the industrial associations to become facilitators in matching their members to technology providers, not for trade purposes but new technology integration.

To explore infrastructure sharing PPP schemes to finance and support the scale up of valuable technologies

To promote a sectorial common challenge to make several companies work together, decreasing the risk. Many companies would benefit from this initiative as it is so spread topic. Lastly, this case would "showcase" the benefits and the advantages of sharing data despite the fact that you display sensitive information. In some cases, the advantages of sharing them are much more relevant than not participating in the project.

To identify and involve the right person from the company in the life-cycle of a development and implementation project

Table 3: Follow up and Topics from interviews to consider in WP5

3 CONCLUSIONS

This report aims at collecting information from projects, which is in some cases challenging. Therefore, a thorough analysis of the most important projects to get in contact with was critical so as to maximize the quality of the information collected addressing the 9 areas of HARMONI. Furthermore, the exercise required to cover a sufficiently varied and spread range of themes, geographic distribution, SPIRE sectors involved and relevant matters to the three elements that drive the HARMONI project, such as; regulation bottlenecks, potential of standards and other non-technological barriers. The P4P exercise was very useful as well as the survey carried out by A.SPIRE in the selection of the most related EU projects to HARMONI, either recently finished or still on-going. Furthermore, analysis of the CORDIS database was also very important in this process. Nevertheless, it is also relevant to analysis the available public information of all those most promising projects so as to figure out whether they were really linked to the HARMONI topics.

After sending around 82 invitations for interview to EU selected project coordinators, 26 interviews were conducted. Not all the interviews were equally productive, but almost all of them were useful to identify a new challenge and/or opportunity or to underline common challenges and/or opportunities. Therefore, all the interviews ended up with barriers which will feed into the recommendations to be developed in the WP3, 4 and 5, in the field of regulation, standardisation and other technological barrier respectively. Each interview has been summarised including the real case they confront with, the general context to understand the scope, including references to those documents that illustrate and explain the cases when additional information is available.

The largest number of useful comments collected in this document will contribute to the WP5, in the field of non-technological barriers. A vary range of ideas and challenges, from financial support, to lack of communication and potential sharing infrastructure schemes were suggested. In the area of regulation (WP3), several general comments and best practices are stressed and will definitely facilitate and support the general frame of the works to be undertaken in WP3. However, there is no detailed information out of the interviews. Specific challenges and conclusions were not gathered as the interviewees did not share this kind of information, because either they were not aware of them or they did not want to mention so strategic information. Lastly, concerning the WP4 dealing with standardisation, some promising ideas and good experiences were mentioned by the interviewees as well. It becomes clear that standards are seen as a powerful tool to boost and exploit the EU project results but beyond the execution of the projects. Due to the length of the standardisation process, the launch of a new standard must take place after the end of the project. Instead, the CWA might be a more suitable procedure in case of EU projects. In total, the interviews concluded with 62 recommendations and good practices/examples (19, 12 and 35 applied to WP3, 4 and 5 respectively) which will seed the activities to be further developed in the WP 3, 4 and 5.

4 REFERENCES

EU Member States. (2012). *Treaty on the Functioning of the European Union (TFEU).* Retrieved from http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:12012E/TXT

European Commission. (2013). *Action for a Resource Efficient Europe (EREP).* Retrieved from http://ec.europa.eu/environment/resource_efficiency/documents/action_for_a_resource_efficient_europe_170613.pdf

European Commission. (COM (2010) 614 final). *An Integrated Industrial Policy for the Globalisation Era Putting Competitiveness and Sustainability at Centre Stage.* Retrieved from http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0614:FIN:EN:PDF

European Commission DG RTD. (2016). *SWD Better regulations for innovation-driven investment at EU level.* Retrieved from http://ec.europa.eu/research/innovation-union/pdf/innovrefit_staff_working_document.pdf#view=fit&pagemode=none

European Commission DG RTD. (2018). *PATHWAYS TO SUSTAINABLE INDUSTRIES − Energy efficiency and CO2 utilisation.* Retrieved from https://ec.europa.eu/info/sites/info/files/sustainable_p4p-report_2017.pdf