



Industrial Symbiosis Facilitator

Joint Curriculum

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1. INTRODUCTION

The main objective of the project **INSIGHT** is to develop a new professional profile - the **INDUSTRIAL SYMBIOSIS FACILITATOR** - who can crystallize the set of skills and competences necessary to develop further the concept of IS. Consequently, the design of a training curriculum aiming at achieving this objective is at the core of the project. The IS facilitator can be responsible of different tasks: conducting a material flow analysis in its area of influence, defining and promoting synergies between companies from different sectors, capitalising on the benefits of EC principles implementation, etc.

In order to develop the Vocational Education and Training (VET) online course, the INSIGHT project follows the recommendations of the European Commission to adopt ECVET as a common methodology framework to facilitate the accumulation and transfer of credits for learning outcomes from one qualifications system to another. Such framework aims at promoting transnational mobility and access to lifelong learning by making it easier for EU citizens to gain recognition for their training, skills and knowledge in another EU country.¹

The current document encompasses the European Framework for VET. It also provides an overview on the national education framework for the partners' countries (namely Belgium, Italy, Romania, Slovenia and Spain). It then focuses on the specifications of the training course by defining Learning Outcomes, Modules and Training Units, alongside with their duration and weight for the future acquisition of ECVET credit points.

Based on the defined Training Path, the content of the INSIGHT training course will be then developed and shaped accordingly by taking into account a transitional approach between consecutive modules for a smooth training delivery.

The objective of this document is to prepare the INSIGHT training course to the future implementation of ECVET system in all of the EU countries. It therefore aims at facilitating the transnational recognition, the transfer to countries and organizations, as well as being ready for a formal validation at European level.

¹ RECOMMENDATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 June 2009 on the establishment of a European Credit System for Vocational Education and Training (ECVET) - 2009/C 155/02

2. OVERVIEW

Job Title	Industrial Symbiosis Facilitator
EQF Level	Level 5 Post-Secondary Qualification (professional specialization)
Job description	Industrial Symbiosis Facilitator is a professional profile responsible for conducting analysis in its area of influence, with the ability to define and promote synergies between companies from different sectors, as well as to capitalize on the benefits of EC principles and their implementation.
Activities	<ol style="list-style-type: none"> 1. Facilitate networking, communication and exchange between companies 2. Update companies on legal context and opportunities 3. Perform Systems Evaluation 4. Propose IS Business Model 5. Monitor performances of the IS Business Model
Target group	<ul style="list-style-type: none"> ▪ VET Students ▪ Business Managers (incl. SMEs, entrepreneurs) ▪ Public Bodies (local and regional)
Methodology	Open Learning Modules made available online
Pedagogical approach	Text, PowerPoint, Video material, Case studies
Language	English (partly in all partners' languages)



STRUCTURE OF THE FUTURE TRAINING COURSE

- 1** IS THEORY, CONCEPTS AND CONTEXT

 - 1.1 Introduction to **Circular Economy**
 - 1.2 Introduction to **Industrial Symbiosis**
 - 1.3 Circular Economy and **IS at EU level**
- 2** RESOURCE MANAGEMENT

 - 2.1 **Source circularity**
 - 2.2 Resources management: focus on **waste materials**
 - 2.3 Resources management: focus on **water resources**
 - 2.4 Resources management: focus on **energy**
- 3** IS MANAGEMENT

 - 3.1 **System-thinking** approach to IS
 - 3.2 Data collection and **resources flow analysis**
 - 3.3 Existing circular economy and **IS platforms**
 - 3.4 **Financial opportunities** for IS
 - 3.5 IS **Business model**
- 4** SOFT SKILLS FOR IS

 - 4.1 **Pitching IS**
 - 4.2 **Entrepreneurship, design thinking** strategies and co-creation methods
 - 4.3 Models of **collaboration** and inter-companies **team work**
- 5** IS CASE STUDIES

 - 5.1 **Territorial** approach
 - 5.2 **Industrial park** approach
 - 5.3 **Company** approach

3. EUROPEAN FRAMEWORK

3.1. The European Qualifications Framework (EQF)

The European Qualifications Framework for lifelong learning (EQF) aims at improving the transparency, comparability and portability of people’s qualifications. The EQF was set up in 2008 as a common reference framework of qualifications, expressed as learning outcomes at increasing levels of proficiency. The framework serves as a translation device between different qualifications systems and their levels in EU country. It is intended to benefit learners, workers, job-seekers, employers, trade unions, education and training providers, qualification recognition bodies, government authorities and international organisations.

There are three categories that define the learning outcomes:

- **Knowledge** is defined as the result of learning and the assimilation of concepts, principles, theories and practices. Acquisition of knowledge takes place in various settings: in the educational process, at work and in the context of private and social life;
- **Skills** may be cognitive or practical;
- **Competences** are classified in terms of complexity, autonomy and responsibility and it is about the ability of putting in practice the skills and knowledge acquired.

Below are described the knowledge, skills and competences of all 8 levels by which the EQF is composed:

Table 1: The eight levels of the EQF

LEVEL	KNOWLEDGE	SKILLS	COMPETENCES
Level 8	Knowledge at the most advanced frontier of a field of work or study and at the interface between fields	The most advanced and specialised skills and techniques, including synthesis and evaluation, required to solve critical problems in research and/or innovation and to extend and redefine existing knowledge or professional practice	Demonstrate substantial authority, innovation, autonomy, scholarly and professional integrity and sustained commitment to the development of new ideas or processes at the forefront of work or study contexts including research
Level 7	Highly specialised knowledge, some of which is at the forefront of knowledge in a field of work or study, as the	Specialised problem-solving skills required in research and/or innovation in order to develop new knowledge and	Manage and transform work or study contexts that are complex, unpredictable and require new strategic approaches; take responsibility for contributing to professional



	<p>basis for original thinking and/or research</p> <p>Critical awareness of knowledge issues in a field and at the interface between different fields</p>	<p>procedures and to integrate knowledge from different fields</p>	<p>knowledge and practice and/or for reviewing the strategic performance of teams</p>
Level 6	<p>Advanced knowledge of a field of work or study, involving a critical understanding of theories and principles</p>	<p>Advanced skills, demonstrating mastery and innovation, required to solve complex and unpredictable problems in a specialised field of work or study</p>	<p>Manage complex technical or professional activities or projects, taking responsibility for decision-making in unpredictable work or study contexts; take responsibility for managing professional development of individuals and groups</p>
Level 5	<p>Comprehensive, specialised, factual and theoretical knowledge within a field of work or study, and an awareness of the boundaries of that knowledge</p>	<p>A comprehensive range of cognitive and practical skills required to develop creative solutions to abstract problems.</p>	<p>Exercise management and supervision in contexts of work or study activities where there is unpredictable change.</p> <p>Review and develop performance of self and others.</p>
Level 4	<p>Factual and theoretical knowledge in broad contexts within a field of work or study</p>	<p>A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study</p>	<p>Exercise self-management within the guidelines of work or study contexts that are usually predictable, but are subject to change; supervise the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities</p>
Level 3	<p>Knowledge of facts, principles, processes and general concepts, in a field of work or study</p>	<p>A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information</p>	<p>Take responsibility for completion of tasks in work or study; adapt own behaviour to circumstances in solving problems</p>
Level 2	<p>Basic factual knowledge of a field of work or study</p>	<p>Basic cognitive and practical skills required to use relevant information in order to carry out tasks and to solve routine problems using simple rules and tools</p>	<p>Work or study under supervision with some autonomy</p>
Level 1	<p>Basic general knowledge</p>	<p>Basic skills required to carry out simple tasks</p>	<p>Work or study under direct supervision in a structured context</p>

Thus, the EQF is extremely important for the development of more homogenous national qualification frameworks considering that each Member State has its own framework.

The INSIGHT partners have agreed that **EQF level 5** best reflects the knowledge, skills and competences, which are to be acquired by the future Industrial Symbiosis Facilitator.

3.2. European Credit System for Vocational Education and Training

The European Credit System for Vocational Education and Training (ECVET) is a technical framework for the transfer, recognition and accumulation of individuals' learning outcomes used in order to achieve a qualification. This credit system has been launched following a Recommendation² of the European Parliament and the Council in 2009.

The reasons behind the recommendation were mainly the difficulty to get validation and recognition of work-related skills, the more attractiveness of moving to other countries, the need to create a more homogenous compatible vocational education and training system in Europe. It also allows VET graduates to have more job opportunities while giving employers confidence in the experience of the person they want to hire.

Furthermore, the qualifications assigned in the ECVET system have to be described in units of Learning Outcomes and associated ECVET points. There is a process to make sure the Learning Outcomes are assessed, validated, recognized and also transferred and accumulated. The partnerships that will be created thanks to the ECVET system are supported by additional documents: the memorandum of understanding and learning agreements.

It is important to note that in the ECVET system there is no automatic recognition of either learning outcomes or points. Its application for a given qualification is in accordance with the legislation, rules and regulations applicable in the Member States.

3.3. European Quality Assurance Reference Framework

The creation of the European Qualifications Framework and the European Credit System for VET needed the development of a system to ensure the quality of the VET systems. The European Quality Assurance Reference Framework (EQAVET), created following a 2009 Recommendation³, is a voluntary system made for the use of public institutions and other bodies. Its goals are the promotion and monitoring of the continuous improvement of VET systems. It also offers VET providers a simple and straightforward way to improve their systems.

² Recommendation of the European Parliament and of the Council of 23 April 2008 on the establishment of the European Qualification Framework for lifelong learning – 2008/C 111/01

³ Recommendation of the European Parliament and of the Council of 18 June 2009 on the establishment of a European Quality Assurance Reference Framework for Vocational Education and Training - 2009/C 155/01

EQAVET is based on a four-stage cycle⁴:

1. **Purpose and plan:** set up clear, appropriate and measurable goals;
2. **Implementation:** establish procedures to achieve the goals;
3. **Assessment and Evaluation:** design mechanisms to evaluate the data collected about the activities that have been done in order to achieve the goals;
4. **Review:** after processing feedbacks, the stakeholders conduct analysis to comprehend how to improve the stages;

4. NATIONAL FRAMEWORK

4.1. National Framework – Qualifications system in Slovenia

A year after Slovenia's accession to the EU, in 2005, there has been a national discussion about the European Qualifications Framework. For that reason, there has been a formal alignment to the EQF in the following years and in 2015 the Slovenian Qualifications Framework was launched. It was officially adopted on 12 January 2016 with the NQF Act⁵.

The main objectives of the SQF are:

- to support lifelong learning;
- to connect and coordinate Slovenian qualifications subsystems;
- to improve the transparency, accessibility and quality of qualifications.

The NQF Act stipulates that there is a national coordination point for the SQF and EQF that has to ensure access to information and the promotion of the SQF and EQF, to manage the process of approving and registering qualifications, to coordinate the positioning of the SQF within the EQF and to cooperate with relevant EU institutions.

Moreover, the Minister of Labour appoints a seven-member expert committee composed by representatives of the Ministry of Education, Economic development and Labour, employees and employers. The committee oversees the administrative and general support of the national coordination point and monitors the overall development of the framework.

In line with the EU-level policies, learning outcomes represent the core of the SQF. Some of the reasons why it is fundamental are:

- the contribution to the comparability and transparency of qualification systems

⁴ <https://www.egavet.eu/EU-Quality-Assurance/For-VET-Providers>

⁵ <https://www.uradni-list.si/glasilo-uradni-list-rs/vsebina/124645#!/Zakon-o-slovenskem-ogrodju-kvalifikacij-%28ZSOK%29>

- the recognition of non-formal and informal learning
- the quality assurance
- a better integration between education and the labour market.

The SQF contains ten levels and it is clearly related to the eight EQF levels through descriptors for both frameworks. SQF descriptors from levels six to 10 are related to descriptors in the qualifications framework for the European Higher Education Area (EHEA).

4.2. National Framework – Qualifications system in Belgium

Education and vocational training are a quasi-exclusive competence of the three linguistic communities: the Flemish Community, the French Community and the German Community. This is why there are three different frameworks. The main focus will be the French-speaking Community.

The current French Community framework dates back to 2010 when the government of the French Community agreed on the principle of creating a qualifications framework with double entry, one for educational qualifications and one for vocational qualifications, placed into eight levels and consistent with the descriptors of the European qualifications framework. The proposed framework structure is close to that applied by the Flemish Community. All major stakeholders agreed in mid-2011 on these main principles of the framework.

The framework was referenced to the European qualifications framework (EQF) in December 2013. The French-speaking qualifications framework for lifelong learning (*cadre francophone des certifications pour l'apprentissage tout au long de la vie, CFC*) was formally adopted in February 2015.

An eight-level structure has been designed, using two blocks of terms: knowledge/skills and context/autonomy/responsibility. The descriptors developed by the Flemish qualifications framework have been used as a basis but adjusted according to the conditions of the region. A competence-based approach is well established in compulsory education and training. Learning outcomes are described in terms of *socles de compétences* and *compétences terminales*. For adult education (including higher education short cycles, bachelor and master degrees) the term used is *capacités terminales*.

In VET, work is continuing to define and describe qualifications in terms of learning outcomes, to meet the need for shared reference systems for VET. Since 2010, regional providers of continuous vocational education and training have created a common certification procedure based on common qualifications standards and common assessment standards. The French service for trades and qualifications had played an important role for learning outcomes, both for vocational compulsory education and for CVET (education for adults and public providers of vocational training in Wallonia and Brussels).

In French-speaking Belgium, the system for validating non-formal and informal learning has undergone important developments since the early 2000s. It is the outcome of initiatives

supported nationally and is framed by important pieces of legislation throughout last 20 years. Validating non-formal and informal learning is now considered a very important element of employment by recent policy studies. With a new regulatory framework in place since 2014 (Decree on the organisation of higher education), VAE in higher education now has a stronger institutional basis.

Table 2: Level correspondence between the CFC and the EQF

CFC	EQF
Level 8	Level 8
Level 7	Level 7
Level 6	Level 6
Level 5	Level 5
Level 4	Level 4
Level 3	Level 3
Level 2	Level 2
Level 1	Level 1

4.3. National Framework – Qualifications system in Spain

The Spanish Qualifications Framework (SQF) is the national qualifications framework and it covers general and adult education, vocational education and training, and higher education. It also includes qualifications obtained outside the education system through in-service training, work activity, collaboration with NGOs, etc and the ones obtained in the education system.

Like the European Qualifications Framework from which it was inspired of, it has eight levels and the level descriptors are defined in terms of knowledge, skills and competences.

The Spanish Qualifications Framework aims to correlate and coordinate the different subsystems of education and training and include the qualifications obtained in compulsory, post-secondary and higher education, as well as integrate the validation of non-formal and informal learning.

The main objectives of the Spanish Qualifications Framework are:

- Make qualifications more understandable by describing them in terms of learning outcomes
- Improve citizens' information on national qualifications, as well as facilitate and promote mobility
- Support lifelong learning and correlate initial vocational training and vocational training for employment, as well as improve access and participation in this type of training, especially of people with disability
- Facilitate the identification, validation and recognition of all types of learning outcomes, including those related to non-formal and informal learning
- Facilitate transition and progression between the different training subsystems

- Develop procedures for the recognition of non-formal learning
- Reduce early school leaving (Spain is the country with more early school leavers in the EU)

The learning outcomes are a fundamental part of the development and implementation of the SQF. The level of implementation of learning outcomes varies depending on the training subsystem, vocational training being the one most developed.

Currently, a Royal Decree about the implementation plan is under preparation. A committee composed by social actors, ministries, trade unions and also employers' associations is highly recommended. This committee would be in charge of deciding on the assignment of qualifications to the levels of the Spanish Qualifications Framework, which should be based on three criteria:

- Comparability between the descriptors of the qualifications, defined as learning outcomes, and the level descriptors of the Spanish Qualifications Framework
- Implementation of a common quality assurance system in higher education and vocational training
- Public consultation with the bodies and organisations involved in the design of qualifications in their respective sectors.

The intention is to assign formal education qualifications to the levels of the Spanish Qualifications Framework in the first place. The assignment of qualifications related to the validation of non-formal and informal learning is expected to be more complicated.

4.4. National Framework – Qualifications system in Italy

Italy has adopted a National Qualifications Framework (NQF) in January 2018. The Italian NQF has eight levels and its level descriptors are knowledge, skills, autonomy and responsibility. The development of the NQF responds, among others, to a need for integrating the different qualifications systems; improving the legibility, transparency and comparability of qualifications of different systems, nationally and regionally; and aiding geographic and professional mobility at national and European levels.

Since the Italian education and training system is managed by both national and regional authorities, the NQF is going to improve the cooperation between the different bodies and the framework will provide a comprehensive map of qualifications awarded at national and regional levels, improving understanding of qualifications and making progression routes clear. The minimum criteria for including qualifications in the framework are defined by the law to ensure the quality of the system.

The necessity of the Italian Qualifications Framework was nothing new: after the reform of the Title V of the Italian Constitution in 2001 which decentralised among all responsibilities and services for education, in that reform was present the need for establishing a National Qualifications Framework. The first report was adopted as early as December 2012 to be presented to the EQF advisory group 6 months later.

In the following years, more steps towards achieving an NQF followed, mainly through several laws. Legislative Decree No 13/2013 initiated the national implementation of the process started with the labour market reform, aiming at adopting common guidelines for an NQF; it also established the national public certification system, while the Interministerial Decree 30/6/2015 establishes the national framework of regional qualifications for national recognition of regional qualifications and related skills.

The aims of defining an NQF were first, to guarantee individual geographic and professional level mobility and the recognition of non-formal and informal learning at national level; and second, to respond to input from the EQF recommendation at European level.

Table 3: The national qualification framework in Italy

IQF levels	Qualifications	EQF levels
8	PhD; Specialization diploma;	8
7	Master's degree; Second level academic diploma; First level university master; Academic specialization diploma;	7
6	Bachelor's degree	6
5	Higher Technical Education pathways (ITS);	5
4	Five-year high school diplomas (<i>licei</i> , technical and vocational schools); Four-year VET pathways; Higher Technical Education and Training pathways (IFTS);	4
3	Three-year VET pathways	3
2	End of the first two years: <i>licei</i> , Technical schools, Vocational schools, three-year and four-year VET pathways	2
1	Lower secondary school	1

4.5. National Framework – Qualifications system in Romania

The Ministry of National Education and the National Council of Qualifications and Adult Training have established a nomenclature with the names of qualifications and titles provided within the Romanian higher education system, in compliance with the provisions of Law 288/2004 and the developments specific to the National Framework of Higher Education Qualifications. This framework includes also Vocational and Educational Training (VET) and its objectives regarding VETs are:

- The recognition of qualifications awarded in a particular context, in other learning or work contexts
- Revision of VET qualifications based on reference level
- Make sure that the VETs are efficient and ensure good quality

- Better involvement of social partners in the process of qualifications description and updating
- Developing the conditions for the implementation of the European Credit Transfer and Accumulation System (ECVET) in accordance with the recommendation of the European parliament and the council of 18 June 2009.

With the draft Lifelong Learning Strategy, the initiatives that have been mentioned are expected to be continued, promoted and developed through:

- A harmonisation of assessment and certification procedures at different levels and in institutions with responsibilities in this area (schools implementing second chance programmes, centres that certify competences, other assessment systems)
- The parallel implementation of the transferable credit system for key competences
- Promoting these systems among those who need them most (disadvantaged groups in the labour market, people living in isolated rural areas, young people and adults in difficulty, etc.)
- Initiating a national program to train competence assessors and career advisors who work in this area
- Improving the quality assurance mechanisms for this alternative certification in order to raise its credibility.

The Romanian Qualifications Framework is composed by 8 levels, a number chosen to match exactly the number of levels in the standard European Qualifications Framework. There will be also a National Qualifications Register (NQR), a national database that includes describing qualifications from Romania, nationally recognized, for all levels in accordance with the National Qualifications Framework, based on a transparent methodology involving all the relevant stakeholders from education and labour market, both public and private sectors.

NQR will summarize the qualifications set out in the NQF, regardless of the system of education and training where they have been acquired, either in formal learning, non-formal and informal contexts. Approval of the National Qualifications Framework in the future, due to the process of referencing and linking national qualifications levels to the European Qualifications Framework contributes to the wider objectives of promoting lifelong learning and increasing opportunities for finding a job, mobility and social integration of workers and learners.

5. TARGET GROUP

As defined in the project proposal, the target group which INSIGHT is addressing mainly consists of VET students, businesses (especially SMEs staff and managers), public bodies at local and regional level as well as entrepreneurs aiming at focusing their professions on green jobs, procedures or green and sustainable industries development.

INSIGHT aims at providing participants with suitable training tools, which will facilitate the transition and accelerate the exploitation rate of IS in the EU in order to boost the development of efficient and sustainable products, processes and services.

- **VET students** are the end users of the INSIGHT training course.
- **Business Managers** play an important role in IS and are therefore major stakeholders.
- **Public bodies** are a crucial actor as they connect all actors in IS and stimulate innovation and cooperation.

5.1. Considerations on the establishment of Training Paths

The INSIGHT partners discussed the possibility to develop different, tailor-made training paths for each of the target groups defined in the project proposal. However, some considerations were made:

- When acting as an industrial symbiosis facilitator, generally different target groups (for instance business managers vs. public bodies) require different needs in terms of Learning Outcomes (knowledge, skills and competences).
- The INSIGHT training course could be split and deviations could be created according to the needs of the target groups. Business managers could focus on different aspects compared to public bodies, as the two target groups play rather different roles when it comes to Industrial Symbiosis.
- The INSIGHT training course should not just be considered at target groups level, but rather on the level of the individual. As Industrial Symbiosis encompasses cross-sectorial topics, which may have been already acquired in the past, each participant comes with different background, knowledge, skills and competences.
- At the same time, VET providers need guidelines on how they can easily and effectively implement the training course and subsequently define the topics, to which further learning process should be dedicated.

In conclusion, the INSIGHT partners agree that it is equally important for each target group and individual to acquire all of the Learning Outcomes foreseen in the INSIGHT training course. In the case that one or more Learning Outcomes have already been acquired, the VET provider should make sure that such information can be verified before establishing a training path.

5.2. Entry-level recommendations for target groups

The following entry-level recommendations can support VET providers by defining the kind of pre-requisites or conditions, which should be taken into consideration in order to understand who the INSIGHT training course is addressing.

- Students with a scientific and/or technical background and a strong interest in environmental issues and industrial innovation sector.
- Business managers involved in the industrial sector, interested in implementing the circular economy principles and decreasing the impact on the environment of the enterprise in which they operate through Industrial Symbiosis.
- Employees at public bodies with green jobs and implementing daily activities supporting companies in the innovation field. In particular, those interested in getting to know Industrial Symbiosis and its application.

5.3. Online digital training approach

As the partners agreed on not utilizing different training paths for different target groups, the issue of how to approach online digital training of the INSIGHT course was raised.

In particular, without defining training path, the online platform will feature the full training content and they might not be fully sure of which topics require their attention more than others. Hence, the partners agreed to adopt a screening methodology, which allows to digitally define the status of the acquired Learning Outcomes by the participants via a series of questions and inter-related answers.

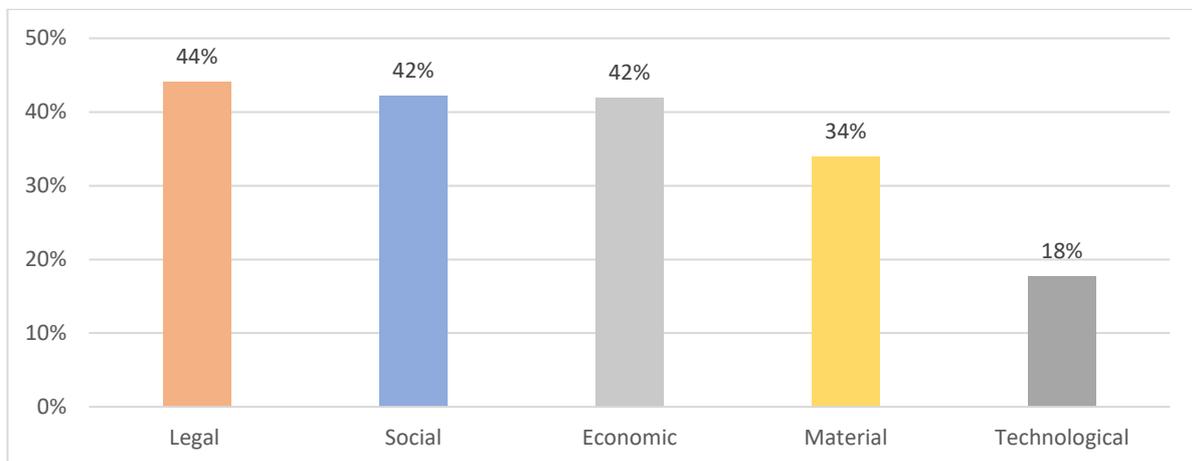
The questionnaire will therefore deliver a result, consisting in a recommendation for the participant to be informed about which Modules he/she is recommended to undertake.

6. LEARNING OUTCOMES

6.1. Main findings and results derived from the Key Study⁶

The key study, which was developed by the INSIGHT partners based on the results derived from 94 interviews, identified and highlighted skills, competences and roles required to implement IS. It involved a variety of organizations working in different sectors across the EU. To this extent, the identification of barriers and enablers was a fundamental step in order for the INSIGHT training course to focus more on certain skills rather than on others.

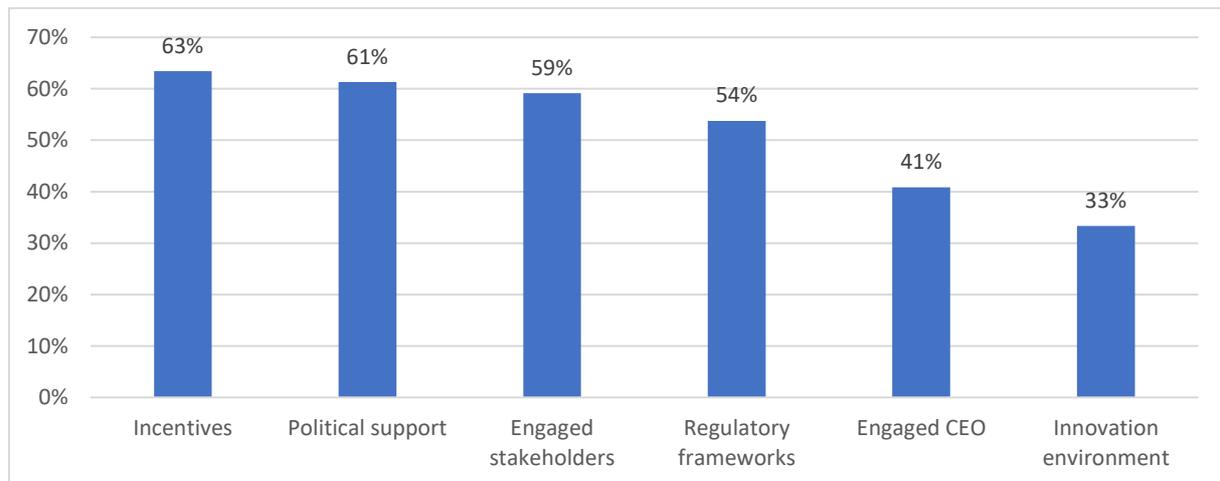
Figure 1: Challenges/Barriers in the implementation and scaling-up of IS initiatives - Average by field, as a percentage of total interviews held



Barriers for the IS facilitator are present especially in the legal sphere, where different definitions and criteria apply and therefore prevent development of IS initiatives to the fullest. On the social level, there is generally a lack of awareness and therefore there is a need for a change in the society mindset on the benefits IS can bring. Economic barriers instead relate to the lack of long-term vision on investments.

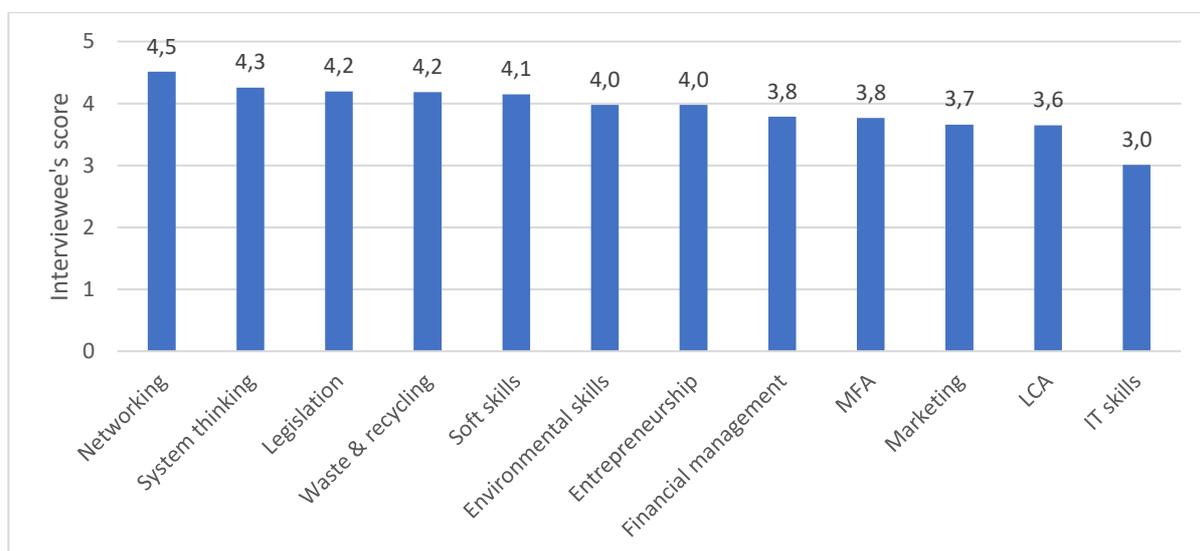
⁶ <https://www.insight-erasmus.eu/library/reports/>

Figure 2: Key enablers for the implementation of IS initiatives



Enablers, which support the IS facilitator role, are identified in different terms. Incentives, such as direct funding, allocation of public funds and tax relief, are considered good incentives for implementing IS. At the same time, it is important that governments understand the benefits and support IS actions, while stakeholders' engagement should be secured by initiating appropriate trust and sharing flows.

Figure 3: IS facilitator's skills



Based on such findings, the skills, which an IS facilitator should be equipped with, cover a broad range of topics. It is clear that he/she should be equipped with clear understanding of theoretical concepts related to IS. These are the basis and starting point for developing competences in the IS management and to be therefore able to define suitable and effective business models. All of these topics cannot be implemented without acquiring the appropriate soft skills needed to carry out communication and for the facilitation to properly take place.

The objective of this chapter is to identify the most appropriate and suitable Learning Outcomes in relation with the selected EQF level and job profile.

In general, Learning Outcomes are defined as statements, which clearly and effectively describe what participants will learn from being involved in the project activities. CEDEFOP (2014) provides two interrelated definitions of this concept:

- (a) learning outcomes are defined as ‘statements of what a learner knows, understands and is able to do on completion of a learning process, which are defined in terms of knowledge, skills and competence’ (CEDEFOP, 2014, p. 74);
- (b) learning outcomes are defined as ‘sets of knowledge, skills and/or competences an individual has acquired and/or is able to demonstrate after completion of a learning process, either formal, non-formal or informal’ (CEDEFOP, 2014, p. 73).

Therefore, there is a strong relationship between intended learning outcomes and achieved learning outcomes (skills), which constantly interconnect in a cycling approach.

The definition of the Learning Outcomes is directly correlated with the European Qualifications Framework (EQF) and ECVET Recommendation. They are specified in three different categories: (1) Knowledge, (2) Skills and (3) Competences.

6.2. Identified Learning Outcomes

Table 4: Learning Outcomes module 1 - IS Theory, Concepts and Context

KNOWLEDGE	SKILLS	COMPETENCES
Have knowledge of Circular Economy concepts and its evolution over time.	Distinguish the main concepts of Circular Economy.	Autonomous ability to apply concepts of circular economy.
Have knowledge about the fundamentals of Industrial Symbiosis.	Distinguish the main steps of IS methodologies, identify barriers and impact.	Autonomous ability to define and plan IS projects using a triple bottom-up approach.
Understand the fundamentals of EU regulations on Circular Economy, IS, waste and resources.	Recognize relevant EU regulations for specific IS projects.	Autonomous ability to inform about relevant EU policies.

Table 5: Learning Outcomes module 2 - Resource Management

KNOWLEDGE	SKILLS	COMPETENCES
Understand how resources circulate, their cycles, levels, how they are incorporated in eco-systems and their sustainable provision.	Describe how resources circulate, distinguishing cycles and levels.	Autonomous ability to identify how resources can be integrated in eco-systems.
Have knowledge about materials and waste assessment methods and recognize waste reduction strategies. Understand how materials derived from waste can be incorporated in ecosystems and what are the best practices in terms of zero waste strategies.	Describe how materials derived from waste can be incorporated in ecosystems and what are the zero waste strategies.	Autonomous ability to examine how waste materials can be incorporated in IS ecosystems and to apply relevant zero waste strategies.
Understand how water resources are planned, developed, distributed and efficiently managed.	Describe how water resources are planned, developed, distributed and efficiently managed.	Autonomous ability to examine how water resources can be optimised in IS ecosystems.
Understand designs, processes and solutions for the optimal management and efficient usage of energy resources.	Describe designs, processes and solutions for the optimal management and efficient usage of energy resources.	Autonomous ability to examine how energy resources can be efficiently optimised in IS ecosystems.

Table 6: Learning Outcomes module 3 – IS Management

KNOWLEDGE	SKILLS	COMPETENCES
Understand the benefits deriving from effective application of system-thinking.	Apply successful system-thinking approach.	Autonomous ability to carry out systematic analysis.
Have knowledge of methods for data collection, resource flow analysis and LCA.	Gather relevant data and distinguish the main steps of resources, waste flows and LCA analysis.	Understand the results derived from resource flow analysis and LCA.

Have knowledge about available platforms for the facilitation Circular Economy and IS.	Ability to identify most appropriate Circular Economy and IS platforms.	Independently conduct cross-sectorial and multi stakeholders' analysis by using dedicated Circular Economy and IS platforms.
Have theoretical knowledge about EU funding programmes, schemes and relevant national entities.	Ability to identify appropriate financial incentives and funding opportunities on the EU level and relevant national entities.	Autonomous ability to inform about relevant financial opportunities and to evaluate outsourcing for legal and financial advice.

Table 7: Learning Outcomes module 4 – Soft Skills for IS

KNOWLEDGE	SKILLS	COMPETENCES
Understand the benefits of effective communication and pitching of IS benefits.	Explain the benefits derived from applying synergies of IS to stakeholders.	Ability to pitch IS and instruct stakeholders on how it can benefit their businesses on different levels.
Have knowledge about entrepreneurial mindset, strategies of design thinking and methods of co-creation.	Ability to develop an entrepreneurial mindset and identify the most appropriate strategies of design thinking and methods of co-creation.	Autonomous ability to apply entrepreneurial mindset, strategies of design thinking and methods of co-creation for the formulation of innovative solutions in IS.
Have knowledge about models of collaboration to facilitate inter-companies team work, brainstorming and decision-making.	Ability to identify most appropriate models of collaboration.	Autonomous ability to organize and efficiently manage inter-companies team work.

Table 8: Learning Outcomes module 5 – IS Case Studies

KNOWLEDGE	SKILLS	COMPETENCES
Have knowledge of how IS is territorially applied	Ability to identify applied IS principles and methodologies.	Enhanced ability to autonomously plan IS projects based on real cases.
Have knowledge of how IS is applied by Industrial Parks	Ability to identify applied IS principles and methodologies.	Enhanced ability to autonomously plan IS projects based on real cases.

Have knowledge of how IS is applied by companies.	Ability to identify applied IS principles and methodologies.	Enhanced ability to autonomously plan IS projects based on real cases.
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The above described Learning Outcomes are the basis and starting point for the definition of the Training Path. Each outcome corresponds to specific learning units defined in the different terms (objective, pedagogical approach, duration, assessment methodology and ECVET).

7. TRAINING PATH DEFINITION

A training (Learning) path (pathway) is normally described as the chosen route, taken by a learner through a range of (commonly) e-learning activities, which allows them to build knowledge progressively.

7.1. Defining Training Modules and Units

The INSIGHT training path is structured in terms of Training Modules and Units, enabling participants and VET centres to select those, which are most appropriate based on the interests and the needs of the trainee.

Based on the identified Learning Outcomes, partners defined and gathered training Units together in the following 5 different Modules:

1. **IS Theory, Concepts and Context**, a module encompassing basic knowledge around Industrial Symbiosis, including history, concepts of industrial ecology and symbiosis, legal framework, key barriers and advantages. A more detailed description of the role of industrial facilitator will be provided.
2. **Resource Management**, a module providing a detailed explanation of the circularity of resources with three major focuses on waste materials, water resources and energy.
3. **IS Management**, a module providing a step by step managerial approach to IS implementation via data collection, resource flow analysis, available circular economy and IS platforms. It includes an overview on the financial opportunities in order to finally build a sustainable business model.
4. **Soft Skills for IS**, a module providing effective training on how to pitch IS to stakeholders, alongside entrepreneurship mindset, design-thinking strategies and co-creation methods. At the same time, it is supported by models of collaboration for inter-company work.
5. **IS Case Studies**, a module providing a concrete view on successful cases of industrial symbiosis. Each unit focuses on different approaches adopted: territorial, industrial park and company.

A leader is assigned to each Module, in order to coordinate the work. At the same time, each Unit has an assigned partner, who is responsible for developing the content.

7.2. INSIGHT Training Structure

Table 9: Description of Module 1

MODULE 1				
IS THEORY, CONCEPTS AND CONTEXT				
TRAINING UNIT	OBJECTIVE	LEARNING OUTCOME	PEDAGOGICAL APPROACH	ASSESSMENT METHODOLOGY
1.1 INTRODUCTION TO CIRCULAR ECONOMY	Introducing to concepts of Circular Economy and describing its evolution over time	Knowledge: Have knowledge of Circular Economy concepts and its evolution over time. Skills: Distinguish the main concepts of Circular Economy. Competences: Autonomous ability to apply concepts of circular economy.	Text PowerPoint Video	Quiz
1.2 INTRODUCTION TO INDUSTRIAL SYMBIOSIS	Introducing to history, concepts, typology of networks, methodologies, barriers and impact of Industrial Symbiosis via a triple bottom-up approach (social, economic and environmental) and the role of the IS facilitator	Knowledge: Have knowledge about the fundamentals of Industrial Symbiosis. Skills: Distinguish the main steps of IS methodologies, identify barriers and impact. Competences: Autonomous ability to define and plan IS projects using a triple bottom-up approach.	Text PowerPoint Video	Quiz
1.3 CIRCULAR ECONOMY AND INDUSTRIAL SYMBIOSIS AT EU LEVEL	Describing international and EU regulation framework in the field of Circular Economy and IS including waste and resources regulations and policies	Knowledge: Understand the fundamentals of EU regulations on Circular Economy, IS, waste and resources. Skills: Recognize relevant EU regulations for specific IS projects. Competences: Autonomous ability to inform about relevant EU policies.	Text PowerPoint Video	Quiz
ASSESSMENT	Assessing and validating the acquired learning outcomes			

Table 10: Description of Module 2

MODULE 2		RESOURCE MANAGEMENT		
TRAINING UNIT	OBJECTIVE	LEARNING OUTCOME	PEDAGOGICAL APPROACH	ASSESSMENT METHODOLOGY
2.1 SOURCE CIRCULARITY	Introducing how resources circulate, cycles, levels, how they are incorporated in eco-systems and their sustainable provision	<p>Knowledge: Understand how resources circulate, their cycles, levels, how they are incorporated in eco-systems and their sustainable provision.</p> <p>Skills: Describe how resources circulate, distinguishing cycles and levels.</p> <p>Competences: Autonomous ability to identify how resources can be integrated in eco-systems.</p>	Text PowerPoint Video	Quiz
2.2 RESOURCES MANAGEMENT : FOCUS ON WASTE MATERIALS	Describing how to manage materials derived from waste and zero waste strategies	<p>Knowledge: Understand how materials derived from waste can be incorporated in ecosystems and what are the best practices in terms of zero waste strategies.</p> <p>Skills: Describe how materials derived from waste can be incorporated in ecosystems and what are the zero waste strategies.</p> <p>Competences: Autonomous ability to examine how waste materials can be incorporated in IS ecosystems and to apply relevant zero waste strategies.</p>	Text PowerPoint Video	Quiz
2.3 RESOURCES MANAGEMENT : FOCUS ON WATER RESOURCES	Describing how to plan, develop, distribute and efficiently manage water resources	<p>Knowledge: Understand how water resources are planned, developed, distributed and efficiently managed.</p> <p>Skills: Describe how water resources are planned, developed, distributed and efficiently managed.</p> <p>Competences: Autonomous ability to examine how water resources can be optimised in IS ecosystems.</p>	Text PowerPoint Video	Quiz

<p>2.4 RESOURCES MANAGEMENT : FOCUS ON ENERGY</p>	<p>Describing how to manage and optimise the usage of energy resources and its transition</p>	<p>Knowledge: Understand designs, processes and solutions for the optimal management and efficient usage of energy resources. Skills: Describe designs, processes and solutions for the optimal management and efficient usage of energy resources. Competences: Autonomous ability to examine how energy resources can be efficiently optimised in IS ecosystems.</p>	<p>Text PowerPoint Video</p>	<p>Quiz</p>
<p>ASSESSMENT</p>	<p>Assessing and validating the acquired learning outcomes</p>			

Table 11: Description of Module 3

MODULE 3		IS MANAGEMENT		
TRAINING UNIT	OBJECTIVE	LEARNING OUTCOME	PEDAGOGICAL APPROACH	ASSESSMENT METHODOLOGY
3.1 SYSTEM-THINKING APPROACH TO IS	Describing system-thinking approach and its role in IS	<p>Knowledge: Understand the benefits deriving from effective application of system-thinking.</p> <p>Skills: Apply successful system-thinking approach.</p> <p>Competences: Autonomous ability to carry out systematic analysis.</p>	Text PowerPoint Video	Quiz
3.2 DATA COLLECTION AND RESOURCES FLOW ANALYSIS	Describing methods of data collection, resources flow analysis and its understanding	<p>Knowledge: Have knowledge of methods for data collection, resource flow analysis and LCA.</p> <p>Skills: Gather relevant data and distinguish the main steps of resources, waste flows and LCA analysis.</p> <p>Competences: Understand the results derived from resource flow analysis and LCA.</p>	Text PowerPoint Video	Quiz
3.3 EXISTING CIRCULAR ECONOMY AND IS PLATFORMS	Describing available platforms for the facilitation of Circular Economy and IS	<p>Knowledge: Have knowledge about available platforms for the facilitation Circular Economy and IS.</p> <p>Skills: Ability to identify most appropriate Circular Economy and IS platforms.</p> <p>Competences: Independently conduct cross-sectorial and multi stakeholders' analysis by using dedicated Circular Economy and IS platforms.</p>	Text PowerPoint Video	Quiz
3.4 FINANCIAL OPPORTUNITIES FOR IS (ANNEX ON	Describing available funding opportunities on EU level	<p>Knowledge: Have theoretical knowledge about EU funding programmes, schemes and relevant national entities.</p> <p>Skills: Ability to identify appropriate financial incentives and funding opportunities on the EU level and relevant national entities.</p>	Text PowerPoint Video Annex: supporting	Quiz

SUPPORTING ENTITIES)	and relevant national entities, who can support IS projects	Competences: Autonomous ability to inform about relevant financial opportunities and to evaluate outsourcing for legal and financial advice.	entities on EU and national level	
3.5 IS BUSINESS MODEL	Describing how to build an effective and sustainable business model based on identified IS opportunities	<p>Knowledge: Have theoretical knowledge about the concepts of value creation and business models in IS.</p> <p>Skills: Ability to generate, select and evaluate IS opportunities based on different perspectives (financial, economic, environmental, social).</p> <p>Competences: Autonomous ability to convey the knowledge about IS business models to the project team and facilitate the developments of a new business model.</p>	Text PowerPoint Video	Quiz
ASSESSMENT	Assessing and validating the acquired learning outcomes			

Table 12: Description of Module 4

MODULE 4		SOFT SKILLS FOR IS		
TRAINING UNIT	OBJECTIVE	LEARNING OUTCOME	PEDAGOGICAL APPROACH	ASSESSMENT METHODOLOGY
4.1 PITCHING IS	Describing how to effectively communicate and pitch about IS benefits to stakeholders	<p>Knowledge: Understand the benefits of effective communication and pitching of IS benefits.</p> <p>Skills: Explain the benefits derived from applying synergies of IS to stakeholders.</p> <p>Competences: Ability to pitch IS and instruct stakeholders on how it can benefit their businesses on different levels.</p>	Text PowerPoint Video	Quiz
4.2 ENTREPRENEURSHIP, DESIGN THINKING STRATEGIES AND CO-CREATION METHODS	Describing entrepreneurial mindset, strategies of design thinking and co-creation methods for the formulation of innovative solutions in IS	<p>Knowledge: Have knowledge about entrepreneurial mindset, strategies of design thinking and methods of co-creation.</p> <p>Skills: Ability to develop an entrepreneurial mindset and identify the most appropriate strategies of design thinking and methods of co-creation.</p> <p>Competences: Autonomous ability to apply entrepreneurial mindset, strategies of design thinking and methods of co-creation for the formulation of innovative solutions in IS.</p>	Text PowerPoint Video	Quiz
4.3 MODELS OF COLLABORATION AND INTER-COMPANIES TEAM WORK	Describing how to implement models of collaboration and carry out successful inter-	<p>Knowledge: Have knowledge about models of collaboration to facilitate inter-companies team work, brainstorming and decision-making.</p> <p>Skills: Ability to identify most appropriate models of collaboration.</p> <p>Competences: Autonomous ability to organize and efficiently manage inter-companies team work.</p>	Text PowerPoint Video Annex: Tools for collaboration	Quiz

ASSESSMENT

companies
team work

Assessing and validating the acquired learning outcomes

Table 13: Description module 5

MODULE 5				
IS CASE STUDIES				
TRAINING UNIT	OBJECTIVE	LEARNING OUTCOME	PEDAGOGICAL APPROACH	ASSESSMENT METHODOLOGY
5.1 IS CASE STUDIES: TERRITORIAL APPROACH	Describing real case studies of Industrial Symbiosis with a territorial approach	Knowledge: Have knowledge of how IS is territorially applied Skills: Ability to identify applied IS principles and methodologies. Competences: Enhanced ability to autonomously plan IS projects based on real cases.	Text PowerPoint Video	Quiz
5.2 IS CASE STUDIES: INDUSTRIAL PARK APPROACH	Describing real case studies of Industrial Symbiosis applied by industrial parks	Knowledge: Have knowledge of how IS is applied by industrial parks. Skills: Ability to identify applied IS principles and methodologies. Competences: Enhanced ability to autonomously plan IS projects based on real cases.	Text PowerPoint Video	Quiz
5.3 IS CASE STUDIES: COMPANY APPROACH	Describing real case studies of Industrial Symbiosis applied by companies	Knowledge: Have knowledge of how IS is applied by companies Skills: Ability to identify applied IS principles and methodologies. Competences: Enhanced ability to autonomously plan IS projects based on real cases.	Text PowerPoint Video	Quiz
ASSESSMENT	Assessing and validating the acquired learning outcomes			

8. INSIGHT ECVET POINTS

In order to implement the ECVET framework, qualifications need to be described in terms of learning outcomes with associated points. These are also called Credit or ECVET points.⁷

ECVET points are defined as *a numerical representation of the overall weight of learning outcomes in a qualification and of the relative weight of units in relation to the qualification.*

Based on this, ECVET points are allocated to:

1. A **qualification**, consisting of 60 points allocated to learning outcomes achieved in one year of formal and non-formal training, hence 120 points are allocated to two years of training;
2. A **learning unit**, in terms of its relevance and therefore its weight when it comes to achieving the qualification. Relevance is expressed in percentage with 100% representing the full qualification.

Project partners shared the following considerations upon defining the ECVET points for the INSIGHT training course.

- It is agreed that ECVET points should be allocated to all learning units consisting of learning outcomes, which can be used to understand and verify already-acquired learning outcomes within other qualifications.
- The successful acquisition of the whole qualification or just part of it leads to the awarding of the ECVET points, no matter the amount of training time.
- ECVET points support participants in acquiring the “Industrial Symbiosis Facilitator” qualification by acquiring the learning outcomes in any country and within any kind of training context (formal, non-formal, informal). Such system complies with national legislations and goes along with the validation and recognition of learning outcomes.

The amount of ECVET points allocated to a learning unit depends on two factors:

- **Time** needed to acquire the learning outcomes in the specific unit;
- **Relevance** of the learning outcomes in the specific unit;

Based on the assumptions of the ECVET Secretariat and several national authorities, ECVET credits are assigned on a system of **1 ECVET = 1 ECTS = 25 hours** of total learning. This includes also non-formal and informal learning. There is not a specific criterion to define the time spent on studying, self-studying, contacting, doing practical exercises and self-assessment, as there are many different areas, fields and objectives in VET. Nevertheless, the high quality of the training materials and the validation of learning outcomes help ensure that results are efficiently achieved.

⁷ Recommendation of the European Parliament and of the Council of 18 June 2009 on the establishment of a European Credit system for Vocational Education and Training (ECVET) (OJ C 155, 8.7.2009, pp. 11-18)

Figure 4: How ECVET points are assigned



In particular,

- Study hours → the time needed to read the training materials;
- Self-study hours → the time needed to understand the training materials and to read additional materials;
- Contact hours → questions launched in specific forums and interaction with other students;
- Practical exercises → required sessions of practice;
- Self-assessment → the time needed to prepare the assessment and execute it.

The following tables showcase an attempt to estimate of ECVET points for each INSIGHT training module, based on time, relevance and weight.

Table 14: ECVET points Module 1

MODULE 1. IS THEORY, CONCEPTS AND CONTEXT			
Training units	Duration (in hours)	Relevance and weight (in %)	No. of ECVET points
1.1 INTRODUCTION TO CIRCULAR ECONOMY	7	32%	0.28
1.2 INTRODUCTION TO INDUSTRIAL SYMBIOSIS	8	39%	0.32
1.3 CIRCULAR ECONOMY AND INDUSTRIAL SYMBIOSIS AT EU LEVEL	5,5	27%	0.22
ASSESSMENT	0.5	2%	0.02
TOTAL	21	100%	0,84

Table 15: ECVET points Module 2

MODULE 2. RESOURCE MANAGEMENT			
Training units	Duration (in hours)	Relevance and weight (in %)	No. of ECVET points
2.1 SOURCE CIRCULARITY	8,5	25%	0.34
2.2 RESOURCES MANAGEMENT: FOCUS ON WASTE MATERIALS	10	28%	0.4
2.3 RESOURCES MANAGEMENT: FOCUS ON WATER RESOURCES	7	21%	0.28
2.4 RESOURCES MANAGEMENT: FOCUS ON ENERGY	8,5	25%	0.34
ASSESSMENT	0.5	1%	0.02
TOTAL	34,5	100%	1.38

Table 16: ECVET points Module 3

MODULE 3. IS MANAGEMENT			
Training units	Duration (in hours)	Relevance and weight (in %)	No. of ECVET points
3.1 SYSTEM-THINKING APPROACH TO IS	6	19%	0.24
3.2 DATA COLLECTION AND RESOURCES FLOW ANALYSIS	7	22%	0.28
3.3 EXISTING CIRCULAR ECONOMY AND IS PLATFORMS	4	14%	0.16
3.4 FINANCIAL OPPORTUNITIES FOR IS (ANNEX ON SUPPORTING ENTITIES)	6	19%	0.24
3.5 IS BUSINESS MODEL	8	25%	0.32
ASSESSMENT	0.5	1%	0.02
TOTAL	31,5	100%	1.26

Table 17: ECVET points Module 4

MODULE 4. SOFT SKILLS FOR IS			
Training units	Duration (in hours)	Relevance and weight (in %)	No. of ECVET points
4.1 PITCHING IS	6	23,5%	0.24
4.2 ENTREPRENEURSHIP, DESIGN THINKING STRATEGIES AND CO-CREATION METHODS	9	37%	0.36
4.3 MODELS OF COLLABORATION AND INTER-COMPANIES TEAM WORK	10	38%	0.40
ASSESSMENT	0.5	1,5%	0.02
TOTAL	25,5	100%	1.02

Table 18: ECVET points Module 5

MODULE 5. IS CASE STUDIES			
Training units	Duration (in hours)	Relevance and weight (in %)	No. of ECVET points
5.1 IS CASE STUDIES: TERRITORIAL APPROACH	13,5	36%	0.54
5.2 IS CASE STUDIES: INDUSTRIAL PARK APPROACH	13	35%	0.52
5.3 IS CASE STUDIES: COMPANY APPROACH	10,5	28%	0.42
ASSESSMENT	0.5	12%	0.02
TOTAL	4.5	100%	1,5

Table 19: Weight and ECVET points per Module

INSIGHT			
EQF level - 5			
Training modules	Learning Duration (in hours)	Relevance and weight (in %)	No. of ECVET points
MODULE 1. IS THEORY, CONCEPTS AND CONTEXTS	21	14%	0.84
MODULE 2. RESOURCE MANAGEMENT	34,5	23%	1.38
MODULE 3. IS MANAGEMENT	31,5	21%	1.26
MODULE 4. SOFT-SKILLS FOR IS	25,5	17%	1.02
MODULE 5. IS CASE STUDIES	37,5	25%	1.5
TOTAL	150	100%	6

9. JOINT CURRICULUM VALIDATION

The methodology determined by the INSIGHT project partners led to the definition of a structured training path, composed by Training Modules and Units that will ensure participants and VET centres to select the most convenient ones considering the competences and interests of the trainee.

In terms of validation and in order to identify potential weaknesses and opportunities for improvement, each partner was requested to identify at least 12 stakeholders, who were in charge of reviewing the INSIGHT Joint Curriculum and to provide feedback in terms of relevance, consistency with the objectives defined in the project and impact.

In order to carry out the evaluation and validation of the Joint Curriculum, the partners identified a series of questions, which evaluates general aspects, but also specific ones related to each individual module and training unit. The tool used to carry out this activity is Google Form.

The partners disseminated the questionnaire to a large number of stakeholders. They represent different kind of organizations and institutions, ranging from universities, regional development agencies, enterprises, business support organizations, etc.

Each stakeholder was provided with a copy of the INSIGHT Joint Curriculum Overview (available in **Annex I**) and was requested to answer different kinds of questions:

- The first part of the questionnaire was dedicated to general information regarding the respondent (name of organization, position, country);
- Question no. 1 and no. 9 were short questions assessing general aspects.
- Question no. 2 and no. 10 asked for an opinion on specific matters.
- The rest of the questions (no. 3, 4, 5, 6, 7, 8, 11, 12) focused on ranking the necessity of Modules and Training Units.

A sample of the questionnaire is available in **Annex II**.

9.1. Results of the Evaluation

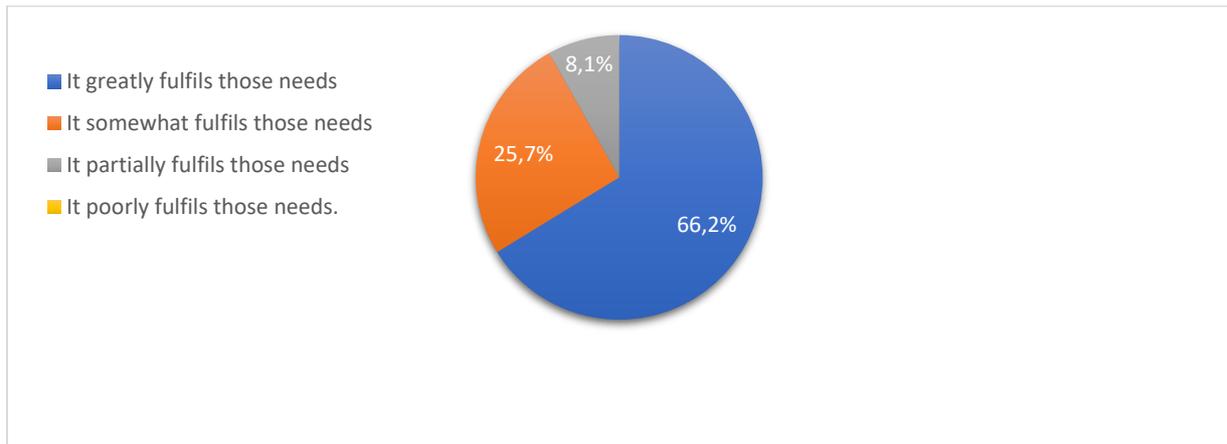
The questionnaire reached out to **72 stakeholders** from different EU countries, with a total of **74 responses**.

Generally, the results are very positive, confirming that the Joint Curriculum meets the expectations. A large number of comments were received due the high number of stakeholders reached out and their different background, with some specific aspects being most recurrent among all of them.

The feedback received is shown and summarized as follows.

1. In your opinion do you think the Joint curriculum properly addresses the needs of the target group to become an industrial symbiosis facilitator?

Figure 5: Level of agreement related to the fulfilment of the target group needs by the Joint Curriculum



An astonishing 92% of stakeholders agrees with the fact that the Joint Curriculum fulfils the needs of the target group, while only 8% of the respondents claim that it partially fulfils those needs. None said that the Joint Curriculum poorly fulfils them.

2. Please explain your answer:

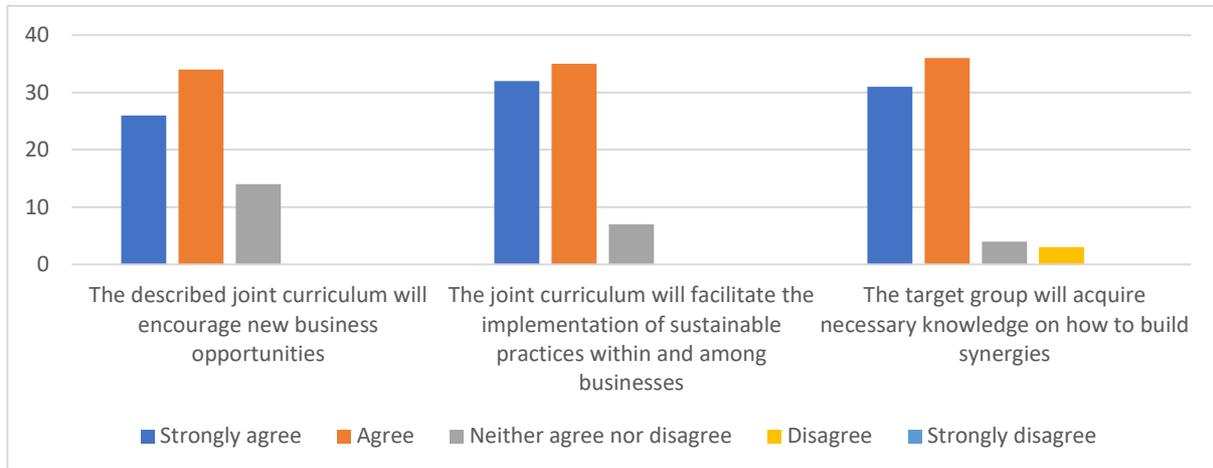
In general, the most recurring comment refers to the need to know more about the sub-topics and content of the Joint Curriculum, especially in terms of length and duration. This proves that it is very important to make sure that the course is neither too long nor too short.

Some other general comments relate to the need to put more focus on certain topics (for instance topics related to soft skills).

All of these comments will be taken into consideration when developing the INSIGHT training materials. However, it is important to notice that most of them had generally positive comments about the Joint Curriculum.

3. Please indicate if you agree or disagree with the following statements:

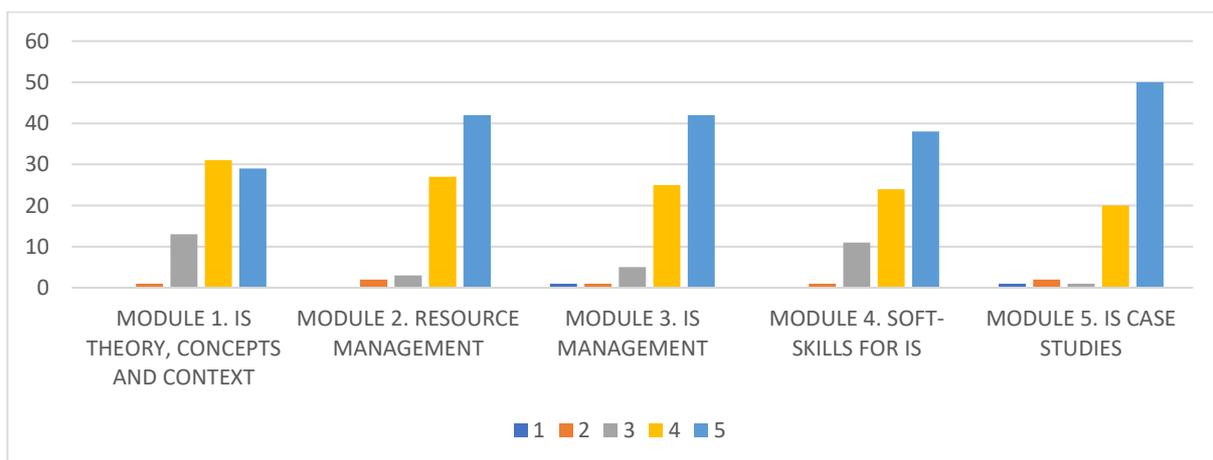
Figure 6: Level of agreement on business opportunities, sustainability and building synergies for the target group



A vast majority of stakeholders agrees with the fact that the Joint Curriculum will encourage new business opportunities, the target group will acquire the necessary knowledge and even more it will facilitate the implementation of sustainable practices.

4. Please rank from 1 to 5 (with 5 being the highest) the necessity for each of these defined modules:

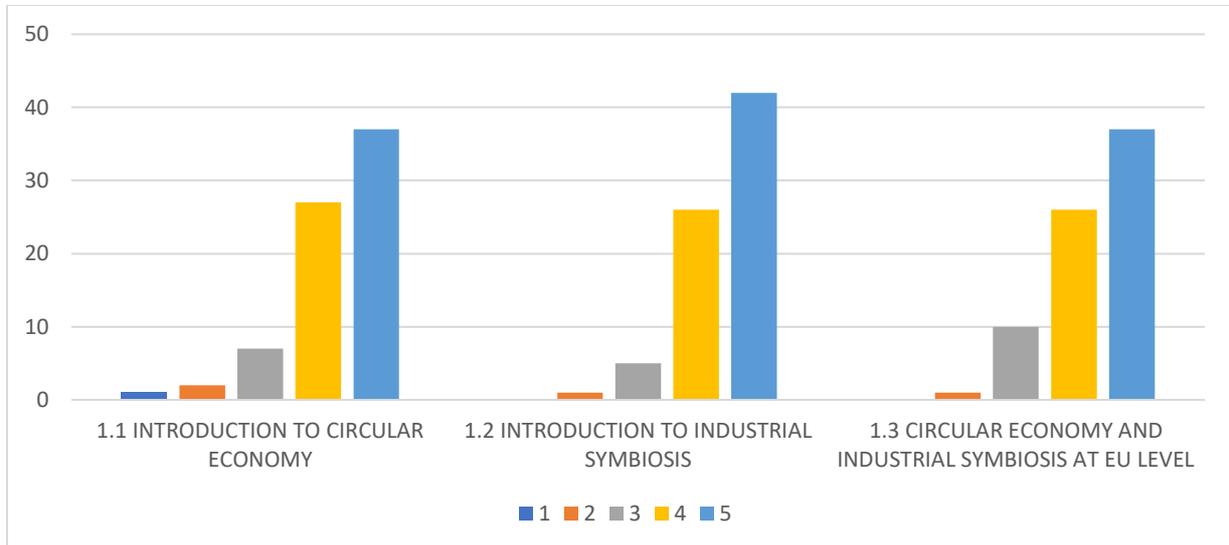
Figure 7: Level of necessity per Module



The strong necessity for **Module 5** shows that there is a need to train participants in the most practical way and to give them concrete examples of successful Industrial Symbiosis implementation. **Module 1** was instead ranked as least necessary, probably because it covers basic concepts related to Circular Economy and Industrial Symbiosis, which somehow participants should be already familiar with.

5. Module 1 - Please rank from 1 to 5 (with 5 being the highest) the necessity for each of these defined learning units:

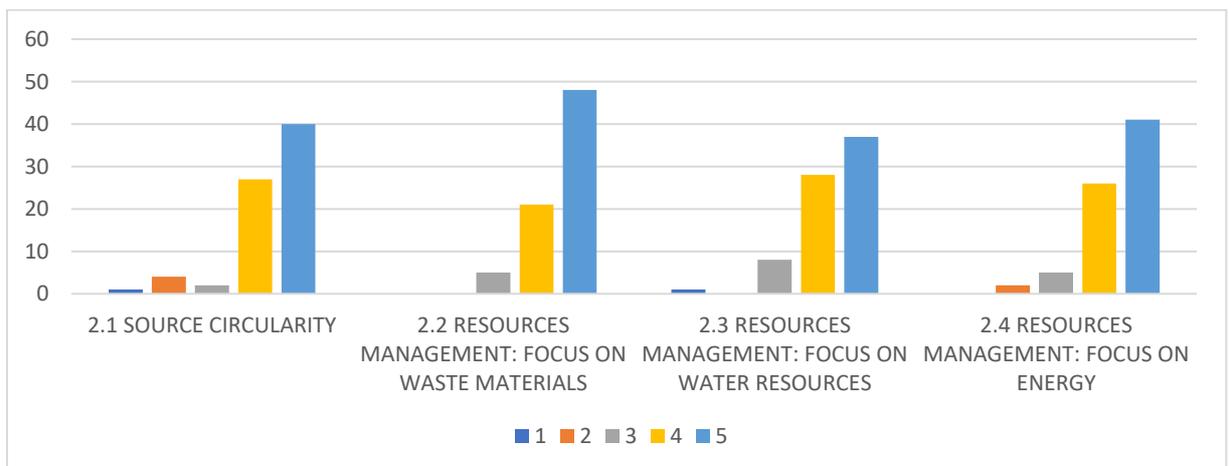
Figure 8: Level of necessity per Training Unit (Module 1)



In Module 1 the stakeholders ranked higher the necessity to have a training course covering basics of Industrial Symbiosis and its legal aspects on the EU level, rather than basics of Circular Economy. This confirms that participants might be familiar with the concept of CE, but need further training when it comes to IS.

6. Module 2 - Please rank from 1 to 5 (with 5 being the highest) the necessity for each of these defined learning units:

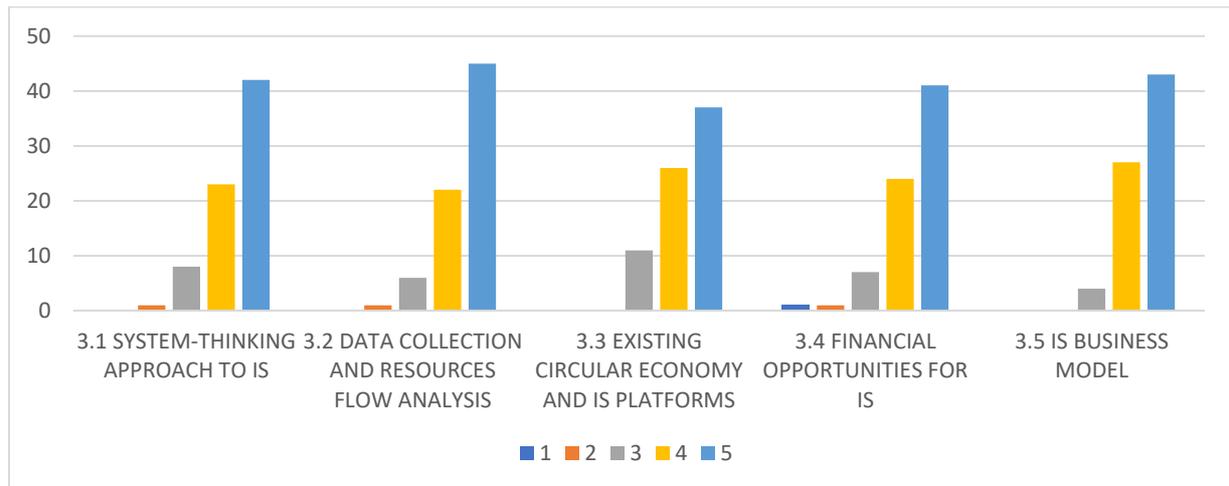
Figure 9: Level of necessity per Training Unit (Module 2)



In Module 2, the stakeholders seem to agree that participants should be equipped with knowledge, skills and competences on how to manage different resources. In particular, there seem to be more necessity for waste resources.

7. Module 3 - Please rank from 1 to 5 (with 5 being the highest) the necessity for each of these defined learning units:

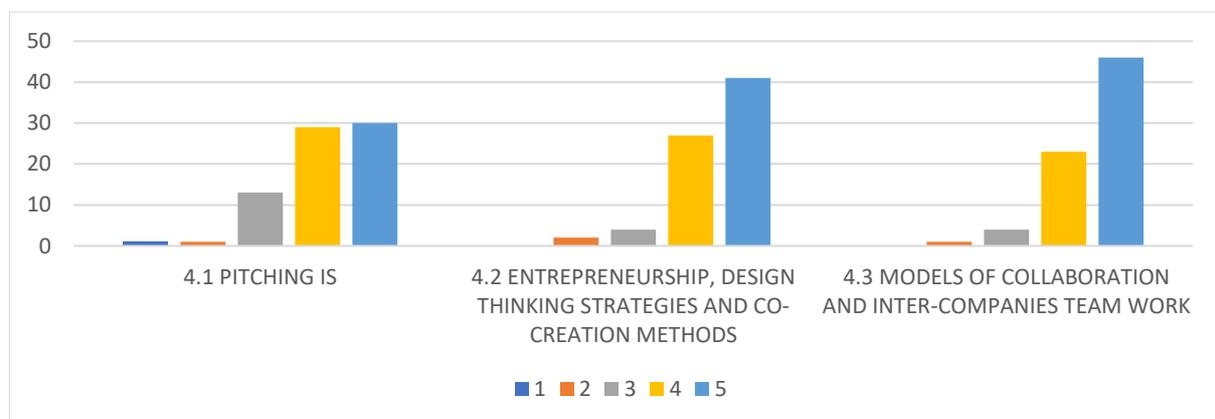
Figure 10: Level of necessity per Training Unit (Module 3)



In Module 3, ‘IS Business Model’ and ‘Data collection and resources flow analysis’ are the Units evaluated more by the stakeholders. This proves that there is a need for participants to be equipped with appropriate knowledge on how to build an efficient IS business model and to learn how to collect data and perform resources flow analysis.

8. Module 4 - Please rank from 1 to 5 (with 5 being the highest) the necessity for each of these defined learning units:

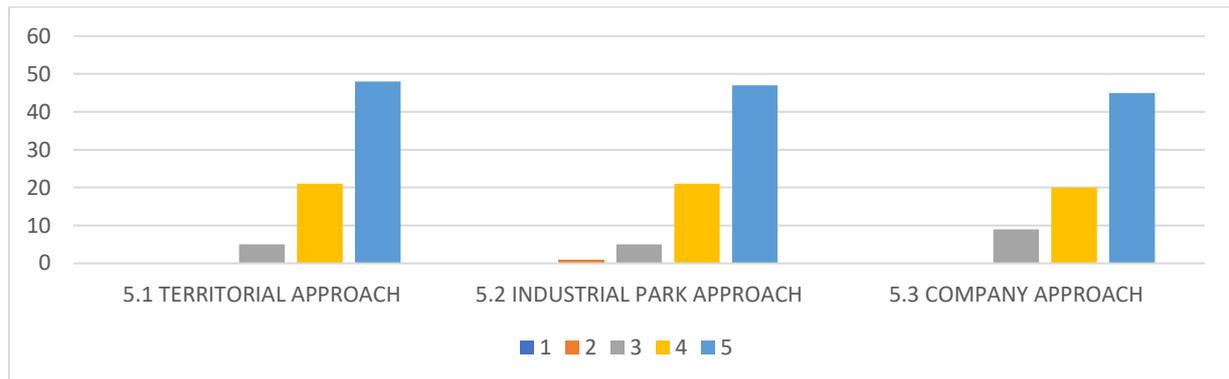
Figure 11: Level of necessity per Training Unit (Module 4)



In Module 4 much more interest was shown for units covering topics like entrepreneurship, design-thinking strategies and models of collaboration between different companies, while less focus should be dedicated to pitching IS.

9. Module 5 – Please rank from 1 to 5 (with 5 being the highest) the necessity for each of these defined learning units:

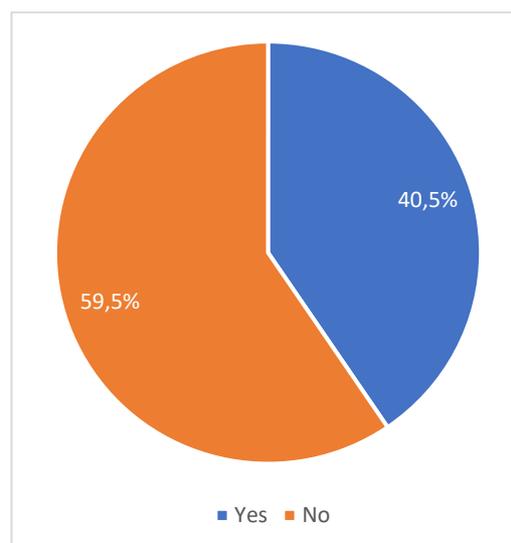
Figure 12: Level of necessity per Training Unit (Module 5)



Module 5 was ranked the most necessary among the modules and there is a strong consensus for all the three Training Units of this Module, which also confirms that a practical aspect should be taken into consideration when developing the INSIGHT training materials.

10. Does the Joint Curriculum lack any important topic?

Figure 13: Level of agreement on the lack of important topics



When asked whether the Joint Curriculum lacks any important topic, the majority agrees that there is no missing topic, while around 40% of respondents think that there is space for improvement.

11. If you chose "Yes", what topic do you think is not properly or at all addressed

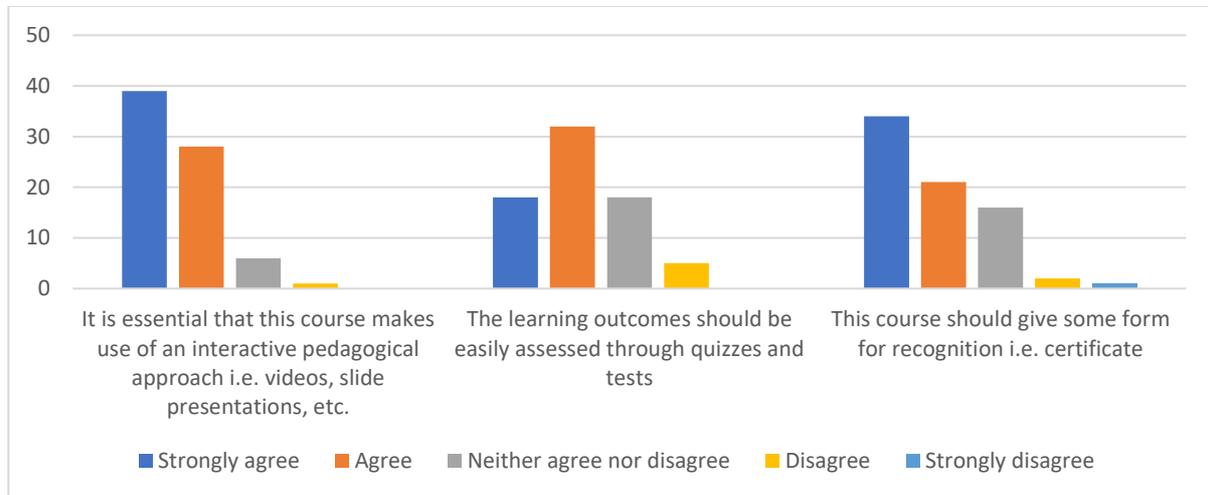
The topics, which stakeholders mostly identify as not properly addressed are as follows (in bold the most recurring):

- Big Data and Data Analysis
- **Brokerage and negotiation skills (and generally soft-skills)**
- Change management and strategy
- Data management
- Difference between waste and by-product (legal aspects, barriers)
- Financial notions
- Green marketing, territorial marketing, life-cycle thinking, cradle to cradle approach, communication
- Legal regulations
- Practical approach
- Product processes/manufacturing/design. Building trust between companies (open innovation, blockchain, intermediary actors (broker)).
- **Public-private relationship**
- Project management
- **Regional approach and regulation, citizens participation, public engagement**
- R&D aspects
- Regulatory affairs
- Social aspects (in Module 1)
- Strategic materials
- Technology, use of space, infrastructure requirements
- Technological surveillance

The project partners will review this list and evaluate whether some of these topics can fit the INSIGHT training course and if some of these aspects should be stressed further in the development of the training content.

12. Please assess the perceived benefits of the Joint Curriculum on the following statements:

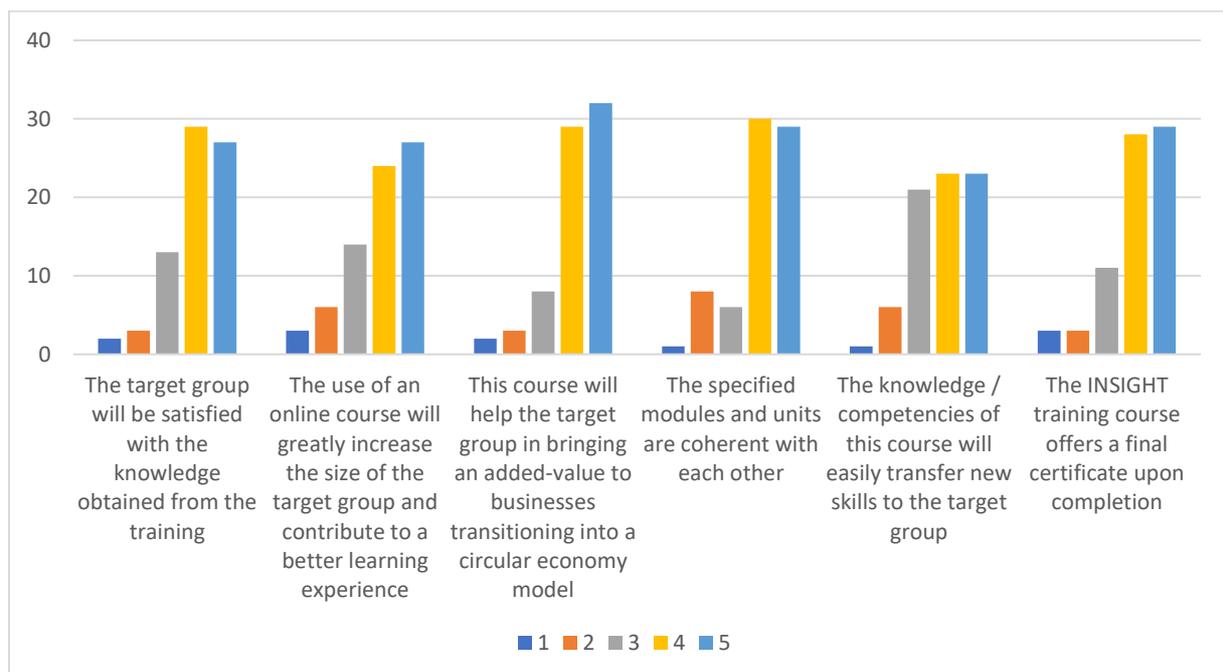
Figure 14: Level of agreement on pedagogical approach, assessment, certification



Stakeholders generally agree on making sure that the INSIGHT course makes of interactive pedagogical approaches and that a certificate should be issued upon completion. Most of them also agree on assessing the learning outcomes acquired by participants through quizzes and other testing tools.

13. Please rank from 1 to 5 (with 5 being the highest) the importance of key drivers for the target group moving forward with the Joint Curriculum.

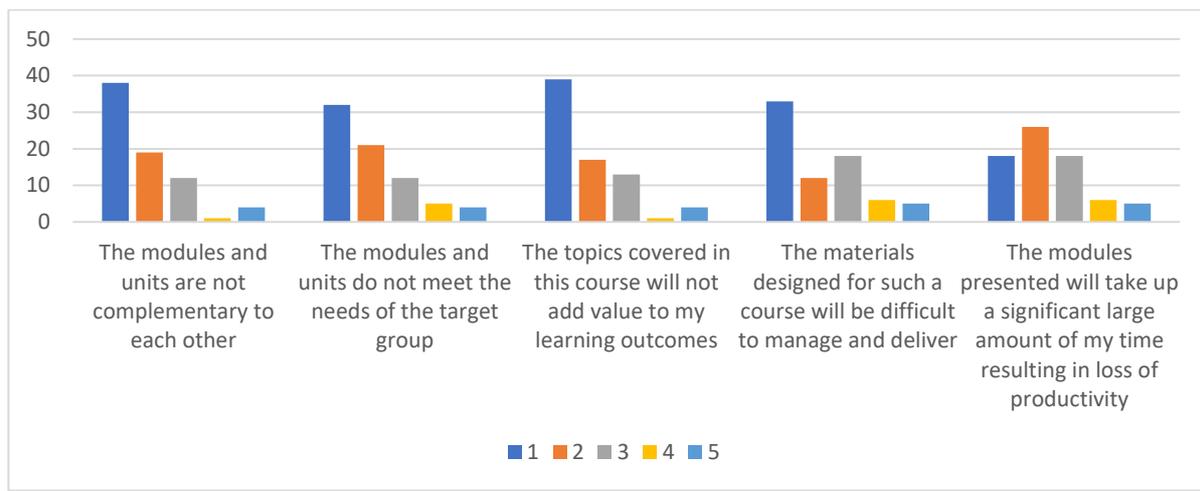
Figure 15: Level of importance of key drivers



When asked about the key drivers for the target group moving forward with the Joint Curriculum, the respondents have ranked higher the fact that the target group receiving the training course will help implement more and more circular economy in the company where they work.

14. Please rank in order, 1 to 5 (with 5 being the highest) the main perceived barriers of this course.

Figure 16: Level of agreement on perceived barriers



Generally, stakeholders do not perceive the above-mentioned barriers to the Joint Curriculum as such, which is a very good result. Instead, there is a slight doubt regarding the duration of the training. This means that partners should make sure to develop a short, but effective INSIGHT course.

15. Please leave any additional comments you may have concerning the INSIGHT Joint Curriculum:

The comments left at the end of the questionnaire are addressing different aspects. In general, there is a necessity to make sure the course is not very long, that it makes use of effective pedagogical approaches like videos and that it is kept as practical as possible.

Most of stakeholders would like to see the developed INSIGHT training materials to be able to give an even more appropriate evaluation.

9.2. Summary of comments

The following table summarizes the most important comments received by the stakeholders throughout the questionnaire. It attempts to identify the main aspects, which partners will most likely follow-up in the Joint Curriculum as well as in the training content.

Table 20: Follow-up actions for the Joint Curriculum and O2 development

No.	Comment	Follow-up
1	It may be necessary to provide students with a feedback.	Quizzes might be enough, but partners will consider implementing peer reviewing in order to get qualitative feedback and generate discussion about the content.
2	Objective and outcomes may be abstract.	Partners will review the objectives and the learning outcomes in the Joint Curriculum to make sure they are even more concrete.
3	The course may be long and complex.	Partners will make sure that each unit keeps an appropriate length of the course.
4	Individual modules may be too theoretical and not practical enough.	Partners will avoid to develop content, which is too theoretical and complex. Rather it should be in line with the needs of the target group, with more focus on practical exercises.
5	The scope of IS may not be clear enough (in enterprises, inter-enterprises, etc.)	Partners agree that, although the scope was already defined in the project application, it will be further developed and explained in Module 1 and practically explained in Module 5.
5	Soft skills and pitching should be assigned more time to cover the topics properly.	Partners will make sure that the right amount of content and learning time related to soft skills and pitching is assigned when developing the training content.
6	A tool to make industrial symbiosis more attractive may be useful	Partners agree to identify an easy-to-use platform / online tool, which helps IS to be more attractive and more of use for the students.

7	<p>The kind of professionals addressed by the project may not be clear.</p>	<p>Partners agree that no specific fields of work are needed to participate to the INSIGHT training course, except for the entry-level requirements defined in the Joint Curriculum. In general, the target group of the project is defined as businesses, public institutions, etc.</p>
8	<p>Financial aspects around governance and risks may need more focus.</p>	<p>Partners will discuss these aspects shortly in the training unit dedicated to IS Business Model.</p>
9	<p>The role of R&D in the development of new products obtained from wastes may be missing.</p>	<p>Though partners agree that this topic is out of the project scope, they also believe it is good to mention the role of R&D in the IS Business Model.</p>

10. CONCLUSION

The INSIGHT training course is structured in 5 different training modules, each of them subsequently has different training units. In order to implement the ECVET framework and EQF recommendations of the European Commission, points have been allocated in order to make sure that the training units fulfil the requirements.

1. Units are defined based on the previously identified learning outcomes deriving from the key study of needs and gaps in the field of Industrial Symbiosis. Each unit addresses specific knowledge, skills and competences that it aims at achieving.
2. The INSIGHT training course is weighted in terms of hours for each unit. Based on the estimated hours, ECVET points are allocated to each unit.
3. INSIGHT addresses the EQF level 5 in accordance with the European Qualification Framework and taking into account the differences between the consortium partner and their National Qualification Frameworks.

There is a general harmony between Modules and Units. Due to the fact that the topic of IS is relatively wide, the comments received are beneficial for the INSIGHT partners to understand which topics require more attention rather than others and if there are aspects that shall be strengthened further. They will therefore be useful to the development of the related training materials.

Generally, there is no significant weakness in the Joint Curriculum. Some aspects are more recurrent, while in general the feedback is mostly positive. Nevertheless, each received feedback is going to be taken into consideration by the partners when improving the Joint Curriculum and transitioning towards the activities foreseen in Output 2.

In conclusion, the INSIGHT training course will have a duration of **150 hours**, corresponding to **6 ECVET points**.

11. REFERENCES

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ANNEX I – JOINT CURRICULUM OVERVIEW



STRUCTURE OF THE FUTURE TRAINING COURSE

- 1** **IS THEORY, CONCEPTS AND CONTEXT**
 - 1.1 Introduction to **Circular Economy**
 - 1.2 Introduction to **Industrial Symbiosis**
 - 1.3 Circular Economy and **IS at EU level**
- 2** **RESOURCE MANAGEMENT**
 - 2.1 **Source circularity**
 - 2.2 Resources management: focus on **waste materials**
 - 2.3 Resources management: focus on **water resources**
 - 2.4 Resources management: focus on **energy**
- 3** **IS MANAGEMENT**
 - 3.1 **System-thinking** approach to IS
 - 3.2 Data collection and **resources flow analysis**
 - 3.3 Existing circular economy and **IS platforms**
 - 3.4 **Financial opportunities** for IS
 - 3.5 IS **Business model**
- 4** **SOFT SKILLS FOR IS**
 - 4.1 **Pitching IS**
 - 4.2 **Entrepreneurship, design thinking** strategies and co-creation methods
 - 4.3 Models of **collaboration** and inter-companies **team work**
- 5** **IS CASE STUDIES**
 - 5.1 **Territorial** approach
 - 5.2 **Industrial park** approach
 - 5.3 **Company** approach

ANNEX II – QUESTIONNAIRE FOR THE JOINT CURRICULUM VALIDATION

The INSIGHT project, co-funded by the Erasmus+ Programme, aims at developing a new professional profile, the INDUSTRIAL SYMBIOSIS FACILITATOR towards the design of a common curriculum and learning approach.

The project targets current and future workers from the industry and businesses, regional development agencies, technology centres, clusters, local and regional administrations, technology parks, as well as on any other entity related to the economic development of specific areas of the territory.

You are kindly requested to complete the following survey about the Joint Curriculum on industrial symbiosis developed in the framework of the INSIGHT project.

The answers are strictly confidential and will only be shared among project partners for the purpose of implementing the project activities. For any inquiries please get in touch: <https://www.insight-erasmus.eu/contact-us>.

Before proceeding, please check the Joint Curriculum overview.

General information

Name of your organization:

Position within the organization:

Your country:

1. In your opinion do you think the Joint curriculum properly addresses the needs of the target group to become an industrial symbiosis facilitator?

<input type="checkbox"/> It greatly fulfils those needs.	<input type="checkbox"/> It somewhat fulfils those needs.	<input type="checkbox"/> It partially fulfils those needs.	<input type="checkbox"/> It poorly fulfils those needs.
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2. Please explain your answer:

3. Please indicate if you agree or disagree with the following statements:

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
The target group will acquire the necessary knowledge on how to build synergies for a more circular economy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The described joint curriculum will encourage new business opportunities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The Joint Curriculum will facilitate the implementation of sustainable practices within and among businesses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Please rank from 1 to 5 (with 5 being the highest) the necessity for each of these defined modules:

	1	2	3	4	5
MODULE 1. IS THEORY, CONCEPTS AND CONTEXT	<input type="checkbox"/>				
MODULE 2. RESOURCE MANAGEMENT	<input type="checkbox"/>				
MODULE 3. IS MANAGEMENT	<input type="checkbox"/>				
MODULE 4. SOFT-SKILLS FOR IS	<input type="checkbox"/>				
MODULE 5. IS CASE STUDIES	<input type="checkbox"/>				

5. Module 1 - Please rank from 1 to 5 (with 5 being the highest) the necessity for each of these defined learning units:

	1	2	3	4	5
1.1 INTRODUCTION TO CIRCULAR ECONOMY	<input type="checkbox"/>				
1.2 INTRODUCTION TO INDUSTRIAL SYMBIOSIS	<input type="checkbox"/>				
1.3 CIRCULAR ECONOMY AND INDUSTRIAL SYMBIOSIS AT EU LEVEL	<input type="checkbox"/>				

6. Module 2 - Please rank from 1 to 5 (with 5 being the highest) the necessity for each of these defined learning units:

	1	2	3	4	5
2.1 SOURCE CIRCULARITY	<input type="checkbox"/>				
2.2 RESOURCES MANAGEMENT: FOCUS ON WASTE MATERIALS	<input type="checkbox"/>				
2.3 RESOURCES MANAGEMENT: FOCUS ON WATER RESOURCES	<input type="checkbox"/>				
2.4 RESOURCES MANAGEMENT: FOCUS ON ENERGY	<input type="checkbox"/>				

7. Module 3 - Please rank from 1 to 5 (with 5 being the highest) the necessity for each of these defined learning units:

	1	2	3	4	5
3.1 SYSTEM-THINKING APPROACH TO IS	<input type="checkbox"/>				
3.2 DATA COLLECTION AND RESOURCES FLOW ANALYSIS	<input type="checkbox"/>				
3.3 EXISTING CIRCULAR ECONOMY AND IS PLATFORMS	<input type="checkbox"/>				
3.4 FINANCIAL OPPORTUNITIES FOR IS	<input type="checkbox"/>				
3.5 IS BUSINESS MODEL	<input type="checkbox"/>				

8. Module 4 - Please rank from 1 to 5 (with 5 being the highest) the necessity for each of these defined learning units:

	1	2	3	4	5
4.1 PITCHING IS	<input type="checkbox"/>				
4.2 ENTREPRENEURSHIP, DESIGN THINKING STRATEGIES AND CO-CREATION METHODS	<input type="checkbox"/>				
4.3 MODELS OF COLLABORATION AND INTER-COMPANIES TEAM WORK	<input type="checkbox"/>				

9. Module 5 - Please rank from 1 to 5 (with 5 being the highest) the necessity for each of these defined learning units:

	1	2	3	4	5
5.1 IS CASE STUDIES: TERRITORIAL APPROACH	<input type="checkbox"/>				
5.2 IS CASE STUDIES: INDUSTRIAL PARK APPROACH	<input type="checkbox"/>				
5.3 IS CASE STUDIES: COMPANY APPROACH	<input type="checkbox"/>				

10. Does the Joint Curriculum lack any important topic?

- Yes
- No

11. If you chose "Yes", what topic do you think is not properly or at all addressed?

12. Please assess the perceived benefits of the Joint Curriculum on the following statements:

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
It is essential that this course makes use of an interactive pedagogical approach i.e. videos, slide presentations, etc.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The learning outcomes should be easily assessed through quizzes and tests	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
This course should give some form for recognition i.e. certificate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

13. Please rank from 1 to 5 (with 5 being the highest) the importance of key drivers for the target group moving forward with the Joint Curriculum.

	1	2	3	4	5
The target group will be satisfied with the knowledge obtained from the training	<input type="checkbox"/>				
The use of an online course will greatly increase the size of the target group and contribute to a better learning experience	<input type="checkbox"/>				
This course will help the target group in bringing an added-value to businesses transitioning into a circular economy model	<input type="checkbox"/>				
The specified modules and units are coherent with each other	<input type="checkbox"/>				
The knowledge / competencies of this course will easily transfer new skills to the target group	<input type="checkbox"/>				
The INSIGHT training course offers a final certificate upon completion	<input type="checkbox"/>				

14. Please rank in order, 1 to 5 (with 5 being the highest) the main perceived barriers of this course.

	1	2	3	4	5
The modules and units are not complementary to each other	<input type="checkbox"/>				
The modules and units do not meet the needs of the target group	<input type="checkbox"/>				
The topics covered in this course will not add value to my learning outcomes	<input type="checkbox"/>				
The materials designed for such a course will be difficult to manage and deliver	<input type="checkbox"/>				
The modules presented will take up a significant large amount of my time resulting in loss of productivity	<input type="checkbox"/>				

15. Please leave any additional comments you may have concerning the INSIGHT Joint Curriculum:

ANNEX III – STAKEHOLDERS INTERVIEWED

N°	ORGANIZATION	COUNTRY
1	Green Synergy Cluster	Bulgaria
2	Institute for Development and International Relations	Croatia
3	AMUEBLA	Spain
4	Chamber of Commerce and Industry Bistrita Nasaud	Romania
5	United Nations Industrial Development Organization	Global
6	RRA LUR	Slovenia
7	Xuppin's	Spain
8	Recircular	Spain
9	SITES	Ireland
10	Circular Flanders	Belgium
11	IDEA	Belgium
12	Wcycle institute Maribor, Institute for Circular Economy	Slovenia
13	Pomurje technology park	Slovenia
14	E-zavod	Slovenia
15	Municipality of Maribor	Slovenia
16	West University of Timisoara Faculty of Arts and Design	Romania
17	Municipality of Timișoara	Romania
18	UCL-ULB-ULiège-UNamur-ICHEC-EPHEC-HENALLUX-IEC	Belgium
19	TehnoCenter at the University of Maribor	Slovenia
20	FUNDECYT PCTEX	Spain
21	denkstatt Romania	Romania
22	VFM Service SRL	Romania

23	Incontro Industrial Platform	Romania
24	Sofies SA	Switzerland
25	MRA, Regional development Agency	Slovenia
26	Association Environmental Professional of Barcelona (COAMB)	Spain
27	Armazones F Perez, S.L.	Spain
28	Hermanos Azorín Soriano, S.L.	Spain
29	Francisco Lorenzo Puche y Pedro Manuel Mora Molina, C.B.	Spain
30	Nogal Yecla, S.L.	Spain
31	Diseño Interior Tapicería, S.L.	Spain
32	Yecflex, S.L.	Spain
33	Creafutur Foundation	Spain
34	ESADE Business School	Spain
35	Autonomous University of Barcelona	Spain
36	Catalan Chamber of Commerce	Spain
37	"Comissions Obreres" of Catalonia (Labor Union)	Spain
38	Anoia Business Association	Spain
39	ENEA - Italian National Agency for New Technologies, Energy and Sustainable Economic Development	Italy
40	ECOZEMA	Italy
41	LINK3c soc. Coop	Italy
42	SFRIDOO	Italy
43	Catalan Industrial Park Association	Spain
44	PIMEC Catalan Business Association	Spain
45	Sant'Anna University	Italy
46	OVAM	Belgium

47	GST	UK
48	Ecodek	UK
49	TECNALIA	Spain
50	BPMI SRL	Italy
51	Service Public de Wallonie	Belgium
52	ZIP, Maribor	Slovenia
53	Metallurgical Industries Association of Baix Llobregat (AEBALL)	Spain
54	Barcelona Provincial Council Productive framework Service	Spain
55	IRCEM	Romania
56	Ministry Territory of and Sustainability (Government Catalonia)	Spain
57	Barcelona Council	Spain
58	Greenloop	Belgium
59	Pannon Business Network	Hungary
60	IFKA Public Benefit Nonprofit Ltd.	Hungary
61	Ecopal	France
62	Institut Eco-Conseil	Belgium
63	CONFINDUSTRIA	Italy
64	Government Office for Development and European Cohesion Policy	Slovenia
65	Chamber of Commerce of Stajerska	Slovenia
66	essencia	Belgium
67	INEC	France
68	ValOrizon	France
69	International Synergies	Belgium/UK
70	UCLouvain	Belgium
71	Circle Economy	Netherlands

ANNEX VI – STAKEHOLDERS' COMMENTS

Table 21: Comments related to the fulfilment of the target group needs by the Joint Curriculum

General comments	
1	<i>It meets future development needs</i>
2	<i>I consider that with this new training course student will be in the position of fostering IS in its company.</i>
3	<i>Romania lacks of networks that encourage companies to cooperate and wastes or by-products of an industry or industrial process become the raw materials for another. A facilitator is a very good idea for the networking process among companies.</i>
4	<i>Joint curricula are great opportunities to implement business practices</i>
5	<i>As I am not familiar with the topic of Joint curriculum for the INDUSTRIAL SYMBIOSIS FACILITATOR, I am guessing that the project INSIGHT greatly fulfilled the needs of the target groups who wish to become industrial symbiosis facilitators.</i>
6	<i>As a professor in the design department at the art faculty in Timisoara, I find this subject, this platform first of all a novelty and secondly a must that the student must know at the time of creation process.</i>
7	<i>All the modules included in the program are suitable, addressing all aspects necessary to train industrial symbiosis facilitators.</i>
8	<i>The program addresses the needs of all stakeholders.</i>
9	<i>It adequately addresses all the training needs of the new professional profile.</i>
10	<i>It meets my needs. I consider the program quite successful.</i>
11	<i>I believe that the programme defined is very appropriate for obtaining the results set out in the initiative.</i>
12	<i>In my opinion the Joint curriculum accurately targets the training needs, in particular it covers a range of topics from competence on business model to soft skills for communication, necessary to understand a complex system in a cross-sectoral vision.</i>
13	<i>It's difficult to codify the kind of action a SLF is called upon to take. By company side, I consider that the SLF's potential role is, in the cases of large companies, in the recognition of a staff figure, in the cases of SMEs it could be an external role to support the emergence of company networks. In any case, I consider the SLF as a professional integrated in a staff with differentiated specialist skills (not an all-rounder).</i>
14	<i>It takes into account soft and hard skills.</i>

15	<i>Generally speaking, this profile is exactly what my company and my team are looking for, but I can hardly find young people with these specific skills. The SLF profile is fully consistent with the needs of the business services sector to support the use of IS and in general to support the Green Economy solutions among Companies. I consider very interesting the profile proposed, in the way you're thinking to address the IS training path to a young target, just after the 4 EQF (with high school and technical institutes). I also agree with the competences you have defined, except for the field of competence for Energy. Due to the well-developed Smart Grid sector, in Italy there are already specific competences and structured training paths on this subject.</i>
16	<i>The curriculum could fulfil different levels of needs: raise awareness/engage middle management levels of companies about potential benefits of industrial symbiosis; give a broader perspective to young professionals working in marketing/commercial departments or junior engineers/technicians</i>
17	<i>The curriculum is well targeted to support introduction of junior workers in companies already having an organizational model oriented towards industrial symbiosis</i>
18	<i>Solid base of knowledge for recently hired staff</i>
19	<i>The joint curriculum covers a wide range of knowledge in the IS field. Perhaps it should find greater verticalization on business issues.</i>
20	<i>The different modules seem to cover most of the needs.</i>
21	<i>Joint curriculum clearly addresses the most important knowledge the participants of the training should gain to be ready for circular economy challenges.</i>
22	<i>I think the theoretical approach is perfectly fine but it may lack of some practical tools (methodologies, evaluation tools, etc.) and case studies</i>
23	<i>The training addresses the needs of the target group perfectly.</i>

Specific comments	
1	<i>The curriculum must take into consideration the new Industrial Strategy in EU (2020). It is obvious that this strategy will change the use of materials and energy. To be included, together with the new CE Circular Plan of Action. CE is itself a concept. IS is one segment of the future CE. The students must be trained with the principles, sectors and actions needed and with the newest methods of assessing the level of circularity. There is a need of a metric to be able to assess the effect of one symbiosis within the frame of the triple bottom-up approach. There is no word about the relationship CE - Sustainability. There is no word about the invisible loop of the CE named Extended Producer Responsibility, which is of huge value (including the new creation of new business models). A stronger focus of the resource use efficiency and energy sector transformation (decentralised systems, AI transformation of energy sectors, etc). There is no word about the concept and criteria for End-of-Waste of material/product/component. As reuse, repair, reman become essential for CE and are</i>

	<i>linked to the industry / manufacturing, as these activities are more and more industrialised, they must be also treated as possible synergic components.</i>
2	<i>The learning objectives and outcomes are quite abstract and hence difficult to judge, much depends on how contents is filled in and what will be the breadth and depths of case studies presented. Specifically: (1) there is no clear indication what is considered to be the scope of IS - solutions within enterprises, solutions between enterprises, solutions between enterprises and cities or other sectors? (2) there seems to be no attention for the necessary engineering - i.e. how can we turn something that is a waste into something someone else can use; (3) data collection needs to be at process level, enterprise level is insufficient; (4) issues of societal acceptance and license to operate for IS need to be covered; (5) the interplay between eco-industrial parks (EIP) and IS needs attention and international guidance documents on IS/EIP need to be incorporated.</i>
3	<i>It contains all the key elements, somehow the practical training should be emphasised.</i>
4	<i>I like the scope of the training, I think it covers the basics and I like the soft skills part, focus on system's thinking and so on. What I miss is a little bit of scope to see what's coming up.</i>
6	<i>There are missing areas/topics for complete overview of Circular economy</i>
7	<i>It is essential to introduce training on updating basic knowledge and concepts: basic concepts of IS, basic understanding, intellectual framework and methodology.</i>
8	<i>The part dedicated to "soft skills" is too short. IS is about trust, human Relationship. You can have a full overview about opportunities of resources' exchanges between companies but without human trusts, you will never get a simple deal.</i>
9	<i>It's difficult to judge only on the basis of the training course structure. Information on learning objectives/outcomes would be required to give an adequate answer.</i>
10	<i>The course is very long and rather complex. It will be difficult to identify the proper human resources to be assigned for this role and our options are limited by the park owners.</i>
11	<i>The joint curriculum seems to be a very efficient way to introduce MS students to industrial symbiosis. It should be integrated in wider courses (maybe Executive Masters) on business management, to give students or professionals a wider approach on management methodologies</i>
12	<i>Referring to the target of young engineers, the curriculum might provide a transversal set of knowledge that technical profiles could lack. It is not totally clear which kind of professionals the curriculum is addressing to (technicians, engineers, hr, marketing, ...)</i>

13	<i>I think that the Joint curriculum addresses the needs of the target group but I would have liked a description of each units and modules.</i>
14	<i>I think that the structure of the training course covers all important aspects, however for me to say it greatly fulfils those needs would require more info on the length and depth of each topic.</i>
15	<i>The structure of the training seems good but I would like to insist on the commercial aspect. It's really important to know how to pitch and to prospect.</i>
16	<i>The joint curriculum properly addresses the needs of target group. However, it is important that the training starting conditions of each participant of the group are opportunely defined and evaluated, even by checking their aptitudes.</i>
17	<i>This sounds very superficial. Soft skills and co-creation need practicing and cannot be learned online.</i>
18	<i>To my opinion it covers all main and relevant topics. One aspect which I think could be more highlighted is the aspect of presenting/selling the business case. I assume that this is anticipated under the "pitching IS", but perhaps more emphasis should be given to this element.</i>
19	<i>INSIGHT JCV covers the most important aspects to become an industrial symbiosis facilitator but I miss extra description of each unit and subunit to have a complete overview.</i>
20	<i>Based on a one-pager, difficult to really grasp the true content of the formation. 2. I notice in my daily work on circular economy that you need a dual expertise of waste management and waste laws and waste policies on the one hand; and of product design/product manufacturing and product policy and laws on the other hand. I miss in the one-pager a module on product design/product manufacturing/production processes. 3. A positive point is the attention on soft skills, and for energy in module 2 (energy and waste/feedstock are often linked and both very relevant for IS). But multi-thematic thinking (waste/products-production) is as important as the soft skills.4. Confidentiality aspects and how building trust between business partners should also be included. 5. What is source circularity? What are you intending to cover in de sections 'waste materials'/waste resources?</i>
21	<i>The learning approach seems flexible enough to allow young professionals get an overall meaningful knowledge of industrial symbiosis professionals. Also, it might be a useful tool to make industrial symbiosis attractive for students approaching the job market.</i>
22	<i>A training program is very interesting. Is it about training people that already are in the industry but not practicing IS? Or is it about training people from scratch that could become the facilitators? In practice, existing estate agents, facilitators and area</i>

	<i>managers have a very broad background. Also learning the diversity of skills proposed in the curriculum can take years to properly grasp.</i>
23	<i>The structure looks ok but it is difficult to evaluate as we are missing information on the content of the different units. (also, in terms of learning outcomes)</i>

Table 22: Additional comments related to the Joint Curriculum

General comments	
1	<i>Looking forward to seeing training materials. Promising Joint Curriculum!!</i>
2	<i>I believe that part of the industry considers that innovative systems will not work, but I believe that both people and industries are evolving and industrial symbiosis must also adapt to this. Thinking about innovation within the IS, connection with industry 4.0 and digitalisation, etc. seems interesting to me. Also, in the link with the circular economy and the European approach to programmes such as the Green Deal, etc.</i>
3	<i>Excellent project</i>
4	<i>Impressive work</i>
5	<i>When curricula will be prepared, I am interested to have access to learning materials</i>
6	<i>Not sure about the last 5 questions, how to answer so I put in the middle</i>
7	<i>The course could offer some feedback from the professor/teacher</i>
8	<i>It was quite a challenge to answer these questions based on a 1-pager; sorry about not being too helpful...</i>
9	<i>The training path fits properly into the level of EQF 5 and, looking at the Italian framework, can be an excellent tool for promoting the STEM culture and in particular the choice of ITS after secondary diploma</i>
10	<i>Deliver useful tools and methodologies</i>

Specific comments	
1	<i>I think that industry and manufacturing must be deeper presented, with personal learning suggestion, with suggestive case presentations for each sector, because promoting/designing/assessing Industrial synergies needs multilateral approach and</i>

	<i>knowledge and a broad vision. An introduction of psychological analyse regarding the methods and forms to approach the stakeholders will be beneficial.</i>
2	<i>Suggest to develop a joint curriculum at different levels, covering all topics from the needs of (1) government and business decision makers; (2) process and environmental engineers; and (3) IS experts</i>
3	<i>The only weakness of this course is lack of practical work between the individual modules.</i>
4	<i>It is important to know the duration of the course, the number of ECVET, the languages in which the course will be available, etc. Also, it could be useful to know which kind of pedagogical approach will be used in each unit.</i>
5	<i>Extra inputs: 1. Why don't you offer online videos and content about a large part of the theory in order to expand the time for soft skills? 2. I prefer to use "liquids" instead of water, in order to open the liquid resources' potential. 3. About the module 2, it is quite important to explain also the balance between materials' waste and energy. Let me explain: these two flows cannot be perceived as disconnected from each other since the resources that will be used to co-produce energy will no longer be de facto available to promote reuse, remanufacturing, etc. And more importantly, these two streams must have a "guarantee" of volumes, recurrence, and qualities (especially for materials) for a given period. It is therefore a question of choosing how to direct the flow of resources between these two potential "destinations". The LANSINK scale could certainly be useful in meeting this challenge. 4. I am not able to answer the 2 following sentences : - "The use of an online course will greatly increase the size of the target group and contribute to a better learning experience" because it will increase the number of students but I am not sure about the improvement of the learning experience. - "it is essential that this course makes use of an interactive pedagogical approach i.e. videos, slide presentations, etc.": I do agree about the need of interactivity but not about the definition of interactivity because for me videos and slides are not interactive at all. 5. About the module number 5, I am missing the interlinks, the symbiosis within a value chain, within a sector, and between sectors.</i>
6	<i>I think the training course is complete enough dealing with all topics related to Industrial Symbiosis, anyway, I'm missing something related to the role of R+D in the development of new products obtained from wastes.</i>
7	<i>You may consider shortening the course by eliminating unnecessary topics</i>
8	<i>It's difficult to answer some of the questions without a proper review of the course.</i>

9	<i>For my Experience leading online courses, the users used to prefer videos as a main way to follow the course. - In order to check the users' knowledge improvement I propose to do tests.</i>
10	<i>Some of the questions above are hard to answer since for me it the information available does not allow fully informed responses. Also, since you are listing at the beginning the range of the target group stakeholders it could be necessary to make bit more tailor-based aspects/modules for different type of participant. It would be easier to give the response when the programme is bit more elaborated. Still, I am very happy that this initiative is taking the place and I hope to be able to deliver results soon.</i>
11	<i>It's necessary to find the way to give some feedback to the students during the course.</i>
12	<i>Some feedback could be given to the students during the course.</i>
13	<i>There is a lot. It certainly covers a gap in actual trainings. Motivation is a big issue in MOOC. If there is a possibility to have part of the training face-to-face this would help. Another option to increase motivation is to incorporate in the MOOC peer tutoring even in the evaluation as this allow more open and complex questions. Important also to - include active pedagogy with interviews. - recognise all work that is being done by the students (readings, tool learning, exercises, peer reviewing and so on)</i>
14	<i>Very interesting modules. A suggestion that, as I wrote to Serena, I feel like giving you is to focus on innovation in material efficiency, rather than energy efficiency. The Circular Economy focuses on matter, rather than energy, and its management. At a regulatory level, they are thinking of excluding energy from the scope of the circular economy. As you know, there are several indicators being examined by the ISO and UNI standards that are precisely focusing attention on this strong debate.</i>
15	<i>Need more insight in the content to provide true and valuable feedback (one-pager not enough to get a clear view on intended content). essence is available for provide feedback on content.</i>
16	<i>The curriculum seems interesting. But as mentioned earlier, it seems very general and contains a lot of information for one to digest. Generalist skills are essential for managing the complexity that the world is increasingly presented with, but good generalists spend years developing their knowledge and skills.</i>