Environmental change

Environmental change in European start-uppers thinking and acting – the solution for common sustainable development

THE ENVIRONMENTAL SYLLABUS FOR VET PROVIDERS

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Introduction

CONTEXT OF PROJECT:

The protection of natural habitat and making Europe more climate-neutral key areas addressed by the Green Deal, proves that the concerns individuals have are not being neglected. Many politicians have noticed that the European Green Deal 'seems to be the most ambitious vision of a major economy to combat the climate crisis. In practice, the approaches addressing the areas of the Green Deal are still very few due to the fact it is still a very fresh strategy. According to the EU Commission President, Ursula von der Leyen (Political Guidelines, 16 July 2019), those who act first and fastest will also be the ones who grasp the opportunities. This project is in line with the European Green Deal postulates focusing especially on topics of circular economy and sustainable solutions. The project Consortium will be taking the topics a step further, transforming opportunities into solutions.

OVERALL PURPOSE OF THE CURRICULUM:

The aim of the environmental syllabus is to define the framework for developing of the training content in the application under the IO2. Additionally, this program is devoted to developing of Vocational Educational and Training (VET) providers and VET Teachers competences in the field of environmental change competences.

OBJECTIVES:

The environmental syllabus will define: the objectives and main learning outcomes of the environmental training digital materials for start-uppers; the concept circular economy; the main peculiarities of circular economy as a useful alternative of self-employment in nowadays labour market; motivation of start-uppers to become entrepreneurs aware of digital opportunities; evaluation of the possibility of becoming a circular economy user, mentoring on circular economy as a new non-formal learning path way, the lesson plan for innovative the training course based on-line learning using set of the practical exercises-OERs; how to introduce opportunities for start-uppers to validate their digital entrepreneurship competences.

SPECIFIC TARGET GROUPS:

This program is devoted enhance start-uppers professional development through improving green and digital entrepreneurship competences as well as

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give them opportunity to evaluate these competences and adapt VET provision. In addition, small companies and also future entrepreneurship are also targeted with this course developed.

IMPACT:

Environmental syllabus will have the general positive impact on increasing the entrepreneur's engagement into non-formal learning; thus, will contribute to achieving EU 2020 benchmark of 15% of learners' participation in lifelong learning. The syllabus will have additional impact on promoting an open access requirement for all materials produced through Erasmus+ projects as it will be presented in virtual environment for free - use.

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I. DEFINITION OF LEARNING UNITS AND TRAINING PATH

1. Structure of each module

MODULE 1:
WAYS OF TRANSITION TO NATURAL ENERGY AND COMBATING CLIMATE CHANGE

The aim of the Module:	
The aim of the "WAYS OF TRANSITION TO NATURAL ENERGY AND COMBATING CLIMATE CHANGE" module is to explain the process of transition to the use of natural energy illustrate through real cases how it can be further embraced, and to explain what are the threats from climate changes.	
Time duration:	4 weeks (6-7 hours of self-study per week; 25 hours in total): • hands-on sessions (presential and/or online): 8 hours (2 hours per unit/main topic) • self-study sessions: 16 hours • assessment: 1 hour
Level of EQF	5
ECVET:	1 point = 1 ECVET = 25 hours
Length of material:	• 20 pages of study materials divided into 4 chapters, • app. 5-6 pages per week, • the last week is devoted to preparation of individual assignment.
Assignment:	The assignment is available through the mobile app: Environmental application for start-ups.
Learning objectives of the Module:	
• to explain the result of climate change, • to understand how transformation to natural energy is going, • to describe the impact of daily behaviours on climate change, • to detail legal regulations in the field of energy transformation and climate change prevention, • to provide the optimal strategy for climate changes, • to analyse the changes in process of energy production and consumption, • to list the possible ways of transformation to natural energy.	

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Learning outcomes of the Module:	
• participants will have a better understanding of the dangers of climate change. • participants will understand what the transition to natural energy looks like. • participants will also be able to learn good examples from everyday life.	
Teaching methods of the Module:	• student-centred learning • self-directed learning • experimental learning • case based learning
Teaching tools used:	• Coursebooks • Internet and other platforms/ applications • Open educational resources • Mobile app • Videos • Interactive presentation

Topics of the Module:

Unit I. Policy of renewable energy - directives and targets

Duration: 6 hours of self-study

Learning outcomes of Unit I:

Knowlegde *General and/or specialized knowledge acquired through knowledge of different academic and/or professional fields and theoretical principles. Learning primarily through analytical thinking.*	**Skills** *Wide-ranging skills, may also be specialized, including the use of appropriate tools, methods, different technological procedures, materials and theories. Evaluation and use of information to formulate decisions and solutions. Formulation of solutions of well-defined abstract problems. Ability to carry out various, non-standardized tasks.*	**Competences** *Ability to operate in diverse and specific settings. Taking responsibility for the quality of the work process and results, showing autonomy and a degree of initiative. Taking responsibility and initiative for the acquisition of new knowledge and skills. Characterized by an entrepreneurial orientation and the ability to organize and work in complex teams.*
The participant has an integrated knowledge about law regulation in the field of renewable energy.	The participant names the solutions in the field of renevable energy based on specific law regulations/acts.	The participant realises the expected effect of regulations in the field of renevable energy.

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Unit II. Changes in process of energy production and consumption		
Duration: 6 hours of self-study		
Learning outcomes of Unit II:		
Knowlegde	**Skills**	**Competences**
The participant has an integrated knowledge of the process of energy production and consumption.	The participant names the possible ways of energy production and consumption.	The participant realises the expected effect of different ways of energy production and consumption.
Unit III. Effects of climate changes		
Duration: 6 hours of self-study		
Learning outcomes of Unit III:		
Knowlegde	**Skills**	**Competences**
The participant has an integrated knowledge about the short- and long-term effects of climate changes.	The participant names the most important effects of climate changes.	The participant realise the consequences of his/her daily behaviours for climate changes as well as the consequence of strategic decisions on climate changes.
Unit IV. Strategy for climate changes		
Duration: 7 hours of self-study		
Learning outcomes of Unit IV:		
Knowlegde	**Skills**	**Competences**
The participant has an integrated knowledge about the strategies for climate changes undertaken by different stages (his/her own, or state, international).	The participant names the most important strategies of climate changes that could be undertaken.	The participant realises the consequences of choosing each strategy for climate changes and is able to choose appropriate one.
Requirements for obtaining a certificate of completion:		

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The minimum requirements for Certificate of completion of Module 1: (WAYS OF TRANSITION TO NATURAL ENERGY AND COMBATING CLIMATE CHANGE) are as follows:

1. Self-study of training materials provided in module sources of knowledge.
2. M-learning with the Environmental Change mobile app, including self-assessment.
3. Submission of the case study assignment to the trainer.

Sources of knowledge of the Module:

Unit I:

1. European Commission, (2021). *EU Green Deal*, https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en
2. European Commission, (2018). *Renewable Energy Directive 2018/2001/EU*; https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en
3. United Nations, (1972). *Declaration of the United Nations Conference on the Human Environment*, Stockholm; http://www.un-documents.net/unchedec.htm
4. United Nations, (1992). *Rio Declaration on Environment and Development,*
5. A/CONF.151/26 (Vol), Rio de Janeiro, http://www.un-documents.net/rio-dec.htm

Unit II:

1. Ritchie, H., Roser M., Energy Production and Consumption, Our World in Data.
2. Smil, V. (2017), Energy Transitions: Global and National Perspectives.
3. Global Electricity Review 2021. Global Trends, Ember, https://ember-climate.org/wp-content/uploads/2021/03/Global-Electricity-Review-2021.pdf
4. Statistical Review of World Energy 2021, Bristish Petroleum, https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2021-full-report.pdf
5. Eurostat 2017-2020; http://ec.europa.eu/eurostat/data/database

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Unit III:

1. Cowie, J. (2012). Climate Change: Biological and Human Aspects, Cambridge University Press, Cambridge.
2. Delbeke, J., Vis, P. (2019). *Towards a climate - neutral Europe*
3. *Curbing the trend*, Routledge, London-New York.
4. Giddens, A. (2009). *The Politics of Climate Change*, Willey, Cambridge.
5. Larminat de, P. (2014). *Climate Change: Identification and Projections*, John Wiley & Sons, Inc., Hoboken.

Unit IV:

1. Gates, B. (2021). *How to avoid a climate disaster. The Solutions We have and the Breakthroughs We Need.* Random House Large Print.
2. Kasprowicz, T. (2019). Warming effect of Poland for example Poznań according to occurrence warmest and coldest months. seasons and years in the period 1848-2018. [In:] *Współczesne problemy klimatu Polski* (eds. Chojnack-Ożga. L. Lorenc. H.). Warszawa: IMGW. https://www.imgw.pl/sites/default/files/2020-08/imgw_wspolczesne-problemy-klimatu-polski.pdf
3. Nasir, M., Sadollah. A., Hwan Choi. Y., Hoon Kim, J. (2020). A comprehensive review on water cycle algorithm and its applications. *Neural Computing and Applications.* Vol. 32. pg. 17433–17488 https://doi.org/10.1007/s00521-020-05112-1
4. Przybylak, R., Filipiak, J., Oliński, R. (2014). Meteorological observations of Gottfried Reyger in Gdańsk from 1722 to 1769 and their applicability to climate change analysis. *Scientific Review – Engineering and Environmental Sciences.* No 66. 360–375.
5. Szczygieł, E. (2020). The problem of circularity measurement in households in the context of improving their quality of life [Problem pomiaru cyrkularności w gospodarstwach domowych w kontekście podnoszenia jakości ich życia], *Rocznik Administracji Publicznej* [*Public Administration Yearbook*], Vol. 6, pg. 237-253.

Web sources:

1. EN-ROADS, (2020). *Climate Change Solutions Simulator* https://www.climateinteractive.org/tools/en-roads/
2. EPA, (2021). *Carbon Footprint Calculator*, https://www3.epa.gov/carbon-footprint-calculator/

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3. European Parliament, (2018). *Greenhouse gas emissions by country and sector (infographic)* https://www.europarl.europa.eu/news/en/headlines/society/20180301STO98928/greenhouse-gas-emissions-by-country-and-sector-infographic
4. Flood Observatory, (2021). *Space-based Measurement. Mapping. and Modelling of Surface Water* http://floodobservatory.colorado.edu/
5. Global Carbon Project, (2020a). *Supplemental data of Global Carbon Budget 2020* (Version 1.0) [Data set]. Global Carbon Project. https://doi.org/10.18160/gcp-2020

Terms related with the Module:		
energy production	climate changes	"adaptation" strategy
energy consumption	greenhouse gas emission	"mitigation" strategy
renewable energy sources	sustainable consumption	

Summary of the syllabus for the Module:

This Module will focus on explaining the concept of energy transformation regarding to combat the climate change. The transition to natural energy seems to be the key solution to prevent irreversible climate change. Scientists predict that if the status quo is maintained there will be irreversible changes in nature in just ten years. The need to stop climate change and rethink energy strategy has been talked about since the 1970s. However, it is only recently that these changes have become more comprehensive by incorporating general and specific recommendations (solutions) into legislation, both national and international. A large role is played here by various types of international agreements, which have resulted in the development of directives and lower-level strategies to stop climate change. By implementing comprehensive solutions, politicians hope to halt irreversible climate change.

The transition to natural energy can positively affect all the economy, the environment and the citizens of the European Union, however it requires huge effort to implement into the economy. When correctly applied, it can become a crucial parameter for sustainable growth (in economic, social and environmental dimension).

There are many ways of producing energy with concrete consequences for both society and the individual citizen. This account takes into account both the satisfaction of needs for electricity, the availability of resources from which it is produced, and the cost of producing it. This last element has not only a

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financial dimension, but increasingly a social and environmental one. Growing awareness in society of the environmental consequences of using specific energy sources also leads to rethinking the ways of using energy. Energy consumption today has become the subject of many both analyses and promoted consumer behaviour in society.

Unfortunately, the transformation to the use of natural energy is not possible immediately and this must take into account the need for different strategies in the face of the intensifying effects of climate change. Two approaches are generally mentioned: a climate change "mitigation" strategy and a climate change "adaptation" strategy. Depending on the model adopted, the transition to natural energy use will be faster or slower. "Mitigation" of climate change will mean the gradual reduction of greenhouse gas emissions responsible for global warming, i.e. trying to halt climate change. The strategy of "adaptation" to climate change will be expressed by reducing the vulnerability of ecosystems and socio-economic systems, while strengthening their resilience to the inevitable effects of an ever-changing climate.

Climate change poses challenges and threats to the environment and the economy. They can be considered both on a micro and macro scale. They are most often associated with an increase in extreme weather events, can result in the loss of natural resources, and often also affect the health or life of people and ecosystems. Knowing the consequences and being able to follow them is becoming a key factor today in increasing the ability to choose appropriate solutions on not only a state-wide or international level, but also on an individual level. The implementation of specific strategies and tools in business practice will allow you to join in the actions taken to protect the environment and improve the quality of life.

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MODULE 2:
TOWARDS BIODIVERSITY AND ECOLOGICAL TRANSFORMATION OF COMPANIES

The aim of the Module:	
Nowadays, it is very common to hear about sustainable businesses. In most cases, this comes from start-ups that try to follow environmental policies so that their work activities have less impact on the planet. However, every company can transform itself ecologically and it is time to do so not only for the sake of the planet but also for the profitability of the organisation itself. This is essential if it is to endure over time. Under this context, the aim of Module 2 "TOWARDS BIODIVERSITY AND ECOLOGICAL TRANSFORMATION OF COMPANIES" is to explain the different tools which could be used by companies in order to carry out a green transformation of their business. This explanation will come from theory but also through real cases of companies which have already implemented this transformation.	
Time duration:	4 weeks (5-6 hours of self-study per week; 25 hours in total): • hands-on sessions (presential and/or online): 7 hours • self-study sessions: 15 hours • assessment: 3 hours
Level of EQF	5 level of EQF
ECVET:	1 point =1 ECVET = 25 hours
Length of material:	• 25 pages of study materials divided into 3 chapters, • app. 7 pages per week, • the last week is devoted to preparation of individual assignment.
Assignment:	The assignment is available through the mobile app: Environmental application for start-ups.
Learning objectives of the Module:	
• to list the different environmental certifications which could be implemented in a company, • to understand the advantages of eco-labels products for companies, • to describe the environmental products declarations for companies,	

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- to understand, through real cases of enterprises that have already carried out their green transformations, the benefits of biodiversity and ecological initiatives,
- to understand how Industrial Symbiosis Processes are going,
- to describe the impact of having a Corporate Social Responsibility in a company to accelerate its green transformation,
- to provide the optimal strategy for the transformation of companies through green entrepreneurship tools such as the sustainable business model Canvas.

Learning outcomes of the Module:

- participants will have increased knowledge about sustainable business and how to implement different actions in their organisation.
- participants will understand how important is to implement sustainable actions in their business.
- participants will also be able to learn good examples from other companies which have already implemented sustainable practices.

Teaching methods of the Module:	• student-centred learning • self-directed learning • experimental learning • case based learning
Teaching tools used:	• Coursebooks • Internet and other platforms/applications • Open educational resources • Mobile app • Videos • Interactive presentation

Topics of the Module:

Unit I. Sustainability in companies

Duration: 5 hours of self-study

Learning outcomes of Unit I:

Knowlegde	Skills	Competences
The participant has an integrated knowledge of the main environmental	The participant names the different green certifications, labels and product declarations to	The participant realises what changes they should implement for integrating green labels, certificates

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certifications, ecolabels and product declarations to integrate in a company for its green transformation.	be integrated by companies for its sustainable and green transformation.	and declarations in his company. Communicating green product aspects in the most efficient way.
Unit II. Ecological transformation of the business		
Duration: 6 hours of self-study		
Learning outcomes of Unit II:		
Knowlegde	**Skills**	**Competences**
The participant has an integrated knowledge about the theoretical concepts of Corporate Social Responsibility, green business models and Industrial Symbiosis concept.	The participant names, select and evaluate the different green opportunities that he have to integrate in their organisation based on different perspectives (financial, social, etc.) but specially the environmental one.	The participant realises its autonomous ability to convey the knowledge about the tools for transform ecological company facilitating new business models and the implementation of Corporate Social Responsibility.
Unit III. Good practices and initiatives for the green transformation of companies		
Duration: 4 hours of self-study		
Learning outcomes of Unit III:		
Knowlegde	**Skills**	**Competences**
The participant has an integrated knowledge about real applications of biodiversity and ecological transformations in companies.	The participant names and understand the peculiarities of the exposed cases for which they have been successful.	The participants realises its potential knowledge for implementing green actions in their companies from the acquired experience of other companies already transformed.
Requirements for obtaining a certificate of completion:		

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The minimum requirements for Certificate of completion of Module: (TOWARDS BIODIVERSITY AND ECOLOGICAL TRANSFORMATION OF COMPANIES) are as follows:

1. Self-study of training materials provided in module sources of knowledge.
2. M-learning with the Environmental Change mobile app, including self-assessment.
3. Submission of the case study assignment to the trainer.

Sources of knowledge of the Module:

Unit I:

1. France. REGULATION (EC) No 1221/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 25 November 2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS), repealing Regulation (EC) No 761/2001 and Commission Decisions 2001/681/EC and 2006/193/EC. Official Journal of the European Union, 22 of November of 2009, no. L 342, p. 45.
2. France. REGULATIONS COMMISSION REGULATION (EU) 2017/1505 of 28 August 2017 amending Annexes I, II and III to Regulation (EC) No 1221/2009 of the European Parliament and of the Council on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS). Official Journal of the European Union, 29 of August of 2017, no. L 222 p. 20.
3. France. COMMISSION REGULATION (EU) 2018/2026 of 19 December 2018 amending Annex IV to Regulation (EC) No 1221/2009 of the European Parliament and of the Council on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS). Official Journal of the European Union, 20 of December of 2018, no. L 325 p. 24.
4. Ihobe, Sociedad Pública de Gestión Ambiental, Departamento de Medio Ambiente, Planificación Territorial y Vivienda, Gobierno Vasco (2020). Guía técnica Etiquetado ambiental de producto. Guía de criterios ambientales para la mejora de producto. Bilbao: Ihobe.
5. Ihobe, Sociedad Pública de Gestión Ambiental, Departamento de Medio Ambiente, Planificación Territorial y Vivienda, Gobierno Vasco (2015). Guía técnica Etiquetado ambiental de producto. Guía de criterios ambientales para la mejora de producto. Bilbao: Ihobe, Sociedad Pública de Gestión Ambiental.

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6. Office of the German EMAS Advisory Board. (2019*). 3x3 Good reasons for EMAS*. IHOBE, S.A - Sociedad Pública de Gestión Ambiental, Gobierno Vasco. Available at: https://www.ihobe.eus/publications/3-3-good-reasons-for-emas

Unit II:

1. Bonnet, F. et al. (2016): *Identification of best practices and lessons learnt in Industrial Symbiosis.* Fissac project. Online. Available at: http://fissacproject.eu/wp-content/uploads/2018/06/FISSAC-D1.2-Best-practices-and-lessons-learnt-in-IS-Summary.pdf. Consulted on 6th October 2021.
2. Carson, R. (1962), *Silent Spring*, Boston, United States, Houghton Mifflin Harcourt.
3. Cohen-Rosenthal, E. (2003): *Eco-industrial Strategies. Unleashing synergy between economic development and the environment.* Sheffield, UK: Greenleaf Publishing Limited. ISBN 187-47-19-624
4. Hohnen, P. (2007). Corporate Social Responsibility: An Implementation Guide for Business. International Institute for Sustainable Development
5. TTGV TV. (2014): *Industrial Symbiosis Documentary-Full Version*. [Online]. Available at: https://www.youtube.com/watch?v=1LzT_vscVAE&t=9s. [Consulted on 06th October 2021]
7. United Nations, UN (2015). *Transforming our world: The 2030 Agenda for Sustainable Development. A/RES/70/1*.

Unit III:

1. Cultivating Capital (n.d.): *The small Business Guide to Sustainable Business Practices. Practical Guidance to Help You Build a Sustainable Business.* [Online]. Available at: https://www.cultivatingcapital.com/sustainable-business-practices/#sustainability. Consulted on 6th October 2021.
2. Ihobe (2002): *Manual on Ecodesign. 7 steps for implementation.* [Online]. Available at: https://www.ihobe.eus/Publicaciones/Ficha.aspx?IdMenu=97801056-cd1f-4503-bafa-f54fa80d9a44&Cod=414a18ef-dd57-4b40-8746-407d517f7bda&Idioma=en-GB&Tipo=. Consulted on 6th October 2021.
3. NH Hotel Group. (n.d.). *Compañía responsible y sostenible.* [Online]. Available at: https://www.nh-hoteles.es/corporate/es/compania-responsable-y-sostenible Consulted on 3rd November 2021

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4. NH Hotel Group. (2021). *Estado de información no financiera consolidado 2020. Memoria Sustainable Business.* [Online]. Available at: https://www.nh-hoteles.es/corporate/sites/default/files/files-rsc/nh_rsc_esp_completo_v11.pdf Consulted on 3rd November 2021
5. Sancal Diseño. (2021). With *Sancal, S is for Sustainability*. [Online]. Available at: https://sancal.com/en/blog-s-is-for-sustainability/ Consulted on 3rd November 2021
6. Sancal Diseño. (n.d.). *Company Certificates.* [Online]. Available at: https://sancal.com/en/downloads/company-certificates/ Consulted on 3rd November 2021
7. RedEco. (2020). *Circular Economy project with IBIAE*. [Online]. Available at: https://www.redecoec.com/en/circular-economy-project-with-ibiae/ Consulted on 3rd November 2021
8. Sempere. (n.d.). *Resistek- Sustainable Mannequins made in Spain.* [Online]. Available at: https://www.sempere.com/resistek-sustainable-mannequins/ Consulted on 3rd November 2021

Terms related with the Module:		
Ecolabel	Industrial Symbiosis	Canvas
Certification	Corporate Social Responsibility	Green entrepreneurship
Declaration	Business cases	Good practices
Standards		

Summary of the syllabus for the Module:

This Module will focus on explaining how companies could carry out a transformation of their business in terms of sustainability and ecological principles.

In the face of the environmental crisis we are experiencing, as a result of an unsustainable development model based on the misuse of natural resources, only those organisations that change their business models towards those that adopt sustainable practices, to become green companies, will be the ones to gain competitive advantages.

Green companies, seeking biodiversity and ecological transformation, are not those that comply with regulations and continue to consider that everything to do with caring for the environment generates a cost for them. Green companies are those organisations that see compliance with environmental regulations as an opportunity to innovate their processes and technology, in order to improve both their results and their efficiency.

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But how do organisations manage to transform themselves into green businesses? It is not easy and, in fact, very few company leaders are able to achieve widespread change. This is due because most of the companies do not understand what sustainability really is, they only focus their efforts on technical aspects and in the implementation of eco-innovation while they forget the importance of having an integrated sustainability strategy that actively involves all members of the organisation.

The main strategies that organisations that want to become green companies should consider in order to achieve a real integral change are the following:

Transformation through cultural change

It involves getting every member of the company to change the way they do business. Integrating a green approach into the organisation's Corporate Social Responsibility. Sometimes this can be particularly difficult to achieve, due to resistance to change; however, it is possible if you understand the reasons why members of the organisation are opposed to it.

However, the key to turning the new vision into a reality will be to make it clear because for achieving this change, the active participation of everyone is necessary, since everyone is a key player in the results obtained, whether good or bad.

Implementing eco-innovation tools

Adapting technological innovations to achieve sustainable business practices is a path that green businesses must follow:

- Build trust through changes that bring quick results.
- Invest in innovation projects, such as a green product line.
- Implement strategies that involve a total change in their system, which requires even more investment.

In order to tackle climate change globally, it is necessary for organisations to seize the opportunities of sustainability and to transform themselves comprehensively into green businesses.

To this end, tools such as ecolabels, environmental certifications or environmental products declarations will greatly help companies to achieve the desired green transformation and, above all, to communicate and project these achievements to other organisations as well as to customers, suppliers and other stakeholders.

Collaboration with stakeholders

When an organisation decides to start on the road to becoming a green company, another aspect to consider is to establish links with other institutions interested in the subject, which will be of great help, since, for example, if it is a company that has already gone through processes that are about to be

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undertaken, it will be possible to detect both those practices that did not work, as well as the most recent innovations. For this purpose, the analysis of success stories and best practices will always be of great use in order to be able to carry out the transformation of another company.

Therefore, this second module of the Environmental Change course will help companies to be aware of the importance and necessity of promoting circular economy, biodiversity and sustainability and how this transformation will allow them to be more competitive and resilient.

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MODULE 3:
PLASTIC WASTE MANAGEMENT IN YOUR SME

The aim of the Module:	
The aim of this third module (PLASTIC WASTE MANAGEMENT IN YOUR SME) is to tackle a relevant topic not only for start uppers, but also for our societies at large: how to manage plastic waste? Its goal is to raise the awareness of start uppers regarding the importance of devising effective plastic waste management strategies in their business, providing them with key insights to address this global challenge.	
Time duration:	4 weeks (6-7 hours of self-study per week; 25 hours in total) • hands-on sessions (presential and/or online): 13 hours • self-study sessions: 11 hours • assessment: 1 hour
Level of EQF	5
ECVET:	1 point = 1 ECVET = 25 hours
Length of material:	• 20 pages of study materials divided into 3 chapters, • app. 7 pages per week, • the last week is devoted to the preparation of the individual assignment.
Assignment:	The assignment is available through the mobile app: Environmental application for start-ups.

Learning objectives of the Module:

- to outline the reasons that dictate the ubiquity of plastics in nowadays,
- to identify plastics environmental impacts,
- to assess the implications of poor plastic waste management,
- to explain why plastic waste has turned into a global environmental challenge,
- to analyse political instruments devised to improve plastic waste management,
- to elaborate on how to mobilise the private sector and citizens to implement plastic waste management strategies,
- to recognise eco-friendly plastic waste management practices suitable for SMEs,
- to list eco-friendly plastic management practices suitable for SMEs,

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• to devise an eco-friendly plastic management strategy for his/her own SME.
Learning outcomes of the Module:
• to outline the reasons that dictate the ubiquity of plastics in nowadays, • to identify plastics environmental impacts , • to assess the implications of poor plastic waste management, • to explain why plastic waste has turned into a global environmental challenge, • to analyse political instruments devised to improve plastic waste management, • to elaborate on how to mobilise private sector and citizens to implement plastic waste management strategies, • to recognise eco-friendly plastic waste management practices suitable for SMEs • to list eco-friendly plastic management practices suitable for SMEs, • to devise an eco-friendly plastic management strategy for his/her own SME.

Teaching methods of the Module:	• student-centred learning • self-directed learning • experimental learning • case based learning
Teaching tools used:	• Coursebooks • Internet and other platforms/applications • Open educational resources • Mobile app • Videos • Interactive presentation

Topics of the Module:

Unit I. The ubiquity of plastic and its environmental impact

Duration: 6 hours of self-study

Learning outcomes of Unit I:

Knowlegde	Skills	Competences
Outline the reasons that dictate the	Identify plastics environmental impacts.	Assess the implications of poor plastic waste management.

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ubiquity of plastics in nowadays.		

Unit II. Global awareness and eco-friendly policies to address plastic pollution		
Duration: 6 hours of self-study		
Learning outcomes of Unit II:		
Knowlegde	**Skills**	**Competences**
Explain why plastic waste has turned into a global environmental challenge.	Analise political instruments devised to improve plastic waste management.	Elaborate on how to mobilise the private sector and citizens to implement plastic waste management strategies.

Unit III. Effective plastic waste management in SMEs		
Duration: 6 hours of self-study		
Learning outcomes of Unit III:		
Knowlegde	**Skills**	**Competences**
Recognise eco-friendly plastic waste management practices suitable for SMEs.	List eco-friendly plastic management practices suitable for SMEs.	Devise an eco-friendly plastic management strategy for his/her own SME.

Requirements for obtaining a certificate of completion:

The minimum requirements for the Certificate of completion of Module 3: (PLASTIC WASTE MANAGEMENT IN YOUR SME) are as follows:

1. Self-study of training materials provided in module sources of knowledge.
2. M-learning with the Environmental Change mobile app, including self-assessment.
3. Submission of the case study assignment to the trainer.

Sources of knowledge of the Module:

Unit I.

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1. Plastic Pollution. Our World in Data, Oxford Martin School, University of Oxford [retrieved at: https://ourworldindata.org/search?q=plastics, October 13, 2021].
2. Plastic Garbage Project, An exhibition by the Museum für Gestaltung Zürich, supported by Drosos Foundation [retrieved at: https://www.plasticgarbageproject.org/, October 13, 2021]

Unit II:

1. (March 22, 2021). *The plastic waste problem explained*, Alliance to End Plastic Waste [retrieved at: https://endplasticwaste.org/en, October 13, 2021].
2. *Guidelines for Reducing Plastic Waste (GRP) & Eco-friendly initiative,* Association for Supporting the SDGs for the United Nations (ASD) (Partnership) [retrieved at: https://oceanconference.un.org/commitments/?id=27466, October 13, 2021].

Unit III:

1. Anderson, S. (August 19, 2019). *Waste not want not: how SMEs are setting the recycling trend for large enterprises*, Business West [retrieved at: https://www.businesswest.co.uk/blog/waste-not-want-not-how-smes-are-setting-recycling-trend-large-enterprises, October 13, 2021].
2. Kieselbach, S. (March 31, 2020). Sustainable packaging. Top 9 Sustainable Packaging Trends. Sphera Spark [retrieved at: https://sphera.com/spark/top-9-sustainable-packaging-trends/, October 13, 2021]

Terms related with the Module:		
Mass plastics	Eco-design	Public policies
Bioplastics	Green purchasing	Plastic waste management
Plastic waste pollution	Sustainable packaging	SMEs

Summary of the syllabus for the Module:

This module addresses a relevant topic not only for start uppers, but also for our societies at large. It aims at raising start uppers' awareness about the importance of devising effective plastic waste management strategies and successfully implement them in their businesses. And it provides key insights for

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SMEs to address the current plastic crisis, while fostering efficient resource usage, innovation and their businesses competitiveness. The module is divided in three units: **unit I** provides background information on plastic, its features and wide-ranging applications, explaining how its pervasive use has turned into a global environmental challenge; **unit II** analyses recent EU political instruments devised to reduce plastic waste and to improve its end-of-life management, uttering that mobilising the private sector address to this challenge in a timely manner is key to promote both a regenerative growth model and SMEs competitiveness; finally, **unit III** highlights the responsibility of SMEs in environmental protection, first and foremost by reducing the amount of plastic waste produced and discarded, resorting to eco-design, green purchasing and sustainable packaging. It also tackles eco-friendly plastic waste management practices, while underlining that start uppers must mobilise and think out of the box to overcome this global challenge.

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MODULE 4: REDESIGNING PRODUCTS AND SERVICES TO MINIMISE THE USE OF MATERIALS

The aim of the Module:	
The aim of module 4 (REDESIGNING PRODUCTS AND SERVICES TO MINIMISE THE USE OF MATERIALS) is to provide information that will increase awareness and motivate towards the minimalization of material usage, whether regarding products or services. Although the assumptions are predominately for start-up companies, anyone that wants to change their behaviour towards more conscious and sustainable management of resources, will benefit from this module. It is key to approach the topic across different sectors to increase the impact and provoke individuals, businesses and the general society to follow-up and act for change to keep products, materials and services in use, sustaining them as long as possible getting the maximum value out of them. Module 4 also aims at proposing strategies regarding eco-designing and redesigning products and services that could be more environmentally friendly for business and day-to-day activities. Additionally, the concept of Design for the Environment (DfE) is explained. Finally, module 4 aims at proposing a sustainable waste management checklist for SMEs, followed by ideas and solutions for eco-minded start uppers and entrepreneurs.	
Time duration:	4 weeks (5-6 hours of self-study per week; 25 hours in total): • hands-on sessions (presential and/or online): 3 hours (1 hour per unit/main topic) • self-study sessions: 21 hours • assessment: 1 hour
Level of EQF	5
ECVET:	1 point = 1 ECVET = 25 hours
Length of material:	• 20 pages of study materials divided into 3 chapters, • app. 7 pages per week, • the last week is devoted to the preparation of the individual assignment.
Assignment:	The assignment is available through the mobile app: Environmental application for start-ups
Learning objectives of the Module:	
• to explain design as the first stage of the product/service lifecycle,	

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• to understand the difference between design, green design and eco-design, • to list features, advantages and disadvantages of eco-design, • to detail techniques and strategies towards reducing, reusing, recycling and reinvesting, • to analyse ways of reducing impact on the environment, • to provide European eco-design regulations and European standards, • to outline the Design for the Environment (DfE) approach, • to assess sectors and businesses on their sustainability approaches and especially in view of redesigning products and services to minimise the use of materials, • to recognize conscious behaviours in dispose of products, • to describe the greenwashing process, • to identify waste prevention strategies and measures for SMEs, • to elaborate on sustainable solutions for eco-minded start uppers and entrepreneurs in the context of minimising material usage, • to plan and take action for the introduction of improved solutions to the business.
Learning outcomes of the Module:
• the participants will have increased knowledge of the difference between design, green design and eco-design. • the participants will understand how to detail techniques and strategies towards reducing, reusing, recycling and reinvesting. • the participants will also be able to identify waste prevention strategies and measures for SMEs.

Teaching methods of the Module:	• student-centred learning • self-directed learning • experimental learning • case-based learning
Teaching tools used:	• Coursebooks • Internet and other platforms/ applications • Open educational resources • Mobile app • Videos • Interactive presentation

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Topics of the Module:		
Unit I. Eco-design definitions, techniques, strategies and standards		
Duration: 10 hours of self-study		
Learning outcomes of Unit I:		
Knowledge	**Skills**	**Competences**
The participant has an integrated knowledge about the first stage of the product/service lifecycle (=design), the difference between design, green design and eco-design, the features, advantages and disadvantages, as well techniques of eco-design, and European eco-design regulations and European standards.	The participant names different strategies towards reducing, reusing, recycling and reinvesting material and analyses ways of reducing impact on the environment.	The participant realises techniques and strategies supporting designing and redesigning, especially to minimise the use of materials.
Unit II. Environmentally friendly products for business and day-to-day activities		
Duration: 7 hours of self-study		
Learning outcomes of Unit II:		
Knowledge	**Skills**	**Competences**
The participant has an integrated knowledge about the Design for the Environment (DfE) approach and across different sectors, as well as about the greenwashing process.	The participant assesses sectors and businesses on their sustainability approaches and especially in view of redesigning products and services to minimise the use of materials.	The participant realizes sustainable practices for reducing the use of materials and recognizes conscious behaviours in dispose of products.
Unit III. Sustainable solutions for eco-minded start uppers and entrepreneurs		

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Duration: 5 hours of self-study		
Learning outcomes of Unit III:		
Knowledge	**Skills**	**Competences**
The participant has an integrated knowledge about ideas and solutions for eco-minded start uppers and entrepreneurs to plan and take action for the introduction of improved solutions to the business in terms of products and services to minimise the use of materials.	The participant names sustainable solutions for eco-minded start uppers and entrepreneurs in the context of minimising material usage and proposes a sustainable waste management checklist for SMEs.	The participant realises waste prevention strategies and measures for SMEs to be eco-minded and eco-friendly.

Requirements for obtaining a certificate of completion:

The minimum requirements for the Certificate of completion of Module 4 (REDESIGNING PRODUCTS AND SERVICES TO MINIMISE THE USE OF MATERIALS) are as follows:

1. Self-study of training materials provided in module sources of knowledge.
2. M-learning with the Environmental Change mobile app, including self-assessment.
3. Submission of the case study assignment to the trainer.

Sources of knowledge of the Module:

Unit I:

1. Pekka Murto (2011) *Sustainable innovation and the issue of scale*, Helsinki, Nordic Design Research Conference, file:///O:/Environmental%20change%20-%20Danzoo%20-%202020/IO1/Curriculum_Syllabus/DANMAR/115-118-1-PB.pdf

Publication exploring the scale and impact of design on sustainable innovation, comparing the eco-design development process.

2. Fabrizio Ceschin, Idil Gaziulusoy (2016) *Evolution of design for sustainability: From product design to design for system innovations and*

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transitions, Design Studies, Volume 47, Pages 118-163, https://www.sciencedirect.com/science/article/pii/S0142694X16300631
Paper defining Design for Sustainability (DfS) and the product innovation level, comparing green design and eco-design by their focus points, limitations and potential future research directions.

3. Danone (February 2, 2017) *Designing the products to meet environmental challenges is possible and needed*, https://medium.com/@Danone/designing-the-products-to-meet-environmental-challenges-is-possible-and-needed-3f251d912420

Blog post explaining the importance of concentrating on the whole lifecycle of a product or service, as well as eco-design benefits.

4. Rikke Friis Dam and Teo Yu Siang (2021) *Learn How to Use the Best Ideation Methods: SCAMPER*, https://www.interaction-design.org/literature/article/learn-how-to-use-the-best-ideation-methods-scamper#

Blog post referring to the SCAMPER technique that is useful for generating ideas to develop or improve existing products or services.

5. Marilu Valente (2021) *Four strategies to develop eco design products*, https://cyclic.design/eco-design-products/

Online publication describing four strategies for designing eco products, either by closing or extending the product's lifecycle.

6. Iberdrola, S.A (accessed 31.01.2022) *Eco-design: how to manufacture sustainable products to satisfy consumers*, https://www.iberdrola.com/social-commitment/eco-design-sustainable-products

Blog post about sustainable production and design, the benefits of eco-design, why eco-design is important, features and examples of eco-design, and regulations considering eco-design.

7. NIBUSINESSINFO.CO.UK (accessed 31.01.2022) *Ecodesign in product and service development*, https://www.nibusinessinfo.co.uk/content/ecodesign-product-and-service-development

E-guide on sustainable design, including principles, advantages, disadvantages, the process priorities and key checkpoints, among others.

8. European Commission (accessed 31.01.2022) *Sustainable product policy & ecodesign*, https://ec.europa.eu/growth/industry/sustainability/sustainable-product-policy-ecodesign_en

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Publication of the EC on sustainable product policies, legal framework for eco-design, including regulations, standards, international aspects and supporting tools.

Unit II:

1. Marilu Valente (2021) *The most sustainable bottle has a unique design*, Cyclic Design, https://cyclic.design/sustainable-bottle/

Blog post proposing unique design for usability and sustainable solution development on the example of product of everyday use, namely a bottle.

2. Brennon Costello (accessed 31.01.2022) *Design for the Environment*, https://sites.tufts.edu/eeseniordesignhandbook/2013/design-for-the-environment/

Article focusing on how the Design for Environment (DfE) impacts production, consumption and disposal of a product, with examples.

3. Katelyn Cresmer (2019) *What is Greenwashing? Examples [2020]*, https://greenandthistle.com/what-is-greenwashing/

Blog post explaining and providing examples on the practice of greenwashing.

Unit III:

1. Max Freedman (December 21, 2021) *23 Green Business Ideas for Eco-Minded Entrepreneurs*, https://www.businessnewsdaily.com/5102-green-business-ideas.html

Article with a proposal of "green" business ideas for the development of a company's products and services, including examples of good practices.

2. Jan Michael Hess (November 3, 2019) *Smart green startups you should know*, https://ecosummit.net/articles/smart-green-startups-you-should-know

Article presenting a list of "YouTube stories" smart green start-ups in energy, mobility and cities.

3. RTS Holding, Inc. (December 8, 2020) *What is sustainable waste management*, https://www.rts.com/blog/what-is-sustainable-waste-management/

Blog post focusing on what makes sustainable waste management important placing waste on the hierarchy and proposing ways to start making waste management more sustainable.

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Terms related with the Module:		
eco-design	environmentally sustainable design	design for Environment
eco-minded	redesigning	reusability
greenwashing	waste management	sustainable practices
sustainability		

Summary of the syllabus for the Module:

With the availability of research material and general information on the topic, we can notice increased awareness on environmental issues, both at production and customer level, also resulting in more environmentally friendly products and services on the market and their wiser exploitation by consumers.

Environmentally sustainable design, as part of sustainable and eco-innovation, focuses not only on the stage of preparing and producing a product or service but also the changes to it resulting from consumption. With this in mind the use of materials can be reduced by utilizing them to the maximum, at the same time saving time, money and human efforts. In many cases products can be reused and services adapted to provide effective solutions. Therefore, redesigning products and services, on the one hand is to minimise the use of materials, but on the other for a better customer experience.

Module 4: Redesigning products and services to minimise the use of materials, highlights the first stage in the product lifecycle, which is the design, and especially focusing on eco-design and what it means across various sectors and considering different actors from the supplier, through the business and to the customer. Besides that, module 4 focuses on designing techniques and strategies for reducing impact on the environment with the use of efficient and as much sustainable as possible resources and processes to meet European standards.

Looking into the future, making environmentally friendly products for business and day-to-day activities will be a challenge, but also an opportunity. Eco-design will create shared values for companies and raise the satisfaction of customers. Simple designs will be more appreciated with increased awareness on the impact the product or service has on the environment. However, increased consumption will also lead to increased environmental effects interconnected with the need for more careful and meaningful behaviours to control the entire product (or service) lifecycle. That is why in module 4 we also focus on the Design for the Environment (DfE) approach and compare sustainable practices for reducing the use of materials. Next, we look at

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different sectors with examples of environmentally sustainable practices in offered products or services, and explain the concept of greenwashing.

Finally, following a sustainable waste management checklist for SMEs, ideas and sustainable solutions for eco-minded start uppers and entrepreneurs are proposed in module 4. Focus is placed on the importance of planning and taking action for the introduction of improved solutions.

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MODULE 5: CIRCULAR BUSINESS MODELS

The aim of the Module:	
This module (CIRCULAR BUSINESS MODELS) addresses a relevant topic not only for start uppers, but also for our societies at large. The aim of module 5 is to provide information that will awareness about the circular business models. It is not entirely clear, what circular business models are. Nor is it clear how SMEs might apply the newly canvassed ideas. This explanation will come from theory and explanation of useful tools but also through real cases of companies that have already implemented the circular business models.	
Time duration:	4 weeks (5-6 hours of self-study per week; 25 hours in total): • hands-on sessions (presential and/or online): 4 hours (1 hour per unit/main topic) • self-study sessions: 20 hours • assessment: 1 hour
Level of EQF	5
ECVET:	1 point = 1 ECVET= 25 hours
Length of material:	• 26 pages of study materials divided into 4 chapters, • app. 6-7 pages per week, • the last week is devoted to preparation of individual assignment.
Assignment:	The assignment is available through the mobile app: Environmental application for start-ups
Learning objectives of the Module:	
• to understand the definition of the circular business model, • to describe the key characteristics of the circular business model, • to recognise the Resource loops as a way of categorising business opportunities, • to list and explain the types of circular business models, • to analyse the economic and environmental potentials of the circular business model, • to understand the business canvas, • to describe and use the circular business canvas, • to understand the best practises.	

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Learning outcomes of the Module:	
• participants will have increased knowledge of the circular business models. • participants will understand how a business can use the circular business models through real cases examples. • participants will also be able to implement the circular business models.	
Teaching methods of the Module:	• student-centred learning • self-directed learning • experimental learning • case-based learning
Teaching tools used:	• Coursebooks • Internet and other platforms/ applications • Open educational resources • Mobile app • Videos • Interactive presentation
Topics of the Module:	

Unit I. Theory of Circular business model		
Duration: 10 hours of self-study		
Learning outcomes of Unit I:		
Knowledge	**Skills**	**Competences**
The participant has an integrated knowledge about circular business model.	The participant knows and names the different types of the circular business model.	The participants realise that each business can find a resource loop an area that can potentially increase their resource efficiency, and through that realise the economic and environmental potential of circular business model.
Unit II. Business canvas		

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Duration: 5 hours of self-study		
Learning outcomes of Unit II:		
Knowledge	**Skills**	**Competences**
The participant has an integrated knowledge of the business canvas.	The participant has the ability to use the tool business canvas.	The participants realise the usefulness of the business canvas.
Unit III. Introduction of circular canvas		
Duration: 5 hours of self-study		
Learning outcomes of Unit III:		
Knowledge	**Skills**	**Competences**
The participant has an integrated knowledge about the circular canvas.	The participant has the ability to use the business canvas.	The participants realises the usefulness of the circular business canvas.
Unit IV: Best practices - Case examples		
Duration: 5 hours of self-study		
Learning outcomes of Unit IV:		
Knowledge	**Skills**	**Competences**
The participant has an integrated knowledge about the diverse and unique circular business models that companies around the globe have already established	The participant names the most important business examples	The participants realises how the a business can use the circular business model

Requirements for obtaining a certificate of completion:

The minimum requirements for the Certificate of completion of Module: 5 (CIRCULAR BUSINESS MODELS) are as follows:

1. Self-study of training materials provided in module sources of knowledge.
2. M-learning with the Environmental Change mobile app, including self-assessment.
3. Submission of the case study assignment to the trainer.

Sources of knowledge of the Module:

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Unit I:

1) Eva Guldmann, University of Aalborg , 2016, Best Practice Examples of Circular Business Models, Ministry of Environmental and Food of Denmark, Environmental Protection Agency
2) Osterwalder, A. & Pigneur, Y. 2010, Business model generation: a handbook for visionaries, game changers, and challengers, 1st edn, John Wiley & Sons, New Jersey, US.
3) Ellen MacArthur Foundation 2013a, The circular 100, Ellen MacArthur Foundation, online.
4) Ellen MacArthur Foundation 2013b, The circular economy applied to the automotive industry. Available: http://www.ellenmacarthurfoundation.org/news/the-circular-economy-appliedto-the-automotive-industry-1 [2014, November 4].
5) Stahel, W.R. 2010, The performance economy, Palgrave Macmillan Hampshire, UK.
6) Larsen, A.H., Bauer, B., Musaeus, P., Gylling, A.C., Zacho, K.A. & Remmen, A. 2015, Fremme af forberedelse med henblik på genbrug af elektronikaffald/ Better preparation for reuse of electronic waste, Miljøstyrelsen, Copenhagen, Denmark.
7) Accenture 2014, Circular Advantage: Innovative Business Models and Technologies to Create Value in a World without Limits to Growth, Accenture
8) The Danish Business Authority 2015, Environmental Consideration is Necessary to Growth/Miljøhensyn er nødvendig for vækst, March Newsletter edn, The Danish Business Authority, Copenhagen.
9) SEVBCSD GREECE, EY building a better working world, 2016, EY study on the circular economy in Greece
10) OECD (forthcoming), 2018 Business Models for the Circular Economy: Opportunities and Challenges from a Policy Perspective, OECD Publishing, Paris. Available: https://www.oecd.org/environment/waste/policy-highlights-business-models-for-the-circular-economy.pdf
11) Anjia-Tatjana Braun, Oliver Schoullhammer, Bernd Rosenkranz, 2021, volume 99, Pages 698-702, Adaption of the business model canvas template to develop business models for the circular economy, Elsevier , Available: https://doi.org/10.1016/j.procir.2021.03.093

Unit II:

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1. Business Models Inc – BMI, 2021, Business model canvas, Available: https://www.businessmodelsinc.com/about-bmi/tools/business-model-canvas/

Unit III:

1. Ellen MacArthur Foundation 2013a, The circular 100, Ellen MacArthur Foundation, online.
2. Ellen MacArthur Foundation 2013b, The circular economy applied to the automotive industry. Available: http://www.ellenmacarthurfoundation.org/news/the-circular-economyappliedto-the-automotive-industry- 1 [2014, November 4].
3. Ellen MacArthur Foundation 2013c, Towards the Circular Economy: Economic and Business Rationale for an Accelerated Transition, Ellen MacArthur Foundation, UK.

Other links:

https://www.boardofinnovation.com/circular-economy-business-models-explained/

https://circulab.com/ - Circular canvas, User manual by Circulab

Unit IV:

1. Nick De Mey, Business Models explained: How sustainability-focused start-ups make money, Available: https://www.boardofinnovation.com/blog/business-models-explained-how-sustainability-focused-start-ups-make-money/
2. Eva Guldmann, University of Aalborg , 2016, Best Practice Examples of Circular Business Models, Ministry of Environmental and Food of Denmark, Environmental Protection Agency
3. Andersen, P.K. 2013, August 06, 2013-last update, Modeindustrien er verdens næstmest forurenende [Homepage of Danmarks Radio], [Online]. Available:http://www.dr.dk/Nyheder/Kultur/Oevrig_kultur/2013/08/06/143830.htm [2014, August 31].
4. Nudie Jeans 2014a, Online shop, Post recycle rug denim. Available: http://www.nudiejeans.com/shop/denim-denim/p/2642 [2014, October 17].

Terms related with the Module:

Circular economy	Business models	Business canvas
Resource loops	Circular supplies	Circular canvas

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Circular Business models	Life extension	Resource efficiency
Sustainability		

Summary of the syllabus for the Module:

This module addresses a relevant topic not only for start uppers, but also for our societies at large. It aims at raising start uppers' awareness about the circular business models. It is not entirely clear, what circular business models are. Nor is it clear how SMEs might apply the newly canvassed ideas.

The module is divided in four units: **unit I:** provides theoretical approach of the business models, explain what the circular business models are, explain the Resource loops as a way of categorizing business opportunities, explain the different types of circular business models and the environmental and economic potential. **Unit II:** presents the business canvas, It is necessary to understand the business canvas and then proceed with the circular business canvas. **Unit III**: presents the Business Cycle Canvas (BCC) is developed and introduced. This is a tool which must support practitioners to think in business systems and beyond the individual BM. **Unit IV:** Special attention is given to examples from the textiles and clothing industry in addition to the durable goods industries. The best practice examples presented aim to demonstrate the diversity of business models found within these industries. Along with the business model frameworks, the examples are intended to provide an impression of the business opportunities in a circular economy that are already utilized by firms today and thus to provide inspiration for companies and entrepreneurs that wish to examine the potentials of circular business models for themselves.

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MODULE 6: LIFE CYCLE THINKING

The aim of the Module:	
The aim of the "LIFE CYCLE THINKING" module is to briefly introduce the concept of life cycle thinking as a business decision-making approach that is based on long-term integrated or holistic thinking. The first part of the module consists of theoretical explanation of basic concepts. The second part presents practical steps to implement the life cycle thinking into practice. The last part of the module presents case studies from different business sectors. Using the Module 6, the learner will know how to set a general framework for life cycle thinking approach in their business.	
Time duration:	4 weeks (5 hours of self-study per week; 20 hours in total): • hands-on sessions (presential and/or online): 4 hours • self-study sessions: 15 hours • assessment: 1 hour
Level of EQF	5
ECVET:	1 point = 1 ECVET = 25 hours
Length of material:	• Websites, documents and videos divided into 3 chapters • Approximately 5 units of study material per week • Last week is devoted to preparation of individual assignment
Assignment:	The assignment is available through the mobile app: Environmental application for start-ups.

Learning objectives of the Module:

- to understand how the production, distribution and consumption of products impact the environment and society,
- to get familiarized with metrics like carbon footprint, water footprint, ecological footprint,
- to define life cycle thinking and life cycles assessment,
- to recognize the difference between different life cycle approaches,
- to explain the basic phases of life cycle sustainability assessment,
- to list possible benefits of conducting a life cycle sustainability assessment,
- to prepare a basic plan for life cycle sustainability assessment,
- to suggest an optimal strategy for implementing life cycle thinking in the business practices,

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• to monitor the impact of life cycle thinking implementation.	
Learning outcomes of the Module:	
• the participants will get theoretical background, • the participants will prepare an action plan for implementation, • the participants will also be able to share the knowledge and skills.	
Teaching methods of the Module:	• student-centred learning • self-directed learning • experimental learning • case based learning
Teaching tools used:	• Coursebook • Internet and other platforms/ applications • Open educational resources • Mobile app • Videos • Interactive presentation

Topics of the Module:

Unit I. Introduction to life cycle thinking

Duration: 5 hours of self-study, 1 hour of hands-on activity

Learning outcomes of Unit I:

Knowlegde	Skills	Competences
Recognize the negative impacts of economic activities and define life cycle thinking and life cycle assessment with their benefits.	Find reliable resources about life cycle thinking and life cycle assessment.	Find appropriate ISO standards and networks of life cycle thinking practitioners relevant to their business.

Unit II. Conducting a life cycle sustainability assessment

Duration: 5 hours of self-study, 5 hours of hands-on activity

Learning outcomes of Unit II:

Knowlegde	Skills	Competences
Distinguish between different life cycle	Divide the life cycle sustainability	Prepare a general plan with indicators, stakeholders and

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assessments and define the benefits of the life cycle sustainability assessment.	assessment in smaller segments and use digital tools to conduct the assessment.	co-workers involved in conducting life cycle sustainability assessments for their business.

Unit III. Real-life examples of life cycle thinking		
Duration: 5 hours of self-study, 1 hour of hands-on activity		
Learning outcomes of Unit III:		
Knowlegde	**Skills**	**Competences**
Recognize different business sectors and business activities that benefit from life cycle thinking.	Know how to implement life cycle thinking in business decision-making.	Single out specific relevant practices from case studies and adjusts them to their business circumstances.

Requirements for obtaining a certificate of completion:

The minimum requirements for the Certificate of completion of Module6 (LIFE CYCLE THINKING) are as follows:

1. Self-study of training materials provided in module sources of knowledge.
2. M-learning with the Environmental Change mobile app, including self-assessment.
3. Submission of the case study assignment to the trainer.

Sources of knowledge of the Module:

Unit 1. Introduction to life cycle thinking

1) ISO, 2016: ISO 14040:2006; Environmental management — Life cycle assessment — Principles and framework.
URL: https://www.iso.org/standard/37456.html
2) European Commission, 2022: Sustainable product policy & ecodesign.
URL: https://ec.europa.eu/growth/industry/sustainability/sustainable-product-policy-ecodesign_en
3) Life Cycle Initiative, 2021 a: What is Life Cycle Thinking?
URL: https://www.lifecycleinitiative.org/starting-life-cycle-thinking/what-is-life-cycle-thinking/
4) Life Cycle Initiative, 2021 d: Life Cycle Approaches.

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URL: https://www.lifecycleinitiative.org/starting-life-cycle-thinking/life-cycle-approaches/

5) Life Cycle Initiative, 2021 i: Life Cycle Networks.
URL: https://www.lifecycleinitiative.org/networks/life-cycle-networks/#1460044002054-0844a199-921f

Unit 2. Conducting a life cycle sustainability assessment

1) Carbon Footprint, 2022: Calculate.
https://www.carbonfootprint.com/measure.html
2) Life Cycle Initiative, 2021 c: Life Cycle Sustainability Assessment.
URL: https://www.lifecycleinitiative.org/starting-life-cycle-thinking/life-cycle-approaches/life-cycle-sustainability-assessment
3) OpenLCA, 2021 a: Open-source Life Cycle Assessment software.
URL: https://www.openlca.org/
4) Life Cycle Initiative, 2021 g: Course curriculum.
URL: https://www.learnlifecycle.com/courses/lct
5) Life Cycle Initiative, 2021 h: Life Cycle Management Navigator for SMEs.
URL: https://www.lifecycleinitiative.org/LCM_navigator/index_c.html

Unit 3. Real-life examples of life cycle thinking

1) Sustainability Guide, 2022: Good Cases.
URL: https://sustainabilityguide.eu/guides/
2) Life Cycle Initiative, 2021 i: LCA Success Stories.
URL: https://www.lifecycleinitiative.org/resources/lcacases/
3) Whole Systems Design: Introduction to Life Cycle Thinking.
URL: https://www.youtube.com/watch?v=7mC9xaJC2dQ
4) The life cycle of a t-shirt - Angel Chang.
URL: https://www.youtube.com/watch?v=BiSYoeqb_VY
5) Life Cycle Assessment (LCA) For Beginners.
URL: https://www.youtube.com/watch?v=2s8wqa_IvoQ

Terms related with the Module:		
Life cycle thinking	Life cycle sustainability assessment	Carbon footprint
Water footprint	Ecological footprint	Sustainability

Summary of the syllabus for the Module:

Never have the human had a greater impact on the environment as we have it today. Global warming, biodiversity loss, waste generation together with soil,

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water and air pollution are some of the negative environmental impacts, mostly resulting from intensive consumerism and profit accumulation. Besides environment, negative impacts are also apparent in communities with health difficulties, inappropriate living situations and unfair working conditions.

One of the main causes is the production and consumption of short-term products, without considering the environmental and social impact of each production phase. The Module 6 is and introduction to the Life cycle thinking (LCT), an approach to holistic decision-making in business, which is often complementary or synonymous to the concept of eco-design. In general, LCT means consideration of all elements and processes in the production, including:

- inputs: energy generation, raw materials extraction,
- processes: production, transportation, consumption of products,
- outputs: air and water emissions, waste generation, excessive heat.

Arguably most important factor when starting LCT in business is an interdisciplinary team of knowledgeable and innovative experts, who can produce a precises inventory of all elements, processes and critical points of the production and later develop a comprehensive action plan. By doing so, companies' benefits can result in reduced expenses, recognizability and reputation, quality of products and services, stimulating local and regional development, better living and safer working conditions and developing innovations. In short, LCT helps the decision makers to understand invisible processes and impacts and plan for better, sustainable products and services.

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2. APPENDIX - GLOSSARY

Module 1: "Ways of transition to natural energy and combating climate change"	
"Adaptation" strategy	The strategy which is expressed by reducing the vulnerability of ecosystems and socio-economic systems, while strengthening their resilience to the inevitable effects of an ever-changing climate.
Climate changes	The change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties that persists for an extended period, typically decades or longer. *Source: https://www.ipcc.ch/sr15/chapter/glossary/*
Energy consumption	The amount of electricity generated for market use by the economic sectors.
Energy production	The amount of electricity generated for market use and delivered to the power grid including generation in auxiliary - emergency generators excluding ship power plants.
Greenhouse gas emission	The emission of gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of terrestrial radiation emitted by the Earth's surface, the atmosphere itself and by clouds. *Source: https://www.ipcc.ch/sr15/chapter/glossary/*
"Mitigation" strategy	The gradual reduction of greenhouse gas emissions responsible for global warming, i.e. trying to halt climate change.
Renewable energy sources	The energy sources that replenish (or renew themselves) naturally, such as solar, water, and tidal energy.
Sustainable consumption	Conscious, optimal and responsible use of available natural resources, goods and services on different levels (individuals, households, communities, local groups, business environments, local governments, country's official government and international organizations). *Source: (Goryńska-Goldmann & Gazdecki, 2020).*
Module 2: "Towards biodiversity and ecological transformation of companies"	

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Business Model Canvas	The Business Model Canvas is a business tool used to visualise all the building blocks when you want to start a business, including customers, route to market, value proposition and finance. Source: https://eship.ox.ac.uk/business-model-canvas-explained/
Corporate Social Responsibility	It is a self-regulating business model that helps a company be socially accountable- to itself, its stakeholders, and the public. Source: https://www.investopedia.com/terms/c/corp-social-responsibility.asp
EU Ecolabel	It is a label of environmental excellence that is awarded to products and services meeting high environmental standards throughout their life-cycle: from raw material extraction, to production, distribution and disposal. Source: https://ec.europa.eu/environment/ecolabel/
Industrial Symbiosis	It is the association between industrial facilities or companies in which the waste or by-products of one become raw materials for another. Source: https://nordregio.org/nordregio-magazine/issues/industrial-symbiosis/what-is-industrial-symbiosis/
Regulation	Document providing binding legislative rules, adopted by an authority. Source: https://oshwiki.eu/wiki/Standardisation_and_certification
Standard	Documented agreements containing technical specifications or other precise criteria to be used consistently as rules, guidelines or definitions, to ensure that materials, products, processes and services are fit for their purpose Source: ISO, 1996.
Module 3: "Plastic waste management in your SME"	
Bioplastics	Plastics made from sustainable raw materials (maize, wood, sugar, or potatoes).
Eco-design	Aims at reducing environmental impacts of products at the design stage. It entails the identification, monitorisation and continuous product improvement to make it as much environmentally friendly as possible.

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Green supply chain	Integrates environmental concerns in every step of the supply chain: manufacturing, material sourcing and selection, product design, transport, sale and end-of-life management.
Green purchasing	Consists of making purchasing decisions that are environmentally conscious, in terms of waste disposal, promotion of reuse, recycle, resource reduction, and material replacement.
Plastics	Polymers of high molecular weight, usually synthetic and derived from petrochemicals.
Plastic waste management	Technique of separating and use resources in terms of waste disposal, avoiding causing harm to the environment.
Sustainable packaging	Combines environmental concerns with business considerations to develop and/or purchase sustainable and eco-friendly solutions in terms of packaging.
Waste hierarchy	Based upon the description of the relative environmental damage of several waste management methods, the concept of waste hierarchy entails five-levels: prevention, reduction, reuse, recycling and recovery. Disposal is situated is considered the last resort in the waste hierarchy.
Module 4: "Redesigning products and services to minimise the use of materials"	
Design for the Environment (DfE)	The reduction of product, process or service impact on humans and the environment, considering the whole life cycle.
Eco-design	Integration of environmental aspects into product design and development, with the aim of reducing adverse environmental impacts throughout a product's life cycle. It can be applied to both existing and new products.
Green design	Redesigning individual qualities of individual products or services to make them more sustainable and ecological, with lower impact on the environment.
Greenwashing	The process of conveying a false impression or providing misleading information about how the products of a company are more environmentally friendly than they really are.

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Sustainability	It means maintaining a product or service at a certain rate or level.
Sustainable waste management	It means to keep products in material in use to minimize waste disposal and focusing on the entire lifecycle to reduce negative impact on the environment or society in general.
Module 5: "Circular businesses models"	
Business model	A business model is a foundation for your company and products. It captures the main idea of how your business will generate revenue.
Channels	The place can your customer buy or use your products or services, the tool can communicate with your customer, etc.
Revenue stream	Represent the ways your company generates cash from each Customer Segment (in the business canvas). It's where your revenue comes from. Method of income.
Sustainability	It means maintaining a product or service at a certain rate or level.
Value	The key characteristics that differentiate the product or service offering.
Module 6: "Life cycle thinking**"**	
Carbon footprint	Amount of greenhouse gases produced and emitted by each activity or entity in a production chain, usually expressed as carbon dioxide equivalent (CO2e).
Eco-design	Integration of environmental impact in all business processes including raw material extraction and processing, product production and transportation, marketing and consumption, and waste management.
Ecological footprint	Amount of natural resources available in comparison to the amount of natural resources used, usually expressed in global hectares (gha) per capita, country or activity.
Ecosystem services	Free benefits from nature like air production, water purification, pollination, food, raw materials, decomposition and space for recreation, education, cultural and spiritual activities etc.
Life cycle sustainability assessment	Methodology for evaluating and balancing environmental, social and economic impacts of product or service.

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Life cycle thinking	Holistic approach to business decision-making and planning including long-term impacts of the product or service on environment and society.
Water footprint	Volume of water used and polluted at each stage of the production process, usually expressed in cubic meter per ton of product of hectare of cropland.
System thinking	Approach to thinking about complex phenomena in terms of inputs and outputs, elements and their interrelations.

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II. Requirements of National Qualification Frameworks

Within the Environmental change project, partners collected a brief overview of the experiences of five European countries that are at different stages of NQF implementation: Poland, Portugal, Spain, Slovenia and Greece. These descriptions are presented in reports prepared by each Environmental Change project partner. The analysis of the national solutions presented here made it possible within the Environmental Change Project to identify the possibility of including informal sectoral qualifications in National Qualification Framework (NQF)-based systems in each country. It also made it possible to compare the European Qualification Framework (EQF) with the various NQFs of the project partners. Even though the experiences of each country are quite different, the short reports refer to the same set of themes by using the same structure, as follows:

Chapter 1. National Qualifications Framework – Specific requirements.
Chapter 2. Links between the National Qualification Framework and the European Qualification Framework.
Chapter 3. Procedures of the Including Qualifications in the National Qualification Framework.

The main catalyst for the development of a comprehensive NQF in Europe, was the EQF (EQF). Moreover, the development of the NQF in Europe also reflects the Bologna Process and the agreement to implement the Qualifications Framework in the European Higher Education Area (EHEA). All the partner countries have joined the Bologna Process. In the course of implementing the Bologna Process, all the partner countries have developed NQFs compatible with the EQF, which provide essential information on qualifications undergoing recognition.

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1. National Qualifications Framework – Specific requirements

The National Qualifications Framework (NQF) is a description of the interrelationship between qualifications, integrating various national qualifications subsystems, serving greater transparency, availability and quality of qualifications, created for the needs of the labour market and civil society. The NQF makes it possible to relate national qualifications to the levels of the European Qualifications Framework (EQF) and through the EQF to the levels of qualifications in individual EU countries. In each project partner country, the NQF is as follows:

Poland

The Polish Qualifications Framework (PQF) is the frame of reference for qualifications awarded in Poland. There are 8 levels in PQF. Each is described by general characteristics of the scope and complexity of the knowledge, skills and social competences required of people with a given level of qualification. PQF considers the characteristics typical of qualifications awarded in general and vocational education and in higher education.

PQF:

- are created for the needs of the labour market and civil society,
- integrate various national qualifications subsystems,
- serve to increase the transparency, availability and quality of the acquired qualifications,
- make it possible to compare and confirm the acquired qualifications throughout Europe,
- contain a description of the hierarchical system of levels of qualifications - each qualification is placed on one of these levels, and each national level is assigned a corresponding level in the EQF[1]

The most important assumptions of the NQF:

- The learning process is separated from the certification process - different institutions teach and test knowledge, as it is now with external examinations at the end of primary, secondary and upper secondary schools.
- One qualification is validated only once, in a way that would be recognized by all employers - a chance to put an end to the practice of

[1] https://www.biurokarier.umk.pl/krajowe-ramy-kwalifikacji

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certain environments that require an additional examination to admit a graduate of higher education to their group.

Portugal

The comprehensive Portuguese Qualifications Framework (Quadro Nacional de Qualificações - QNQ) is a single reference for classifying all qualifications in the Portuguese education and training system. Portugal referenced its national qualifications levels to the EQF and self-certified to the qualifications framework of the European Higher Education Area (QFEHEA) in 2011. In 2017, a national credit system for vocational education and training was created, aligned with ECVET principles. This enables allocation of credit points to qualifications at NQF level 2, 4 and 5, included in the national qualifications catalogue, and to quality-assured and certified training.
The design of qualifications in terms of learning outcomes also enabled the creation of the National credit system for vocational education and training, aligned with ECVET principles and aimed at increasing permeability between VET pathways and higher education.
The Portuguese NQF includes eight levels with descriptors defined in terms of learning outcomes: knowledge, skills and attitudes. The learning outcomes approach plays an important role in reforming Portuguese education and training and was an underlying principle in the development of the national qualifications catalogue.

Spain

The Spanish Qualification Framework is a national qualifications framework (degrees, diplomas and certificates) that includes lifelong learning. It is a structure that organises qualifications according to levels and comprises the most basic to the most complex learning. It, therefore, covers general and adult education, vocational education and training, as well as higher education. It also includes qualifications obtained outside the education system through in-service training, work activity, collaboration with NGOs, etc.
The Spanish Qualification Framework aims to correlate and coordinate the different subsystems of education and training, including the qualifications obtained in compulsory, post-secondary and higher education, and integrate non-formal and informal learning validation.
The main objectives of the Spanish Qualification Framework are:

- Make qualifications more understandable by describing them in terms of learning outcomes.

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- 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 for 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.

The proposed framework has eight levels and the level descriptors, defined in terms of knowledge, skills and competencies. It is inspired by the EQF for Lifelong Learning level descriptors adapted to the national context.

Slovenia

The Slovenian Qualifications Framework Act, adopted in 2015, stipulates that the Slovenian Qualifications Framework (SQF) is a tool for the development and classification of qualifications into a unified system. The SQF includes three categories of qualifications:

- Educational qualifications: the result of formal education and indicates the level and field of formal education acquired by the individual. It is evidenced by a public certificate of completed education.
- Vocational qualification: qualification obtained through the national vocational qualification (NVQ) procedure, vocational and professional training and further training programs and further study programs;
- Supplementary qualification: additional competences tied to the needs of the labor market on levels 3 to 8.

The purpose of the SQF is to achieve transparency and comparability of qualifications in Slovenia and the EU. Its basic goals are support lifelong learning, connect and harmonize Slovenian qualifications subsystems and improve the transparency, accessibility and quality of qualifications in relation to the labor market and civil society.

Greece

The aim of the Hellenic Qualifications Framework (HQF) is to create a coherent and comprehensive system of classification of all qualifications obtained from formal, non-formal education and informal learning in Greece. This will be done

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gradually. In this first phase, the objective is the classification of qualifications within the formal educational system of the country. At a later stage a classification system will be developed for qualifications acquired through non-formal education and informal learning. The HQF is a mechanism, which facilitates transparency and comparability in the Greek context. It will be a benefit for students, graduates and stakeholders of the Greek labour market. On the other hand, in accordance with the common European strategy "Europe 2020", which aims at smart, sustainable and inclusive growth the Hellenic Qualifications Framework and its referencing to the EQF provides a tool for "translating" and comparing qualifications and aims at becoming an opportunity to help promote the mobility of learners and employees.

Summary

The National Qualifications Framework (NQF) is a description of the interdependence between qualifications, integrating the various national qualifications subsystems, serving greater transparency, availability and quality of qualifications, designed for the needs of the labor market and civil society. The National Qualifications Framework enables the linking of national qualifications with the levels of the European Qualifications Framework (EQF) and, through the EQF, with the levels of qualifications in individual EU countries. The Polish Qualifications Framework (PQF) is the frame of reference for qualifications awarded in Poland. There are 8 levels in PQF. Each is described by a general description of the scope and complexity of the required knowledge, skills and social competences of people with a given level of qualification. PQF takes into account the characteristics of qualifications awarded in general and vocational education and in higher education.
The Portuguese Qualifications Framework is a single source that classifies all qualifications in the Portuguese education and training system. The Portuguese NQF covers eight levels with descriptors defined in terms of learning outcomes: knowledge, skills and attitudes. Playing with the Learning Outcomes Approach has played an important role in reforming Portuguese education and training and has been a guiding principle in the development of the National Qualifications Catalog.
The Spanish qualifications framework (degrees, diplomas and certificates) covers lifelong learning. It is a structure that organizes qualifications by level and covers learning from the most basic to the most complex. It therefore covers general and adult education, vocational education and training, and higher education. It also includes qualifications acquired outside the education system

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through professional development, professional activity, cooperation with non-governmental organizations, etc.

The Slovenian Qualifications Framework (SQF) is a tool for developing and classifying qualifications into a single system. SQF includes three categories of qualifications: educational, professional and supplementary, defined according to national standards.

In Greece, the National Qualifications Framework system is under development. The aim of the Greek Qualifications Framework (HQF) is to create a coherent and comprehensive classification system for all qualifications acquired through formal, non-formal and informal education in the country.

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2. Links between the National Qualification Framework and the European Qualification Framework

The European Qualifications Framework (EQF) is a scoreboard for all types of qualifications that is used to compare the levels of qualifications across different education systems.
All qualifications awarded in Europe refer to the level of the NQF and, through them, to the EQF. This international frame of reference is entirely based on learning outcomes - there are no important factors characterizing local education systems, e.g., the number of years of primary school education.
For this reason, each country develops its own NQF model and then refers to the EQF in the so-called reference report. Each country is responsible for its education system, its assessment of qualifications, and therefore also for how practice will verify the value that will be assigned to its qualifications.[2]

Poland

The Polish Qualifications Framework (PQF), like the EQF, consists of eight qualification levels. Each PQF level is described with the use of descriptors. The descriptors in the PQF capture the full spectrum of learning outcomes. They reflect progress from the lowest to the highest level achieved by the learner. The PQF descriptors show how the following abilities advance at successive levels through learning in different contexts and stages of life:

- knowledge (e.g., depth, scope),
- skills (including problem-solving, the innovative application of knowledge in practice, learning and communication),
- social competence (e.g., readiness to work with others, to assume responsibility for assigned tasks).

A unique Polish solution is to distinguish two stages of descriptors in the PQF levels:

- first stage generic (universal) descriptors – these relate to all sectors of education,
- second stage generic descriptors – these detail the first stage generic descriptors.

The PQF can also have third stage generic descriptors. These descriptors already function in fields of learning in higher education. They are also used to describe specific fields of activities (sectors) – known as "sectoral qualifications frameworks". The purpose of the sectoral qualifications frameworks (SQFs),

[2] https://prk.men.gov.pl/europejska-rama-kwalifikacji-erk-2/

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which can be referenced to the PQF, is to organise the qualifications and competences of a given industry, thus enabling a better understanding and comparability of its qualifications and creating better conditions for occupational mobility, both locally and internationally. They also provide both employers and employees with an intentional and individualized approach to career development.

EQF levels	PQF levels	
1	1	General elementary education
2	2	General post-elementary education
3	3	Lower vocational education
4	4	General secondary education
5	5	"Empty level" – debate on the full qualification of the level continued
6	6	Higher education: BA, engineer
7	7	Higher education: MA, post diploma non-degree programmes
8	8	Higher education: PhD

Graph 1: Structure of the PQF compared to the EQF. Source: Krajowe Ramy Kwalifikacji

Portugal

Portugal took the decision to adopt the eight EQF levels and the EQF level descriptors in setting up the comprehensive NQF. Aiming to integrate and coordinate qualifications from all education and training subsystems into a single framework, to aid the recognition of non-formal and informal learning, to improve transparency and comparability of qualifications and to facilitate double certification, the NQF is believed to have reduced barriers between the different subsystems.

Qualification Type	QNQ LEVEL	EQF LEVEL
Second cycle of basic education	1	1
Third cycle of basic education Third cycle of basic education and professional certification	2	2
Secondary education to proceed to higher education studies	3	3
Secondary education and professional certification Secondary education and professional internship; minimum six months	4	4

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Post-secondary qualification, with credits to proceed to higher educations studies	5	5
Bachelor's degree	6	6
Master's degree	7	7
Doctorates Degree	8	8

Graph 2: Structure of the Portugal Qualification Framwork compared to the EQF. Source: https://angep.gov.pt/np4/file/312/QNQ_GuiaInterpretativoQNQ_2014.pdf

Spain

The correlation of the Spanish model with the EQF is made from the Spanish Qualifications Framework (Marco Español de Cualificaciones - MECU), which includes qualifications obtained in compulsory, post-secondary and higher education, and will integrate validation of non-formal and informal learning processes. The MECU is therefore the product of the sum of the National Catalogue of Professional Qualifications (CNCP) and the Spanish Framework of Qualifications for Higher Education (MECES).

These specifications are superimposed on level 3 of the CNCP, which would correspond to level 1 of the MECES and level 5 of the EQF, establishing as higher education the corresponding to the title of Higher Vocational Training Technician (Table 1).

The higher four level of MECU will be linked to the qualification's framework of higher education (Marco Español de Cualificaciones para la Educación Superior- MECES).

This framework has been self-certified against the framework for qualifications of the European Higher Education Area as part of Spain's continuing commitment to the Bologna process. The self-certification followed the procedures and criteria set down for such work within the Bologna process and involved a committee of senior Spanish and international experts and stakeholders.

<table>
<tr><th colspan="1">EQF</th><th colspan="2">MECES</th><th colspan="2">CNCP</th></tr>
<tr><td>Level</td><td>Level</td><td>Current qualifications</td><td>Level</td><td>Current qualifications</td></tr>
<tr><td>1</td><td rowspan="4" colspan="2"></td><td rowspan="2">1</td><td rowspan="2">Operators</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td><td rowspan="2">2</td><td rowspan="2">Middle-level technician</td></tr>
<tr><td>4</td></tr>
</table>

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5	1	- Higher Technician of VET - Superior Technician of Plastic Arts - Superior Sports technician	3	High-level technician
6	2	- Graduate Degree - Higher Artistic Education Diploma Degree	4	Degree
7	3	- University Master's degree - Bachelor's degree in 300 ECTS (60 with Master level) - Master's Degree in Artistic Education	5	Master
8	4	Doctor	6	Doctor

Graph 3. Spanish NQF compared to the EQF. Source: Galindo-Rueda, F.J., et. al. 2002

For the effective correlation between the national framework and the EQF, references must be established in the different domains of responsibility, coordination, legal administrative, methodological and quality assurance.

Slovenia

SQF encompasses 10 levels, which correspond to EQF 8 levels. Comparison between the SQF and EQF can be seen on the figure below. The main difference is the:

- level 4 of EQF, which includes level 4 and 5 of SQF and
- level 8 of EQF, which includes level 9 and 10 of SQF.

Level 5 of SQF, which corresponds to level 4 of EQF, is presented in more detail below (SQF, 2022 a):

- Knowledge (result of learning and the assimilation of concepts, principles, theories and practices)
- Skills (cognitive like logical, intuitive, creative; practical like manual, use of materials, tools, instruments)
- Competences (ability to use and integrate knowledge, skills in educational, professional, personal situations).

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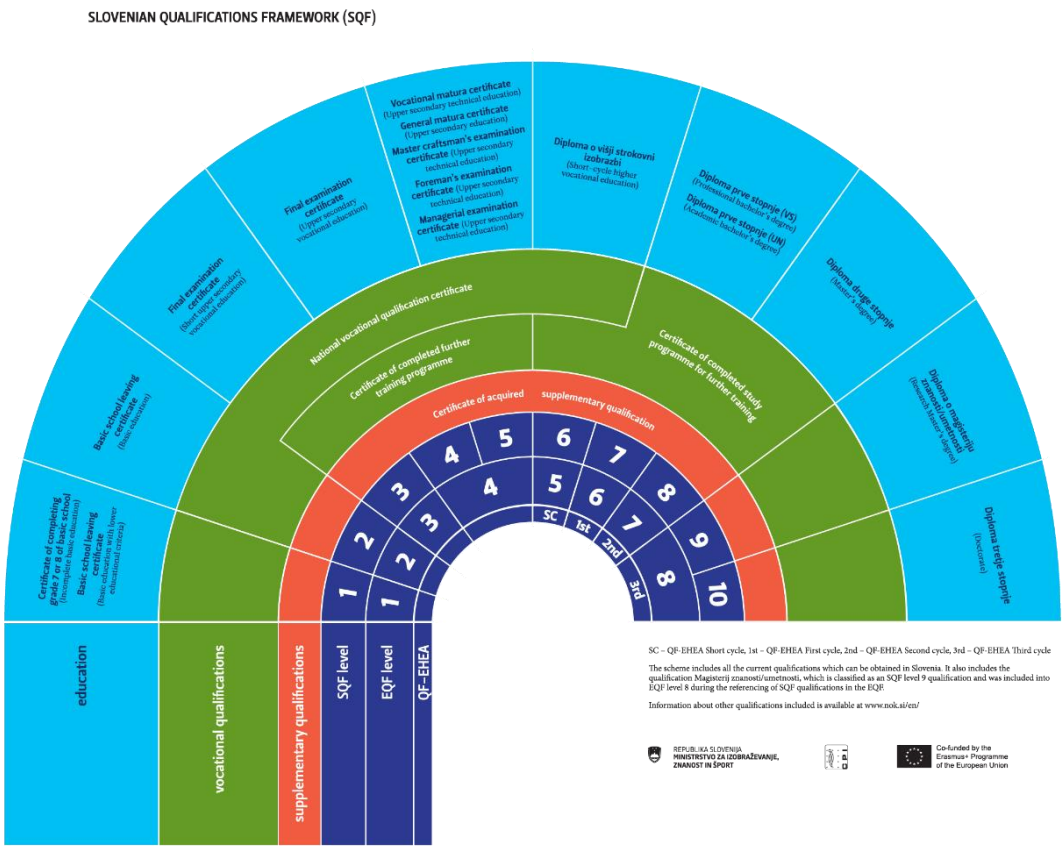

Graph 4. Comparison between SQF and EQF. Source: SQF, 2022 a

Greece

There is a clear and demonstrable link between the qualifications levels in the national qualifications framework or system and the level descriptors of the EQF. The link between the qualifications levels of the Hellenic Qualifications Framework (HQF) and the level descriptors of the EQF derives in the first instance from the use of the EQF descriptors as guidelines for the development of the HQF levels. The primary function of the HQF is to be an instrument for referencing to the EQF, and the HQF development process had, from the outset, the objective of developing a structure of eight levels corresponding to the levels of the EQF. The EQF descriptors were modified and elaborated to adapt them to the particular context of the Greek qualifications system, but the overall correspondence of the levels in the two frameworks is close. This can be demonstrated by a comparison of

- the structures of the two frameworks.
- the conceptual basis of the two frameworks.

• the HQF level descriptors and EQF level descriptors.

LEVELS OF NATIONAL & EUROPEAN QUALIFICATIONS FRAMEWORK	VOCATIONAL EDUCATION AND TRAINING	GENERAL EDUCATION	HIGHER EDUCATION
1		PRIMARY SCHOOL CERTIFICATE	
2		LOWER SECONDARY SCHOOL CERTIFICATE	
3	VOCATIONAL TRAINING SCHOOL (SEK) 'DEGREE' (***) *VOCATIONAL TRAINING INSTITUTE (IEK) CERTIFICATE		
4	VOCATIONAL SCHOOL (EPAS) CERTIFICATE VOCATIONAL UPPER SECONDARY SCHOOL (EPAL) CERTIFICATE VOCATIONAL UPPER SECONDARY SCHOOL (EPAL) 'DEGREE' (***)	GENERAL UPPER SECONDARY SCHOOL CERTIFICATE	
5	OCATIONAL POST-SECONDARY SCHOOL 'DEGREE' (***) VOCATIONAL TRAINING DIPLOMA **VOCATIONAL TRAINING DIPLOMA (IEK) POST-SECONDARY AND NOT HIGHER EDUCATION DIPLOMA or 'DEGREE' (***)		
6			BACHELOR DEGREE
7			MASTER'S DEGREE
8			DOCTORATE

Source: EOPPEP www.eoppep.gr.

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Having undertaken a comparative analysis on the basis of these three factors, it can be concluded that the HQF levels and the EQF levels are the same in Greece. It is now well established that this concept is in harmony with the general approach of the EQF and, indeed, is widely considered to be an effective vehicle for the transparent inclusion of qualifications in the HQF.

Summary

The European Qualifications Framework (EQF) is a scoreboard for all types of qualifications that is used to compare qualification levels across different education systems. All qualifications awarded in Europe relate to the NQF level and through them to the EQF. Within the European Union, each country develops its own NQF model, and then refers to the EQF in the so-called a reference report, thanks to which each country is responsible for its education system, assessment of qualifications, and therefore also for how the practice will verify the value that will be assigned to its qualifications. Poland and the Slovenian Qualifications Framework, like the European Qualifications Framework (EQF), consists of eight levels of qualifications and each NQF level is described by descriptors. In order to ensure an effective correlation between the national framework and the European Qualifications Framework, references should be made in the various areas of responsibility, coordination, legal / administrative, methodological and quality assurance. In Greece, the relationship between the qualification levels of the Greek Qualifications Framework (NQF) and the level descriptors of the European Qualifications Framework (EQF) is derived primarily from the use of EQF descriptors as a guide for the development of Greek NQF levels.

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3. Procedure for Including Qualifications in the National Qualification Framework

Each Environmental Change project partner country has a different procedure for including qualifications in the National Qualifications Framework (NQF). Despite having all the NQF based on the EQF, there is a different expansion and addition of new qualifications. It follows from the experiences of individual countries, history, standards and regulations. Some countries, such as Spain, for example, have not yet completed the process of unifying the qualifications framework. The following describes how the inclusion process works in each partner country:

Poland

A qualification may be included in the Integrated Qualifications System (IQS) at the request of entities that conduct organized activity in the area of: economy, labour market, education or training. It can be, for example, a trading company, an organization of entrepreneurs from a given industry, an association of producers, a sports association or an association of training companies.

The electronic application is submitted via the Integrated Qualifications Register (IQR) at the following website: http://rejestr.kwalifikacje.gov.pl/.

This publicly available Register includes all qualifications in the IQS – those awarded in the formal general, vocational and higher education systems, regulated qualifications and market qualifications. An application should contain a detailed description of the qualification, i.e., learning outcomes that the person who wants to obtain the qualification should have and conditions that should be met by the entity wishing to award it. It contains a justification why the qualification is needed, a description of the need for it and the possibility of its use.

The minister will check that the qualification is of the right quality and if it is needed, afterwards including it in the IQS and entering it into the IQR with a defined PQF level. [3] Qualifications included in the IQS are entered in the IQR regardless of whether they appear in other registers (catalogues, lists) maintained by individual ministries, industries, communities and institutions. Qualifications that are not included in the IQS cannot be entered in the Register. Information on the listed qualifications is regularly updated.

[3] https://kwalifikacje.edu.pl/baza-wiedzy/dzialaj-w-zsk/wlaczanie-kwalifikacji/

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Portugal

The CNQ qualifications are structured by certification level and training areas. In October 2020, the CNQ included 390 qualifications in 47 areas of education and training with 7 427 training units of short duration.
Each qualification standard is composed of:

a) a professional profile, including the work tasks linked to the qualifications and the necessary knowledge and skills to perform them.
b) a training framework, defining the content and the competences that a learner should acquire to get the double (education and professional) certification.
   The framework consists of a basic training component (school-based) and a technological training component structured in autonomously certifiable units of 25- to 50-hours duration, promoting flexibility and permeability among different qualifications in the same education and training field;
c) a framework for RVCC, fostering the recognition of prior formal or informal learning, easing the acquisition of an education certificate and/or a vocational qualification.

The Sectorial Councils for Qualification (CSQ) are consultative bodies created within the SNQ framework, supporting ANQEP in updating the CNQ. They have as main task the identification of strategic and essential skills and competences for the different sectors of the economy in response to labour market needs. They also ensure the active and regular participation of relevant stakeholders by including representatives of ministries, social partners, enterprise representatives and training providers. The CSQ responsibilities are to:

- identify the developments in their sector and skill needs;
- suggest specific updates for the CNQ;
- analyse and advise on proposals for updating and revising CNQ received from third parties;
- support the design of qualifications;
- ease cooperation among the different stakeholders of each economic sector.

Spain

Spain does not have a comprehensive national strategy for validation due to the different laws frame validation and the targeting different education sectors. Spain has started to develop the Spanish Qualification Framework for

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Lifelong Learning (Marco Español de Cualificaciones, MECU). However, framework development is not concluded at the moment, and MECU is not yet operational.

The future framework aims to include, in a first stage, all diplomas and certificates from the education system, while remaining open for inclusion of official qualifications issued by other administrative sectors. The Ministry of Education, Culture and Sport is working on aligning qualifications in the education system to the EQF levels, in according with the EQF recommendation.

The validation process in Spain for non-formal and informal learning in view of achieving a qualification typically will follow these phases:

- Identification of knowledge, skills and competences developed during voluntary activities, in a family or work environment or during leisure.
- Documentation of these learning outcomes through the collection of evidence such as descriptions of previous working activities, development of a portfolio or assessment.
- Validation of these learning outcomes against standards, referential or list of expected learning outcomes.
- Award of a qualification or part of a qualification (recognition of learning outcomes).
- Final validation of an educational institution by the Signature of a Memorandum of Understanding with the Course's author (in this case Environmental Change Consortium) for the validation of the course's credits.

Slovenia

One option which bypasses the formal education qualifications is a special form of non-formal education called National Vocational Qualifications (NVQ), which is managed by the CPI under the National Professional Qualifications Act. NVQ provide formal certification of non-formal skills acquired for the specific profession. In the process, the candidate prepares a portfolio which, together with an exam, demonstrates the candidate's knowledge and skills in a particular field. This form of non-formal education is particularly suitable for those older than 18 years who wish to have a publicly valid certificate for a profession without formal education. Since 2000, almost 85,000 such certificates have been awarded in Slovenia. However, programs for individual expert fields are implemented at formal institutions, which need to apply for accreditation. Examples include primary and secondary schools, higher education institutions, adult education centers, third-life universities, employment services, training centers at companies, private institutions and private non-profit institutions,

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chambers, societies, associations of societies, libraries, museums, galleries and driving schools.
Another option not including formal education is a Supplementary Qualification, which supplements individual's competences at the level attained in a specific professional field. Application for the inclusion of a supplementary qualification in the SQF may be submitted by an employer, a group of employers or by the Employment Service of Slovenia. The application form for the inclusion of a supplementary qualification in the SQF consists of six sections: 1. basic details of the qualification, 2. standard of the supplementary qualification, 3. the training program, 4. quality assurance, 5. needs in the labor market, and 6. references of the proposer.

Greece

The development of the HQF and its introduction into the qualifications system in Greece require that a range of organizations collaborate and interact. EOPPEP is the body responsible for the design and development of the HQF. It is also the body that represents Greece as the national coordination point for EQF and is responsible for undertaking the referencing of the HQF to the EQF. The design of the architecture of the HQF and the development of the framework levels was led by EOPPEP, in consultation with a wide range of stakeholders. The development of specifications for Qualification Types is the joint responsibility of EOPPEP and the relevant awarding bodies. The task of identifying and describing the learning outcomes for specific qualifications of each type will be the responsibility of the relevant awarding bodies – in some cases, with the support of education providers.
EOPPEP has established the Greek Qualifications Register online: http://proson.eoppep.gr under its responsibility for the creation and development of the Hellenic Qualifications Framework and its referencing to the EQF and under the supervision and coordination of the Ministry of Education, Research and Religious Affairs. It comprises the qualifications classified in the HQF and referenced to the EQF, coupled with information based on a unified description standard suggested by the European Commission, in order to allow for uniformity in the structure of information concerning qualifications among European countries. The Qualifications Register was linked to the European Portal "Learning Opportunities and Qualifications in Europe" (http://ec.europa.eu/ploteus) in the section of "Qualifications". Clearly it is an application with the dynamics of constant updating and content enrichment. 674 qualifications are already included in the Register sent by the respective educational institutions and these are available on the website http://ec.europa.eu/ploteus/en/search/site.

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Currently, EOPPEP is in the process of constant updating of the Register the types represent groups of qualifications that are well-known in the Greek society. They reflect the state of play within the labour market. Together with the levels, Qualification Types constitute a particularly flexible mechanism for the recognition/referencing of any learning achievement and will also facilitate decisively one of the basic principles of the Framework, the ability of learners to access, transfer and progress within the system. The identification of Qualification Types required, and the development of Type Specifications, was undertaken with the support of working groups appointed by the relevant awarding bodies Methodology for the classification of Qualification Types to Levels in the HQF The classification of Greek qualification types to the HQF levels involved two related processes:

- the identification of an appropriate range of types; and
- the development of specifications for each type and the testing of each type to ensure its location at the correct level of the HQF.

Summary

Each country involved in the project implementation has different requirements for the procedure of including qualifications into the National Qualifications Framework. This is due to the different experiences of individual countries, their history, standards and regulations. Some countries, such as Spain, have not yet completed the process of harmonizing the qualifications framework in their area. In Poland the qualification may be included in the Integrated Qualifications System (ZSK) at the request of entities conducting organized activity in the area of: economy, labor market, education or training. In Portugal, Qualifications are organized by certification level and training area, and in Slovenia, one option that omits formal educational qualifications is a special form of non-formal education called National Vocational Qualifications (NVQ), which is governed by the National Vocational Qualifications Act. The creation of the Greek framework system and its introduction into the qualifications system in Greece requires the strong collaboration and interaction of many organizations.

In order to effectively include qualifications in the National Qualifications Framework, each partner must focus on the necessary activities and procedures in his country to enable it. Due to the lack of full uniformity and compatibility, it is impossible to create a single solution enabling qualifications to be included in the National Qualifications Framework in each partner country.

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III. ESCO

ESCO (European Skills, Competences, Qualifications and Occupations) is the European multilingual classification of Skills, Competences and Occupations.

ESCO works as a dictionary, describing, identifying and classifying professional occupations and skills relevant for the EU labour market and education and training. Those concepts and the relationships between them can be understood by electronic systems, which allows different online platforms to use ESCO for services like matching jobseekers to jobs on the basis of their skills, suggesting trainings to people who want to reskill or upskill etc.

ESCO provides descriptions of 2942 occupations and 13.485 skills linked to these occupations, translated into 27 languages (all official EU languages plus Icelandic, Norwegian and Arabic).

The aim of ESCO is to support job mobility across Europe and therefore a more integrated and efficient labour market, by offering a "common language" on occupations and skills that can be used by different stakeholders on employment and education and training topics.

ESCO is a European Commission project, run by Directorate General Employment, Social Affairs and Inclusion (DG EMPL). It is available in an online portal and can be consulted free of charge. Its first full version (ESCO v1) was published on the 28th of July 2017. The latest version of the classification can be downloaded or retrieved through the ESCO API.

At the moment, looking at the ESCO Database, there is not a specific VET providers specialized in the development, implementation and Validation of concept circular economy for start-uppers, in spite of the fact that it is an occupational profile that companies need to successfully implement these concept in an integrated manner. The qualifications currently available relates only to the contents and requirements of the norms.

The Environmental change project introduces a modular competency-based framework enhanced by subsets of defined learning outcomes. The learning outcomes have been formulated after analyzing the data available on the ESCO platform (Commission, n.d.). It is based on the EQF and ECVET framework, considering the National Qualifications Framework. In terms of EQF, the project

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included learning outcomes divided by knowledge, skills and competences for EQF level 5. As for ECVET, the project covers 25 hours for each training module.

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