Erasmus+ KA2 Knowledge Alliances project

"Greening Energy Market and Finance – GrEnFIn"

AGREEMENT NUMBER: 612408
PROJECT NUMBER: 612408 – EPP-1-2019-1-EPPKA2-KA

WP6 – D6.3 Report on the Preliminary definition of the new educational methodologies to implement for the professional module

With the support of the Erasmus+ Programme of the European Union

Work Package (WP)	WP6 – Analysis and Draft of the Professional Module
WP Leader	HERA
Deliverable Title and Number	D6.3 – Report on the Preliminary definition of the new educational methodologies to implement for the professional module
Release date	MAY 2022
Version	Final
Dissemination Level	Public
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Revised and Approved by	All Partners

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0. INTRODUCTION

Starting from the results of the stakeholders' survey, the design of the professional module, in term of contents and methodologies, represents the outcome of discussions and dialogues among the partners of the Consortium and stakeholders. As a matter of fact, during 2020 the Consortium submitted a Consultation survey in order to explore the needs of the labor market and to identify the relevant competences requested for the professional figure in the energy and sustainability field. At the end of 2021 and early 2022 some brainstorming activities and events also had been implemented in order to validate the most suitable and effective methodology for the professional module. The entire design of the professional module had, therefore, to take into account all the suggestions collected by the Consortium and the interested stakeholders; among these suggestions there is certainly the need to develop a training course able to meet the needs of the Professional market, taking into account the requested skills for the professional figure of "***Sustainable Energy Expert***", which certainly include the technical ones, but at the same time the transversal and entrepreneurial, always more relevant in the actual work context. The purpose of this report is to show, based on the findings collected, how the implemented professional module responds to the emerged energy sector needs.

1. NEW EDUCATIONAL METHODOLOGIES:

1.1 The learning specificities of the professional module

As extensively described in the "*D6.1 – Report on the Preliminary definition of learning outputs of the professional module*", the starting points to identify the competences required to the profile of "***Sustainable Energy Expert***", that the GrEnFIn project aims to create, was the stakeholder consultation submitted in 2020. In terms of professional module development, the consultation's findings emphasize the complex, integrated and systemic nature of the core skills required, balancing hard (quantitative) and soft (more qualitative) scientific knowledge, paired with a lesser academic, more operational orientation. In addition, the uncertain, transformative and complex environment where we live today, demands a specific attention to a wider and more integrated trans disciplinary approach, focused on problem setting, problem solving and decision making.

Based on these premises, from the consultation survey an awareness among all respondents, it has emerged about the existing gap between Industry and Academia, which the GrEnFIn project aims to bridge. This gap concerns soft, transversal and managerial skills but above all the technical skills as the figure below, summarizing the deliverable D2.3 (Report on the consultation-Survey's Report), shows:

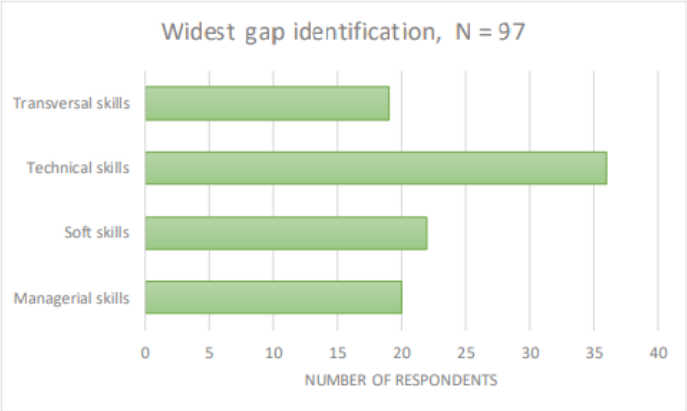

Figure 1 – Widest Gap

As far as hard skills, the results show that the most required skills on these issues from the labour market are Economics, Sustainability and Environmental Science.

Moreover, in order to complete the professional profile of the ***Sustainable Energy Expert***, the survey's results highlighted also a strong importance of soft skills. As a matter of fact, the figure below shows the soft skills needed to address the market demand: the most important ones are related to Problem-solving, Responsibility and Team Working.

Skill	Financials	Producers	Industrials	Policymakers	Overall	1	2	3	4	5
Problem-Solving	4.11	4.18	3.92	4.27	4.18	8%	1%	9%	30%	**52%**
Responsibility	3.93	3.89	3.54	4.31	4.03	9%	1%	11%	**37%**	**42%**
Team Working	3.82	3.87	3.58	4.26	3.99	8%	2%	18%	28%	**44%**
Communication	3.86	4.11	3.25	3.96	3.91	10%	1%	15%	**37%**	**37%**
Creativity	3.71	3.90	3.42	3.80	3.77	9%	**4%**	**21%**	33%	33%
Work Ethics	3.89	3.58	3.33	4.00	3.77	**12%**	2%	**21%**	28%	**37%**
Flexibility	3.50	3.89	3.58	3.79	3.75	8%	**4%**	**20%**	**41%**	27%
Adaptability	3.54	3.69	3.38	3.85	3.70	**11%**	**3%**	**21%**	**35%**	30%
Time Management	3.50	3.52	3.21	3.82	3.61	**12%**	**3%**	**25%**	32%	28%
Leadership	3.39	3.50	3.08	3.58	3.47	**10%**	**9%**	**27%**	32%	22%

Figure 2 – Soft Skills Relevance

On one side, following the findings of the Stakeholder survey, the core skills exhibit a complex and systemic nature, coherently with the paradigm-shift required. As detailed in the Report, sustainability requires to integrate many fields of knowledge, as:

- general economic, statistical and mathematical modelling, finance, energy market's structure and trends;
- technological innovation in the energy production, storage, use;
- environmental sciences and climate changes;
- circular economy and digital transformation.

Their integration, in turn, require a core-set of entrepreneurial and transversal skills, among them Risk evaluation and Strategic Decision Making; Sustainable development; Complexity and interdependency thinking. All that raises the cognitive costs of learning.

On the other side, the professionals involved in the energy sector, potentially interested in the module, show a various background, in terms of formal learning (i.e. type of degree) and personal experience. The recent history of the sector, their own structure (i.e small vs large firms; processual vs functional organizations; aims and role differences between energy providers, private companies, etc.), the impacts of the different national policies in the sustainable energy field and the innovations under way result in a wide range of professional backgrounds and competencies already in existence, as well as in a potentially various kinds of learning needs. In learning terms, the variety might determine the risk of redundancy of the training offer (teaching knowledge and competencies also acquired by the professional via non-formal learning), demanding a "customizable" approach, respectful of these differences.

Teaching and learning the technical, behavioural and meta-cognitive skills require a specific educational approach, aimed at reducing the cognitive costs, enact and promote the mindset change, favour the recognition of the individual prior learning, and – last but not least – cope with the presumably lack of time of the potential recipients.

1.2 The key findings from validation activities

As anticipated in the introduction, between the end of 2021 and early 2022 some Partners of the Consortium implemented validation activities where they submitted to participants a validation questionnaire, developed by each Partner with the support of the rest of the Consortium, in order to gather feedback about the professional module from the stakeholders.

Based on the local workshops organized on remote basis at the end of 2021 by the SMEs of the Consortium (in particular we refer to Speed Development Consultants SA, Delab and MIWenergia) the main results obtained demonstrate an overwhelming acceptance on the proposed learning path in term of methodology used.
Despite the low rate of attendance and the criticality concerning the missing filling in of the questionnaire during the event by all participants (for more details please refer to deliverable D2.4 Reports on the validation's activities M24 – M26), the answers received confirmed the preference for a blended training path, where section 1 and section 2 are online and section 3 is in presence; for that last section, the major of responses agree also with a duration of 2-3 days.

At the same time, in October and November 2021, another Partner of the Consortium, Tauron, developed an analysis to identify the market expectations regarding the competences requested for the ***Sustainable Energy Expert*** of the future. This analysis was developed in two phases: a first one in which meetings were organized with Tauron Group experts and representatives of the universities in order to answer to questions like: "*what competences does the transforming energy sector need*?"; a second one where the results of these meetings were used to prepare a survey addressed to employees of 14 Tauron Group companies. The survey results showed that among the competences required by the ***Sustainable Energy Expert*** there are certainly economic and law knowledge. Moreover, it is important to create specialist profiles of people for single fields and to acquire knowledge of modern technologies.

The most recent event is the Umbrella Organization Meeting organized on April 2022 by UNIBO at the headquarters of Prometeia, Italian firm leader in financial consulting, in Bologna. In this occasion, different kind of stakeholders potentially interested in the project have been involved, from students to companies, to collect their suggestions. At the end of the event, all the participants had the possibility to validate the project's contents by filling out a questionnaire and, after that, a restricted round table composed by 15 specific stakeholders was created to discuss the GrEnFIn findings.

The feedbacks collected during the round table and from the questionnaire are very satisfactory. Focusing on the results emerged for the professional module (for more details please refer to deliverable D2.4 – Reports on the validation's activities M30), all responses received from the questionnaire were overall positive in term of interest for the topics of the GrEnFIn's professional module, the methodology and the e-learning lectures available on the platform. In addition, during the round table, the comments that emerged were really positive: the main finding was that the proposed structure of the GrEnFIn Master reflects exactly the expectation of the market in matter of sustainability and management of the transition. In contrast, a point of attention that stakeholders highlighted was the level of perceived urgency in the offered education since the energy and sustainability topics are not always perceived relevant such as they actually are.

2. LOOKING AT THE PROFESSIONAL MODULE: FOR AN EDUCATIONAL APPROACH

2.2 The learning methodology proposed and adopted

2.2.1 Module design

In order to cope with the above-mentioned needs, the proposed design of the professional module, reflecting the findings collected, has been developed on the following five assumptions:

- ***Modularity***. The professional module is assumed as a coordinated system of Learning Outcomes, each one clearly identifiable and well related to a sustainability value driver;
- ***Scalability***. Each of the Learning Outcomes is defined as a minimum common transnational reference, able to assume more advanced features in each national/regional context, accordingly with the energy sector specificities
- ***Integrability and re-usability***. Each (or the majority) of the Learning Outcomes is defined in order to be readily usable, as a specific component, in educational/training courses already present.
- ***Digital interactions***. A prominent role to the interactions and sharing between the members of the professional community, via digital resources.
- ***Adoption of the European Framework applicable***. The professional competences and each of the Learning Outcomes are expressed referring to the Council Recommendation of 22 May 2017 on the European Qualifications Framework for lifelong learning (EQF); the Recommendation of the European Parliament and of the Council of 18 June 2009 on the establishment of a European Credit System for Vocational Education and Training (ECVET); the Council recommendation of 20 December 2012 on the validation of non-formal and informal learning.

The partner's consultation has seen a confirmation of the general proposition, with a specific emphasis on five points:

- Taking into account the previous learning of the recipients, in terms of credit self-recognition;
- Organizing the curriculum into several, small self-consistent thematic units, consistently with an individualised and self-paced fruition;
- Adopting a blended approach, mixing distance and on-site learning;
- Realizing a joint practical case study, seen as a compulsory terminal unit of the entire module;
- Adopting EQF and ECVET as a common referencing framework.

On these premises, the professional module has been designed following an ascending approach and a progression from individual to collective learning, moving:

- from a base (section 1) of 4 learning units addressed to introduce and reinforce the common ground of the "Green [R]evolution in the Energy Sector". These units, strongly recommended but not compulsory – neither in itself, nor in their order of fruition – are accessible without limits via a digital platform, on demand. Following a MOOC approach, each unit is composed by up to 5 video-lessons of a time length between 30 and 45 minutes, integrated where relevant with various knowledge resources. At the end of each learning unit, the user will have to perform a learning verification test and a satisfaction questionnaire; there is no threshold to pass the test, but our suggestion is to move to the next learning unit only if you have answered at least 60% of exact answers;
- through a middle block (section 2) specifically oriented to transfer operational skills and use of tools, composed by 3 learning units, each one composed by up to 5 video-lessons equally provided on a remote basis. Each video lesson lengths from 20 to 30 minutes, for a learning unit length between 60-120 minutes. The access to this block is allowed only for those who pass an entry test based on topics of section 1;
- to a final joint moment (section 3) where all the participants are divided in group to solve a common project work (for the Summer Training of 2021 the case study was about Biomethane Plant and Green Hydrogen), topping the entire professional module, consisting of a project work of 2-3 days to which professionals can participate by sending application.

2.2.2 Skills (Mis)match

In a context like the current one, characterised by uncertainty, complexity and continuous evolutions, in which the competences requested from the labour market often do not match those provided by education system, the aim of the professional module is to put in place a learning offer able to match the current demand of skills for professionals who are involved in the energy sector.

On these premises, the professional module design, led by Hera as WP6 leader with the support of the whole Consortium and approved firstly by the Consultation survey and then by the validation activities, is developed on three sections: the first two sections are composed by learning contents in video lesson format, accessible on remote basis, while section 3 represents the part more applicative, in which professionals are involved in the resolution of a case study, that for the Summer Training of 2021 was on Biomethane Plant and Green Hydrogen.

For each section, in the content design phase it was tried to follow up the needs that emerged from the Consultation survey, structuring the professional module in the more suitable way to respond to the skills demand requested by the labour market in the energy and sustainability field.

Learning contents of section 1 represent the first step of the learning path: for this reason, they are suitable to provide general and background information on issues like climate change and its risks, sustainable development, energy transition and energy efficiency. The aim of this section is to provide a common framework of knowledge; indeed, the potential participants in the professional module may have different backgrounds in terms of learning and experience and not have the same level of knowledge on these topics that are deemed useful to proceed to the next sections.

Following the other learning units of section 1, the topics of the video lessons become more technical, related to financial, sustainability and energy markets issues, up to the last learning unit of section 1 that is the one most linked to the case study on Biomethane plant and green hydrogen.

Section 2, realized by University Partners of the Consortium, represents the more academic section of the professional module, oriented to provide to professionals the fundamentals of the project evaluation, in economic and financial terms, the basics of the risk management and notions on the support schemes for green investments.

Last but not least, Section 3 meets a dual objective in terms of competences covered:

- on one hand, it is strictly related with technical skills covered by the case study;

- on other hand, it surely allows participants to develop those soft and transversal skills that emerged as relevant to the current labour market, like Problem-solving, Responsibility and Team Working.

For further details about structure and contents of the professional module, you can refer to the annex at the end of this report.

2.2.3 Learning environment

Following the methodological choices of the design, the more coherent and suitable learning approach has been identified in the dynamic integration between distance and in presence training, supported by a specific e-learning digital platform. This approach enables individual and collective, synchronous and asynchronous interactions, meeting both the individual and the cooperative learning requirements. In order to cope with the pandemic requirements, also the “in presence” learning has been designed to be realised, exceptionally, in distance mode, ensuring an adequate degree of interactivity. Therefore, the whole pilot version of the professional module, well known as “Summer Training”, has been performed on remote basis, exploiting the GrEnFIn-Hub Vplatform designed with Unibo and created by Pixel.

On this basis, as well described in the “*D6.2 – Descriptive document of the facilities and services to implement in GrEnFIn-Hub Vplatform*” – the e-learning platform that was implemented for the Summer Training of June 2021 is structured as follows:

- **Section 1**: *Understanding the Green (R)evolution*
  - divided into 4 learning units, composed by up to 5 video-lessons;
  - available on a remote and individual basis;
  - strongly recommended but not compulsory;

- available at least one month before the 2/3 days in presence regarding the Case Study of Section 3;

- **Section 2**: *Developing skills and tools to master the Green (R)evolution*
  - available only for those who: *i)* have passed the test of learning units in section 1 (at least 60% of exact answers) or *ii)* have passed the entry test of section 2, that is based on topics of section 1 (at least 6/10 correct answers);
  - divided into 4 learning units, composed by up to 2 video-lessons;
  - available on a remote and individual basis;
  - strongly recommended but not compulsory;
  - available some weeks before the 2/3 days in presence regarding the Case Study of Section 3;

- **Section 3**: Case Study *"A Biomethane Plant and Green Hydrogen"*
  - consists of a Case Study of 2-3 days in presence;
  - available via application;

In the figure below, we summarize all the choices above explained:

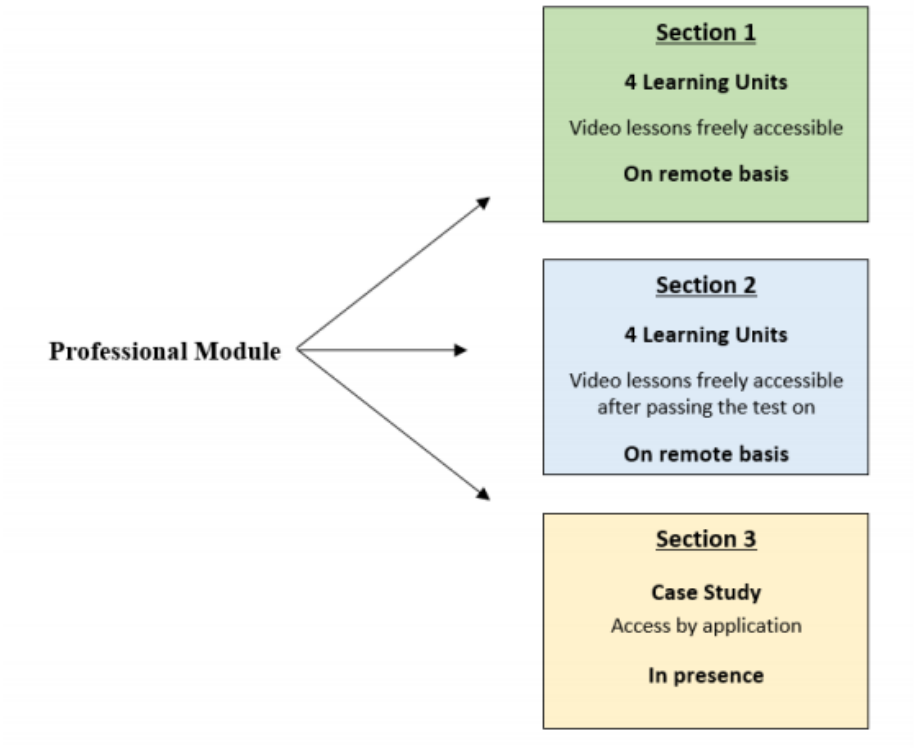

Figure 3 – The Structure of Professional Module

In order to access the learning contents, the users must, first of all, register themselves on the platform. For this purpose, the user had to enter some fields as his name, surname, email address, password and specify what type of user is (student, professional, lecturer). Then, he received an email to confirm and activate the account and credentials (username and password) to access the platform.

The simple registration on the platform is a necessary, but not sufficient condition to access to the contents of the professional module. Indeed, each user had to specifically ask the access to all the sections. In case of section 1 the access was automatic and does not require any authorization, but it only serves to give evidence of the number of people asking to access.

In order to complete each learning unit, each user must:

- Do the lessons;
- Perform the final test;
- Fill the satisfaction questionnaire.

For each of these points the user can see the progress at any time. The completion of each unit enables the user to download a certificate of attendance, reporting the highest score obtained at the final test. All the learning units and their contents remain available even after their completion.

Instead, as specified above, the access to section 3 is limited and subject to a selection: application procedure, target audience and selection criteria are explained from the beginning in the dedicated page of professional module. The aim is to create harmonious and heterogeneous class, with a specific attention to integrate diverse theoretical and practical skills, as well as cultural orientations, expression of the different and country-specific contexts.

As above anticipated, due to the pandemic situation of 2021, for Summer Training the section 3 was held remotely on Microsoft Teams and participants had to use the platform to consult the section dedicated to the Case study, i.e. the classroom, where they found the agenda of the 3 days, with appointments and links to connect to meetings online, and downloaded the useful materials made available for the development of the case study.

However, for the second and last one testing experience of the project, i.e. Full Immersion Experience, which took place in June 2022, it was possible to held section 3 in presence in Bertinoro (Emilia-Romagna) with the joint presence of students and professionals who worked together to resolve three case studies.

3. ANNEX

3.1 The overall structure of the professional module

SECTION 1 – UNDERSTANDING THE GREEN (R)EVOLUTION

Learning Unit 1.1 - "Greening Corporate Strategy"

1. The challenge of Climate Change and the need for a green corporate strategy

2. Applying the Sustainable Development Goals framework in a corporate strategy

3. Applying the climate change risk management in a corporate strategy

Learning Unit 1.2 - "Business opportunities and the EU Green Deal"

4. Next Generation EU as business opportunity: main issues, goals and projects of national Recovery Plan

5. Circular Economy: rethinking business models and value chains

6. Energy transition: the need to pursue both green power and low-carbon gases

7. Energy efficiency: the way forward on the consumers' side

Learning Unit 1.3 - "Financial tools in support of the Green (R)evolution"

8. The evolution of Green Finance: from the EU legislation to practice

9. Gas & Power Markets in EU: from commodity to flexibility

Learning Unit 1.4 - "A Green Infrastructure case study: clean gases"

10. Technological evolutions in the domain of clean gases

11. Setting-up a green infrastructure: Hera's biomethane plant

12. Operating and managing a biomethane plant

SECTION 2 – DEVELOPING SKILLS AND TOOLS TO MASTER THE GREEN (R)EVOLUTION

Learning Unit 2.1 - "Project evaluation: assessing economic and financial fundamentals"

Economic and financial evaluation of investments.

1. Net Present Value, Internal Rate of Return, Cost-Benefit Analysis, Business Planning

2. Cash Flow, debt and short-term equilibrium

Learning Unit 2.2 – "Risk-management tools for a full-blown representation of the project"

1. Valutation Hedging Investment Decisions
2. Energy Markets Risk Factors

Learning Unit 2.3 – "Support schemes for Green investments: a tool-kit economic review"

SECTION 3 - CASE STUDY "A BIOMETHANE PLANT AND GREEN HYDROGEN"

The energy transition to be effective requires not only renewable energy, typically produced by wind, solar, biomass and hydropower, but also transmission and storage systems, mainly because solar and wind are discontinuous sources. The solar energy is linked to the seasons (more in summer and less in winter) and to the day-night cycle while the wind energy is linked to the presence or less of winds.

To correlate these productions with energy consumption, electrical and thermal, we need a system that allows us to accumulate energy when it is produced, for instance in the warmer months for solar energy, and release le it when we need it most: hydrogen fulfils this function. A key feature of hydrogen is its ability to act as both a source of clean energy and an energy carrier for storage. Hydrogen, in fact, can be transported through existing gas pipelines, in mixture with natural gas and in perspective in dedicated gas pipelines, and it can offer a solution to store energy at a cost ten times lower than batteries (about 20 dollars per megawatt/hour versus 200 $/Mwh).

Currently, hydrogen is produced mainly from fossil methane and used as a raw material in the fertilizer industry and in fuel refining. In this case, the starting material from which hydrogen is obtained is methane (CH_4) through a specific treatment in which hydrogen atoms (H) are separated from carbon atoms (C). This separation process produces two types of emission: a hydrogen flux (also known as "gray hydrogen") and a carbon dioxide flux (CO_2) with climate altering effects. An alternative system to produce hydrogen in a sustainable and not climate altering way ("**green hydrogen**") is one that uses water (H_2O) and renewable electricity to separate hydrogen (H) from oxygen (O), without causing CO_2 emissions.

The purpose of this case study is to consider a third way of producing hydrogen using biomethane as raw material. Biomethane consists of methane atoms that were produced by bacteria through the digestion of biomass (for instance organic waste or agricultural and agro-industrial by-products) and that, due to their origin, do not produce climate altering effects. Also, in this case, when biomethane is used for combustion, CO_2 is produced but at the same time it is reabsorbed through the photosynthesis of biomass that allowed the production of biomethane itself.

On this hypothesis we can think of being able to produce hydrogen using as a raw material the biomethane and as a technology the one currently used to produce hydrogen from fossil methane, called **Steam Reforming**. Therefore, based on previous assumptions we ask you to:

1. Calculate the **carbon footprint** as kgCO2eq./kgH2 **of the three hydrogen production modes** described above. With regard to SMR, assume that about 60% of the emissions come from the carbon contained in the natural gas input used as feedstock, with the remaining 40% coming from the other stages of the process (combustion of fuel to provide energy and steam, power for separation and compression). Assume a Higher Heating Value (HHV) for hydrogen of 39,37 kWh/kg.

2. Calculate **the Capex** (Capital Expenditure) **and the Opex** (Operating Expenditure) for the realization of a plant suitable to treat the 100% of the biomethane produced at the plant of Sant'Agata Bolognese in Emilia-Romagna, Italy.
3. Define an **incentive to produce green hydrogen** necessary to ensure an IRR (internal rate of return) of the initiative exceeding 8%.

Greening Energy Market and Finance

With the support of the Erasmus+ Programme of the European Union