



*Erasmus+ KA2 Knowledge Alliances project*  
*“Greening Energy Market and Finance – GrEnFln”*

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**WP3\_D3.4 - Final Draft of the basic structure of the Learning Outcomes**





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## Executive Summary

This Deliverable exposes the final Structure of the Learning Outcomes in terms of Hard and Soft Skills provided by the courses that will be activated in the Educational Path for the GrEnFin Master. This Deliverable takes in consideration the Stakeholders consultations which have followed the last one in 2020. The Deliverable shows the current courses related to the competences that the students will acquire. This document also shows the different potential professional profiles the Course aims to educate.





## 1. Stakeholders Consultations

Given that the project aims to provide the job market with a new professional figure it was pivotal to assess the opinion and the demand of the stakeholder in the design of the GrEnFin Master.

With regard to the documentation and the research of the sector, the need for Sustainable Energy Experts was apparent in a series of EU documents. Among these, it is important to notice that in the EU Commission statement to the EU Parliament, to the EU Council and to the Economic Committee (Brussels 21/04/2021), it was deemed as important to invest in initiatives aimed to create a sustainable financial ecosystem. The ecological transition process will require significant investments, not only in technological capital, but also in human capital. Having clear the long-term objective, it is important to improve the training and the research in the field of sustainability.

Here is reported the description of the consultation working plan with the Stakeholders. Consultations have taken place to support every course design phase. The Consultation Commission was composed by the coordination unit of the KA Erasmus+ GrEnFin project, associated with the Department of Statistical Sciences of the University of Bologna and was organized at the end of July 2021.

The interested parties have significantly contributed to orient the design of the course with the objective of adapting the student training to the demand of the society and the job market by modifying or confirming the Educational Offer proposed.





The Stakeholders consulted include professional and cultural figures with specific field of expertise:

**Ludwig-Maximilian University Munich (LMU):**

- Full Professor (Mathematics)
- Full Professor (Mathematics)

**Birkbeck College London (BIRKBECK):**

- Full Professor (Applied Economics)
- Full Professor (Finance)

**Vienna University of Economics and Business (WU):**

- Full Professor (Economics)

**University of Katowice (UEK):**

- Full Professor (Economics)
- Lecturer/ Vice Dean of School of Undergraduate and Graduate Studies

**University Paris-Dauphine (PARIS-DAUPHINE):**

- Full Professor (Economics)
- Full Professor (Economics and Finance)

**Tauron Energia (TAURON):**

- Leading Specialist – Regulation /Development division
- Leading Specialist/Asset management

**Institute of Pure and Applied Mathematics (IMPA-Brazil):**

- Full Professor (Economics – Engineering of Renewable Energy)

**Hera srl (HERA):**

- Trading Manager
- Corporate Training Manager

**Pixel (PIXEL):**

- Financial Officer
- Project manager

**Ego Energy srl (EGO):**

- Market Analyst
- CEO



**JFDigital (JFDIGITAL):**

- 2 Consultant Engineers

**My Energia Oner SL (MIWENERGIA):**

- 2 Project Managers

**Speed Development Consultants (SPEED):**

- 2 Managers

**Federação das Indústrias do Estado de São Paulo:**

- Manager of Infrastructure Department
- Energy Specialist

**Atos SPA:**

- Southern Europe E&U Head, Enel Global Executive Partner
- Italy FS&I Head, Generali Global Executive Partner

**Prometeia spa:**

- Research Unit
- Executive

**ECB:**

- 2 Financial Risk Analysts

**SUSTAINALYTICS:**

- Quantitative Analyst



## Consultation Findings:

With regard to the Findings of the Consultation, the Educational Offer has been found as innovative on the International dimension given the existing gap in the offer. The professional figures have been recognized to have interdisciplinary competences (mathematical – engineering – statistical – informatics area). These competences are considered to be of great interest for the market's energy transition.

The Consultations organized have been made in these occasions (Project Meeting, 15 – 16 June 2020):

1. **2°Summer School 2021**, 7 – 11 June 2021
2. **Project Meeting and External Consultation**, 20 – 21 July 2021

The Consultation brought to the attention the following topics:

- ✓ The new denomination for the different curricula will be like this: Sustainable Energy Expert in Renewable Technologies, Environmental Finance and Climate&Business Science, respectively. This to give more attention to the role of the “Sustainable” expert, to be in this way declined in the three different curricula.
- ✓ The course will also include legal themes and public policy aspects. These contents have been indicated as of utmost importance to understand the legal environment for a Green transition.
- ✓ The course will include laboratories aimed at connecting the different teachings to give organicity to the overall Educational Path.





## 2. Learning Outcomes

### 2.1. Hard and Soft Skills

The Learning Outcomes are defined in term of expected **knowledge and understanding** acquired through the GrEnFin Educational Path, i.e. the SEE is expected:

- To be a high skilled professional capable to face the changing challenges in the field with an inclusive global logic;
- To have a number of competences usually belonging to different profiles, such as engineering knowledge of green sources of energy, competences in sustainable economy and quantitative skills in risk management and financial engineering;
- To have specialized competences related to a specific curriculum, which allows to shape the professional figure. This includes strengthening their financial knowledge in view of facilitating a sustainable transition of the market through a diversification policy of energy supply, new financial products able to implement a control policy of natural risks, and a management of the transition process advised by a deeper understanding of Climate science, prediction and mitigation strategies.

Knowledge and understanding goals are reached by lectures delivered in presence, integrated by specialized seminars and supported by tutorship, training activities, team work, flipped classes sessions and individual work. The mix of these methodologies upholds transversal skills as well.

GrEnFin Joint Master proposes a model for advanced study organized around the goal of fostering learning with deep conceptual understanding or, more simply, **learning with understanding**. Learning with understanding is strongly advocated by leading mathematics and science educators and researchers for all students, and is reflected in the national goals and standards for mathematics and science-oriented curricula and teaching (American Association for Advancement of Science, 1989, 1993; National Council of Teachers of Mathematics, 1989, 1991, 2000). Guidance on how to achieve learning with understanding is grounded in research-based principles for the design of curricula, instruction, and assessments for study that aim to



implement classroom activity that, when skilfully orchestrated by the teacher, jointly promote learning with understanding. More precisely the SEE is expected:

- To be able to manage future changing processes either in the external scenarios (due to climate change impact) and internal ones (due to technological progresses and innovations);
- To be able to manage future societal and economical challenges arising from global warming;
- To have a profile which could be helpful in managing the transition process, either at the enterprise level or institutional/regulatory one.

These abilities, related to the goal of learning with understanding, are assured by a global educational methodology that merges theoretical and practical learning through innovative methodologies, implying an active participation of students (flipped classes methodologies, direct involvement of students as tutors or supporter of their pairs, involvement in the governance of the master with a role of consultants to solve possible criticalities arousing or simply to give suggestion for improvements) and a reinforcement of transversal skills through team work activities based on assigned projects (related to different scientific fields). Students are expected to display purposeful behaviour from which they derive new assertiveness and **independent mindset**; particularly relevant to acquire a deep consciousness of their abilities is the individual elaboration of information grasped (in class, during the tutorship, during the internship, during a team work activity,...). The critical thought empowering is strictly connected to the experience of internship and the elaboration of the final thesis, where a joint work with an academic and a professional supervisor requires a deep understanding of the topic, from a theoretical, empirical and feasible point of view and the ability to imagine a solution which is totally comprehensive with these shapes of the problem.

Finally the SEE is expected to be endowed with **transversal skills** such as:

- **Making Judgement:** the SEE is able to critically evaluate pros and cons, balance them and make a conscious decision;
- **Communication Skills:** the SEE is able to communicate his decision and clearly explain reasons of it with a prompt reply to eventual contrary opinions. Communication abilities are really important to fruitfully collaborate with a team;
- **Complex Learning Skills:** the SEE is able to analyse and identify multiple dimensions of a problem and to come up with a final solution with critic and independent thought.





## 2.2. Learning Areas: Details

### **Learning Area: Mathematics – Probability – Quantitative Finance**

The student will be provided with the following contents:

- Quantitative knowledge necessary for the market risk modelling of the low-carbon transition process.
- Knowledge of probability theory related to the Financial Markets and Financial Derivatives pricing.
- Knowledge of Absence of Arbitrage opportunities

These will be tested in the following courses:

- Mathematical Finance, Asset Pricing and Derivatives
- Risk modelling and Probability
- Advanced Mathematical Finance

### **Learning Area: Law - Economics**

The student will be provided with the following contents:

- Economic knowledge for the analysis, comprehension and modelling of climate change risk for financial markets.
- Specific knowledge about Energy Market and Commodities.
- Essential knowledge of the Regulation in the field of climate change and social responsibility.

These will be tested in the following courses:

- Climate-Related Risk and Commodity market
- International Law and Sustainability



## **Learning Area: Corporate Finance**

The student will be provided with the following contents:

- Knowledge of the principles of Asset Management related to Green Finance products.
- Risk Management knowledge; from corporate to financial risk.
- Basic knowledge of Investments evaluation, Corporate Governance, financing methodologies.

These will be tested in the following courses:

- Asset management and transition risk
- Credit and Weather Derivatives

## **Learning Area: Engineering**

The student will be provided with the following contents:

- Knowledge of the fundamental systems of energy production and storage.
- Knowledge of the principles of solar and wind energy production.
- Renewable Sea Energy and Biomass Energy.

These will be tested in the following courses:

- Smart Grids for Smart Cities
- Solar & Wind Energy and Storage System



## **Learning Area: Physics – Statistics**

The student will be provided with the following contents:

- Physical – Statistical knowledge related to the simulation and prediction of climate variables.
- Advanced Statistical knowledge.
- Mitigation strategies and Climate Change impact evaluation.
- Econometrics foundation (mathematical and financial aspects).
- Main Data Science Software knowledge.

These will be tested in the following courses:

- Climate System and Climate Change
- Economics of Financial Markets and Sustainable Perspectives

## **Learning Area: Informatics**

The student will be provided with the following contents:

- Knowledge of the main programming languages, including Python.
- Technical knowledge of Machine Learning and financial application.
- Basic Knowledge of Artificial Intelligence
- Fundamental knowledge of the Blockchain system and Cryptocurrencies Market related to sustainability.

These will be tested in the following courses:

- Python Coding and Data Science
- Machine Learning and Artificial Intelligence





## **Learning Area: Transversal – Specialistic**

The student will be provided with the following contents:

- Frontier topics connected to the market needs.
- Themed Case Studies on the underlying contents.
- Problem comprehension and solutions suggestion to solve specific tasks.
- Team work with other students and Professionals coming from external parties.
- Report and presentation of the project resulting from the combined effort of the team.

These will be tested in the following courses:

- Summer/Winter School
- Intensive Programme
- Summer/Winter Training





### 2.3. Potential Professional Profiles

<b>Professional Profile</b>	<b>Sustainable Energy Expert specialized in Renewable Technologies</b>
<b>Functions &amp; Competences</b>	<ul style="list-style-type: none"><li>• Cost effective and climate efficient supply decisions</li><li>• Regulatory framework for the private sector</li><li>• Regulator decision making support for the Sustainable Development Goals</li><li>• Climate Risk evaluation for Renewable Energies</li><li>• Climate impact analysis of the strategic choices</li><li>• Ideation, elaboration, redaction, creation, financing, promotion, monitoring and evaluation of programs on Climate Sustainability</li><li>• Technical support for international agreements in the field of Energy Transition and Climate Change</li><li>• Energy Resources management (production and storage)</li></ul>
<b>Occupational Positions</b>	<ul style="list-style-type: none"><li>• Sustainable energy consultant for the private sector</li><li>• Economical – Financial Institutions for the monitoring of the environmental impact</li><li>• National and European regulating authorities</li><li>• International Organizations like EU, World Bank, IMF, OECD</li><li>• Private firms and corporations for energy supply</li><li>• Private and public administrations, regional and local, for environment protection</li></ul>





<p><b>Professional Profile</b></p>	<p><b>Sustainable Energy Expert specialized in Environmental Finance</b></p>
<p><b>Functions &amp; Competences</b></p>	<ul style="list-style-type: none"> <li>• Evaluation of the natural variables involved in the overall Corporate Risk assessment</li> <li>• Impact of climate change in corporate decision making</li> <li>• Skills required to design new financial instruments to cover, at least partially, the risk from the exposition of natural variables and catastrophic macro events</li> <li>• Coordination, elaboration, redaction, creation, financing, promotion, monitoring and evaluation of national and international programs on sustainability and risk control</li> <li>• Research in the economic and financial field, creation of innovative hedging products</li> </ul>
<p><b>Occupational Positions</b></p>	<ul style="list-style-type: none"> <li>• Financial and risk manager</li> <li>• Financial engineer for banks and institutions</li> <li>• Sustainable Energy Consultant for the private sector</li> <li>• National, regional and local Administrations for the management of climate risk and the energy transition</li> <li>• National and European regulating authorities</li> <li>• Non – profit organization and public institutions for the environmental and transition risk</li> <li>• International Institutions (ECB, IMF, OCSE, European Commission, World Bank)</li> <li>• Consulting Firms</li> </ul>





<p><b>Professional Profile</b></p>	<p><b>Sustainable Energy Expert specialized in Climate&amp;Business</b></p>
<p><b>Functions &amp; Competences</b></p>	<ul style="list-style-type: none"> <li>• Empirical and simulated analysis of climate scenarios, including drastic events.</li> <li>• Statistical analysis of financial events in a climate impact hedging.</li> <li>• Statistical software knowledge</li> <li>• Portfolio management in the framework of climate impact and transition risk</li> <li>• Corporate risk management</li> <li>• Regulator support in decision making process over climate change and policy impact on the productive system.</li> <li>• Asset management, including green financial product management</li> <li>• Investments and corporate governance evaluation.</li> </ul>
<p><b>Occupational Positions</b></p>	<ul style="list-style-type: none"> <li>• Sustainable Energy Consultant for the private sector</li> <li>• Local, National, International Public Administration for the management of climate risk and drastic events.</li> <li>• National and European Regulating Authorities</li> <li>• International Institutions (ECB, IMF, OCSE, European Commission, World Bank)</li> <li>• Research Institutes (private and public)</li> <li>• Consulting firms</li> </ul>





### 3. Checking the Abilities Acquired

Learning outcomes are mainly checked by oral-written exams, project evaluation both on individual and team basis. On-track evaluation through tutorship practical tests and problem-solving assignments allow to check the capability of students in managing instruments and methodologies with a critical approach.

Seminars during which the students are finally requested to elaborate a related project to be publicly presented and evaluated by their pairs, will be useful to support transversal skill check along with increasing students' motivation and involvement.

Oral and written communication skills are checked in the educational activities whose final evaluation is based on a written report and a following oral presentation, possibly with a multimedia support. Moreover, during classes and tutorship, students are invited to actively participate to the discussion, being propositional in term of suggestion for further analysis or showing their divergent opinion on specific points.

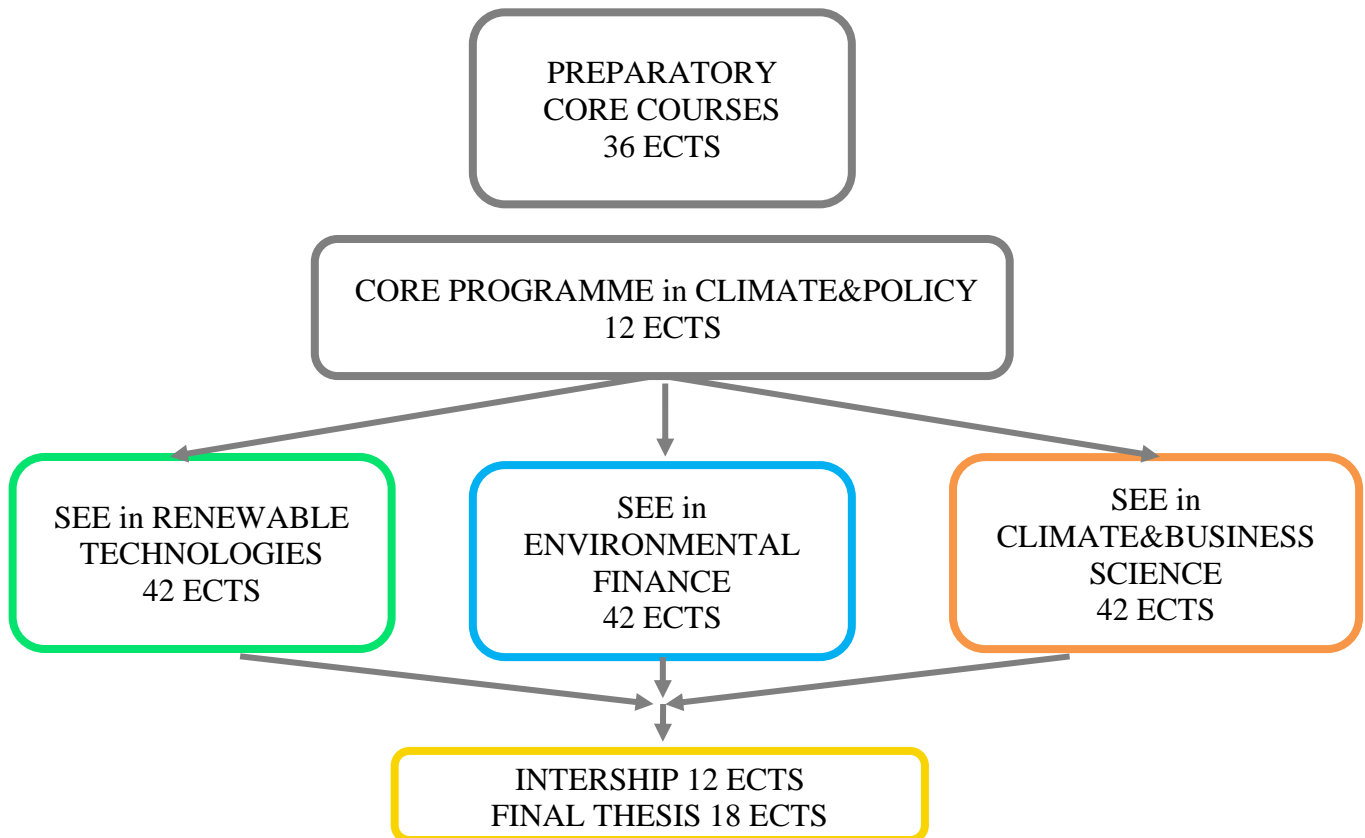
The internship and the elaboration of the final thesis, where a joint work with an academic and a professional supervisor is requested, represent a step to check students' ability to imagine a solution which is comprehensive of theoretical, empirical and feasible aspects of the problem.





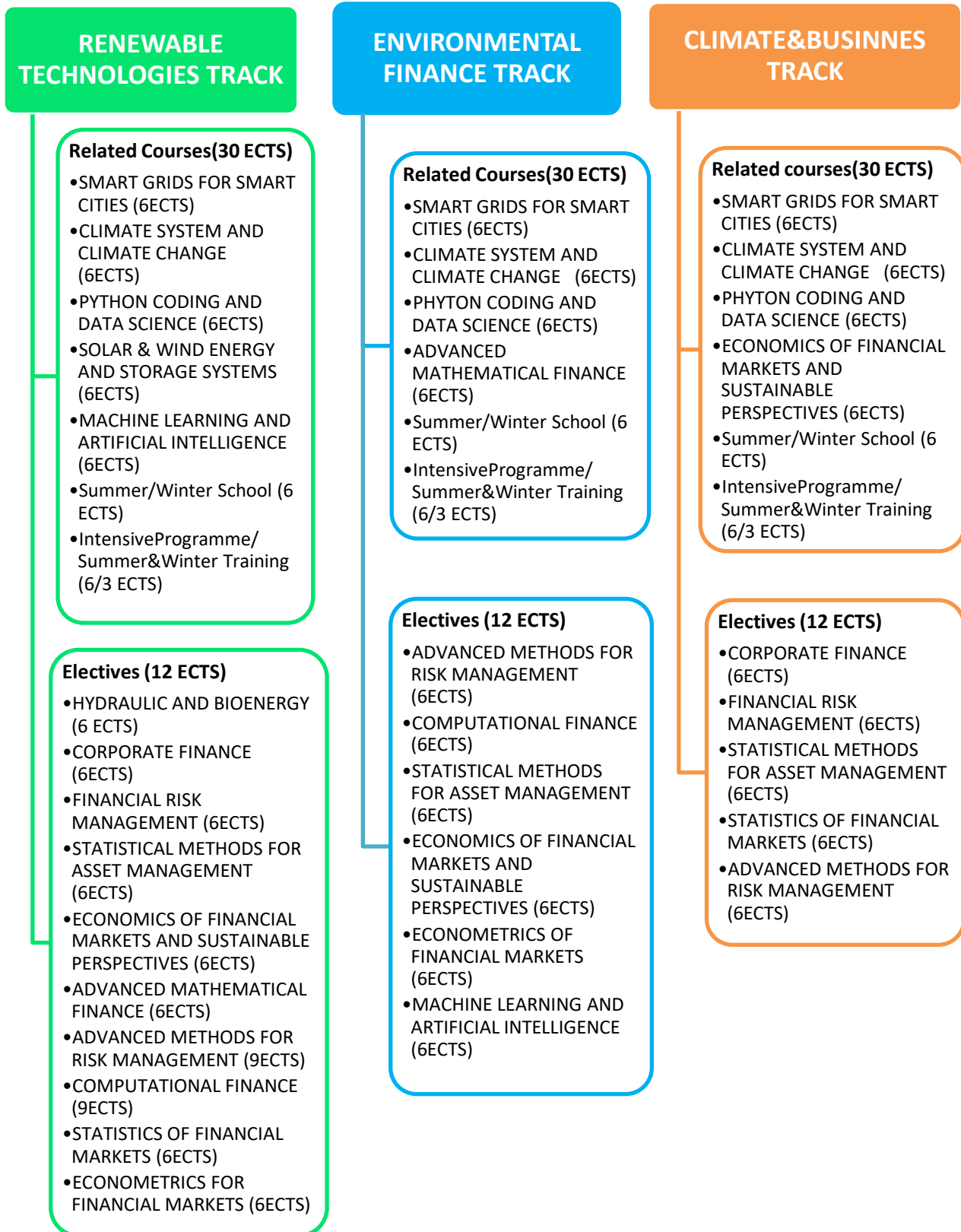
## 4. Master's Structure Overview

Here below an overview of the structure of the GrEnFin Master Programme:



Here a detailed description of the three curricula. The courses are listed along with the ECTS assigned and their classification as related and elective modules.

Related courses are compulsory for the track at hand while electives are expected to be chosen by students in order to tailor their educational path.





## 4.1. Preparatory Core Courses (36 ECTS)

The Preparatory courses are intended to provide a fundamental background common to all students and to acquire a good knowledge of the fields required in the next specialized modules.

The preparatory courses will provide a good knowledge of probability theory and stochastic processes, diffusive and with jumps. The students will master the main principles and tools of financial mathematics, pricing and hedging techniques; in particular they will be able to design a process of market risk measurement and reporting, and to make market risk management decisions.

Moreover, the asset management knowledge aimed to portfolio selection with a full awareness of the risk-return trade-off, will be acquired. Investment opportunities discussed include government financing through sovereign bonds, private sector financing through equity or bond purchases, and financing infrastructure needs, with the aim of generating a return that is shared between the asset manager as remuneration and the investor as their return.

A special focus on the understanding of climate change and the impact it has at different levels of decision-making and policy options, is one of the most important feature of the course. Keeping in mind that policy choices are impacted by both risk and uncertainty, a deep knowledge of the commodities (energy, raw materials and base metals, agricultural, and soft commodities) will be provided. Students will understand the way prices are formed in markets for physical commodities and futures contracts as a result of complex interactions between idiosyncratic factors, such as:

- product characteristics, quality, storability or substitutability, etc
- supply and demand factors capital intensity, industry concentration, production facilities, average personal income level or technological developments, etc and exogenous factors access to finance, public subsidies and interventions, and the weather.





The previously described learning outcomes correspond to the following core courses, detailed in both their modules.

**RISK MODELLING AND PROBABILITY (12 ECTS):**

- Introduction to probability and the mathematics of risk (6 ECTS)
- Risk modelling and evaluation (6 ECTS)

**CLIMATE-RELATED RISK AND COMMODITY MARKET (12 ECTS):**

- Climate and transition risks: uncertainties, complexity, and implications for economic and financial dynamics (6 ECTS)
- Commodities and Energy Markets: interactions with climate policy (6 ECTS)

**FINANCIAL MARKET & CLIMATE CHANGE: PRICING/HEDGING AND ASSET MANAGEMENT (12 ECTS):**

- Mathematical Finance, Asset Pricing, Derivatives (6 ECTS)
- Asset Management and Transition Risk (6 ECTS)

## 4.2. Specialization Courses 2<sup>nd</sup> and 3<sup>rd</sup> SEMESTER (42 ECTS)

The specialization phase aims to provide a deep knowledge on the chosen track. The main knowledge framework of the specialized field is provided by the Related courses, which are compulsory and can be seen as core courses for the specialization at hand. Nevertheless, students have the chance to tailor the educational path choosing their favourite courses among the class of the elective ones. Elective courses are meant to specialize students through developing a deeper knowledge of a topic. This is a factor of flexibility that allows students to improve their practice of soft skills. The level of freedom is not the same in every specialization due to the type of special courses the Master has offered; therefore, the number of ECTS attributed to the electives varies from one specialized course to another.



### 4.3. Core Courses 2<sup>nd</sup> and 3<sup>rd</sup> SEMESTER (12 ECTS)

During the specialization semesters, the class will be requested to attend two last core courses in the field of economics/management and market regulations, named:

- INTERNATIONAL LAW AND SUSTAINABILITY (6ECTS)
- CREDIT AND WEATHER DERIVATIVES (6ECTS)

At the end of the first course students have a broader and deeper legal knowledge of the contemporary legal issues related to market regulation, and the consequences of economic agents' behaviour, both under the international and the national legal framework.

At the end of the second course the student knows how to transfer credit and climate risk by means of swap arrangements asset swaps and TRORS (Total Return Swap), and with credit/weather derivatives. The student knows the analysis developed both on a single name basis CDS (Credit Default Swap) and on a multiname basis: CDX (Credit Default Index), iTraxx (Credit Derivative Index). The analysis is extended to large CDO (Collateralized Debt Obligation), ABS (Asset Backed Securities) and ABX (Residential Mortgage Backed Security).





#### 4.4. Internship (12 ECTS) and Final Thesis (18 ECTS) 4<sup>th</sup> SEMESTER

The last semester is devoted to the practical experience and the elaboration of the final thesis, as described in the table below:

INTERNSHIP (12 ECTS)

FINAL THESIS (18 ECTS)

The internship is compulsory in order to stress the important role of companies in the project. The student will develop a deep knowledge of green energy solutions, keeping in mind a holistic and interdisciplinary view which is expected to be strongly firm's oriented.

The elaboration of the Final Thesis is expected to be supervised by a professional and an academic and to be about a frontier topic whose industrial relevance is related to either its sustainable perspectives or its connections and implications with/duo to regulatory requests.





## 5. Master's International Dimension

The objective of the GrEnFin project is to build a Joint/Multiple Master Degree in collaboration with some of the universities partners of the Consortium. At this moment the Mobility structure involves a Double Degree signed as a bilateral agreement between LMU and UNIBO. This structure is, of course, not definitive and, having clear the Mobility structure objective, the Consortium aims to build official long term collaborations with other HEIs (within and outside the partnership) which can contribute and support the reputation of the master, through specific and well detectable contribution.

The objective is to have a University network that specializes his course offer obtaining in this way a widespread Master course. The mobility of the students will take advantage from the principles of the Erasmus+ Study and Internship Programs. The two programs will enable the students to move to the partner HEIs to study or to complete an Internship period. Moreover the final goal is to accreditate the Master for the Erasmus Mundus programme, receiving in this way mobility grants from the EU.



# Greening Energy Market and Finance



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