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MAIL project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 823805; [H2020 MSCA RISE 2018]



## D5.2 Potentialities of emerging stock b1 exchange markets for carbon transaction and proposed policies

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**MAIL:** Identifying Marginal Lands in Europe and strengthening their contribution potentialities in a CO<sub>2</sub> sequestration strategy



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|                            |   |
|----------------------------|---|
| Project title              | Identifying Marginal Lands in Europe and strengthening their contribution potentialities in a CO2 sequestration strategy  |
| Call identifier            | H2020 MSCA RISE 2018  |
| Project acronym            | MAIL  |
| Starting date              | 01.01.2019  |
| End date                   | 31.31.2021  |
| Funding scheme             | Marie Skłodowska-Curie  |
| Contract no.               | 823805  |
|                            |   |
| Deliverable no.            | D5.2  |
| Document name              | MAIL_D5.2b1_00_20191025_Executive_Summary.docx  |
| Deliverable name           | Executive Summary on the report for the utilization of carbon transactions at stock exchange markets for emission trading as part of ML management (information collection) |
| Work Package               | <b>WP5</b>  |
| Nature <sup>1</sup>        | <b>R</b>  |
| Dissemination <sup>2</sup> | <b>CO</b>   |
| Editor                     |   |
| Authors                    | Vassilios Tsioukas  |
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| Date                       |   |







<sup>1</sup> **R** = Report, **P** = Prototype, **D** = Demonstrator, **O** = Other

<sup>2</sup> **PU** = Public, **PP** = Restricted to other programme participants (including the Commission Services), **RE** = Restricted to a group specified by the consortium (including the Commission Services), **CO** = Confidential, only for members of the consortium (including the Commission Services).

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## Contents

|                         |   |
|-------------------------|---|
| Abbreviations .....     | 8 |
| Executive Summary ..... | 9 |



## Abbreviations

| Term               | Explanation   |
|--------------------|---|
| CDM                | Clean Development Mechanism                                       |
| CORSIA             | Carbon Offsetting and Reduction Scheme for International Aviation |
| CO <sub>2</sub>    | Carbon Dioxide  |
| ETS                | European Trade System   |
| Jl                 | Joint Implementation  |
| LULUCF             | Land Use Land Use Change and Forest                               |
| tCO <sub>2</sub> e | ton CO <sub>2</sub> equivalent                                    |
| UNFCC              | United Nations Framework Convention on Climate Change             |
| UN                 | United Nations  |





## Executive Summary

Giving a price on the effects from the use of fossil fuels releasing CO<sub>2</sub> and other greenhouse gases into the atmosphere was one of the most important actions of the United Nations (UN) joint action to tackle the problem of global warming. International conventions, notably the Kyoto Protocol and the Paris Agreement, have established the foundations for the principle of recording both GHG emissions from large industrial installations and many polluting human activities in order to be offset by their absorption from the natural environment processes and mainly from forests.

To fight the greenhouse effect, a drastic reduction in all polluting human activities could be applied by a large percentage or even to 100% of the current situation. But it is not easy for anyone in the world to sacrifice their wellbeing and technological evolution and go back decades or even centuries without major consequences. For example, it is not easy to trade products that may be delivered today by shipping boats, if zero-emission vessels (e.g. sailboats) are used. Such an evolution will inevitably lead to unrealistic solutions and practices, and more importantly at a time when even developing countries are in their route for rapid growth and technological evolution which is mostly based on energy production and mainly by unsustainable processes (natural gas and oil).

Therefore, the big stake of the human race is to implement actions to fight against climate change without compromising the modern way of living sacrificing services, wellbeing etc. and without applying backward practices. We must follow a sustainable approach that aims at the ultimate evolution of our modern society into zero emission one.

Experts have set the goal of reducing the planet's temperature by 1.5°C compared to a past reference year, and most parts of the UN (others more and others less) have accepted their responsibility.

The most important part of the carbon cycle from its extraction (oil, gas or coal) to its consumption and production of energy and its transfer to the atmosphere as CO<sub>2</sub> and its forestation, is its transformation back to the soil sequestered by the vegetation through the process of photosynthesis.

Scientists have been trying to create devices that simulate the process of photosynthesis through modern technology, but nature has for millions of years already found the solution to the problem of CO<sub>2</sub> sequestration and this is the tree: a simple biological-living mechanism that feeds on carbon from the atmosphere and it grows by itself. The most important element of this process is that the trees, if the conditions allow, want minimal help and monitoring from humans. Their only disadvantage is perhaps their poor performance to our current needs of absorption of CO<sub>2</sub>. Trees are lifelong organisms that, like all other living things, have their own life cycle from birth to adulthood and death.

So, the role of forests, and in particular Land Use, Land Use Change and Forests (LULUCF) is important to tackle the problem of Climate Change. However, the contribution of LULUCF

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has not been addressed with due importance mainly because there were (since the beginning of the Climate Change issue) problems in recording their positive effects of CO<sub>2</sub> sequestration and the fact that nothing is maintained permanently in the biosphere and forests through human intervention or accidents (e.g. wildfires) could in a fraction of time become from a carbon sink to the exact opposite: a huge source of new CO<sub>2</sub> emissions.

The first steps to tackle Climate Change were carbon pricing. Climate Change cannot be mitigated unless the economic consequences of offsetting the negative impact of fossil fuels is not calculated. Thus, any process that produces CO<sub>2</sub> emissions must record what amount (in absolute values) of CO<sub>2</sub> or other GHG generates in order to be sequestered by Offset Projects. One such action is tree planting but not so simplistic as it seems.

Forests which have been deforested or destroyed due to natural, anthropogenic and other phenomena belong to areas that will most definitely need to be reforested. But even if reforestation of all the damaged forests is achieved (since huge areas of rainforests and other forested areas e.g. in European Mediterranean countries are burnt annually) human activity and especially in countries like China and India as they continue to grow, produce more and more CO<sub>2</sub>. Therefore, regarding the absorption of CO<sub>2</sub> by the atmosphere two are the most important reforestation actions that could help better and greater CO<sub>2</sub> absorption. The first is the conversion of agricultural land used to produce biofuels to forest land and the second is the cultivation of trees to produce technical timber (e.g. for the manufacture of furniture and building materials but not fuels) in areas that are not used for food production but neither they are forests. These areas are defined as Marginal Lands and this report aims to investigate their exploitation methods with a sustainable mechanism as CO<sub>2</sub> sinks.

Carbon markets were created to trade CO<sub>2</sub> emissions or in other words allowances to produce CO<sub>2</sub> emissions equal to those sequestered from the atmosphere by other procedures. These procedures (Carbon Offset Projects) can therefore permit emissions and can be investment or ecological actions such as tree planting. Trees that mitigate CO<sub>2</sub> emissions can be applied to Marginal Lands.

This report consists of 9 chapters.

Chapter 1 deals with existing carbon markets. The carbon markets are divided into 2 categories. The compliance or obligatory and the voluntary markets.

The compliance markets began after the Kyoto Protocol and the first to be created with the most significant emission rate covered is the European Trade System (ETS). Since then, several more have been created covering national or even international and regional emissions and all major polluters are required to pay by purchasing emission allowances from either state or transnational public entities. The operation of markets is based with cap and trade concept. Each industry or polluting entity has a cap for a certain amount of emissions and if it exceeds this cap, they must purchase the respective allowances from someone else who has not exceeded their allowances. In case of non-compliance, the state imposes fines.

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The compliance markets that are currently in operation or are in the process of development are currently 26 while the creation of another 12 is under negotiation. The operating conditions of the markets vary from country to country, as well as the cost of a metric unit which is a tonne of equivalent CO<sub>2</sub> (tCO<sub>2</sub>e). Emphasis is given to the operation of the European Trade System since it was the first one operating but was also an innovative system and many other systems followed their own basic operating principles.

There exist several issues in compliance carbon markets. Probably the most important is that they are not linked, and this is quite unfair for some pollutants since they cannot trade emissions from other markets except of their own country. Additionally, the prices for 1 tCO<sub>2</sub>e is varying among the separate public entities who are running the markets. Finally, we must note that the compliance markets are growing year by year and in many countries they co-exist with carbon taxes. The highest carbon tax is applied in Sweden and Switzerland which is as high as more than 100\$/tCO<sub>2</sub>e. However, the mean value for a tCO<sub>2</sub>e is currently about 15\$/tCO<sub>2</sub>e and this price is not so promising to tackle the Climate Change problem. Specialists from all around the world have calculated that the price of 40\$/tCO<sub>2</sub>e is the minimum to achieve the Paris Agreement reduction of the temperature by 1.5°C. The reason for this low carbon unit price is due to several reasons and one of them was the financial crisis that started in the last years of the previous decade. Additionally, the first allowances for CO<sub>2</sub> emissions in the ETS were given for free during its first phase of operation while only a small number of auctioning took place during the last years. In the future the beginning of the operation of the Chinese National Trade System will boost the market globally and will trade almost double of today's total emissions. This fact will probably change the prices of tCO<sub>2</sub>e and our ambitions to mitigate the Climate Change problem.

Chapter 2 describes the concept of Carbon Offset Projects while the next two chapters (3 and 4) are describing the Kyoto Protocol mechanisms that were created to apply carbon trade to other regions.

Countries not belonging to the European Union could not participate so other CO<sub>2</sub> trading mechanisms had to be created. One of them and very effective was the Clean Development Mechanism (CDM). It operated under the Kyoto Protocol and many of the CO<sub>2</sub> absorption programs involved forestation of Marginal Lands (over 60).

In addition to the CDM (operating in countries of the third world) which had a dual purpose: the absorption of CO<sub>2</sub> pollutants through Offset Projects and the creation of co-benefit in developing countries, there was also a Joint Implementation (JI) Mechanism with similar characteristics but involving countries from the former Soviet Union.

But apart from compliance markets, there are also the voluntary markets (chapter 5). Voluntary markets were developed before the ETS was even created and were originally intended to mitigate environmental damage with Offset Projects in the US. They involve companies (large industrial plants) or even small ones that were not obliged to but invest in Offset Projects to mitigate their CO<sub>2</sub> emissions. Usually, they obtain a certificate of



environment friendly company. Such recognition applies a significant impact on consumers as they are many of them that, before buying a product, are looking how these products are produced and most preferably with a zero-emission procedure.

The voluntary markets which are a lot and many financial organizations publish annual reports on them giving their CO<sub>2</sub> trade volume and tCO<sub>2</sub>e price. Following the abolition of the Chicago Climate Exchange of the larger standard in 2008, voluntary markets lost a large part of the traded carbon share, and the price of tCO<sub>2</sub>e fell due to an overflow of allowances. However, with the introduction of new polluting sources (such as Carbon Offsetting and Reduction Scheme for International Aviation-CORSIA) into future CO<sub>2</sub> trading systems, both the price per tCO<sub>2</sub>e and the development of the voluntary market are expected to increase.

Chapter 6 is dedicated to the description of the European Trade System (ETS) and the future mechanism of EU which is the Effort sharing Mechanism and its connection with LULUCF. The ETS is operating for many years now and it has traded carbon from over 10,000 polluting entities. The current phase that started in 2013 is covering more tCO<sub>2</sub>e generating installations such as those producing petrochemicals, ammonia, nonferrous and ferrous metals, gypsum, aluminum, as well as nitric, adipic, and glyoxylic acid (various thresholds). European Union will put into effect the Effort Sharing mechanism which will trade CO<sub>2</sub> emissions from other EU activities such as central heating and transport without including LULUCF for the above-mentioned reasons that are also mentioned in the text report.

Chapter 7 is dedicated to accounting standards of CO<sub>2</sub> emissions and allowances. One of the major problems of the carbon markets is the precise calculation of both emissions and absorptions through Offset Projects. There exist several standards. The United Nations Framework Convention on Climate Change (UNFCCC) has published guidelines for the calculation of CO<sub>2</sub> emissions since 2006 that were recently updated (2019). In addition, the European Union itself has published its own guidelines using the organizations and directorates created by the European Commission (eg JRC), but also following the standards set up by the UNFCCC.

The CDM follows its own standards which have not, however, been highly productive and applied to a great extent as they involve many bureaucratic and time-consuming processes.

Voluntary markets have created more flexible standards and there is numerous specializing in offset projects and especially LULUCF. Within the report there is a brief reference to the major standards as well as an overview of the entities that are either Carbon Offset Project Developers, Retailers, Wholesalers or Brokers.

As there exist several voluntary markets with completely different operational principles, one of the major problems is the fact that they are also not linked (at least all of them) with other voluntary or compliance markets. Some of the standards accept the trade with other voluntary or even with compliance markets. For example, the American Carbon Registry standard may trade emissions with the compliance California cap-and-trade market.



However, this is not applicable to all voluntary markets. The ultimate goal of all markets is to have them all linked, both compliance and voluntary.

Chapter 8 is devoted to public offset projects that are operating in Germany, Spain, Greece and Poland and private offset projects (mostly applying voluntary accounting standards). Only Spain has developed 2 public mechanisms to trade CO<sub>2</sub> emissions and the other countries are trading emissions mainly through ETS. The voluntary market is huge and only the major accounting standards have been investigated. A list of more than 150 projects (covering not only the LULUCF sector) are given as examples projects. Additionally, more than 60 CDM projects have been found and the most important about these projects is that they relate to reforestation activities in degraded lands. These projects are described with big detail through the CDM site and they can be nice examples for the implementation of similar future projects within the MAIL Project.

The last part of the report (chapter 9) gives other actions that cannot be categorized as compliance or voluntary markets but can be combined with Carbon Offset Projects. Carbon Offsetting and Reduction Scheme for International Aviation - CORSIA is one such major initiative that will begin operating in the near future and will cover emissions from the international aviation sector. According to experts in field of carbon markets the future operation of CORSIA will significantly benefit voluntary markets in the future. Additionally, certain individual efforts by companies (ie. operating in the automotive or apparel sector) have announced their own initiatives for Carbon Offset Projects. These actions are not directly related to the Marginal Lands but they can be related to them and moreover the private initiatives show the current trend.