

GUIDELINES FOR PAs

Zadar Region

WP 4 Pilot project implementation
Activity 4.5 Follow up activities

GECO2 – Green Economy and CO2

Safety and resilience | SO 2.1

Work Package:	4. Pilot project implementation
Activity:	4.5 Follow up activities
Phase Leader:	ARPAE
Deliverable:	Guidelines for PAs- Zadar

Version:	Final	Date:	31/06/2022
Availability:	Public		
Responsible Partner:	Zadar region		
Editor:	Ivana Devic		
Contributors:			

Table of Contents

<u>Section I - Context, analysis of the results of the voluntary CO₂e credits market experiment developed by GeCO₂</u>	<u>3</u>
<u>2 THE GECO₂ PROJECT</u>	<u>3</u>
<u>3 GECO₂ market principles</u>	<u>4</u>
<u>4 The GECO₂ carbon credit market</u>	<u>5</u>
<u>5 GECO₂ cultivation protocol and credits calculation system</u>	<u>6</u>
<u>6 Technical tools developed by GECO₂ project</u>	<u>8</u>
<u>7 Project results</u>	<u>11</u>
<u>8 Conclusions on project experience</u>	<u>12</u>
<u>Section II – Suggestions and guidelines for regional interventions to support the voluntary credit market - the development of local credit markets</u>	<u>13</u>
<u>9 Integration with European, National and Regional Policies</u>	<u>13</u>
<u>10 Opportunities coming from the new European agricultural and environmental policies</u>	<u>13</u>
<u>11 Why and how to implement a regional carbon market</u>	<u>14</u>
<u>12 Regional structures to support and control Projects</u>	<u>17</u>
<u>13 Indications for PAs</u>	<u>21</u>
<u>Annex</u>	<u>24</u>
<u>Glossary and definitions</u>	<u>24</u>

1 About the Guidelines

These guidelines are addressed to PAs of the seven regions involved in the project and intend to give feedback about the experience developed by GECO2 and its possible next development in agricultural and environmental regional policies and strategies.

In this frame the Guidelines will give an operational framework and suggestions, derived from project experience, in order to develop a long-term local market, linking regional farming projects and communities of buyers.

Section I - Context, analysis of the results of the voluntary CO₂e credits market experiment developed by GeCO₂

2 THE GECO2 PROJECT

Climate change is one of the biggest challenges facing our society today. Increasing carbon sink and reducing CO₂e emissions, also in agriculture, are both undisputable prerequisites for limiting and counteracting the negative effects of climate change, improving the quality of agricultural ecosystems and fostering landscape resilience. Agroecosystems significantly expand biodiversity areas and the microclimate, prevent flooding during heavy rainfall, reducing soil erosion.

GECO2 activities move towards this direction.

The creation of a voluntary CO₂ credits market, experimented by the project, enables therefore to pursue the following general objectives:

- to foster CO₂ sinks, adopting farming management models based on increasing biomass/biodiversity and soil regeneration.
- to increase awareness and consensus on climate change topics, among the actors: farmers, emitting firms, consumers, public administration.

- to favour the implementation of measures to reduce and mitigate emissions both in agricultural and industrial sectors at local level;
- to propose and develop an idea of circular economy that could help actors to implement effective environmental improving actions on an economic and ecological sustainability logic.

The original idea of the GECO2 (Green Economy and CO2) project is the active role that the agri-food sector — one of the most affected by global warming — can play in reducing CO2 equivalent emissions to air. Sustainable cultivation practices can store carbon in soil and biomass. Encouraging these good practices and then measuring the amount of CO2 in the form of carbon credits allows farmers to improve their business management and to reap the economic benefits of a voluntary market. The buyers, for their part, will get a new green marketing lever to qualify and enhance their products environmentally.

GECO2, funded by the Interreg Italy-Croatia Programme of the European Union, started in 2019 and saw the participation of eight partners of the Adriatic regions of Italy and Croatia:

ARPAE Emilia-Romagna (Project Leader), Legacoop Romagna, the Regions Marche and Molise,

CIHEAM Bari, RERA S.D. - Region of Split Dalmatia; AGRRA - Region of Zadar; Region of Dubrovnik- Neretva.

GECO2 has been based on the experimental creation and modelling of a voluntary CO2e credits market applied to the agricultural sector.

The aim was to test the limits and potential of such a market and to strengthen and enhance the capacity of the agricultural sector to reduce carbon emissions into the atmosphere.

This capacity was directly linked to the adoption of improved soil tillage practices and appropriate farm management, including the correct treatment of crop residues and the adequate use of fertilisers, soil conditioners and pesticides.

The credits market experimented by GECO2 was fully voluntary and dedicated only to credits produced by the agricultural sector. It was based on a platform where carbon credits, calculated using the project tools (GECO2 credits calculators for sellers and buyers), are traded.

A carbon credit is a tradable emissions unit. Each carbon credit that is generated represents one ton of GHG emissions that was not emitted to or removed from the atmosphere compared to baseline emissions. To enable standardized accounting, GHG emission reductions and removals are measured in carbon dioxide equivalent (CO2e) units, expressed in tons (t) of CO2e.

The credits can be purchased by companies, individuals, and other organisations to offset GHG emissions or otherwise to contribute to emissions abatement.

Within the platform created by GECO2, public and private actors (farmers, small and medium-sized companies, private and public organizations, service and multi-utility companies,) can interact.

On one hand, farmers offer to sell carbon credits (generated by agricultural practices) and on the other hand buyers can purchase them in order to offset their emissions or for other pursuits.

The interactions between supply and demand have been supported and managed, in this experimental phase, by the project.

3 GECO2 market principles

The GECO2 project market has been designed according to the main international standards (especially ISO 14064 and 14067), as regards the carbon footprint, but being experimental, has followed its specific development lines with reference to the following topics:

- A local market organised in a regional scale
- Wide and open participation of many farmers and firms (most of them SMEs), PAs and public and private organizations.
- A system for market government which is simple, low-cost and of easy to access mainly through the presumptive software tools.

The adoption of the abovementioned criteria and their easy friendly use and implementation allow a proactive role of local PAs, and a broad participation of the whole civil society.

Carbon balance includes direct emissions, indirect emissions, biogenic emissions and removals.

In this frame the GECO2 pilot action has been developed on a few key principles which made it a fair, transparent, reliable, efficient and innovative market.

Fair, because the project is open to all the actors having the requested characteristics, establishes clear criteria for credit calculation and eligibility and provides procedural guarantee that the credit couldn't be sold twice.

Transparent, because information diffusion is foreseen in each project phase and all the actors and their transactions will be published on line and verified by the project. All the project protocols, defining the cultivation and calculation will be available to anyone. The carbon calculator will not be protected through a patent.

Reliable because the calculation procedures chosen by the project are based on established scientific evidences and adopt very conservative calculation estimates.

Furthermore, the system is based on defining a baseline, applying additionality, fixing credit permanence, performing counting and monitoring actions through the use of software tools, tests and controlling visits.

The project calculation tool includes “buffer” in order to prevent overestimations.

It is efficient, because the technological component of the project tools, developed by GECO2, makes easier to use the credit market system. Very simple operating tools like the calculators and an open registering and matchmaking platform, assure large accessibility, speed and participation.

Innovative: a CO₂e credits market earmarked to the agriculture sector is experimented for the first time in an organized framework system.

The market has been characterized by a “locally based” platform to trade credits and it will be totally voluntary guaranteeing mitigation effects and faster flexibility of sector evolution towards more environmentally sensitive objectives and practices. On the other hand while compliance markets bind “big emitters” only, voluntary markets can also involve in the process small and medium enterprises, locally based, increasing additional CO₂ emissions savings. Local communities and emitters, which invest in this market, can appreciate the geographical proximity of both sink and emission sites, giving an added value to the communication strategy of the buyers.

4 The GECO2 carbon credit market

STEP 1: Farmers wishing to participate are supported in choosing new and improved agronomic practices

STEP 2: Farmers sign up to the farm plan and introduce new agronomic practices

STEP 3: The CAFÉ tool calculates the farm's carbon footprint and CO₂ sequestration capacity

STEP 4: If the results of the measurement are positive, the calculated credits are placed on the bidding platform

STEP 5: On the platform, the buyer can select the companies and introduce the purchase option

STEP 6: GECO2 monitors data and gives green light to exchange

STEP 7: The buyer makes the payment

STEP 8: The transactions are recorded in an ad hoc public register and the credit deleted.

5 GECO2 cultivation protocol and credits calculation system

GECO2 calculation system assess the number of biogenic removals as of carbon sequestered (carbon offset) in soil and in (long term) plant biomass.

In particular, the following elements are considered:

Sequestration in woody biomass. Biomass production is dependent of natural growth and improvements and agricultural practices producing plant dry matter.

Sequestration of organic carbon in soil. As they grow, plants take up carbon and return it to the soil, where it is broken down in the form of soil carbon.

From a general point of view the practices improving carbon stocks considered by the project are the following:

Organic farm management:

- Conservative ploughing
- Covers crops
- Conservative land use management & biodiversity
- Conservative use of woody residues as carbon source for Soil Organic Carbon (SOC)
- Conservative use of green residues as carbon source for SOC
- Use of organic amendments
- Avoid the use of synthetic fertilizers
- Reduction of pesticides: use of pesticides less than 1 kg / ha
- Optimal recycling of organic matter due to biomass produced within the experimental field

GECO2 Carbon calculation system consists in a set of tools made in order to support the calculation of carbon stocks (credits) and emissions (debts or carbon footprint).

Carbon calculation scheme considers objectives, available resources and limits of GECO2 Project.

The concept of “additionality” is used within the time limits of the project, the duration of the project and the subsequent implementation of the carbon local market. The “Additionality” principle is based on the presumption and on the application of a forecasting model of carbon stock. This approach overcomes the

time limits, and it is in line with GECO2 main objective, i.e. the experimentation of a voluntary market in the agricultural system.

In order to properly apply the calculation principles and to develop speed and ease calculation procedures for all the involved actors, GECO2 has developed an *ad hoc* web-based software on-line tool, a carbon calculator.

Principles adopted for the calculation system imply a set of assumptions.

These assumptions, in line with objectives and time limits of the project, were built on scientific guidelines and literature.

Literature data, previously developed, are used in order to overpass the time and budget limits of the project.

The principal goal is to set up and test an agriculture-based carbon market in a limited time.

In this experimental market frame, GECO2 has created a simple tool to calculate the carbon uptake due to agricultural practices and the carbon emission due to production emitting subjects (which have not already calculated their carbon footprint).

For the purpose of the project, carbon uptake in soil and biomass is transformed into carbon dioxide equivalent, and this into carbon credit/offset.

The principles on which GECO2 schemes are based are similar to the main international offset's standards.

GECO2 standard comprehends the following characteristics:

- Additionality.
- Carbon reduction would not have happened without the offset.
- Permanence.
- Reduction will continue for the entire certification period of the offset.
- Absence of Leakage.

Implementing an offset policy in one place must not lead to a relocation of those emissions in another place (e.g., wood is protected in one location, and lumber companies cut a forest down elsewhere).

Verification

The above characteristics have been verified by GECO2 Project Management.

Furthermore, the GECO2 calculation mechanisms were based on the following construction principles:

Conservation and prudence.

The data used for the calculation are based on the minimum values of carbon storage. A buffer is used in order to reduce the error. The criterion of prudence is expressed in the carbon stocks and sinks chosen calculation methods and through the definition of buffers in calculating credits from agricultural systems. Conservativeness principles imply the use of conservative assumptions and the use of values and procedures able to ensure that a specified emission/reduction/sequestration would not be overstated.

Use of buffers

In order to apply the above-mentioned principles of conservation and prudence is foreseen the implementation of two different types of buffers related to the accumulation of carbon in soil and biomass.

Both have a sigmoid function that grows according to the number of practices implemented, starting from a minimum value and extending to an asymptotic maximum value for infinite practices adopted.

Baseline state refers to the Business As Usual (Farm BAU) absorption and production of greenhouse gasses. It is analysed as having occurred in the past and which are being produced prior to the introduction of any strategies to reduce emissions (farm project).

6 Technical tools developed by GECO2 project

The project developed some important operational tools in order to create a user-friendly access to the market and a fast and low-cost management of the system.

CAFÉ (Carbon Fixing Elaborator)

In order to facilitate the calculation of CO₂e sequestration capacities provide a rapid, homogeneous and scientifically reliable calculation of the balance of CO₂e emissions and sequestration, a system for calculating the carbon credits that can be generated by an agricultural enterprise (CAFÉ Carbon Fixing Elaborator) has been defined. The system makes use of several variables related to climate, soil characteristics, crop and field management, agronomic practices and energy consumption and constitutes the basis for a future simple evolution of regional markets for CO₂e credits.

CAFÉ had two different aims:

Calculation of the carbon balance. In particular the tool allows to evaluate and to assess the current carbon budget of the farms, in the selected fields (farm patches) chosen by farmers wishing to participate to GECO2 who meet the basic conditions required by the project;

Definition of CO₂e credits per farm field, and per hectare. Each credit is calculated in tons of equivalent carbon dioxide sequestered. These credits will be registered in the GECO2 database. A specific offset registry is a part of this database. The registry is a system for reporting and tracking offset project information including project status, project documents, created credits, ownership, sale, and retirement.

The principles of calculation find its application in the calculator structure.

Calculation scheme of the GECO2 calculator (CAFÉ) is based on an algorithms system.

The algorithm system is built in a modular form to determine, at the field level, the greenhouse gas emissions produced by the farm and its practices, the loss of carbon due to erosion and the accumulation of carbon instead due to the sustainable practices applied.

In addition to that, calculator has the objective of evaluating the carbon credits. Credits are produced by the agricultural organization (farm).

In order to exploit calculator functions, input forms must be filled in by farms. Model (algorithms), on which the calculator was designed, estimates the corporate carbon credits /debts, in connection with the farm data and the answers provided.

At the end of the computation, a budget is determined, specifying which procedural components have the most impact on the final result.

Emissions are calculated considering the following five categories:

- 1) CO₂ emissions due to energy consumption (fuel and electricity);
- 2) CO₂ emissions due to the production of pesticides then applied in the field (the emissions of the application are not considered here because they fall within the first point);
- 3) CO₂ emissions due to the production of the fertilizers used (the emissions of the application are not considered here because they fall within the first point). N₂O, NO and NH₃ emissions due to the application of nitrogen fertilizers in relation to the management and type of soil (texture, pH, drainage, etc.) following the Bowman model;
- 4) CO₂, N₂O, CH₄ emissions due to the management of crop residues;
- 5) CO₂ emissions due to carbon oxidation in the soil due to field management practices.

Carbon loss is estimated by calculating the amount of soil lost due to erosion with a RUSLE equation (acronym for Revised Universal Soil Loss Equation).

Factors influencing RUSLE are: annual rainfall, field slope, soil texture, land cover and practices.

Carbon budget is calculated considering two different pools:

The carbon stored in the soil (underground part):

- 1) Type of soil management (forest, stable meadow, grassy orchard or field with worked land);
- 2) Type of tillage (conventional, minimum tillage, no tillage);
- 3) Use of cover crops in the period in which the crop is at rest (cover crops);
- 4) Application of organic amendments with a non-negligible organic carbon content;
- 5) Release or not of crop residues in the field (woody, herbaceous);
- 6) Annual increase of root biomass;

The carbon stored in the topsoil (epigeal part):

Calculation of the increase of the woody system following a tabular method for each species based on a specific annual growth of biomass.

With this growth, the carbon lost from any pruning or removal of trees from the orchard is reduced.

The calculation of the carbon balance is done for the selected fields chosen by farmers participating to GECO2. To determine the carbon balance, the following are considered as outputs: carbon emissions due to energy use, chemical fertilisers, pesticides, tillage, other carbon emissions due directly or indirectly from agricultural works and finally the loss of soil carbon (erosion). The inputs are the carbon fluxes stored into soil and biomass, through the adoption of the selected agricultural practices.

The definition of CO₂e per farm field and per hectare: Each credit is calculated in tons of equivalent carbon dioxide sequestered. The carbon stock annual increase is transformed into carbon credits using reduction factors, considering errors and risks of carbon volatility. The applied calculation method is based on ISO 14064-1 international standards.

COFFEE (Carbon Offsetting Emission Elaborator)

COFFEE allows the definition and the assessment of global energy emissions, and in particular the quantity of GHG emissions that credits buyer, in the absence of a carbon footprint, can offset.

COFFEE is a tool that estimates buyer's carbon footprint.

It registers buyers' data and their carbon footprint (for selected activities and /or production of goods and services). The calculation can be linked to the selected activities to be offset, in compliance with marketing choices made by the buyers.

MAP – Market Platform

Furthermore, GECO2, with the aim to ease the matchmaking process of CO₂e credits, has created an ad hoc project web-based database (MAP – Market Platform) where it is possible:

- To upload calculated credits
- To insert purchase options made by buyers
- To create firms and credits register and its continuous updating
- To monitor credit transactions
- To cancel credits, after the conclusion of transactions.

It is a “locally based” CO₂e voluntary credits exchanging platform that guarantees the needed flexibility of regional markets.

Once that data has been collected from farmers and their CO₂e sequestration capacity has been calculated, credits are saved into the project database and then uploaded on MAP. Then the matchmaking process starts, crossing selected offer and demand. The potential buyer can consult the platform and he has the chance to consider the offers and choose credits from one or more farmers.

At the end of the phase, after the final check of compliance, the GECO2 Project Management allows the economic transactions between the parties and checks the effective payment of the credits.

By recording market transactions and guaranteeing the withdrawal of sold credits, MAP acts as a public registry and ensures the traceability and transparency of transactions.

The MAP platform can play an important role in building a regional observatory measuring and controlling CO₂ emissions and absorptions and supervising a future locally based CO₂e voluntary market.

Link to the MAP platform: <http://geco2.iamb.it/>

7 Project results

GECO2 has received a great deal of appreciation and interest. Croatian Ministry of Agriculture have expressed their attention all along the lifespan of GECO2 for the activities and operational tools developed by the project. Project management closely cooperates with the Ministry of Agriculture and the Ministry of Economy in the procedure to amend the law that would regulate the market of CO₂ credits and the agricultural sector.

The positive impact with all the actors has eased the participation of farmers and buyers to the project increasing public awareness concerning GECO2 environmental themes.

The pilot project has reached some important results:

- Research about the CO₂e voluntary and coactive market experiences at international level
- The guidelines underlying the technical content of the pilot action
- Three protocols covering the three basic areas of development of the system:
 - Market protocol
 - Calculation system protocol
 - Cultivation protocol
 - Documents for the participating actors (sellers and buyers of credits) defining the commitments and the development plan.

During the pilot phase of GECO2 more than 42 farmers have been contacted and 36 farms have been selected to participate.

Number of agricultural companies in Zadar region:

36 Zadar

The total amount of experimental fields was of 205 with a total of 1877 hectares.

2,4-ton of CO₂e /hectare has been the average CO₂e sinking value per hectare with a total of about 4500-ton CO₂e sequestered by the project.

Regarding Zadar County data on emissions from companies emitting greenhouse gases were entered into the database. Using a calculator, it was calculated that it is possible to sequester 847 tons of CO₂ in the Zadar County.

42 Seminars and training sessions on project topics and tools organised in the seven partner regions (18 in the preliminary phase and 24 in the pilot phase)

Seminars and training sessions were addressed to different target groups:

- Staff and external consultants of the partners
- Farmers
- Companies in the industrial and service sectors
- Public administrations and citizens

Furthermore, the project developed also some important communication activities:

Educational materials and gadgets;

Articles published in newspapers sectorial and scientific journals;

Videos and Interviews published on websites and on TV;

Participation in events (Ecomondo, Macfrute BIM world -Solutions bas-carbon)

Video animation (winning the prize "Europe is here" as the best promotional tool)

An Hoc logo, available for communication purposes to all the project actors.

8 Conclusions on project experience

The experience developed by GECO2 showed that organizing a voluntary CO₂e credits regional market in agriculture is possible.

Despite the technical, regulatory and cultural obstacles encountered by the project during its life, the results achieved encourage actors and stakeholders to give continuity and development to this experience.

The following section of these guidelines collects indications on how regional PAs could contribute to realize this objective.

Section II – Suggestions and guidelines for regional interventions to support the voluntary credit market - the development of local credit markets

9 Integration with European, National and Regional Policies

The EU's current policy framework aims to reduce the EU's greenhouse gas emissions by 55 % by 2030. The Commission also proposed to achieve net zero emissions by 2050. Since 2013, climate actions have been one of the main objectives of the Common Agricultural Policy – the CAP. The Commission attributed over €100 billion – more than a quarter of the total CAP budget – to mitigating and adapting to climate change during the 2014-2020 period. A Regional carbon voluntary market can accelerate the EU, National and Regional Climate response and contribute to achieve the EU targets foreseen in 2030 and 2050.

There is a total of 118 Rural Development Programs (RDP) in the EU. In most Member States there is a national program which covers the entire territory but, in some countries, there are several programs at regional level. Carbon Market based on agriculture can be a support for these plans. National and Regional Plans support investments in farms to improve their performance; investments in processing and marketing (not necessarily only for farmers); investments in farm- or forest-level infrastructure; and "Non-productive" (primarily environmental) investments.

Within the strategic area of the Green Deal, the European Commission launched in May 2020 the EU "Farm to Fork Strategy" that aims to ensure a sustainable food value chain.

In order to implement the European policy of a sustainable agriculture, it is important to consider nature conservation to ensure a fair, healthy and environmentally friendly food system. As part of the European Green Deal, the Farm to Fork Strategy sets out a vision to change the way Europeans value food sustainability and to position Europe as the first climate neutral continent by 2050. This strategy proposes objectives and targets for the future, that can be implemented also developing a regional carbon market:

- Reduce by 50% the overall use of – and risk from – chemical pesticide by 2030 and reduce by 50% the use of more hazardous pesticide by 2030.
- To bring back at least 10% of agricultural areas under high-diversity landscape features (with buffer strip, rotational or non-rotational fallow land, hedge, non-productive trees, terrace wall and ponds).
- 25% of the EU's agricultural land must be composed by organic farms within 2030.

10 Opportunities coming from the new European agricultural and environmental policies

Regional Carbon Markets, like that developed by GECO2, appear in line with recent European Regional Policies.

The development of a sustainable food system also brings new opportunities for operators in the food value chain and the coherence with the abovementioned EU strategies is crucial.

Each regional PA can develop a local market and provides guidance on how to design, implement and manage a CO₂e credits market.

Such a kind of local carbon market will enable PAs to pursue the following objectives:

- a) to benefit all the community with real, measurable, long-term, and sustainable actions.
- b) to contribute to mitigate climate change.
- c) to support virtuous farmers and buyers on implementing practices enable to cut emissions and maximize CO₂e sinking it in soil and biomass.
- d) to contribute to a Regional Food Policy (see glossary) to improve the operation of the food and agriculture system balanced with ensuring sustainability, human health needs, mitigate and reduce risk of climate changes.
- e) to introduce new innovating items activities and tools related to a regional carbon market

PAs can therefore use CAP funds to develop a voluntary regional carbon market and to create a set of actions in which farmers can act. This strategy allows creation of an ecosystem service payment, forming a circular economy scheme from the buyers to the farmers. The platform (database) can also be exploited as an observatory not only for the CO₂e credits market but as a monitoring system of carbon removals and emissions.

11 Why and how to implement a regional carbon market

Potential systemic effects of a regional carbon market

In synergy with the Farm to Fork Strategy the local voluntary market contribute to acceleration of our transition to a sustainable food system and reach the following objectives:

- have a neutral or positive environmental impact reducing carbon emission and maximizing CO₂e sequestration capacity.
- help to mitigate climate change and adapt to its impacts.
- reverse the loss of biodiversity.
- ensure food security, nutrition and public health, making sure that everyone has access to sufficient, safe, nutritious, sustainable food.
- reduce water consumption and geomorphological risks and increase farm resistance to drought.
- preserve affordability of food while generating fairer economic returns, fostering competitiveness of the EU supply sector and promoting fair trade.

If they are not sustainable, regional food systems cannot be resilient to crises as shown by the COVID-19 pandemic. Regional environment goals can be achieved only through a new strategy. European Food systems today account for nearly one-third of global GHG emissions, consume large amounts of natural resources, result in biodiversity loss and negative health impacts (due to both under- and over-nutrition) and do not allow fair economic returns and livelihoods for all actors, especially for farmers. Moving food systems along a sustainable path, introducing regional voluntary markets, also brings new opportunities for operators in the food value chain. New production systems, technologies and scientific discoveries, combined with increasing public awareness and demand for sustainable food, will bring benefits to all stakeholders, as GECO2 regional carbon model, already proved.

PAs can take the opportunity for launching a local voluntary market.

Capacity building: organizing meeting and training from qualified technical advisers and make sure that all project partners take the opportunity to learn new skills. This may save on future costs and increase local engagement and ownership of the carbon farming projects; buyers voluntary actions, carbon transactions.

A local carbon market is based on carbon credits production.

The credits can be calculated according to the carbon footprint and sequestration capacity defined in the farming projects.

Farming Projects can be easily defined (for example using GeCO₂ tools and adapting the instruments to the specific features of each region).

The same process can be developed for local buyers, defining emissions trading and offsetting plan (see glossary).

PAs, in order to create a long-term carbon local market must consider the following points:

- Define a regional management unit (for example including regional environmental agency and regional agricultural Agency / Administration).
- Define a regional standard methodology for both farmers and buyers and define the market process. All the standards, methodology and market rules are suggested to be a fool proof, handy, accessible, adaptable, cheap, easily operated, easy to understand, feasible.

Before the implementation of the regional market, PA can organize:

- Stakeholder consultation: involving farmers, farmers associations, technical organizations, economic and industrial associations, consultants, NGOs.
- Definition of the steps of the farming project cycle.
- Preparation of software programs for calculators and market platform/data base like those developed by GECO2 (open-source tools).
- Organization of the farming community involving farmers on communication/training regional events.

Collection of carbon data through a regional database/observatory related to:

- a) Quantifying the baseline: Collection and validation of pre-existing inventory data. Define Actual carbon emissions and alternative land-use scenarios.
- b) Required investment for the projects: to compare the economic and financial profile of the proposed project activity with and without carbon credits, and against other identified land use models.
- c) Identification of existing and potential barriers that need to be overcome in order to implement the project.
- d) Assessment of prevailing land-use practices and other relevant practices in the region.
- e) Mapping: Preparation of a farming map to record situation and activities (e.g. for at least ten years prior to the start of the projects), including all the regional area.
- f) Baseline inventory of farming activities, ecological network biomass and biodiversity, in particular the identification and mapping of areas with High Conservation Value (including Natura 2000 habitats).

Farm fieldwork (including measures and support of farming communities) and regional carbon database);

Buyers field work: information communication, define activities to compensate, calculate carbon footprint.

Verifying process of the project's outcomes.

Support marketing carbon credits.

Define the steps of the buyer project cycle.

Organizing ad hoc training sessions for all the actors involved:

- Farmers
- Buyers
- PA officers.

If we observe the global trends of the carbon credit market, it is clear that the market has come to life. The prices of carbon credits have reached levels where investment in emission reduction projects pays off and the quantities of carbon credits being sold/purchased are constantly increasing and the volumes are worth billions of Euros.

As a member of the EU, the Republic of Croatia is obliged to reduce greenhouse gas emissions by 45% by 2030 (less than 55% because the Republic of Croatia belongs to underdeveloped members). Numerous procedures have already been implemented in numerous EU countries that take into account the Directive of the EU Commission on the reduction of emissions. Examples of these measures and consequences are:

- Calculation of carbon footprint for companies
- Availability of carbon footprint calculators for individuals and families and built awareness of personal responsibility and contribution
- Including the obligation to implement the reduction of the carbon footprint at the company level as a prerequisite for participation in Public Procurement procedures
- Disclosure of the amount of CO₂ generated by the production and logistics of food products (and for now voluntary payment for sequestration) on every supermarket bill
- Subsidies for switching to ecological production
- Subsidies for the purchase of motor vehicles that use only electricity or have a hybrid drive
- Subsidies for investing in energy efficient equipment in industry and households

For now, the Republic of Croatia lags behind in the breadth and intensity of measures aimed at reducing emissions and sequestering greenhouse gases. But as an EU member state, the Republic of Croatia will have to implement (probably soon) the measures that more advanced EU member states already apply.

The carbon credit market in Zadar County is by definition voluntary (Voluntary market). Persons and companies that create carbon credits can sell their credits in Zadar County, but if they have quantities greater than 100 tons of CO₂, they can also sell their carbon credits abroad on one of the stock exchanges. Since consumer awareness in the Republic of Croatia is currently relatively low, it can be assumed that the market will have problems for some time on the part of voluntary buyers because they will not see the purpose of the purchase (pure cost for the company). Over time, potential CO₂ potential carbon buyers will feel the "pressure of expectations" of their clients and then the market will come to life. We expect that the largest owners of carbon credits will sell their quantities abroad in the first years.

12 Regional structures to support and control Projects

A regional operational unit could develop and manage the following activities:

- To define promote and control carbon farming development steps
- To define promote and control carbon offsetting
- To define support and control carbon market transactions.

This operational unit must support the preparation and implementation of a successful carbon farming project. The activities for each project can be summarized as follows:

General activities

To prepare regional market rules and organize proper financial support for the implementation.

To identify a market managing unit within the PA departments or agencies.

To update and improve the software programme tools (calculators and market platform) developed by GECO2 for managing the market.

To organize sample controlling procedures in farms and buyers in order to verify the reliability of the information provided and the proper conduct of the market.

To use the platform, crossing data produced, as a regional observatory related to CO₂e sinks and emissions.

Farmers/sellers

Promote support and provide technical assistance to the farmers for their participation to the market

Support farmer carbon farming project description and project design.

Selection of the projects according to the results of the calculators and the established rules.

Validation of the projects and its registration in the regional market platform.

Project implementation monitoring and verification of carbon credits.

Carbon credits presentation in the market platform.

Buyers

Promote support and provide technical assistance to the buyers for their participation to the market

Support buyer project description and project design.

Selection of the projects according to the results of the calculators and to the established rules.

Validation of the buyer's projects and registration in the regional market platform.

Technical assistance for matchmaking activities and carbon credits purchasing options.

Control the CO₂e credits final economic transactions and inserting it in an ad hoc register in the platform.

Regional structures to support and control Projects regarding Zadar County can be seen list of measures (economic, fiscal, organizational, technological measures) for the development of green marketing and green agriculture in Zadar County.

The simplest and most effective measures to achieve energy efficiency and reduce emissions are:

Use of energy-efficient machines (internal combustion engines, condensing boilers, etc.)

- Use of efficient electrical devices (class A or A+)
- Replacement of coal and oil/gasoline with gas as fuel (for vehicles, boilers, etc.)
- Installation of high-quality envelopes (thermal insulation of the facade) on buildings and industrial facilities
- Installation of a heat recuperator (so that heat or cold is not lost by airing the space)
- Installation of heat pumps in buildings
- Installation of photovoltaic panels on the building
- Installation of thermal panels on the facility for the preparation of hot water

- Installation of LED lighting
- Installation of a system for managing electricity consumption
- Installation of a system for managing fuel consumption in boiler rooms for heating and regulating the heating of the building
- Micro switches for heating/cooling if the windows of the building are opened (interruption of operation during ventilation)
- Reduction of water consumption in buildings and industry (use of rainwater for industrial needs)
- Recycling of plastic products

What can local public authorities in the Republic of Croatia realistically do to reduce greenhouse gas emissions?

Here are examples of measures:

- Replacement of vehicles in public transport with LPG or electricity powered ones
- Replacement of the municipal vehicle fleet with vehicles powered by LPG or electricity
- LGU gasification (installation of a gas network under roads and establishment of a city gas plant); gas emits 50% less CO₂ per kg than heating oil or fuel oil (for heating citizens, for technological processes in companies, etc.).
- Installation of solar panels on the roofs of buildings owned by LGUs (schools, hospitals, kindergartens, dispensaries, public parking lots, etc.)
- Energy renovation of facades (saving energy for heating and cooling)
- Help when citizens apply for state facade renovation programs
- Economic stimulation for market participants with CO₂ credits from Zadar County (Diamond Coconut Model)
- Creation of an application for mobile phones/computers that informs citizens about the CO₂ footprint (calculator)
- Creation of an application for mobile phones/computers that enables trading with CO₂ credits (like the one in the Finnish city of Lahti)
- Restoration of losses in the water supply system (savings on electricity)
- Installation of charging stations for electric vehicles

- Traffic "facilitation" for owners of hybrid and electric vehicles (free parking, special lane for their faster traffic through city traffic, etc. modeled on the advantages offered by Norway to owners of electric cars)
- Construction of a city heating plant for gas heating
- Construction of a city garbage incinerator that converts the energy of burned garbage into energy for firewood

Green policies of the city:

- Gasification – GHG emissions for heating are reduced by 50%
- LPG-powered public transport – emission savings of around 50%
- The city is building a solar power plant on the city surface - citizens can "invest" in a share of the power plant and acquire the right to "their" green electricity, which is also cheaper than electricity from HEP
- Minimal use of energy and non-renewable resources
- Zero net energy for new and existing government buildings
- Purchase of vehicles with zero emissions and regulation of equipment for the service of electric vehicles
- Purchase of diesel, biodiesel and diesel fuel from renewable hydrocarbons
- Maintenance and use of government buildings and grounds in order to consume as little energy as possible
- Reduction of energy consumption for new, existing and rented buildings
- Policy of minimum fuel savings that must be observed (default efficiency of devices and vehicles)
- Energy efficiency in data centres and server rooms
- Standard operating procedures for energy management in public buildings
- Indoor environmental quality for new, renovated and existing buildings
- Water efficiency and conservation
- Repaired, used or refurbished car parts; Re-refined or synthetic motor oils and lubricants

Economic, fiscal, organizational, technological measures for the development of green marketing and green agriculture in Zadar County.

Among the economic measures for the development of green marketing and green agriculture, Zadar County can implement the following:

- Education of farmers about green marketing and green agriculture
- Ease of access to the market for products from green agriculture (lower price of a point of sale at the market, lower price of a point of sale at the wholesale market, priority parking for delivery vehicles, cheaper parking for delivery vehicles, etc.)
- Construction of a cold storage facility with a controlled atmosphere for long-term storage of freshly harvested fruits/vegetables, where priority or cheaper storage costs are given to products of green agriculture
- Education of children in schools (in Austria and Germany, cities and federal states instructed children in primary schools about the importance of recycling waste and techniques for reducing emissions into the atmosphere, and children in families were "agents of change" in behaviour)
- Organizing annual awards for the most successful farmers who achieve the best results. The amounts of the awards must be at the level of the necessary annual investment in production change so that the award (if awarded) makes economic sense for the 3 best farmers (the level of HRK 50-100,000 should be sufficiently stimulating with public recognition and marketing promotion of the most successful farmers.

Zadar County can apply some of the organizational measures of agriculture to encourage the development of green marketing and green:

- Continuous education of all factors (children, farmers, consumers)
- Continuous promotion of the value of green agriculture for farmers and consumers
- Annual awards and PR for the most successful farmers in implementing green agriculture (according to clearly defined criteria with an objective selection of the best)
- Creation of a web-application for communication/trading between farmers who are registered for organic production and buyers who want such products (in the north of the Republic of Croatia, there are a number of such web-applications that have become economically viable and function due to a sufficient number of sellers and buyers throughout the year)

Efficient and easily applicable organizational measures of Zadar County that would influence the behaviour and business decisions of companies that buy and process agricultural products unfortunately do not exist. These market factors will begin to change their business practices the moment consumers

begin to demand certain "green" standards in behaviour/production and product origin. Manufacturers will react to a "marketing pull" from the market, a "marketing push" is unlikely. Technological measures for the development of green marketing and green agriculture in Zadar County are reduced to:

- Investing in the use of renewable energy sources
- Investing in switching to energy sources that emit less CO₂ (gas) during combustion
- Investing in the purchase of more energy-efficient machines and equipment (agricultural machines, air conditioners, lighting, etc.)
- Investing in the transition to the use of electric energy where possible (for now, agricultural machines cannot work for 8-10 hours with electricity stored in batteries, the English JCB has gone the farthest in attempts to electrify soil tillage machines, but they are not profitable yet)
- Investing in equipment and practices that lead to water savings

13 Indications for PAs

A new regional government strategy, based on GECO2 experience, may pursue an important objective: the creation of a regional removal system and creation of a local market with minus carbon price.

Carbon credits can be grouped into two large categories: avoidance projects (which avoid emitting GHGs completely therefore reducing the volume of GHGs emitted into the atmosphere) and removal (which remove GHGs directly from the atmosphere). The removal category includes projects capturing carbon from the atmosphere and storing it. They can be nature-based, using trees or soil for example to remove and capture carbon. GECO2 has been the first attempt to organize a local removal carbon market based on agriculture projects.

GECO2 experimentation shows that it is possible and manageable to develop a voluntary CO₂e credits market on a regional scale. Regions can function as controllers and aggregators. An aggregator serves as an administrative and trading representative for several small offset projects, typically on an exchange. By 'pooling' the offsets generated by multiple projects, aggregators reduce the participation cost for project owners, for whom the costs of entering the market- place as a stand-alone project would have been prohibitive.

Furthermore, GECO2 shows that a properly designed regulatory market could create real local offer, real demand and quick improvements of the resilience of the regional system.

GECO2 demonstrated that agriculture can capture carbon. A carbon credit, providing it has met agreed quality assurance standards, represents a reduction in regional emissions against a documented business-as-usual or baseline scenario.

Such a kind of market gives to the industries more flexibility to box regional credits and to make reductions inside or outside of their fence line. This gives them the ability to look for lower-cost carbon credits to accomplish the desired environmental results.

Being the market regional, created by farmers, it can be easily assessed by buyers, knowing where and how the carbon farming project is, and the real benefits of project-based carbon finance.

Importance of GECO2 success for regional and local governments is demonstrated by strong government endorsement of high-quality voluntary carbon instruments as complementary to mandatory emissions caps and carbon taxes. Focus on a high-quality standard and calculation free tools demonstrate that these are as good if not better than current CDM standards; tangible, large-scale examples of how voluntary offsetting activities have resulted in better decision-making and real reductions.

Regions can develop a local market inserting it in their regional policies.

In particular:

- Trough integration of carbon market in regional agricultural policy,
- Increasing the multi functionality and the Farm to Fork in regional farmers actions,
- Introducing and integrating in the Regional policy ad hoc financed measures, in order to support innovation for credits sellers and buyers.

In addition, in the future, the regions can play a role of reference for the government of an upcoming voluntary market of local credits.

The functions exercised by the project, thanks to the use of the technological tools developed by GECO2, show how the regional scale and regional institution can be a key stakeholder in EU Climate policy. In fact, they can in principle be directly assumed by regional governments or by structures controlled by them (agencies for the environment or agricultural development) through technical and financial control.

Such a regional model could be one of the possible follow-ups of the project.

The region to develop local markets could:

- Create the role of local administration in development of local credits carbon markets from the controlling and management point of view;
- Provide levels of transparency and public reporting of the management activities of the voluntary market in order to bring confidence to the sector and to work towards developing a common understanding of the term 'carbon neutral';

- Control offset quality, whether in voluntary or mandatory markets, especially for what that concern the additionality of the project and associated emissions reductions;
- Provide purchasers with a great deal of information about sellers' projects.
- Develop a regional registry that can become an observatory of carbon reduction, soil increase and serve as measure of regional carbon policy, including all kind of stakeholders. EU region can serve as local carbon standard.
-

Annex

Glossary and definitions

Carbon farming projects

Carbon farming projects increase carbon sequestration in soil and biomass and reduce farm emissions. Projects are characterized by additionality and longevity (permanence).

The farming activities include mitigation and adaptation.

Each farm project can increase ecosystem services and reduce both energy and water demand from agriculture. It is important to note that carbon benefits are always quantified against the baseline: it is the difference between what *would have happened* in the Business As Usual (BAU) scenario and what *expected to happen* in the project case that matters. That includes situations whereby the project case reduces emissions in comparison to the baseline but is still causing net emissions. Region and /or observatory has to control and measure leakage.

Additionality

A farming carbon project is considered additional if it meets the following requirements:

- a. The activity does not take place on land that was covered by a natural ecosystem in the ten years preceding the start of the project.
- b. It cannot be the only option. There must be plausible, credible alternative land-use scenarios that could happen on the land in question. If there are none, and the farming activity planned under the project is the only plausible, credible land use, the project is not additional.
- c. An investment analysis must demonstrate that without the income from carbon credits, one or more of the alternative land-use scenarios would be more economically viable.

d. Non-financial barriers (e.g. legislative, regulatory, technical, or governance barriers) need to be identified that would prevent the implementation of project activities without the benefits provided through the farming carbon project.

Buyer

An organization who after calculating the carbon footprint of his activities carbon offsets all or part of those GHG emissions.

Carbon Footprint

A carbon footprint is the total greenhouse gas (GHG) emissions caused by an individual, event, organization, service, place or product, expressed as carbon dioxide equivalent (CO₂e). A carbon footprint is the total amount of carbon dioxide and other GHGs the activities of a person or organization generates. It includes both direct and indirect emissions. A direct emission originates from a source the reporting entity owns. An example is carbon dioxide produced from fossil fuel combustion inside a delivery vehicle a company owns. Indirect emissions result from the reporting entity's activities but originate from sources the reporting entity does not own. These are also referred to as upstream or downstream activities.

Carbon offset

Carbon offsetting is any reduction of greenhouse gas (GHG) emissions to make up for emissions that occur elsewhere. Carbon offset credits show that an organization or person has reduced its emissions. The term carbon offset is used to describe both the credit and the act of carbon offsetting. A carbon offset is a credit that a person or organization can buy to decrease its carbon footprint. When the number of carbon offset credits obtained is equal to an individual or organization's carbon footprint, that person or organization is carbon-neutral.

Carbon Pool

The locations within an ecosystem where carbon is present continuously. In a agroecosystem, the main carbon pools are in biomass (both above and below ground), organic dead matter (pruning) and soil.

Carbon Sequestration

The uptake and storage of carbon is known as carbon sequestration. Trees and other plants, for example, do this by absorbing CO₂e from the atmosphere. In the process known as photosynthesis, CO₂e is broken down into oxygen, which is released back into the atmosphere, and carbon, which becomes part of the plant. As a result, agroecosystems store (or 'sequester') large amounts of carbon.

Carbon Sink

Carbon sinks are *carbon pools* which store more carbon than they release. Soils, forests and oceans act as major carbon sinks in the global carbon cycle; carbon constantly flows into them and out of them, back into the atmosphere.

Food Policy

Food policy is the area of public policy concerning how food is produced, processed, distributed, purchased, or provided. Food policies are designed to build a sustainable agriculture and to influence the operation of the food and agriculture system balanced with ensuring human and environmental health needs.

Leakage

Reductions in GHG emissions that are offset by increases in emissions in other areas or in other carbon pools, where both the reductions and the increases are the direct or indirect result of the same project or activity.

Permanence

Permanence refers to the longevity of a carbon pool and the stability of its stocks. A feature of land-based carbon projects is the possibility of a reversal of carbon benefits due to natural disturbances (e.g., fires, disease, pests, and unusual weather events), or due to human-induced activities, such as deep plowing, reduction of herbaceous cover, cutting of hedges. This may result in the reversal of the carbon benefits previously achieved.

Project Description (PD) and Project Design Document (PDD)

A document that describes how a particular agriculture project will work in order to increase carbon stocks. It includes, among other things, a basic description of the project context, monitoring methods, estimate of emission reductions and potential social and environmental impacts.

Reducing Emissions from Agriculture

A type of agriculture carbon project in which existing agroecosystems are managed differently than before. A project that reduces emissions from weathering and erosion, recycling internal resources in order to fertilize (e.g.: green manure, composting, using of pruning to reduce erosion, or increase soil organizing matter, biochar production, etc.). These projects relate to the area of farm. A project that reduces emissions from agroecosystem degradation slows the loss of soil organic carbon and with that the loss of products and services from a defined area. These projects don't change the farm or parcel size (the farming area remains the same).

Verified Carbon Unit (VCU) and credit production

A type of carbon credit traded under the Verified Carbon Standards (VCS) system, using for example Cafe calculator. Whenever they are traded as carbon offsets on the VCM, they are tracked through a registry system (e.g.: GeCO2 data abseils).

Voluntary Carbon Market (VCM)

The 'carbon market' involves the buying and selling of carbon credits, usually as carbon offsets. The VCM consists of buyers who are not obligated to reduce their carbon emissions. They offset their emissions voluntarily. In contrast, the compliance carbon market is driven by the commitments taken on by industrialized countries that have signed the Kyoto Protocol. If these countries are not able to meet these commitments through their own actions, they have to pay for carbon offsets.