

## "Targeting sustainable bioeconomy: A new development strategy for Southern European countries . The Manifesto of the European Noon"

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### Abstract:

The Italian Chimica Verde Bionet Association (Green Chemistry Italian Association) features Capraia Smart Island, a project co-ordinated on an island in northern Tyrrhenian Sea, one of the most beautiful areas of the Mediterranean Sea, inside the sanctuary of cetaceans. Capraia Smart Island is intended to be a pilot model of circular economy, a lighthouse project for the Mediterranean Sea. In the European Union, lighthouse projects are those applicable to several territories, characterized by a large breath, featuring a key importance. Over 50 researchers and experts gathered in May 2017 in a first event, where the study of the opportunities to build and develop a broad process of island economy decarbonization was started; they are now trying to build a model to raise up Capraia Smart Island.

Project innovation is not limited to the original idea, but includes also a continuous, face-to-face dialogue with people living in the territory concerned, a complex co-operation among several researchers, the involvement of multiple bodies, each of them different to the others, including, but not limited to, environmental agencies and no-profit organizations.

A second Capraia Smart Island event is scheduled on May 17/18, 2018. The agenda will include technical sessions (farming, recycling, marine litter and trash) and a general session where first outcomes achieved will be presented and guests from other smart island projects will give their contributions.

**Keywords:** Decarburization - Economy –Circular Economy-Renewable Energy– biodegradable bioplastics compostable.

### Introduction

For many years, Chimica Verde Bionet has taken care of production process decarbonization and sustainability in the farming field, providing new development opportunities for farms thanks to business diversification and development of green chemistry in rural areas through the replacement of carbon of petrochemical origin with renewable carbon. The development of activities related to agriculture like farming, production of energy from renewable sources, bioenergy, didactic farms are excellent tools to raise up incomes, enhance knowledge transfer, extend training (students and families) and promote business; at the same time, it allows subjects concerned to be stable food manufacturers and also vigilant sentinels in the protection of rural areas.

Since 2006, Chimica Verde Bionet has been promoting bio-refineries, as well as the use of agricultural crops and agro-industrial cascade and byproducts in the whole.

Climate change affecting the Mediterranean Sea zones along with the loss of land rotation in agronomy are leading to a progressive desertification of agricultural areas, resulting into a serious damage to local and national economy. As of 2012, the European Union promotes with integrated strategies the concepts of knowledge development applied to bio-economy, i.e. the production of renewable biological resources and the transformation of such resources and of waste streams in value-added products just like food, power, bioenergy and biological products. Bio-economy constitutes the best way for an efficient use of resources and the development of the so-called sustainable circular economy, encouraging recycling and waste recovering both in the agricultural and industrial fields; it cuts down both the use of imported raw materials and the production of rubbish. Economy is capable to reconcile food safety, use of renewable resources and reduction of fugitive emissions.

For several years, Chimica Verde Bionet has been composed by multiple sections, each of them related to a specific production field (bioenergy, biological composites, dyes, technical means for agriculture, fibers, biological cosmetics, biological cleaning products, etc...). The sea and fishing section has been recently constituted and involves members concerned with fishing, fish organic farming, disposal of fishing nets and production of brand new field materials, such as compostable biomaterials, which are intended to face the complex field of management, enhancement and protection of tourist and environmental marine resources.

The opportunity of coordinating all sections in a complex work in progress on an island belonging to a national park, thus building a pilot model applicable to all small islands in the Mediterranean Sea, has been taken in a jiffy. The island of Capraia, pearl of the National Park of the Tuscan Archipelago, situated in the heart of the sanctuary of cetaceans and not interconnected with the continent, has been selected for that purpose. The municipality of Capraia falls under the province of Leghorn, in Tuscany. The basic idea is that Capraia can be intended as a balance point between anthropic activities and territory; for that reason, it could become a laboratory of circular economy, a virtuous model replicable both in small Mediterranean Sea islands and on a global scale. Capraia distinguishes from all other Mediterranean Sea islands for having a surface area of about 20 square km inhabited by 415 people; it is the only 100% "renewable power island" as the entire electric power needs of the inhabitants is satisfied by an Energy pilot plant fed by biodiesel.

Even though the tip of this project is very high, everything was raised up from the bottom. We can say that the island itself raised up the project, through a process of participation involving the entire island population. For years, some residents have cultivated the idea to fight for the "decarbonization" of local economy, by working not only (as it is used to do) on Energy Plan, but also moving up to promote a sustainable management of building, farming, fishing, tourism and internal mobility, giving a primary role to waste collection, disposal and reuse as well as to the optimization of water procurement and distribution services, including people education to water consumption. Being Capraia an island, harbor ecology plays a fundamental and central role in this perspective. Capraia harbor is not only meant to be a logistic structure for inhabitants, visitors and goods, both also a sort of visiting card toward the outer world. It is also a key point in the revival of rugged Capraia rural attitude. Island territory is featured by a landscape consisting of beautiful terraces facing the sea.

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The model consists of different themes synergically analyzed and built; all of them are dealt with according to the three pillars of sustainability, I.e. technical feasibility in all components of the economic, environmental and social matters. The areas identified are: Energy, Waste, Water, Farming, Sustainable Mobility, Buildings Energy Efficiency, Harbor Ecology, Fishing.

As for energy, production of energy from renewable sources and development of a software capable of assisting decision-makers, scientific community and island parties concerned (local authorities, public services, tour operators) in renewable energy production process (photovoltaic, tidal, wind and accumulation power) and improving energy efficiency in island system (including electric mobility and water production through deionization with the recovery of concentrated salt coming out of the water desalination plant) were concerned.

After having defined best scenarios, we shall proceed to the realization of the smart grid on the island to test defined model sources.

**Waste:** the waste field should be characterized by an excellent collection of paper, organic stuff, glass, metal cans, and plastics. In addition, waste oils and exhausted batteries should be considered. Door-to-door collection should be organized; tourists and seamen should be aware of the importance of a good differential waste collection. Plastic, glass, cans and exhausted batteries shall be compacted after collection and shipped by sea to the continent, while the production of bioenergy (biogas) shall be started from organic stuff. From the digestate product from biogas obtained only by paper collected in twigs and residues of public green areas, a soil conditioner for farming and island family gardens shall be obtained. A public spot light shall be fed by exhausted oil. Public signs and communication campaigns for a correct waste differentiation will be promoted both in winter, where island population shall not exceed 200 souls, and in summer, when peaks of 3500 people can be attained. Through environmental education on issues related to marine litter on one hand and the recourse to specific regulations on the other hand, it should be possible to reduce plastic on the island, from bottled water to dishes, while it is expected to replace it with biodegradable compostable products which will then be disposed in the biogas plant to be placed in the ecological waste collection area. As for detergents and household products, the use of plug products shall be promoted. For typical hotel disposable detergents and cosmetics, provisions shall be made for the use of containers made of bioplastics and biodegradable and compostable bioplastics. The use of products with minimum packaging shall be encouraged.

**Water:** Unfortunately, water sources are not enough to ensure water to all the citizens, especially in the summer. Too much bottled water is consumed. Provisions should be made for the installation of two "water houses" (harbor and village) delivering free fresh water, natural or sparkling to cut down the use of PET bottles. Water supply in some of the smaller islands, not connected to the mainland, has to be implemented by means of barges or tankers. This solution is featured by extremely high social expenditures (around 15 € per cubic meter) and in case of bad weather conditions it is not possible to guarantee the continuity of supply. Capraia has a reverse-osmosis desalination system. Thanks to that, costs are considerably reduced (approximately 1 € per cubic meter, including depreciation), although the garrison of two components is required: energy management (every cubic meter of water requires from 2 to 3 kwh) and the environmental management, mainly related to the proper discharge of saline concentrate, which under certain conditions may cause anoxia and/or increase in salinity up to 65-70 gr/l with potential damage to the marine phanerogams. While the second aspect may be kept under control with the use of appropriate diffusers or through techniques of recovery of the salt present in the brine, the theme of energy remains the hard point. The model consisting of desalination + renewable energy is a sustainable one. The model consists of integrating water desalination plant with sources of renewable electricity, getting a sustainable management of the saline concentrate discharged into the sea by using these salts in biological cleaning products. Another question is waste water coming out of the sewer system. Purification of such waste should be promoted to get water for irrigation and avoid the losing of a resource.

**Agriculture:** it is clear that such an important goal like getting a smart integrated island should be started from the farming system, not as a picture but as a primary productive structure for every future development and especially for an island. The development of organic farming is already consolidated. An island according to the model "Capraia" shall be a laboratory for the safeguard of biodiversity, which is present at natural level, in endemic species and officinal plants, but also a type of sustainable agriculture, going over to biological farming as a model of agricultural ecology.



The agricultural management is very delicate because of climate change, the erosive processes are intense and terracing has to be maintained and recovered, because it has been partially destroyed. The decarbonization of the island where special attention is given to the increase of the organic carbon in the soil is a key point, but also the management of all organic resources that can derive from a farming process or by an energy management process, such as compost or digestate, should be considered. An essential point is training farmers, who should understand that what they have under their feet has a value equal to that of the carbon stocks, thus they should work to increase it.

**Sustainable mobility:** the use of electric public bus, the bike sharing (both city bicycles and mountain bike) should be promoted. The same applies to boats powered by electric motors, and boat sharing. There are several charging stations located throughout the island.

**Energy efficiency in buildings:** in Italy, smaller islands not interconnected with the mother land are covered by a legislation that facilitates the installation of technologies for energy efficiency in buildings. It also proposes an increased efficiency for all public buildings.

**Ecological harbor and fishing:** Capraia harbor should constitute a sort of visiting card of the island. Boats on the docks represent a great opportunity for island economy, but also in this case it is necessary to study a greater sustainability for the harbor management. Issues such as the importance of differential waste collection and the inappropriate use of drinking water should be explained to sailors and yacht people and applicable regulations should be enforced. It should be envisaged to provide a line of non-potable water, coming from the purification of waste water for boat washing. As for fishing, it is already restricted and sustainable, given the rules imposed in the protected marine area around the island. It should be necessary to work on consumer information to push the purchase of less known but more sustainable species and reduce the environmental impact of the catch. Moreover, the project aims to create a certificate of guarantee for local fish in the spirit of short production chains, seasonality, compliance with the rules and the exploitation of the economy of the territory. A fisherman cooperative who fosters fish with the rules of organic farming and represents an acknowledged Italian excellence is already working on the island. The project provides for the replacement of existing expanded polystyrene fish containers with other makes of polylactic acid (PLA) foam. Expanded bioplastics with PLA matrix are renewable and biodegradable-compostable items.

## Conclusion

Proposals made constitute the trial version of a bottom-up" project, which was born from the population of Capraia and by a group of experts who have accepted the challenge. First projects were drafted, we are promoting the participation through the collection of European funding on energy, water and smart grid. Soon other projects on waste and renewable energy shall be promoted. The agricultural component is in the study phase. In May 2018 there will be a second meeting on the island to make the point on the work in progress. On that occasion, we could try to set down the ideas for a pilot project constituting the "Manifesto of bioeconomy in a smart island of the European Noon".

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