

THE SCIENCE PAPER...

I.I.S.S. BOSELLI — Special Edition— October 2010

In this edition:

Intercultural Project

“Common Goods and Peace”

This Comenius project, called “Common Goods and Peace”, is about the treasures of our land, that are common to all its inhabitants and are shared, unfortunately not always in a fair and right way.

Wind, water, the sun, clean air, woods and land belong to everybody and they should be maintained in good condition as long as possible for the future generations.

Men have been using dangerous energy for a long time and they menace the humans' health.

In our school journal, we are going to illustrate the causes and effects of “bad energy” and the hope for the use of renewable power in the future.

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Liguria is full of energy

We hope it will get cleaner and cleaner



In Savona there are some electricity supply companies (ENI; AEEG..) but the most important is certainly Enel, that provides, electricity and natural gas to more than 61 million people, in 23 different countries. Enel produces energy through plants that use 2% of renewable energy and 98% of non-renewable energy. Liguria has climatic and territorial conditions which are favourable to make it at the best position about the exploitation of renewable energy sources. At three kilometers from Savona, there is a thermoelectric plant: Tirreno Power, one of the most important electricity producers in Italy.

The energy plant is powered by natural gas and coal and even if it uses new technology systems of environment protection, it causes environmental damages in our area.

Its impact is highly dangerous not only for the environment but also for people; apart from the damages caused by the logging of woods to take room for the energy plant, there is an emission of waste in the atmosphere coming from the chemicals of the cooling water plant that severely endanger the flora and the fauna of our the territory, determining an imbalance in the ecology of air and water.

The most polluting agents are:

Emissions of fine (about 6500 tonnes per year of carcinogenic and cardio toxic dust);

nitrogen oxides (4500 tons per year);

sulfur oxides (5900 tons per year);

Carbon dioxide (7,5 million tones per year).

There is a project to expand the energy plant, but

every expansion is a criminal act against the survival of life in our area and consequently on the Planet.

Coal represents the first world threat, because during combustion it produces big amounts of CO₂ and of GHG that determine an increase of medium temperature in our country and it is responsible for climate changes. These dusts produced by the chimneys of the plant aren't completely absorbed by its filters and fall into the low layers of the air causing respiratory and nervous diseases, because they are absorbed directly by lungs, especially in children. In women on menopause, the mortality due to cardiovascular causes and ictus is increased up to 83%; instead in men, lung cancer hits 33% more than in the rest of the province.

The percentage of chronic respiratory diseases has also increased (150% more than other region provinces). Its now certain that pollution values increase enormously near the energy plants that burn coal. To solve this type of problem we are trying to pass to the production of clean energy, that is renewable energy. Speaking of renewable energy sources, in our region hydropower is especially exploited through hydroelectric plants distributed on the Apennines mountains on the borders of Liguria and low Piemonte and Emilia Romagna. It is a group of 16 plants, most of them fed by reservoirs obtained from dams (the average annual energy produced is 200.000.000 kW/h).

Among the Italian regions, Liguria is at the 19th place for the production of hydropower.

Moreover, in these recent years new projects for the use of photovoltaic energy have been developed, such as the one in Albenga, a town near Savona; in the province of

Savona a particular greenhouse is also being experienced, heated and lit by solar energy through photovoltaic panels.

Photovoltaic is the technology that allows you to use solar energy, converting it into electricity.

The photovoltaic system respects the environment and our health, it is a clean and renewable resource, essential to life on earth, it does not pollute and it is not harmful, it decreases the weight of electricity bills and improves the quality of life.

Every year in Liguria there are about 1600 hours of sunshine, meaning that this type of energy source could be much more used and exploited.

It's calculated that using photovoltaic energy it is possible to prevent significant emissions of CO₂ in the atmosphere.

Currently, with the funds coming from the European Community, the use of photovoltaic panels is spreading into private houses, various public buildings, industries and illumination of public roads. In the port of Savona, on the roof of the terminal cruises building, some photovoltaic panels have been positioned towards the south, with an annual translation of electric power estimated in 130 MV, corresponding to 1/5 of the annual requirements of the building. Also on the roof of our school building, 86 photovoltaic panels have been set, on a surface of 500 squared metres, that supply enough electric power to the requirements of the institute, as a good example for students and their families that it is possible to produce clean energy.

Another renewable very exploited source is wind energy, since the watershed of the Ligurian Apennine and the western Alps are very windy zones. Unfortunately, the use of wind energy is only the 0,65% of the total energy production and so it has a small importance in the electricity balance; this fact is not provoked by lack of people's interest, or by lack of wind, but by the absence of sensibility towards the safeguard of the environment by Italian government. The wind factory, in the

Liguria small town of Stella, has been one of most innovative in Italy since the last ten years for the protection of environment and consequently, for the enhancement of the land; it's located at about 20 kilometres from the sea in Savona hinterland at 600 meters from the sea level, it has an extension of 3ha and it produces about 6000 MW a year.

Wind energy has the advantage of not producing any kind of pollution, but it has some negative aspects: the visual impact, the noise pollution that causes disease to people that live nearby and the damages provoked to birds and bats that fly near the blades.

It is important to build wind plants far from migratory routes or if there are protected species of birds living nearby. Varese Ligure, a small country situated on the Apennines between la Spezia and Parma, is the first place in Europe where cattle are fed only with organically produced food and electricity is supplied by two wind turbines. The quantity of energy generated by plants in Varese Ligure (capable of producing 4000 KW for year) exceeds by far the needs of the small town, and it is thus partly sold to a national network in exchange for environmental services.

This wind factory gives the opportunity to save tons of fuel (coal, oil and natural gas), it prevents the formation in the air of about 8000 tons of Co₂ every year.

A new perspective of alternative energy, still under experiment in our region, consists in the use of green biomasses, of forest origin, considering the big quantity of wood which is available.

The conservation of natural environment is so the main objective to be reached by defending the habitats present on the territory.

We hope that in future we' ll have a Liguria full of clean energy!

The Tirreno Power

The Tirreno Power is a power plant located in many areas of Italy, including the town of Vado Ligure. Its work is linked to the combustion gas (consisting of combined cycle unit of 800 MW in size, which uses two gas turbines powered exclusively by natural gas) and coal (coal-fired and two units of 330 MW each), while once it was worked by fuel oil and coal.

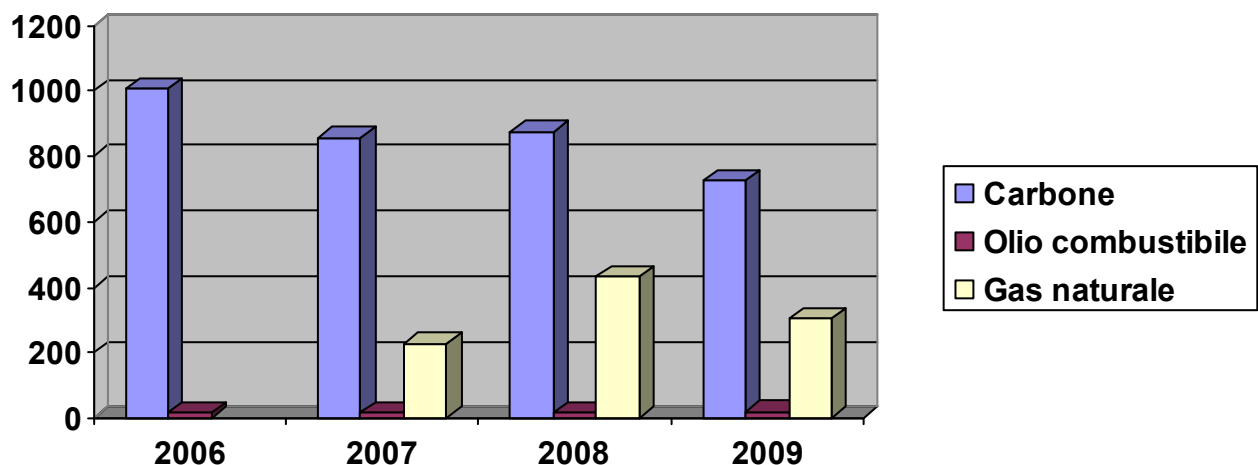
The waste inevitably pollutes the environment and especially the air through two exhaust stacks. Because of the problems that fine particles emanate from the facility many health problems were reported, especially to people living in Vado and at a distance of 50 km and the damage can be observed even in the reality. In fact, the Tirreno Power building is low, especially in the creek near the sea, it uses hot water, and throws out many chemicals that seriously harm the ecosystem. Moreover are emitted into the air gases such as nitrogen oxides or sulfur dioxide, which cause significant harm to the atmosphere and, as it has been demonstrated and studied, even death.

It was found that pollution from coal-fired plants produces more diseases and deaths. And the number of people with cancers on the vocal cords, lungs, bladder and other vascular diseases, is increasing as a person gets close to one of these



plant s .
It is ares 36.5 billion euro a year.
Becoming aware of the serious problems it creates, the Tirreno Power has already launched a rennovation to improve drainage and to emit fewer pollutants.
The result was:

- Re-use and upgrading of existing production sites
 - Use of natural gas and coal as fuels
 - Achieving high levels of efficiency, up to 57%, through the adoption of advanced technologies
 - Significant reduction of air emissions
- Reduction of generalized SO₂, NOX and dust
 - Improving efficiency
 - Improving the visual impact
 - Dissemination of a strong environmental awareness in all staff.



Tirreno Power

Our health in danger..



Scientific data indicate that pollution from the Tirreno Power of Savona, is highly toxic and causes serious damage to health. According to the Scientific reference, in the province data get worse as we approach the energy plant, with a great variety of cancers and other vascular diseases, dramatically increasing the national average.

Please note that in the province of Savona in 16 years about 2.664 people have died more than we expected.

The collected data say that we have in our area of Savona pollution values among the highest in Italy, as we are near the coal power plants.

Scientific studies prove that cancer and childhood leukaemia are strongly correlated with high levels of emissions from combustion processes. Children, moreover, are exposed to the risk of significant harm to the development of their brain and their physical, and so they are the most exposed to pollution and the electrostatic precipitators that are responsible for respiratory pathologies.

In women in menopause mortality has increased considerably (from 76% to 83%).

In men, lung cancer is much higher than in the rest of the Province, while for respiratory pathology data go to 150% more than other parts of the Region.

Ester Hoxha

..our environment in danger

Tirreno Power, the company which wants to expand the coal plant in Savona, goes against all logic and democratic debates, after 40 years of environmental data in dramatic terms of mortality and pollution in our city. It's a battle of civilization, and for life.



The causes of environmental damage

Coal is the first threat to the balance of global climate. More than one third of global CO2 emissions is due to the use of coal, that is the fossil fuel with higher specific emissions of greenhouse gases.

If the growth rates of fossil emissions increase dramatically, we will have no ability to limit environmental damage.

We should leave our dependence on this fossil fuel as soon as possible.

Nowadays emissions have increased of 10% and government with its commitments, continues to allow new coal plants: for example the new Enel plant in Civitavecchia and the expansion of the one in Vado Ligure, near Savona.

Pollution of the cities

While we use the Kyoto protocol, the agreement that should limit the emissions of gases that cause the "greenhouse effect", cities are choking under the smoke of traffic. This situation, is sufficient to remind the question of the "car culture". Why don't governments invest in public transport, which will also do some good to the wallet of people who travel to work?

Ester Hoxha e Chiara Genta

Liguria is full of energy

Liguria region (especially the plain of the west) presents climatic and territorial conditions particularly favourable that make her an ideal place to exploit solar radiation, but it is at the last position for the number of plants that will become operative in 2008.

In the recent years in our region there has been an increase of home automation plants, or electric intelligent plants that make home a singular place for comfort, safety and wellness. With a home automation plant it is possible to merge the various systems of a house, exploiting everything fully. Through it you can also have the following advantages:

- Improve the quality of life;
- Improve safety;
- Save energy;
- Simplify the design, installation, maintenance and use of technology;
- Reduce operating costs;
- Convert the old environment and old plants.

The energy policy of Liguria is a central question to realize a sustainable land development. The energy choices affect at various levels all human activities and determine in large measure the impact of these natural resources.

The renewable source mostly used today is hydroelectric energy, but the one which has the most perspectives of development is formed by green biomass from forests. The conservation of natural environments is then a priority objective that is possible to achieve.

Patrone, Brondo e Calcagno

The Photovoltaic

The Province of Savona has created various plants using different renewable energy, among which the photovoltaic one. An example is represented by the plant of Albenga, a town near Savona, where a photovoltaic greenhouse is being experienced, that covers a surface of 400 squared metres, in which the modules have been integrated in the structure of the greenhouses. The plan will last 24 months and it will be accompanied by a study that will check and estimate the production of various cultivations diffused in the Mediterranean that will be grown under the greenhouses. Besides this plant, another one has been put into effect on the roof of the Terminal Cruise of Savona, where have been installed some solar panels to the cost of 550.000 €. The annual production of electric power of the system is estimated in 130 MW, equal to approximately 1/5 of the annual requirements of the terminal. With time the cost of installation of the photovoltaic panels has been lowered remarkably; in fact at present the installation of a solar panel is on average up to 6,500 € while only 28 years ago, it would have been about 30.000,€.

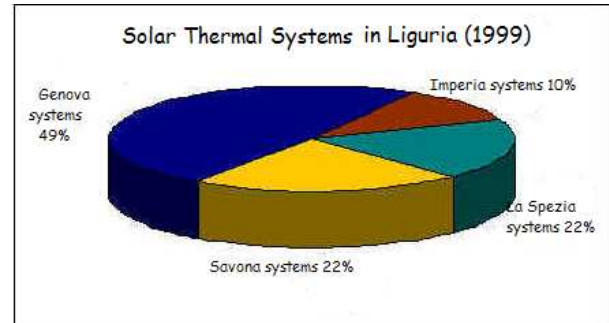
Amore Desirè, Marta Piombo e
Zeneli Arilda



The Photovoltaic in Liguria

Photovoltaic is a device that converts solar energy into electricity by using the properties of certain materials to produce electricity when irradiated by sunlight.

Sunlight is converted into direct current, passing through devices called “balance of system” and converted into alternating current through a system of “inverter”. The Region has recently joined the ministerial programme called "monocrystalline photovoltaic roofs" that is attracting a remarkable interest, taking into account that in 1999 in Liguria two projects had been organized, that would boost production of solar and photovoltaic energy. The announcement of 15 permissions to set photovoltaic solar systems, for a capacity of 66.5 KW and the cooperation with ENEL, has led to the connection of the first plants to the electricity grid in Liguria with an exchange contract with private companies.

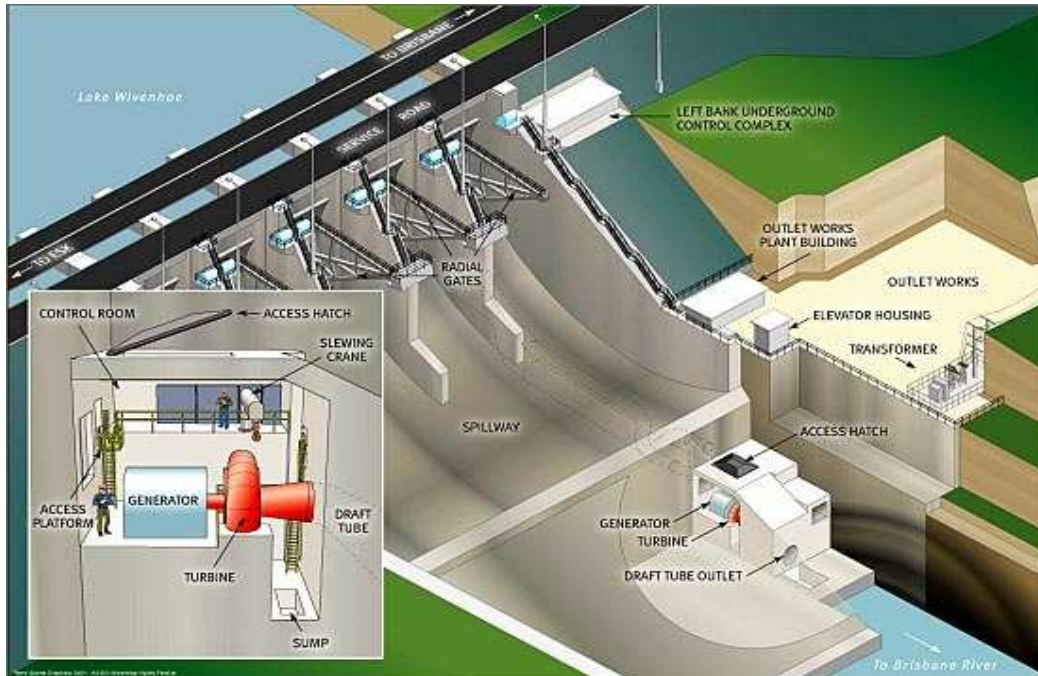


The graph shows the breakdown of solar thermal systems carried out under this contract province by province.

Andrea Jitaru, Elisa Briasco
e Silvia Giacobbe



Hydroelectric plant



There are many difficulties to obtain the authorization for hydroelectric power plants, as hydroelectric potential is very limited due to scarcity of rivers. Osiglia differs from the other countries of Val Bormida for its forests, its unspoiled nature, but especially for the waters of the lake. Water is a “goods” of the planet and for our small country a v e r y i m p o r t a n t a d d e d v a l u e . The original purpose was to regulate the plant annually between the energy of the underlying hydro Lombard Steel and Iron on Bormida Falck and provide water for the industrial companies in Bragno:Montecatini company, for example, during the summer. Today the plant is used for hydroelectric purposes by the operator Tirreno Power SpA The waters are contained in the river Bormida bed, only to be caught and brought to Millesimo in t h e p l a n t s o f C a i r o M o n t e n o t t e . In addition, the theme of energy production from renewable sources, has been of great importance, not just today, but for a long time and it is really urgent. Italy. The ability to store the energy possessed by water in the final section of the pipeline under pressure belongs to this systems aa well as to others. The mini-hydro is a low installed power, which involves the use of structures much smaller than a normal dam, much safer, thanks to the lower volume of water in the basin, and that also have a low environmental impact on landscape. For this reason it is more applicable than other plants. The micro-hydro is a term used for hydroelectric plants that typically produce up to 100 kw of power. These installations can provide energy to isolated places as well as in housing or related communities connected to the electricity network. Micro hydro systems can be complementary to solar photovoltaic systems, because in many areas, the flow of water, and then the power available in water, is highest in winter, when solar energy is the minimum.

Chiara Briano e Sara Laviola

Hydroelectric plants in Liguria

The hydroelectric nucleus of Genova is formed by the main Ligurian hydroelectric installations and by the ones present on the regional watersheds with Piemonte and Emilia Romagna: it is a complex of 16 plants, most of which are fed by reservoirs obtained from dams (11 in total). The total power is 63.000 kW and the average annual energy output is 200.000.000 kW/h.

The production of electricity is characteristic of plants on the Apennine watercourses, that record the best performance during autumn and spring; exceptions are installations on the river Roja which originates from the Maritime Alps and in summer it keeps a good flow; moreover, all the installations of the nucleus are automated and conducted by radio.

Luca Manzino e Daniel Wojcikowski

Plants	Dams
Airole (IM)	Osiglietta (SV)
Bevera (IM)	Millesimo (SV)
Argentina (IM)	Piana Crixia (SV)
Millesimo (SV)	Valla (AL)
Cairo (SV)	Ortiglieto (AL)
Spigno (AL)	Giacopiane (GE)
Molare (AL)	Pian Sapeio (GE)
Pescia (GE)	Zolezzi (GE)
Lago (GE)	Malanotte (GE)
Caroso (GE)	S. Maria del Taro (PR)
S. Michele (GE)	S. Margherita Vara (SP)
Borzonasca (GE)	
Tigliolo (GE)	
Chiesuola (GE)	
Strinabecco (PR)	
Vizzà (SP)	



Wind turbines in Finale Ligure



The wind turbines of Pian dei Corsi, above Finale Ligure, are in the area of the former NATO military base at 1050 m height. They have been active since March 2002 and have a wind generator of 800 kw. Considering the success of the system over the time, it has been expanded with 2 more identical generators that started to operate in 2004. In total these plants produce enough energy to power about 2,000 families. Each blade is about 50 metres from the ground. The production of energy through wind farms leads to enormous savings in CO2 emission, which is the main cause of the greenhouse effect, reduces the dependence of Italy on foreign energy. But it presents also a defect: energy production depends on the amount of wind and that is difficult to predict. There are other wind farms in Liguria, Albenga, for example, La Spezia and Sassello. In total there are 33.

For reasons of safety and efficiency, wind generators can only operate under certain wind conditions, then, wind energy is produced intermittently, and therefore it is not programmable, it can not replace completely traditional sources of energy: such as fossil fuels or hydropower. The modern facilities for their large size are visible from great distances and can create a bad visual impact on the landscape.

The mortality risk for migratory birds is certainly realistic. The sound of a wind turbine, according to some studies, could provoke in residents of homes nearby the so-called "wind turbine syndrome," a set of neurological disorders in the background.



Elena Ganduglia, Sirine Haj Sassi
e Clara Bagat

Wind farm “Cinque Stelle”

The small town of Stella is located on the Ligurian Apennines; here there is the wind farm “5 Stelle” at a distance of about 20 kilometres from the sea. The area interested by the plant is developed in 400 m and it has 3 hectares extension, it is a 600 metres high on the sea level: only 20 squared kilometres of this area will host the structure of the plant, while the remaining part will be unchanged in her shape and destination.



The environmental impact of the wind farm

These wind generators are studied not to disturb the nearer

houses; in fact at 500 metres distance, where we live, we don't hear the blades rotation. The expert has designated this zone before the building of the plant because of the constant wind, and also considering the visual impact. Wind energy has the advantages not to produce any kind of pollution, except for a little quantity provoked by the building of the turbines.

The impact of the machines against birds and bats is one of hardest themes of this kind of plant. There

are many studies about this matter, but the results are different and contrasting according to the country where they are conducted. It's really important to know if the place chosen for the wind farm is located in a migratory route or if in the neighbourhood live protect species of bats or birds. About that, the experts are doing a monitoring on the place, and it seems that animals (especially birds) are able to avoid the turbines eve 200 metres before.

The monitoring of FERA has confirmed the bad interest of the birds in the area. Instruments such as the bat detector are used to detect the presence of bats and their hunting strategies.

Thanks to the data collected, it will be possible to give a quantity of the real impact of little plants.



Alberto Remus e Manuele Deidda

Energetic production

The energetic production is 6000 MW/a year, equal to the energy needs of about 3000 inhabitants, which is the number of inhabitants in the town. Now the every generator produces 800 kW, and in 2011 a new machine will be built in the wind farm.

Machine height	50 metres
Diameter rotor	48 metres
Machine weight	96 tons
Establishment	130 m ³
Establishment diameter	13,2 metres
Establishment deep	ca. 2 metres
Speed of rotation of the blades	16-30 gears a minute
Speed max. wind	3 m/s
Speed min. wind	30 m/s

Wind farm in Varese Ligure

Varese Ligure, a small town in the Apennines between La Spezia and Parma, it's the first European country with an environmental certification: fields are cultivated with organic farming, cattle are fed with natural food and electricity is produced by the wind farm.

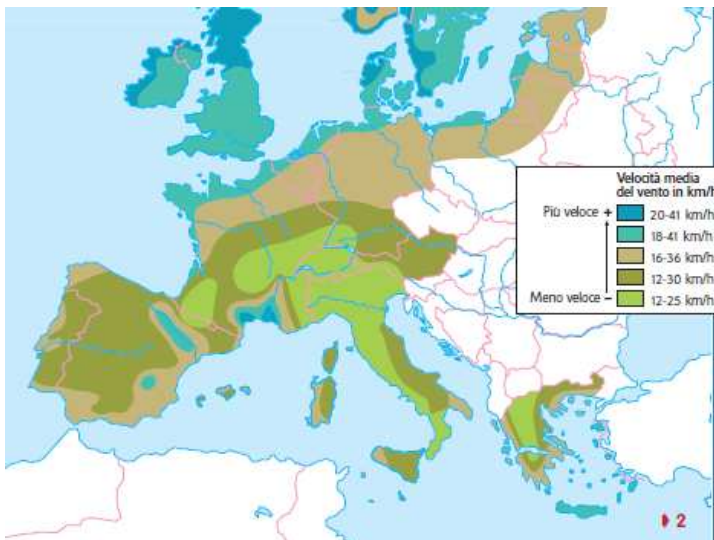
Varese Ligure, produces every year about 4000 KW of energy; this energy exceeds the requirements of the country, and some of it is given to a national network in return for environment services.

Wind farm saves tons of fuel (Coal, oil, natural gas) and it prevents the formation of CO₂ in the atmosphere. Varese Ligure wants to build two more wind turbines.

One of the prospects for alternative energy source, still under development in our region, consists of the use of green biomasses from wood, since there are a lot of forests.

The conservation of natural environments is the main objective that is possible to achieve, while defending the habitat in the area.

Angela Mazza e Giulia Restivo



The paper represents the intensity of the winds in Europe.

The wind farms are installed in an area where the wind blows at a speed of 6 meters per second.

