



report

Our stay in Denmark passed in two stages (since from here we flew to Iceland), and in two places mainly: Jutland, the area where the Folkecenter is, and Copenhagen. Two very different places. One, reserved, immersed in the rural life, and which survives by making use of nature's resources; the other, urban, more overt and where the presence of the industry is patent. Such differences seem to cause antipathy to each other. As they commented to us in Copenhagen, in the capital they are not very fond of the Jutlanders. The disparity between capital and provinces that is well known everywhere.

On this subject we think that the policy, affected by the latest international events, has something to do with this matter. In Denmark the conservative right wing, Jutland being the base of their support, won the last elections.

Concerning this, and apart from differences, on both sides, people are worried about the drift to the right that is impelling the government. Evidently, it is practicing a class and conservative policy; it is worth mentioning the presence of Danish troops in Iraq. Denmark has sent a division of its Navy to Iraqi land, and the declarations of his president are that they would not have objections in sending more soldiers.

Leaving the controversies to one side, we must say that we are pleasantly surprised with the welcome in Jutland. We needed to connect to Internet, and we stopped in a little village; where, after passing by the information bureau, they sent us to the school! Still surprised, we saw ourselves within the scholastic enclosure surrounded by children who were playing rolling on the ground... and without even asking any questions, they let us use the computers of the library next to the children.

And that was not all. In the FolkeCenter it was the same. We were warmly welcomed and given a lot of help.

Small towns and dispersed farms are scattered around the impressive landscape of these rural surroundings. Located in the west coast of the country, it receives the visit of a multitude of German tourists who go to camp sites (impeccable) along these coasts. It is a rich and fertile land and apparently they live quite comfortably here, in this peacefulness. And when we speak of European tranquillity, we mean total calm and tranquillity.

It's not surprising that most of the young people who we knew expressed their desire to go to Copenhagen to study. To leave the small towns in Jutland with two taverns for the atmosphere that is offered by the great city.

The nightlife in Jutland was peculiar. Besides the capital of the region, Åhrus, everything is small towns that have few taverns and places to go. They all know each other, which creates a very homely and private atmosphere. It goes without saying that we were considered strange within that night time atmosphere. But, for us a strange thing to see was the dance style of the villagers. To see, a couple holding hands dancing to a song of Metallica in Denmark, was incredible. If we mixed a bit of Twist and a Tango, the result would be something similar to their jutlander dance. The rhythm of the song is not the important part.

We did what the young people want to do, we left Jutland and went to Copenhagen, intending to spend a couple of days before flying towards Iceland.

After a trip of 5 hours by train we arrived at the Central Station of Copenhagen, where Maria and Balder were waiting for us. They really looked after us. Thank you very much to both of them.

Once installed, in an immigrant area, we went to look around the capital. To take a walk in this city, full of bicycles and beautiful people is our first recommendation. The lakes, birds, green spaces, sculptures, the famous "Little Mermaid"... and the famous attacks that she receives. And it is because of the latest of these attacks that we could not see the sculpture. A couple of days before our arrival in the capital the "Little Mermaid" underwent another aggression, somebody had put an explosive device under her. It is surprising but nobody looked too indignant, and it means that it is normal to have the sculpture in the "factory" for restoration, since in the last years it has undergone several attacks.

In the last attack it's not clear what happened, but we were told the tale of a previous



Caricature of the Danish Guard



Shield of Copenhagen



The famous Little Mermaid, these days in reparation



aggression. It was a photographer eager for an exclusive. He hit the sculpture hard with a hammer. Then, he took a few snapshots from the crippled siren, thus becoming the first person to obtain the photos. Also he would be the first one in being jailed, shortly after, for this cause.

Danish people like to look after their surroundings, but they have a big problem in this matter - apart from the reticence that their Government shows in these matters – and that is the proximity of a nuclear power station.

As we commented in the technical part of the report, the Danish population fought for the no implantation of nuclear energy in the country- The popular image of the sun of "Nuclear? No, thanks" is theirs and they achieved it. Nowadays there is no nuclear power station in Denmark, and what is very important: they were able not to depend on this type of energy. But a black cloud is on its horizon in the form of a nuclear power station, in Swedish land. Only 20 kilometres separate the coasts of Sweden and Denmark. From the docks of Copenhagen the Swedish coast can be seen perfectly, and unfortunately the ungraceful nuclear power station can also be seen. A situation similar to that of Basque Country with the nuclear power station of Garoña, in Burgos (Spain).

Returning to the capital, on one of our walks we paid attention to the kiosks and we realized that in the majority of publications there was a great coverage of the royal family (newspapers and sensationalist press)

We asked our friends about this and the answer was that the Queen is very popular with the Danish society.

It was during the Nazi invasion, when the Monarchy gained this good reputation. While the government and the institutions submitted to the demands of the invaders, the Danish monarchy stayed firm against the Nazi oppression. The interest that is aroused from the news, " the Queen gives her approval her son ´s new relationship, proves that the people still maintain their affection for the Monarchy gained through that resistance.

It is not surprising that Christiania was the chapter that caused most interest to us in our visit to Copenhagen, for the international fame of this district. Thanks to Balder we got to know it more closely.

This well-known free district has been alive for more than 25 years in the centre of Copenhagen.

Everything began in 1971, when a group of people occupied the abandoned territory of Grey Hall, "induced by their ideas of anarchy and love". They were interested in the possibility of enjoying green space and recreation areas for the children. Thus what nowadays is a small town within the city arose. With its own rules and organization; they are exempt from paying the local taxes; they work together to cover their necessities, they respect their surroundings, and the decisions are taken through common agreement, (not by majority) in an assembly composed of all the neighbours. These would be the distinguishing characteristics of Christiania.

The history of Christiania is full of conflicts with the authorities. The number of times the City council of Copenhagen and of the Central Government have tried to make Christiania disappear are innumerable. Prohibitions, a thousand laws, military occupation... of everything have been suffered by those that wanted and want to live their own way. Only for that reason: they don't want to pass through the mesh imposed by the authorities and their model of society.

Everything has been used against them, but above all the subject of drugs. In Christiania marijuana is legal, many stalls can be found where it can be bought. While the government maintains that it is a den of dealers, their inhabitants carry out a campaign against hard drugs. This has always been the attitude of Christiania as opposed to the harassment of the authorities: imagination; in any format: plastic music, arts...

Again they are in a state of siege by the City Council, which wants to expropriate the land of Christiania to build on. Everybody knows that it is another one of the excuses used against the existence of this district.

According to the surveys, 70% of the population of the city agree with the existence of Christiania. But, in spite of the support of people, hard times are coming to enlarge the history of Christiania.

After Copenhagen and 10 fantastic days in Iceland, we returned to the FolkeCenter, where they were keeping our van and the caravan. Although this time it would not be for continuing discovering new places, but to study all the compiled information and to put ourselves fully into the work.

Among other things this report that we are offering you here:

Fish from the North Sea



Logo of a taxi-bicycle company



Asier driving a Christiania bike



Plate of Christiania



Nuclear? No, thanks!

ekogaia project

Denmark has been without a doubt a pioneering country in terms of renewable energies at a European level.

Among all the renewable sources that they use at different levels, is the Aeolian one which is by far the one most widely used. In fact, 21% of the electrical consumption that nowadays Denmark demands is generated by these mills, which are scattered all over the country. And according to the plans anticipated by the government this contribution will be of 50% in the year 2030.

We had the opportunity to see a practical case of clean electricity local production by means of the wind in the lands of Sydthy. Here, in a region in which 12,000 people live and 75 MW of electrical energy is consumed, thanks to the 145 installed mills they get 130 MW, much more than they will use. This power surplus is sold to the national network to be distributed to other users. This way they are soon able to pay off the investment made in the installation of the mills.

Many farmers have mills connected to the network, and after covering its particular necessities, they sell the extra energy to the national network, that pays 0.09 to them E/KW/h. According to the present legislation there are two ways to be able to buy and to install a generator of this type: by means of a cooperative or being a farmer. So that most of the existing mills in Denmark are of private ownership.

At first, when Denmark began to work with the Aeolic energy, the government subsidized 30% of the cost. The subsidies were lowered as the mills increased in number and capacity, until in 1988 the aids stopped. So nowadays public aid for their installation does not exist.

Most of the Aeolic generators of this area oscillate between powers of 200-500 KW, and can produce between 500,000 and million KW/h/year, depending on its power. Therefore, if a mill of 200 KW of power costs about 180,000 euros, and considering its annual production, the average term of repayment of the initial investment comes out as 6 years. Later, all is through revenue.

You would think that, with so many windmills in such a small country as Denmark, the landscape would be disfigured. It is true that there are a multitude of mills of all types and colours, but at no moment did they gave us the sensation of being "extra natural" elements in these surroundings. In fact, they are usually well integrated into the landscape, without negative consequences. Moreover, in some cases they have given a special aspect to those places in which they have been placed, for example the famous mills in a row along the coast of Copenhagen, so often portrayed in the postcards.

You will be able to find more information on this and other subjects about Aeolic energy in www.windpower.org, a very well worked website that you will find very pleasant and didactic.

But in addition to the wind it is not difficult to see the use of other power sources, for example, taking a walk in the streets of Copenhagen, we verified by the multitude of dishes installed on balconies and facades of the buildings, the fact that solar energy is quite popular.

Nowadays Denmark is the only country in the world that has created an association for the development of the energy of waves at an individual level.

- **FolkeCenter for Renewable Energies (www.folkecenter.dk)**

The FolkeCenter (house for the people) has been one of the main reasons for coming to Denmark. During the last few days we have had the opportunity there to meet people of diverse places who work in different areas of renewable energy. Among them the president of the world-wide association of Aeolian energy (WWEA) Preben Maegaard, as well as his homonym in the Wave Energy Association, Stig Vindelav.

Regarding learning, without a doubt the days spent in the centre have been the most productive ones of the trip. Wave energy, Aeolian energy, solar power, biogas, biomass, the varied uses of the pure plant oil, bio construction, solutions for residual waters... it is incredible what it is possible to see and to learn in the facilities of the FolkeCenter.

The centre has been invaluable to us in making contacts. We met Ibrahim Togola, for example, the person in charge of the Mali FolkeCenter, who after a pleasant exhibition of



Solar panels in the garden



Renewable energies in danish



The famous windmills in a row, in the sea



Folkecenter logotype

the activities of their centre, invited us to collaborate with them in the future. It is not surprising then, that the work of the Folkecenter, which appeals to many people from all over the world who wish to learn and to widen their knowledge of the Renewable ones, is an advantage because of its vast experience.

The folkecenter, is an independent non-profit making institution, managed by a Board. Funding is from the Danish Government plus project funding. It has 3.000 square metres including offices, workshops, exhibitions, training centre, etc. 8 hectares of land, 10 different windmills, 12 solar cell plants. 10 solar heating plants; hydrogen plant; plant oil for transport; 4 green wastewater treatment plants; dike pond system; cars running on plant oil or hydrogen produced from wind energy. Test site for wave energy machines. Exhibition of 40 windmill blades up to 31 meters. And special buildings: Plus Energy House, Bio dome, Underground House, Straw Bale House and Solar Barn. In order to maintain all this, they have about 20 workers and 15 trainees. With a clear objective: the experimentation, study and development of the renewable energies and its spreading, give great importance to the development at a local level, which is the reason why they are pleased to work with small and medium groups.

Folkecenter works on four major fronts:

- Development and implementation of renewable energy systems: small-scale wind power innovation and design; advanced generator construction; CO2 neutral transportation with hydrogen and plant oil; solar architecture and integration of solar cells in buildings; wave energy testing.
- As consultants to manufacturers, local consumer groups, and relevant initiators within renewable energy.
- Disseminating information on renewable energy in Denmark and elsewhere, to trainees, concerned citizen groups; and political decision makers focusing on decentralized solutions.
- The Village for Green Research, where Folkecenter is situated, demonstrates practical examples of integration of several energy solutions, solar housing, water recycling system, etc. as an experimental and functional example of a future ecological society.

We really wish to thank them for the tremendous welcome and hospitality we received, for the possibility that we had to use facilities that were essential to us for work, and, to thank Jane, Niels, Raghavan, Preben, Stig, Ibrahim, and all the rest, for the wisdom that they have shared with us. To all of them, thank you very much.

***Except for the part of the bio construction in Copenhagen, all the following experiences have been guided and/or recommended by the people in charge of the FolkeCenter.

• **TVINDKRAFT windmill (www.tvindkraft.dk)**

Nowadays, of its size, it is the oldest Aeolian generator in operation in the world. They have spent 28 years since in 1975 the idea of constructing the generator was born amongst a group of teachers of the Tvind School. With the construction of an Aeolian generator that produced clean energy and that would end up becoming the standard of its fight; they wanted to put the practical counterpoint to a form of energy generation that they considered a threat to nature, such as the nuclear one. In those years Denmark was submerged in a great controversy because of the intention of its government to install one that would be its first nuclear power station. They had two objectives; on the one hand to cover the necessities of the school and their surroundings with ecological energy and on the other hand, to demonstrate to the world that clean and productive ways exist to obtain energy instead of the nuclear one.

So that, with the aid of students and volunteers, the work began. Time went by and the project was gaining fame and hundreds of people volunteered their help. It is estimated that around 100,000 people interested in this extraordinary project, got to visit the place during its construction.

Thus, after two years of arduous work of hundreds of volunteers, they were able to raise the one that in its day would be the greatest Aeolian generator in the world, a windmill of 54 meters. But their great deed did not finish there, since with its participation in the debate against the nuclear power plants they achieved an agreement that no power station of this type would be allowed in Denmark. Nowadays Denmark is a country that does not have nuclear power stations.



Jane, one of the persons in charge of Folkecenter



Solar power car of the Folkecenter



A member of Mali Folkecenter, installing a solar panel



World Wind Energy Association logo



Tvindkraft, the oldest windmill working

Teachers totally financed the project, with a cost around a million euros. In spite of being finished by the year 1977 it would not be put into operation until 1978. This mill generates 900 KW of electrical power that is used for the consumption of all the school's facilities; the remaining energy is sold to cover other economic necessities.

It is fantastic and surprising to verify how by means of communitarian work, known so well in our land, and with the voluntary aid of people, the construction of a nuclear power station could be avoided using an ecological system that still today supplies power- and economically - to the whole school complex. It is necessary to say that the initial investment has been more than repaid. Therefore, in addition to being a system which respects the environment, it had, and has, a way of covering its economic necessities that still lasts.

An absolutely excellent example.

- **Wave Energy. Wave Dragon (www.wavedragon.dk)**

The Wave Dragon is an invention that produces electrical energy from the waves of the sea located just 5 minutes from the FolkeCenter. This construction, which in its totality reaches 250 meters, is composed of two wings or arms of 126 meters that channel the force of the waves towards the central body, constructed in steel of 8 mm of thickness; weighs more than 150 tons, to which there are added other 87 tons of weight from the water and thus to obtain the ideal weight so that the platform can work.

In spite of the impressiveness, it works very simply. The waves are directed towards the central body by means of the arms of the platform, the gathered water will rotate the installed turbines. It is the rotation of the turbines that generates the electricity. The location of the plant, its size and its capacity will depend on the circumstances and the force of the waves in each place.

The people in charge of this installation have a connection to Internet that allows them at any time to consult the production and the statistics, for the complete following of the work of this prototype.

The Wave Dragon is the project most subsidised by the government, within its policy of support to the emergent Wave energy, to the detriment of the aids to the Aeolian energy, which is much more developed. New projects are being promoted from here with the support of the Danish authorities.

- **A farm that uses its own biogas**

Although it seems incredible, all the energy consumed in the form of electricity, heating, including installation for the land, comes from pig manure (that creates so many problems in our soils), by means of a system of recycling based on biogas.

It is a very simple system. Manure is stored in a silo specifically prepared, and is dried there, approximately 3 weeks. During the drying, the biogas has a tendency to rise, then it is transferred by pipes installed in the ceiling and comes off the silo, towards the places where it will be stored and used. The process also produces dry manure, that is stored to use as fertilizers. As you can see everything is exploited, nothing is left unused.

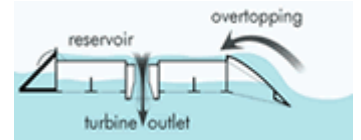
Biogas can cover without any problem all the necessities for which nowadays we use "natural gas".

On the journey to this farm we visited another potential example of biogas. In concrete two generators of electricity and 750 hot water of KW/h each one. Although today they work by means of natural gas, they will be fed with biogas in the near future. It's a complex and impeccable infrastructure of constructed canalisation to be able to provide the hot water to the dispersed 270 houses of the area.

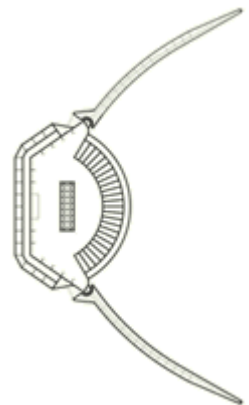
- **PPO(Pure Plant Oil), the utilities of the vegetal oil. (www.folkecenter.dk/plant-oil/)**



Parts of the windmills, of Vestas factory



Operation of Wave energy



Plan of Wave Dragon



One of the turbines of the Wave Dragon



Installin the PPO kit in a car

The power cycle of the PPO is the following one:
 After harvesting (sunflower, rapeseed, jathropa...) the seeds are pressed; also seaweed can be used. From the pressed seed, oil and cake are obtained. This last one is used as food for the animals or as installation depending on the used plant. Once filtered, the obtained oil is, normally suitable for human consumption. This oil can be used as fuel for heating, and in all types of transport vehicles, cars or trains, tractors and boats, once a simple kit has been installed in its engine.

Advantages of using vegetal oil as fuel:

- The higher the degree of bio fuels produced in Europe, the higher the independence.
- Damage price fluctuations can be avoided in the future.
- Agriculture can have an important role as energy supplier.
- CO2 emissions are the equivalent to ones which the same plants consume that is to say, are compensated.
- It is a well developed technology and available on the market today.
- Can be stored in any place more than a year; will not deteriorate. No danger of fire.
- As the system is dual, it is possible to use any diesel, oil or its mixture in the engine.
- It is economic and up to date (diesel) can be used in any car.
- The vehicle does not lose significant power.
- It can be used in feeding.
- With a small investment, and great facility in handling, a local production is obtained.
- Quieter motors with the same consumption as the diesel engine.



Elsbett, inventor of the kit to run with plant oil



Jens Bøgild, on his farm where he produces pure plant oil

Nowadays the vegetal oil used as fuel for transport is not subsidized. What's more, it's charged with taxes that increase considerably its price . This affects the consumers who use vegetal oil as fuel, who are awaiting the reform of the legislation of the EU in this matter, since supposedly this tax will disappear.

However, the use of this oil for heating does not pay taxes. So that it is this last option that is most used in Denmark as far as the consumption of this fuel. We verified it on Jens Builders farm, which produces a great amount of oil and fodder. He uses the oil for the heating but not for his vehicles; as he has to pay taxes to use it, it's cheaper to buy diesel oil; so that he sells most of the product, for example to the FolkeCenter.



Mussels, so appreciated, in the fish shop

• **Eco-village, Hjortshoj (www.eco-village.dk)**

The eco-village in Hjortshoj was established in 1986. It has developed from a 10-family-home society to one with 76 private houses today (and one common one), and is looking for 100 more in the near future. Before the building started hundreds of people were interested in this idea, but only a few families took the initiative and built the first houses. They used clay and recycled paper (for insulation) to construct the buildings. They intensely discussed what kind of energy to use to make it as environmentally friendly as possible. So they decided to build the local heating system, which uses wood. They use fast-growing willow trees on a plot that is also used to purify the grey waters from the village.



With the shells of the mussels, they obtain a natural insulator

Actually, they introduced almost everything "green", which is possible: use of rainwater, dry toilets, solar architecture patterns, wood as one of the main building materials, and waste-recycling systems.

Today almost everything works well, but many of their objectives have yet to be reached. When fully-established, the community will consist of about 500 people on an area large enough to ensure self-sufficiency.

• **Logik & Co bio-construction cooperative (www.logikogco.dk)**

Balder has been working in bio-construction for 20 years. He has developed his work in

different coops and actually he is member of the cooperative Logik&Co

-- -Cooperatives and bio -construction. What they are, how they work.

In the cooperatives the workers have the production means, and together (in community) they are looking for a way to make and to distribute the work.

In bio-construction, it is constructed so that the house needs as few resources as possible, in shape of heating, electricity and water, and emits the minimum possible residues . When they are chosen, the construction equipments are picked which implies less cost of energy, its life span and the possibility of recycling .

--*Application of renewable energies in bio-construction*

It is a natural part of the bio-construction, its base.

--*Your stay in Christiania. Summarize your vision of Christiania*

Christiania was the dream of being able to make something different and to create a better world. But it has not been fulfilled, because the world that is around it has not wanted it. But Christiania contains thousands of possibilities and many small dreams have won. To be as it is , Christiania is more than anything a great contrast.



Finnish oven, in a house the Eco-village



Info: info@ekogaia.net Webmaster: axier@ekogaia.net