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SWOT Analysis and Case Study

Tirano Municipality

Task nbr. D2 by IREALP

2009

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Intelligent Energy

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I. THE TERRITORY

1. Geographical position

Tirano is one of the largest towns in Valtellina, the natural northern extremity of the region Lombardy. Located at the end of the flat part of Valtellina flood plain, crossed by river Adda, Tirano is in a strategic geographical position as it is an important crossroad for traffic coming from and going to Switzerland through the Poschiavina valley and the Bernina Pass, and is also a railway terminus for both Italy and Switzerland (through the well known Rhaetian Railway, included by UNESCO in 2008 in the World Heritage List).

Tirano has 9,168 inhabitants (as at 01/01/2009 – Source: municipal register and ISTAT, the State Statistics Institute) and is located 441 metres above the sea level. Tirano is 25 kilometres away from Sondrio, the Provincial capital, and about 150 km away from Milan, the regional capital.

Its territory includes the flood plain, the Rhaetian mountains and the Orobi mountains, including the interesting plateau of Trivigno, part of a site of EU relevance (SIC IT2040024 “From Mount Belvedere to Vallorda”).
2. Natural environment, climate and geomorphology

Geomorphologic configuration. It is the result of the modelling action carried out by various morphogenic agents, glacial flows in particular, which have repeatedly crossed the Adda valley giving it its typical glacial morphology with a U shaped cross section featuring aflat and wide bottom and steep slopes. Tirano is therefore located in a mountain valley environment, whose landscape in the floodplain is marked by a strong urbanisation and, to a lesser extent, apple (Cologna fan) and grapevine (Rhaetian slope, more sunny) crops.

Hydrologic configuration. The municipality of Tirano is part of the catchment area of the Adda River (that belongs to the catchment area of the Po river), stretching over a surface of 7.927 square km, 70% of which being mountain territory. The Adda river originated from the release of the Cancano dam and flows north to south; from Tirano to the Como lake the river increases in discharge due to the input of torrents from lateral valleys and for the release of a number of hydro-electric plants. In particular, the main tributaries of the Tirano area are: Roasco torrent, Saliento torrent, Poschiavino torrent, Boalzo torrent and Belviso torrent.

Rainfall. The municipality of Tirano is marked by a moderate rainfall (700 mm yearly average) thanks to the wind that from lake Como – penetrating into the valley – prevents air from condensing water vapour. This peculiarity makes Tirano a rainfall depression area. It is moreover useful to observe:

- that the maximum rainfall occurs between May and October, with a Continental coldhumid climate;
- that peaks occur between May and October, often stretching through to November, while minimum levels occur during winter;
- that, in general, during rainy periods there are 2 to 3 peaks.

The image shows Tirano, considered as a rainfall depression centre.
Temperatures

Winter 2007-2008: minimum and maximum temperatures

Estate Summer 2008: minimum and maximum temperatures
The town of Tirano, in the flood plain, is the most largely urbanised area and is mainly a residential and commercial settlement. The urban area stretches along the state road SS38 while the industrial-handicraft area is located at the junction of Adda and Poschiavino. Most cropping areas is in the strip nearer to the urban zone. At higher altitudes, crops are replaced by chestnut trees and woods. The remaining plots are occupied by pasture, that is free spaces that are essential to the development of activities linked to animal husbandry. The area near to the river is totally built within the town, while the opposite Adda banks is made of bare gravel. Although the territory of the municipality has a strong inclination towards farming and animal husbandry, the progressive industrial development of the town of Tirano and the modern outsourcing phenomena turned them into secondary activities, often even liked to leisure.
The **Rhaetian slope** of the valley is marked by a strong human presence linked to intensive farming, with a considerable terracing with dry masonry walls where registered designation of origin grapes are cropped. The ideal solar radiation and a particularly fertile land did create a very favourable condition to vine growing. Starting from the Adda river and going up between 500 and 750 m, it is easy to see the typical vineyard system of terraces with the inter row often dedicated to cereals and vegetable crops. After the terraced area there comes a slight plateau hosting the hamlet of Baruffini, surrounded both by cropped land (rye, vegetable crops and potatoes) and chestnut woods. At a further altitude, between 950 and 1800 metres, woods develop, with patches made by pasture land. A further area, the hamlet of Roncaiola, is in a situation of disuse, possibly due to the lack of an adequate road system that would allow its use as vineyard area.

The **Orobian slope** is the southern area of the municipality of Tirano, very steep and with scarce solar radiation, making it unfit for agriculture. The main land use of the soil is woods and, at higher altitudes, pasture. In the past the area was actually cropped (potatoes and rye) and used for animal husbandry (there are still many “maggengo”, the intermediate pasture areas used between winter and summer). The area nearer to Tirano was once cropped with vineyards, while now specialised crops as apple orchards prevail (stark delicious and golden delicious DOP apple varieties), although profitability is lower as compared to the Rhaetian area. At higher altitudes, chestnut woods abound, to give way to true woods, in bands: both coppice (beech, hornbeam, birch, alder and durmast) at lower altitudes and resin (larch, fir and pine) higher up. The Orobian area is marked by the presence of many torrential water courses flowing along the slope in small valleys that they themselves dig.

This slopes hosts the site of EU relevance “From Mount Belvedere to Vallorda” (SIC IT2040024).

## 4. Natural resources available for energy and their impact on the environment

**Wood.** Wood is the most important resource for Tirano in terms of biomass. Wood is an neutral energy vector as far as CO2 is concerned, as when dissolved it does not produce more CO2 than the quantity taken by plants from the atmosphere during their growth. The use of wood for energy therefore has a neutral balance in terms of CO2, provided that the quantity of biomass used is lower than the quantity that grows. Wood produced may therefore, in a climate protection framework, replace a part of oil and
gas used for heating. This choice, in the short and medium run, appears as technically and economically viable although the combustion of wood in traditional heating plants (without expensive filters) does produce an increase of atmospheric pollutants (mainly fine particles and nitrogen oxide).

Firewood is moreover not an unlimited resource, it is therefore desirable to obtain a maximum energy return, without further damage to the environment. In this respect, it would be interesting to start wood gasification procedures, turning it into synthetic natural gas (SNG) as already done in Switzerland and Austria.

![Diagram of wood to SNG conversion]

The main steps of the transformation of wood into SNG.

Synthetic natural gas preserves 60% of the caloric power of wood, the rest is lost in form of thermal heat which can partially be recovered as internal industrial heating or to produce electricity with steam turbines.

The experience of the collective heating plant in Tirano with the use of wood splinters coming from the woods, highlighted that the rural world of forest owners is very fragmented and marked by a scarce entrepreneurial attitude. The first step to seize the opportunity of biomass is that of making forest owners associations more professional in their offer, aggregating and working together in order to be more interesting and competitive on the energy market.

**Water.** In the framework of the rational use of “alternative” energies, the exploitation of hydraulic energy certainly has a great importance and interest for a series of reasons: its diffusion in the area, the long-standing technology in the sector and a desire to be independent from centralised services of production and distribution of electric energy, coupled with the unpredictability of fluctuations of prices of traditional fossil fuels and the awareness of how rapidly their reserves are running short.

The province of Sondrio invested on an intensive exploitation of water for hydroelectric energy production, covering now over 90% of available discharge, with a provincial energetic production which, alone, covers 46% of power capacity of the region Lombardy. A few figures, as at 2007: 310 uptake plants, 71 large and average production plants, 500 Km of conduits, 800 Km power transmission lines and 56 dams with a storage capacity of over 400 million cubic metres.

The aim now is to promote a wider and more capillary use of hydraulic energy on a small scale, as it offers many advantages both technical (reliability of the energy source, use of small and marginal water courses, protection of natural ecosystems with a very low environmental impact, high global yield, simple construction and duration of the plant) and economical (small financial investment, very low operational and maintenance costs.

By small falls it is intended all hydroelectric concessions lower than 3000 kW. The construction of such plants is financially interesting for the production of clean renewable energy and to obtain the so called “green certificates”.
It is interesting how the energy obtained from small falls in the 36 plants (operating or under construction) would increase the production of the province by about 100 million KWh (+1.7%) and if all the envisaged plants were to be actually built, that would lead to an increase by 500 million KWh.

CRITICAL ISSUES: This 8% increase would however cause a countless environmental damage, as such plants would be built in natural areas of great environmental value.

II. THE POPULATION

1. Inhabitants
The municipality of Tirano is the third municipality in the province of Sondrio for the number of its inhabitants; in January 2009 the number of residents amounted to 9,168 units.

• stability of the resident population: over the last 20 years it increased by 200 units only, with long periods of total absence of significant increase except for a short period in the early 2000 and a new decrease over the last three years.

• structure of the population by age groups: a quick ageing of the resident population over a relatively short period (2001-2006).

• working rate of the resident population is around 50-51% (62-63% for the male segment, 39-40% for females); such activity rate refers to resident population over 15.

• resident population in a condition of unemployment (always over 15) is slightly lower than 50%. The most relevant figure is that of retired persons which, in 2001, were 47,1% of non work force. Housewives are also in a high percentage, 29%, while the number of students (high school and university) is 13% of the non working force.

2. Economic activities
Most of the population works in the wide sector of the tertiary and services: in particular in trade (15%) and hotel and catering sector (7%). A good share of the residents in the municipality of Tirano also works in the health and social sector, and this also for the presence of health facilities in the area and in the neighbourhood. A considerable group of residents work in the sector of education (8,3%) and of public administration (7,7%). Lower than 6% is occupation in other activities, with about 5% of the population working for example in banks and insurances.

Employment in the field of agriculture and anima husbandry is marginal, 3,6% (a value that has most likely decreased to 3% over the last five years). Also the population that works in the manufacturing industry and handicraft is not very relevant (16% as a whole, 20% for men and 10% for women). Around 2% is the percentage of residents working in the field of the production and distribution of electric energy, while those working in the field of building constructions are around 8%.

Companies in the area: 800 service and production units, 130 of which in the field of manufacturing industry and constructions; 2300 units in the tertiary and services, 700 of which devoted to trade and tourism.

Commuters. 30% of the active resident population living within the municipality works
outside of the territory of the municipality, thus generating an outflow of commuters. According to the census carried out in 2001, jobs in the municipality of Tirano are equal to 3200 units and active residents amount to 3700.

This is therefore the situation:
- working citizens residing in Tirano 3700; working in Tirano 2900; working outside Tirano 800
- jobs in Tirano 3200, held by residents in Tirano 2900 and held by residents outside Tirano 300.

Outbound commuters rate 22% inbound commuters rate 9%.

3. Services and infrastructure
In the municipality of Tirano there are 3 elementary schools, attended by about 500 children, only one junior high school with over 300 students, three high schools attended by an average of 850-900 students, many of which come from neighbouring municipalities.

Students mainly commute by coach (80%) and by train (13%).

Sports facilities on the municipal territory allow to practice various sports both indoors and outdoors.

The municipal library, active for several years now, increased its cultural and lending activities.

The municipality of Tirano hosts about 70 associations active in various fields: social, cultural, civil, sports and leisure.

Connections between Tirano and other municipalities are ensured by over 50 bus trips leaving from and reaching the municipality. Over 30 trains depart and arrive at Tirano, on the Tirano-Sondrio-Lecco-Milano line. More trains depart and arrive at Tirano from Switzerland.

III. ENERGY
1. Local energy policy

The municipal policy on energy mainly concerns:
- the participation in the collective heating company
- decrease of consumption for public lighting replacing bulbs with high energy efficiency items (led)
- implementation of the energetic audit on buildings owned
- use of the falls of drinking water for the production of hydroelectric energy
- installation of photovoltaic panels on municipal buildings
- creation of a building regulation that encourages the implementation of high energy efficiency building by awarding volumetric bonuses.

2. Energy costs

| Heating energy          | collective heating (dataTCVVV, 2007-2008) | 0.08918 €/kWh |
gas oil (data CCIAA Sondrio, 31.12.2007) | 0.1485 €/kWh |
Electric energy (data AEMT, October 2009)

<table>
<thead>
<tr>
<th>Type of use</th>
<th>€/ kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic use (for residents) up to 3kW</td>
<td>Da 0,1129 a 0,2959</td>
</tr>
<tr>
<td>Domestic use (for residents) over 3kW</td>
<td>Da 0,1449 a 0,2742</td>
</tr>
<tr>
<td>Domestic use (for non residents)</td>
<td>Da 0,1449 a 0,2742</td>
</tr>
<tr>
<td>Other uses (crafts, industry...) up to 1,5 kW</td>
<td>0,1307</td>
</tr>
<tr>
<td>Other uses (crafts, industry...) over 1,5 kW</td>
<td>0,1329</td>
</tr>
</tbody>
</table>

3. Production and consumption of energy

Consumption

In Tirano, the energy consumption for 2008 has been evaluated:

<table>
<thead>
<tr>
<th>Electric energy (data AEMT) Domestic use</th>
<th>Electric energy (data AEMT) Domestic use</th>
<th>10.000.000 kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>Public</td>
<td>1.000.000 kWh</td>
</tr>
<tr>
<td>Other uses (crafts, industrial,..)</td>
<td>Other uses (crafts, industrial,..)</td>
<td>23.000.000 kWh</td>
</tr>
<tr>
<td>Total</td>
<td>Total</td>
<td>34.000.000 kWh</td>
</tr>
<tr>
<td>Energy for heating (data TCVVV)</td>
<td>Collective heating (ca. 70% total)</td>
<td>36.500.000 kWh</td>
</tr>
<tr>
<td>Other heat sources (estimated)</td>
<td>Other heat sources (estimated)</td>
<td>13.500.000 kWh</td>
</tr>
<tr>
<td>Total (estimated)</td>
<td>Total (estimated)</td>
<td>50.000.000 kWh</td>
</tr>
<tr>
<td>TOTAL CONSUMPTION</td>
<td></td>
<td>84.000.000 kWh</td>
</tr>
</tbody>
</table>

The pro capita consumption is of 9.179 kWh per inhabitant.

Energy consumed for private transport

Based on the population (9.151 inhabitants), on the latest data about cars circulating in Italy (592 cars every 1000 inhabitants), on the data of the Swiss federal bureau for territorial development, indicating that every car covers about 13.500km per year; based on an estimated consumption of 8 litres fuel per 100km, the consumption estimated has been of 5.850.360 litres of fuel per year, that is (at 9 kWh per litre) 52.653.240 kWh of energy.

Production

The producers of energy from renewable resources are:

Electric energy:
Biomass Collective Heating Plant, with a co-generation system (in 2008 it produced 7.500.000 kWh)
Private photovoltaic panels (unavailable data)
Photovoltaic panels that are public or owned by companies that have a public share:
- AEMT plant, built less than one year ago, it produced kWh (since activation).
- installation on the Collective Heating Plant (73.000 kWh in 2008)
Heating energy:
Biomass Collective Heating Plant: in 2008 it produced the 36,500,000 kWh indicated as a consumption, net of energy losses for production and transportation, that may be assessed as about 15% of energy invoiced (5,475,000 kWh).
Data concerning the production of solar collectors for self-heating or hot water production are unavailable, and equally unknown are data concerning the consumption of gas for cooking, yet they are considered as negligible.

4. Raising awareness in the population
In order to raise awareness among the young people (and indirectly their families) about the theme of energy, and to promote virtuous behaviours that concern its use, didactic programmes and workshops have been organised in primary, junior high and high schools.
Public meetings have also been organised in the evenings, aiming at raising awareness among the population on the themes of sustainable development and energy saving. Various materials and information leaflets have been issued to the same end, concerning in particular chances offered for tax relief, by means of which the Italian Government encouraged refurbishment of buildings fostering energy saving (improvement of energy efficiency with the use of insulating material etc.).

IV. LEGISLATION AND PUBLIC POLICIES

1. Public initiatives

Regional level
The Energetic Regional Programme (Programma Energetico Regionale, PER, approved on the 21st of March 2003 by D.G.R. n. 12467) sets the framework for the situation of energy in the Lombardy Region and describes the expected evolution over the next ten years, highlighting the guidelines of the policy to be implemented by the Regional Government in relation with the objective of increasing renewable sources and diffusing Collective Heating projects and cogeneration plants, describing implementation tools chosen (i.e. the Action Plan for Energy – Piano d’Azione per l’Energia, PAE). The PER is a flexible tool and is updated every year, supporting the local government body in directing its action in the following fields:
- the definition of new norms and regulations supporting the world of energy and its actors and users;
- the destination and use of available financial resources;
- the contents of information aimed at economic actors and households;
- the promotion of innovative initiatives supporting new technologies and management models;
- the support to scientific research.

The Lombardy Region is the first in Italy to have approved the Action Plan for Energy (PAE), thus complying with the indications of the European Union. It is an implementation tool of PER and includes the guidelines of a regional energy policy, defining strategic objectives, fields of action (regulations, stimulation and support to innovation) and actions to be implemented on the short/medium run. It includes measures that aim at decreasing the cost of energy produced and its effects on the environment, at enhancing the competitive growth of enterprises in the area and at consumers protection.
The strategic objectives of the regional action are the following:
- reducing energy costs for companies and families;
- reducing polluting and climate-altering emissions;
- promoting the competitive development of industries in the field of new energy technologies;
- increasing employment at local level, as a direct consequence of energy policies;
- protect weak and vulnerable consumers.

Action guidelines:
- reducing the energetic dependence of the Region, increasing the production of electric energy and heating by building new high efficiency plants;
- restructuring existing plants to enhance efficiency to match new standards offered by better technologies;
- improving and diversifying the interconnections with national and international energy networks, in order to ensure supply;
- promoting the increase of energy production at regional level, taking into account the health of citizens;
- re-organising the energy system of the Region Lombardy in compliance with its environmental and territorial features and in the framework of an overall programming structure;
- reducing specific energy consumption by improving energy efficiency and promoting action for a rational use of energy;
- promoting the use and capillary diffusion on the territory of renewable energy sources, at the same time enhancing the industry which is linked to renewable resources;
- promoting the development of the Lombardy energetic system, in compliance with town planning tools.

The Region Lombardy, through the coordination of decisions taken at various administrative levels, regulates relations with local authorities. The PAE is therefore also a point of reference for all public and private actors who decide to start an initiative in the filed of energy in their territory.

The Decision of the regional Council n. 674 dated 3rd December 2003, stating the guidelines to draw the energy programme, highlights in the chapter “Criteria and modes for the promotion of the use of alternative renewable sources” how water resources are nearly totally exploited and a further use must be “tuned to the need of protecting the natural environment of water courses”.

Building sector
The Region Lombardy issued two Regional Laws aiming at energy saving and the reduction of emissions:
- Regional Law 26/2003 “Norms in the field of management of waste, energy, use of the subsoil and water resources”, stating that the Region must regulate the modes and criteria to certify the energy efficiency of buildings
- Regional Law 39/2004 “Norms for energy saving in buildings and for the reduction of polluting and climate-altering emissions”, stating the need to improve the performances of buildings in terms of heat dispersion. The law is currently being revised to make it comply with the D.lgs. 192/05.

Provincial level
At the level of the Province of Sondrio, the PAE highlights a critical situation as to the degree of exploitation of surface water resources. It therefore indicates as a perspective of development the rationalisation and optimisation of uses already implemented, envisaging more sustainable actions that mainly concern two fields of action:

- the promotion of small plants, defined as mini-hydroelectric (< 3 MW), exploiting small falls linked to irrigation canals and municipal aqueducts;
- maintaining the efficiency of present production capacity, mostly offered by ancient plants in need of relevant maintenance, together with a more general rationalisation of the system of plants with an uptake from each river and watershed that is in tune with the objectives of the Water Protection Plan, a new tool for the integrated planning of water resources.

**Territorial Plan of Provincial Coordination (PTCP)**

The Territorial Plan of Provincial Coordination of the Province of Sondrio is the tool by which the Provincial Government states the guidelines to manage the landscape and territory of the province. It aims at favouring sustainable development of the territory by guidelines and prescriptions as to the socio-economic development process of local population, according to environmental sustainability criteria and protection and enhancement of the historic and cultural features of the population of Valtellina and Valchiavenna valleys.

Macro-actions aiming at these objectives and that are connected to energy issues include:  
- the innovation of networks through the development of communication techniques and the rationalisation if energy transportation networks.

Art. 54 “Infrastructure for energy transportation”, paragraph 1, states: “The PTCP aims at rationalising electric energy transportation network within the provincial territory, minimising the environmental and sanitary impact of the network and improving its effectiveness in terms of yield (energy saving). This is the framework of the Agreement “Rationalisation of the national transmission network of north-eastern Lombardy and localisation of the 380 kV line S. Fiorano – Robbia connecting to Switzerland” mentioned by the following.

**Provincial Energy Plan (PEP)**

The elaboration of a Provincial Energy Plan is envisaged in the Territorial Plan for Provincial Coordination (PTCP) as a sector plan. The setting up of the Energy Plan of the province of Sondrio, which is presently under way, aims at identifying and programming the use of energy resources, with special reference to renewable resources, taking also into consideration the local sustainability in the use of each resource. This is a chance to create a synergy between the drafting of territorial development policies and a new approach to energy planning. In particular, it envisages the development of various activities, branching out in a few key-issues:

- a provincial energy balance
- the analysis of the state of the art in the use of renewable energy sources (FER) and rational energy use systems (URE)
- the evaluation of the potential use of FER and URE with a cost-benefits analysis;
- the setting up of an action plan.

The province of Sondrio, being a relevant producer of hydroelectric energy and being located in an international border area, is crossed by a significant number of power transmission lines implemented, in time, by various operators. This caused two main problems: a loss of power and the multiplication of impacts on the territory, both due to an excessive fragmentation of the network.
• Agreement “Rationalisation of the national transmission network of north-eastern Lombardy and localisation of the 380 kV line S. Fiorano – Robbia connecting to Switzerland”

The agreement concerns the rationalisation of the electric energy transportation network of Valtellina and Valchiavenna valleys, aiming at minimising the environmental impact of electrodes at the same time increasing its effectiveness in terms of energy saving. Such agreements indicates the three steps of the construction of a new 380 kV line and subsequent progressive dismantling of many existing lines. The PEP will define the elements that are necessary to the full implementation of such Agreement.

• Agreement Territorial Development Framework “Environment, Energy, Water and Wastes” (in compliance with L.R. 14th March 2003, n.2)

The AQST is a negotiated programming tool that is considered adequate, by the Provincial Government of Sondrio, to implement socio-economic and cultural development actions with particular reference to environment, energy, water and wastes. The Region Lombardy attributes to the Province of Sondrio, as a transitional solution and awaiting a specific law to be issued, the function of Water Property Manager, including the management of its earnings (with particular reference to yearly earnings deriving from the collection of fees). The present AQST moreover aims at achieving objectives that are coherent with the indications contained in the regional programming documents which need an integrated approach. The six strategic objectives identified concern:
- strengthening the energy system;
- producing energy from renewable sources;
- reducing emissions in the atmosphere of climate-altering substances;
- managing water;
- giving a new drive to the productive system;
- strengthening the tourist-sports system.

They can all be summarised in two main action guidelines: the energy and productive system and the touristic sector, with particular reference to weaker areas. The two themes and projects related have a common ground in the environment, marking the only province of Lombardy having a totally mountain landscape.

Energy system. Action proposed aim at developing a unitary framework of the energy system, in synergy with other projects and agreements under way, through the diversification of offer (methanisation), the promotion of plants using renewable resources (mini hydroelectric, biogas), the study of the use of renewable resources and energy saving, the analysis of themes that concern water exploitation, the definition of an action programme involving the re-naturalisation and control of solid transport, the implementation of pilot cogeneration plants applied to public structures.

2. Legislative and procedural obligations

The Regional Energetic Programme (PER) and the Action Plan for Energy (PAE) are orientating tools and for the time being they do not include implementation measures.

Building sector

In compliance with directive 2002/91/CE concerning energy efficiency in building construction the D.lgs. 311/2006 states that:
- starting from July 1st 2007 existing buildings larger than 1000 square metres that are going to enter the real estate market must have an energy certification;
- starting from July 1st 2008 the obligation is extended also to buildings below 1000 square metres, in case the whole building is traded;
- starting from July 1st 2009 the energy efficiency certificate is mandatory, also to trade
single flats.

3. Aids and incentives
The Region Lombardy granted aids in various sectors: implementation of thermal solar plants (servicing public buildings and private companies), buying ecological vehicles, restructuring according to energy saving and efficiency parameters.
SWOT Analysis
TIRANO - Italy

INTERNAL

Strengths
- RES potential: biomass, solar radiation
- Existence of energy market
- Research & Development in RES issues
- High value of natural heritage, favoring the development of clean energies
- Existence of Energy management Agency

Weaknesses
- Absence of a local Energy Plan
- No incentives at a local level
- Few RES/ES/RUE applications in area
- Absence of TOR for the construction of the building (eg. no bioclimatic criteria)
- Low public awareness
- Low sensitiveness to energy saving
- Lack of RES resources
- Insufficient infrastructure for RES use (eg. Injection of Biomethane into the natural gas grid)
- No feed-in-law for thermal applications
- Energy efficiency in buildings in not an obligation yet

EXTERNAL

Opportunities
- Existence of areas suitable of taking measures
- Suitable climate for bioclimatic applications
- Private investors
- Country commitments
- Secured tariff for RES electricity
- Liberalization of electricity market
- Subsidies – incentives
- Funds to invest in clean technologies

Threats
- Lack of capacity and resources at regional and local level
- Bureaucracy
- Reactions and suspicious to RES applications
- Unwillingness to changes
- Excessive dependency on fossil fuels (eg. Lignite, coal)

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