

Title: Guidelines to promote a Low Energy Solution: an Italian Experience

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Abstract:

Building development and City Planning are the most difficulty fields in which Low Energy Architecture Solutions and introduction of Renewable Energy Systems can be promoted and increased. There is little knowledge about the opportunities given by these applications in a single building or District.

We have proposed an economic incentive for each kind of intervention to reduce the energy cost LCA of buildings. Targets are the promotion of Low Energy Solutions and Renewable Energy in different purpose buildings (housing, office, industrial) and in a new District. On this topic we propose an approach to promote a Low Energy Solutions and change the current energy standards in the Italian City of Macerata.

The Project title is “*Guidelines for a Sustainable Development of the City of Macerata*”. This task is currently starting.

Keyword:

Political and financial issues, local government and energy, guidelines, reduction of energy consumption.

Paper text:

1. Introduction

In 2004 the administration of the City of Macerata City decided to promote a new policy addressed towards sustainable development, introducing a new energy concept and increasing.

The local authorities asked Comes s.r.l. and Arch.Kristian Fabbri to elaborate a new instrument, as the “*Guidelines for a Sustainable Development of the City of Macerata*” turned out to be.

The Administration doesn’t want to make the guidelines instrument compulsory for stakeholders but wants to explain the advantages in introducing an innovation in each productive sector. The Guidelines are not binding or obligatory but are a model to choose. *What is the innovation? Innovation is represented by the different inventions.*

Invention is a new technical solution, therefore innovation is the introduction of new technical solutions.

“Innovation takes place when a individual or a group of people undertake an activity that is new to them. Innovation therefore differs radically from invention: it is the process through which inventions are translated into industrial and social change¹”

Innovation is not a ‘natural’ phenomenon, it may be encouraged by policies and incentives

The local authority had decided to improve the quality of life in City of Macerata through different solutions to reduce energy requirements and to reduce environmental impact of industry and human activity. “Think global and act local”.

Purpose of guidelines has been to work out a simple tool to explain different technical solutions and options to reduce energy consumption for each of the city’s active fields: industrial, agriculture, residential, administrative and (more important) Building sector (approximately 10% of energy consumption to build the construction and other 40-50%

¹ Introduction on “Strategy Report-Building for Europe Congress 13-14 October Maastricht

to use it). This is the first level to introduce a new energy concept in the community. Therefore guidelines are not a technical solution list but represent and promote energy reduction and self-produced energy. The future ESCO or “Sportello per l’Energia” (energy office) could be a next step to promote a second level of intervention: application of guidelines in new and existing building and plants.

1.1_City of Macerata

The City of Macerata is central southern Italy a few kilometres inland from the Adriatic coast, in South Europe. Macerata is an ancient Roman city with a medieval city centre located on the top of a hill and other areas distributed on the plain. It has 41.000 residents c.a. and several manufacturing industries.



View of Macerata

2. Structure of Guidelines

The guidelines consist in a matrix:

- **Stakeholders** are the most important actor because they can decide what to change, how to construct the building, etc... Each stakeholder supports a different action and has different financial possibilities, as well as different energy requirements and consumptions.
- **Area** is the field where to take out a different action: city planning and construction field, Energy Balance and Environmental Balance.

2.1 Stakeholders Description

Stakeholders are the subjects who could change an environmental and energy issue.

This actor needs to be involved in the actuation of guidelines. Participation is the most important factor if we want to introduce innovative issues.

The Guidelines suggest for each stakeholder different opportunities to reduce the impact.

The stakeholders are:

Builders, Building Contractors, Project Managers, Architects and Technicians.

They are the most important actors in the environmental alteration and use, because they could promote and support different energy-consumption in building:

- Energy requirements necessary to build, LCA and LCC
- Energy requirements for energy consumptions
- Reduce costs and energy for maintenance

The construction and architectural project are the most important tools to change human activity impact. An example is the passive low energy architecture, sustainable architecture project and study.

Establishment Companies and plant technicians are involved in planning schemes.

From the largest establishment in an environment to the single plant of a house: boiler, electricity and other utilities. They could change a plant and choose a more efficient one, using renewable energy solutions for each project phase. These Stakeholders include Esco and energy managers (Energy Certification, Energy Audit).

Other firms and companies, including each activity that could start and support different actions to reduce environmental impact. They could apply for an ISO certification (ISO 14000, ISO 14040 and Ecolabel), Corporate Social Responsibility (CSR) and environmental qualifications.

- *Private Citizens*. Single owners could choose differently and change the energy consumption of their home or office. There are several kind of advantages: quality of space and life, consumption reduction, quality of comfort and quality of life
- *Public Administration*. They could start different actions to promote, to use, and to spread the guidelines concepts. They are:
 - City Planning Tools (Agenda 21);
 - Public Project financing, Public Green Requirements;
 - Different building regulations and economy issues (financial incentives);
 - Energy Audit and Energy Management for administrative buildings to reduce consumption;
 - Sustainable mobility;
 - Information and training.

Public authorities could promote a partnership with other actors in the city, as universities, Multi-Utilities or other big contractors.

The *second step* is the scale of transformation: from city level to single buildings and single technical components.

Stakeholders could be offered several solutions for each scale of transformation:

- City planning and micro urban zone, new constructions or urban retrofitting, possibilities: sustainable architecture, solar orientation, use of passive solution systems, green project to reduce a hydro-impermeability of area, study of wind and sun orientation, low-energy infrastructures, use of cogeneration and biomass districts;
- New Single Building projects: Solar orientation, passive and active low energy systems, use of biomaterials, reduction of energy consumption through thermal insulators.
- Existing Building projects or retrofitting, including Ordinary Maintenance,
- Energy Efficiency: conversion of obsolete plants.

2.2 Area –Describe

2.2.1 Area: city planning, construction and architectural project

This area includes all the options to change planning and architectural projects.

Architecture projects are the most important tool if we want reduce energy consumption and gain a better quality of life (comfort standard thermoigrometic, acoustics and lighting quality). Buildings must have an energy balance exchange between indoor optimisation and outdoor ambient. Sustainable architecture is a way to promote a new architecture and to retrofit an existing building.

The task is to reduce energy dispersion in winter (with an insulation and solar orientation projection) and to increase hot energy dissipation in summer time (with a shade projection). In the guidelines we present a different criteria to do an architecture project in a different scale:

Architectural project:

External space: bio climatic orientation, study and reuse of local architecture typologies (arcade, windows, stone and wood construction system, compact building), different and separate ways between pedestrian and car, green areas and ground water permeability, reduction of hot insulation areas, and other criteria.

Internal space: interrelation with different functions and spaces, quality of bio-materials, day light factors and acoustic isolation, quality of environment, solar active and passive cooling systems, solar orientation and shade projects.

Technological project:

To promote the reduction of energy consumption, the guidelines propose three standard categories of energy dispersion reduction (heat consumption), certification standards in

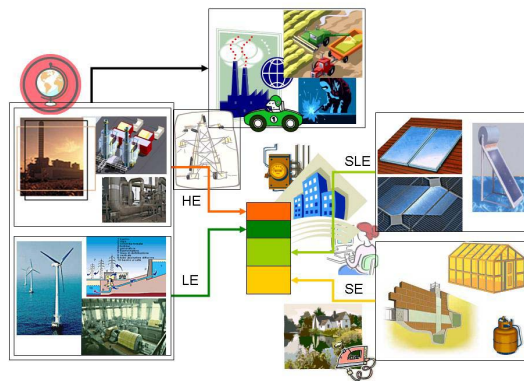
relation with heat kW: the best solutions are buildings with less of 30 kWh/m² per year Class A (25% of standard consumption), for Class B 50 kWh/m² per year, for Class C 70 kWh/m² per year (Italian standard is 120 kWh/m² per year)².

2.2.2 Area: Energy Balance

This is the most important area. We propose three different kinds of energy consumption and energy actions:

- -First, the most important thing is to reduce of energy consumption (energy saving S.E:) with passive and build-in solutions, passive low systems, thermal insulations, passive cooling systems
- -Second, apply energy efficient solutions, to optimise the existing plant, artificial light and electric consumption, using low energy systems, active low energy solutions, solar collectors (LE),
- -And last but not least, the use of renewable energies, biomass, cogeneration or micro cogeneration, wind energy, and Self-Energy production (SLE).

We present several choices between different possibilities and technical solutions. These solutions aren't a new discovery but are existing (biomass for example) and tested solutions, that in this case are suitable for a local contest. The innovation is to present the advantages if stakeholders use them. In the guidelines an important factor is the measurements necessary to reduce energy consumption, to accomplish the tasks this needs to be measurable.



The *measure units* are a heat and cold kW consumption (kWh_t/m² year), electricity kW consumption (kWh_e/m² year), water consumption (m³/m² year).

1) Reduction of Energy Consumption (Spread action, in large part of existing and new buildings)

Heat and cold consumption, Heating & Cooling plant, and hot water use;

Electrical consumption, low consumption in domestic appliances, low consumption of artificial light, electricity use management (Binary Unitary System or Computer Integrate Building);

Water Consumption, water cycle: re-use of non sanitary potable water, re-use of rainwater for other applications.

For each part of this section the guidelines propose: objective targets, methods and technical solutions.

2) Energy Efficient Solutions (Energy Certification, Energy District, White and Green Certificate).

This section of the Guidelines proposes several technical solutions to use an energy efficient plant. The target is to promote recycled use of energy, especially in Productive Districts and Urban Districts, and use low energy plants as solar thermodynamic collectors.

The *scale of transformation* includes parts of City Planning, new or existing micro-urban areas, single buildings and single plants (per single citizens).

The Energy Office (Sportello dell'Energia), who will be set up with the Guidelines approval, could promote and give incentives for Energy Certifications.

² Enea "Annual Report" and Provincia di Bolzano "Progetto Casaclima"

3) Use of Renewable Energy and Energy Autonomy

The last proposed option to reduce the impact of human activity, is to use a renewable energy. The Guidelines characterizes a Renewable Energy Solution, linked to the Reduction of Energy Consumption and Efficient Energy Solutions; a chance to increase local economy with sustainable activities.

In this sector we present a list of renewable energies suitable for a city: biomass, solar energy, heat pump, cogeneration, wind energy and a *diffusion of Energetic-Environmental Culture*.

2.2.3 Area: Environmental Balance

The third area's aim is the reduction of pollution and to increase the quality of life, reduction of gas and CO₂ emissions, and other polluting and disturbing aspects in city-life. In this part the guidelines introduce LCA and LCC materials and propose EMAS and Ecolabel certifications for local companies, building materials producers or shops. Above all they would promote the use of certificated materials, ISO Certification for local companies, reduce Acoustic and Light pollution.

Guideline Matrix
Stakeholders

		BUILDERS, ARCHITECTS AND TECHNICIANS	PLANT FIRMS	OTHER FIRMS OTHER COMPANIES	PRIVATE CITIZENS HOME OWNERS	PUBLIC ADMINISTRATIONS	
Area	City planning, construction and architectural projects	Different Architectural Projects, Sustainable Architecture, Quality of architecture, form and space	Energy Audit Cogeneration and micro cogeneration net heating	Corporate Social Responsibility (CSR)	Quality of space and architecture	City Planning Tools (Agenda 21) Different building regulations and financial issues (economic incentives), Information and training	
	Energy Balance	SAVING ENERGY	Green roof, solar orientation and other solutions to reduce the building impact.	Low energy Esco and Energy Management	Reduction of energy consumption, different	Energy Certification	Energy Office ("Sportello per l'Energia") Energy Audit and energy management for public administration buildings to reduce consumption Public Projects financing Green Diffusion of Energetic- Environmental Culture.
		EFFICIENT ENERGY	Efficient Energy plants Energy Districts Energy Nets	Efficient energy plants	Esco and Energy Manager	Plant Retrofitting	
		RENEWABLE ENERGY	Low and Passive energy systems. Cogeneration, RES Solar Thermodynamic Solar Photovoltaic Wind Energy etc...	Renewable Energy System, Reuse of biomass and wind energy	Renewable Energy System,	Single action (solar panel) Renewable Energy System,	
ENVIRONMENTAL BALANCE	Comfort standards indoor air quality, acoustics and lighting	Reduction of emissions and pollution	Promote ISO 14000 ISO 14040 Ecolabel Certification "Ecological area"	Bio-materials Indoor air quality	Sustainable mobility Public Requirements		

3. Political and financial aspects in guidelines actuation

Guidelines are a challenge. The Administration of Macerata decided to start this project to change local government. This is a good opportunity to increase local economy in a

sustainable prospective, and they could change and introduce an innovative factors in a political and energy contest. *The uncertainties lie in the real use of guidelines by city actors.* The Guidelines are a tool for political action to be translated in real technical solutions.

The political approach appears clear and determined; there is a line to follow that could start different actions and incentives: financial actions, promotion action, award actions and information actions

Political action and the guidelines themselves are not the only change factors; another important factor is:

- participation for different stakeholders and technicians
- incentives for guidelines solutions, administration internal incentives and external incentives
- promotion of direct financial systems (external incentives and social initiatives) and indirect (awards and Class certifications).

3.1 Political advantages, disadvantages and external reflections

What advantages could Macerata's administration receive in using "GuideLines for a Sustainable Development of the City of Macerata"?

The first advantage would be new local financial benefits in introducing an innovative factors as reduction of energy consumption and of costs of energy consumption. Then the administration would reduce CO₂ and other emissions, change quality of life for citizens and promote citizens and stakeholders taking part in energy-economics and city transformation processes. Other external reflections are a widespread use of Renewable energy, reduction of the uses of non-renewable energies, better Environmental balance and improved quality for professional and technicians.

To introduce an Sustainable Development Regulations, without citizen's share, is not possible; guidelines are a good opportunity to change.

On the other hand the disadvantages and difficulties lie in the evaluation of economic costs of the project for the local authority (tax refunds) that has to be in line with the economic balance of the public administration. Other difficulties are the training and information process, and the creation of a check list and database for Energy Office. The difficulty lies in the management of these guidelines and political stability.

4. Conclusion

The Guidelines have two main characteristics:

- they suggest different solutions and are flexible and adaptable: stakeholders and technicians could choose the better solution for the Guidelines targets;
- they promote (all) stakeholders participations with information about different energies and environmental issues at different scales of transformation process in the city.

The "GuideLines for a Sustainable Development of the City of Macerata" are the start of a process. They are a challenge for Macerata's administration and a bet for the future that could gain political and economical advantages.

We don't sit here waiting for the future, we make it!

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