THE EDUCARUE METHOD

FOR THE SCHOOL OF THE FUTURE

Intelligent Energy
Educa-RUE project presentation

Educa-RUE a European project co-financed by the European Commission, under Intelligent Energy Europe programme, intends to improve energy performance in the building sector at local level and with particular attention to educational building. The specific aim of the project is to speed up implementation of the European Directive on Energy Efficiency in Building (2002/90/EC) in Member States at Local government level. This objective will be fulfilled by: establishing a minimum energy performance requisites in municipal building regulations and local legislation and apply them to identified sample of educational building; ensuring the qualification of technicians operating in the building sector with
regard to energy-related issues; improving the effectiveness of financial and other tools currently used as incentives; raising all educational process awareness vis-à-vis energy efficiency.

The aim of the project is to strategically increase the ability of local players to guide and orient building initiatives, and especially residential building and restructuring projects, according to a structured model.

The strategy will involve: the development and testing of an integrated set of tools and incentives; the definition of a common methodology of intervention (following EPBD) on educational buildings for energy purposes; the development of a building management model which ensures efficiency in terms of energy performance; the continuous involvement of society at local levels.

The partners involved:
Province of Potenza, lead partner, Italy

Province of Rieti, Italy

Province of Perugia, Italy

Province of Palermo, Italy

Energy Solutions North West London (ESNWL), UK

Essex Energy Efficiency Advice Centre Ltd (Climate Energy Ltd), UK

Associacion Aragonesa de Entidades Locales (ASAEL), Spain
(withdrawn at the end of 2009)

Municipality of Prenzlau, Germany
Expected results:

- Development of actions to support and encourage sustainable energy usage through the development of Local Energy Plans based on eco-compatible criteria;

- The definition of an eco-compatible energy management model for public buildings;

- Strengthen the role of local authorities in the implementation of European and national legislation.

- Increasing the awareness of local players and public institutions vis-à-vis the sustainable use of energy as a result of both “strong” highly technical project actions and “soft” actions of communication and information dissemination;

- Increase the adoption of social behaviours environmentally friendly, developing and updating the technical skills of energy
sector operators by involving all the partners in joint actions which will include the organization of the training courses developed by the project at local level.

PROCEDURES FOR ENERGY EFFICIENCY IN PUBLIC BUILDINGS: the EducaRUE method

The EducaRUE method represents a model of territorial management for the improvement of energy performance of public buildings, and it can be efficiently used by Public Administrations through the EducaRUE Tools.

BUILDING SELECTION

The first phase of the EducaRUE methodology consists in the energy check of all the public buildings owned by the Public Administration (schools etc.) which will undergo an energy Audit.
The data collected for the selection of one or more collective buildings considered representative of the competent territory, can be used as a basis for the energy check or audit to be carried out subsequently on the selected buildings.

The preliminary survey on the existing buildings is supported by the use of computer-based tools and questionnaires to fill in.

EDUCATION AND PARTICIPATION PATHS

The efficiency of the interventions of energy efficiency of public buildings is linked to the degree of specific competences of designers and workers. For this reason, it is necessary to involve the protagonists of the planning process in training paths and
continuous professional refresher courses, like that foreseen by EducaTEC training course, in the framework of the EducaRUE Project.

Besides the purely technical aspects linked to the planning and execution of the efficiency interventions, the feasibility of initiatives promoting the energy efficiency of public buildings is closely linked to several aspects regarding the management and use of public goods, involving, therefore, the entire community (user and protagonist of the entire process).

As for the energy Audit of high schools, the active participation of students and teachers is necessary. As for primary and secondary schools, the sharing will be aimed above all at the involvement of
the school community by explaining the process and its main phases, using simple language and approach.

Families should be invited to actively take part to the process through informative sessions, so as to raise awareness towards energy saving and transfer it into their houses.

The “open” EducaRUE methodology aims at allowing both the awareness and participation of the entire school community to the process, understanding its importance and its technical and social implications.

The training paths are the following:

EducaKID
The course aims at training "young savers", by stimulating the children to consume less energy through a series of games-formative activities that will involve the teachers and the relatives.

Data on energy consumptions of the school will be as well collected, with the aim of evaluating the impact of simple actions introduced during the year to eliminate the wastes.

In some schools it will be possible to receive grants and contribution from external bodies (public institution, associations, private bodies) involved in environmental and eco-compatible education.

At the end of the course, the pupils will participate in the drafting of the "scholastic Regulation of aware consumption."
EDUCATIONAL TARGET INVOLVED

Primary schools. First years of the Secondary schools.

AIMS:

• to make the pupils of primary and secondary schools responsible towards energy consumption and active protagonists in the respect of the environment, trying to guide them in the adoption of behaviours aimed at energy saving and use of renewable sources;
• to make pupils aware of the real significance of consumptions, starting from the energetic analysis of their own school (by applying the results of the projects financed by the EU, developed in the framework of the project "Kids4energy", as "Young savers of energy" and "energetic Table");

• to promote the contacts and information exchange among students in the different schools, in the framework of "EducaRUE" project (schools in Germany, UK, Italy and Spain), through the web-site of the project;

• to encourage the transfer of experiences done by the children in families and in the social life, by the direct
involvement of adults (parents and grandparents, teachers friends).

COURSE DURATION

The didactic course will be structured in six interventions in class of three hours each: the teachers and trainers will establish the didactic path on the basis of specific needs and planning requirements.

THEMES

Examples of the subjects that will be dealt:

- Energy and its forms: renewable and not renewable
• the greenhouse effect and other effects on environment in the use of energy;

• the natural house and the solar energy;

• waste and energy;

• Methods to save energy in the daily life.

Both in class and at home the pupils will realize small experiments to simulate the production of energy, to verify the electric
consumption of electrical appliances in everyday life and they will be asked to adopt behaviours for reducing waste.

At the end of the training course, the pupils will visit plants and buildings where renewable energy is used (aeolic plants, photovoltaic systems, etc.).

METHODOLOGY AND INSTRUMENTS

From an educational point of view, the pedagogic methodology that this project intends to promote is the active learning, through practical experiments and direct involvement of pupils. The training intends to highlight the experimental and motivational aspects rather than factual knowledge, in order to build a strong
awareness in pupils, as a result of the adoption of virtuous behaviours in daily life.

The educational tools already developed, in the framework of the project "kids4energy" (the guide of the good practices, comics and the audiovisual, games and tests of laboratory) will be adapted and used for the purpose of EducaRUE training modules.

The educational tools will consist in the projection of images and films, in the submission of questionnaires, interviews and crossword, in the execution of experiments and surveys, in production of posters, in the development of games and in guided visits.
EducaSTU

The course is addressed to the pupils of secondary technical schools: through a set of training activities, the pupils will be trained in order to be able of registering data related to their school energy consumption. Pupils will acquire knowledge for the application of their technical competences in the planning and implementation of interventions oriented to energy saving measures.

In some schools it will be possible to receive grants and contribution from external bodies (public institution, associations, private bodies) involved in environmental and eco-compatible education.
EDUCATIONAL TARGET INVOLVED

Pupils attending the last years of studies in technical, vocational and building surveyor institutes.

AIMS

The course aims at providing professional information for students in order to allow them to carry out the analysis of energy consumption of their school, by identifying the weakness and strengthen, as well as the understanding that the technical and specialized subjects, taught during the year, can be better implemented by taking into account energy saving and environmental sustainability measures.
COURSE DURATION

The course will be divided into two interventions in the classes/laboratories of the duration of three hours each and five guided visits to buildings or centres in which it will be possible to know and see directly the available techniques and technical tricks that can be adopted in the construction or renovation of buildings (plants of renewable energy production, significant buildings, professional bio-architecture offices, industrial plants in which equipments for energy saving improvement are produced).

Teachers and trainers will establish the programme of the visits on the basis of their availability.
THEMES

The theoretical training will deal with:

- the use of fossil fuels and climatic change;
- the renewable energy sources, their advantages and their limits of use;
- the physics principles at the basis of heat generation and transmission and new findings;
- thermal conductivity of materials and new products;
- the natural home of solar energy;
- pollution forms: greenhouse effect and indoor pollution;
- the energy saving materials for construction;
- solar and artificial light;
- methods for the individuation of energy saving intervention in the existing buildings.
METHODOLOGY AND INSTRUMENTS

We exclude the execution of traditional frontal lessons that will overlap the didactic methods, by causing indifference among pupils.

The introductory concepts will be taught, in the classes or in the laboratories, by studying technical fiches of products and technologies for housing, and by viewing directly building materials through slides and/or illustrative films.

The guided visits will be held in buildings or plants in which materials and technologies for better energy use and renewable energy are produced. Furthermore it will be possible to visit plants where renewable energy are generated or to visit buildings with an effective didactic value to be used as bad or best practice.

The activity will not be only limited to the observation, as during
the visits the pupils will be taught with technical lessons, held by technicians that work on the field. In this way pupils will be able to understand the potentials derived by the application of systems studied, by stimulating them to be updated and to deepened the themes in an autonomous way.

EducaPOL

The course aims at providing the contents and the training supports capable of improving the competences of administrators and employees of public authorities interested in the development of their territories thanks to the technological potentials, costs reduction and environmental efficiency in housing, from an energy perspective.

The technical and theoretic contents will be limited to the real
needs and knowledge of participants.

TARGET

Public administrators working in public works, town planning, building supervision, energy, ecology, environmental protection, productive activities sectors.

AIMS

The course will be developed through a path starting from basic contents in the field of energy production, energy saving and reduction of CO2 emission, EU, national and local legislative framework.

The experiences carried out by public administration and other
subjects that have reached important objectives in terms of citizens participation in the political choice, of support in the introduction of systems for energy consumption reduction in public and private buildings, in the systems of control and supervision will be showed.

The trainees, on the basis of the competences learnt, at the end of the educational path will be able to evaluate the energy indicators of their administration and to contribute to support a better use of energy and better energy policies in their public body.

DURATION OF THE COURSE

The course is structured in eight modules for a duration of three hours each, usable by home through an online service available in
www.educarue.eu website) and provision of questionnaires and exercises.

At the end of each module each trainee will be asked to fill in some tests and they will be evaluated.

THEMES

Following topics will be taught:

Introduction to the strategies for improvement of public services in the field of energy

The plan for Energy management

The survey of consumption and energetic accounting

First elements for the drafting of Energy plan

Definition of public Energy strategies
The role, competences and responsibilities of Energy manager.

Analysis of Energy needs of their public body and opportunity in the territory: key players and instruments

The model of the ESCO (Energy Service Company) for the improvement of Energy performance

Photovoltaic Energy grant for public bodies.

Practice: simulation of a photovoltaic project with an ESCO

Incentives for local and public authorities for solar Energy and methodology for use thermal solar Energy plant.

Practice: development of an hypothesis of solar ESCO

The legislative framework and the Energy certification of buildings

the integration of Italian law N.311/2006 (UK, SPAINISH, GERMAN national legal framework): detail analysis of the national legislative framework (contents, implementation ambiets, thermal transferability, average seasonal efficiency, technical relation, technical control reports).

National guidelines for energy certification of buildings: UNI-CTI rules; energy certification; energy analysis.

Examples of calculation and energy certification: qualification and energy certification in an existing building; intervention of energy requalification in housing; technical-economic analysis: saving in primary sources and reduction of the costs.

Fiscal and financial contribution (for example in Italy the Financial Law 2009 establishes a tax allowance of 55% for energy efficiency intervention).
Governmental contribution for energy produced by renewable sources (economic incentives for the installation of solar and photovoltaic plants and principal aspects of the law).

Regional and local legislative framework. Instruments of town planning negotiation and local planning instruments as incentives mechanisms and support for the construction of eco-sustainable buildings.

Principles and techniques of air-conditioning

Thermal wellbeing in indoor spaces

Building coat and energy efficiency: main characteristics of components (thermal insulation, mass surface) and of windows; interaction on energy consumption and on thermal wellbeing.
Heating and air-conditioning plants: characteristics of different typologies and supply in terms of micro-climatic control capacity; description of main components of the plants.

Public service management with a view of Energy saving

Energy and economic save in plants: technologies, regional law, national bill, European directive and regulations.

Plan of plants and calculation of economic and energetic benefits.

Maintenance and optimal management of plants.

Cogeneration systems, renewable Energy, waste management.

METHODOLOGY AND INSTRUMENTS

The web-based lessons will use case studies and concrete examples carried out by local, national and European authorities.
The lessons will be conceived in order to provide:

- a general framework of the topic from the financial and local national and European legislative perspective;
- suitable competences for introducing, within the planning instruments and local regulations, measures for the support and incentive schemes (contribution, tax relief, prizes, equalization) of private building intervention conceived for the reduction of management costs;
- instruments for the concrete economic evaluation of interventions for energy efficiency improvement in manufactured products, especially if belonging to public property;
- suitable instruments for increasing controls in environmental field.
The lessons will provide as well methodologies indication that can help the technical-political decision makers in expressing, in a conscious and correct way, the public demand as regards to administrative practice (call for proposals, bids, tenders etc).

EducaTEC

*The course, addressed to the professional technicians, installers and building companies, aims at verifying the degree of knowledge and raising awareness among the professional categories involved on the topics of environmental sustainability and the energetic reduction.*
Furthermore the course will aim at increasing the skills of the participants, through the training activities and thanks to the comparison and interaction among different professional profiles in the classes. This course is aimed at obtaining technical indications and preliminary planning for the adjustment and the energetic improvement of a real scholastic building, selected in the framework of WP2 and object of executive planning during the WP5.

MAIN TARGET

Professionals, technicians, installers and building companies.
AIMS

The course aims at wide spreading among professionals the knowledge of best techniques, construction technologies and plants that allow to obtain a general increase of the energetic performances of the buildings, by respecting a global sustainable perspective.

In line with the expected results of the project EducaRUE, the course will lead to a practical application of the examined subjects, a process that will conduct to draft a planning and executive proposal for a school building previously analyzed by the students of technical Institutes.
DURATION OF THE COURSE

The scheduling of the course consists in five meetings of three hours each (in total 15 hours), plus three visits in the selected school building object of study.

THEMES

The preliminary theoretical educational path will concern:

- the principles of eco-sustainability and responsible energetic consumption concept
- the energetic project and energy management;
• the bioclimatic principles useful for drafting an executive project;
• the coat (isolation) system;
• plants management and executive project;
• the active solar technologies;
• the energetic and plant design restructuring;
• the analysis of the energetic performances of the buildings;
• the evaluation and the interventions for the elimination of the energetic dispersions;
• the aspects of environmental comfort in the indoor spaces;
• the systems to increase the energetic efficiency;
• analysis costs / benefits of the energetic upgrading
METHODOLOGIES AND INSTRUMENTS

The methodological approach will be practical-operative, essentially aimed at discussing real problems found in the selected building and possible use of materials for the executive plan preparation.

During the training sessions in the classes, samples of materials, technical and graphic schemes of building details will be showed and presented. Furthermore, some visits in the yard for the survey of the state of the art and the check of the possibilities in relation to the planning proposals already advanced will follow the practical lessons.

The trainees will contribute to the creation of a "index of the adopted solutions", in which trainees will write different solutions
available for similar needs, with indication of motivations that has lead to a specific choice.

Evaluation emerged for specific products or technical solutions will be underlined.

The training paths foreseen by EducaRUE trace an important line for the development of competences and new knowledge in learning.

THE ENERGY AUDIT OF PUBLIC BUILDINGS

WHAT IS AN ENERGY AUDIT?

The word ‘audit’ derives from Latin and means check.
The Energy Audit is a fundamental tool to analyse the conditions of an existing building from an energetic point of view and to foresee interventions which can improve their energy efficiency.

WHERE CAN AN ENERGY AUDIT BE CARRIED OUT?

The Energy Audit can be carried out in all kinds of buildings, both private and public.

WHICH ARE THE MAIN LAWS ABOUT THESE ISSUES?

The reduction of energy consumptions and emissions are some of the principles contained in the European Directive 2002/91/EC regarding the energy certification of buildings.
WHAT IS THE OBJECTIVE OF AN ENERGY AUDIT?

The energy audit should:

- Point out the consumptions / m²
- Point out the inefficiencies and dispersions
- Propose interventions of improvement of the building, from the shell or plant points of view

The energy audit can be light or detailed

- THE LIGHT ENERGY AUDIT consists in a survey of the building, on the basis of the information found in the energy bills (electricity, fuel, hot water production). This analysis is useful to get the first results about the efficiency of the energy plants and to point out any possible critical points in the building shell which could deserve a more in-depth study.
• THE DETAILED ENERGY AUDIT includes all the passages of the light audit. The second part includes the analysis of the interactions among the shell, plant and external environment, and a simulation of the thermal behavior of the shell. Moreover, it points out the technical-economical benefits brought about by the improvement.

ARE THERE ANY APPLICATIONS OF ENERGY AUDIT IN SCHOOLS?

An example is IEE (Intelligent Energy Europe) EducaRUE Project. Each project partner carried out a detailed Energy Audit in a school on his territory, which was selected according to common criteria and after a phase of analysis on several different schools, foreseeing suitable energy efficiency measures.
METHODOLOGY OF THE ENERGY AUDIT

The pilot action begins with an energy check or audit of buildings which represents the main tool to understand and consequently to effectively intervene on the energy situation of a building. In fact, it is a thorough analysis conducted through site inspections and examination of energy consumption rates, in order to get an overview of the current state of energy uses of the building, and identify possible interventions aimed at replacing the existing technologies or improving their management with the purpose of reducing fuel and electricity consumption.

The results of this action in the framework of EducaRUE Project, may be addressed to schools, students and administrations - both public and private - which manage schools at the local level and
represent a tool for the selection of possible energy saving initiatives (e.g. rehabilitation interventions). Furthermore, this collection provides a report on energy consumption in the school sector.

**Collection of data on the characteristics of the building-plant system**

At this stage, during the survey of the selected school building, it is required to collect information about:

- The *general data*: location, year of construction and/or renovation, gross heated volume, gross surface of the building floors, dispersing surface.
• The characteristics of the building shell. As for the opaque elements, it is necessary to provide a description in terms of: type of element - (perimeter vertical walls, flat or gabled roofs, floor slabs, etc.) - and relative description (type of masonry), thickness, area, transmittance. As for window frames: type of glass, type of frame, window frames transmittance. Further information about the dispersions can be collected by means of measurements with the help of an infrared thermo-camera.

• The characteristics of the installations/plants. As for the heating installation, it must be pointed out the typology of heat generator, the nominal power, the average seasonal production performance (last available and detectable value), characteristics of the distribution net, of the emission terminals and regulation system; such data can be surveyed
by consulting the central record book. The plant for the production of hot sanitaria water must be described in terms of typology of generator, installed power, alimentation, storage. The knowledge of the methods of operation and maintenance of these facilities becomes necessary as well.

- Presence of **renewable energy sources**: solar thermal collectors and/or photovoltaic panels (collector, orientation, inclination, typology of collector/module, energy input); for different cases, indicate the type of renewable energy source used, the technology applied to the school building and the associated energy input.

All the collected data are put into an Excel spreadsheet. In order to complete the analysis of the consumptions and to point out the
critical points, it is necessary to compare these data to the historical data of electricity, water and heating consumptions.

- **Data relating energy consumption and cost**

It is necessary to collect data regarding the consumptions of gas and electricity for each single building: main building, gym, laboratories and other structures.

The energy consumptions of the school building can be found in the energy bills issued by the suppliers in the three years before the audit.

The collected data are put into an Excel spreadsheet and give information about the average monthly and annual consumptions.
1. Collection of Data on energy consumption and cost

Energy consumption of a school (fuel used, power supply) are surveyed from the bills or invoices relating to the supplies destined for the Institute concerned. Therefore, it is necessary:

- For power supplies: detailed analysis of the monthly consumption data referred to a period of at least two school years before the year in course (for a total of three years).

These data, which can be surveyed from the bills or invoices relating to the power supplies, are expressed in terms of:

- Maximum used power;

- total energy consumption and consumption broken down into time-bands (pursuant to and by effect of the Deliberation of the Authority for Power Energy and Gas n. 181/2006);
- tax base.

  - As for thermal consumptions: detailed analysis of the monthly consumption data referred to a period of at least two school years before the year in course (for a total of three years).

These data are expressed in terms of:

- Fuel typology;

- Fuel consumptions;

- consumptions of primary energy, through the true and accurate knowledge of the fuel heating power (this value can be surveyed from the bills or provided by the service operator), or, alternatively, through the analysis of old data;

- tax base.
Where the management of power plants is regulated by an energy service contract, consumption data must be provided by the service operator.

The above mentioned consumptions are, moreover, referred to the total gross surface of the building floors (Sg), defined as the sum of the surfaces of each floor; it must include the areas covered by partition walls, and exclude the perimeter walls. If the school building is made up by more than a single building, the total gross surface of the building floors will be the sum of the surfaces of all the buildings. The objective is that of getting an indicator for the specific consumption rate (consumption rate per m² of gross surface).

2. Collection of data on energy charges
The assessment of the energy charges peculiar to the building is carried out through the collection of data relating:

- *power supply* and *refrigeration consumption* in terms of installed power and working hours;
- *water consumption*, through an analysis of the bills paid for water supply.

A *site inspection* of the selected building represents an essential element to detect and verify the characteristics described above and identify possible installation, structural and managerial inefficiencies.

Further information can be collected through *measurement campaigns* carried out on site, for example by installing a network analyzer which allows acquiring the trend of the power supply
consumed over a given period, or a thermographic analysis of the structure which allows identifying the points of greatest waste.

- **Critical analysis and comparison with average parameters**

After having detected the heating and electric consumptions, you can determine the Normalized Energy Indexes $IC_H$ (heating consumptions) and $IC_E$ (electricity consumptions), that is the school’s specific consumptions corrected according to normalization factors (the heated volume, the dispersing surfaces, days, the school’s operation daily hours and building shape).
Also these data are put into an Excel spreadsheet so that the Energy Indexes for heating and electric consumptions can be comparable to values of the reference merit classes.

A more detailed investigation can be conducted through the use of software dedicated to the calculation of the energy performance of the building/plant systems and thermal/refrigeration charges. There are many possibilities to choose amongst different types of software, according to the degree of complexity and consequent detail in terms of results (i.e. Stima 10, Docet, BestCLASSTS, MC4, etc.).
• Interventions to improve the energy efficiency of a building-plant system

After the data collection and analysis, it is possible to point out the inefficiencies and critical points of the selected building where there is the highest energy consumption.

Then, the surveyor can evaluate the possible saving and energy efficiency measures, also considering the targets of environmental comfort to be reached.
The objectives and strategies to be adopted are then decided and the possibility to intervene is evaluated. The best solutions foresee lower costs and higher efficiency (in terms of energy consumption reduction and maximum environmental comfort).

It is requested to indicate the energy saving potential (expressed in kWh/year) in terms of possible solutions proposed for improving the energy efficiency of the institute.

The improvement can be achieved by intervening: on building shell; on installations and equipments; on the modes of management of the building; analyzing the existing supply contracts and proposals on the market most suitable for the specific case.
The software applications listed above prove valid tools for estimating the energy savings achievable through the adoption of specific interventions and determining the contribution of each one to the overall consumption reduction.

The selected solutions will be illustrated in an ad hoc report enclosed to the Excel spreadsheet completed with information regarding the proposed building(s).

PILOT PROJECTS

ENERGY CERTIFICATION METHODOLOGY_ The EducaRUE certification methodology is based on the procedure of
Environmental Sustainability Certification of buildings foreseen by the Regional Law 17/2008 of the Umbria Region (Italy).

It consists in a simplified certification system based on marks applicable to every kind of public buildings. The simplification introduced by eliminating two macro-areas and some technical cards involved a general revision of the criteria that tries to conjugate the methodology with the need for procedural simplification of the process.

The report cards, attaining environmental and energy issues affecting the building to be classified, are based on 3 ASSESSMENT MACRO-AREAS and 11 SUB-CRITERIA:
1_CONSUMPTION OF RESOURCES _This criteria allow the analysis of the building from an energy and water/material consumption point of view.

The **energy demand** of the building is verified using

3 report cards:

- **1.1.1 - TRANSMITTANCE OF THE BUILDING SHELL**
  
  (insulation)

- **1.1.2 – PRIMARY ENERGY FOR HEATING PURPOSES**
  
  (energy need in order to suitably heat the building)

- **1.1.3 – NET COOLING ENERGY**
  
  (energy need in order to suitably cool the building)
The ability to reduce energy, water and materials consumption is verified using 4 report cards:

- 1.2.1 – THERMAL ENERGY FOR HOT SANITARY WATER PRODUCTION
- 1.2.2 – ELECTRIC ENERGY
- 1.3.1 - MATERIALS FROM RENEWABLE SOURCES
- 1.4.1 – POTABLE WATER FOR INDOOR USES

2_ENVIRONMENTAL CHARGES _These criteria assess the impact on air and water matrix. The 2 report cards are the following:

- 2.1.1 - EMISSIONS IN OPERATIONAL PHASE
- 2.2.1 – METEORIC WATER PICKED UP AND STORED
3_ ENVIRONMENTAL INDOOR QUALITY_ These criteria assess the building indoor welfare using two assessment report cards:

- 3.1.1 - VENTILATION
- 3.2.1 – AIR TEMPERATURE

Each report card has a well defined performance scale ranging between "insufficient" to "very good" with a relative mark ranging between -1 and 5, expressing the correspondence of the building with specific environmental sustainability criteria.

The sum of the obtained marks in each of the report cards determines the total mark associated with the single assessment area.
The sum of the marks obtained in the three assessment areas, determines the general mark of the building, which determines its certification class, among the five following classes.

Table 1 – Certification class as a function of the obtained mark

<table>
<thead>
<tr>
<th>EVALUATION MARK/100</th>
<th>CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>85 - 100</td>
<td>A+</td>
</tr>
<tr>
<td>70 - &lt;85</td>
<td>A</td>
</tr>
<tr>
<td>55 - &lt;70</td>
<td>B</td>
</tr>
</tbody>
</table>
OPERATIONAL PHASE_ The pilot energy requalification project of the public building considers the issues pointed out during the energy check of the building itself.

The operational phases of the project describe the energy situation of the building before and after the intervention:

- **Assessment of the existing energy–environmental sustainability degree**, i.e. the mark obtained using the calculation tools
associated with the criteria (Annex A, 11 cards; Annex B, 9 tools)

- **Improvement of energy efficiency of the building** and calculation of the deriving energy saving (in terms of kWh, money saved, avoided kgCO2) with proposals taking into account the energy check. The executive project describes the detailed elements of the building-plant system needing to be replaced and/or improved, by means of ecocompatible and certified materials.

The proposed format (Annex D) aims at representing in short the foreseen interventions and the energy-environmental benefit obtained, together with an evaluation of the annual saving and the cost of the intervention. Moreover, the format is useful to compare the energy efficiency interventions in public
buildings owned by the same Administration or by different Administrations, therefore guaranteeing transparency in the connected operations.

- **Assessment of the energy-environmental benefit obtained** on the basis of the proposed solutions, and definition of the new mark of the building, through the use of the calculation tools associated with the criteria (Annex A, 11 cards; Annex B, 9 tools). The detailed survey is carried out using suitable software for the calculation of energy performance of building-plant systems and thermal/cooling charges.

- **Economic quantification of the interventions**
Comparison before and after the intervention (Annex C). The energy requalification interventions of a public building should demonstrate to belong at least to Class A (according to the above mentioned methodology) or the transition to a superior merit class together with the 20% reduction of the energy performance index for winter acclimatization EP₁, defined as the primary energy consumption for winter acclimatization and calculated according to the normative in force.

In order to correctly fill in and elaborate the documentation about certification according to the EducaRUE methodology, please see the following calculation EducaRUE tools:

- model of all report cards to be filled in
- calculation tools associated to some of the criteria
• general spreadsheet to determine the final mark

**CALL FOR TENDERS PROCEDURE AND STATEMENT OF WORKS**

The Revision of the EPBD Directive foresees the energy self-sufficiency for those public buildings constructed from 2019 onwards, with interventions of high energy efficiency and development of renewable energy sources (photovoltaic and biomass).

The procedure of environmental certification prepared in the framework of EducaRUE Project - with the system of report cards
and tools – is a useful tool for Public Administrations to assess the sustainability degree of a building energy efficiency intervention.

Other useful tools for the feasibility of energy efficiency interventions in public buildings are:

_ the Statement of the works to entrust the energy efficiency works of a public building and of the energy audit and executive project activity aiming at the energy requalification of the building _and, finally, the model Call for Tenders.

The normative in force, which is in continuous evolution, aims at promoting **new planning criteria** oriented towards ecologic and ecocompatible building, sustainable development and protection of
human health, capable of matching the safeguard of natural resources with the living comfort.

The experimental application of the EducaRUE method in the operational procedures of call for tenders will have to take into account the energy-environmental assessment modality, with reference to the use of natural materials and to the need to integrate sustainable technologies in building industry, for the safeguard of architectonic quality.
The Local Plan for Energy efficiency in public buildings

The Local Plan is a planning tool which Public Administrations or those subjects that own school buildings or are in charge of their management, should have.

The Local Plan, in particular, is a tool which, within the EducaRUE Project, is conceived to make it possible to use the experience deriving by the planning, design, analysis and other activities preceding the Local Plan itself in order to work out a prospective picture of the interventions to be carried out.

How is the Local Plan conceived?

It is a table in which the works which the Public Administration intends to carry out in order to improve the Energy efficiency of its buildings are inserted, together with the data relating the
quantification of the intervention and the foreseen period for contracting and planning. More precisely, following the methodology adopted for the pilot intervention illustrated with the help of the EducaRUE Tools, the following data will be indicated in the table of the Local Plan:

- Name of the school;

- Place;

- Parameter linked to the consumptions: first of all, the CIH index (energy index of heating consumptions) will be calculated. If this is not possible, the total annual primary Energy consumption $C_{tot}$ (average value of consumed kWh in the last three years) will be indicated;

- Priority of intervention $P$;

- Quantification of costs;
- Information about the financial measure to be adopted in order to realize the interventions;

- Information about the time schedule of the realization of the interventions (specifying the period of time within which each necessary step is being carried out).

The first and most important point is, therefore, to fix the financial need for the quantification of the interventions.

How can this objective be realized? By applying the same method used for the building selection in the previous interventions.

As a matter of fact, the quantification of the costs associated with the interventions to be realized in the n\textsuperscript{th} building, can be obtained by multiplying the summary costs associated with the pilot intervention by the ratio between the energy index for heating
consumptions of the \textbf{nth school building} (CIH,n ) and the energy index for heating consumptions of the \textbf{pilot school building} (CIH,pilot) .

After this calculation, the feasibility of the intervention is verified, on the basis of the economic-financial assessment that the Administration can do and on the basis of the tool which can be used, such as turning to Indebtedness Claim, or to a private backer, or to a financial leasing, or to amounts of money already available to the Administration itself. Then, the most suitable financial tool for the contracting of the intervention is decided.

Finally, on the basis of the established priorities, such as Energy consumption, demographic trend of the institute and/or the local area served by the school, the characterization of the areas where the schools are located, other interventions to carry out in the school building with no energy efficiency aim, and on the basis of
certain priorities decided by the Administration, the years of actual realization of such works and/or interventions can be evaluated.

It is very important to take into account other specific needs which might arise for some buildings which could be in a particular situation before or during the planned intervention.

The above mentioned spreadsheet will have to be accompanied by a detailed but short report where the criteria selected to determine the priorities, the foreseen financial tools to be adopted, the time schedule, etc. are clearly pointed out.
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<th>PARTNERSHIP</th>
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