Interreg - IPA CBC
Italy - Albania - Montenegro
EFFECTS

Best practices on EE in schools

Municipality of Barletta
Municipality of Termoli
Italian National Agency for new Technologies, Energy and Sustainable Economic development
Municipality of Vlora
Ministry of Education, Science, Culture and Sports

DOCUMENT HISTORY

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Introduction and rationale of the document

The present document constitutes the main output envisaged by the EFFECTS project.
It firstly envisages a description of the project, in terms of summary, objectives, approach and results. Afterward, it outlines an overview of the entire process followed by the project, enriched by some additional features.
In particular, the purpose of this document is to provide, as precisely as possible, the steps followed by the EFFECTS consortium during the project's implementation to achieve the final result, representing the entire process which starts with the energy audit, includes the involvement of school environment-related communities and stakeholders, and ends with the monitoring activities, which also represent the potential re-starting point of the virtuous circle.
It also includes the explanation of one of the main features of the EFFECTS project: the combination of top-down and bottom-up approaches to identify energy efficiency interventions that best meet the needs of those who inhabit the spaces involved by the energy efficiency interventions every day.
The section related to the involvement of the school communities in the involved territories gives an overview of the main characteristics of the capacity building events organized by the project partners, in terms of target groups, educational approaches and main topics covered.
This allows to move away from the activities concretely implemented within the EFFECTS project and to rather outline a general scheme, usable and replicable elsewhere.
Each descriptive step of what has been accomplished and how it has been accomplished is also accompanied by attachments that offer practical samples, useful for other local administrations to reply the scheme underlying the EFFECTS project in other contexts.
In particular, **REEHUB**, the Simplified methodology of the energy audit, implemented in the framework of INTERREG Italia, Albania, Montenegro "REEHUB - Regional Energy Efficiency HUB and proposed within the EFFECTS project by ENEA as methodology allowing professionals of public administration to approach to building energy audit step by step, is here provided as an Annex, useful for the purposes of replicability.
Moreover, the **model of the tenders** for the execution of the works for energy efficiency at pilot building in Barletta is attached to the document as well as Terms of Reference (Annex 2).
Finally, the **Model of the Memorandum of Understanding** – MoU – signed by project partners to formalize their commitments in a future perspective, and particularly for the establishment of the CBC Open Innovation Lab, and the **PPPP model** are also attached (Annexes 3 and 4).
The overall purpose, therefore, is to provide not only an explanation of the steps necessary to improve energy efficiency in schools but also to outline a "path", feasible for other local entities interested in enhancing the energy efficiency of public buildings.
Therefore, this document is proposed to represent a valuable tool for the replicability and transferability of the process followed by the EFFECTS project, understood as a method or model, in other territorial contexts and by other local administrations throughout the program area, with the aim of enhancing the energy efficiency of other buildings in a future perspective.

1. Project description

1.1. Project summary

The EFFECTS project, "EFFective Planning of schools' buildings for Environment and ClimaTe changeS", funded under Interreg IPA CBC Italy-Albania-Montenegro 2014-2020 Program, is strategically positioned with regard to the long-term goals of the European Union, contributing to one of its key pillars for current and future programming: the green sustainable transition, as clearly expressed by the European Green Deal and related strategies and legislative initiatives.

The construction sector accounts for approximately 40% of the total energy consumption in the European Union. In this regard, Europe has issued a dedicated directive on energy performance in buildings. Therefore, cross-border cooperation with Albania and Montenegro is crucial for exchanging best practices, transferring innovation aimed at reducing heating demand (in terms of annual energy balance) and minimizing peak cooling demand.

It is also essential to support industry operators in identifying economically efficient approaches to renovation works on specific types of buildings.

In this context, the EFFECTS project has promoted innovative practices and tools to reduce carbon emissions and enhance energy efficiency in the public sector, particularly in school buildings, leveraging on synergies between n. 5 project partners, which are n. 3 local public administrations (the Lead Partners Municipality of Barletta, P2 Municipality of Termoli, P4 Municipality of Vlora), n. 1 research center, P3 ENEA, the Italian National Agency for New Technologies, Energy and Sustainable Economic Development, and n. 1 national public authority, P5 the Ministry of Education of Montenegro.

Within the project, in particular, energy efficiency improvements have been identified and carried out in pilot school facilities located in Barletta, Termoli, Valona, and Tuzi.

But it hasn't just been about simple works decided by the local administration to improve the energy efficiency of these buildings: in fact, considering schools as the most suitable environment for spreading the culture of sustainability and energy savings, the project has carried out specific awareness and capacity-building actions dedicated to students, teachers, and families, in all the territories involved.

They had the opportunity to closely participate in planning and renovation activities aimed at energy efficiency of the spaces they daily live, and the school community has been fully engaged in a process that represents a piece of the green transition, promoted at the European and global levels.

This bottom-up approach has been emphasized within the project through the provision and establishment of a Living Lab focused on energy efficiency in each of the pilot school buildings, with the aim of continuing to raise awareness among school communities about environmental sustainability issues.

During the project's Final Conference, the Living Labs were also interconnected through the creation of a Cross-Border Cooperation Open Innovation Living Lab, as outlined in a specific Memorandum of Understanding signed by the partners.

This CBC Open Innovation Living Lab will serve as a framework for future projects based on the Open Innovation approach.

Finally, the virtuous cycle created by the project, which starts with the energy audit conducted by a technician on the pilot buildings, involves active engagement of school communities and awareness-raising activities, and then identifies and implements improvements to the well-being of people within the pilot buildings, concludes and can restart thanks to the monitoring element.
Under this point of view, the developed ICT Tool functions as a permanent repository of information related to the energy consumption of the buildings and serves as a useful tool for regular technical monitoring.

Here is a **summary table** of the progress of the technical working packages and related activities, completed within the EFFECTS project:

Name of the WP	Description of related Actions
T1. Assessment of the Energy System	Under coordination of ENEA, PPs tackled the issue of comparing technologies, regulations and financial measures to create a benchmark at international level. Within **A.T1.1 "European benchmark"**, PPs conducted a study on bioclimatic design and physical improvement of buildings at CB level under coordination of ENEA, which after collecting and harmonizing their contributions delivered the final benchmark analysis, referred to technologies, legal and financial measures to support the transition towards new Energy Saving systems that can empower energy efficiency in school buildings, safeguarding the indoor comfort. Within **A.T1.2, "Customization of protocols for schools"**, PPs analyzed Strength, Weakness, Opportunities and Threats of the mapped models, leading to the SWOT analysis for developing a common customization of protocols for Energy Efficiency in public buildings, such as schools. In **A.T1.3**, **"Common methodology to conduct an Assessment"**, PPs defined a common CBC census tool to monitor parameters such as energy consumption, comfort, etc., as well as a common methodology to draft an intervention plan. In **A.T1.4 "ICT Tool development"** has been centered on the ICT tool, representing a hub to collect all documents developed within Pilot actions, also in view of monitoring activities over time: ENEA implemented the requirement analysis, while LP the repository.
T2. Schools Living LAB on Energy Efficiency and Renewable Energy Sources	T2 envisaged the core activities of the EFFECTS project. During **A.T2.1**, **"PPPP model and possible scheme"**, under coordination of ENEA, PPs developed a common model for Public-Private-People-Partnership (PPPP) and, by using the approach of Living Lab, the creation of a PPPP as new cooperation model has been developed to promote demand and production of EE and RES solutions. Within **A.T2.2**, **"Sustainable energy action Plans development",** coordinated by Municipality of Termoli, PPs delivered a SEAP (Sustainable Energy Action Plan), identifying a set of priorities and interventions and a related roadmap for the 4

specific interventions that have been implemented in Termoli, Barletta, Valona and Montenegro.

A.T2.3 has been dedicated to the effective equipment of identified public school buildings in the mentioned localities with technological installations and new EE systems. In particular:

LP worked on "G. De Nittis" School, installing 44 high-performance shading systems on existing window frames to increase sunlight shelter, optimizing the use of natural and artificial lighting, 44 humidity sensors to monitor the air quality to improve the indoor comfort, and SMART thermostatic valves, for precise control of heat delivery, accessible via tablet or smartphone, as in the pictures below (Figure 1).

Figure 1. The equipment for Pilot EE interventions in "G. De Nittis" School, Barletta.

P2 worked on the Municipal Nursery School "Madonna delle Grazie" in Montecarlo Street, installing solar panel of 20 KW, renovation of lighting with LED systems and the heating system, as shown below.

Figure 2. The equipment in "Madonna delle Grazie" Nursery School, in Termoli.

P4 worked on "kindergarten Nr. 11" in Vlora with infrastructural works (walls, roof and windows) and by change lighting, electrical and cooling/heating systems.

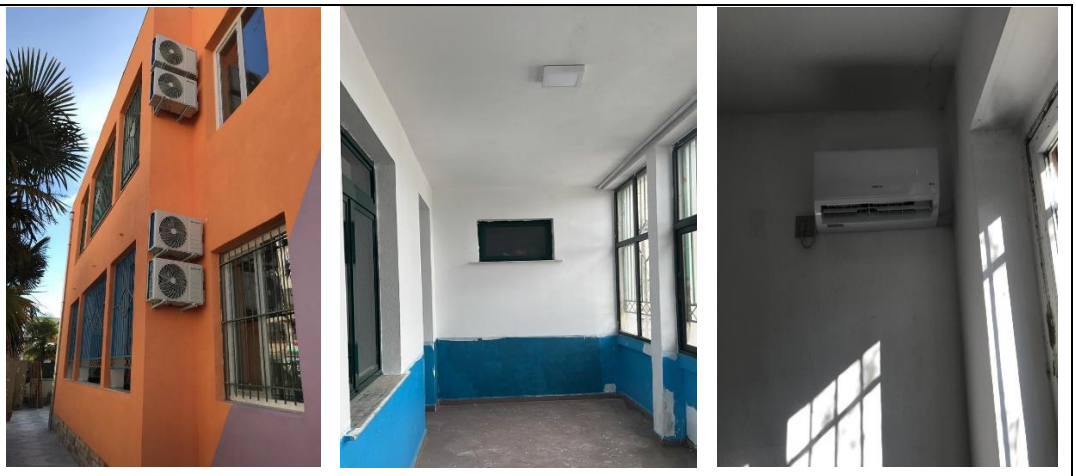

Figure 3. Some of the Pilot interventions carried out in Vlora, Kindergarten nr. 11.

P5 installed a new cooling system in a Public Institution Secondary Mixed School in Tuzi Municipality called "25. Maj".

Figure 4. Pilot EE interventions in "25 May" School in Tuzi, Montenegro.

In parallel, ENEA monitored the EE developed by energy audit and explained students, teachers and other schools' stakeholders, which are the direct beneficiaries of interventions, the importance of a sustainable development. It is important to highlight that all the installations here represented by figures have been later confirmed after the participatory activities foreseen in T2.1 and the external energy audit foreseen in T2.3, assuring a bottom up approach.

A.T2.4, Guidelines for innovative technologies and evaluation, has been focused on the definition of one of the EFFECTS project main output: these "Guidelines for innovative technologies", with regard to which reference is made to the initial paragraph of this document, where the function of this deliverable is described.

T3. Capacity Building and Skills Improvement

Within this WP's activities, PPs tackled the challenge of ensuring continuation and longer-term impact of the activities implemented, under coordination of Ministry of Education of Montenegro.

In **A.T.3.1**, **"Training sessions for building energy audit",** MoE coordinated the realization of a common training path, implemented in each project partners territory, addressed to operators, installers and industry leaders to promote technology innovation for EE.

In AT3.2, **"Capacity building"**, PPs organized 2 events addressed to public institutions and schools' communities' actors, sharing experience gained and best

	practices, and raising awareness about EE and environmentally sustainable behavior. These activities have generated a virtuous cycle of increased awareness and knowledge that started with the students and had a positive impact on the entire school community, including the students' families. **AT3.3**, **"CBC Open Innovation Lab"**, envisaged the creation of a CBC Open Innovation Lab under coordination of Municipality of Barletta, networking the Living Labs created in each school used for the Pilots. These Labs have been the effective frameworks to ensure the participatory and bottom-up approach during the EFFECTS planning phase and have been used as open innovation containers after Pilot activities. The establishment of the CBC Open Innovation Lab has been formalized during the final conference of the project held at "G. De Nittis" School and outlined in the Memorandum of Understanding (MoU) signed by all the partners.

1.2. Project objectives

The **main objective** of the EFFECTS Project was in line with the specific objective of the Program, aiming at promoting innovative practices and tools to reduce carbon emission and to improve energy efficiency in public sector.

The EFFECTS consortium worked for improving not only the local environment but also the Cross-Border capacity for sustain energy efficiency action plans, developing tailored pilot actions in all the 3 Program Countries, and creating a network for exchanging information, knowledge and technologies focused on energy saving and, more generally, on the topics related to environment sustainability.

Summarizing, the **three main specific objectives** of the EFFECTS project were as follows:

- **Definition of Common Strategic Plans and Roadmap for Energy Efficiency in public buildings**. This project goal included some sub-objectives, namely: establishing a shared foundation for the development of the 3 regions involved, encompassing technical, economic, and politic aspects; designing common methods and tools for mapping energy consumption in the targeted areas as well as for performing environmental and economic evaluations; developing and implementing specific ICT Tools along with the implementation of a PPPP model to facilitate the collaboration among public entities, private entities and citizens.
- **Creation and testing of innovative solutions for improving the energy efficiency of public buildings and related processes**. It included the study phase, the creation and testing of common action plans through pilot actions based on the Living Lab Paradigm.
- **Creation of a CBC Open Innovation Lab**. In order to ensure long-term impacts of the pilots on the three territories, the EFFECTS Consortium worked to spread the knowledge gained through specific capacity building activities.

  In addition to this, the establishment of the CBC Open Innovation Lab had the following fundamental objectives: stimulating the attention regarding the energy Efficiency in schools and to increase the awareness of citizens at cross-border level, promoting the continuous

sharing of methods to save energy and fostering environmentally sustainable behaviors at CB level also in the future perspective.

1.3. Project approach

The EFFECTS project has entirely based its activities on an approach aimed at combining two different but interconnected components, from whose combination the added value generated by the project has arisen, especially in the long term.
The first component is the technological-scientific one, given by the study and energy audit of the involved school buildings carried out by professional technicians.
The second component is represented by the human-social aspect, which involves the active participation of the entire school communities of the Pilot schools, making them protagonists in various stages of the project through the method of **Open Innovation**.
This approach is typical of the Living Labs, which have indeed been implemented in all the Pilot schools subject to energy efficiency interventions within the project and is also the basis for the CBC Open Innovation Lab that networks these labs at a cross-border level in the future perspective.
In particular, the EFFECTS objective of improving the capacity to plan and manage integrated energy-saving actions was pursued through an **experimental, participatory, bottom-up approach**, involving public actors, citizens, professionals, and individuals linked to the school community.
All these stakeholders were encouraged to consider themselves at the center of a virtuous cycle, within a continuous process of innovation and knowledge supported by a partnership involving both public and private entities, thereby becoming effective agents of social innovation.
The "Open Innovation", according to the Oxford Review Encyclopedia of Terms and to the doctrine therein cited[1], is referred to a situation where an organization doesn't just rely on their own internal knowledge, sources and resources (such as their own staff or R&D, for example) for innovation (of products, services, business models, processes etc.) but also uses multiple external sources (such as customer feedback, published patents, competitors, external agencies, the public etc.) to drive innovation.
In the first text of the pioneer of this innovation model, Henry Chesbrough[2], it is defined as "the use of purposive inflows and outflows of knowledge to accelerate internal innovation and expand the markets for external use of innovation". It represents a more distributed, more participatory, and more decentralized approach to innovation, outlining new ways of "doing things".
The most recognized benefits that this innovation model brings to businesses, are represented by the reduction of risks in innovation projects, the reduction of Research and Development costs, the adoption of new technological trends as a consequence of better interaction with the innovator's ecosystem, the identification of new business opportunities[3] etc.

[1] Chesbrough, H., & Bogers, M. 2014. Explicating open innovation: Clarifying an emerging paradigm for understanding innovation. In H. Chesbrough, W. Vanhaverbeke, & J. West (Eds.), New Frontiers in Open Innovation: 3-28. Oxford: Oxford University Press. Page 17, in https://oxford-review.com/oxford-review-encyclopaedia-terms/encyclopaedia-open-innovation-definition-explanation/.
[2] Chesbrough, H., Open Innovation: The New Imperative for Creating and Profiting from Technology. For modern businesses, Harvard Business Review Press, 2003.
[3] https://blog.osservatori.net/it_it/open-innovation-guida

Nevertheless, despite the concept of Open Innovation was conceived in the business environment, this model brings important benefits not only in the business and organizations sectors.
In fact, it is an innovation model that brings advantages even at a purely social level, strengthening the active involvement and engagement of system actors. On one hand, it represents a paradigm that holds society accountable for the changes which are necessary in the modern era, such as those related to the challenge of environmental sustainability. On the other hand, it fosters a collaborative environment among different stakeholders, as a prerequisite for creating genuine innovation ecosystems connecting different type of skills and perspectives.
Through these synergies, new and creative solutions to complex problems can be found.
Under this perspective, this paradigm conveys the idea that innovation is determined, above all, by interaction, openness to others and collaboration.
One of the models linked to the Open Innovation approach is that represented by the "Co-creation labs", in which resources, mentoring, and knowledge people need to explore challenging questions are concentrated and shared[4].
In view of the potential added value that the Open Innovation approach can bring to innovation processes, and of vision of collaborative society that it encompasses as well, the EFFECTS project consortium have chosen to focus on this paradigm, matching the technical aspect with the social aspect within the Living Labs, thus creating a **smart community** which is fully aware of environmentally sustainable behaviors and is also the protagonist player in designing the energy efficiency interventions involving spaces they daily live in.
For these reasons, **Living Labs** have been established in each of the pilot schools involved by the project interventions after the energy audit, so that to collect issues, needs, habits related to energy consumption not only of the students – to whom the capacity building activities have been directly addressed – but also of their families, based on the assumption that the project's objective could not be fully achieved without the active participation of the entire school community.
Under this point of view, the EFFECTS project embraced the Living Labs approach, in which the paradigm of Open Innovation has been able to find tangible expression in all the territories involved.
Following the definition developed within the European Network of Living Labs, the latter represent Open Innovation ecosystems in real-life environments, using iterative feedback processes throughout a lifecycle approach of an innovation to create sustainable impact.
They focus on **co-creation**, rapid prototyping & testing, and scaling-up innovations & businesses, providing joint-value to the involved stakeholders, and operating as intermediaries-orchestrators among citizens, research organizations, companies and government agencies or levels[5].
The Living Labs created within the project, to be understood both as tangible spaces and as approaches to shared-open models of innovation, have been conceived following the most common definitions of these infrastructures, therefore including the following aspects[6]:

[4] https://www.braineet.com/blog/open-innovation
[5] https://enoll.org/about-us/what-are-living-labs/
[6] David V. Keyson, Olivia Guerra-Santin, Dan Lockton, Living Labs. Design and Assessment of Sustainable Livings, 2016.

- **Active involvement of stakeholders and end users** (who represent those who actually use the service tested or validated – in our context those who daily live the spaces of the school buildings affected by energy efficiency interventions –);
- **Integration of the stakeholders' involvement** into all phases of the Living Lab' development (in fact, within the EFFECTS project the school community has been engaged both *before* and *after* the energy efficiency interventions in school buildings, and has been the focus of the creation of the CBC Open Innovation Lab during the Final Conference as well);
- **Experimental approach in a real-life context**, which means that the user involvement occurs in conditions related to normal living or working environments rather than in artificial environments (in the EFFECTS case: the school buildings, the classrooms and the indoor spaces in which school community generally spends many times every day.
- **Collaboration and co-production of knowledge**: considering the Living Labs as Networks of heterogeneous actors, resources, and activities integrating stakeholder-centered research and Open Innovation, this approach brought to identifying the most suitable EE interventions to carry on in the pilot school buildings, aligned with the actual needs of the school community.

The latter had the chance to express its needs and share its habits related to environmental sustainability within the Living Labs created during the project in the pilot schools, and also validated the interventions that were identified by intersecting the results of the technical audits with the outcomes of the carried-out capacity-building activities.
Furthermore, following a living lab approach, the school community was also actively involved in the creation of the CBC Open Innovation Lab, especially considering that its inauguration coincided with the Final Conference of the project hosted at one of the pilot schools, in Barletta.
Students had the opportunity to witness both the physical setup of a dedicated space for future co-creation activities on environmental topics, and the essence of their ongoing involvement as well.
This involvement allows them to continue discussions and collaborate on cross-border projects focused on environmental sustainability, therefore representing an indispensable prerequisite to ensure the continuation of the virtuous cycle generated by the project.
Regarding the virtuous cycle, which will be the subject of paragraph 1.5, it should be emphasized that it was made possible just by leveraging the combination of the two components mentioned above: the technical component and the human-social one, which expressed itself in the created Living Labs as well as in the Open Innovation approach.
Actively involving the individuals affected by the pilot interventions for energy efficiency by assessing their needs and habits and cross-referencing this data with the technical audits carried out by professionals, made it possible **to merge a top-down approach with a bottom-up one** in the project's implementation, as represented in the infographic below.

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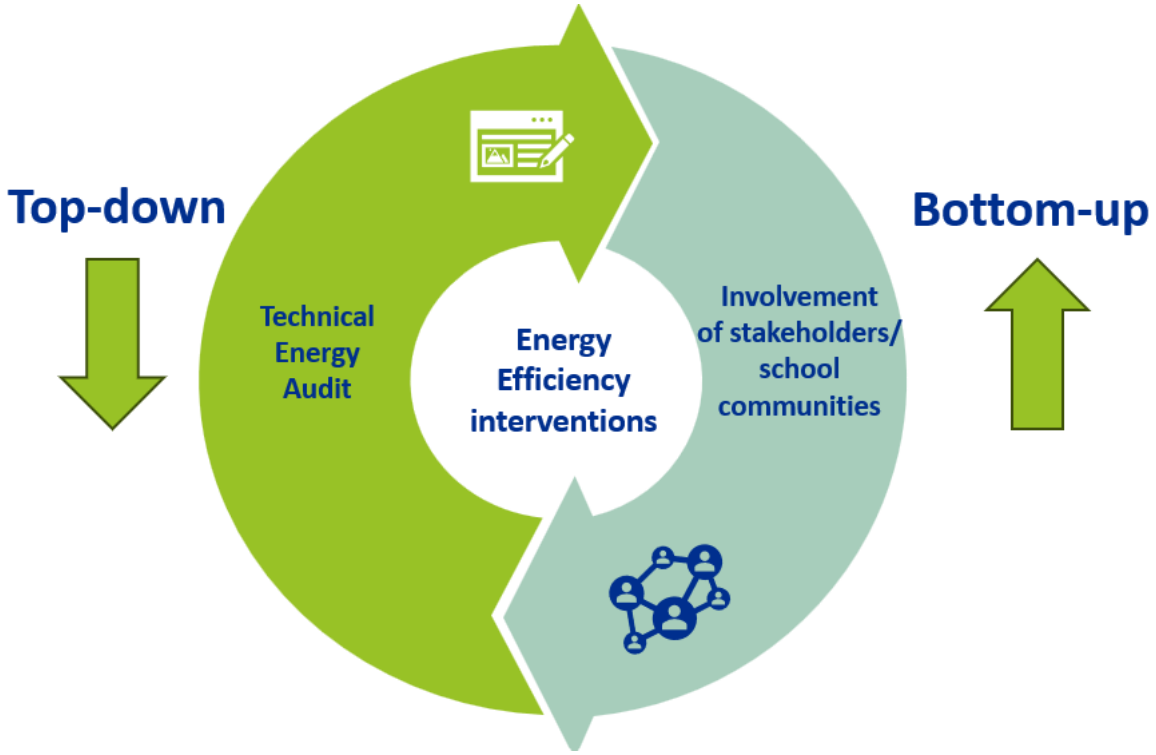

Figure 5. The combination of top-down and bottom-up approaches within the EFFECTS project.

This hybrid method, people-centered, ensured that the school community (as it would have happened in any other type of human community in any other context) did not perceive the energy efficiency interventions carried out on the pilot school buildings as "foreign", imposed from above, or simply dictated by the local administration.
Instead, this method led to extensive acceptance and sharing of the interventions by the stakeholders because they were placed at the center of the process, both as users and as recipients of efforts to understand their needs and habits related to energy consumption and use of natural resources.
Additionally, they benefited from specific capacity-building activities, planned, and implemented in all the pilot schools, addressed to students and indirectly to their families too.
This resulted in the creation of a smart, aware, and informed community that was sensitized to environmental issues and played a leading role in "green transition" initiatives – such as the ones implemented within the EFFECTS project – seen as co-designed in order to effectively meet people own needs.

1.4. Project results

The **main results** achieved by the EFFECTS project are the following:

Improved CB framework conditions related to energy efficiency, in which PPs have worked as facilitators in developing a virtuous scheme.
In particular, within the EFFECTS project specific **common action plans for energy efficiency and sustainable energy production** in school buildings have been developed and the **awareness about environmentally sustainable behaviors has been increased** among the school and local

communities of the involved territories in all the 3 Program Countries, by effectively involving students, teachers, parents and professionals (architects, engineers and surveyors) in implementing the common action plan through a Living Lab/Open Innovation approach.
This result, related to the "human component", to the behaviors, and habits of local communities, truly envisioned as "smart communities", is highly significant in ensuring a long-term positive impact and has found tangible expression in the CBC Open Innovation Lab as well as in the Public-Private People Partnership Model.

1.5. The EFFECTS project virtuous circle

When we talk about the virtuous circle generated by the EFFECTS project, we are actually referring to a dual characteristic of the project. On one hand, it represents the primary objective achieved thanks to the Capacity building and awareness-raising activities implemented within the school communities of the involved pilot schools.
In fact, by making students protagonists of specific activities tailored to them through games, questionnaires, and informal teaching approaches – and involving teachers as well – a cascading effect is achieved on families in terms of data related to energy consumption habits and an increase in awareness of environmental sustainability issues, as illustrated in the infographic below.

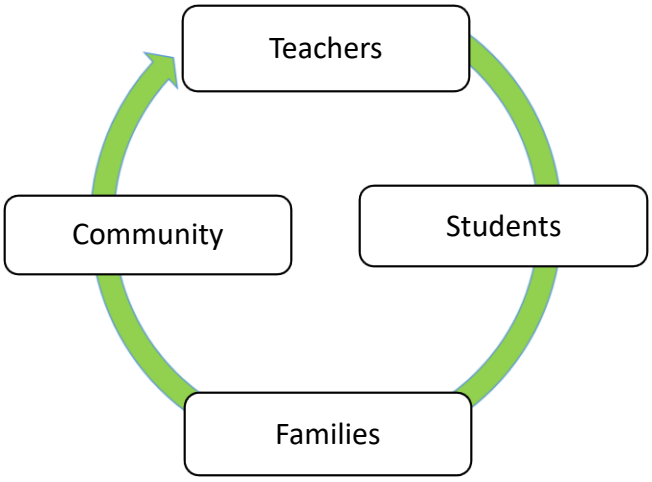

Figure 6. The virtuous circle generated by the Capacity building activities within the EFFECTS project.

On the other hand, all the activities outlined and implemented in the EFFECTS project, considering both their temporal sequence and the underlying method and approach as explained in the previous paragraphs, have generated a virtuous circle.
This aspect extends the project's impact over the long term, ensuring results even beyond the project's completion, and it also integrates a genuine positive model that can replicated and transferred elsewhere.

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This paragraph shows the single components of the circle, considering the process not a linear one but rather a circular one, as the first step related to the study and assessment of the buildings 'objective state, reconnects with the last step, represented by the creation of the CBC Open Innovation Lab, a cycle that can be repeated over time.
It is important to stress that the infographic presented here below takes into account only the fundamental steps for the description of the virtuous circle and does not describe them in detail, as in the following paragraphs, where the steps are illustrated one by one and enriched by annexes.

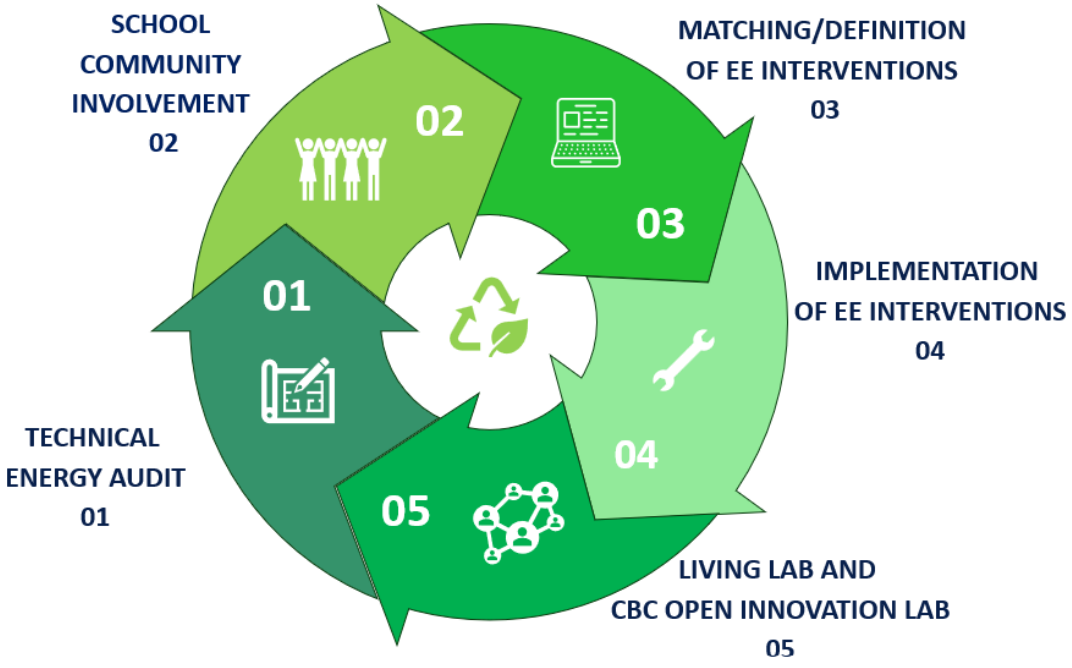

Figure 7. The virtuous circle generated within the EFFECTS project implementation.

The **first** component to mention, which begins the circle, has been represented by the energy audit conducted by professional technicians at each of the Pilot schools identified by project partners. Technical assessments provided objective data on the energy conditions of the buildings, such as energy class and the state of energy efficiency etc.
These studies formed the basis for possible interventions to improve the energy efficiency of the buildings.
In the **second** component, school communities linked to the pilot school buildings were actively engaged within activities aimed at assessing their energy consumption habits at school and at home, as well as within awareness-raising and capacity building activities focused on environmental issues, designed to have a cascading effect from young students to their families.
The **third** one involved the combination, or matching, of the first two mentioned steps, underlying a top-down and a bottom-up approach respectively; it led to the concrete identification and implementation of interventions in the pilot school buildings (**fourth** component).
The **final** component of the circle envisaged the creation of Living Labs at each pilot school building and their networking within the CBC Open Innovation Lab.

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This aspect connects back to the first (energy audit), because the establishment of these places for experimenting the Open Innovation method, leads to a permanent sensitization of school communities to environmental sustainability issues and responsible resource use, empowering them.
Greater awareness of these issues within communities encourages them to pay more attention to their well-being in indoor spaces (indoor comfort), and to promote additional monitoring and control activities related to this well-being over time.
Consequently, the phase of technical audit to verify the actual improvement of parameters related to indoor comfort and building energy consumption, around which a conscious and attentive community has formed, can start again.

2. The process of the EFFECTS Project: an overview

The present paragraph aims at providing a comprehensive overview of the entire process followed within the EFFECT project implementation by an infographic envisaging all the single steps, which are explained in the following sub-paragraphs.

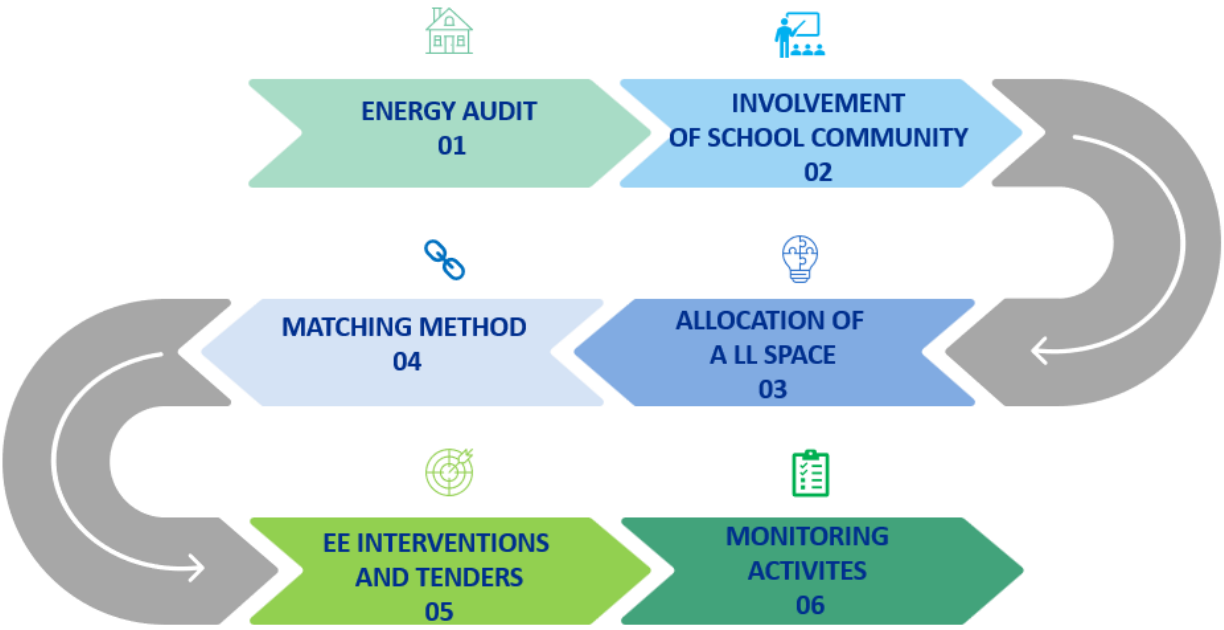

Figure 7. The EFFECTS project roadmap and the steps of the process.

It is represented as a roadmap for a clearer understanding of the process, but it is important to highlight that, as outlined in the previous paragraph, it is not a linear model, including a starting and an ending point, but rather a circular one. The last step, related to the monitoring phase, serves as both the endpoint and potentially the starting point for what we have described as a virtuous circle. It's also important to remember that the starting forces behind this process, following the Living Lab and Open Innovation approach embraced by the EFFECTS project, are the empowered communities at Cross-border level.

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In particular, in the framework of this model, school communities and stakeholders in the involved territories, together with local administrations, are part of a smart, aware, and interconnected community able to generate innovation through their synergies and by perpetuating knowledge and awareness on environmental issues among society.
It should be noted that all the described steps represent potential components of a replicable and transferable model, and their implementation is presented as guidelines to follow in order to achieve the desired outcome.

2.1. Step 1. The Energy Audit

This first step, focused on Energy Audit – coordinated by ENEA – has been articulated in several sub-steps, preliminary to the actual energy audit conducted in the identified pilot schools, which need to be mentioned.
Firstly, there has been the preliminary study on the state of school buildings in each involved territory, collecting information by project partners to provide a multidimensional overview including technology regulation and financial aspects, and obtaining a benchmark analysis.
Afterwards, a common protocol for Energy Efficiency in schools has been delivered. This has been the result of the activity of customization of protocols to improve the process of retrofitting schools with energy efficiency in the involved territories. ENEA selected a software tool, Teeschool, developed within the INTERREG Mediterranean project TEEESchools – Transferring Energy Efficiency in Mediterranean Schools, useful to allow local authorities to assess the needs of each school, defining priorities for interventions, and the municipalities gave their feedback on the appropriateness within the EFFECTS project.
At the heart of this step there is the **identification of a common methodology** to conduct the energy efficiency assessment in the pilot buildings.
In particular, **REEHUB - Simplified methodology of the energy audit –** (Annex 1) which within the EFFECTS project was proposed by ENEA, is a methodology implemented in the framework of INTERREG Italia, Albania, Montenegro "REEHUB - Regional Energy Efficiency HUB", allowing professionals of public administration to approach to building energy audit step by step[7].
It represents Guidelines for energetic diagnosis, aiming at providing practical guidance for public administration technicians and professionals, stressing the importance to know the building in all its aspects before any energy efficiency intervention.
It includes basic technical notions and procedures to follow according to International Standards and Community Policies in progress, therefore serves as a valuable supporting tool that can be used as in the case of the EFFECTS project.
The document is articulated in a description section, outlining the methodological approach of an energy audit of a building, and an explanatory section, including examples of "Best Practice" and describing how the audit is used within the regional centers established under the project.

[7] Within the EFFECTS project implementation, PPs filled in the template prepared by ENEA, collecting data on the selected school building; the data collecting was necessary for the first step of the energy audit, and then the PPs could choose the software for auditing the school as well as the most suitable intervention to carry-out.

Here, the link to the official page of REEHUB project from which it is possible to download the document in all the program languages: https://reehub.italy-albania-montenegro.eu/outputs.

2.2. Step 2. The involvement of school community and stakeholders.

The second step envisages the involvement of the school communities in all the involved territories, including teachers and students, in the framework of targeted capacity building activities which, within the EFFECTS project, have been implemented by all the project partners.
In particular, each partner organized 2 events with the 2 main stakeholders of the project, therefore schools 'actors and public institutions, expect from ENEA which organized only 1 event in school, with the purpose to share experience gained in the project, to raise awareness about energy efficiency and environmentally sustainable behaviors, and to spread best practices.
In order to enable the replicability of this step in other territorial contexts, the **main characteristics of the capacity building events** organized by the project partners are outlined below, in terms of target groups, educational approaches and main topics covered.
To provide a wider overview of the capacity building activities implemented, which are all necessary in order to achieve the goal of creating a virtuous circle involving local communities, the table below also includes information about the events addressed to professional bodies/professional technicians, nevertheless to the children parents (which have a particular importance in the case of the capacity building activities tailored to students of the nursery school).

Target group	Type of event	Approach	Main topics
Teachers	• Round Table • Training course	• Approach aimed at discussing and sharing of objectives, tools, and methodologies, especially with the science teachers. • Combination of theoretical and practical approach.	• Tools, objectives, and methodologies to use to involve students in the project topics. • Environmental ethics and principles of sustainable development. • SDGs and Critical issues. • Energy efficiency and climate change.
Students-junior high school	• Student awareness classes/campaign	• Informal teaching. • Inclusive education. • Flipped classroom.	• Energy efficiency. • Correct behaviors to contribute to energy efficiency.

		• Gamification tools. • Interactive approach. • Workshop approach.	• Sustainable cities.
Students – nursery school	• Dissemination Workshop	• Learning by doing/Hands-on learning	• Correct behaviors for energy efficiency, environmental respect and responsible resource usage.
Families	• Capacity building session	• Combination of theoretical session and data collection by using questionnaires.	• The importance of daily sustainable behaviors for energy efficiency; • The rationale of the pilot interventions foreseen in the school.
Order of Architects, Engineers and Surveyors	• Training and updating Conference	• Frontal lecture and concluding debate.	• Energy efficiency and energy retrofit; • Sustainable construction; • Guidelines and case studies for ecological and energy transition.
Managers of energy consumption in public institutions, **auditors** eligible to inspect public buildings, **professional engineering staff** maintaining	• Technical training path divided in modules	• Frontal lecture	• Legal framework for Energy Audit and Energy Certification of Buildings; • Technical Regulatives; Methodology for Estimating Energy Consumption; • Calculation Methodology;

public official records of energy consumption.			• Basis of Energetics and Statics of the Building; • Basis of the Construction of Buildings.

Focusing on the target represented by the **students**, here below is a general outline of a possible dynamics of each meeting, along with a brief explanation of each key point, to replicate.

Phase	Notes
Presentation of the project	The meeting moves from the presentation of the project to the students in a simple manner while providing all the basic information.
Flipped classroom	In this flipped classroom phase, the students are invited to explain concepts related to energy efficiency and behaviors that can contribute to it. The subsequent discussion with the teacher/facilitator has allowed for the identification of correct answers, thus increasing the overall awareness of the class.
Interactive education and workshop on "My ideal sustainable city"	Students are invited to imagine, discuss, and draw their ideal sustainable city. More in general, this phase involves an in-depth exploration of sustainability through non-conventional educational approaches, not frontal lecture but by emphasizing interaction with learners and their creativity.
Data collection on students and their families habits	This phase envisages anonymous questionnaire to learn about the daily habits of students (and related families) about energy consumption. In particular, some of the possible questions to propose can be: • *Do you ever find yourself studying by leaving TV, PC and console on?* • *How much time do you spend in the shower?* • *How do you get to school?* It is suggested to transfer and graph the data results so that the answers can be analyzed and tracked, also in view of subsequent monitoring activities.

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Quiz	This phase allows to test some knowledge of the students related to the project main topics, combining questions and games.

2.3. Step 3. The allocation of a space for the Living Lab

The third step to consider in implementing the EFFECTS process is the allocation of a specific space within the building, preferably the one involved in the energy efficiency intervention, to the Living Lab.

As widely outlined in paragraph 1.3., the "Living Lab" concept refers to a type of approach or method used for community engagement and involvement, leveraging the Open Innovation paradigm and focusing on keywords such as co-creation, network, collaboration, etc.

Nevertheless, it can also represent a physical space. In fact, combining the Living Lab and Open Innovation methods with allocating a specific space for conducting activities within this framework can be a valuable choice in making the community (school community as in the EFFECTS case, or of other type) engagement process more tangible and effective.

Large spaces or rooms with specific characteristics are not necessary.

What's important is that these are spaces where users/beneficiaries/co-creators can feel comfortable discussing, proposing initiatives, and engaging in discussions, exchanging knowledge together.

In the case of school buildings, as implemented within the EFFECTS project, it could be a laboratory or a gym, for example.

In both cases, it is advisable to set up the space with informative materials aimed at **disseminating information that stimulates discussion** among students, teachers and in general, local target community, and maintains high attention and awareness on the topic/issue/challenge around which the Living Lab is focused.

For example, in the Living Lab set up in a pilot school within the EFFECST project, the walls have been adorned with posters focusing on tips related to the correct behaviors to enhance indoor comfort in the school building, covering topics ranging from the use of natural light to proper opening of windows and doors, and humidity control etc.

This **informative material** not only decorates the physical space dedicated to the Living Lab room but also serves as a mean to convey important concepts that leave an impression on the school community, especially among younger students. They can use these concepts as subjects for reflection, discussion and even as a starting point for planning concrete new actions.

Furthermore, the presence of **digital devices** such as computers and projectors, along with internet connectivity, can be beneficial in a Living Lab as it facilitates presentations by potential speakers, networking activities with other labs and stakeholders, real-time online research, more.

Figure 8. An example of Living Lab implemented within the EFFECTS project, included digital devices.

In the case of the EFFECTS project, the Living Lab created inside one of the pilot school, namely the "G. De Nittis" School in Barletta, has been the location for the final conference of the project, which has been an important chance for students, already involved in the carried out Capacity building activities, to effectively experience a moment of dialogue among European partners on the importance of cooperation in achieving environmental sustainability goals and also to share the "lessons learned" during awareness-raising activities.
In this way, with the active participation of local government representatives and even the mayor, the Living Lab has become a platform for community discussion, not only involving the school community but also the local community – including policy makers and stakeholders – oriented toward a cross-border dimension and focused on sharing ideas for a more sustainable future.

Figure 9. The Living Lab created in pilot school in Barletta within the EFFECTS project, also used as stage for the Final Conference of the project involving the school community.

2.4. Step 4. The matching method between technical and human components

The fourth step of the process is a very important one, because it is the true added value of the model outlined by the EFFECST project: the matching between the two components envisaged

within the project, the technical aspect related to the energy needs of the pilot buildings, on one hand, and the social-human aspect, consisting of the desires and needs of local and school communities who experience the spaces affected by the interventions every day.
As previously stressed in these guidelines, only the combination of these two elements can lead to the identification and implementation of energy efficiency measures that are perceived as closely aligned with the real needs of the people, rather than decided from above, by a local administration supported by experts.
Adhering to this step concretely realizes the principle of a green transition that leaves no one behind, because centered on people and their demands.
In fact, while it is true that indoor comfort is measured by scientific parameters, which in the case of the EFFECTS project can now be monitored in the pilot school buildings thanks to the dedicated equipment installed, it is also true that it represents something extremely tangible and perceptible by anyone living or studying or working in an enclosed environment, such as a classroom.
In other words, the human component, intended as sensations/feelings of greater or lesser comfort and well-being of individuals in relation to changes and climatic conditions, is already an essential part of the green transition by itself.
What the EFFECTS model has achieved in this regard – and can be replicated too – is enhancing this component by bringing together the top-down and the bottom-up approaches through the paradigms of Living Lab which leverages the Open Innovation method.
Therefore, what this step entails is that, once the technical energy audit of the pilot building is conducted, and the school community including stakeholders is engaged, there is an operation to cross-reference what has emerged from the technical assessment with concerns and issues raised by the people.
Involving the communities may either confirm the choices of interventions that would have been made based solely on technical data or guide these choices towards specific types of work or lead to a reconfiguration of interventions.
The possibilities are open, and only the participatory approach can ensure the exploration of all potential solutions. The methods for engaging communities to understand their habits and needs can depend on different aspects, such as the type of target group. For example, addressing young students, as in the EFFECTS Capacity building activities implementation, it is advisable to organize interactive and playful activities that allow for informal needs assessment through quizzes and games, as well as drawing and other creative activities.
When involving teachers or families, on the other hand, it should be possible to directly administer questionnaires and facilitate discussion and conversations in specific meetings or round tables, with the participation od technicians as well.

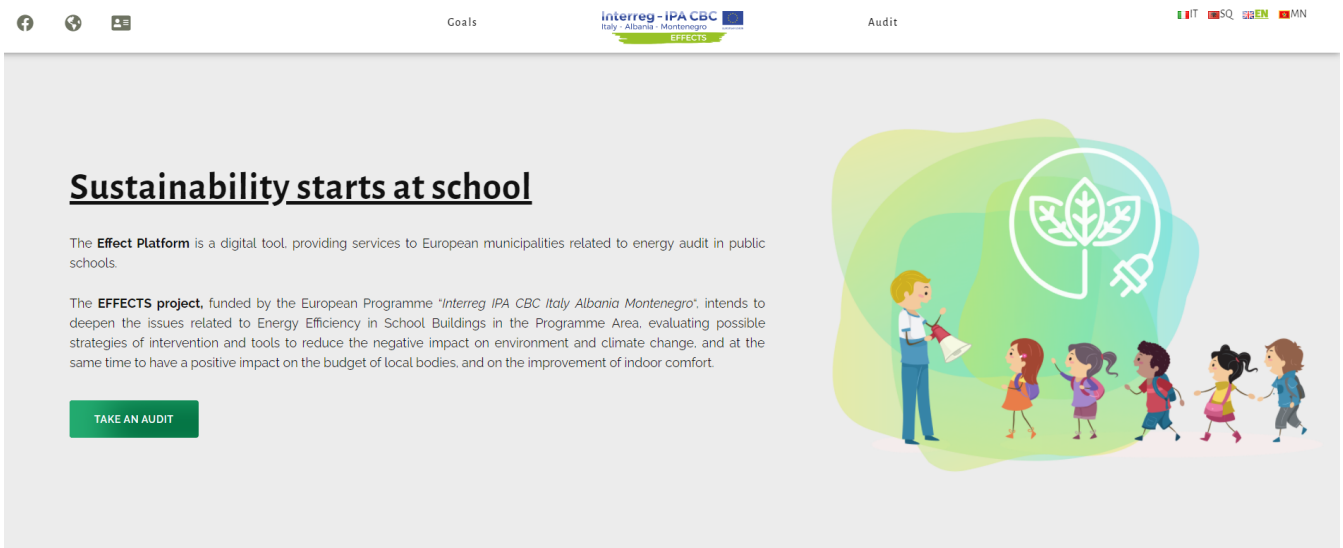
2.5. Step 5. The interventions in pilot buildings and the tender model

According to the fifth step of the EFFECTS model, once the works and interventions that better meet the needs of the involved communities and the technical requirements of the building have been identified, it is the responsibility of the local public authority and/or Public-Private-People-Partnership (PPPP) to implement them.

In order to carry out the interventions, the administration (and/or the PPPP) should issue a tender for installations, aimed at procuring the necessary equipment, performing the works/interventions, or both.
For an overview of the energy efficiency interventions carried out within the EFFECTS project, please see paragraph 1.1. of this document, entitled “Project summary”.

2.6. Step 6. Monitoring activities

The last step to consider foresees the monitoring activities, aiming at verifying, after a specific time interval, the actual improvement in air quality and indoor comfort, and, generally speaking, the enhancement of well-being following the implementation of the energy efficiency interventions.
As in the previous step, this is also an activity of fundamental importance because it allows, on one hand, to complete the virtuous circle and, on the other hand, potentially restart it.
In fact, after monitoring it is possible to understand if, and how much, the energy state of the building has actually improved and, at this point, the interested community and stakeholders can be involved again, perhaps through interviews and questionnaires, to re-assess their needs, explore new ones, and plan for additional possible technical interventions always leveraging the Living Lab approach.
In this regard, within the EFFECTS project a valuable **ICT Tool** has been designed and developed.
It is a platform which allows to enter data on the energy consumption of a building and, on the basis of these data, provides information on the amount of CO2 that has been generated by the building in a certain period of time, thus showing how much of CO2 is saved over time.



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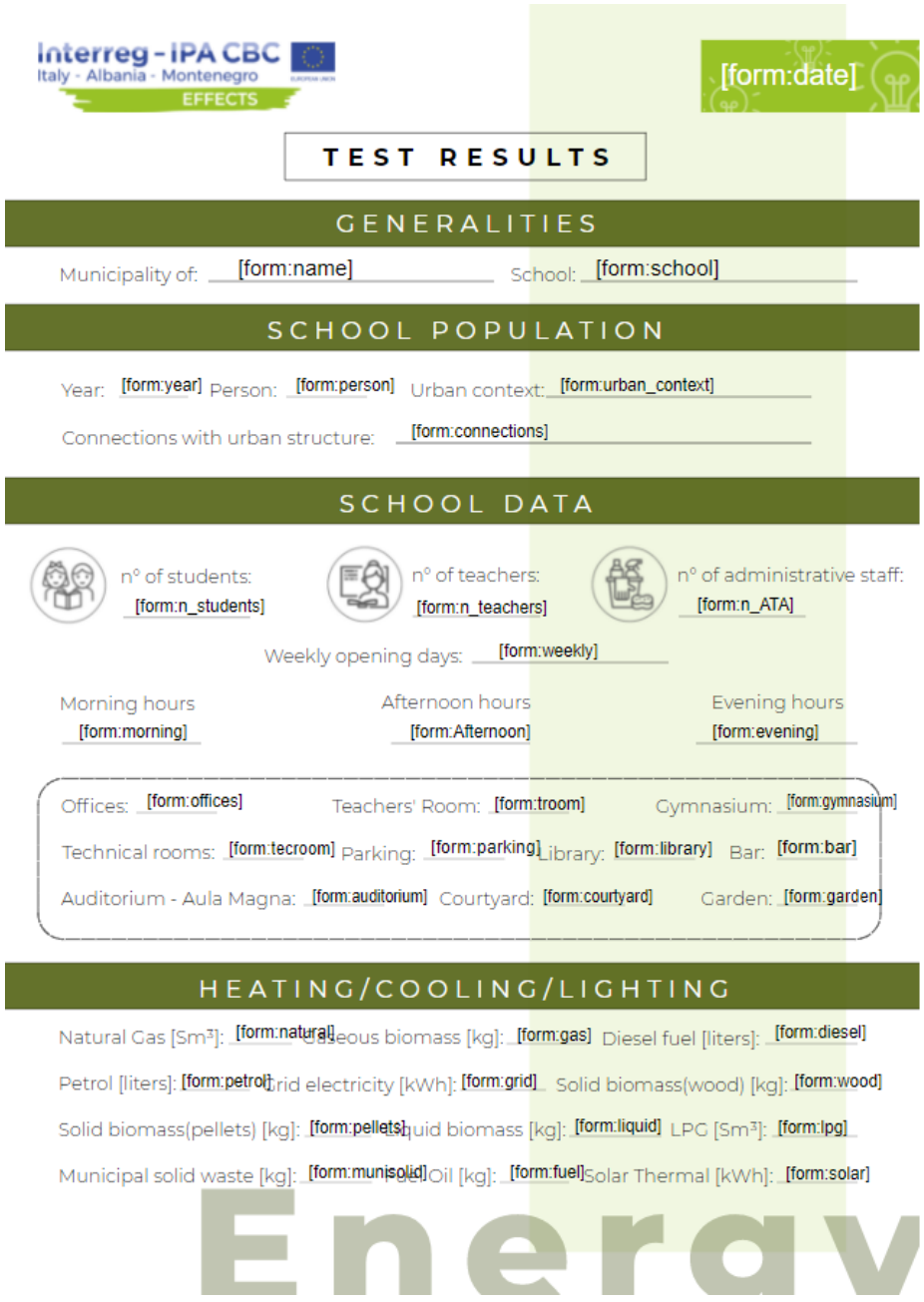
In particular, it is a digital tool, designed to be used also through smartphone, providing services to European municipalities related to energy audit in public schools. It includes a login page, in which the user can access his personal area or register, and an audit page, including a form divided into 7 steps to enter the energy data regarding:

- General info about the school;
- School environment;
- Heating/cooling/lighting;
- Municipal school transport;
- Local distributed power generation;
- Local heat/cool production;
- Number of users/years of school public transport.

At this point, the registered user can keep a copy of the energy data acquired by filling in the form on the Audit page, can review them or print it on a customized form, as in the picture below:



3. Additional features

3.1. Signing the Memorandum of Understanding to join the CBC Open Innovation Lab

The first additional component to consider among the guidelines for replicating the EFFECTS model is represented by the signature, by all the project partners, of a Memorandum of Understanding aimed at formalizing the parties 'commitment to establish a CBC Open Innovation Lab.

The opportunity to establish such a cross-border living lab on energy efficiency based on the Open Innovation method, representing a network of the Living Labs on energy efficiency created in the pilot schools, has arisen during the implementation of the capacity building activities.

The purpose of this CB Open Innovation Lab is also to facilitate the enlargement of the network, because it can attract new labs to the network by promoting policies and behaviors geared towards environmental sustainability.
Indeed, the signature of the MoU does not have the value of formalizing the establishment of a new legal entity.
Instead, through this document, the partners decide to put their mutual commitments in writing for the future perspective after the project's completion, and to create an informal network that connects all the Living Labs created in pilot schools in each involved territory (or, more generally, in the buildings subject to energy efficiency interventions, or somewhere else).
The CBC Open Innovation Lab, in fact, is to be considered a kind of unmaterial framework within which the collaboration among the project partners can continue over time.
In order to make the document less vague and indefinite, the MoU can include a possible list of topics of interventions in the further activities, such as the collaboration for the collection and exchange of data and information about the topics of interest, the collaboration for the design, development, and implementation of joint project ideas to be nominated for the various funding programs, the definition of the conditions necessary to present and support one or more project proposals in partnership, the further support to the increasing of awareness about the Energy Efficiency and Sustainable behaviors and policies at CB level.

3.2. The PPPP model

The Organization for Economic Co-operation and Development (OECD) gives a broad definition for Public-Private Partnerships (PPPs): "long term contractual arrangements between the government and a private partner whereby the latter delivers and funds public services using a capital asset, sharing the associated risks"[8]; actually, they can be used to achieve different objectives in various sectors, such as transport, social housing and healthcare, public buildings and environment, and can be structured under different approaches. These forms of cooperation between public authorities and businesses usually aim at carrying out infrastructure projects or providing services for the public and are strongly promoted by European Commission since the 2009 Communication[9].
According to the website of The World Bank, PPP cover a wide range of contractual arrangements between public authorities and private entities contributing to the private financing of public infrastructure in the broad sense, as a relevant tool to meet national infrastructure needs and achieve the Sustainable Development Goals[10].

[8] OECD, "Principles of Public Governance of Public-Private Partnerships", 2012, cited in European Court of Auditors, Public Private Partnerships in the EU: Widespread shortcomings and limited benefits, 2018, https://op.europa.eu/webpub/eca/special-reports/ppp-9-2018/en/#A3
[9] COM (2009) 615: Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Mobilising private and public investment for recovery and long term structural change: developing Public Private Partnerships, COM(2009) 615 final, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2009%3A0615%3AFIN
[10] https://ppp.worldbank.org/public-private-partnership/library/uncitral-model-legislative-provisions-public-private-partnerships

Under this point of view, and stressing just the important role PPP can play in improving the provision and sound management of infrastructure and public services and in supporting government efforts to achieve the SDGs, the United Nations Commission on International Trade Law – UNCITRAL – prepared the Model Legislative Provisions on Public-Private Partnerships and the UNCITRAL Legislative Guide on Public-Private Partnerships, adopted at its fifty-second session (Vienna, 8–19 July 2019)[11].

In relation to this, the second additional feature to mention for a full and comprehensive replicability of the EFFECTS project process is the Public-Private-People Partnership model.

In fact, the implementation of the energy efficiency interventions, as outlined in step 5, can be attributed to a PPPP.

It is a concept also known as the 4P approach, emerged as a way to address the problems related to public-private partnerships by bringing the general public – in other words the "people" – into the partnerships alongside with public and private actors.

Although there are also other new policy concepts aiming at creating more inclusive governance involving different actors, this approach specifically targets attention to adding the general public and the citizens to public-private partnerships, particularly addressing the problems of exclusion and lack of transparency[12]. This collaborative arrangement ensures that citizens are actively involved and engaged, and this aspect seems to motivate the stakeholders to work towards a common objective.

To facilitate the potential conclusion of a PPP contract, below are outlined the minimum characteristic elements that these agreements typically feature, as summarized in a Guide by the Western Balkans Investment Framework and the European PPP Expertise Centre (EPEC)[13].

A PPP contract will cover the following topics at a minimum:

- the risk allocation (this is usually achieved through setting out events which give the private party a right to some relief and/or compensation);
- the Public Authority's requirements for the project, defined by construction and service performance standards and targets. These should be objective and measurable;
- the procedure for permitted changes to the Public Authority's requirements, and the scope and nature of permitted changes;
- the payment mechanism and process for making adjustments to payments in response to various contingencies;

[11] Official Records of the General Assembly, Seventy-fourth Session, Supplement No. 17 (A/74/17), chap. III and annex I, https://uncitral.un.org/sites/uncitral.un.org/files/media-documents/uncitral/en/19-11011_mlpppp_e.pdf

[12] L. Perjo, Public-Private-People partnerships – a new concept to bring public and private actors and citizens together, Nordregio News, 4, 2016: People and Cities, https://nordregio.org/nordregio-magazine/issues/people-and-cities/public-private-people-partnerships-a-new-concept-to-bring-public-and-private-actors-and-citizens-together/

[13] European PPP Expertise Centre, A Guide to the Main Provisions of an Availability-based PPP Contract Public-Private Partnerships in the Western Balkans, 2018, https://www.wbif.eu/storage/app/media/Library/8.%20Public%20Private%20Partnership/5.%205-Main-Provisions-of-an-Availability-based-PPP-Contract-FINAL-310818.pdf

- performance deductions (and possibly bonuses) which have financial consequences or give rise to warning notifications (eventually leading to termination of the PPP contract);
- security and performance bonds;
- project insurances;
- the duration of the PPP contract;
- the conditions for early termination of the contract (categorized by party and type of event) and the compensation payable on termination (for each type);
- step-in rights, both for lenders and the Public Authority;
- the definition and impact of force majeure and changes in law; and
- the dispute resolution procedure.

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ANNEXES

- Annex 1. REEHUB - Simplified methodology of the energy audit
- Annex 2. Terms of Reference
- Annex 3. Scheme of the Memorandum of Understanding
- Annex 4. PPPP Model

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REEHUB

Program Interreg IPA CBC Italy–Albania–Montenegro

"REEHUB – Simplified methodology of the energy audit" – Deliverable WPT1

REGIONE PUGLIA

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REEHUB – Simplified methodology of the energy audit

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REEHUB Project

INTERREG IPA CBCITALY-ALBANIA-MONTENEGRO2014_2020
Priority Axis III: Environmental Protection, Risk Management and Carbon Reduction Strategy
Specific Objective 3.2: Promotion of practices and innovative tools to reduce the carbon emissions and improve energy efficiency in the public sector.
Leading partner of the project: Ministry of Infrastructure and Energy

This document describes the activities of WPT1 of REEHUB project
ENEA Scientific Supervisor: Vincenza A. M. Luprano
ENEA Project manager: Monica Misceo
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CONTENT

INTRODUCTION

The construction sector is fundamental to achieve the energetic and environmental objectives of the EU, and for this reason, all the efforts that aim the decarbonization of building stock encourage. The most successful buildings for an energetic perspective, improve the quality of life of citizens bringing further benefits for the economy and society.
For this reason, the European Union updated the directive 2012/27/ of European Union with **directive 2018/844** with the object to promote the widespread of the energy efficiency and renewable energies in buildings, to ensure that long-term restructuring strategies provide the progress needed to transform existing buildings into near-zero energy buildings by 2050.
Energetic Audit is a fundamental step to improve the efficiency of energy in the public buildings, to reduce energy consumption and to bring benefits for the environment. Also, special attention was paid, in updating the Directive, to build control and automation systems, to be able to assess better energy efficiency measures, comparing their costs and benefits, and sensibilize owners to real savings from newly improved building functions. REEHUB project has set as the main objective, the establishment of competence centers, in the four regions, on energy efficiency and sustainable construction in general. Also, before all, each partner has identified a place in Tirana, Podgorica, Brindisi, and Agnone to establish a HUB. ENEA has considered the methodology important to transfer the best practices for the energy audit, not only conducting training on this topic, for the staff assigned by each project partner but above all to allow the trained staff to experiment in this area the notions learned, conducting energy audits in HUBs, using tools purchased from the project.
The methodology of energy audit – REEHUB is a simple procedure for energetic diagnosis and applied in 4 regional HUBs.
These guidelines aim to become a manual for local public administration dealing with energy, technical, and executive actions. In the following pages, the fundamental steps are shown to make an accurate diagnosis of energy, starting from the manners on how the specific data are secured, how to use the technical tools, and how to perform a measurement campaign, how to monitor the consumption of energy, how to interpret the collected results, and how to evaluate the most appropriate energetic intervention comparing the costs.
These guidelines will be available for all the interested stakeholders, such as universities, constructors, engineers, architects, financial institutions and developers of real estates, hoping that they will be the moving force for a wide and efficient spread of the practices of the energetic qualifications for the buildings, in a way to give a contribution for the achievement of the carbon neutrality until 2050.

1. INTRODUCTION OF REEHUB GUIDELINE FOR ENERGETIC DIAGNOSIS

Simplified procedure for energetic diagnosis, illustrated in REEHUB guidelines, allows us to define easily the value of Primary Energy and other energy indicators, without using calculator software and/or articulated and complex algorithms.
It is an immediate procedure "construction site" and for this reason it is always applicable, especially in those cases where the use of programs and very detailed investigation is expensive, both in terms of time but also cost. For example, when you want to work in only a few rooms, inside an apartment, when you need energy efficiency measures.
These guidelines for Energetic Audit are based on the method used in EN 16247.

UNI CEI EN 16247-1 defines the requirements, usual methodology, and products of energetic diagnosis. It's is useful for all the companies and organizations, for all the kind of energy and its usage, except the individual units of residential real estate. It defines the general requirements for all the energetic diagnosis.

UNI CEI EN 16247-2 is applicable for specific energetic diagnosis for buildings. It defines the requirements, methodology, and reporting of an energetic diagnosis related to a building or a building block, except the private individual residencies.

UNI CEI EN 16247-3 defines the requirements, methodology, and reporting of an energetic diagnosis within a process, related to a) organizing and performing an energetic diagnosis; b) analyzing the collected data with the energy diagnosis; c) reporting and documenting the results of energy diagnosis. The rule applies to places where energy use is due to the process.

In the end, UNI CEI EN 16247-4 defines the specific requirements, methodology and reporting for energetic diagnosis in the transportation sector and addresses any situation in which a move is made, regardless of who the operator is (public or private company or whether the operator is exclusively dedicated to transporting or not). The procedures described here apply to different modes of transport (road, rail, sea, air), as well as to different areas (local, long-distance) and the transported facility (mainly goods and people).

The simplified procedure essentially requires defining data that are easily accessible by manual calculations or achievable from tables, graphs provided, or described by the sector literature and technical standards.
Final results that the simplified procedure provides an order according to the size, in absolute value, not bigger than the one that is defined by the use of a software calculator that is in the

market. Everything depends on quality, in terms of accuracy and authenticity of input data namely more accurate the input data about reality, the smaller the difference between the result obtained from the simplified procedure and the one obtained from the software calculation.

The difference between the simplified procedure and the one predicted in the directives (defined in the sector's software) consists on achieving the required results, in a simple immediate way and with minimal economical expenses for the users, without neglecting the physical concept of the building –implant system and all the parameters that are used for primary energy calculation. It is a very efficient procedure, so all those who are deal with these concepts without having considerable work experience in the sector of engineering of thermos-technical implants.

In this way, the application of the simplified procedure is appropriately borrowed in the analysis of cases that are not very complex, such as those directed to some premises/rooms of an object that are subject to energy efficiency measures, or for all those cases in which there is no need to intervene throughout the building.

The obtained result with the application of the simplified procedure is different with that taken by applying the algorithms used from the software of calculation (regarding the absolute value) or it could be on a more approximate scale, but this is possible depending on how accurate the input data in the procedure are, which can achieve the intended results, in terms of energy savings and amortization time of investments for energy efficiency interventions, with deviations as low as possible about the congruence index used for the validity of the physical-mathematical model which we refer to both in the software calculations and in the case in which the simplified procedure is used (never more than 15%).

As a conclusion, the user who judge as appropriate to choose the simplified procedure to analyze "building-plant" system, for the reasons that justified its use, or in any case because he is the user, should care to define the input parameters with extreme accuracy, close to reality, by the requirements of literature and technical norms, aiming to achieve results that differ a little of the most accurate ones obtained with computing software, but, at the same time, with the advantage of instant computing, less economic cost for the users to whom it is addressed and even more with the main advantage of step-by-step tracking and concretely, from the physical point of view, the individual parameters used as input data such as: (thermal powers, transmissions, working hours, day degrees, yield, temperature changes, exposure coefficients, coefficients due to system downtime, etc.).

Finally, it is useful to remember that energy diagnosis defined either by the use of software or by the use of the simplified procedure, is intended to provide a preliminary outcome of the situation, which allows you to assess the existence or not of the conditions, suitable for the development of energy efficiency initiatives in the building and its plants.

2. SIMPLIFIED PROCEDURE OF ENERGETIC DIAGNOSIS

To identify the favorable economic measurements of the efficiency of energy regarding the building – implant system, we use the ENERGETIC DIAGNOSIS.
Below are described the main points that represent the activity of energetic diagnosis, such that consist of an applicable simplified procedure even in those cases when not all the buildings should be undergone the efficiency measurements, but only some of its premises..

1. Obtaining data that interest us for energy performance (winter, summer, etc.) about the building system - plant: technical characteristics of the building enclosure, type, and operation of existing plants, fuel consumption, etc.;

2. Analysis of the energy performance behavior of the building-plant system through simplified algorithms or more generally through specific software, or the construction of a physical-mathematical model that stimulates the building-plant system for diagnosis;

3. Calculation of specific indicators that allow comparison between calculated and expected consumption (taken from the analysis mentioned in the previous point) and those derived from energy bills (real results/values);

4. Comparison between calculated and in reality (energy bills);

5. If the comparison is far from expectations (low compatibility) it is necessary to modify the parameters used as input, or it will be necessary to modify the data mentioned in point 1 (area characteristics, plant operation, etc.), so that the new indicators, defined after the changes, are as close as possible to the real ones (for example medium / high compatibility);

6. Identification of improved interventions (insulation of walls, terrace, replacement of windows, replacement of the boiler, etc.) and identification of combinations of different interventions (replacement of windows + replacement of the heater). The combination of individual interventions should be derived from what is indicated primarily by the client's wishes, as well as, from the advantage deriving from the economic analysis;

7. Analysis of the building system - plant with the application, in the physical-mathematical model, of the interventions or combinations of energy efficiency interventions identified in point 6;

8. The economic analysis aimed at determining the priority of combinations of interventions or the priority of specific interventions identified - Ease of intervention or combinations of interventions; generally considered energy and economic adequacy has given the interventions that are amortized over a period not exceeding 15 years.

The energy diagnosis does nothing else but reproduces, during the analysis of the building-implant system, the real conditions to which the system is placed

During the analysis, it is considered the real implant flow, realized by the client, and the real climatic conditions dictated by the temperatures on real.
The latter is taken from at least a three-year trend of the daily temperature of the forecast hours, for the area in question, by the public bodies that release the temperatures during the outside air hours, referring to the period that winter begins in October and ends in April.
Thus, taking into account the real and effective flow of the implant and the real trend of outdoors air temperatures, in a well-defined period, it is important to compare the defined results with the built-in physical-mathematical model (points 1. and 2. of the previous list) and current fuel or electricity consumption.
Energy diagnostics do not claim to establish accurate estimates of economic benefits but allows you to assess the existence or not of suitable conditions for the development of energy efficiency.
The more accurate the data made available by the client, the higher the level of depth of the energy diagnosis, and therefore, the more accurate the results regarding the economic and energy expectations of the interventions.

To make an accurate Energetic Diagnosis should be available:

a. Geometric data related to the room of the residential unit or the building under study (plans, facades, cuts, surveys, photographs of exposed areas such as borders, terraces, surrounding buildings, type and size of windows, identification of accurate exposure from the north, the function of the premises, etc.);

b. Use of an on-site thermofluximeter for measuring the transmission of building envelope elements (see par. 3);

c. Type of plants present, with accurate data on and off hours, both during the day and weekdays (where days with extended shutdown schedules must be taken into account);

d. Survey and typology of the plant system as a whole: production, distribution, discharge and regulation system. In particular, the technical characteristics of heat generators, heat pumps, emitting components (radiators, solar panels, multisplits, etc.) should emphasize;

e. If it exists, it is helpful to obtain all existing plant design documentation;

f. Climatic data of the area and the place where the envelope of the study building was made, for which real data should be extracted, at least for the last three years, of temperatures (within 24 hours) of the outside air. Data are available from meteorological stations in the area. This will allow you to determine important and essential data for calculating the thermal forces required by the building as well as the thermal energy required for the entire current and effective heating period. In particular, it will be necessary to determine the minimum external temperature of the project (calculation of peak thermal power) and temperature during the day (calculation of thermal energy required by the building-plant system);

g. Consumer consumption and costs (fuel/electricity) that refer to at least the last three

years of operation and if possible, refer to each month;

To test an accurate simplified analysis of the Energy Hub I take into consideration, it is necessary to provide the following data and conduct an inspection to gather all the useful information:

Name of the owner
Date and place of activity
Operator data

Data of the real estate:

- Building typology
- Building year
- Town/city/country;
- Height in floors.
- Width;
- Wind speed;
- Place and description of the building /real estate unit/hub/bar/premise;
- Category/usage destination
- Gross heated volume
- Total surface lost
- Climatic area
- Degree day
- Real (monthly) duration of the warm period (days)
- Real daily on / off duration of the plant (hours)
- Minimum daily calculation temperature (winter)
- Average monthly temperature
- Projected air temperature (indoors / thermal zone)
- Construction technique used:
- Composition of perimeter walls

Visual description of the building (Ground visit):

- Photographic relief
- Constructive supporting typology
- The composition of the walls, its layers

Furthermore, the following transmission values for dark and window elements should be calculated, based on appropriate thermofluxometric analysis:

- Transmission of external walls;
- Transmission of premises in borders / unheated areas;
- Transmission of the border environment with the body of the ladder;
- Transmission of solet over garage / canteen / porch / unheated premises;
- Transmission of the floor / terrace / roof;
- Floor transmission;
- Transmission of walls to the ground;

Plant data:

- Hours of functions of the plant;
- Fuel used;
- Typology of heat generator / heat pump and determination of output efficiency value;
- Typology of the fluid distribution system and determination of the value of the distribution efficiency;
- Emission system typology and determination of emission efficiency;
- Regulation system typology and regulation efficiency determination;

In the meantime, we need to perform:

1. Calculation of thermal power lost from transmission (opaque elements and windows); Qd;
2. Calculation of thermal power lost from ventilation (natural / mechanical); Qv;
3. Calculation of the temperature difference (between the minimum indoor and outdoor air of the project); DT;
4. Calculation of real hours of operation of the plant: hg (hours);
5. Calculation of real daily temperature; GGr;
6. Calculation of Calculation of the square feet area of the hub / real estate units / building; Su;
7. Calculation of the production performance; np;
8. Calculation of distribution performance; nd;
9. Calculation of emission performance; ne;
10. Calculation of regulation performance; nr;

11. Calculation of average global seasonal performance; ng=np x nd x ne x nr;

That's why it is possible through the other values calculated before to define the value of requested Primary Energy:

Epr = (Qd + Qv) x GGr x hg / (Su x DT° x ng); (kWh/m2 * vjet)

Regarding the values that will attribute to the production, distribution, emission, and regulation performance, we can use or the dictated values of reference from the actual technical norms (UNI TS 11300, recommendations of CTI, etc.).

To calculate the GGR (real daily degree), it will be necessary to use the same formula given by the norm (calculation of daily degrees) but taking as the average daily air temperature, the real values (taken from weather data of control units in the area) referring to a certain period (heating period).

In this regard, to calculate the real reference period and the average daily temperature of the outside air, proceed as follows:

a. We analyze the air temperature data (data in 24 hours) for every single day starting from October to April (at least three years following the years of electricity billing referred to energy); usually elected last three years;
b. For each day, the average daily temperature will be calculated as follows:
The following values will be detected: T min, T Max, T at 6:00, T at 20:00;
With these values the arithmetic mean will be calculated;
The arithmetic average value will be considered as the value of the average daily temperature of the outdoor air.

Within the period initially considered, October-April, starting from October, we will look for the day on which the temperature is equal to 12 Celsius and which remains lower than this value for three consecutive days.

Once this day is determined, it will represent the beginning of the real warm period.

The same will be done to determine the day on which the heating period ends. That is within the period we will initially consider the day on which the average daily temperature of the outside air will be higher than 12 degrees Celsius and will remain above this value for three consecutive days.
After the determination of this day, it will represent the end of the real warm period.

It is possible to determine with the calculated data the value of the degree-day real for each year, ensuring that the same years in the study are the same referring to energy bills (natural gas, GPL, oil, energy electrical, etc.); usually analyzed at least every three years.

Based on the three GGR values, we will find the most important, and consequently, the relative energy bill will be identified.

After calculating the primary energy Epr, it is simple to determine the value of fuel consumption entering the production system (natural gas, GPL, electricity), which will be compared with the relative energy bills.

So, it will be possible to validate the structured model according to the physical-mathematical approach approved by us for performance analysis.

Validation will be as followed:

- Calculation of fuel-consuming input/output (Ccomb) determined by the calculated value of Epr (value calculated with the model structured according to the physical-mathematical approach approved by us);

- Calculation of the real fuel consumption (C. Comb.) refered to the warm period to determine the real degree-day;

- Comparison of the two calculated data before:

Ccomb. - C'comb = DCcomb (absolute value); the difference between two consumption values (input and real) to be evaluated as an absolute value;

If DCcomb. / Ccomb. <5%; it exists high compatibility between the approved model and the real one.

If DCcomb. / Ccomb. <10%; it exists average compatibility between the approved model and the real one.

If DCcomb. / Ccomb. <15%; there is low compatibility between the approved model and the real one.

If DCcomb. / Ccomb. > 15%; the approved model is not in compliance with the real one.

Therefore, in the hypothesis of low model compatibility and equally nonconformity, the input data to the model structured according to the approved physics-mathematical approach should be corrected to stimulate the performance analysis of the building-plant system, i.e. the data will have to be reviewed, and remodeled according to the relative data of the transmission, efficiency, emission, distribution and adjustment of the plant in service, the hours of operation/fixing of the plant, or everything that constitutes the input data according to the model approved for analysis.

The value of Epr will be recalculated using the new re-modulated data, so that we can repeat the comparison with real fuel consumption.

Once we have the new Epr results after reviewing the input data compared to C'comb (real consumption), they will determine at least an average compliance (<10%). It is possible to adopt final data as a model structured according to the physics-mathematical approach, and then proceed with subsequent economic analysis to evaluate interventions or a combination of energy efficiency improvement and requalification.

As a conclusion, we can say that the approved model stimulates in a congregative way the system of the building/real plant; so, we have verified the model that acquire a latter analysis (valuable model).

After validity, it will be possible to calculate the coeficient μ = C 'comb. / Ccomb.

Coeficient μ will be applied in the latter analyses regarding the intervention and/or combinations of efficiency intervention of the energy in a way that could be calculated, for any calculation, relative consumption of real fuel (methane, gpl, diesel, electricity etc.);

After the validity of the structured model according to the physical-mathematical approach, which reproduces with good adhesion therefore the building / plant system that is subject to diagnosis, it is possible to identify what will be the individual energy efficiency interventions or the combination of multiple interventions to be performed in reality; this will be possible after building a degree of priority determined by economic analysis.

In essence, priority will be given to interventions and / or a combination of interventions that will be amortized over a short period of time, which will result in payback periods of less than 10-15 years (cost-benefit analysis).

Once we have evaluated the model structured according to the physical-mathematical approach that the building system / real plant reproduces, the object that is subject to energy analysis / diagnosis, it is necessary to use this model for subsequent economic feasibility analysis (see page 4).

To sum up, this will mean that we will use this model to be able to determine, in standard conditions, even the value of Epr before the intervention, even the latter consequences in conditions after the intervention.

Standard conditions mean that in the structured model according to the adapted and evaluated physical-mathematical approach, the standard values dictated by the technical regulations in force regarding GG (day degrees) and working hours of operation of the plant will be applicable.

Whereas, the post-intervention state (future state) means the realization of a single energy efficiency intervention or in general combinations of several interventions is hypothesized; likewise, the state before the intervention means the real and current state of the building / plant system that is analyzed and studied (state of works).

Therefore, in the upstream of the economic analysis (cost-benefit analysis) it will be necessary to first determine the Epr value associated with the building / plant system in the pre-intervention state, calculated by applying, in the structured model according to the valid physico-mathematical approach, the standard values dictated by the technical regulations.

Therefore, it should be taken into account as input data in the valid model, not the values of GGR

(real daily degrees) and actual working hours (hg), but the standard values dictated and imposed by the current legislation for the site and for the intended use of the object being studied and analyzed.

In this way it will be possible to determine the value of Epr (before intervention) from which, depending on the type of fuel, get Ccomb (fuel consumption before intervention under standard conditions) and then determine, applying the coefficient μ, the C'comb value or the real value of fuel consumption under standard conditions that will be compared from time to time with those related to energy efficiency measures:

C'comb (real standard consumption of fuel) = μ x Ccomb (standard consumption of fuel); (the formula will be used not only before the intervention but also for the after intervention conditions)

Subsequently, the further values of Epr in relation to each energy efficiency intervention will be determined gradually and for each of them the same calculation will be performed, i.e. after calculating the relative fuel consumption (Ccomb), the final value will be multiplied by the coefficient μ thus obtaining the real value of fuel consumption C'comb = μ x Ccomb (in relation to the intervention). Therefore, for each intervention and / or for a well-defined combination of interventions, the value of C'comb will be taken which will be compared with the value determined in standard conditions and before the intervention thus obtaining R energy savings:

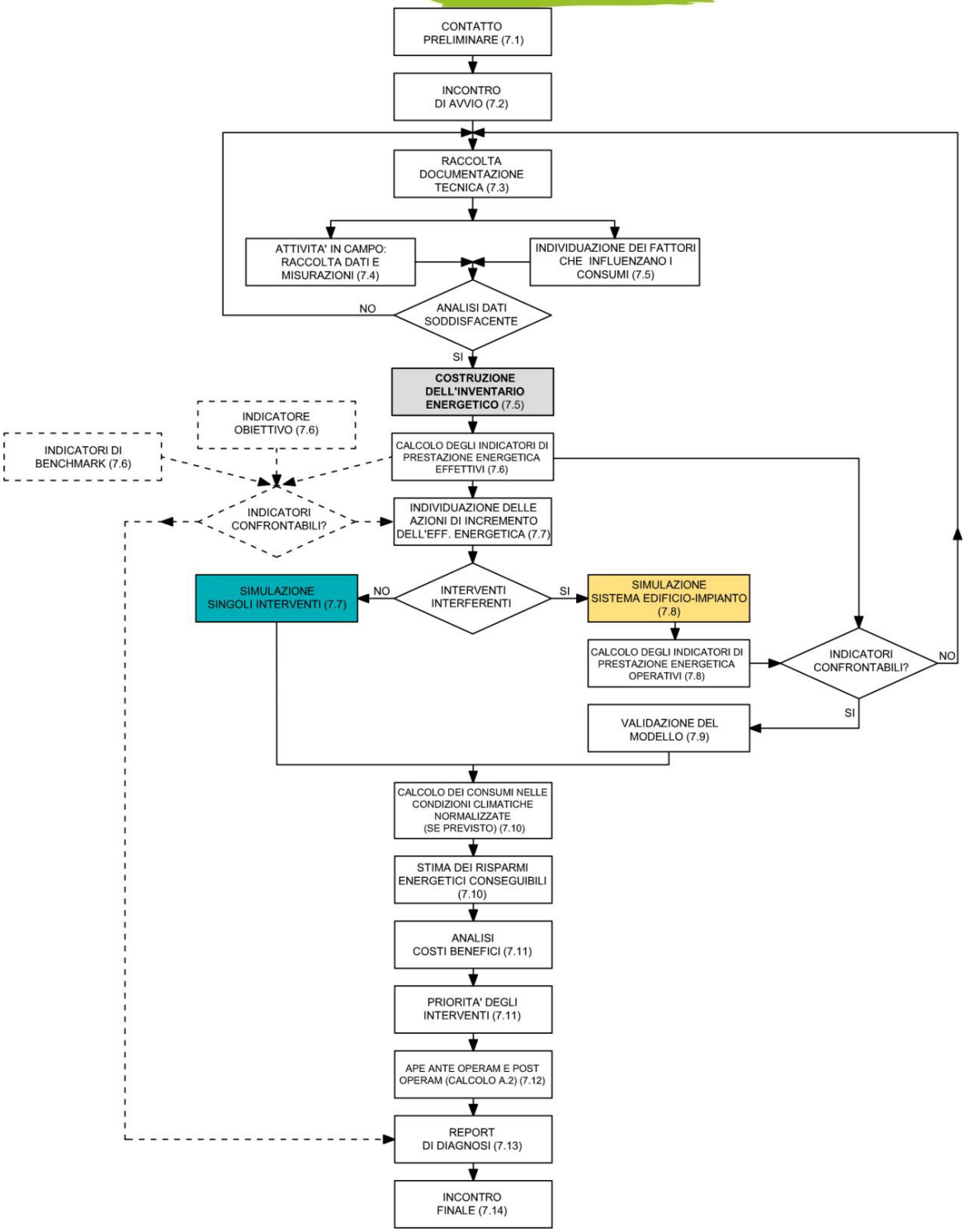
R (energy consumption) = C'comb (before intervention) - C'comb (after intervention).

The value of R will be used after in the economic analysis that aims to identify the return investment time (the cost of intervention) and after the determination of a priority degree of individual interventions or combinations of multiple energy efficiency interventions as a function of the value of each return time; minimum return time values will give the highest priority.

2.1 Summary of actions to be performed for energy diagnostics

A. The construction of the structured model according to the physics-mathematics approach (plant system of the buildings) based on the dimentional technical data, real climatic data, performed instrumental measurements and plan function as it's required by the client,
B. The calculation of the main expected energy (the calculated value using the model mentioned at A.);
C. The calculation of energy indicator related to the primary expected energy (fuel consuption)
D. The calculation of the real consumption of fuel (data from the energy bills);
E. The comparison of fuel consumption in absolute numeric terms;
F. The vadility of the structured model according to the physics-mathematics with the determination of the adaptation profile (if it is not adaptable or low adaptation, the input data should be re-modulated and everything should be repeat starting from A to F.)
G. In case of a positive validity of the model (high or average adaptation), the coefficient value μ will be calculated;
H. The calculation of value of Primary Energy in conditions before the intervention and standard conditions;
I. The calculation nof the real consumption of fuel in conditions after the intervention and standard conditions;

J. The identification of individual intervention or the combined efficiency of energy (two or more interventions);
K. The calculation of main value of energy for each individual intervention or for each combination of the intervention of the energy effect; after the intervention and standard conditions;
L. The calculation of the real consumption of the fuel for all the conditions after the intervention and standard conditions;
M. The calculation of the energy consumption as a difference between the real consumption in the condition before the intervention and the real one determined for each one or combined intervention of the energy effect;
N. For each value of the R (energy saving) associated with negative value of the economic investement (the one intervention or combined costs) will be performed by an economic analysis (cost=benefit analysis);
O. The results of the economic analysis, in terms of return on investment time, will reverse the advantages of relative intervention; the minimum return time determines the highest priority of the intervention.



Picture.1 Diagram for diagnosification of the energy buildings
Source: ENEA, ES-PA Project – Energy and Stability for Public Adminstration - https://www.espa.enea.it

1. INSTRUMENTAL DIAGNOSIS (with tools or with the help of suitable tools)

Energy diagnostics requires the use of some non-destructive controls in the procedure, in order to be reliable and complete, in particular, for the evaluation of pre-intervention transmission measurement to improve efficiency in the absence of stratigraphy of dark vertical and horizontal structures, as reported in the simplified procedure paragraph 2.2.

3.1 Measurement for on-site thermal transmission

The protocols adopted for diagnosis with the help of appropriate instrumental tools refer to the following rules:

UNI EN ISO 6946: 2018 Components and building elements - Thermal resistance and thermal transmission - Calculation methods

UNI ISO 9869-1: 2015: Thermal insulation - Building elements - On-site measurement of thermal resistance and thermal transmission - Part 1: Thermal flow method (thermofluximeter).

UNI EN 13187: 2000: Thermal performance of buildings - Qualitative detection of thermal irregularities in building envelopes - Infrared radiation method.

ISO 18434-2: 2019 Machinery diagnostic monitoring monitoring conditions, thermogram interpretation.

Terms and definitions of non-destructive testing infrared radiation thermography UNI 10824: 2000

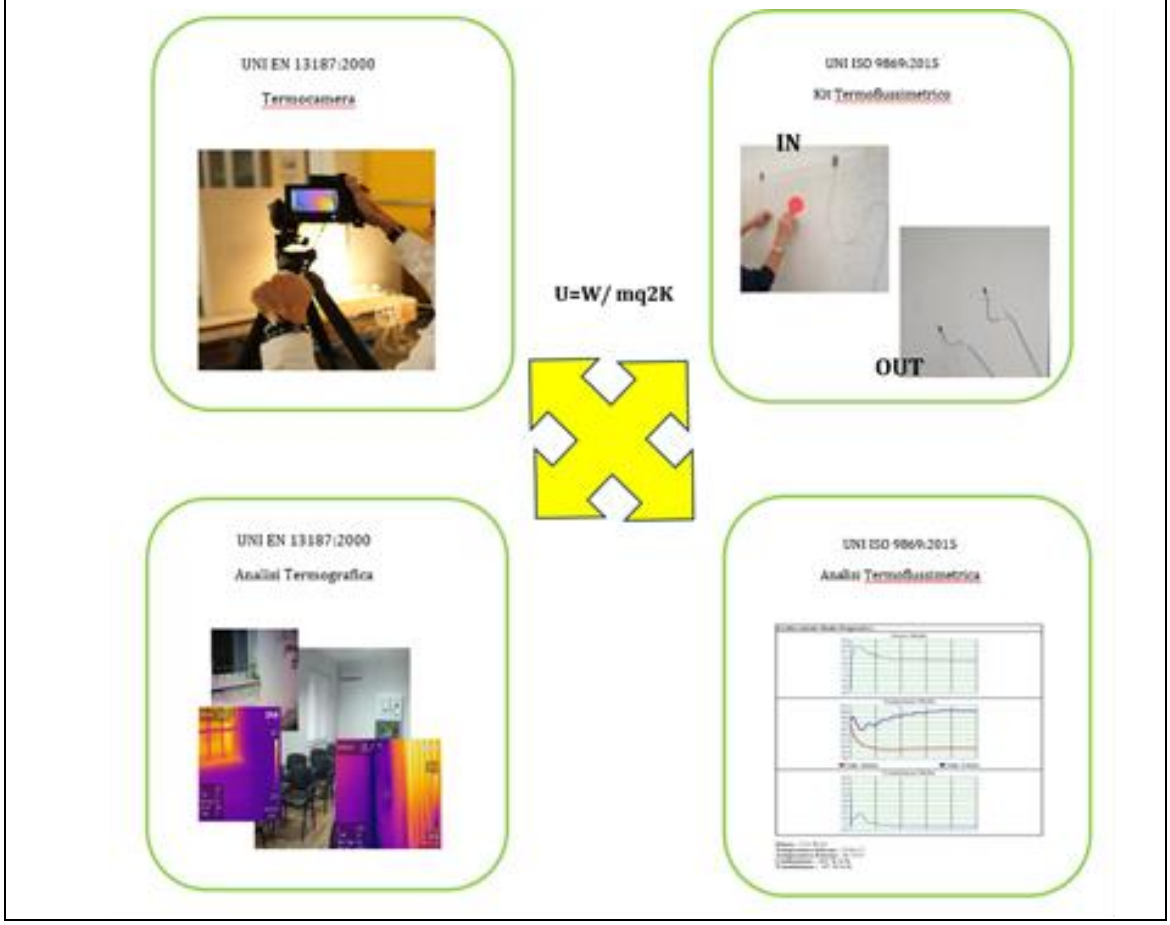
The standards describe the method for measuring the transmission of dark components in buildings using the heat flow meter and thermal imaging camera.

The transmission measurement instrument consists of a KIT that includes basic data for receiving and managing the data, a sensor for measuring thermal flow, and four thermo-elements for measuring the surface temperatures of internal and external walls. The configuration envisages the positioning of the sensor for measuring the thermal flow on the inner surface of the wall, and at least two temperature sensors on the inner surface and two on the outer surface of the wall, which is not directly irradiated by the sun. It is the best practice to carry out measurements to assess transmission over a period characterized by temperature changes between indoor and outdoor environments with ΔT ° C equal to or greater than about 10 ° C. The duration of the test should be at least 72 hours assuming that the final value of the resistance does not differ by more than 5% from the values obtained in the previous 24 hours.

Diagnosis of thermo-thermal leakage in the absence of adequate training for the correct installation of the instrument can produce an error in the transmission estimation of up to 30% compared to the assumed value. Because of this, before making the measurement, we proceed with a thermographic investigation to verify the textiles/wall layer under the plaster, the lack of homogeneity of materials, thermal bridges.

A thermal camera, a device capable of displaying contact energy with infrared rays, is used to investigate the situation. It is recommended to set the parameters accurately and perform indoor and outdoor temperature gradient measurements equal to or greater than 10 ° C.

Thermographic valuation	Trasmission measurement



PIC.2 Synthetic diagram for thermic on-site transmission

3.2 Measurement of indoor microclimate

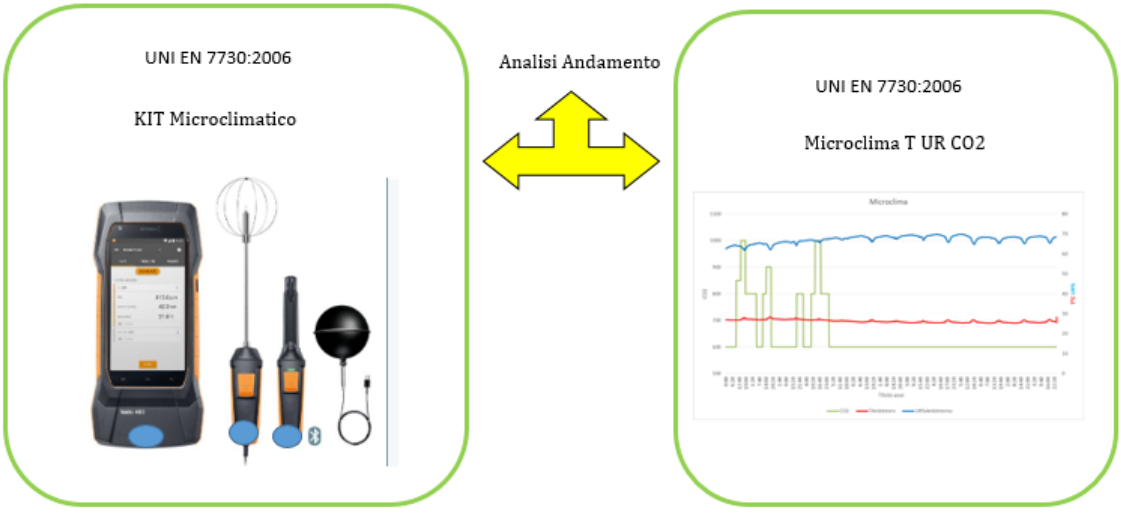
Finally, the following guidelines suggest the use of control units or completed indoor temperature, humidity, and CO2 monitoring according to the regulations already in force to comply with those indicated in European Directive 844/2018.

The directive, the objective of which is sustainable development, suggests that it is necessary to carry out an assessment or diagnosis, in terms of well-being and comfort in indoor environments about energy control interventions in buildings.

Welfare defined by the European Commission Observatory for Health systems and policies as a state of emotional, mental, physical, social, and spiritual well-being that allows people to achieve and maintain their potential in society.

UNI EN 7730: 2006 Ergonomics (Scientific discipline that deals with problems related to human labor concerning the design of machines and work environments, to identify the most appropriate solutions to the psycho-physical needs of workers and at the same time those of production) of thermal environments.

- Analytical definition and interpretation of thermal well-being by calculating PMV and PPD indices and local thermal well-being criteria.



PIC.3 Synthetic scheme of indoor microclimate

3.3 Operator qualification

The complexity of on-site measurement methodologies and the execution of measurements are not sufficient for the interpretation and evaluation of performed data according to the standard that requires the necessary skills and specialized personnel with knowledge of relevant techniques and technologies. The reference regulations require for assigned staff to instrument measurement diagnosis and preparation of measurement reports are reported below.

UNI EN ISO 9712: 2012 qualification and certification of personnel involved in non-destructive / destructive tests.

CND License - Level 1 - A Level 1 certified person in a non-destructive test method is qualified to perform operations in the certified method based on written instructions and under the control of Level 2 or Level 3 personnel. He/she must be able to: a) adjust PND equipment; b) perform the tests; c) record and classify the results to the written criteria; d) compile a report of results.

CND License - Level 2 - A Level 2 certified person in a specific PND method, is qualified to perform tests in the certified method according to established procedures. Must be able to: a) choose the technique for the test method to be used; b) determine the limits of application of the test method; c) translates PND codes, standards, specifications, and procedures into PND instructions adapted to current working conditions; d) adjust and control the device settings; e) perform and supervise the tests; f) interpret and evaluate the results according to the standards, codes, specifications, and procedures in force; g) draft test instructions for level 1; h) perform and supervise all specific tasks of a level 1; i) training or leader of level 1 staff; j) draft PND reports.

CND License - Level 3 - A Level 3 certified person in a specific PND method, is qualified to perform and direct the PND activities for which he/she is certified. Must be able to: a) take full responsibility for a testing laboratory or examination center and relevant staff; b) establish and certify testing techniques and procedures; c) interpret rules, codes, specifications, and procedures; d) establish the specific test methods, procedures, and instructions to be used; e) perform and supervise all offices at all levels; f) provide assistance to PND staff at all levels.

3.4 Report preparation

The report generally reports information on performed methods, measurement, and instrumental conditions, encountered problems, results, and, if required, suggestions for solutions. The report should draft in such a way that it is understood not only by technicians and should contain the following elements.

Applied methodology

Normative requirements

Functioning conditions

Instrumental conditions

Encountered problem

Results

Photographic documents, thermogram

Conclusion and/or suggestions if asked

3.5 Operator safety requirements

Mandatory training certification of DLGs. 81/08

Hard hat

Visible phosphorescent jacket

Leather gloves

Glasses and FFPP1 CE mask for dusts, if it's necessary

Construction site shoes/safety shoes

Security of the construction site is responsible of the client

4. Economic values of the intervention

After identifying energy reclamation interventions, advisable in a given structure, taking into account the whole building-plant system, and after verifying the technical feasibility, a cost-benefit analysis should be found for the economic comfort of the interventions identified.

For this purpose, the NPV methodology is proposed. This is an accurate, simple, but very effective method of determining the goodness of an investment. The question is whether the investment produces more or less money than can be obtained by leaving an identical amount in the bank for a certain period at a specific rate.

Starting from the net present value, it is possible to develop a series of economic indicators capable of highlighting the key characteristics of the investment that we are considering.

This methodology is not reserve for energy saving. It has a width validity and can be applied whenever the decision can benefit from the information made available by the cost-benefit analysis.

4.1 Net Present Value

The net present value is calculated by comparing the investment cost with the economic benefits that are created.

NPV = Economic benefits – Investment

So, if the NPV is positive, the investment is suitable, and if the NPV is negative, it is not advised for the intervention.

However, it is not accurate that only by comparing the economic benefits with the investment because the terms of this comparison have a diachronic evolution.

The investment is made in cash, while the benefits it creates will only be converted into cash later. It is, therefore, necessary to use correlation coefficients that make the value of money available in different comparable periods.

Therefore, the future cash flows that make up the economic benefits that will flow from the investment should be multiplied by an annual factor that makes these benefits homogeneous and comparable to the amount invested. Therefore we have:

NPV = (CF) (AF) - I

NPV = Net Present Value

CF = Cash Flow

AF = Annual Factor

I = Net Investment

4.2 Cash Flow

It represents the economic benefits generated by the investment during all its life.

With good approximation, we can estimate the money supply equal to the economic value of the energy saved.

4.3 Annual Factor

To analyze the correlation coefficients, which allow us to equalize the value of money available in different periods, we need to introduce the concepts of capitalization and deduction.

A. Capitalization and deduction

If we have 1 Euro and we use it at interest rate "I" after a year, it pays interest equal to:

$$1 \times i = i$$

so at the end of the year we will have the initial capital of 1 Euro plus the calculated interest, in total:

$$1 + i \text{ (euro)}$$

it follows that 1 Euro available within a year at the present time has a value equal to:

$$1/ (1+i) \text{ or } (1+i)^{-1}$$

If we use our Euro at the "i" interest rate for two years, at the end of the first year we will have, as seen above, capital 1 + i. At the end of the second year, we will have the following total capital:

$$(1+i)(1+i) \text{ or } (1+i)^2$$

It follows that 1 Euro available in two years at present time has a value equal to:

$$1/ (1+i)^2 \text{ or } (1+i)^{-2}$$

In general, we can say that one Euro today in n years will be worth:

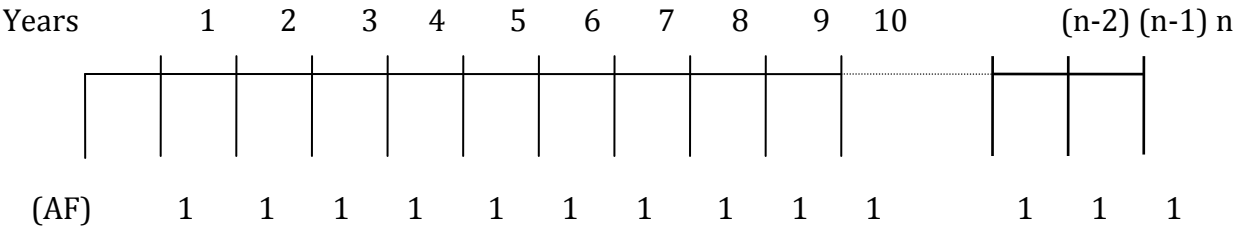
$$\mathbf{(1+i)^n} \quad \textbf{Capitalization Factor}$$

And that one Euro available in n year is worth today

$$\mathbf{1/(1+i)^n \text{ or } (1+i)^{-n}} \quad \textbf{Deduction Factor}$$

B. Annual Factor Formula

Annual Factor is given by the Present Value of a continuous deferred year for one Euro:



That is equal to the sum of future Euro deducted until now.

So, we have:

$$AF = \sum_{J=1}^{n} (1 + i)^{-J}$$

the Annual Factor value can be found in the double-entry tables compiled based on "n" and "i". It represents the equal life of the investment, which takes into account the discount effect. Therefore the FA will be less than n, the greater the interest.

C. Investment life

Represents the period during which the investment will continue to produce the expected economic benefits. It is given by the smallest of the following:

- Physic life (due to the pants coating)

- **Technical life** (due to technical evolution of plant, the age of the plant)

- Commercial life (due to sustainability of demains for goods or services produced by the plant in the market)

- Political life (defined by unclearness regarding the general political and economical situation: legal requirements, confiscations risk, wars, etc.).

D. Interest rate

Calculation interest or capital cost depends from the origin of financial means. They can be supplied using credit or owned by the entrepreneur. Therefore there are the following two cases:

- **Investment with credit capital** (highest level of interest of financial means that the entrepreneur really is withdrawing.

- **With capital owned by the entrepreneur** (lowest level of interest among the activities available to the entrepreneur for any diversion with which the necessary funds can be supplied).

E. Inflation and differential increase of the prices

Finally, we need to consider the worrying effect of inflation and differentiated price increases. With a good approximation we can consider the real interest equal to the net nominal interest of the average estimated inflation rate for the years of investment life. Moreover, if we assume that the price of goods produced by our plants will change differently from the inflation trend, it is necessary to consider the extent of this diversification. Therefore we have the following formula:

$$\mathbf{i = r - f - f'}$$

i = real interest rate
r = nominal interest rate
f = inflation rate
f ' = the rate of shift of the price of goods produced against inflation

4.4 Net Investment

Once the present value of the future economic benefits of the investment has been calculated with the criteria we have seen, we can compare it to the total cost of the intervention. The following articles contribute to its definition:
1) Net price of the production system (machinery, factory, building, etc.);
2) Installation cost (modeling, assembly, arrangement, etc.);
3) The relative cost of transportation (taxes included);
4) Initial cost (additional cost for necessary operations at the beginning, every fee for not production, interest expenses for fixed activities until the beginning of production, etc.);
5) Immobilized working capital (spare parts, stored lubricants, etc.).

The number of items from 1) to 5) should be deducted from the recovery value of the existing plant, which is withdrawn due to the new investment.

4.5 Economic indicator

We now present some of the most common economic indicators that summarize the characteristics of the investment and allow greater speed in the decision-making process, especially in a comparative key.
A. Return Time (RT)
Return time, which the Americans called the "payback" is the most popular economic indicator and in many cases is sufficient to determine the benefit of the agreement identified. However, it is advisable to use it with caution, as its exclusive and indistinguishable use may, in some cases, provide the wrong answers. It does not take into account investment life, interest, inflation, and the cost rate of the product produced.

$$RT = I / CF$$

RT = Return time
I = Investment
CF = Cash Flow
B. Profit index (PI)

The profit index tells us how much a Euro invested in the activity in question produces. This index is very useful when you do not have enough capital to make all the investments identified as suitable. In this case, this indicator helps us make the best use of the little money available.

The formula is as follows:

$$PI = NPV / I$$

PI = Profit Index

NPV = net present value

I = Investment

To better illustrate this, let us take as an example two investments:

Case 1):

CF = 15.000 € of the deducted profits;
I = 10.000 €;

NPV = 15.000 – 10.000 = 5.000 €.

Case 2):

CF = 10.000 € të përfitimeve të zbritura;
I = 5.000 €;

NPV = 10.000 – 5.000 = 5.000 €.

Both cases offer the same NPV, but it is clear that the latter is preferable, requiring a lower initial cost for the same achievable profit.
Using the profit index we have:

PI = NPV / I

Case 1):

PI = 5.000 / 10.000 = 0, 5

Case 2):

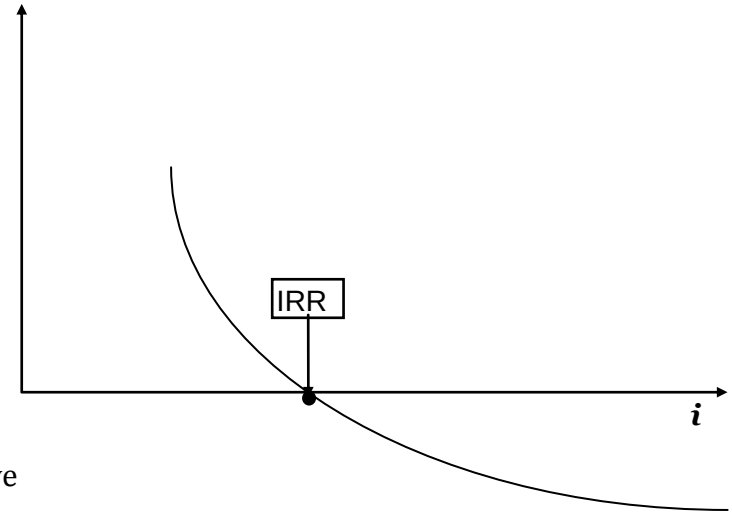
PI = 5.000 / 5.000 = 1

The preference for the second solution is justified by the fact that one euro invested in this activity produces 1 profit, while in the first case the same euro produces 0.5.

C. Internal rate of return (IRR)

If we place the NPV value on a Cartesian axis system and the interest rate on the horizontal axis, we obtain a curve like the one shown in the following figure.

NPV

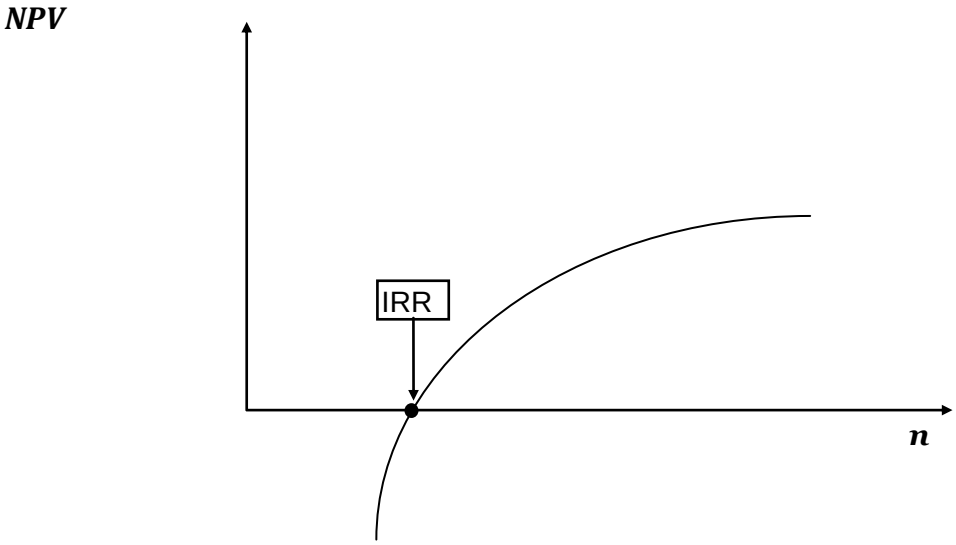


PIC.4 Interest rate curve

The value of ***i*** for which the NPV is canceled is a special value, which is called the "Internal Rate of Return". This indicator tells us at what rate we are using our money to perform the intervention.

D. Return Time (RT)

Similar to what is seen for IRR, we place the NPV in the vertical axis and the expected life n on the horizontal axis. The number of years for which the NPV is canceled identifies the return time (RT).



PIC.5 Return time curve

5. CONCLUSION

The REEHUB project established regional energy distribution in each country of the geographical area included in the IPA INTERREG Program Montenegro, Albania, Molise and Puglia, reference centers for public administration on issues of energy-saving and efficiency. HUBs are physical meeting places, exchange with community and professionals to spread the culture of environmental and energy sustainability, and transfer good practices on this topic through training and capacity building courses. A specialized technician manages each HUB. He has attended a training course on the methodology described in the guidelines and has become the "Protector" of good practices, as well as the HUB's technical equipment.

Each HUB has its construction specificity, and this has allowed us to share problems and solutions for different types of buildings. During the implementation of the project, HUBs were field laboratories equipped with instruments to perform measurements on-site, and technicians were able to experiment and apply the REEHUB ENERGY AUDIT methodology shared by all partners.

The methodology described in the previous pages highlights the basic technical notions that every professional should know and what are the procedures you should follow according to International Standards and Community Policies in progress.

These guidelines have in two sections, a descriptive one explaining the methodological approach of an energy audit of a building and the second section with examples of "Best Practice" which describe how the audit is used within the regional centers established under the project.

The purpose of these guidelines is to provide practical guidance for public administration technicians and professionals and emphasizes that before any energy efficiency intervention, it is necessary to know the building in all its construction aspects and the plant located in it and the measurement of the interventions with a cost-benefit analysis.

Allegato f_Capitolato Tecnico

PROCEDURA SOTTOSOGLIA TELEMATICA AI SENSI DELL'ART. N.2 LETTERA B) DELLA LEGGE N.120 DEL 11/09/2020, DA AGGIUDICARSI CON IL CRITERIO DEL PREZZO PIÙ BASSO, AI SENSI DELL'ART. 1, COMMA 3 DELLA L. 120/2020 E S.M.I DA ESPLETARSI TRAMITE IL PORTALE MEPA.

PROCEDURA AVENTE AD OGGETTO LA FORNITURA ED INSTALLAZIONE DI STRUMENTI PER L'EFFICIENTAMENTO ENERGETICO NELL'AMBITO DEL PROGETTO "EFFECTS" N. 475 – FINANZIATO DAL PROGRAMMA INTERREG IPA CBC ITALIA-ALBANIA-MONTENEGRO 2014-2020. CUP H99D20000220006 - CIG _____

1 PREMESSA

Il settore dell'edilizia rappresenta circa il 40% del consumo totale di energia nell'Unione Europea. A tal proposito, l'Europa ha emanato una direttiva ad hoc sulla prestazione energetica nell'edilizia. Per questo, la cooperazione transfrontaliera con Albania e Montenegro è importante al fine di scambiare buone pratiche, trasferire l'innovazione volta a ridurre la domanda di riscaldamento (in termini di bilancio energetico annuale) e a ridurre al minimo la domanda di picco di raffreddamento. È anche importante sostenere gli operatori del settore nell'individuare approcci economicamente efficienti rispetto a lavori di ristrutturazione su specifici tipi di edifici.
Il progetto EFFECTS intende promuovere pratiche e strumenti innovativi per ridurre le emissioni di carbonio e migliorare l'efficienza energetica nel settore pubblico. In particolare, la proposta vuole approfondire le questioni relative all'efficienza energetica negli edifici scolastici, valutando possibili strategie per ridurre l'impatto negativo sull'ambiente e sui cambiamenti climatici degli enti locali e sul miglioramento del comfort interno.
La scuola è il contesto più adatto per diffondere la cultura della sostenibilità e del risparmio energetico che può essere espressa non solo negli interventi strutturali, ma anche attraverso azioni educative, partecipative e condivisione di esperienze che possono e devono essere adottate facendo riferimento all'approccio didattico all'interno del sistema scolastico.
Attraverso azioni pilota specifiche, studenti, insegnanti e famiglie avranno l'opportunità di partecipare da vicino ad attività di pianificazione e ristrutturazioni all'insegna dell'efficienza energetica.
Gli obiettivi specifici di EFFECTS sono:
- creare una rete transnazionale tra città, centri di ricerca, scuole e ministeri, per promuovere l'efficienza energetica negli edifici scolastici, sviluppando una strategia comune basata sulle caratteristiche climatiche dell'area cross-border;
- attuare attività di benchmarking per confrontare tecnologie, normative e misure finanziarie applicate ai 3 Paesi al fine di definire un piano d'azione comune circa i progetti di risparmio energetico da promuovere, stabilendo nuovi modelli di interventi di risparmio energetico negli impianti scolastici (energia, illuminazione, riscaldamento e raffreddamento) e sui rivestimenti esterni;
- definire un piano d'azione per i 4 interventi pilota (2 in Italia, 1 in Albania e 1 in Montenegro) per monitorare le prestazioni energetiche;
- progettare e attuare un percorso formativo per gli studenti;
- progettare e attuare un percorso formativo per operatori privati, installatori e leader del settore per promuovere la tecnologia;
- creare un "Open Innovation Lab" sull'efficienza energetica al fine di animare e stimolare il focus energetico sul risparmio energetico, anche dopo la fine del progetto.

	ORGANIZZAZIONE	PAESE	BUDGET
LP	Città di Barletta	Italy	€ 204.023,80
P2	Città di Termoli	Italy	€ 170.007,95

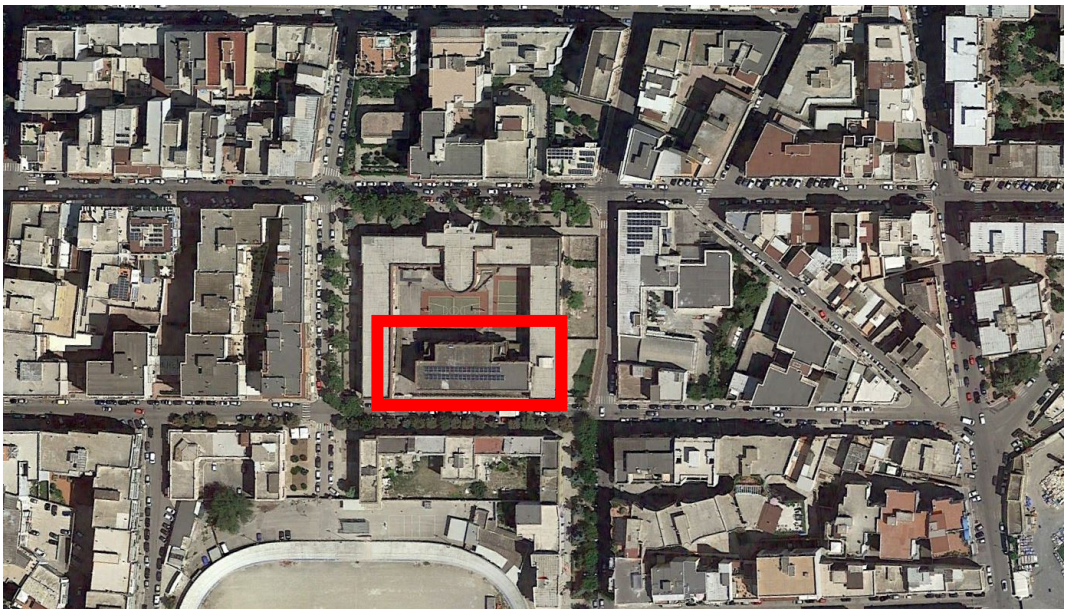
P3	ENEA	Italy	€	84.987,00
P4	Città di Valona	Albania	€	131.740,45
P5	Ministero dell'Educazione del Montenegro	Montenegro	€	131.740,80

All'interno del territorio di Barletta, oltre che ad un'analisi generalizzata del contesto scolastico locale, verrà effettuata un'applicazione in uno specifico edificio scolastico. Per applicazione quindi, si intende, sia la sensibilizzazione dell'utente alle problematiche di risparmio energetico e confort dell'edificio, sia alla vera a propria installazione di dispositivi impiantisti/edili atti al miglioramento energetico dell'edificio.

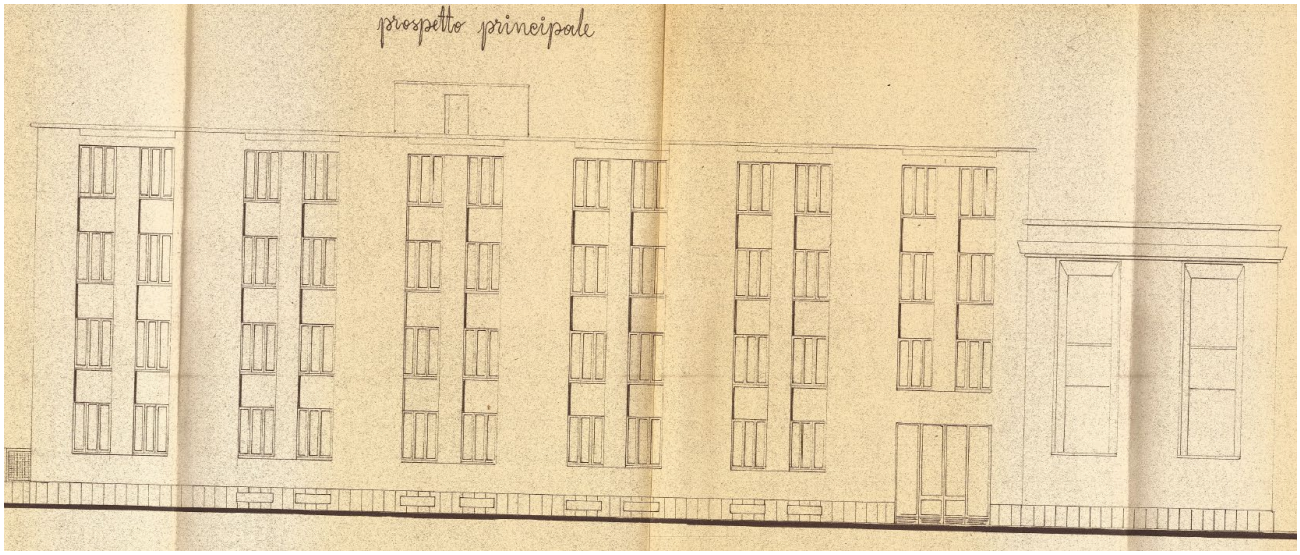
1.1 Ubicazione intervento

L'intervento previsto all'interno del progetto EFFECTS riguarderà l'efficientamento energetico dell'edificio costituente il Plesso "De Nittis", ricompreso all'interno dell'"I.C. D'Azeglio – De Nittis". L'efficientamento energetico verrà attuato attraverso piccoli interventi di installazione di componentistica, utile al risparmio di combustibile per l'alimentazione dell'impianto di riscaldamento dell'edificio e per il miglioramento della qualità dell'aria all'interno dei locali scolastici.

L'edificio si individua in una zona semicentrale della città, in particolare poco più a sud rispetto al Castello Svevo della città di Barletta. In particolare costituisce elemento di completamento del polo scolastico costituito da tre edifici ovvero il Liceo Classico A. Casardi, Scuola Nicolò Fraggianni ed il terzo ovvero la Scuola Media De Nittis.



L'Edificio, costruito nel 1957-59 si compone di un corpo di fabbrica compatto, avente pianta regolare e rettangolare di dimensioni 640 mq circa, con sviluppo longitudinale est-ovest, quindi avente facciate principali nord sud. Il fabbricato è sviluppato in 4 piani fuori terra ed un piano interrato. In corrispondenza della facciata principale, ovvero quella a sud vi è la presenza di 46 aperture, aventi dimensioni 1.9 x 2.4 m.



A livello distributivo il fabbricato è composto da 20 aule aventi dimensione di circa 50 mq ciascuna, il restante numero di locali è destinato ai servizi di segreteria e servizi generali dell'edificio, come ad esempio, distributori di piano, scale, servizi igienici e locali tecnici.
Relativamente alla parte edile, si compone di una struttura in C.A. a telai completata da solai latero cementizi e tamponature in tufo, intonacate sia internamente che esternamente. Le chiusure verticali trasparenti invece, sono state oggetto di successivo intervento di riqualificazione energetica e sono composte da intelaiature in PVC intervallati da vetrocamere con gas nobile all'interno.
Anche la chiusura di copertura ha subito un successivo intervento di riqualificazione, intorno al 2010, migliorando ulteriormente le prestazioni energetiche dell'edificio.

A livello impiantistico, in particolare impianto termico, elemento essenziale quando si studia il problema del risparmio energetico, si individua in impianto a combustione con centrale termica costituita da due caldaie a basamento alimentate da gas metano. Tali caldaie riscaldano il fluido termovettore che alimenta a mezzo di tubazioni in ferro (non isolate) un impianto a termosifoni in ghisa, configurando un impianto tradizionale.
Per quanto concerne l'impianto elettrico, si rileva la presenza di illuminazione a neon, come caratterizzato in tutti gli edifici scolastici del territorio, alimentati sia dal vettore energetico classico proveniente dalla rete, sia da un piccolo impianto fotovoltaico ubicato in copertura, costituito da numerosi pannelli fotovoltaici policristallini, ma con potenza di picco unitaria ridotta, in quanto lo stesso impianto è stato installato nel 2015 circa.
In termini catastali, l'edificio risulta censito al NCEU avente foglio 138 particella 154, all'interno del contesto territoriale della Città di Barletta.

2 STAZIONE APPALTANTE

Comune di Barletta, Corso Vittorio Emanuele, 94, 70051 Barletta BT- Codice Fiscale 00741610729 – P.IVA 00443960729 – Telefono +39 0883 578111 e-mail: ufficioeuropa@comune.barletta.bt.it indirizzo Internet: www.comune.barletta.bt.it – PEC: politicheeuropee@cert,comune.barletta.bt.it.
Il Responsabile Unico del Procedimento è _____ Dirigente del Servizio Coordinamento Politiche Europee, e.mail: _____

3 OGGETTO DELLA FORNITURA

L'intervento di miglioramento energetico previsto, comprenderà la FORNITURA ED INSTALLAZIONE di dispositivi atti all'utilizzo efficiente delle risorse ed al miglioramento del confort interno degli utenti. Rammentando le esigenze sopracitate sono previsti i seguenti interventi:

1. Fornitura ed installazione di schermature solari esterne personalizzate, atte al controllo della radiazione solare nelle stagioni di transizione autunnale e primaverile, in luogo alle attuali schermature interne in tessuto, non efficienti e scarsamente manutenute;
2. Fornitura ed installazione di apri infissi elettromeccanici per l'attuazione della ventilazione naturale meccanizzata, in modo da consentire un'idonea apertura delle parti vasistas degli infissi affacciati a sud;
3. Fornitura ed installazione di valvole termostatiche di tipo SMART, utili al controllo dell'erogazione del calore in maniera puntuale e di facile gestione, a mezzo di applicazioni accessibili tramite tablet o smartphone;
4. Fornitura ed installazione di centraline portatili per il controllo della qualità dell'aria utili al monitoraggio dei parametri di confort indoor, integrabile con il sistema di ventilazione, in modo da consentire i ricambi orari al raggiungimento dei livelli limite di CO_2.

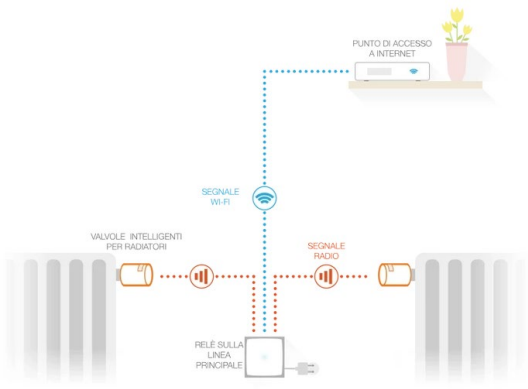
3.1 Fornitura ed installazione di schermature solari

Il controllo dell'irraggiamento solare estivo è un elemento essenziale per il miglioramento energetico dell'edificio, in quanto consente di migliorare sensibilmente il confort termico e illuminotecnico durante le stagioni di transizione, in cui il calore proveniente dalla radiazione solare, può risultare fastidioso nei confronti dell'utenza.
Gli infissi attuali di dimensioni 1.9 x 2.4 m, costituiti da telai in PVC e vetrocamere con gas interposto in intercapedine, non consentono un adeguata schermatura della radiazione solare non richiesta (ovvero nelle stagioni di transizione), per cui sono state installati dei tendaggi interni che non risultano efficienti dal punto di vista energetico e di confort.
In luogo agli attuali sistemi di schermatura, saranno installati dei sistemi di schermature esterne, costituiti da veneziane in alluminio a controllo motorizzato. Le veneziane previste saranno installate nell'apposito vano di 7 cm tra la parte esterna dell'infisso e la parte interna della grata di protezione. Date le ridotte dimensioni di quest'ultimo vano si rende necessaria l'installazione di veneziane di spessore ridotto, massimo 60 mm, in modo da consentire un ottimale scorrimento delle lamelle orientabili.
L'utilizzo di veneziane in alluminio, possibilmente, pre-forate, consentirà di ottenere un'adeguata resistenza del materiale all'azione del vento, una ridotta esigenza manutentiva ed un aspetto estetico idoneo all'utilizzo.
Le lamelle saranno orientabili e movimentate da un sistema a motore integrato nel cassonetto di sommità e sarà possibile impacchettare tutta la schermatura all'interno di quest'ultimo, in modo da consentire l'entrata di radiazione solare in inverno ed evitare l'esposizione prolungata della schermatura alle sollecitazioni ventose.
La movimentazione elettrica degli elementi sarà diretta da interruttori ubicati a parete collegati con l'impianto elettrico dell'edificio.
Ogni infisso installato in corrispondenza della facciata SUD dell'edificio sarà dotato di tale sistema di schermatura, in quanto data l'esposizione, è proprio in corrispondenza di tali elementi che si genera il maggiore apporto di calore.
Ogni schermatura solare dovrà essere personalizzata con una rappresentazione di un'opera d'arte di Giuseppe De Nittis ad esempio in serigrafia (da concordare con la Stazione Appaltante), in modo che dall'esterno dell'edificio si possa avere un richiamo chiaro e nitido del famoso pittore Barlettano. La Stazione Appaltante si riserva di concordare la riproduzione delle opere con l'Affidatario.

3.2 Fornitura ed installazione di apri infissi elettromeccanici

La ventilazione naturale meccanizzata consiste nell'apertura automatica degli infissi esterni, utile all'attivazione dei meccanismi convettivi di ventilazione e purificazione dell'aria interna ai locali.
L'attuazione di l'apertura degli infissi, nel caso di progetto, non sarà più demandata all'utente, ma sarà automatizzata da elementi elettromeccanici che consentano l'apertura automatica dell'infisso. Tali dispositivi sono costituiti da un attuatore a catena o pistone che a seguito di un comando elettrico, da interruttore o remoto, consentono l'apertura di parte dell'infisso. In particolare, per il caso in oggetto, si prevederà l'installazione del dispositivo di apertura, in corrispondenza del sopraluce apribile a vasistas, di dimensioni 1.9 x 0.6 m.
L'attuazione dell'apertura potrebbe essere gestita sia manualmente, impostando l'elemento in ON – OFF o automaticamente in base a orari o a misurazione della CO2 misurata all'interno degli ambienti, con dispositivi che saranno descritti successivamente nel punto 5.4.

3.3 Fornitura ed installazione di elettrovalvole termostatiche SMART



L'erogazione di calore negli impianti centralizzati presenta un vantaggio dal punto di vista di produzione di calore complessiva e di numero di componenti, ma lo svantaggio in termini di gestione dell'erogazione del calore puntuale.
L'impianto all'interno dell'edificio, essendo centralizzato presenta questi pregi ma anche difetti, per cui si rende necessario migliorare l'emissione del riscaldamento.
Utilizzando delle valvole termostatiche SMART sarà possibile regolare l'emissione di calore dai terminali (termosifoni) direttamente a mezzo di una semplice APP, gestibile da uno smartphone o tablet, oppure agendo direttamente sull'intuitivo sistema di regolazione manuale della manopola. L'utilizzo di valvole termostatiche intelligenti inoltre, consente l'interruzione di erogazione di calore quando vi sono infissi aperti, riducendo lo spreco di energia di riscaldamento.

3.4 Fornitura ed installazione di centraline portatili di controllo dell'aria

Il controllo della qualità dell'aria interna ai locali è fondamentale all'interno degli ambienti scolastici, soprattutto a seguito della manifestazione pandemica COVID 19. L'utilizzo di semplici strumenti elettronici connessi alla rete internet a mezzo di app, consente di monitorare il livello di CO2 all'interno degli ambienti fornendo utili fattori per l'attivazione della ventilazione naturale controllata, citata all'interno del punto 5.2. Tali centraline sono costituite da moduli in alluminio caratterizzati da una forma compatta e maneggevole, che posizionati all'interno di un ambiente, consentono il monitoraggio dello stesso.

Gli articoli della presente fornitura, sono destinati in locali ad uso didattico e ricomprenderanno l'installazione di componenti adibite al risparmio energetico
Le prestazioni a carico del Soggetto aggiudicatario saranno le seguenti:

- eventuale sopralluogo conoscitivo direttamente in sito;
- fornitura ed installazione dei seguenti elementi:
    - Veneziane per esterni gestite da interruttori a parete, con tutte le opere murarie connesse;
    - Attuatori apri serramenti elettromeccanici a vasistas;
    - valvole termostatiche di tipo smart gestite da relè collegate alla rete wi fi dell'edificio scolastico;
    - centraline portatili di controllo della qualità dell'aria e CO2.
- smaltimento dell'eventuale materiale di risulta;

3.5. Consistenza della fornitura

La fornitura sarà applicata a tutte le aule del plesso scolastico, oltre che in corrispondenza dei locali adibiti a segreteria, per un totale di 20 vani, tutti esposti a sud, facciata importante dal punto di vista energetico, soprattutto per quanto concerne il controllo della radiazione solare
Le componenti installate nel loro complesso, come illustrato negli elaborati (All.1 – TAV. 01 _ Tavola Unica), devono garantire efficienza e funzionalità, presentare caratteristiche di flessibilità, aggregabilità e componibilità in modo da essere facilmente adattabile agli ambienti.
Gli elementi da fornire in corrispondenza di ogni aula sono i seguenti:

- N. 2 tende alla veneziana personalizzate in alluminio per esterni, con dimensioni: 190 cm (L) x 240 cm (H) e max 5 cm (Sp. Cassonetto), motorizzate ed attivabili a mezzo di interruttore a parete nei pressi della finestra o retro-cattedra
- N. 2 Valvole termostatiche SMART, tipo netatmo, comprese di relè di controllo tramite app, collegabili alla rete WiFi dell'edificio scolastico;

- N.2 Attuatori apri serramenti elettromeccanici a vasistas, controllabili a mezzo di interruttore a parete nei pressi della finestra o retro-cattedra;
- N.1 centralina portatile controllo qualità dell'aria indoor tipo netatmo "centralina interna integrativa".

3.6. Quantitativi complessivi della fornitura

I quantitativi complessivi della componentistica in oggetto del presente capitolato sono analiticamente descritti di seguito:

- N. 44 Tende veneziane personalizzate in alluminio per esterni, di dimensioni 1.9x2.4x0.05 m (tutti gli infissi ubicati nella facciata sud) dell'edificio, compresi collegamenti elettrici ed interruttori di attuazione;
- N. 44 Apri-infissi elettromeccanici a vasistas in corrispondenza di tutti gli infissi con affaccio a sud, compresi i collegamenti ed interruttori necessari per l'attivazione del meccanismo di apertura/chiusura;
- N.45 Valvole termostatiche di tipo SMART controllate da 20 RELE, 1 per ogni aula, tipo netatmo;
- N.45 Centrali di controllo qualità dell'aria, tipo netatmo;

I concorrenti potranno presentare l'offerta per l'affidamento della suddetta fornitura, sia che partecipino singolarmente, sia che partecipino in raggruppamento temporaneo di imprese, in forma consortile ovvero in Gruppo Europeo.
È fatto divieto ai concorrenti di partecipare in più di un raggruppamento temporaneo o in forma consortile ovvero in Gruppo Europeo a pena di esclusione di tutte le offerte presentate, ovvero di partecipare in forma individuale qualora partecipino alla medesima procedura in raggruppamento o in forma consortile ovvero in Gruppo Europeo.
Nella fornitura devono essere inclusi tutti i componenti necessari all'integrazione e al corretto funzionamento del sistema. La fornitura dovrà appartenere alla più recente generazione di prodotti rilasciati in commercio ed essere costituita esclusivamente da elementi nuovi di fabbrica.

Per tutte le voci, è prevista la prestazione dei seguenti servizi connessi:

1. Servizio di ***"Consegna, installazione, configurazione ed avvio operativo dei sistemi"*** della fornitura, da erogarsi in conformità alle modalità indicate nel presente Capitolato Tecnico;
2. Servizio di ***"Assistenza in garanzia delle attrezzature"***, da erogarsi in conformità alle modalità indicate nel presente Capitolato Tecnico.

L'Aggiudicatario, assumendo verso la Stazione Appaltante il ruolo di "Aggiudicatario Chiavi in Mano", dovrà garantire la completezza e l'omogeneità della fornitura stessa, indipendentemente dalla eterogeneità delle componenti delle apparecchiature base e delle opzioni previste dalla fornitura.
La fornitura dovrà conformarsi ai requisiti di seguito indicati:

1. Tutte le attrezzature in configurazione base dovranno presentare caratteristiche tecniche minime non inferiori a quelle riportate nel presente Capitolato Tecnico;
2. Tutte le attrezzature in configurazione base e i componenti opzionali dovranno essere nuovi di fabbrica, ed essere costruiti utilizzando parti nuove;
3. Ciascuna attrezzature dovrà essere consegnata presso la sede indicata ed avviata;
4. Tutta la fornitura dovrà risultare conforme ai requisiti riportati nel presente Capitolato Tecnico;
5. Per ciascuna attrezzature dovrà essere fornita una copia digitale della manualistica tecnica completa edita dal produttore; la documentazione dovrà essere in lingua italiana oppure, se non prevista, in lingua inglese.

4 MARCATURA CE

La fornitura dovrà essere munita - per le componenti che lo richiedono - della marcatura di certificazione "CE" richiesta dalle norme vigenti in Italia in materia di sicurezza e prevenzione degli infortuni, ai sensi e per gli effetti della Direttiva 2006/42/CE del 17 maggio 2006 (detta "Nuova direttiva macchine") recepita ed attuata per l'Italia mediante il Decreto Legislativo 27 gennaio 2010, n. 17 (pubblicazione del 19/2/2010 Supplemento ordinario n. 36/L alla Gazzetta Ufficiale Serie generale - n. 41) e s.m.i.

5 CONDIZIONI AMBIENTALI E SOPRALLUOGO FACOLTATIVO

Le Ditte con la presentazione dell'offerta riconoscono di essersi rese pienamente edotte e di avere tenuto in debito conto tutte le condizioni ambientali e le circostanze ed alee ad esse connesse che possono avere influenza sulla esecuzione del contratto e sulla determinazione dei prezzi. L'aggiudicataria, pertanto, non potrà sollevare alcuna obiezione per qualsiasi difficoltà che dovesse insorgere durante la fornitura appaltata in relazione ad una pretesa ed eventuale imperfetta acquisizione di ogni elemento relativo all'ubicazione nonché alla natura e caratteristiche della fornitura stessa.
La Ditta aggiudicataria assume su di sé, sollevando e manlevando il Comune di Barletta, ogni e qualsiasi responsabilità in ordine a danni a cose o persone che la stessa, con i propri dipendenti o delegati di società di trasporti ("Corrieri"), dovesse arrecare al Comune di Barletta e al personale di questa, ai propri dipendenti o a terzi in genere, in occasione della fornitura in oggetto.
A tal fine, la Ditta deve essere dotata di polizza assicurativa a copertura della Responsabilità Civile.
La Ditta è invitata a fare un sopralluogo presso la sede di destino, al fine di acquisire ogni informazione utile alla formulazione dell'offerta tecnico-economica, agli spazi e volumi, nonché alla gestione in sicurezza della consegna. In caso di offerte per prodotti non idonei per peso o volume ad essere posizionati nel luogo destinato dal Comune di Barletta, il RUP si riserva di escludere l'offerta per inidoneità.

6 LUOGO DI CONSEGNA DELLA FORNITURA

Il luogo di consegna della fornitura è il Plesso "De Nittis", ricompreso all'interno dell'"I.C. D'Azeglio – De Nittis", Via Libertà, 20/A, 76121 Barletta (BT).

Anche le verifiche di conformità e collaudo si terranno da parte del personale del Comune di Barletta presso la sede precedentemente indicata.

7 IMPORTO

L'importo posto a base di gara è fissato in € 73.770,49 (Euro settantatremilasettecentosettanta/49 (IVA esclusa), (complessivi € 90.000,00), come per legge. Gli oneri di sicurezza per interferenze sono pari a 1.126,01 euro. Pertanto L'importo soggetto a ribasso è di € 72.644,48, oltre IVA se dovuta.
Il valore dell'appalto, come sopra indicato, è stato stimato tenendo conto dell'importo previsto nell'Application Form del progetto EFFECTS.
La succitata somma è finanziata dal Programma di Cooperazione Italia-Albania-Montenegro 2014/2020, ed in particolare: 85% dai fondi di Programma e 15% dal Fondo di Rotazione (Delibera CIPE n.10/2015).
Il Comune di Barletta si riserva la facoltà, ai sensi dell'art. 106, c. 12, del D.Lgs. n. 50/2016, qualora in corso di esecuzione si renda necessario un aumento o una diminuzione delle prestazioni fino a concorrenza del quinto dell'importo del contratto, di imporre all'appaltatore l'esecuzione alle stesse condizioni previste nel contratto originario. In tal caso l'appaltatore non può far valere il diritto alla risoluzione del contratto originario.

Si specifica, inoltre, che il Comune di Barletta, ai sensi dell'art. 63, c. 5, del D.Lgs. n. 50/2016, nei tre anni successivi alla stipula del contratto, potrà richiedere all'operatore economico individuato eventuali ulteriori forniture analoghe a quelle della presente procedura, fermo restando che l'importo complessivo degli affidamenti non potrà superare l'importo di € 209.000,00 I.V.A. esclusa. Detto importo costituisce il valore stimato dell'appalto relativo alla presente procedura, ai sensi dell'art. 35, c. 4 del D.Lgs. n. 50/2016 e, pertanto, i requisiti di partecipazione sono commisurati allo stesso.

8 DURATA

I termini massimi di consegna ed installazione della fornitura oggetto del presente lotto sono indicati in tabella. I termini si riferiscono a giorni naturali e consecutivi decorrenti dal giorno successivo alla stipula del contratto:

LOTTO N.	TERMINE DI CONSEGNA
1	45

Tale intervallo è quantificato in relazione sia alle lavorazioni, sia considerando la tempistica necessaria per la messa in regime del sistema di automazione attuato a mezzo di app, che andrà configurata nei sistemi di ogni singola classe, ovvero in corrispondenza di ogni dispositivo mobile messo a disposizione della docenza.
Il periodo di installazione dovrà essere quello estivo, escludendo le festività, in quanto, in termini di interferenze si consentirebbe una più facile capacità di installazione da parte degli operatori, la quale può avvenire in assenza di interruzione delle attività scolastiche.
Qualora vi siano attività scolastiche non derogabili e indipendenti dal periodo di frequentazione da parte degli alunni, ad esempio all'interno delle segreterie, per consentire la prosecuzione del servizio scolastico, si procederà all'installazione pomeridiana dei dispositivi previsti.
In ogni caso resta fermo l'obbligo del prestatore fornitore di garantire al Comune di Barletta tutta l'attività di assistenza necessaria per consentire la regolare attuazione e rendicontazione del Progetto in oggetto.
Il Comune di Barletta potrà richiedere all'operatore economico individuato quale assegnatario della fornitura, l'avvio delle attività in corso di perfezionamento del contratto, redigendo apposito verbale ai sensi dell'art. 32 comma 8, dal D.Lgs. n. 50/2016.

9 CONTENUTI TECNICI E PRODOTTI RICHIESTI

Gli elementi da fornire in corrispondenza di ogni aula sono i seguenti:

- N. 2 tende alla veneziana personalizzate in alluminio per esterni, con dimensioni: 190 cm (L) x 240 cm (H) e max 5 cm (Sp. Cassonetto), motorizzate ed attivabili a mezzo di interruttore a parete nei pressi della finestra o retro-cattedra
- N. 2 Valvole termostatiche SMART, tipo netatmo, comprese di relè di controllo tramite app, collegabili alla rete WiFi dell'edificio scolastico;
- N.2 Attuatori apri serramenti elettromeccanici a vasistas, controllabili a mezzo di interruttore a parete nei pressi della finestra o retro-cattedra;
- N.1 centralina portatile controllo qualità dell'aria indoor tipo netatmo "centralina interna integrativa".

Inoltre, bisognerà fornire:

- N. 44 Tende veneziane personalizzate in alluminio per esterni, di dimensioni 1.9x2.4x0.05 m (tutti gli infissi ubicati nella facciata sud) dell'edificio, compresi collegamenti elettrici ed interruttori di attuazione;

- N. 44 Apri-infissi elettromeccanici a vasistas in corrispondenza di tutti gli infissi con affaccio a sud, compresi i collegamenti ed interruttori necessari per l'attivazione del meccanismo di apertura/chiusura;
- N.45 Valvole termostatiche di tipo SMART controllate da 20 RELE, 1 per ogni aula, tipo netatmo;
- N. 45 Centrali di controllo qualità dell'aria, tipo netatmo.

9.1 Requisiti

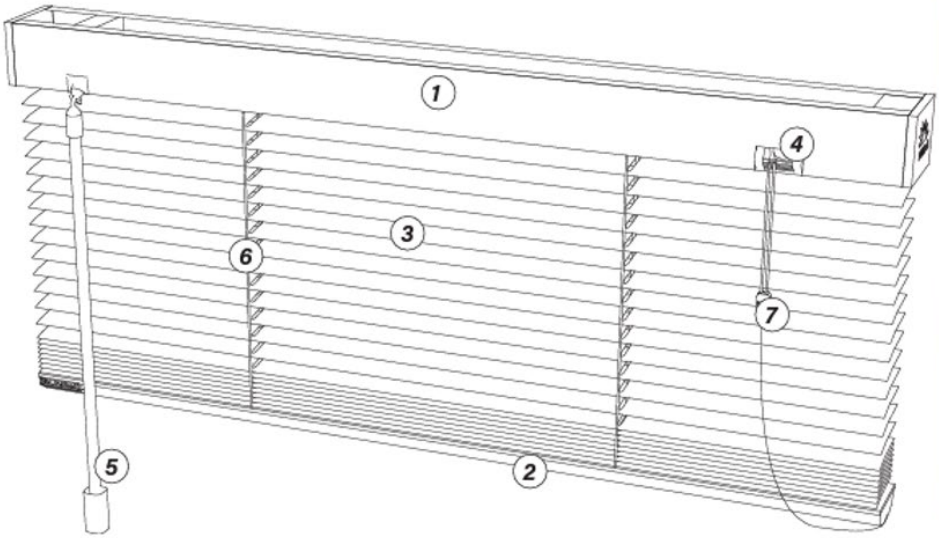
I prodotti offerti devono rispettare le caratteristiche previste dalle normative vigenti, riassunte come di seguito:

- Norme per schermature solari:
  - UNI EN 13561 "Tende esterne requisiti prestazioni compresa la sicurezza" (in obbligatorietà della Marcatura CE)
  - UNI EN 13659 "Chiusure oscuranti requisiti prestazionali compresa la sicurezza" (in obbligatorietà della Marcatura CE)
  - UNI EN 14501 "Benessere termico e visivo: caratteristiche, prestazioni e classificazione"
  - UNI EN 13363-1 "Dispositivi di protezione solare in combinazione con vetrate; calcolo della trasmittanza totale e luminosa, metodo calcolo semplificato"
- Norme per apri-infissi elettromeccanici:
  - Direttiva 2006/42/EU -Direttiva Macchine;
  - Direttiva 2014/35/EU -Direttiva Bassa Tensione (LVD Low Voltage Directive);
  - Direttiva 2014/30/EU -Direttiva Compatibilità Elettromagnetica;
  - Direttiva 2014/53/EU -Direttiva Apparecchiature Radio;
  - Direttiva 2011/65/EU -Direttiva sulla restrizione dell'uso di determinate sostanze pericolose nelle apparecchiature elettriche ed elettroniche (Direttiva RoHS);
  - NORMA EN 60335-2-103 -Sicurezza degli apparecchi elettrici d'uso domestico e similare Norme particolari per attuatori di cancelli, porte e finestre motorizzati;
- Norme valvole termostatiche SMART:
  - UNI EN 215:2019
  - UNI EN 215:2007

9.2 Tolleranze e scostamenti

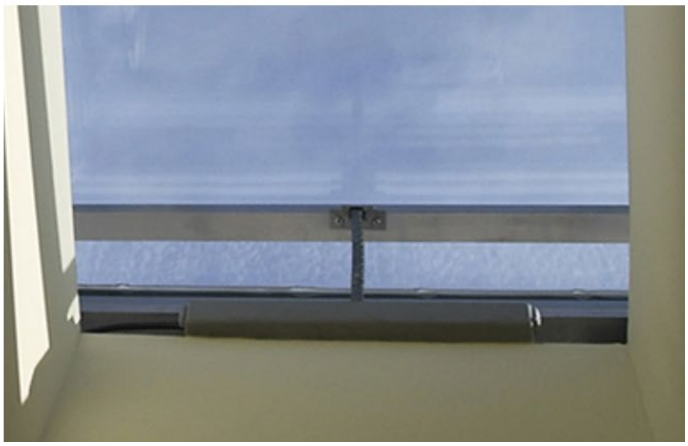
È consentita la fornitura di componenti con caratteristiche in parte differenti da quelle succitate, solo se equivalenti o migliorative del prodotto e tali da non cambiarne: la configurazione le dimensioni significative ossia tali da incidere sull'ingombro complessivo;
Gli elementi di schermatura solari (tende veneziane) dovranno garantire una connotazione estetica coerente con il contesto cui sono destinati, con particolare riferimento alla cura dei dettagli e delle finiture superficiali. Il fornitore è tenuto ad offrire un insieme unitario e stilisticamente coordinato di prodotti facenti parte della stessa linea, ovvero prodotti nei quali sono evidenti coerenze della gamma di: componenti, materiali, finiture e colori.

9.3 Schermature solari - movimentate elettricamente



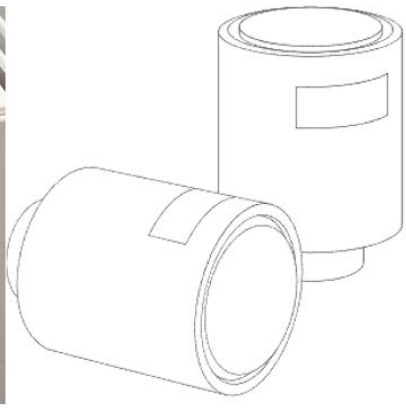
Profilo superiore cassonetto estruso in lega alluminio tipo en aw-6060 t5 mis. Max 50 mm di larghezza x Max 80 mm di altezza x sp. 1 mm verniciato a polvere nei colori disponibili in abbinamento tinte lamelle come da campionario, munito di appositi tappi laterali di chiusura con logo stampati a disegno.
Profilo inferiore fondale estruso in lega alluminio tipo en aw-6060 t5 mis. Max 50 mm di larghezza x Max 30mm di altezza x sp. 1,5 mm verniciato a polvere nei colori in abbinamento tinte lamelle come da campionario, munito di appositi tappi laterali di chiusura stampati a disegno senza la presenza di antiestetici e poco funzionali tappi ferma scaletta.
Lamella da max 50 mm in speciale lega di alluminio-manganese spessore tipo 0,23 mm, resistente alla corrosione, temprata, pretrattata e verniciata a caldo con vernici senza piombo al fine di garantire durata e luminosità dei medesimi colori disponibili per i profili estrusi.
Il movimento e l'impacchettamento dovranno avvenire mediante sistema motorizzato inserito in cassonetto, incluso l'attuatore utile alla movimentazione della veneziana e al collegamento all'impianto elettrico del locale, oltre all'interruttore di attuazione della chiusura/apertura.
Scaletta e corda in terilene 100% poliestere multifilo termofissato ad alta resistenza alla rottura e allungamento con trattamento anti raggi UV. Fornita con sfumature in tinta con colori lamelle la scaletta ha passo 28 mm (36 lamelle al m lineare). Connettore munito di separatore corde utili per impacchettamento.
Le dimensioni del vano di chiusura sono: 1.90 m (L) x 2.40 m (H) DIMENSIONI FINITE, lo spazio di alloggiamento della veneziana sarà max 8 cm intercorsi tra la parte esterna del telaio del serramento e la parte interna della grata di protezione, non rimovibile per motivi di sicurezza.
La veneziana sarà personalizzate con la rappresentazione delle opere di Giuseppe De Nittis ed il colore di sfondo sarà stabilito in opera, non potrà comunque discostarsi dal colore della grata di protezione, in modo da mantenere la tinta della facciata inalterata all'esterno.
La veneziana sarà movimentata e mantenuta in sede a mezzo di cavi o guide laterali che dovranno essere opportunamente distanze dagli stipiti, architrave e davanzale.

9.4 Attuatore Apri – Serramento Elettromeccanico

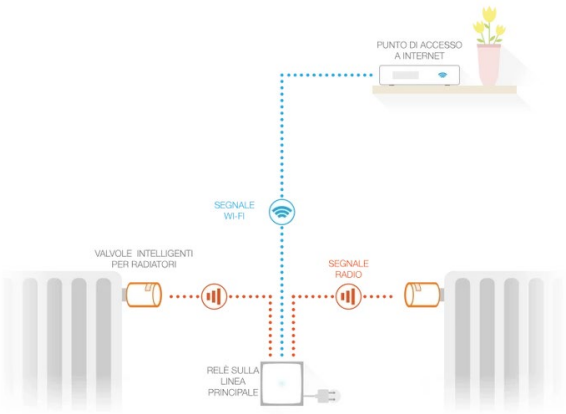


Attuatore per infissi a sporgere o vasistas TIPO TOPP C15 con catena articolata doppia maglia, contenuta in apposito involucro, completo di supporto ed accessori per apertura a sporgere o a vasistas. Funzionamento 230V 50Hz, oppure, in alternativa, a 24V c.c. Carico massimo applicabile 300N. Corsa regolabile dall'estreno mediante interruttore di selezione con fermi a 120mm e 240mm. Forza regolabile dall'esterno mediante interruttore di selezione. Fine corsa in chiusura elettronico ad assorbimento di corrente. Apparecchio marcato CE. Assorbimento 12°, Velocità di traslazione 8 mm/s, temperatura di funzionamento -5°Ce +50°C,grado di protezione dispositivi elettrici IP 30, finecorsa elettronico, compresi tutti gli elementi necessari per il collegamento elettrico e la gestione a mezzo di interruttore ON-OFF.

9.5 Valvole termostatiche smart



Valvola termostatica tipo NETATMO VALVOLA TERMOSTATICA INTELLIGENTE + RELE', con operazione intelligente; Schermo e-Paper; Cilindro traslucido in plexiglass, design di Starck. La temperatura può essere regolata direttamente sulla Valvola. Progettata per essere utilizzata all'interno della propria abitazione. Resiste al 95% di umidità relativa. Dimensioni del prodotto 80x58 mm. Sensori e misure: Temperatura (media): 0°C a 50°C (± 0,5°C) Temperatura (valore di riferimento): Gamma di misurazione: 5°C to 30°C (± 0,5°C) Unità di misura: °C Alimentazione: Batteria Compatibili con i termosifoni ad acqua calda, si avvitano sui detentori del radiatore. Funziona con termostato intelligente tipo Netatmo oppure con il Kit di Base Netatmo per riscaldamento centralizzato; Requisito: Rete con collegamento Internet wireless ad alta velocità necessario. Hotspot pubblici non supportati Tra le Valvole ed il Relè del Termostato o del Kit di Base: radio a lunga distanza (868 MHz) Compatibilità App iOS 9 minimo richiesto Android 4.2 minimo richiesto PC e Mac attraverso la Webapp;



9.6 Centralina portatile controllo qualità dell'aria tipo netatmo misuratore intelligente della qualità dell'aria

Gruppo monoblocco in alluminio resistente, Progettato esclusivamente per uso interno. Dimensioni 45x45x155 mm, sensori e misure: Frequenza di misurazione: ogni 5 minuti, temperatura di esercizio 0°C a 50°C, precisione +- 0.3 °C, umidità 0% a 100%, Misuratore di C02 Gamma: da 0 a 5 000 ppm Precisione: ± 50 ppm (da 0 a 1 000 ppm) o ± 5% (da 1000 a 5 000 ppm); Fonometro: Gamma: da 35 dB a 120 dB. Requisiti: Richiede una connessione internet wireless ad alta velocità Non supporta hotspot pubblici; Specifiche di connettività: Compatibile con Wifi 802.11 b/g/n (2,4 GHz) Sicurezza: aperto/WEP/WPA/WPA2-personal (TKIP e AES)., alimentazione: Misuratore Intelligente della Qualità dell'Aria alimentato mediante adattatore USB a parete, compatibilità app iOS 9 minimo richiesto Android 4.2 minimo richiesto;

9.7 Smaltimento imballi

Gli imballi dovranno essere ritirati dall'Aggiudicatario ai fini dello smaltimento nei giorni stessi in cui avviene l'installazione della fornitura.

9.8 Garanzia

L'aggiudicatario fornitore dovrà garantire la perfetta funzionalità e posa delle componenti oggetto della fornitura, e conseguentemente fornire gratuitamente il servizio di assistenza e manutenzione per un periodo pari a 24 (ventiquattro) mesi a partire dalla data di ultimazione della fornitura.
La garanzia comprende la prestazione della mano d'opera ed ogni attività necessaria a garantire il ripristino del perfetto funzionamento dei manufatti, inclusa la fornitura dei pezzi di ricambio.
Gli interventi in garanzia atti ad assicurare la funzionalità del prodotto devono essere effettuati entro 2 (due) giorni lavorativi successivi alla data di richiesta d'intervento, e dovrà essere garantito il ripristino o la sostituzione del bene entro 5 (cinque) giorni lavorativi dalla data di richiesta dell'intervento.
Nulla dovrà essere addebitato per gli interventi sopra descritti, compresi i costi di viaggio, percorrenza chilometrica ed ore di viaggio del tecnico con relative trasferte.

10 CERTIFICAZIONI E ATTESTATI DI CONFORMITÀ

Prima della stipula del contratto il Soggetto aggiudicatario dovrà fornire le certificazioni dei materiali oggetto della presente fornitura richieste nel presente capitolato, inoltre, al termine dell'istallazione, dovrà fornire il certificato di corretto montaggio delle apparecchiature.

Le certificazioni dovranno essere prodotte in originale o in copia conforme all'originale.

11 PENALITÀ

Per ogni giorno naturale e consecutivo di ritardo dell'appalto si applicherà una penale pari all'1‰ (uno per mille) dell'importo contrattuale, al netto dell'IVA e dell'eventuale costo relativo alla sicurezza sui luoghi di lavoro derivante dai rischi di natura interferenziale.
Nel caso in cui la prima verifica di conformità della fornitura abbia esito sfavorevole non si applicano le penali; qualora tuttavia l'Aggiudicatario non renda nuovamente la fornitura disponibile per la verifica di conformità entro i 20 (venti) giorni naturali e consecutivi successivi al primo esito sfavorevole, ovvero la verifica di conformità risulti nuovamente negativa, si applicherà la penale sopra richiamata per ogni giorno solare di ritardo.
Nell'ipotesi in cui l'importo delle penali applicabili superi l'importo pari al 10% (dieci per cento) dell'importo contrattuale, al netto dell'IVA e dell'eventuale costo relativo alla sicurezza sui luoghi di lavoro derivante dai rischi di natura interferenziale, la Stazione Appaltante risolverà il contratto in danno all'Aggiudicatario, salvo il diritto al risarcimento dell'eventuale danno patito.
Gli inadempimenti contrattuali che daranno luogo all'applicazione di penali di cui ai precedenti periodi verranno contestati all'Aggiudicatario per iscritto.
L'Aggiudicatario dovrà comunicare in ogni caso le proprie deduzioni nel termine massimo di 5 (cinque) giorni lavorativi dalla stessa contestazione. Qualora dette deduzioni non siano accoglibili a giudizio della Stazione Appaltante ovvero non vi sia stata risposta o la stessa non sia giunta nel termine indicato, si applicheranno le penali sopra indicate.
Le penali verranno regolate dalla Stazione Appaltante, o sui corrispettivi dovuti all'Aggiudicatario per le forniture già effettuate oppure sulla garanzia definitiva. In quest'ultimo caso la garanzia definitiva dovrà essere reintegrata entro i termini fissati dalla Stazione Appaltante.

12 ONERI ED OBBLIGHI DELL'AGGIUDICATARIO

L'aggiudicatario:

- Si impegna ad eseguire le prestazioni oggetto del presente contratto, senza alcun onere aggiuntivo, salvaguardando le esigenze della Stazione Appaltante e di terzi autorizzati, senza recare intralci, disturbi o interruzioni all'attività lavorativa in atto.
- Rinuncia a qualsiasi pretesa o richiesta di compenso nel caso in cui lo svolgimento delle prestazioni contrattuali dovesse essere ostacolato o reso più oneroso dalle attività svolte dalla Stazione Appaltante e/o da terzi.
- È direttamente responsabile dell'inosservanza delle clausole contrattuali anche se questa dovesse derivare dall'attività del personale dipendente di altre imprese a diverso titolo coinvolto.
- Deve avvalersi di personale qualificato in regola con gli obblighi previsti dai contratti collettivi di lavoro e da tutte le normative vigenti, in particolare in materia previdenziale, fiscale, di igiene ed in materia di sicurezza sul lavoro.
- Risponderà direttamente dei danni alle persone, alle cose o all'ambiente comunque provocati nell'esecuzione dell'appalto che possano derivare da fatto proprio, dal personale o da chiunque chiamato a collaborare. La Stazione Appaltante è esonerata da ogni responsabilità per danni, infortuni o qualsiasi altra cosa accadesse al personale di cui si avvarrà l'Aggiudicatario nell'esecuzione del contratto.
- Si fa carico, intendendosi remunerati con il corrispettivo contrattuale, di tutti gli oneri ed i rischi relativi alle attività ed agli adempimenti occorrenti all'integrale espletamento dell'oggetto contrattuale, ivi compresi, a mero titolo esemplificativo e non esaustivo, gli oneri relativi alle spese di

trasporto, di viaggio e di missione per il personale addetto alla esecuzione della prestazione, nonché i connessi oneri assicurativi.

- Si impegna ad eseguire le prestazioni oggetto del presente contratto a perfetta regola d'arte e nel rispetto di tutte le norme e le prescrizioni tecniche e di sicurezza in vigore e di quelle che dovessero essere emanate nel corso del presente contratto, nonché secondo le condizioni, le modalità, i termini e le prescrizioni contenute nel presente contratto e nei suoi allegati;
- Si impegna a consegnare gli elaborati progettuali e tutte le dichiarazioni e/o certificazioni discendenti da specifici obblighi normativi e legislativi correlati con l'oggetto della prestazione;
- Si impegna a consegnare i certificati di omologazione "CE" per tutte le apparecchiature che lo richiedano;
- Si impegna a consegnare le schede tecniche e i manuali delle singole apparecchiature fornite, preferibilmente su supporto digitale;
- Si impegna a consegnare le eventuali schede di manutenzione ordinaria e straordinaria delle apparecchiature suddivise per interventi giornalieri, settimanali, mensili, ecc.

13 NORME DI RIFERIMENTO E SICUREZZA SUL LAVORO

Tutti i componenti devono soddisfare i requisiti minimi specificati nel presente Capitolato Tecnico ed essere conformi alla normativa vigente per gli ambienti di lavoro D.Lgs. n.81/08 e ss.mm.
Dovranno altresì essere conformi a tutte le caratteristiche tecniche previste dalle norme UNI e dalle norme europee per quelle specifiche in oggetto del presente capitolato. Le norme UNI richieste, se non altrimenti specificato, si riferiscono alle loro versioni più recenti. A norma dell'art. 68 del Dlgs. n. 50/2016, i concorrenti hanno la possibilità di dimostrare con qualsiasi mezzo appropriato che le soluzioni proposte ottemperano in maniera equivalente ai requisiti definiti dalle specifiche tecniche richieste.

13.1. Prevenzione incendi - resistenze al fuoco

Tutti i materiali combustibili devono soddisfare almeno la "classe 2" di reazione al fuoco certificati ai sensi delle norme UNI 9174, UNI 9174/A1, UNI 9175, UNI 9177/87 e UNI CEI EN ISO 13943/2004.
In ogni caso nel corso della fornitura dovranno essere rispettate le norme e le leggi vigenti di carattere generale, con particolare riguardo a:
- D.P.R. n. 151 del 01.08.2011 "Regolamento recante semplificazione della disciplina dei procedimenti relativi alla prevenzione incendi";
- D.M. del 22.02.2006 "Approvazione della regola tecnica di prevenzione incendi per la progettazione, la costruzione e l'esercizio di edifici e/o locali destinati ad uffici" (in particolare i materiali combustibili devono soddisfare le classi di reazione al fuoco previste in detto D.M.);
- D.M. del 15.03.2005 "Requisiti di reazione al fuoco dei prodotti da costruzione installati in attività disciplinate da specifiche disposizioni tecniche di prevenzione incendi in base al sistema di classi europeo";
- D.M. del 10.03.2005 "Classi di reazione al fuoco per i prodotti da costruzione da impiegarsi nelle opere per le quali è prescritto il requisito della sicurezza in caso di incendio".

13.2. Eventuali cablaggi necessari per l'automazione

Eventuali cablaggi, necessari per l'elettrificazione e attuazione degli elementi, devono essere conformi a eventuali indicazioni della norma CEI 64-11. Le canalizzazioni e i mezzi che consentono ai cavi l'attraversamento dei piani di lavoro, devono essere privi di spigoli vivi, sbavature e punti di schiacciamento dei cavi stessi.

13.3 Sicurezza sui luoghi di lavoro

L'Aggiudicatario si assume la responsabilità per gli infortuni del personale addetto, che dovrà essere opportunamente addestrato ed istruito.

La valutazione dei rischi propri dell'Aggiudicatario nello svolgimento della propria attività professionale resta a carico dello stesso, così come la redazione dei relativi documenti e la informazione/formazione dei propri dipendenti.
L'Aggiudicatario è tenuto a garantire il rispetto di tutte le normative riguardanti l'igiene e la sicurezza sul lavoro con particolare riferimento alle attività che si espleteranno presso l'Ente.
In relazione alle risorse umane impegnate nelle attività oggetto del presente contratto, l'Aggiudicatario è tenuto a far fronte ad ogni obbligo previsto dalla normativa vigente in ordine agli adempimenti fiscali, tributari, previdenziali ed assicurativi riferibili al personale dipendente ed ai collaboratori.
Per quanto riguarda i lavoratori dipendenti, l'Aggiudicatario è tenuto ad osservare gli obblighi retributivi e previdenziali previsti dai corrispondenti CCNL di categoria, compresi, se esistenti alla stipulazione del contratto, gli eventuali accordi integrativi territoriali.
Gli obblighi di cui al comma precedente vincolano l'Aggiudicatario anche qualora lo stesso non sia aderente alle associazioni stipulanti gli accordi o receda da esse, indipendentemente dalla struttura o dimensione del medesimo e da ogni altra qualificazione giuridica, economica o sindacale.

14 DIVIETO DI CESSIONE DEL CONTRATTO

È vietata la cessione del contratto ai sensi dell'art. 105, comma 1 del D. Lgs. 50/2016 e s.m.i.;
Per quanto riguarda le modificazioni soggettive che comportino cessioni di azienda e atti di trasformazione, fusione e scissione riguardanti l'Aggiudicatario, si applicano le disposizioni di cui all'art. 106 del D. Lgs. 50/2016 e s.m.i.
L'Aggiudicatario è tenuto a comunicare tempestivamente alla Stazione Appaltante ogni modificazione intervenuta negli assetti proprietari e nella struttura organizzativa.

15 VERIFICA DI CONFORMITÀ DELLA FORNITURA

La fornitura sarà soggetta a verifica di conformità per certificare che l'oggetto del contratto in termini di prestazioni, obiettivi e caratteristiche tecniche, economiche e qualitative sia stato realizzato ed eseguito nel rispetto delle previsioni contrattuali e delle pattuizioni concordate in sede di aggiudicazione, ai sensi dell'art. 102 del D. Lgs. 50/2016 e s.m.i.
Le attività di verifica saranno effettuate entro 30 (trenta) giorni naturali e consecutivi decorrenti dal giorno successivo alla ricezione della comunicazione di completamento delle attività oggetto dell'appalto da parte dell'Aggiudicatario.
Durante le suddette operazioni, la Stazione Appaltante ha altresì la facoltà di chiedere all'Aggiudicatario tutte quelle prove atte a definire il rispetto delle specifiche strumentali dichiarate e quant'altro necessario a definire il buon funzionamento della fornitura.
Sarà rifiutata la fornitura difettosa o non rispondente alle prescrizioni tecniche richieste dal Capitolato tecnico e accettate in base all'offerta presentata in sede di gara dall'Aggiudicatario.
L'esito positivo della verifica non esonera l'Aggiudicatario dal rispondere di eventuali difetti non emersi nell'ambito delle attività di verifica di conformità e successivamente riscontrati; tali difetti dovranno essere prontamente eliminati durante il periodo di garanzia.

16 FATTURAZIONE E PAGAMENTO

Ai fini del pagamento del corrispettivo contrattuale il Fornitore, se stabilito e/o identificato ai fini IVA in Italia, dovrà emettere fattura elettronica ai sensi e per gli effetti del Decreto del Ministero dell'Economia e delle Finanze N. 55 del 3 aprile 2013, inviando il documento elettronico al Sistema di Interscambio che si occuperà

di recapitare il documento ricevuto alla Stazione appaltante. Il Comune di Barletta è soggetto all'applicazione del meccanismo dello ***"Split Payment"***. In caso di Fornitore straniero la fattura dovrà essere cartacea.
Il Comune di Barletta provvederà al pagamento del corrispettivo contrattuale, secondo le seguenti modalità:

- L'90% del corrispettivo contrattuale in rate il cui importo sia commisurato ai relativi stati di avanzamento effettivi delle attività presentati dall'Aggiudicatario;
- Il 10% del corrispettivo contrattuale a saldo delle attività entro 30 giorni dalla conclusione delle attività (30.09.2022 salvo proroghe), previa verifica della regolare esecuzione delle prestazioni attese, in termini di corrispondenza, completezza, adeguatezza e tempestività.

Per ciascun pagamento l'operatore economico dovrà emettere apposita fattura riportante i codici CIG e CUP ed applicando lo split payment ai sensi art. 17-ter del DPR 26 /10 1972, n. 633.
Ad ogni fattura dovrà essere allegata una relazione sulle attività svolte nel periodo di riferimento.
L'operatore economico, inoltre, dovrà contestualmente comunicare il conto corrente bancario/postale dedicato, anche in modo non esclusivo, al pagamento della commessa pubblica per il rispetto degli obblighi di tracciabilità cui all'art. 3 della L.136/2010 e s.m.i..

17 RECESSO

Fermo restando quanto previsto dall'Art. 109 del Codice, la Stazione Appaltante potrà recedere dal presente contratto anche nelle seguenti ipotesi non imputabili all'Aggiudicatario: i) per motivi di pubblico interesse; ii) durante l'esecuzione del contratto in applicazione delle facoltà concesse dall'Art. 1464 C.C.
La volontà di recesso sarà comunicata all'Aggiudicatario con un preavviso non inferiore a 30 (trenta) giorni naturali e consecutivi. La Stazione Appaltante in caso di recesso sarà esonerata dalla corresponsione di qualsiasi indennizzo o risarcimento.

18 RISOLUZIONE DEL CONTRATTO

In adempimento a quanto previsto dall'art. 108 del D. Lgs. 50/2016 e s.m.i. la Stazione Appaltante risolverà il contratto nei casi e con le modalità ivi previste.
Per quanto non previsto nel presente paragrafo, si applicano le disposizioni di cui al Codice Civile in materia di inadempimento e risoluzione del contratto.
In ogni caso si conviene che la Stazione Appaltante, senza bisogno di assegnare previamente alcun termine per l'adempimento, potrà risolvere di diritto il contratto ai sensi dell'art. 1456 c.c., previa dichiarazione da comunicarsi all'Aggiudicatario tramite posta elettronica certificata nei seguenti casi:

I. Mancata reintegrazione della cauzione eventualmente escussa entro il termine di 10 (dieci) giorni lavorativi dal ricevimento della relativa richiesta da parte della Stazione Appaltante;
II. Nel caso in cui l'UTG competente rilasci la comunicazione/informazione antimafia interdittiva;
III. Nei casi di cui ai precedenti paragrafi:
    - Penalità;
    - Oneri ed obblighi dell'Aggiudicatario;
    - Sicurezza sul lavoro;
    - Divieto di cessione del contratto.

19 RINVIO A NORME VIGENTI

Per quanto non esplicitamente previsto nelle presenti Condizioni particolari si fa rinvio alle norme del D.Lgs. n. 50/20106, al Regolamento che disciplina l'Attività Contrattuale del Comune di Barletta e, in quanto applicabili, alle disposizioni del Codice Civile, nonché alle disposizioni contenute nel Regolamento UE n.

1299/2013, nel Regolamento UE n. 1303/2013 e nella manualistica specifica dei Programmi di riferimento dei singoli progetti e alle leggi e regolamenti vigenti che disciplinano la materia.

20 CONTESTAZIONI

Per qualsiasi controversia derivante dal presente Capitolato resta stabilita la competenza territoriale del Foro di Barletta.

21 INFORMAZIONI SULLA PROTEZIONE DEI DATI PERSONALI

Nella presente procedura saranno rispettati i principi di riservatezza delle informazioni fornite, ai sensi del D.Lgs. n. 196/2003, così come modificato dal D.Lgs. 10/8/2018 n.101 e integrato dalle disposizioni del Regolamento UE 2016/679 (GDPR), compatibilmente con le funzioni istituzionali, le disposizioni di legge e regolamentari concernenti i pubblici appalti e le disposizioni riguardanti il diritto di accesso ai documenti ed alle informazioni. In particolare, in ordine alla presente procedura:

a) le finalità cui sono destinati i dati raccolti riguardano la verifica della capacità dei concorrenti di
b) partecipare alla gara;
c) i dati forniti saranno raccolti, registrati, organizzati e conservati per le finalità di gestione della gara e
d) saranno trattati sia mediante supporto cartaceo che magnetico anche successivamente all'eventuale
e) instaurazione del rapporto contrattuale per le finalità del rapporto medesimo;
f) il conferimento dei dati richiesti è un onere pena l'esclusione dalla gara;
g) i soggetti o le categorie di soggetti ai quali i dati possono essere comunicati sono:
    1. il personale interno alla stazione appaltante;
    2. i concorrenti;
    3. ogni altro soggetto che abbia interesse ai sensi della legge n. 241/1990;
h) i diritti spettanti all'interessato sono quelli di cui all'art. 7 del D.Lgs. n. 196/2003, cui si rinvia;
i) titolare del trattamento dei dati personali è il Comune di Barletta.

Supporto Tecnico progettazione interna
Ing. Gaetano Lomuscio
Gaetano Lomuscio

Comune di Barletta
Provincia Barletta Andria Trani

COMPUTO METRICO

OGGETTO: Progetto Effects

COMMITTENTE: Comune di Barletta

Barletta,04/2022

IL TECNICO

Num.Ord. TARIFFA	DESIGNAZIONE DEI LAVORI	DIMENSIONI				Quantità
		par.ug.	lung.	larg.	H/peso	
	R I P O R T O					
	LAVORI A MISURA					
1 1C.22.400.0050.a	Tende alla veneziana con lamelle di alluminio verniciate a smalto, oppure in materiale plastico, complete di nastri e congegni per il sollevamento e l'orientamento, cassonetto e sp ... sa la posa in opera nonchè le assistenze murarie, pulizia ed allontanamento dei materiali di risulta: - lamelle da 50 mm Tende Frangisole alla veneziana (44 Finestre esposte a Sud dimensioni 1.9 x 2.4 m), spessore stipte di inserimento 7 cm	44,00	1,90	2,400		200,64
	SOMMANO m²					200,64
2 MC.22.400.0070.d	Accessori per tende alla veneziana (per ogni tenda): - motorizzazione Motorizzazione frangisole (44 finestre esposte a Sud)					44,00
	SOMMANO cad					44,00
3 MC.22.400.0070.e	Accessori per tende alla veneziana (per ogni tenda): - centralina telecomando e ricevitore Centralina motorizzazione frangisole (44 finestre)					44,00
	SOMMANO cad					44,00
4 MC.22.400.0070.f	Accessori per tende alla veneziana (per ogni tenda): - pulsantiera telecomando Pulsantiera telecomando tenda (44 finestre per ogni elemento)					44,00
	SOMMANO cad					44,00
5 1C.22.350.0090	Comando elettrico per apertura a distanza di serramenti motorizzati. In opera, comprese assistenze murarie Comando apertura vasistas finestre (44 finestre, parte vasistas)					44,00
	SOMMANO cad					44,00
6 05.P59.P05.005	Testa termostatica con comando elettrico Teste termostatiche SMART tipo NETATMO (40 aule x 2 termosifoni ad aula + 10 di riserva)	45,00			2,000	90,00
	SOMMANO cad					90,00
7 1E.12.060.0380	Fornitura e posa in opera di Modulo sensore di umidità per misura di umidità relativa e temperatura ambiente completo di ingresso digitale a relè e di due ingressi digitali . Relè 2A - 24V Sensori misurazione qualità ambientale indoor tipo NETATMO (40 aule + 5 di riserva)					45,00
	SOMMANO cad					45,00
	Barletta, 07/03/2022 **Il Tecnico**					
	A R I P O R T A R E					

Comune di Barletta
Provincia di Barletta Andria Trani

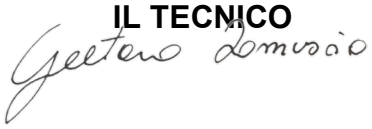
STIMA DEI COSTI DELLA SICUREZZA

OGGETTO: Progetto Effects

COMMITTENTE: Comune di Barletta

Barletta, 04/2022

IL TECNICO



Num.Ord. TARIFFA	DESIGNAZIONE DEI LAVORI	DIMENSIONI				Quantità	IMPORTI	
		par.ug.	lung.	larg.	H/peso		unitario	TOTALE
	R I P O R T O							
	LAVORI A MISURA							
1 S.002.002	Segnali informativi di forma rettangolare delle dimensioni di 250x310mm. In alluminio luminescente di mm1,1 di spessore. Segnaletica COVID 19					2,00		
	SOMMANO cad					2,00	18,35	36,70
2 S.002.009.a	Kit in conformità al D.M. 388 ALL. 2, indicato per luoghi di lavoro con meno di tre lavoratori. La dotazione è costituita da: 1 copia del D.M. 388 del 15/07/2003; 2 paia di guanti ... chetto per rifiuti sanitari mm 250x350; 1 libretto di istruzioni multilingua per il pronto soccorso. Per ogni armadietto Kit pronto soccorso 1 kit					1,00		
	SOMMANO cad					1,00	34,54	34,54
3 S.003.009	Ponte su cavalletti di altezza non superiore a m 2, costituito da cavalletti in legno o ferro e tavole ad essi assicurate, in opera, compresi gli spostamenti nell'ambito dello stesso ambiente, sviluppo a superficie orizzontale del piano di lavoro. 1 Ponte su cavalletti per installazione schermature solari e relativi dispositivi (4 mq)					4,00		
	SOMMANO mq					4,00	3,75	15,00
4 SIC.COVID. 01	Dispositivi per la protezione delle mani, dotati di marcatura CE ai sensi del DLgs 10-1997- Guanti monouso in lattice UNI EN 420-374 2 e 455 1 2. Sottoguanti da indossare ... da lavoro, o da utilizzare per gli spostamenti nei mezzi aziendali. Sono compresi nel prezzo gli oneri di smaltimento. Guanti monouso COVID 19 (2 paia per operatore(2) per 30 giorni)	4,00			30,000	120,00		
	SOMMANO cadauno					120,00	0,10	12,00
5 SIC.COVID. 07	SEMIMASCHERE FILTRANTI FFP2 SENZA VALVOLA: Sono maschere facciali tridimensionali monouso, che vengono posizionate su naso e bocca e fissate alla testa con lacci o e ... ervano la documentazione dei DPI forniti ai lavoratori. Nel costo è compreso l'onere per lo smaltimento. 2 Mascherine FFP2 per ogni operatore (2) per 30 giorni	4,00			30,000	120,00		
	SOMMANO cadauno					120,00	4,43	531,60
6 SIC.COVID. 09	Fornitura di soluzione idroalcolica per l'igienizzazione delle mani. Dotazione minima di 1 litro di prodotto al giorno per ciascun dispenser computato con le voci SIC.COVID.26.a e SIC.COVID.26.b. Soluzione idroalcolica per igienizzazione mani					1,00		
	SOMMANO litro					1,00	28,75	28,75
7 SIC.COVID. 13.a	Formazione ed informazione addetti con indicazione procedure specifiche e dettagliate da adottare in cantiere, compreso eventuale addestramento. Formazione ed informazione specifica per ciascun preposto e/o direttore di cantiere. - per ciascun preposto / direttore di cantiere. Formazione ed informazione addetti					1,00		
	SOMMANO cadauno					1,00	126,50	126,50
	A R I P O R T A R E							785,09

Num.Ord. TARIFFA	DESIGNAZIONE DEI LAVORI	DIMENSIONI				Quantità	IMPORTI	
		par.ug.	lung.	larg.	H/peso		unitario	TOTALE
	R I P O R T O							785,09
8 SIC.COVID. 21.a	Disinfezione di superfici piane di aree esterne o interne mediante nebulizzazione di prodotti igienizzanti a base di ipoclorito di sodio in soluzione acquosa o altro prodot ... nto disciplinato dal Ministero della Salute e normative di riferimento emanate in materia. - per superfici fino a 500mq. Disinfezione ambienti scolastici in caso di contagio					1,00		
	SOMMANO corpo					1,00	304,22	304,22
9 S.002.002	Segnali informativi di forma rettangolare delle dimensioni di 250x310mm. In alluminio luminescente di mm1,1 di spessore. Segnaletica informativa di cantiere					2,00		
	SOMMANO cad					2,00	18,35	36,70
	Parziale LAVORI A MISURA euro							1´126,01
	T O T A L E euro							1´126,01

Data, 04/2022

Il Tecnico

Gaetano Domusio

	A R I P O R T A R E							

Interreg - IPA CBC
Italy - Albania - Montenegro
EUROPEAN UNION
EFFECTS

D.T3.3.2 CBC Open Innovation Lab Version 1

27/09/2023

Municipality of Barletta
Municipality of Termoli
ENEA Italian National Agency for New Technologies, Energy and Sustainable Economic Development
Municipality of Vlora
Ministry of Education of Montenegro

During the Final Conference, Municipality of Barletta shared a draft of the Memorandum of Understanding (MoU) with all the project partners, aimed at formalizing the mutual commitments of the partners in the future, and particularly for the establishment of the CBC Open Innovation Lab.

This Open Lab represents a network of all the existing Living Labs created in each Partner Pilot venue, and it is created by the signing of the proposed MoU by the EFFECTS project partners.

The scheme of the MoU is represented here below.

Actually, the need to create such a network has arisen during the Capacity building and awareness raising activities implemented within the project, and also as a consequence of the discussion between project partners about future collaborations in the field of energy efficiency.

The main aim to achieve by developing the attached MoU is enhancing the level of awareness on Energy Efficiency of public buildings and related topics at Cross-border level. To reach this goal, the EFFECTS project partners agree on implementing some actions such as collaborating for collection and exchange of data and information about the topics of interest, nevertheless for the design, development, and implementation of joint project ideas, to define the conditions necessary to present and support one or more project proposals in partnership and so on.

Memorandum of Understanding (MoU) for the establishment of the CBC Open Innovation Lab

made and entered on [**27/09/2023**] between the following partners, for the increasing of the awareness about the Energy Efficiency in public buildings:

Partner	**Address**	**VAT**	**Country**
Municipality of Barletta	Corso Vittorio Emanuele 94, 76121 Barletta	00443960729	ITALY
Municipality of Termoli	LARGO MARTIRI DELLE FOIBE SNC, 86039 TERMOLI	67530709	ITALY

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Italian National Agency for New Technologies, Energy and Sustainable Economic Development-ENEA	Via Appia km 706, 72100 Brindisi	00985801000	ITALY
Municipality of Vlora	Square "4 Heronjte", 9400 Vlora	K56703201O	ALBANIA
Ministry of Education of Montenegro	Vaka Đurovića NN, 81000 Podgorica	02014432	MONTENEGRO

Whereas

The Parties have established a strong partnership and positive collaboration during the Project EFFECTS, funded by Italy-Albania-Montenegro 2014-2020 Programme.

1. BACKGROUND

Within the Capacity building and awareness raising activities addressed to different target groups focused on energy efficiency, implemented according to the bottom-up approach within the EFFECTS Project, the need to establish a network of national living labs, creating a cross-border living lab on energy efficiency based on the open innovation method, has arisen.

The purpose of this kind of hub would be connecting individual national labs and also attracting potential new labs to the network, in order to promote environmentally sustainable behaviours and cross-border energy efficiency policies, with particular reference to the public buildings.

Based on these Capacity building and Pilot activities, the Parties agreed on the development of this Memorandum of Understanding.

2. POSSIBLE TOPICS OF INTERVENTION IN THE FURTHER ACTIVITIES

The parties agree on the following tasks to be carried out in the MoU:

- To collaborate for the collection and exchange of data and information about the topics of interest;
- To collaborate for the design, development, and implementation of joint project ideas to be nominated for the various funding programs;
- To define the conditions necessary to present and support one or more project proposals in partnership;
- To further support the increasing of awareness about the Energy Efficiency and Sustainable behaviours and policies at CB level.

3. GENERAL TOPIC ON ENERGY EFFICIENCY FOR FUTURE COOPERATION BETWEEN THE COUNTRIES

The parties agree on the following general aim to be achieved:

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Enhancing the level of awareness at CB level on Energy Efficiency of public buildings and related topics

Moving from the experiences gathered in the Pilot Actions implemented within the EFFECTS Project, the Parties agree on the opportunity of organizing and implementing special promotion campaigns in order to increase the awareness about the Energy Efficiency and Sustainable behaviours and policies at CB level, also through the cooperation between the individual Living Labs on Energy Efficiency in the framework of the Cross-border Living Lab.

4. FUNDING

This MoU is not a commitment of funds. Each Party shall finance any joint activities under this MoU from sources available to them, and neither Party shall have any financial obligation to the other.

5. ADDITION OF PARTIES TO THE CONSORTIUM

Institutions may be invited to join the informal network only by the unanimous decision of the Parties, and on the condition that the new institution becomes a party to this Agreement.

6. AMENDMENTS AND TERMINATION

This MoU is written in English. Nothing in this MoU shall be construed as creating any legal relationship between the parties. This MoU is a statement of intent to foster genuine and mutually beneficial cooperation.

This MoU is at-will and may be modified by mutual consent of the Parties. This MoU shall become effective upon signature by all the authorized officials from the Parties and will remain in effect, until modified or terminated by mutual consent of the Parties.

IN WITNESS WHEREOF, the Parties have signed this MoU in seven (XXX) originals in the English language on the date set forth below:

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CONSORTIUM PARTNER:	MUNICIPALITY OF BARLETTA
Address:	
Postal code:	
City:	
Country:	
Represented by (name and surname):	
Signature:	

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CONSORTIUM PARTNER:	MUNICIPALITY OF TERMOLI
Address:	
Postal code:	
City:	
Country:	
Represented by (name and surname):	
Signature:	

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CONSORTIUM PARTNER:	ENEA
Address:	
Postal code:	
City:	
Country:	
Represented by (name and surname):	
Signature:	

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CONSORTIUM PARTNER:	MUNICIPALITY OF VLORA
Address:	
Postal code:	
City:	
Country:	
Represented by (name and surname):	
Signature:	

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Montenegro
Ministry of Education

CONSORTIUM PARTNER:	MINISTRY OF EDUCATION
Address:	
Postal code:	
City:	
Country:	
Represented by (name and surname):	
Signature:	

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This project is co-financed by the European Union under the instrument for Pre-Accession Assistance (IPA II)

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PROJECT NAME: EFFECTS **PROJECT NUMBER**: 475

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Interreg - IPA CBC
Italy - Albania - Montenegro
EFFECTS

D.T2.1.1 Definition of a PPPP model

Municipality of Barletta
Municipality of Termoli
Italian National Agency for New Technologies, Energy and Sustainable Economic Development
Municipality of Vlora
Ministry of Education of Montenegro

DOCUMENT HISTORY

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Definition of PPPP

Public-private-people partnership (PPPP) is a mechanism and a method to conduct of public authorities' tasks, including energy efficiency related activities. PPPP is a model for delivering public infrastructure and services in which the public sector collaborates with the private and people sector. The goal of PPPPs is to leverage the strengths of all sectors in order to achieve better outcomes for society and improved value for money. In a PPPP, the private sector takes on the responsibility for designing, financing, building, and operating an infrastructure project, while the public sector retains ownership of the asset and provides a long-term revenue stream to the private sector in exchange for its services. This revenue stream may come in the form of user fees, government grants, or other forms of payment. The objective of PPPPs is to bring the efficiency, innovation, and private and people sector financing to public infrastructure projects, while also providing a level of accountability and transparency that is not always present in traditional public procurement methods. PPPPs have been used in various sectors such as transportation, energy, healthcare, and social infrastructure, and have been successful in many countries around the world. No clear definition on PPPP is given inside the EU legal framework. However, Guidelines provide a brief PPP framework and include:

- A cooperation method between the public and private sectors;
- Task execution scheme and service procurement scheme that is usually done by the public sector;
- Economic calculation and overview of infrastructure setup and provision of services.

The Public-Private-People Partnership (PPPP) framework provides a structured and collaborative approach for governments, people and private sector entities to work together in delivering public services and infrastructure. The key objective of the PPPP framework is to utilize the expertise, resources and innovation of the private and people sector to deliver public services and infrastructure that are cost-effective, efficient and of high quality. The framework typically includes various stages, from project identification and selection to contract design and implementation, as well as monitoring and evaluation. The PPPP framework also provides a legal and regulatory framework that facilitates the negotiation, agreement and delivery of PPPP projects, while ensuring that the interests of the government, the people and the private sector are protected.

TEC has defined PPP as the following:

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PPPs are forms of cooperation between public authorities and the private sector that aim to modernize the delivery of infrastructure and strategic public services. In some cases, PPPs involve the financing, design, construction, renovation, management or maintenance of an infrastructure asset; in others, they incorporate the provision of a service traditionally delivered by public institutions. Whilst the principal focus of PPPs should be on promoting efficiency in public services through risk sharing and harnessing private sector expertise, they can also relieve the immediate pressure on public finances by providing an additional source of capital. In turn, public sector participation in a project may offer important safeguards for private investors, in particular the stability of long-term cash-flows from public finances, and can incorporate important social or environmental benefits into a project.

Source: The European Commission, Mobilising private and public investment for recovery and long term structural change: developing Public Private Partnerships, Brussels, 2009.

Montenegrin framework

Montenegro adopted the Law on Public-Private Partnership (*Official Gazette of Montenegro no. 01-2257/2* adopted 25.12.2019. year). The Law defines public-private partnership in the following manner: *Public-private partnership, in the sense of this Law, is a long-term contractual relationship between a public and a private partner, based on the distribution of rights, obligations and risks for the purpose of performing works of public interest on public infrastructure and facilities and/or providing services of public interest.*

Italian Framework

PPP Laws/Concession Laws - Italy

The Italian PPPP Model is regulated at various legislative levels: at municipal, regional and national level, and finally at European level.

Here below the regulatory references for the two Italian project partners are included.

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STATUTE OF MUNICIPALITY OF TERMOLI (Approved with resolution of C.C. n. 76,28.10.2000).
Art. 3 - Institutional cooperation.
1. The Municipality contributes to the determination of the objectives contained in the plans and programs of the Molise Region, while respecting mutual autonomy, also through studies and proposals. 2. It shall cooperate, in the forms and matters provided for by law, in the management of activities and services, together with the Province and other local authorities, by means of agreements or, for specific projects, by means of program agreements. 3. The Municipality, within the framework of the laws, promotes initiatives and participates in international activities. LEGISLATION OF MOLISE REGION: D.LGS. N 104/2017: Implementation of Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the environmental impact of certain public and private projects, pursuant to articles 1 and 14 of Law 9 July 2015, n.114 published in the Official Gazette n.156 of 06.07.2017 amends Legislative Decree 152/2006 and ss.mm.ii. and establishes in art.16, the Single Authorization Measure Regional, aimed at the release of all authorizations, agreements, concessions, licenses, opinions, concerts, nothing and assents however called, necessary for the implementation and exercise of the proposed project. The Single Regional Authorization Measure is issued in the event that the project is subjected to a regional Environmental Impact Assessment procedure.
The procedure for the release of the Provision is very articulated and the stages of verification of the request and the initiation and completion of the consultation, both public, both institutional, converge in a synchronous Conference of Services where, in addition to the assessment of compatibility due to the Environmental Impact Assessment, all the authorizations for the implementation and operation of the proposed Project.
STATUTE OF MUNICIPALITY OF BARLETTA (Approved with D.C.C. n. 64, 25.08.2000).
Art. 3. Relations with Institutions.
1. The Municipality of Barletta (…) establishes the principle of collaboration as the foundation of its activities with all the municipalities within the provincial territory, with the Province itself, and with the Puglia Region, in order to create, within the framework of constitutional and current legal norms and in accordance with the European Charter of Local Self-Government, a system of local autonomy that is as integrated, harmonious, and capable as possible of meeting the economic, social, and cultural development needs of the communities.
The Municipality's activities are guided by principles of transparency, effectiveness, efficiency, cost-effectiveness, subsidiarity, cooperation with the State, Regions, and other local entities, as well as responsibility for covering financial costs and the proper management of assets.
Art. 52. Public services and intermunicipal functions.

The Municipal Council is responsible for identifying the services, public works and functions to be managed through agreements and consortia with other territorial entities, in accordance with the forms and procedures provided by State or regional laws.

LEGISLATION OF PUGLIA REGION:

Regional Law of May 26, 2021, no. 11, Amendments to Regional Laws of April 12, 2001, no. 11 (Rules on Environmental Impact Assessment). According to this Regional Law, the paragraph 1 of Article 1 of Regional Law no. 11/2001 is replaced with the following: 1. The Puglia Region, in implementation of Directive 2014/52/EU of the European Parliament and of the Council of April 16, 2014, amending Directive 2011/92/EU on the assessment of the environmental impact of certain public and private projects, and Part Two of Legislative Decree No. 152 of April 3, 2006 (Environmental Regulations), establishes with this law the provisions concerning environmental impact assessment'.

Moreover, Regional Law of November 7, 2022, no. 26, includes rules related to the organization and methods of exercising Administrative Functions regarding environmental assessment and authorizations.

NATIONAL LEGISLATION:

- CIPE Decision of 21 March 1997, No 29, concerning the rules governing negotiated programming, and in particular point 1 thereof, b), which provides that the Framework Programme Agreements to be concluded must involve the peripheral bodies of the State, local authorities, sub-bodies in the negotiation process regional authorities means public bodies and any other public and private entities interested in the process and contain all the elements referred to in letter c), paragraph 203, of Article 2 of Law No. 662/1996;
- Legislative Decree no. 267 of 18 August 2000 on "Consolidated text of the laws on local government";

DEFINITION OF PPPP MODEL: NATIONAL AND EUROPEAN LEGISLATION

The defining basis and source of the core principles of the Public Private Partnership ("PPP") framework is contained in the Green Paper on Public Private Partnerships and Public Procurement and Concession Law of the European Commission of 30 April 2004 (to which is added the Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions on public private partnerships and Community law on public procurement and concessions, Brussels 15.11.2005, COM(2005) 569 final. and the Commission Interpretative Communication on the application of Community law on public procurement and concessions to institutionalized public private partnerships, Brussels 5.2.2008, 2008/C 91/02). The institute therefore has neither a definition nor a binding regulation in EU law. The 2004 Green Paper identifies the distinctive features of PPP contracts, by tracing the coordinates of the rules applicable to them in accordance with the principles of competition and equal treatment imposed by the Treaty on the Functioning of the European Union and the European Directives on contracts and concessions. In particular, it indicates the following basic characteristics of the PPP contracts: a) long-term relationship involving cooperation between the two partners (public and private) on the various aspects of the project to be implemented; b) financing of the project guaranteed in whole or in part by the private sector; c) the strategic role of the private operator involved in all phases of project development; d) risk distribution between public and

private partners, to be carried out on a case-by-case basis; depending on the ability of the parties to evaluate, control and manage them. The document also distinguishes two main forms of PPP:

the contractual PPP in which the relationship between public and private entities is based on exclusively contractual/conventional links;
the institutionalized PPP in which cooperation between the two entities takes place within a separate entity with its own legal personality. Within this form of PPP, the public partner may retain a relatively high degree of control over the structure created, consistent with the rules of company law.

Areas of application of PPP contracts The areas in which the typical forms of collaboration of the PPP for the implementation and management of works and/or services are carried out are the following: transport (motorways, bridges, ports, local public transport); energy (production plants from renewable sources, energy efficiency, public lighting); environment (MSW disposal, waste to energy plants, water treatment plants); sports facilities (sports facilities, swimming pools, multipurpose sports centers); structures of cultural value (congress centers, restoration of buildings/historical contexts, museums); other public works (schools, hospitals, buildings for the use of the Public Administration, car parks, barracks).

At national level, in Italy Public-Private Partnerships (PPPs) are defined and regulated by the new Public Contracts Code, which is a primary source of law. The current regulation of PPPs has evolved over time, and it is rooted in the introduction of the promoter concept in Law No. 109/1994, known as the 'Merloni Law.' Articles 37-bis and subsequent provisions inserted into the framework law on public works provided the possibility for a private entity, the so-called “promoter”, to promote the realization of a public work under a concession regime. The promoter could potentially become the concessionaire through a complex procedure.
In 2016, in order to implement the enabling Law No. 11 of 2016, Legislative Decree No. 50/2016 was issued, which implemented Directives 2014/23/EU, 2014/24/EU, and 2014/25/EU on the award of concession contracts, public procurement, and procurement procedures by contracting authorities in the fields of water, energy, transport, and postal services.
The new Public Contracts Code rationalized and provided greater detail to the regulations governing both concession contracts and Public-Private Partnerships (PPPs), although retaining the fundamental framework of provisions related to PPPs and project finance included in the repealed Legislative Decree No. 163/2006."
According to Article 3 paragraph 1, letter eee) of the new Code, a 'public-private partnership contract' is a remunerated written contract through which one or more contracting entities confer on one or more economic operators, for a specified period based on the duration of the investment amortization or the specified financing methods, a set of activities involving the construction, transformation, maintenance, and operational management of a work in exchange for its availability or economic exploitation, or the provision of a service connected to the use of the same work, with the assumption of risk as determined in the contract by the operator. Without prejudice to the communication obligations provided for in

Article 44, paragraph 1-bis, of Legislative Decree No. 248 of December 31, 2007, as converted, with amendments, by Law No. 31 of February 28, 2008, only the contents of Eurostat decisions shall apply for the sole purpose of protecting public finance.
Part IV of the Code of Contracts, in articles 179 and ss, also dictates a general discipline of the Public Private Partnership. In particular, according to the provisions of art. 180, paragraph 8 of the Code, fall within the type of contracts PPP: the concession of construction and management (concession of works); the concession of services; the financial lease of public works; the contract of availability; entrustment in project finance; any other procedure of realization in partnership of works or services that present the characteristics referred to in art. 180 of the Code of public contracts. The same art. 180 outlines the basic characteristics of the PPP contracts, identifying them as follows: the object of the contract can also include the design of the work or related services; the private partner is remunerated through fees or other types of economic counterpart by the P.A. or through prices/tariffs paid by the users of the work and/or service; the risk of availability or demand for the services provided must be transferred to the private partner in addition to the construction risk, in the case of external activities. Payments must be proportionate to the quantity and quality of the services and/or conditioned by the demand on the market; it is possible to pay the private partner a public contribution (price) for the sole purpose of achieving economic balance-of the transaction and to an extent, however, not exceeding 49% of the total investment.

Albanian Framework

PPP Laws/Concession Laws - Albania

1. Concessions and public - private partnership.
The new law n. 125 of 25.04.2013 "For the concessions and the public private partnership" abrogates the previous law n. 9663 of 18.12. 2006, "For concessions" and subsequent changes, totally changing the discipline of concessions in the Republic of Albania.

Extensive support for Law 125/2013 is also given to Law No. 8652, of 31.7.2000 "For the organization and operation of local government" which as of 1 January 2002 by extensive decision-making functions to municipalities and municipalities. Through this law, local government is fully responsible for the exercise of its functions in the field of infrastructure and public services. Local authorities have the power to impose taxes on public services within their competence and may grant to third-party private legal persons the performance of services and public works under a public-private partnership concession contract.
The law is of focal importance for all operators who carry out business activities in the fields listed by law, since it aims, art. 1, the objective of "creating a favorable and stable framework for the stimulation and creation of facilities for investments that are realized as concessions/public private partnership".

2. The public authorities responsible for the approval of the concessions and the public-private partnership

Currently according to the law "For the concessions and the public private partnership" the competent public organs for the conferral of the concessions are:

- The government and the relevant ministries;
- The European Parliament;
- The local government authority is the Municipalities and Municipalities.

3. The fields of economic activity on which concessions/public-private partnerships may be implemented shall be:

Art. 4 of the law 125/2013, entitled "fields of application of the concessions/public private partnership", exposes the fields of interest - under listed - where the interested subjects can take part:

- Transport (railway system, rail transport, ports, airports, roads, tunnels, bridges, car parks, public transport);
- Production and distribution of electricity and heating energy;
- Production and distribution of water, treatment, grouping, distribution and management of black water, irrigation, drainage, cleaning of canals and dams;
- Waste management, including collection, treatment, transfer and storage;
- Telecommunications;
- Science and education;
- Tourism, leisure and hotel business;
- Culture and sport
- Health
- Social services;
- Prisons and judicial infrastructure;
- The rehabilitation of land and forests;
- Industrial parks, mines and similar infrastructure for business support;
- Accommodation;
- Buildings of public administration, technology and information and the database infrastructure;
- The distribution of natural gas;
- Rehabilitation and urban and suburban development.

Art. 4, paragraph 2, finally, provides that the Council of Ministers has the competence to grant concessions in other fields with the proposal of the competent Minister or the proposal of the local Government.
The Council of Ministers in particular cases can grant connections to local or foreign economic operators with the symbolic price of 1.00 (a//00) Euro.

4. The public-private partnership

Art. 3 of the aforementioned Law, rubric "Denominations", lists the names of the concessions contemplated by law. Among them, in paragraph 23 of the same article, the "public private partnership

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contract" stands out. It, the law reads verbatim, "has the meaning of a public employment contract or a public service contract which contains the criteria which determine that as a public private partnership as regulated in this Act and which is signed through the contracting authority by one party and the economic operator chosen as the highest bidder".
According to art. Article 8 of Law 125/2013 the public-private partnership implies a form of long-term cooperation based on a contract between the contracting authority, that is, the public partner, and one or more economic operators, that is the private partner, where: the private partner undertakes to provide users of public services within its field of competence of the partnership and/or undertakes to guarantee to the public partner the necessary prerequisites for the provision of public services the users of the services and/or activities within the scope of its powers
In support of this law in its application, the Council of Ministers Decision No. 575 of 2013, and other regulations dictate rules for the application of the above-mentioned law both by the public administration and by the companies concerned in the field of concessions.
Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088 (OJ L 198, 22.6.2020, pp. 13–43).
Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions – The European Green Deal (COM(2019) 640 final, 11.12.2019).

While implementing the PPPP scheme, public entities should follow, among others, the rules on the contract notice, as well as the equal and competitive procedure of choosing a private partner (in particular, a licensee) regulated by:

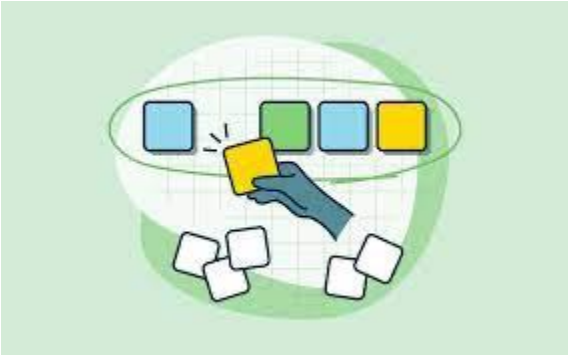
- National provisions on PPP;
- The Directive 2004/18/EC on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts, dated: 31.03.2004;
- The Treaty on the Functioning of the European Union (primary legislation
- of the UE), 2012/C 326/01;
- National provisions on public procurement.

Tasks and services performed under PPPP

The public administration has a statutory obligation to provide a range of public utility tasks and services in the following sectors:

- Transport and infrastructure;

- Healthcare;
- Education;
- Defense;
- Telecommunications;
- Environment (e.g., innovative sources of energy);
- Public order and safety;
- Recreation and culture (e.g., tangible and intangible cultural heritage
- protection and restoration);
- General public services;
- Other.



The funding and provision of the tasks/services within these sectors can be delegated to the private entities under the PPPP formula. Nevertheless, the public authority remains responsible for maintaining relevant quality of services.

Efficient execution of the tasks

Public-Private-People Partnerships (PPPPs) are becoming increasingly popular in the South Adriatic region as a way to improve energy efficiency and reduce public procurement costs. PPPPs involve the collaboration of public and private entities to achieve a common goal, such as providing energy services or infrastructure.

The efficient execution of tasks in PPPPs is essential for their success. This requires careful planning, coordination between stakeholders, and effective management of resources. It also involves the use of innovative technologies and techniques to ensure that projects are completed on time and within budget. By leveraging the expertise of both public and private entities, PPPPs can help create more efficient solutions for energy efficiency in the South Adriatic region.

The main work being carried out as a project with a life cycle promotes efficiency because the benefits (such as collaboration in the following project cycle) are directly related to the project's outcomes.

The task or service is the only concern of the outside provider/private partner under the PPPP arrangement. The private entity's technology and managerial skills contribute to efficiency improvement as well.

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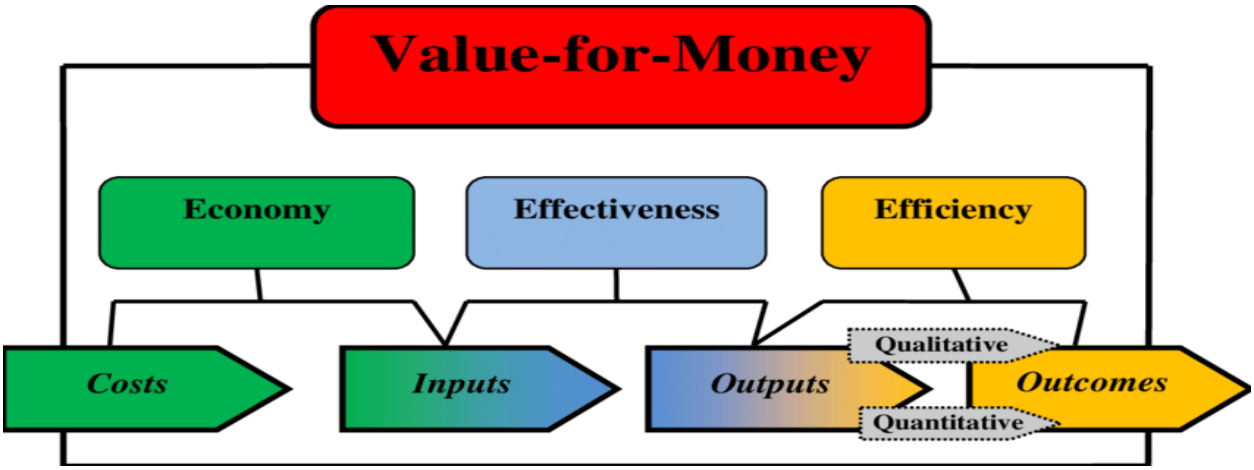
VfM comparative analysis

Value for money refers to the perceived benefit or worth that a consumer receives in relation to the price they pay for a product or service. It is a measure of the cost-effectiveness of a purchase and can be influenced by factors such as the quality of the product or service, the durability, and the level of customer service provided. Consumers will often compare the value for money of different products or services before making a purchase, in order to ensure that they are getting the best deal possible.



Value for money comparative analysis is a method used to evaluate and compare the relative worth or benefit that different products or services offer in relation to their price. The goal of this type of analysis is to determine which options provide the best value for money, based on factors such as quality, durability, and customer service. This can be done by comparing the prices, features, and performance of different products or services, and using this information to create a rating or score that reflects their overall value for money. It can also be done by comparing the cost of one option with the benefits it provides over the alternatives. This analysis can be useful for consumers, businesses, and governments when making purchasing decisions.

VfM is a method used to evaluate the relative cost-effectiveness of different products, services or options. It involves comparing the features, benefits and costs of each option, and determining which one offers the best value for the price. This type of analysis is often used in procurement, where organizations need to make informed decisions about which products or services to purchase.

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The process typically involves identifying key factors that are important to the decision-making process, such as cost, quality, and performance. The options are then evaluated against these factors to determine which one offers the best value for money. The analysis may also consider factors such as long-term costs, maintenance, and scalability.

It's important to note that the outcome of this analysis can be affected by the criteria and the weight given to each criterion, the data used, and the assumptions made. It's a tool that helps to make a more informed and rational decision, but it's not a guarantee of the best choice.

One example of a value for money comparative analysis would be a consumer comparing the prices and features of different smartphones before purchasing one. The consumer may look at factors such as the phone's camera quality, battery life, storage capacity, and overall design, and compare these features across different models and brands. They may also compare the price of each phone, taking into account any promotions or discounts that are available. By comparing the value of these different factors across the different phones, the consumer can determine which option offers the best value for money and make a more informed purchasing decision.

Another example could be a government procurement of goods and services, where the government agency will conduct a value for money analysis and compare different bids or proposals from vendors or contractors. They will take into account factors such as the cost, quality, and performance of the goods or services, as well as the experience and qualifications of the vendor or contractor. By comparing these factors across the different bids or proposals, the government agency can determine which option offers the best value for money and make a decision on which vendor or contractor to award the contract to.

In the context of Public-Private-People Partnerships (PPPPs), value for money (VFM) refers to the optimization of the costs and benefits of a project for the public sector, taking into account the risks and responsibilities shared between the public and private sectors. In PPPPs, the private sector is typically responsible for designing, building, financing, and operating a facility or service, while the public sector is responsible for regulating and paying for the facility or service over a specified period of time.

To ensure that a PPPP project provides value for money for the public sector, a VfM analysis will be conducted. This analysis will evaluate the costs and benefits of the project over its lifecycle, taking into account the risks and responsibilities shared between the public and private sectors. The purpose of the analysis is to compare the costs and benefits of the PPPP option with the costs and benefits of alternative delivery options such as traditional public procurement.

The VFM analysis will consider factors such as:

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- The costs of the project, including the costs of design, construction, financing, and operation;
- The benefits of the project, including the benefits to the public sector and the wider society;
- The risks and responsibilities shared between the public and private sectors, and how these are allocated and managed;
- The quality and performance of the facility or service provided.

The results of the VfM analysis will be used to determine whether the PPPP option provides better value for money than the alternative delivery options and whether the project should proceed.

In many countries Value for Money (VfM) assessment is used by public authorities as a decision-making tool in the context of public investment. These decisions are diverse and may involve, for example, the choice of which new project to initiate, the selection of the best technical solution for a particular project, the identification of the best delivery option or even the choice among PPPP bids for a particular project. The overall approaches and objectives of VfM assessment are broadly the same in various countries: comparing the costs and benefits of project delivery options in a structured manner in order to identify the best option. However, there is no unique approach to VfM assessment, as its precise objectives, and therefore related methodologies, reflect government policies and different administrative processes.

VfM assessment is central to decision-making in PPPPs in many countries. Comparing methodologies and approaches used for VfM assessment is therefore of interest for a number of reasons:

- different approaches to VfM assessment have now been developed in a range of countries and in some countries for over twenty years. These have also been periodically revised and enriched, providing a growing body of available methodologies;
- a significant number of VfM assessments using these approaches have now been undertaken on projects, providing valuable feedback based on experience; and
- public authorities continue to seek ways to introduce or improve their approaches to VfM assessment and are therefore interested in understanding existing approaches and lessons learnt from their application.

The definition of key terms used in VfM assessment can vary among different policies and methodologies. VfM seeks to capture the relationship between cost and value. The cost element usually represents the cost over the lifetime of the project to deliver the associated value, including the costs of managing the

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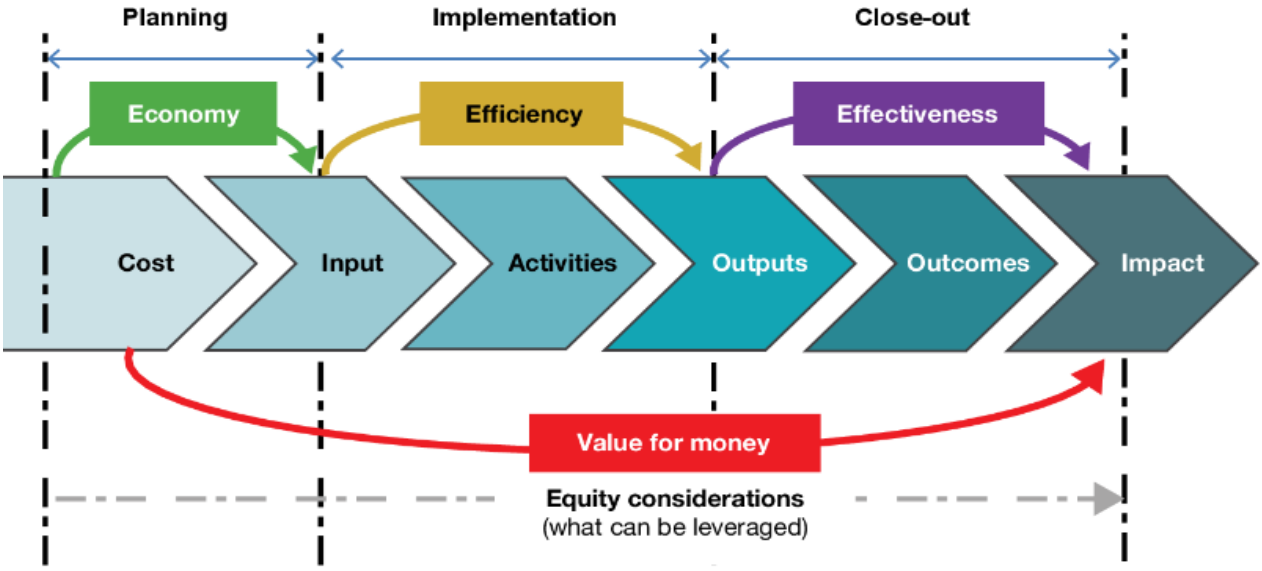
associated risks in doing so. Value comprises the quality and quantity of service or performance level over the same period.

The relationship between value and cost can be presented conceptually in the form of Figure 1, where different options represent different combinations of performance and cost. Options 1 and 2 could typically represent the assessment of different procurement options: in assessing these options, it is usual for them to be compared on the basis of the delivery of the same performance levels. In this case, for the same performance level, option 1 can be expected to represent better VfM (lower cost for a comparable level of performance) and therefore this is the procurement option to choose. This broadly and conceptually describes the quantitative part of a VfM assessment.



The relation between value and cost can in theory apply to other areas for decision-making for a procuring authority. These could include: (i) a new project to initiate, (ii) the selection of the best technical solution for a particular project, or (iii) the choice among PPP bids for a particular project.

For example, if the various options in the Figure above represented different bids, Option 3 is the least expensive of all the acceptable options, but the lower performance level associated with this option suggests that the VfM of this option is expected to be worse than options 1 and 4. This illustrates an important feature of VfM, in that the cheapest option may not necessarily be the best option.

Option 4 illustrates another important feature of VfM in the sense that it captures the proportionality between value and cost. Thus option 4, with a different performance level and cost to option 1 may still represent a similar level of VfM to option 1 (it is more expensive but its performance levels are also higher) – in this case the Authority will need to take into consideration issues such as any benefits that might not be captured already and optimum/maximum required levels of performance when deciding between these two options.

VfM is a relative concept: knowing the VfM of a particular option in itself is not necessarily useful. The VfM concept takes its full meaning when used to compare options. Therefore, VfM is usually used in the

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context of comparing one option relative to another. An Authority will usually have identified a minimum requirement or performance level for a project. Therefore, an option that falls below this level (option 5 in Figure 1) would not be considered as it does not meet minimum performance requirements (even though it is the least expensive of all the options).

Equally, an Authority will usually have a budgetary limit to the amount that it can afford to spend over the life of a project and the services it delivers. An option (option 6 in Figure) that requires a level of expenditure above this limit may not therefore be available for consideration, however attractive it might be in terms of performance. It is deemed not to be 'affordable'. This also illustrates the important difference between assessing the VfM of an option and assessing its affordability, both of which are important but different considerations in identifying and choosing options.

As this report focuses primarily on the procurement option decision, VfM assessment is defined here as the structured comparison between a conventional procurement and a PPPP option that is carried out by an Authority in accordance with a defined methodology.

Context for VfM assessment

VfM analysis can be used to identify which countries or regions are delivering the best results for their investment, and where there are opportunities for improvement. This can help to identify best practices and areas for reform and can inform policy decisions and resource allocation.

The analysis can be conducted using a variety of methods, including:

Benchmarking: Comparing the performance and costs of different countries or regions against a set of standards or benchmarks.

Cost-benefit analysis: Comparing the costs and benefits of different countries or regions in terms of the value that is delivered for the resources invested.

Input-output analysis: Examining the relationship between inputs (e.g. resources invested) and outputs (e.g. results achieved) for different countries or regions.

It's important to note that VfM analysis is a complex process that requires a comprehensive understanding of the country's or region's economy, politics, culture, and other factors. Additionally, the data and information used in VfM analysis are not always reliable or comparable across different countries or regions.

The role of the VfM assessment differs between countries. In some countries (for example France, the UK and Australia) VfM assessment forms an integral part of the project development process with VfM being assessed regularly as the PPP option is developed and designed. In other countries (for example Belgium (Flanders) and the Netherlands) the PPP option is usually developed independently of the VfM assessment process itself.

Similarly, the various methods and practices demonstrate significant differences in the requirement to use prescribed VfM assessment methodologies, how the VfM assessment contributes to decision-making and the timing/frequency and scope of the VfM assessment.

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When describing, analysing and seeking to understand VfM assessment in different jurisdictions it is therefore important to identify the different country-specific contexts and processes that drive the assessment.

Green Public Procurement

Green public procurement is a concept that has been gaining traction in Europe's public authorities, as they recognize the potential for it to make a significant contribution to meeting their energy efficiency and sustainability targets. The European Commission has taken an active role in promoting green public procurement and has developed several initiatives to support its implementation. These initiatives are designed to provide public authorities with the necessary tools and guidance for making green procurement decisions. In addition, the Commission provides information on best practices and case studies of successful green procurement projects.

Europe's public authorities are major consumers. By using their purchasing power to choose environmentally friendly goods, services and works, they can make an important contribution to sustainable consumption and production - what we call Green Public Procurement (GPP) or green purchasing.

Although GPP is a voluntary instrument, it has a key role to play in the EU's efforts to become a more resource-efficient economy. It can help stimulate a critical mass of demand for more sustainable goods and services which otherwise would be difficult to get onto the market. GPP is therefore a strong stimulus for eco-innovation.

To be effective, GPP requires the inclusion of clear and verifiable environmental criteria for products and services in the public procurement process. The European Commission and a number of European countries have developed guidance in this area, in the form of national GPP criteria. The challenge of furthering take- up by more public sector bodies so that GPP becomes common practice still remains. As does the challenge of ensuring that green purchasing requirements are somewhat compatible between Member States - thus helping create a level playing field that will accelerate and help drive the single market for environmentally sound goods and services.

Article 11 of the Official Gazette of Montenegro of the Law on Public Procurement in Montenegro says that:

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"The ordering party is obliged to ensure in the public procurement procedure that all business entities comply with the obligations established in part of environmental protection, social and labor law, including collective agreements, in accordance with the law and confirmed international conventions on environmental protection and social and labor law. The customer is obliged to procure goods, services or works while ensuring an adequate reduction in consumption of energy, i.e., respecting the principle of energy efficiency."

Climate Mitigation Concessions

Climate mitigation concessions are becoming increasingly popular as governments and businesses recognize their potential to reduce emissions and promote sustainable development. They can be used to encourage businesses to invest in energy efficiency, renewable energy sources, and other climate-friendly technologies. With the right incentives in place, we can make sure that our planet is better protected from the effects of climate change.

Climate mitigation-oriented concessions are an important tool for achieving sustainable development. They provide incentives to businesses and individuals to invest in energy efficiency and other climate mitigation measures. Concessions can be used to reduce emissions, increase energy efficiency, and promote renewable energy sources. By providing these incentives, governments can encourage businesses and individuals to take action on climate change. This will help reduce the impacts of climate change while also promoting economic growth.

Sector	PPPP aspect in educational sector	Potential Indications	Sustainability
Transport and infrastructure	Procurement of sustainable vehicles for needs of educational sector and student transport	Reduction of expenditures	Gas emission reduction
Defence	Implementation of innovative security technologies for improvement of	Reduction of expenditures	Automated security mechanisms Increased efficiency of defense services

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	standards in educational sector		
Telecommunication	Partnership in order to increase electronical services	Cost and waste reduction	Educational sector without paper
Sources of energy	Renewable energy sources	Cost reduction	Gas emission reduction, elimination of waste
Environment	Partnership with private sector for enhancement of school economy in the field of agriculture	Revenue increase	Elimination of food shortages
General public services	Development of electronic systems between schools and other public services	Cost reduction Efficiency increase	Government without papers

JOINT INVOLVEMENT OF PARTNERS

The private partner is typically required to carry out the terms of the contract and pay all or a portion of the associated costs under the PPP framework. The program differs from the standard public procurement process in that partners are jointly involved. This signifies that the public authority's engagement goes beyond the standard public procurement operations, such as the purchase of a service, delivery of goods, or completion of work in exchange for a set price. The public body is required to work with the private partner to achieve the project's objectives, particularly by providing financial support and/or compensation to the private partner.

DIVISION OF TASKS BETWEEN PARTNERS
DURATION OF CONTRACTS

According to the Green Deal, large public investments aimed at action in the area of protection from climate mitigation and environmental protection are required, as well as ending dependence on unsustainable practices.

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Green Deal Implications

The extensive array of tools provided by the Horizon Europe initiative will aid in the necessary efforts in research and innovation. Four "Green Deal Missions" will support the implementation of significant reforms in areas like soil, oceans, cities, and climate change adaptation. A wide range of stakeholders, including regions and citizens, will participate in these missions. Research and innovation in transportation, including batteries, clean hydrogen, low-carbon steel production, circular bio-based sectors, and the built environment, will be supported through partnerships with industry and Member States.

High potential start-ups and SMEs will receive finance, equity investments, and business acceleration services from the European Innovation Council in order for them to develop game-changing Green Deal innovations that can be quickly scaled up on international markets.

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There are enormous investment demands in order to meet the European Green Deal's ambitious goals. According to the Commission, achieving the existing 2030 climate and energy targets will need an additional annual expenditure of €260 billion, or around 1.5% of 2018 GDP. Over time, this investment flow must be maintained. Due to the size of the investment problem, both the public and private sectors must be mobilized.

The green transition's financing will be mostly provided by the private sector. To steer financial and capital flows toward green investments and prevent stranded assets, long-term signals are required. In the third quarter of 2020, the Commission will unveil a revised sustainable finance strategy that will center on many initiatives.

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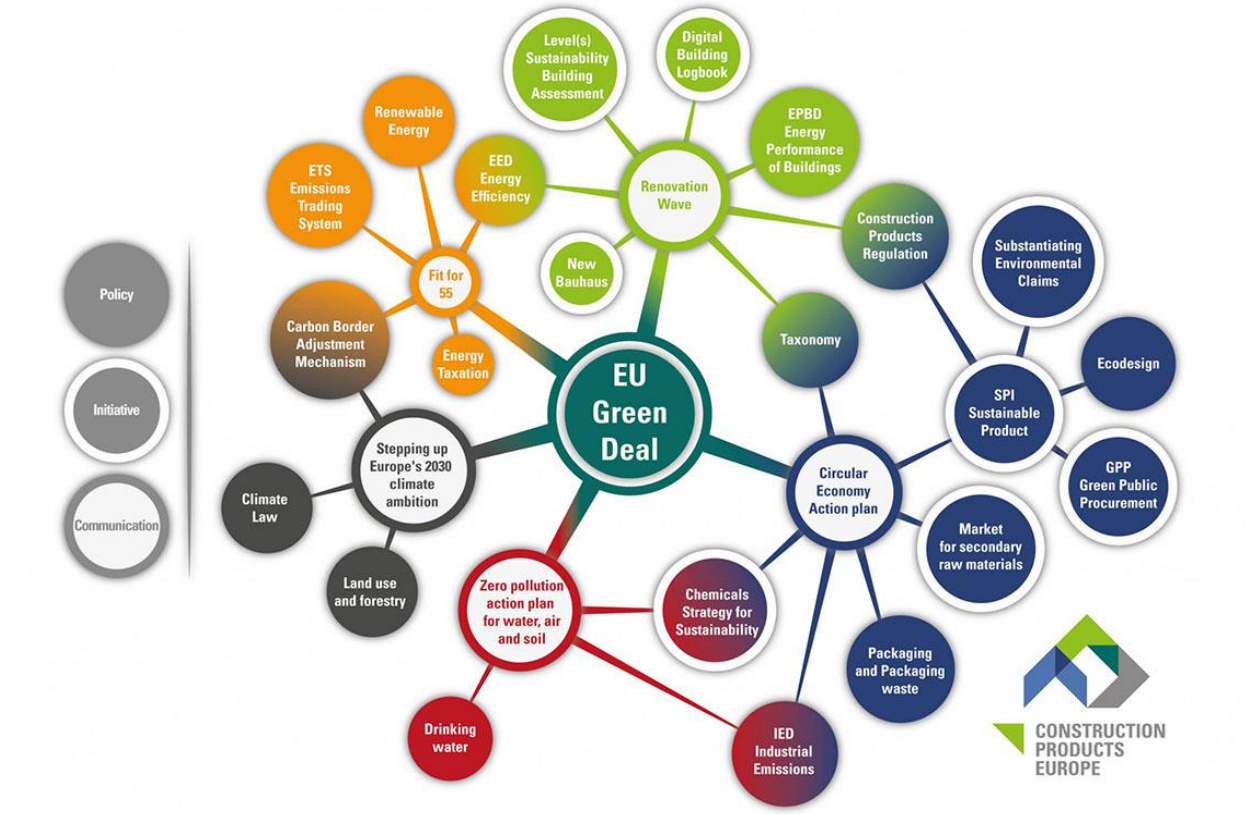

Budgets at the national level are crucial to the changeover. By utilizing green budgeting methods more frequently, we can shift public spending, taxation, and investment toward green goals and away from negative supports. The Commission will examine and compare green budgeting techniques in collaboration with the Member States.

This will enable determining how much environmental issues and risks are factored into annual budgets and medium-term fiscal planning, as well as learning from best practices, easier. A mention of green public investment in the context of the caliber of public finance will be made in the assessment of the European economic governance framework. This will contribute to a discussion on how to enhance EU budgetary governance. The conclusion of the discussion will serve as the foundation for any potential subsequent actions, including how to classify green investments in accordance with EU fiscal regulations while maintaining safeguards against threats to the sustainability of debt.

The European Green Deal is an ambitious plan to reduce greenhouse gas emissions and make Europe the first climate-neutral continent by 2050. Public-private partnerships are essential for this goal, as they can provide the resources and expertise to help governments and businesses achieve their energy efficiency targets.

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Public-private partnerships in the energy efficiency field can be used to develop innovative solutions and technologies, create jobs, attract investments, and reduce emissions. By leveraging the strengths of both public and private sectors, these partnerships have the potential to drive significant progress in achieving sustainable development goals.

The success of public-private partnerships in energy efficiency depends on a number of factors such as effective coordination between partners, clear objectives, adequate resources, appropriate incentives for businesses, regulatory support from governments and effective communication with stakeholders. With these elements in place, public-private partnerships can play an important role in helping Europe reach its ambitious climate goals while reducing gas emissions.

Municipality of Barletta
Municipality of Termoli
Italian National Agency for New Technologies, Energy and Sustainable Economic Development
Municipality of Vlora
Ministry of Education of Montenegro

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