

Lesson learnt from Italy: case studies on sustainable school construction under the Green Public Procurement

The training has been organised by EIPA and CPVA
under the Framework Contract Nr 2023CE160AT004.



- The GPP systemic process
- The case studies from Italy
- Barriers & Gaps
- Recommendations & Results
- Discussion

Public Procurement Systemic Process: What are the questions?

How to manage the Green Public Procurement ...

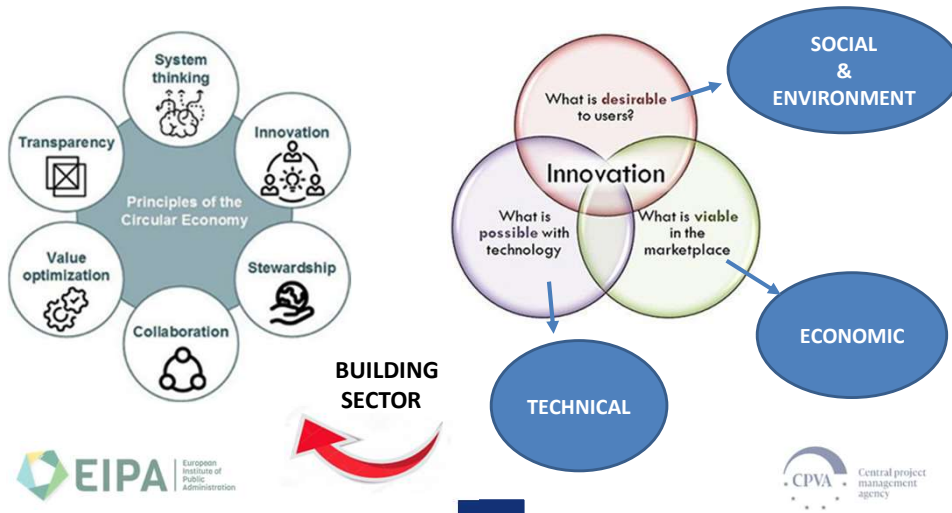
- To contribute to the achievement of the objectives of the Paris Agreement (SDGs) and the Circular Economy Strategy;



How to develop the Green Public Procurement procedures ...

- To meet Social, Environmental and Economic goals;
- To Incorporate selection criteria in the contract notice aligned with EU GPP principles;
- To develop the award criteria and their weighting in the contract notice or in the tender specification to achieve the required goals.

Public Procurement Systemic Process: how to start



A circular approach in managing the writing phase of the call for proposals.



Stakeholders Analysis Needs:

Needs and expectations of citizens

... ..

Needs and expectations of students, teachers,

... ..

Expectations of the client, owner

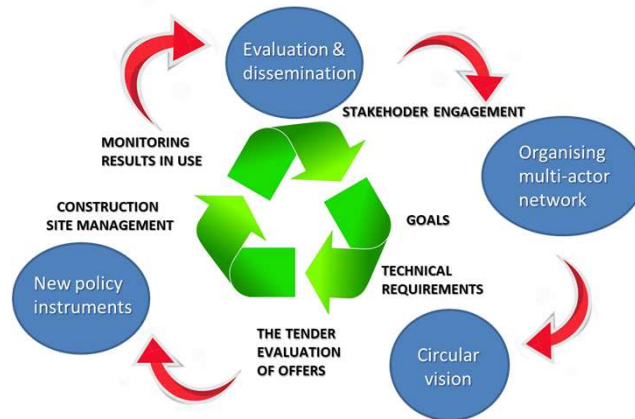
... ..

Protection of the environment

... ..

Harmonious integration into the existing environment

Systemic Procurement Process: how to design the tendering process



Systemic Procurement Process: Analysis Needs

Mandatory Requirements in Italy:

- near Zero Energy Building
- Construction & Demolition Waste Management



Life Cycle Assessment (LCA) recommended



Case Study from Italy: public authority process

4 Goals for achieving sustainability within GPP



LOW CARBON FOOTPRINT



COMFORT FOR ALL



RENEWABLE ENERGY
PRODUCTION



ENERGY CONSUMPTION
REDUCTION

Technical Requirements



Tendering Requirements





Selected Indicators for Sustainable Construction Practices by Italian National Property Agency

The Italian National Property Agency has chosen various indicators for:

- Life Cycle Impact Reduction
- Indoor Air Quality
- Construction Indoor Air Quality (IAQ)
- Low emitting Materials
- Construction & Demolition waste management (C&D)
- Environmental Product Declaration (EPD)
- Water Efficiency
- Rain water management





Public Procurement Process: N. 1 Case Study from Italy: a new middle school

General information

Brancati School

- Country: Italy
- Owner : Municipality of Pesaro
- Contractor: Conscoop
- Technical manager: Office for Public Works
- Pilot project: New middle school building
- Date: Planning project: Dec. 2017/Aug.2018
- Start work: Sept. 2018
- End of work: June 2020
- Standard used: Edicational service
- Data sources: local authority

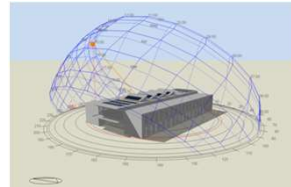




Public Procurement Process: Holistic Approach

Mandatory tender requirements:

- achievement of nZEB standards
- LEED certification at a minimum Gold level



This project was internationally awarded with many prizes:

- it is [the most sustainable LEED certified school in Europe](#) with 88 points (LEED Platinum) and the 3rd in the world among 1733 LEED certified buildings
- at COP26 in Glasgow, as part of the Green Solution Award, the Brancati school received the [2020-21 ENERGY AND TEMPERATE CLIMATES award](#)
- the school also won the CRESCO award, promoted by ANCI (association of Italian municipalities)





How incorporate sustainable, economic & social targets

	Technical Requirements to achieve social economic environmental goals	Score UP TO	
Building Envelope	1 Thermo-hygrometric efficiency of transparent elements	8	Envelope Efficiency
	2 Thermo-hygrometric efficiency of the roof	8	
	3 Thermo-hygrometric efficiency of outer walls	8	
	4 Ventilated facade	6	
	5 Solar screen	6	
Energy Performance	6 Automated light system	8	Plant Efficiency & Monitoring System
	7 Use of Controlled Mechanical Ventilation	7	
	8 Heat Pumps Performance	11	
	9 Consumption Monitoring	6	
Environmental Performance	10 Waste Material Management usage phase	2	Environmental Efficiency
	11 Environmental Certification	15	



Public Procurement Process: Case Study from Italy: the results



LOW CARBON FOOTPRINT



- ❑ **Low impact school:**
 - construction and demolition waste management, waste management during the construction phase;
 - zero land consumption;
 - EPD material labelling.
- ❑ **Waste management:**
 - 556,630 kg of waste were created
 - 546,378 kg was recycled
 - 98% recovered waste
- ❑ **Architectural design:**
 - shape and position of the building orientated to best exploit solar radiation and optimize the free solar gains and natural lighting and shading
- ❑ **Labeling:**
 - LEED Platinum with 88 points – nZEB standard

Public Procurement Process: Case Study from Italy: the results



COMFORT FOR ALL

- ❑ Remote and customized temperature
- ❑ both natural and artificial light control
- ❑ high acoustic performance obtained to create the best environment for learning and teaching
- ❑ parking for bicycles, electric charging stations for cars
- ❑ **indoor air quality** by mechanical filtered ventilation climate system with a CO2 monitoring able to guarantee higher levels of indoor air quality with the air exchange of 5V per hour
- ❑ **natural ventilation** thanks to opening in the upper window sections



Public Procurement Process: Case Study from Italy: the results



Renewable Energy Production

Optimal production of electric energy due to the PV panels

- Photovoltaic installation of 158,40 m²;
- n. 96 photovoltaic modules of 300Wph and 1,96 m² each
- Photovoltaic power ratings 28,8 Kw continuous current
- Inverter Solaredge 27,6KW alternate current
- 113,5 kW heat pump



Public Procurement Process: Case Study from Italy: the results



ENERGY CONSUMPTION REDUCTION



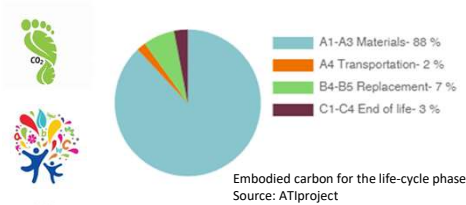
Energy Consumption Reduction:

- -59,07% considering TEP reduction compared to standard construction (UNI TS 11300 and UNI EN 15193)
- - 34,8% reduction of annual costs thanks to:

Envelope efficiency:

- thermal insulation
- thermal bridges evaluation
- green roof and
- ventilated wall made of modular porcelain stoneware avoids overheating, minimize losses and reduces also the maintenance costs of the façade
- the high efficiency heat recovery unit
- optimized lighting (LED)
- automatic consumption monitoring control system to make also friendly and easy the use of building
- heating system: floor heating and VAV system (variable air volume)
- cooling system: floor cooling and VAV system (variable air volume)

Public Procurement Process: Case Study from Italy: sum up the results



The model is replicable Construction cost 1,300 € / sqm

- Less than 10 kg CO₂ m² / y against 550 kg CO₂ of a traditional corresponding building
- nZEB energy standard
- 98% recycled C&D waste

CE Principles applied:

- Holistic approach
- Stakeholders' engagement in the value chain to get data as much as possible
- Consumption reduction
- Renewable energy production
- Indoor quality
- Control of all incoming and outgoing materials
- Decrease environmental impacts
- Decrease in the amount of waste
- Biodiversity protection

Essential factor

Mandatory tender requirements:

- Achievement of nZEB standards
- LEED certification at a minimum Gold level



Public Procurement Process: N. 2 Case Study from Italy: a new schoolgym

General information

IAQ+LCA and EPD New gym for the school Olivieri in Pesaro, Italy



- Country: Italy
- Owner : Municipality of Pesaro
- Contractor: Conscoop
- Technical manager: Office for Public Works
- Pilot project: New gym for a school building
- Date: tender published on the 4th of August 2021
- Standard used: Sport facility
- Data sources: [local authority web site](#)

The final project was already provided by the municipality. The tender was issued to select the contractor, the building firm that will improve the project and build the gym.

Technical and economic offer were weighted as below:

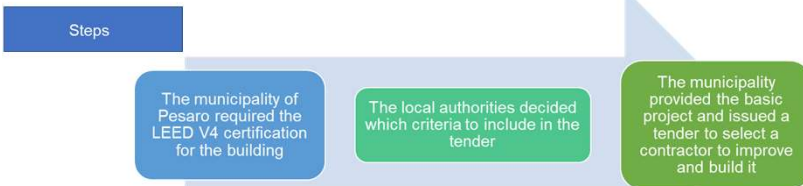
Type of offer	Score
Technical offer	up to 95 (of which 48 to life cycle related requirements)
Economic offer	Up to 5
Total	100





Public Procurement Process: steps and methodology

In Italy, LCA is not mandatory. However the municipality of Pesario decided to include it in its tenders, as well as IAQ.



Methodology and tools

The municipality has chosen various indicators for LCA and IAQ. Each indicator was then given a score and a weight to calculate the total score of the project.
The relevant weights can be summarized as follow:

- 25 to the use of timber frame instead of pre-cast concrete structures
- 19 to the sustainability rating system certification LEED v4 with mandatory criteria: LCA analysis, building fabric commissioning, building systems commissioning
- 4 to environmental certification of construction products





Public Procurement Process

Methodology and tools

Energy parameters

nearZEB: CPE-Pres ≤ 0
 CPE ≤ 25 kWh/m²y
 CHVAC ≤ 20 kWh/m²y
 Clighting ≤ 5 kWh/m²y

Indoor environmental

quality parameters

CO₂ max: 1000 ppm (daily average)
 CO₂ > 1000 ppm for 100 hours/year
 VOC < 0,05 ppm
 PM10 < 50 µg/m³ (24hours average)
 T min (winter) 19-21°C
 Tmax summer 25-27 °C
 T air above 28 °C ≤ 40 hours/year

Timber load bearing structure

The tender awards 25 points to the integration in the final design of a load bearing structure in timber panels from certified timber value chains, instead of the pre-cast concrete panels structure foreseen in the preliminary design.

Scorecard

Topic	UP TO	Score
Environmental performance of the structure improvement: timber structure		25
Building envelope environmental performances improvements: solar shading devices		11
Energy performance improvements: heat/cold fluids production systems; mechanical ventilation, heat recovery		15
Improvement of water distribution system		2
Rain water collection system and green areas irrigation		2
Energy performance monitoring system		8
Acoustic performance improvement: building envelope		6
Acoustic performance improvement: building service		2
Site improvement: material and waste collection areas		1
Sustainability certification of the building		19
Building materials and products sustainability certification		4

Specifications

Building sustainability certification:

LEED v4 : gold or platinum

With mandatory credits about:

- LCA
- Envelope commissioning
- Building systems commissioning

Building materials and product environmental certification:

- Building carbon footprint calculation (UNI ISO/TS 14067)

Labelled products:

- EPD for reinforced concrete and steel bars, screeds and insulating products
- ECOLABEL for paints and adhesives
- FSC or PEFC for timber products



Public Procurement Process: Case Studies from Italy: the planning process

The vision of the project is based on the concept of the building **as if it were a bank of materials** and an attempt to activate a circular and sustainable approach to the entire design and construction process minimizing waste.

Technical requirement for achieving the goals

Building Structure	Replace the concrete structure with timber structure
Building Envelope	Solar screen
Acoustic Performance	Acoustic improvement based on UNI 11367, UNI 11532-2 e CONI N.1379 Electro-acoustic plant
Energy Performance	Use of Controlled Mechanical Ventilation and Heat Recovery Systems & Heat Pump Energy consumption monitoring system
Environmental Performance	Waste materials management Water consumption reduction Rainwater harvesting Material optimization Environmental energy efficiency certification

GOALS:

- Consumption reduction
- Renewable energy production
- Indoor quality
- Control of all incoming and outgoing materials
- Decrease environmental impacts
- Decrease in the amount of waste





Case Study from Italy: engagement of the local authority

The Italian National Property Agency decided to include in the design planning the use of environmental scheme certification.

Steps

The National Agency Property makes the use of the environmental scheme certification mandatory.

The INPA with the local authority decided which criteria to include in the design project

The INAP provided the final project and all the administrative documents for the tender to select a contractor to guarantee the achievement of sustainability and build it

Methodology and tools

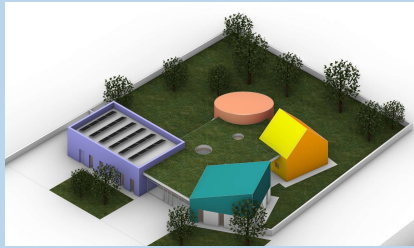
A special tender specification was developed to make mandatory the achievement of sustainable goals guaranteed by the use of environmental certification at the required scoring.





N. 3 Case study from Italy: a new nursery school - Next Generation EU

General information



- Country: Italy
- Owner : Municipality of Porto-Recanati
- Contractor: Italian Company
- Pilot project: New nursery school
- Technical manager: Office for SpP – Italian National Property Agency
- Date: 30th November 2023 construction works started
- Standard used: Educational Service
- Data sources: Italian National Property Agency



Sustainable criteria for a new nursery school



Technical information

Indoor environmental quality parameters

CO₂ max: 1000 ppm (daily average)

CO₂ > 1000 ppm for 100 hours/year

VOC < 0,05 ppm

PM₁₀ < 50 µg/m³ (24hours average)

T min (winter) 19-21°C

Tmax summer 25-27 °C

T air above 28 °C ≤ 40 hours/year

Energy parameters

nearZEB: CPE-Pres ≤ 0

CPE ≤ 25 kWh/m²y

CHVAC ≤ 20 kWh/m²y

Clighting ≤ 5 kWh/m²y



Methodology and tools for the tender

Scorecard: GOLD

These scoring are mandatory

Y	?	N	Credit Definition	Score
1	0	0	Integrative Process	1
7	2	6	Location & Transportation	15
7	2	3	Sustainable Site	12
8	0	4	Water Efficiency	12
16	6	9	Energy & Atmosphere	31
6	6	1	Materials & Resources	13
7	8	1	Indoor Environmental Quality	16
5	1	0	Innovation	6
3	1	0	Regional Priority	4
60	26	24		110

Specifications

Building sustainability certification:

LEED v4 : gold or platinum

With mandatory credits about:

- LCA
- Envelope commissioning
- Building systems commissioning

Building materials and product environmental certification:

- Building carbon footprint calculation (UNI ISO/TS 14067)

Labelled products:

- EPD for reinforced concrete and steel bars, screeds and insulating products
- ECOLABEL for paints and adhesives
- FSC or PEFC for timber products



N. 4 Case study from Italy: a new nursery school - Next Generation EU





Sustainable criteria for a new nursery school

General information

- Country: Italy
- Owner : Municipality of Montegranaro
- Contractor: Italian Company
- Technical manager: Office for SpP – Italian National Property Agency
- Pilot project: New nursery school
- Date: 30th November construction works started
- Standard used: Educational Service
- Data sources: Italian National Property Agency



Sustainable criteria for a new nursery school

Technical information

Indoor environmental quality parameters

CO₂ max: 1000 ppm (daily average)
CO₂ > 1000 ppm for 100 hours/year
VOC < 0,05 ppm
PM₁₀ < 50 µg/m³ (24hours average)
T min (winter) 19-21°C
Tmax summer 25-27 °C
T air above 28 °C ≤ 40 hours/year

Energy parameters

nearZEB: CPE-Pres ≤ 0
CPE ≤ 25 kWh/m²y
CHVAC ≤ 20 kWh/m²y
Clighting ≤ 5 kWh/m²y





Methodology and tools:

Scorecard: **GOLD**

Specifications

Y	?	N	Credit Definition	Score
1	0	0	Integrative Process	1
7	3	5	Location & Transportation	15
7	5	0	Sustainable Site	12
6	2	4	Water Efficiency	12
15	14	2	Energy & Atmosphere	31
7	5	1	Materials & Resources	13
8	7	1	Indoor Environmental Quality	16
6	0	0	Innovation	6
4	0	0	Regional Priority	4
61	36	13		110

Building sustainability certification:

LEED v4 : gold or platinum

With mandatory credits about:

- LCA
- Envelope commissioning
- Building systems commissioning

Building materials and product environmental certification:

- Building carbon footprint calculation (UNI ISO/TS 14067)

Labelled products:

- EPD for reinforced concrete and steel bars, screeds and insulating products
- ECOLABEL for paints and adhesives
- FSC or PEFC for timber products





Public Procurement Process: Barriers & Gaps

- Limited expertise and capacity:
 - Lack of skills among technicians
 - Lack of awareness among construction firms
- Sometimes a too articulated bureaucracy process
- An immature market that is not yet ready to embrace sustainable practices in the whole value chain with effective results, notwithstanding recent rapid advancements
- Lack of local policy and incentives
- Resistance to change from contractors, suppliers, and other stakeholders can hinder the adoption of sustainable practices





Public Procurement Process: Main Findings

These case studies demonstrate how to integrate sustainability requirements in public procurement and how to ensure their achievements. The GPP plays a strategic role at stimulating development and diffusion of environmentally sound, at promoting the integration of social development, environmental protection, and economic feasibility in the building sector.

Two main key learning for countries on a similar situation are:

- To pay attention to the distribution of the awarding points of the full tender to give enough weight to sustainability and life cycle principles and related requirements to prioritise the achievement of circular requirements whilst the economic offer is assigned a comparatively low value.
- To include in tenders the request for building certification with rating systems such as LEED, DGNB and other will help in the achievements of the results thanks to the use of LCA. In tenders there should be a specific reference to the rating systems' credits that makes mandatory the use of LCA.

Why is it working?

The reference to rating systems that already encompass the use of LCA overcomes the barrier of the lack of a national law, methodology and database on life cycle impact assessment of buildings.

The weight given to life cycle principles and solutions in the tender score, about 50%, indirectly makes the requirement mandatory for a project to be awarded





Results & Recommendations

It is essential to ensure that the **economic offer only does not affect the result of the tender** in order to reward the companies that offer the best offer.

The life cycle thinking approach provides economic benefits by avoiding unnecessary expenditures and retaining long-term value for money, ensuring energy savings, and lowering operating expenses. As a result of rising demand, product and technology costs are falling, allowing the local market to expand.

It is worth mentioning that, because the life cycle thinking approach is completely absent in the typical procurement process, all these elements are rarely analysed comprehensively with a systematic approach.

The model is replicable because in the case of the previous school we have:

- Construction cost 1,300 € / sqm Middle School (2020) 1,760€/sqm Nursery School (2023)
- Less than 10 kg CO₂ m² / year against 550 kg CO₂ of a traditional corresponding building
- nZEB energy standard
- 98% recycled C&D waste

This GPP model built around a circular approach has already resulted in a budget that allows for great replicability showcasing to be a crucial contribution to a net zero carbon transition





Case Studies from Italy: where to find more information

<https://www.construction21.org/case-studies/h/antonio-brancati-middle-school.html>

https://circulareconomy.europa.eu/platform/sites/default/files/circular_buildings_and_infrastructure_brochure.pdf

[Land Clearing and Construction Material Recovery, Pesaro, Italy | One Planet network](#)

M. Finamore, C. Oltean-Dumbrava, "Green Public Procurement and the circularity of the built environment." IOP Conference Series: Earth and Environmental Science, Volume 1122, SBFin2022 Emerging Concepts for Sustainable Built Environment (SBFin2022) 23/11/2022 - 25/11/2022 Online

[Green Public Procurement and the circularity of the built environment – IOPscience](#)

C. Oltean-Dumbrava, M. Finamore, "The Achievement of Sustainability in the Built Environment," In: Hehenberger, P., Habib, M., Bradley, D. (eds) EcoMechatronics. Springer, Cham., 2022, pp.195-215.

[The Achievement of Sustainability in the Built Environment \(springer.com\)](#)

Iyer-Raniga, Usha & Finamore, Margherita. (2021). Green public procurement: learnings from Pesaro city, Italy. IOP Conference Series: Earth and Environmental Science. 855. 012006. 10.1088/1755-1315/855/1/012006.

https://www.researchgate.net/publication/357347013_Green_public_procurement_learnings_from_Pesaro_city_Italy

The Green Public Procurement (GPP) developed and used for the school construction was selected by the Italian standardization body called UNI under UNI/TR 11821 "Analysis of good circular economy practices for the evaluation of their operation and performance and for their replicability" [UNI/TR 11821:2023 - UNI Ente Italiano di Normazione](#)





Thank you!

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The training has been organised by EIPA and CPVA under the Framework Contract Nr 2023CE160AT004. The opinions expressed are those of the contractor only and do not represent the EC's official position.

