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## **Measuring and assessing sustainability through LEED® rating system: a growing trend, from global to local Focus on the Piedmont Region**

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### **ABSTRACT**

*Green Building Council Italia (GBC Italia), founded in 2008, promotes sustainability in the building sector, adhering to the global network of the World Green Building Council . Its mission is to spread ecological practices and improve the quality of life, promoting the certification of buildings according to international standards, such as LEED®. GBC Italia has certified over 500 buildings, saving natural resources and reducing environmental impact. In collaboration with research institutions and universities, the organization develops projects and provides professional training for industry experts.*

*GBC Italia’s 2030 goals include reducing CO<sub>2</sub> emissions, saving water and minimizing waste, estimating significant savings at a national level. In Italy, the diffusion of the protocols is growing, with 1460 certified buildings and 9 million square meters already completed. Two case studies, the renovation of the Paideia Center and the redevelopment of Racconigi 25 ATC (Agenzia Territoriale della Casa) building stock, show the application of the LEED® 2009 Italia Nuove Costruzioni e Ristrutturazioni and GBC Condomini protocols in Piedmont. These interventions highlight the centrality of sustainability in renovations, with innovative technologies for energy saving and structural resilience, representing best practices in urban regeneration. However, access to economic resources remains a challenge to replicate such successes on a large scale.*

**KEYWORDS:** Sustainability assessment, LEED®, GBC Italia, LEED® 2009 Italia Nuove Costruzioni e Ristrutturazioni, GBC Condomini®.

### **1 GREEN BUILDING COUNCIL ITALY**

The Green Building Council Italia (GBC Italia) is a non-profit organization that promotes environmental sustainability in the construction sector. Founded in 2008, GBC Italia is part of the international network of the World Green Building Council (WorldGBC), which includes

over 70 GBC national. The main objective of GBC Italia is to transform the Italian construction market through the adoption of sustainable practices and the certification of buildings according to internationally recognized standards, such as LEED® (Leadership in Energy and Environmental Design) [Web- 1].

### *Mission and Vision*

GBC Italia is committed to promoting a sustainable built environment, improving people's quality of life and reducing the environmental impact of buildings. The organization's mission is to spread the culture of sustainability in the building sector, encouraging the adoption of innovative practices and technologies that respect the environment and improve the well-being of occupants.

### *Structure and Governance*

GBC Italia is led by a Board of Directors composed of representatives of companies, professionals and academic institutions. The organization uses a team of experts who collaborate with members and partners to develop and implement sustainability projects. The structure of GBC Italia includes several technical committees and working groups that deal with specific thematic areas, such as energy, water, materials and indoor air quality.

### *Impact and Results*

GBC Italia has certified over 500 buildings in Italy, for a total surface area of over 9 million square meters. These buildings represent a concrete example of how it is possible to combine environmental sustainability with technological innovation and architectural quality. The data collected demonstrate that buildings certified according to the GBC Italia and LEED® protocols have significantly reduced energy consumption, CO<sub>2</sub> emissions and the use of natural resources, helping to improve the quality of life of the occupants and reduce the overall environmental impact.

### *Collaborations and Partnerships*

GBC Italia collaborates with numerous institutions, universities, research bodies and companies to promote sustainability in the building sector. Among the main partners are the USGBC, the WorldGBC, ENEA, the Politecnico di Milano, the Politecnico di Torino and the University of Bologna. These collaborations allow GBC Italia to develop innovative projects, share best practices and promote training and professional development in the field of sustainability.

### *Professional Training and Certification*

GBC Italia offers numerous training courses and professional certification programs for architects, engineers, builders and other professionals in the building sector. Among the most recognized certifications are the LEED® Green Associate and the LEED® Accredited Professional (LEED® AP), which attest the skills of professionals in the sustainable design and management of buildings. GBC Italia also organizes seminars, workshops and conferences to spread the culture of sustainability and update professionals on the latest news and trends in the sector [1].

## **2 THE PROTOCOLS**

The internationally recognized protocols are a voluntary certification system and aim to promote the integrated design of the entire building and the evaluation of sustainability

performance. The evaluation tools consist of checklists of environmental criteria, in the form of mandatory prerequisites and optional credits to be respected in order to obtain points: based on the points achieved, different levels of certification can be accessed.

During the building assessment, multiple aspects are analysed, both in the design and construction phases: starting from the choice of the construction site, continuing with the evaluation of energy efficiency, water and energy management, materials used and waste disposal, up to the well-being of end users. The different protocols can then be diversified according to the type of building on which they are applied, in order to provide a certification model "tailored" to each case.

GBC Italia adopts and promotes various certification protocols for sustainable buildings, including:

- **LEED®**: the LEED® certification system, developed by the US Green Building Council (USGBC), is one of the most recognized standards worldwide for the sustainable design, construction and management of buildings. GBC Italia has adapted the LEED® protocol to the Italian context, creating specific versions such as LEED® Italia.
- **GBC Home**: a specific protocol for the certification of residential buildings, which evaluates the energy and environmental performance of homes.
- **GBC Neighbourhoods**: a certification system for the planning and sustainable development of neighbourhoods, which promotes the creation of resilient and low environmental impact communities.
- **GBC Historic Building**: a protocol dedicated to the sustainable redevelopment of historic buildings, which integrates cultural heritage conservation criteria with environmental sustainability criteria.
- **GBC Condomini**: a protocol dedicated to the certification of sustainable renovation of condominiums

### *Projects and Initiatives*

GBC Italia is involved in numerous projects and initiatives at national and international level, including:

- **Upon Project**: a European initiative that aims to improve energy retrofit policies for existing buildings, involving public and private stakeholders.
- **Life Level(s)**: a project funded by the European Union that promotes the adoption of a common framework for the assessment of the sustainability of buildings, based on environmental performance indicators.
- **Advancing Net Zero**: A global initiative by WorldGBC that aims to achieve net zero carbon emissions in the construction sector by 2050. [Web-2]

## **3 SUSTAINABILITY GOALS 2030**

GBC Italia's 2030 goals are in line with European strategies for reducing carbon emissions and promoting environmental sustainability. These goals include:

### *1. Reduction of CO<sub>2</sub> emissions*

GBC Italia aims to reduce CO<sub>2</sub> emissions from the building sector through the widespread adoption of LEED® and GBC certification protocols. It is estimated that, cumulatively, in the period 2022-2030, thanks to the greater diffusion of the LEED®-GBC rating systems, the emission of 2.7 million tons of CO<sub>2</sub> can be avoided. This result is equivalent to the absorption of CO<sub>2</sub> by 2.3 million trees, six times the number of trees in Rome.

## 2. Water Saving

Another key goal is water saving. GBC Italia plans to avoid the consumption of 20.7 billion liters of water by 2030, a volume equal to that of 8,300 Olympic swimming pools. This result will be achieved through the implementation of sustainable water management technologies and practices in certified buildings.

## 3. Waste Reduction

GBC Italia is committed to reducing waste generation in the construction sector. It is estimated that, cumulatively, in the period 2023-2030, thanks to the greater penetration of the LEED®-GBC rating systems, the generation of 928,442 tons of waste can be avoided, a weight equal to that of 66 Domes of St. Peter's Basilica.

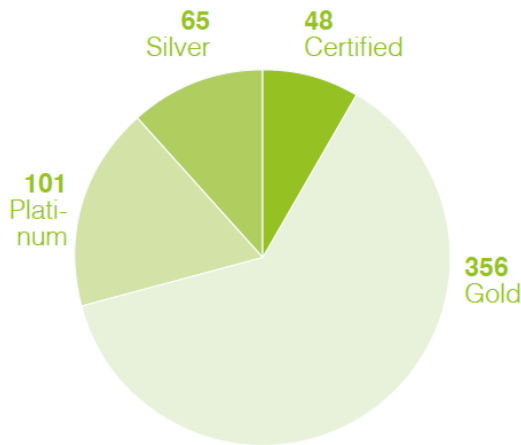
## 4. Negative Externalities Avoided

Buildings certified according to LEED® and GBC protocols will help avoid almost 200 million euros of negative externalities every year. This includes the reduction of CO<sub>2</sub> emissions, water savings and waste reduction, with a significant positive impact on the country system. [2].

## 4 CERTIFIED AND REGISTERED PROJECTS IN PIEDMONT

The diffusion of LEED® and GBC protocols in Italy has undergone a significant increase in the last 10 years, which has been duly tracked: currently, in fact, there are 1460 buildings certified or in the process of being certified, equal to 19,000,000 m<sup>2</sup>, which in spatial terms, correspond to a city of approximately 380,000 people [1]. Of these, 9 million m<sup>2</sup> are already certified, while 10 million m<sup>2</sup> are in the process of being certified, showing how the trend of development of certified sustainable construction appears to be growing exponentially. Furthermore, the vast majority of certified buildings (80%) report high certification levels, such as Gold or Platinum (Fig. 1): this result demonstrates that the level of sustainability achieved is the result of the pursuit of many objectives, according to a holistic approach to sustainability applied both in the design and construction phases.

### Livelli di certificazione LEED + GBC



Numero di edifici e relative superfici LEED e GBC	
Numero progetti totali:	1460
Numero progetti registrati:	890
Numero progetti certificati:	570
Area superficie lorda totale [mq]:	19.851.417,45
Area superficie lorda certificata [mq]:	9.191.525,18

Figure 1: Number of buildings and their LEED® and GBC surfaces according to Impact Report, 2023

On the other hand, it is also necessary to highlight that a diversified diffusion of the protocols is observed on the national territory, as shown in Fig. 2; in fact, it clearly emerges that the certified buildings to date do not have a homogeneous dispersion in Italy, although in almost all Italian regions it is possible to appreciate the presence of certified buildings. Obviously, the objective of the activity of GBC Italia is the diffusion of the protocols throughout the territory, in the most equitable way possible; in fact, thanks to their transparency in declaring the performance and environmental impact of a building according to a common standard, they are increasingly considered important guarantee tools for the real estate sector and for the entire community.



Figure 2: Territorial distribution of LEED® and GBC projects according to Impact Report, 2023

Going into greater detail on Piedmont, it emerges that it is the fifth Italian region for the diffusion of protocols. The protocols began to spread about 10 years ago and the types of projects involved in the local territory are of various nature (residences, industrial sites, logistics hubs, offices, tertiary sector, etc.). In this regard, the mapping of the projects that was presented at the Green Torino event held in mid-2022 is proposed below [3], in which other certification

systems in addition to LEED® and GBC were identified, namely BREEAM and WELL. The outcome of the survey had highlighted 60 buildings publishable on the map (Fig. 3), i.e. declared as “public” on project directory database.

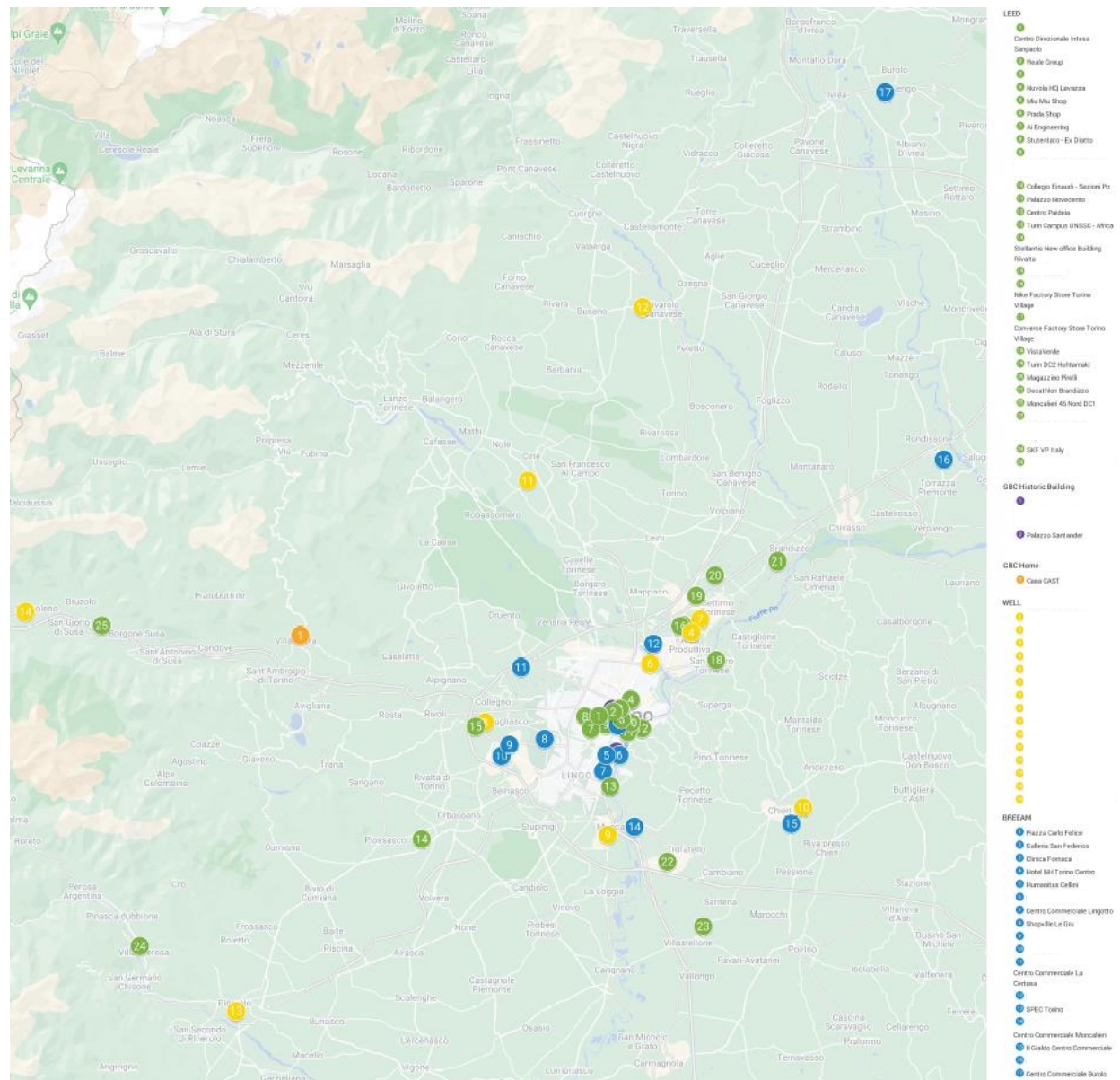


Figure 3: Mapping of certified buildings in Piedmont, Green Torino 2022

On that occasion it was highlighted that the first registration in Piedmont occurred in 2008, for the Huhtamaki manufacturing building, certified in 2011. The spread of certified buildings in Piedmont, however, began to take hold with the certification of iconic buildings in the area, such as the Intesa San Paolo Management Center (registered in 2012 and certified for the first time in 2015), followed by the Nuvola Lavazza in Turin (registered in 2011 and certified in 2017). To date, certifications continue, also involving other newly created protocols, in particular the GBC Condomini Protocol, developed in Turin and whose first certification occurred in 2023 with the Teodosia building [Web 3].

With an update to 2024 in the Piedmont area, for LEED® certification there are 134 registered buildings and 58 certified buildings (Fig. 4), confirming the national trend of high-level certification (Fig. 5). Focusing on GBC protocols, it is possible to count: 1 GBC Home certified building; 1 GBC HB certified building, and 4 GBC HB registered buildings; 5 GBC Condomini certified buildings. Finally, 56 buildings are registered for WELL certification, while the number of BREEAM in-use certificates is strongly increasing, with 57 currently assessed building.

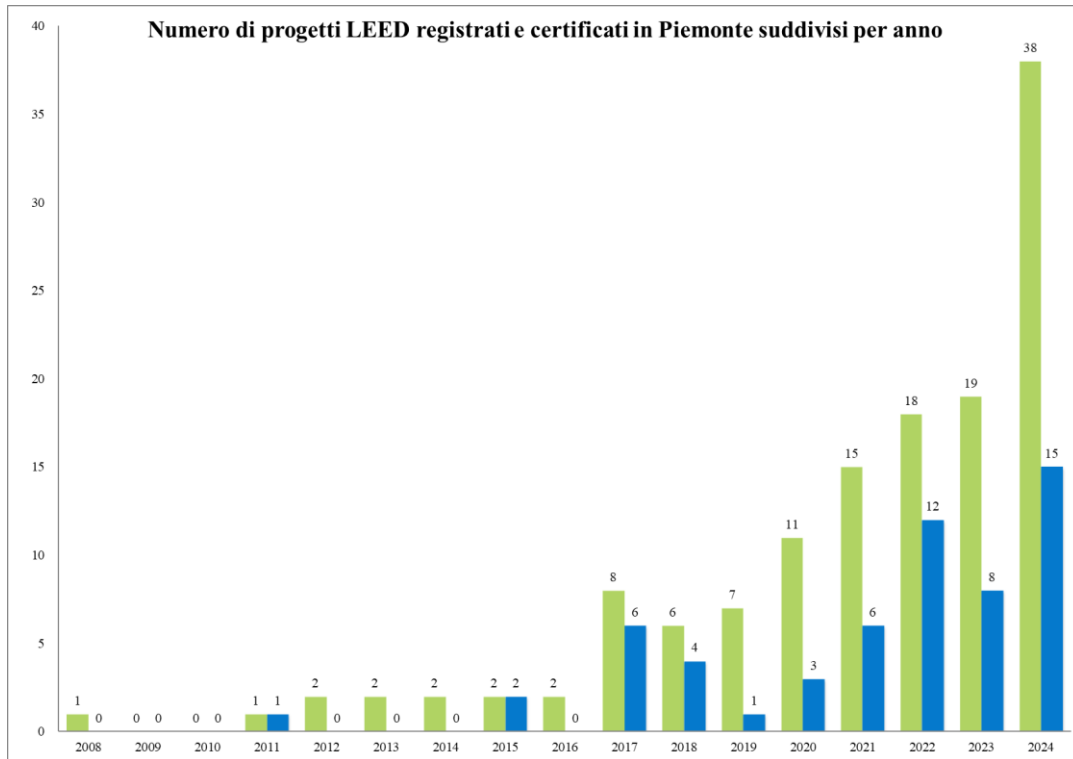


Figure 4: Number of LEED® projects registered (green) and certified (blue) in Piedmont divided by year

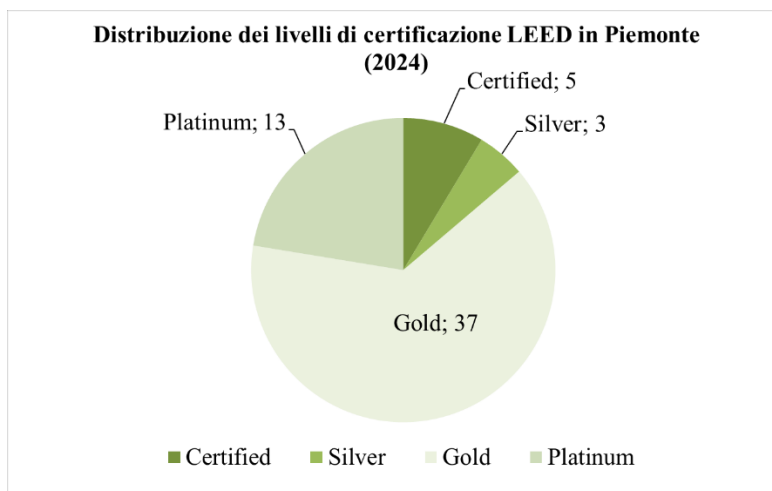


Figure 5: Distribution of LEED® certification levels in Piedmont (total certified building: 58)

## 5 CASE HISTORY

In the following, two case studies related to building renovations are described, starting from the assumption that renovation is now a necessity, considering that Italian cities already have a densely urbanized urban fabric. However, it must also be seen as an opportunity: in fact, renovation represents a highly sustainable act. For example, instead of occupying free areas, renovation allows to recover spaces already occupied and materials already used, and to give them a second life.

In the following cases, the application of two different protocols will be analyzed: BD+C New Construction and Major Renovation protocol for the Paideia center, and GBC Condomini protocol for Racconigi 25.

### 5.1 “Paideia Onlus” Headquarters in Turin

#### Team

- General Contractor: CGG – Costruzioni Generali Gilardi;
- Architecture Design: arch. Elena Vigliocco, arch. Lorenzo Giubergia;
- MEP and Energy Design: Studio Proto - ing. Elisabetta Carlucci, ing. Luciano Agostini (mechanical plants), EI Consulting - p.i. Simone Fazio, p.i. Stefano Santoni (electrical plants);
- Sustainability consulting: Ai Engineering Srl.

The Paideia Center is a place for families with children in difficulty or who live with a disability, which was created with the aim of accompanying them from the moment of diagnosis until their inclusion in the network work with social health services and school, to the choice of rehabilitation, sports and free time activities [Web-4].

The Paideia Foundation, which strongly supported the realization of this project, was founded in 1993 by the Giubergia and Argentero families from Turin, who wanted to carry out solidarity initiatives for the children of the area. Recognized among the Non-Profit Organizations of Social Utility (ONLUS) in 1997, today it is actively supported by the Ersel Group and by numerous other donors [Web-5].

The property is located in via Moncalvo 1, a few steps from the center of Turin. It consists of three buildings, two of which were built in the late 19th and early 20th century and constitute the building known as "ex villa Gariglio", a building of historical-cultural interest protected by the Superintendence of Architectural Heritage and the third building dating back to the 1960s. An integral part of the property is also the historic garden that overlooks via Moncalvo and via Villa della Regina.

The renovation project is aimed at enhancing the entire property both internally and towards the urban environment in which it is located.

The most representative macro-elements of the intervention can be summarized as:

- the renovation and conservative restoration of the two historic buildings with demolition of the 1960s addition;
- the demolition of the school building built in the 1960s and the reconstruction from scratch of a new building with a swimming pool in the basement;
- the construction of the new adjacent building integrated with the existing ones;
- the recovery of the completely degraded garden with the insertion of a play area accessible to all children.





Figure 6: View of the “Paideia Onlus” Headquarters

The air conditioning system of the structure was divided into two systems serving the existing historical building and the new building respectively.

The historic building, due to its construction typology, is characterized by a casing permeable to thermal flows, even if all the windows have been replaced respecting the original shapes. In each room one or more two-pipe fan coils have been installed.

The newly constructed building, characterized by very low energy consumption, is air-conditioned with different types of terminals depending on the intended use. The low-crowding areas are served by a system consisting of radiant panels and primary air, while the larger rooms are served by dedicated AHUs.

The heating plant, serving all the buildings, houses a reversible water-to-water heat pump with geothermal probes for generating heat and cold, a reversible air-to-water heat pump for integration and a condensing boiler that starts working when the external temperature drops below the set threshold temperature ( $4.5^{\circ}\text{C}$ ). Rainwater will also be recovered and used to feed the toilet flush tanks.

The building complex of the new Paideia Centre has obtained LEED® Platinum certification with 85 points (Fig. 8) according to the LEED® 2009 Italia New Construction and Renovation protocol.

This protocol is developed primarily for new or renovated Italian buildings and was chosen precisely because it is closely linked to the Italian construction, regulatory and production reality but is recognized in the global market at the same level as US protocols.

With the aim of reducing environmental and economic damages associated with excessive energy consumption, the global Energy Modelling of the building in dynamic regime was developed in the executive design phase. The Energy Modelling activity allowed to compare the project building (the “proposed” building) with a model of the same building (the “baseline” building) built according to Ashrae 90.1 appendix G in order to calculate a percentage of savings in terms of energy costs.

The comparison between the energy model of the reference building and the model of the project building gave the following results:

- reduction of Primary Energy compared to the reference building of over 46%;
- score for EA credit 1 equal to 19 points.

# LEED 2009 ITALIA NUOVE COSTRUZIONI E RISTRUTTURAZIONI

ATTEMPTED: 89, DENIED: 2, PENDING: 0, AWARDED: 85 OF 110 POINTS

<b>SUSTAINABLE SITES</b>	<b>24 OF 26</b>	<b>MATERIALS AND RESOURCES</b>	<b>7 OF 14</b>
SSp1 Construction Activity Pollution Prevention	Y	MRp1 Storage and Collection of Recyclables	Y
SSc1 Site Selection	1/1	MRc1.1 Building Reuse-Maintain Existing Walls, Floors and Roof	1/3
SSc2 Development Density and Community Connectivity	5/5	MRc1.2 Building Reuse-Maintain 50% of Interior Non-Structural Elements	0/1
SSc3 Brownfield Redevelopment	1/1	MRc2 Construction Waste Mgmt	2/2
SSc4.1 Alternative Transportation-Public Transportation Access	6/6	MRc3 Materials Reuse	0/2
SSc4.2 Alternative Transportation-Bicycle Storage and Changing Rooms	1/1	MRc4 Recycled Content	2/2
SSc4.3 Alternative Transportation-Low-Emitting and Fuel-Efficient Vehicles	3/3	MRc5 Regional Materials	2/2
SSc4.4 Alternative Transportation-Parking Capacity	2/2	MRc6 Rapidly Renewable Materials	0/1
SSc5.1 Site Development-Protect or Restore Habitat	0/1	MRc7 Certified Wood	0/1
SSc5.2 Site Development-Maximize Open Space	1/1		
SSc6.1 Stormwater Design-Quantity Control	1/1	<b>INDOOR ENVIRONMENTAL QUALITY</b>	<b>5 OF 15</b>
SSc6.2 Stormwater Design-Quality Control	1/1	IEQp1 Minimum IAQ Performance	Y
SSc7.1 Heat Island Effect-Non-Roof	1/1	IEQp2 Environmental Tobacco Smoke (ETS) Control	Y
SSc7.2 Heat Island Effect, Roof	1/1	IEQc1 Outdoor Air Delivery Monitoring	0/1
SSc8 Light Pollution Reduction	0/1	IEQc2 Increased Ventilation	0/1
		IEQc3.1 Construction IAQ Mgmt Plan-During Construction	1/1
		IEQc3.2 Construction IAQ Mgmt Plan-Before Occupancy	0/1
		IEQc4.1 Low-Emitting Materials-Adhesives and Sealants	1/1
		IEQc4.2 Low-Emitting Materials-Paints and Coatings	1/1
		IEQc4.3 Low-Emitting Materials-Flooring Systems	0/1
		IEQc4.4 Low-Emitting Materials-Composite Wood and Agrifiber Products	0/1
		IEQc5 Indoor Chemical and Pollutant Source Control	0/1
		IEQc6.1 Controllability of Systems-Lighting	0/1
		IEQc6.2 Controllability of Systems-Thermal Comfort	0/1
		IEQc7.1 Thermal Comfort-Design	0/1
		IEQc7.2 Thermal Comfort-Verification	0/1
		IEQc8.1 Daylight and Views-Daylight	1/1
		IEQc8.2 Daylight and Views-Views	1/1
<b>WATER EFFICIENCY</b>	<b>10 OF 10</b>	<b>INNOVATION IN DESIGN</b>	<b>6 OF 6</b>
WEp1 Water Use Reduction, 20% Reduction	Y	IDc1.1 Innovation in Design	1/1
WEc1 Water Efficient Landscaping	4/4	IDc1.1 Innovation in Design	0/1
WEc2 Innovative Wastewater Technologies	2/2	IDc1.2 Innovation in Design	1/1
WEc3 Water Use Reduction	4/4	IDc1.2 Innovation in Design	0/1
		IDc1.3 Innovation in Design	1/1
		IDc1.3 Innovation in Design	0/1
		IDc1.4 Innovation in Design	1/1
		IDc1.4 Innovation in Design	0/1
		IDc1.5 Innovation in Design	1/1
		IDc1.5 Innovation in Design	0/1
		IDc2 LEED® Accredited Professional	1/1
<b>ENERGY AND ATMOSPHERE</b>	<b>29 OF 35</b>	<b>REGIONAL PRIORITY CREDITS</b>	<b>4 OF 4</b>
EAp1 Fundamental Commissioning of the Building Energy Systems	Y	WEc1 Water Efficient Landscaping	1/1
EAp2 Minimum Energy Performance	Y	WEc2 Innovative Wastewater Technologies	1/1
EAp3 Fundamental Refrigerant Mgmt	Y	WEc3 Water Use Reduction	1/1
EAc1 Optimize Energy Performance	18/19	EAc1 Optimize Energy Performance	1/1
EAc2 On-Site Renewable Energy	2/7		
EAc3 Enhanced Commissioning	2/2		
EAc4 Enhanced Refrigerant Mgmt	2/2		
EAc5 Measurement and Verification	3/3		
EAc6 Green Power	2/2		
		<b>TOTAL</b>	<b>85 OF 110</b>

Figure 7: Project Checklist

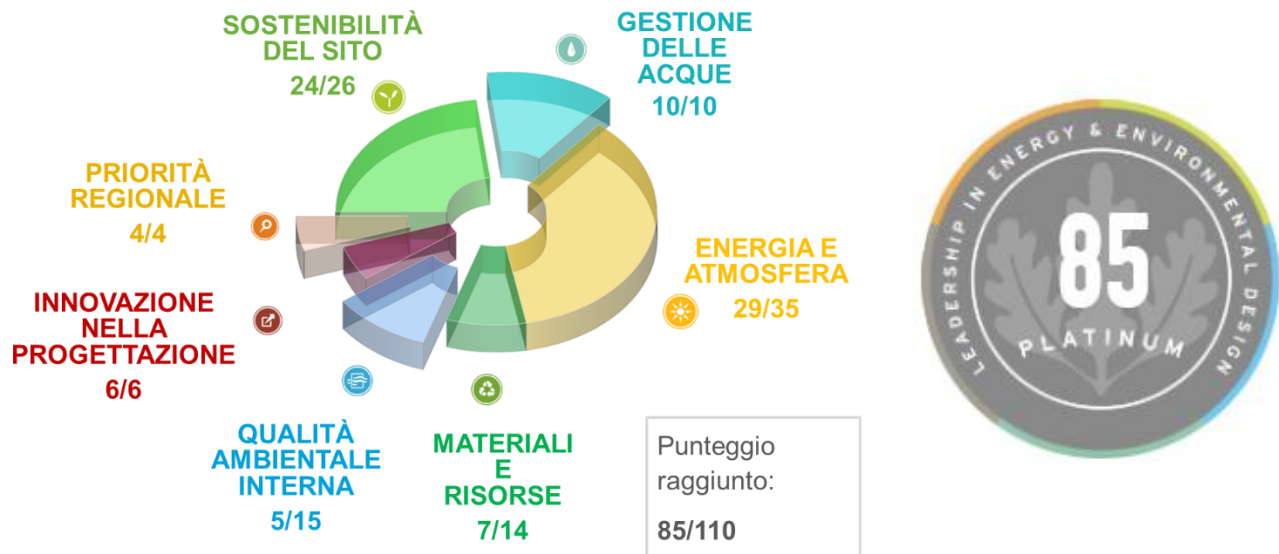


Figure 8: Graph LEED® score by category

## 5.2 Racconigi 25 – the regeneration of public housing according to the GBC Condomini Protocol

### Team

- General Contractor: Secap SpA;
- Architecture Design: SMA Progetti;
- MEP and Energy Design: Studio Chiabrera;
- Sustainability consulting: Onleco Srl.

Residential construction certainly occupies one of the most important assets in Europe in relation to the need for a regeneration action in terms of sustainability. From the point of view of energy requalification aimed at reducing consumption, in recent times there has been a growing trend of works, particularly in Italy thanks to dedicated incentives since 2006 and with a real surge from 2020 to today by virtue of the incentives of the so-called Superbonus 110%. Without prejudice to this, however, we cannot ignore the need to proceed with a regeneration of the residential heritage that embraces all the themes of sustainability. In this context, the GBC Condomini® Protocol was born in 2022, after a long and timely work started in 2015, dedicated to the requalification, management and maintenance of existing condominium residences. The protocol introduces an absolute novelty in the panorama of the sustainability rating protocol in construction, namely the Resilience area. It is responsible for enhancing the actions and interventions aimed at ensuring a long life for requalification interventions of residential condominium buildings. This is true from various points of view, both general and typical of condominium buildings, starting from documentary resilience to structural optimization, passing through the issues of seismic and hydrogeological vulnerability assessment, fire safety, emergency management, accessibility, availability of social spaces and last but not least, conflict management and minimization. A building undergoing major redevelopment must in fact guarantee that the investment lasts over time and this can only be satisfied if the building is able to "resist the stresses" to which it is subjected, whether these are natural (for example earthquakes or intense meteorological phenomena) or social (for example) conflicts between condominiums. In this context, it can be said that the regeneration intervention carried out on the Racconigi 25 complex in Turin has particularly stood out.

One of the first cases of application of this protocol, which in addition to being a sustainability rating tool is configured as a real support manual for the design of this type of intervention, is the residential complex called Racconigi 25 in Turin.



Figure 9. Aerial view of the Racconigi 25 residential complex.

It is composed of 4 condominiums located in the city area of the Cenisia district of Turin. The majority of the real estate units constituting the four condominiums are owned by the ATC (Territorial Housing Agency) of Central Piedmont. In the phase prior to the interventions, carried out following the emptying by all the occupants, in addition to poor energy performance and a need for various extraordinary maintenance building interventions, the complex presented a marked state of social degradation. The regeneration implemented, carried out according to the canons of the GBC Condomini® protocol, represents a true best practice in this sector because it has addressed all the challenges that typically characterize sustainable regeneration interventions of residential buildings and in particular public housing.



## CONDOMINIO AUTONOMO DI CORSO RACCONIGI 25 SCALE N. 2-4-6-6BIS-8-10-12

Corso Racconigi 25, Torino

GBC Condomini - Ed. 2022 - codice progetto: GBCCO2304



Resilienza			Punteggio conseguito: 23/27		
RE 1	Resilienza documentale	Obbligatorio	AE 8	Termoregolazione	1/2
RE 2	Vulnerabilità ed esposizione	Obbligatorio	AE 9	Ottimizzazione idrica	4/6
RE 3	Ottimizzazione strutturale	14/14	<b>Materiali e Risorse</b> Punteggio conseguito: 6/10		
RE 4	Prevenzione incendi	-	MR 1	Rifiuti condominiali	Obbligatorio
RE 5	Rischio idrogeologico	2/2	MR 2	Approvvigionamenti	3/3
RE 6	Emergenza pianificata	1/1	MR 3	Materiali edili	-
RE 7	Accessibilità	2/2	MR 4	Riutilizzo da manutenzioni straordinarie	3/3
RE 8	Manutenzione programmata	2/2	<b>Qualità percepita</b> Punteggio conseguito: 0/14		
RE 9	Spazi sociali	-	QP 1	Qualità dell'aria	Obbligatorio
RE 10	Gestione dei conflitti	2/2	QP 2	Qualità dell'aria in costruzione	Obbligatorio
<b>Connessione e Territorio</b> Punteggio conseguito: 3/10			QP 3	Gestione della qualità dell'aria interna	-
CT 1	Cantiere sostenibile	Obbligatorio	QP 4	Pulizie ecosostenibili	-
CT 2	Trasporti alternativi	1/2	QP 5	Divieto di fumo	-
CT 3	Gestione ambientale	-	QP 6	Acustica	-
CT 4	Acque meteoriche	-	QP 7	Qualità percepita	-
CT 5	Isola di calore	2/3	<b>Innovazione nella Progettazione</b> Punteggio conseguito: 6/6		
CT 6	Illuminazione artificiale	-	IP 1	Professionista accreditato	1/1
<b>Acqua e Energia</b> Punteggio conseguito: 23/39			IP 2	Innovazione	5/5
AE 1	Contabilizzazione idrica ed energetica	Obbligatorio	<b>Priorità Regionale</b> Punteggio conseguito: 4/4		
AE 2	Prestazione energetica	Obbligatorio	PR 1	Priorità Regionale	4/4
AE 3	Prestazione idrica	Obbligatorio	<b>Livello di certificazione raggiunto: 65/110 ORO</b>		
AE 4	Indagini energetiche	-			
AE 5	Consumi analizzati	-			
AE 6	Ottimizzazione energetica	18/22			
AE 7	Quote rinnovabili	-			

Figure 10. Project Checklist



Figure 11. Distribution and percentage of credit achievement.

The energy theme was one of the most carefully considered aspects, allowing energy consumption to be reduced by 67%, operating on a building that is also protected and characterizes the historical architecture of the 1930s in the city of Turin, therefore with strong limitations on intervention on the envelope. The intervention saw the centralization of the winter air conditioning and ACS production systems, previously autonomous and inefficient. In addition to the introduction of an efficient generation system, of the hybrid type (condensing boiler and air heat pump) (Fig. 12), high performance was obtained through a complete replacement of the external windows and in the insulation of the horizontal elements of the envelope.



Figure 12. Plant systems.

These were accompanied by the introduction of a widespread energy and water accounting system that could be understood in real time by users.

Without any doubt, the majority of the efforts made in this redevelopment can be found in the credits of the Resilience area. First of all, the great result of the radical structural redevelopment emerges, preceded by an in-depth analysis aimed at ensuring both high performance and respect for a historical structure. The diagnostic and structural analysis phase with confidence level LC1 (Fig. 13).



Figure 13. Structural analysis and three-dimensional design processes.

No less important were also the other actions. On these here we want to emphasize the solutions sought in the field of accessibility. Our country is undoubtedly characterized by an increase in the average age with a strong increase in the elderly population who often have limitations in walking. If we add to this the more recurrent presence of disabilities in the contexts of public housing, we understand how the study and management of the increase in accessibility have been, for the Racconigi 25 complex, markedly paid attention to (Fig. 14).

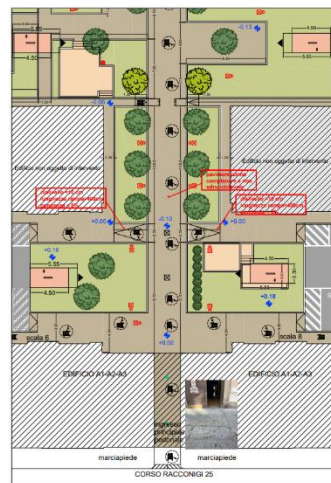


Figure 14. Plan of the main project interventions to ensure accessibility.

The design solutions addressed this aspect not only within the four individual buildings but were prepared with a global focus on the accessibility of the entire complex.

Without any doubts, the regeneration intervention of the Racconigi 25 complex is to be considered a case study and excellence, both for the quality of the design and the work, and for the results certified by the application of the GBC Condomini® Protocol where the Gold level was achieved. Having said that, however, we cannot ignore that all this was possible only thanks to a generous and unrepeatable form of incentive. If on the one hand the path to urban regeneration is traced and this, is it, the difficulty remains in understanding with which resources it can be followed.

## 6 CONCLUSION

This article highlights the value of LEED® certification and GBC protocols as fundamental tools to promote sustainability in construction, both globally and locally, as demonstrated in the context of the Piedmont Region. The analysis of case studies such as the Centro Paideia and the Racconigi 25 residential complex highlights how such protocols can guide urban renewal through an integrated approach, which considers the reduction of energy consumption, the improvement of the quality of the environments and structural resilience.

Experience suggests that, while LEED® and GBC certifications represent cutting-edge models for sustainable construction, their implementation requires access to significant financial resources, which may limit their large-scale application. Nevertheless, the success of the initiatives in Piedmont indicates a promising direction for future redevelopment policies that, supported by adequate incentives, could accelerate the transition towards a more sustainable and inclusive built environment.

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Web-2: <https://gbcitalia.org/certificazione/>

Web-3: <https://gbcitalia.org/2023/06/29/editore-teodosia-a-torino-primo-condominium-in-italia-a-ottenere-la-certificazione-gbc-condomini/>

Web-4: <https://gbcitalia.org/certificazione/LEED®/progetti-LEED®/centro-paideia/>

Web-5: <https://fondazionepaideia.it/chi-siamo/>