Net Zero Carbon Cities
Building Value Framework

Case Study
Building: San Mauro Torinese
Company: Enel X
Location: Turin, Italy

January 2022

In collaboration with Accenture
Accelerating the transition to a greener built environment

About the Building Value Framework initiative

The Building Value Framework has been developed in collaboration with World Economic Forum’s stakeholders, multi-sector and cross-industry leaders from the building ecosystem, to accelerate flow of capital investment towards decarbonization of the urban built environment.

The framework aims to shift how the value of decarbonization is perceived and defined by proposing a more holistic decision-making approach, which recognizes the importance of social and environmental outcomes and system performance. It guides decision-makers in linking holistic performance outcomes to traditional financial outcomes (e.g. improved tenant satisfaction increases rental value).

Case studies on new-construction and renovation/retrofit building projects were conducted to demonstrate and map how applying the BVF methodology can accelerate decarbonization while generating more value for project stakeholders.

The Building Value Framework

Click here to learn more about the framework methodology, to read the briefing paper, and to find additional case studies.
Enel X helped its municipal client to optimize system performance and public service delivery

Project background and vision

• Enel X delivered an integrated building project under a public-private partnership with the Municipality of San Mauro Torinese located in a temperate climate zone in Northern Italy
• The municipality aimed to digitalize and retrofit their portfolio of buildings incl. public offices, townhall and sport facilities while maintaining the historical architecture of the city
• The project’s main objectives were to reduce municipal operating expenses and increase energy efficiency at both building and portfolio levels while maximizing the quality of life and public services for residents and city customers
• **Hybrid heating systems** and an **IoT platform**, alongside thermal insulation, PV panels and street lamp replacement (LED lighting), were some of the key technologies used

Key investments to make the vision reality

<table>
<thead>
<tr>
<th>Hybrid heating systems</th>
<th>IoT platform</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combination of ultra-efficient gas boilers, air-sourced heat pumps and micro cogeneration plants with interventions at 17 buildings</td>
<td>IoT Platform integrating various types of data sources incl. weather forecast, internal real time environmental data (temperature, humidity, etc.), hardware performance, and energy consumption</td>
</tr>
<tr>
<td>Building thermal insulation created an ideal internal temperature range to maximize efficiency of heat pumps. The gas boiler operates in certain temperature ranges to support heat pumps or serve as backup if exceptionally low outdoor temperature limits heat pump efficiency.</td>
<td>Enables planning of time to reach temperature setpoints, as well as early detection of operating anomalies and system malfunction</td>
</tr>
<tr>
<td>Assists in the management of 32 buildings</td>
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</table>
Identifying outcomes that maximize the value of building investments

The framework brings together a set of holistic outcomes that optimize the value of building investments. Enel client’s building, user and system vision resulted in achieving the following featured outcomes:

**Emissions reduction**
- Minimize embodied carbon
- Minimize operating carbon
- Maximize use of locally generated clean electricity

**Environmental improvement**
- Minimize water usage
- Minimize waste
- Increase biodiversity

**User satisfaction**
- Health, well-being, and productivity improvements

**Systemic value efficiency**
- Improve efficiency
- Increase flexibility
- Improve resilience
- Improve grid services

**Socio-economic improvement**
- Job creation
- Lower energy costs to consumers

*Note: Blue colored boxes in white font indicate the key project outcomes as identified by Enel X*
Hybrid heating systems create user satisfaction and enable access to lower financing cost

Hybrid heating systems increase building energy efficiency, thermal comfort and resilience linking to public approval and constituent user satisfaction, as well as reduced financing and compliance cost.

<table>
<thead>
<tr>
<th>Non-financial Outcomes</th>
<th>Financial Outcomes</th>
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<tbody>
<tr>
<td><strong>Asset Outcomes</strong></td>
<td>✓ Rent increase</td>
</tr>
<tr>
<td>Minimize operating carbon</td>
<td>Revenue increase</td>
</tr>
<tr>
<td>• Usage of electrified and more efficient heating as heat pumps cover bulk of energy usage</td>
<td>✓ OPEX reduction</td>
</tr>
<tr>
<td>Health, well-being and productivity improvements</td>
<td>CAPEX reduction</td>
</tr>
<tr>
<td>• Increased heating performance enables higher thermal comfort at lower tenant energy cost</td>
<td>✓ Asset Value increase</td>
</tr>
<tr>
<td>Improve resilience</td>
<td>✓ Compliance cost reduction</td>
</tr>
<tr>
<td>• Increased portfolio efficiency reduces grid load and risks of disruptions</td>
<td>✓ Financing cost reduction</td>
</tr>
<tr>
<td></td>
<td>✓ Brand value increase</td>
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</table>

Reaching certain energy efficiency targets is linked to compliance cost, and is subsidized by the national government for additional efficiency gains.

Public user satisfaction resulting from investments are of highest priority to government. In this context, reputational value results from higher quality of service for constituents at affordable cost. The investments made increased thermal comfort through well-heated public indoor spaces, lower operating expenses and lower risk of service disruption.
## IoT platform enables leap in tenant quality of life while building operating efficiency

Digitalization of the building portfolio increases efficiency of operations and maintenance and lower operating cost, while providing citizens with better services improves public approval.

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<tr>
<td>• Machine learning for smart regulation of heating activation time and level based on collected evidence from previous days combined with weather forecast.</td>
<td></td>
</tr>
<tr>
<td>• Monitoring of consumption data.</td>
<td></td>
</tr>
<tr>
<td>Health, well-being and productivity improvements</td>
<td>✓ CAPEX reduction</td>
</tr>
<tr>
<td>• Auto-diagnostic for early detection of malfunctioning for planned and combined maintenance interventions – reduces or prevents downtime and minimizes service disruption for citizens.</td>
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**Financial Outcomes**
- Rent increase
- Revenue increase
- ✓ OPEX reduction
- ✓ CAPEX reduction
- ✓ Asset Value increase
- ✓ Compliance cost reduction
- ✓ Financing cost reduction
- ✓ Brand value increase

Data-driven maintenance and operation of buildings and building equipment increases energy efficiency and reduces operating expenses. Furthermore reduces CAPEX and improves quality of service due to reduced downtime.

Automation and digitalization of building operation and building services improves citizen experience and thermal comfort while freeing up resources and time for building managers to focus on high-priority tasks. The uplift in quality of life and services leads to significant gain in public approval for the municipality.