The economic sustainability in social housing interventions: analysis of the operating variables impact on the housing costs of a temporary dwelling in Turin
BUILDING ENERGY EFFICIENCY

EPBD Recast (2010)

- High energy performance building
- Low energy requirements
- Renewable energy sources

nearly Zero Energy Building (nZEB)

Cost optimal

1. Costs of energy - related investment
2. Maintenance costs
3. Operating costs (including energy savings)
4. Costs of disposal

2 research projects in Europe focused on the analysis of building types and the implementation of the EPBD at Community level.

Ingaramo L., Sabatino S., Talarico A., Housing Cost Affordability in social housing interventions: analysis of the operating variables impact on the housing costs of a temporary dwelling in Turin.— ERES Conference 2013
KEY POINTS

- Social housing: temporary dwelling (TD)
- Building technologies
- Inhabitants income burdens
- Housing cost components
- Energetic performances

Ingaramo L., Sabatino S., Talarico A., Housing Cost Affordability in social housing interventions: analysis of the operating variables impact on the housing costs of a temporary dwelling in Turin. – ERES Conference 2013
1. How energetic performances can impact on the tenants running costs?

2. Which economical advantage derives from changes in housing-energy efficiencies on the housing cost of the case study?

3. Which is the tangible economical advantage for the TD future inhabitants, in comparison to renting a similar dwelling in the free market?
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## San Salvario TD

### MAIN FEATURES

<table>
<thead>
<tr>
<th>Site</th>
<th>Torino, via San Pio V 11/11 bis - San Salvario</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of intervention</td>
<td>refurbishment</td>
</tr>
<tr>
<td>Uses and Purposes</td>
<td>temporary dwelling of social housing, commercial areas, nursery school, nunnery</td>
</tr>
<tr>
<td>Type of building</td>
<td>an historical building (XIX) with 4 floors</td>
</tr>
<tr>
<td>Users</td>
<td>families or people living in condition of housing emergency or vulnerability and city users</td>
</tr>
<tr>
<td>Rooms</td>
<td>24 apartments (6 one room apartments, 10 two rooms apartments, 6 three room apartments)</td>
</tr>
<tr>
<td>Communal areas</td>
<td>kitchen, laundry room, multifunctional room</td>
</tr>
<tr>
<td>Social activities</td>
<td>day-care centre, trade rooms, territorial cultural activities</td>
</tr>
<tr>
<td>Timing (construction phase)</td>
<td>autumn 2012 - summer 2014</td>
</tr>
<tr>
<td>Total sqm</td>
<td>2.414 sqm (TD), 3.632 sqm (total building)</td>
</tr>
</tbody>
</table>

### PARTIES INVOLVED ON THE DESIGN

<table>
<thead>
<tr>
<th>Promoters</th>
<th>Programma Housing della Compagnia di San Paolo/Ufficio Pio - <a href="http://www.programmahousing.org">www.programmahousing.org</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>Manager of social housing TD</td>
<td>Coop. sociale Atypica, Coop. sociale Progetto Muret onlus, Coop. sociale Luci nella Città onlus</td>
</tr>
<tr>
<td>Designer</td>
<td>Studio De Ferrari Arrchitetti Associati</td>
</tr>
<tr>
<td>Structural designer</td>
<td>ing. Marco Tobaldini</td>
</tr>
<tr>
<td>System designer</td>
<td>CYD Consulting&amp;Engineering</td>
</tr>
<tr>
<td>Constructor</td>
<td>Fantino Costruzioni S.p.A.</td>
</tr>
</tbody>
</table>
1. How energetic performances upgrades can impact on the tenants running costs?

Primary energy demand: heating, hot water, electricity (project) energy efficiency compared to A,B,C,D,E energy performance categories

The different energy performance categories have been calculated by means of the “National Guidelines for energy certification of buildings”, according to the Italian Ministerial Decree of June 26th 2009.

EPI = energy performance index in the winter season (only for the Italian context). It is a function of several variables such as: energetic demand for heating (kWh); gross floor area; season average global efficiency based on the UNI TS 11300 – 2.

$\text{Category A: }$ EPI 31.5, EPi domestico hot water 8.75

$\text{Category B: }$ EPI 40.34, EPi domestico hot water 10.50

$\text{Category C: }$ EPI 56.47, EPi domestico hot water 15.00

$\text{Category D: }$ EPI 72.61, EPi domestico hot water 19.50

$\text{Category E: }$ EPI 96.81, EPi domestico hot water 22.50

EPglobal [kW/sqm y]

0.88 €/m² month Category A

1.41 €/m² month Category E

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1. How energetic performances can impact on the tenants running costs?

<table>
<thead>
<tr>
<th></th>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>29 m²</td>
<td>26</td>
<td>28</td>
<td>32</td>
<td>36</td>
<td>41</td>
</tr>
<tr>
<td>35 m²</td>
<td>31</td>
<td>33</td>
<td>38</td>
<td>43</td>
<td>49</td>
</tr>
<tr>
<td>46 m²</td>
<td>40</td>
<td>44</td>
<td>50</td>
<td>57</td>
<td>65</td>
</tr>
<tr>
<td>58 m²</td>
<td>51</td>
<td>55</td>
<td>63</td>
<td>71</td>
<td>82</td>
</tr>
<tr>
<td>64 m²</td>
<td>56</td>
<td>61</td>
<td>70</td>
<td>79</td>
<td>90</td>
</tr>
<tr>
<td>69 m²</td>
<td>61</td>
<td>66</td>
<td>75</td>
<td>85</td>
<td>97</td>
</tr>
<tr>
<td>75 m²</td>
<td>66</td>
<td>71</td>
<td>82</td>
<td>92</td>
<td>106</td>
</tr>
<tr>
<td>86 m²</td>
<td>76</td>
<td>82</td>
<td>94</td>
<td>106</td>
<td>121</td>
</tr>
</tbody>
</table>

Increasing ave. costs: +60% (from A to E energetic category)
2. Which economical advantage derives from changes in housing-energy efficiencies on the housing cost of the case study?

\[
\text{HOUSING COST} = \text{RENT} + \text{OPERATING VARIABLES}
\]

- **Market Rent (range)** for the urban area considered at present: 7.8 - 11.5 €/sqm
- **On the basis of the “Agreed Local Rent”**: 6.2 €/sqm * month
- ...a discounted rent for social purpose... not a market rent...
- -20% emergency housing
- +40% city users

*The applied discount is ruled by the Municipality on the basis of a national act (L 431/98) to support housing stress.*
2. Which economical advantage derives from changes in housing-energy efficiencies on the housing cost of the case study?

<table>
<thead>
<tr>
<th>Housing emergency</th>
<th>( % ) progressive increase of the total HC</th>
<th>( % ) bills incidence on the total HC</th>
<th>Two room ap. (2 p)</th>
<th>Three room ap. (3 p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>(-%)</td>
<td>17%</td>
<td>299</td>
<td>334</td>
</tr>
<tr>
<td>B</td>
<td>(+1,4%)</td>
<td>18%</td>
<td>303</td>
<td>339</td>
</tr>
<tr>
<td>C</td>
<td>(+4,1%)</td>
<td>20%</td>
<td>311</td>
<td>348</td>
</tr>
<tr>
<td>D</td>
<td>(+6,8%)</td>
<td>22%</td>
<td>319</td>
<td>356</td>
</tr>
<tr>
<td>E</td>
<td>(+10,3%)</td>
<td>25%</td>
<td>330</td>
<td>368</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Housing vulnerability</th>
<th>( % ) progressive increase of the total HC</th>
<th>( % ) bills incidence on the total HC</th>
<th>Two room ap. (1 p)</th>
<th>Two room ap. (2 p)</th>
<th>Three room ap. (3 p)</th>
<th>Three room ap. (4 p)</th>
<th>Four room ap. (3 p)</th>
<th>Four room ap. (4 p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>(-%)</td>
<td>14%</td>
<td>288</td>
<td>361</td>
<td>404</td>
<td>433</td>
<td>469</td>
<td>541</td>
</tr>
<tr>
<td>B</td>
<td>(+1,1%)</td>
<td>15%</td>
<td>292</td>
<td>365</td>
<td>408</td>
<td>438</td>
<td>474</td>
<td>547</td>
</tr>
<tr>
<td>C</td>
<td>(+3,4%)</td>
<td>17%</td>
<td>298</td>
<td>373</td>
<td>417</td>
<td>447</td>
<td>485</td>
<td>559</td>
</tr>
<tr>
<td>D</td>
<td>(+5,6%)</td>
<td>19%</td>
<td>305</td>
<td>381</td>
<td>426</td>
<td>457</td>
<td>495</td>
<td>571</td>
</tr>
<tr>
<td>E</td>
<td>(+8,5%)</td>
<td>21%</td>
<td>313</td>
<td>392</td>
<td>437</td>
<td>469</td>
<td>509</td>
<td>586</td>
</tr>
</tbody>
</table>

[\(\€/\text{month}\)]

Decreasing energetic categories (A \( \rightarrow \) E)

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2. Which economical advantage derives from changes in housing-energy efficiencies on the housing cost of the case study?

Comparison of maximum housing cost for families to the housing cost calculated in different scenarios of energy efficiency of the building (assuming 30% of net income, despite of 35%, in order to verify a prudential minimum threshold)

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Two room ap. (1p)</td>
<td>288</td>
<td>42</td>
<td>292</td>
<td>39</td>
<td>298</td>
<td>32</td>
<td>305</td>
<td>26</td>
<td>313</td>
<td>17</td>
</tr>
<tr>
<td>Two room ap. (2p)</td>
<td>361</td>
<td>-31</td>
<td>365</td>
<td>-35</td>
<td>373</td>
<td>-43</td>
<td>381</td>
<td>-51</td>
<td>392</td>
<td>-61</td>
</tr>
<tr>
<td>Three room ap. (3p)</td>
<td>404</td>
<td>-1</td>
<td>408</td>
<td>-5</td>
<td>417</td>
<td>-14</td>
<td>426</td>
<td>-23</td>
<td>437</td>
<td>-34</td>
</tr>
<tr>
<td>Three room ap. (4 p)</td>
<td>433</td>
<td>36</td>
<td>438</td>
<td>32</td>
<td>447</td>
<td>22</td>
<td>457</td>
<td>12</td>
<td>469</td>
<td>0</td>
</tr>
<tr>
<td>Four room ap. (3p)</td>
<td>469</td>
<td>-66</td>
<td>474</td>
<td>-71</td>
<td>485</td>
<td>-82</td>
<td>495</td>
<td>-92</td>
<td>509</td>
<td>-106</td>
</tr>
<tr>
<td>Four room ap. (4p)</td>
<td>541</td>
<td>-72</td>
<td>547</td>
<td>-78</td>
<td>559</td>
<td>-90</td>
<td>571</td>
<td>-102</td>
<td>586</td>
<td>-117</td>
</tr>
</tbody>
</table>

Max Housing Cost for families (30% income)

330
330
403
469
403
469

On the basis of the Turin income limits letting families to take advantage of housing public program
3. Which is the tangible economical advantage for the TD future inhabitants, in comparison to renting a similar dwelling in the free market?

<table>
<thead>
<tr>
<th>Operative costs (project)</th>
<th>Housing vulnerability</th>
<th>Fixed component = project bill (energetic category A)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Housing cost</td>
<td>Housing cost</td>
</tr>
<tr>
<td></td>
<td>Agreed rent + project bill</td>
<td>Market rent + project bill</td>
</tr>
<tr>
<td>Two room ap. (1P)</td>
<td>288 €/month</td>
<td>-40 %</td>
</tr>
<tr>
<td>Two room ap. (2P)</td>
<td>361 €/month</td>
<td>-41 %</td>
</tr>
<tr>
<td>Three room ap. (3P)</td>
<td>404 €/month</td>
<td>-40 %</td>
</tr>
<tr>
<td>Three room ap. (4 P)</td>
<td>433 €/month</td>
<td>-40 %</td>
</tr>
<tr>
<td>Four room ap. (3p)</td>
<td>469 €/month</td>
<td>-41 %</td>
</tr>
<tr>
<td>Four room ap. (4p)</td>
<td>541 €/month</td>
<td>-40 %</td>
</tr>
</tbody>
</table>

\[\text{Fixed component} = \text{project bill (energetic category A)}\]
• **Obtained results:** hypothesis and suggestions for a good design and managements:
  • replicable methodology
  • useful to be applied in a pre-feasibility stage of a project
  • can help in defining, in a later stage, the input data for a business plan

• **Open question:**

  ...it would be of a paramount importance to be able to verify these data in a real context, monitoring the actual energy consumption costs of the TD, once it comes into operation in order to define precise thresholds
Thank you for your kind attention!

For any further information please contact:

stefania.sabatino@polito.it