World SB08 Melbourne

# 38 Social Elderly Housing, Palma-SPAIN

## Building information

- **Building Type/use**
  Social Elderly Housing Building
- **Country**
  Spain
- **Client**
  IBAVI
  (Instituto Balear de la Vivienda)
- **Architect**
  L. Velasco/ A. Hevia+G.Golomb/ A. García/ M.A. Garcías
- **Occupation**
  September 2006

**Aims of the project**

To use the undeveloped part of the plot:

Environment
Pleasant adaptation

Volumetry
Re-distribuition of the volume. Less compact building and more exterior permeability. Staggered floors, with an opening from the courtyard to the exterior pedestrian area. Interior space with better proportions.

Use
Several common areas with different treatments. Interior courtyard, porch, secluded terrace, terrace with opened views.

Sunlight and ventilation
Reduction in height of the south-facing part of the building. Permeability controlled determined by dominant winds. Better bioclimatic conditions. Energy saving

## Building performance information

**Design Process**

The designers proposed a bioclimatic approach using:
-DOE-2 simulation tool for heating and cooling calculation.
-Visual LISP. AUTOCAD software for natural lighting simulation.

The results of a dual cooling system were evaluated through the mathematical approach developed by Prof. M. Santamouris and José Marco.

**Energy Efficiency**

Passive house measures have been integrated to the building, such as:
- Ventilation Passive Cooling using underground air pipe lines.
- PV electric fans provide driven forces to air movement through the rooms connected with chimneys.
- Green house for gaining solar energy during winter.
- Solar protection system during summer.

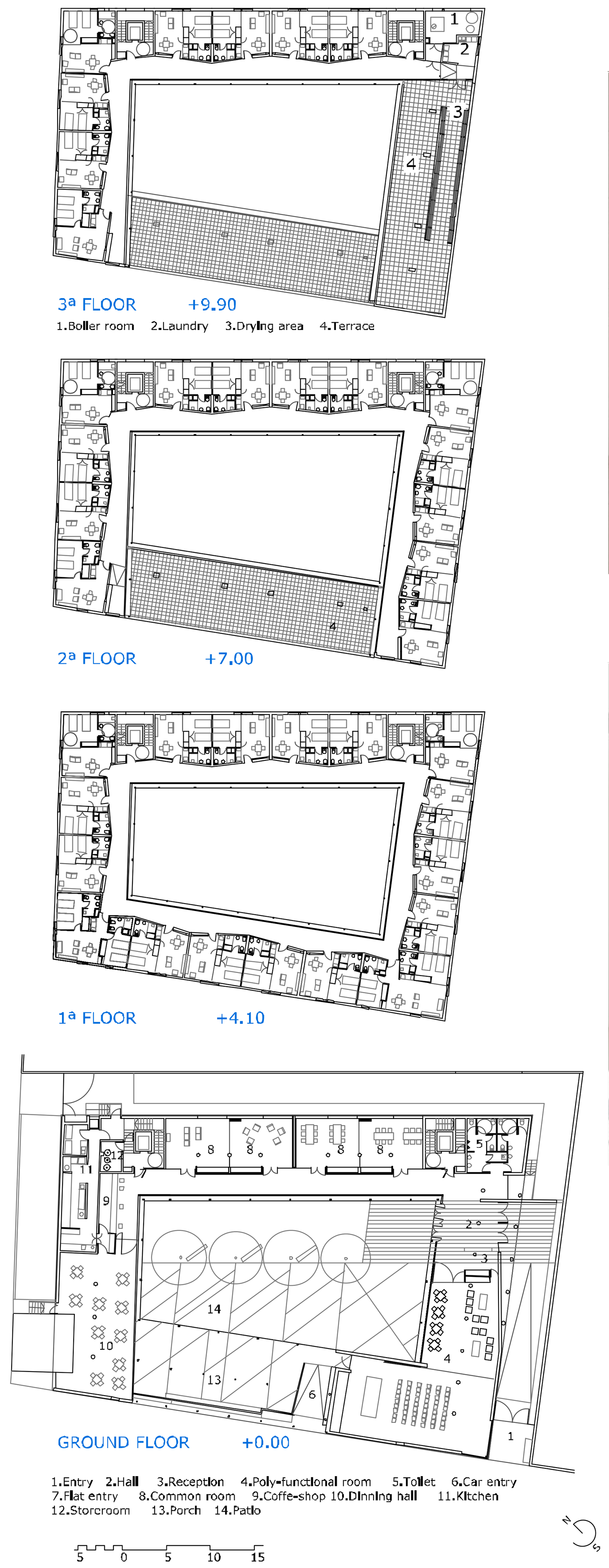
**Other Relevant Building Features**

*Water*
Rain water storage for later re-use.

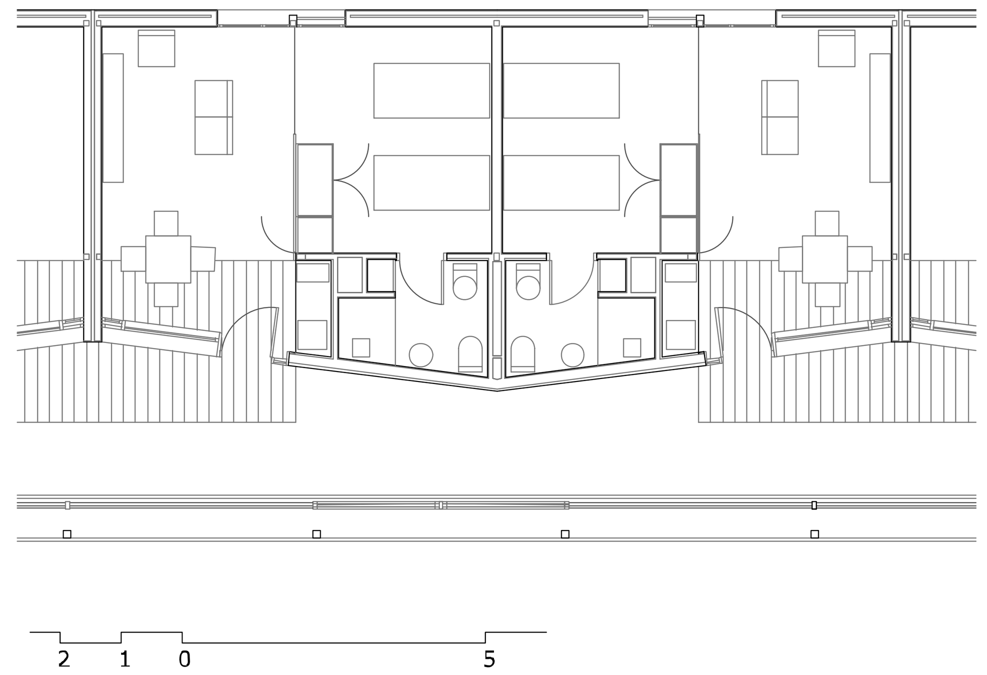
*Renewable*
Solar panels use for domestic hot water consumption.

*Comfort*
Natural light simulation in order to reduce the electrical consumption.
Primary occupation areas were designed to provide natural cross-ventilation.

*Social issues*
Common areas and recreational areas were designed to improve the social relations between residents.




## Indor space quality



**Indor space design**

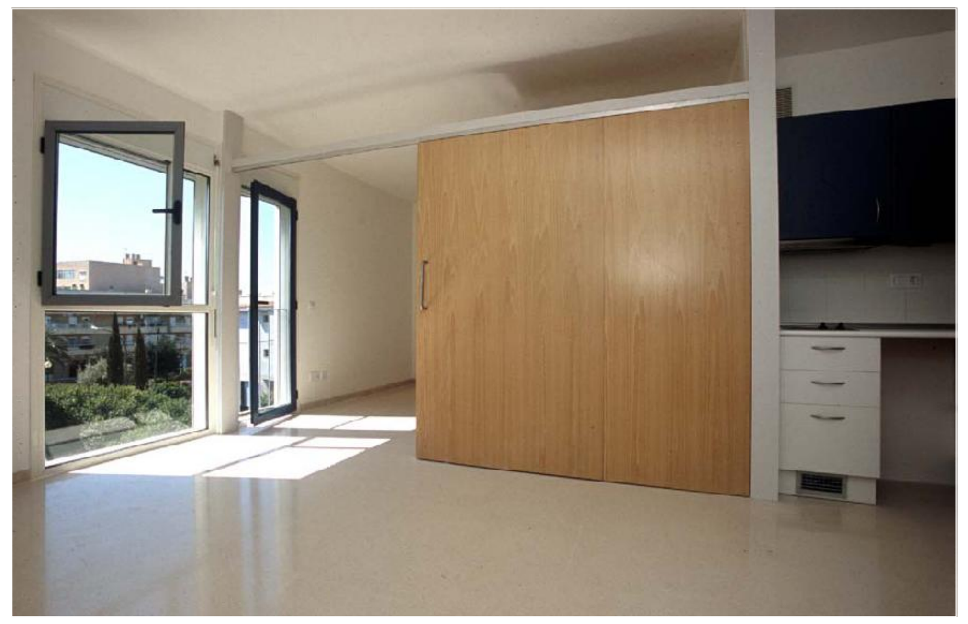
1 bedroom - 1 badthroom - 1 living – dining room – kitchen

Open space in the living room

Crossed ventilation

Permeability with the gallery

Double situation with regard to the exterior



**Program requirements**

*Rented housing*
Aimed at elderly people, not dependent, with few resources
Common Services, dining room, polyvalent rooms...

*Assistance*
New model of inhabitation, a combination of residence and normal housing

*Small units*
Small but enough private space
Wide community areas for building relationships

*Common services*
Assistance if needed
Control and maintenance of the building

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Assesment by iiSBE-Spain
Work Team: Manuel Macías, Irina Tumini, Javier Marcos, Carmen Alonso, Dora Guzmán, Francesca Olivieri

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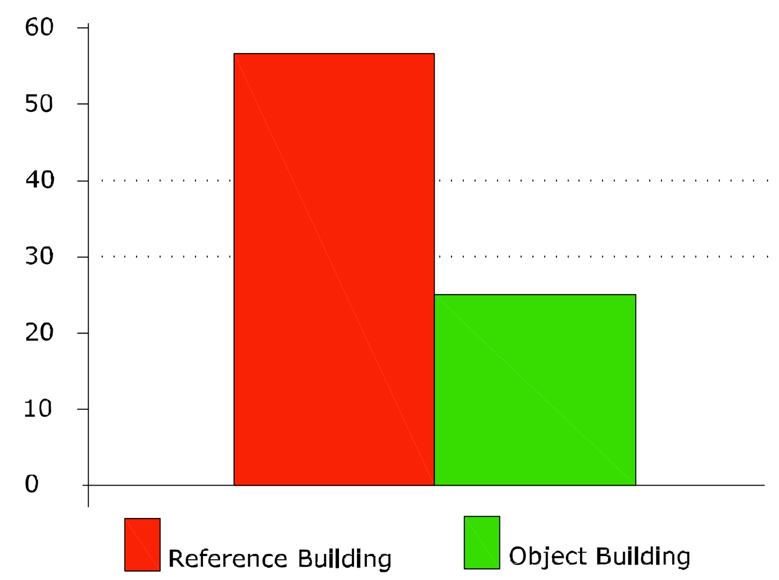
## Building evaluation

## SBTool-Verde

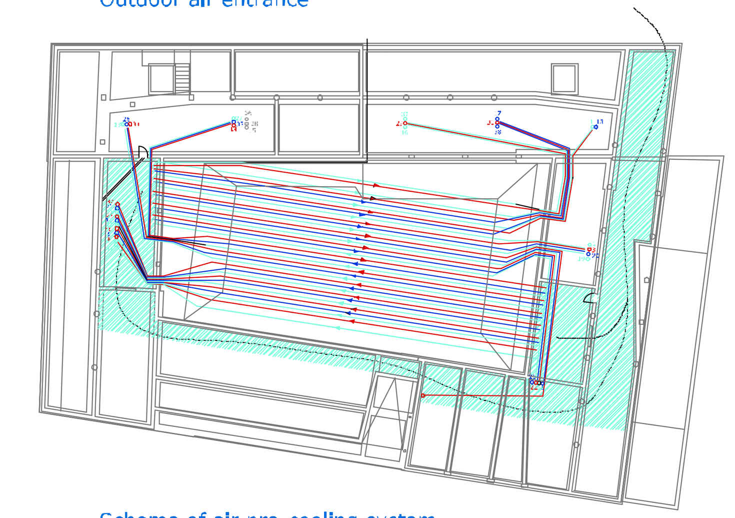
The Evaluation process was carried out using SBTool-Verde, a system developed by iiSBE TC Work -group. The system evaluate the performance of building as impact reduction in comparison to reference building

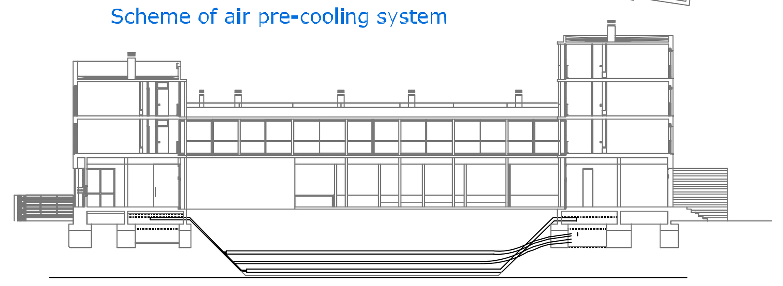
### 1. Climate change

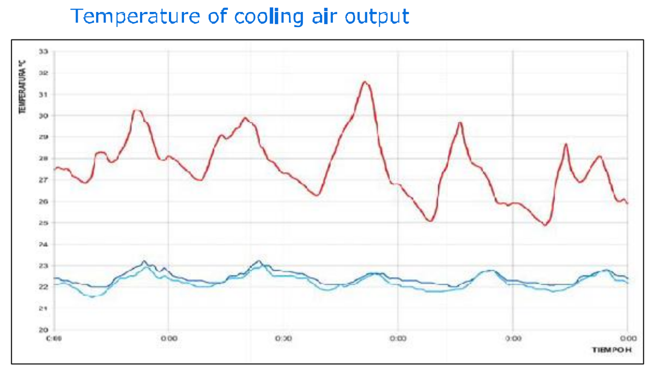
Estimate annual emissions of GHG gases on kg CO2 eq per m2




| Criteria | Reference Building | Object Building | Score |
|---|---|---|---|
| Energy embodied en construction materials | 7,18 | 6,32 | 2 |
| Energy used for transport of construction materials | 0,21 | 0,73 | 0,5 |
| Energy consumption for facility operations | 54,81 | 46,82 | 2 |
| Electrical consumption for facility operations | 54,81 | 34,46 | 4,2 |
| Renewable energy systems | 54,81 | 29,36 | 0,4 |



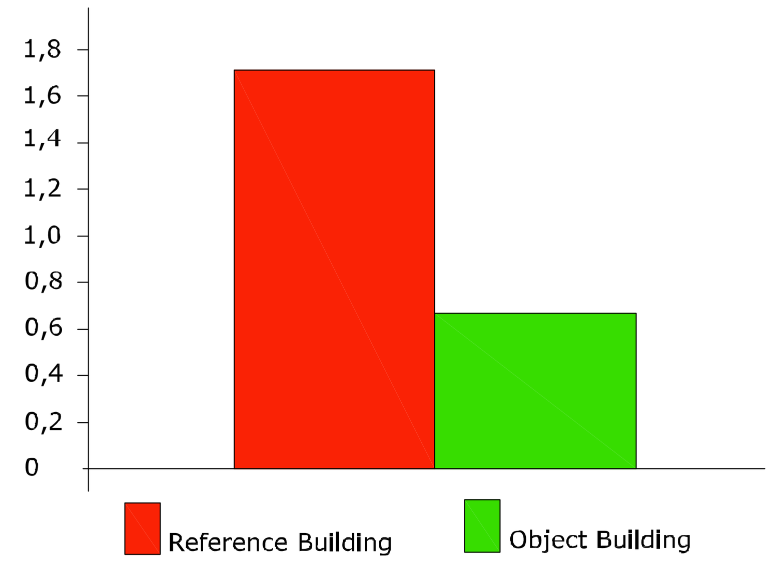




The project was selected due to its convenient use of typical passive house techniques, the use of innovative passive cooling systems, the study of light and thermo hygrometric comfort and the good quality of natural ventilation.

### 3.Loss of aquatic life

Estimated of annual emissions of PO4 kg per m2

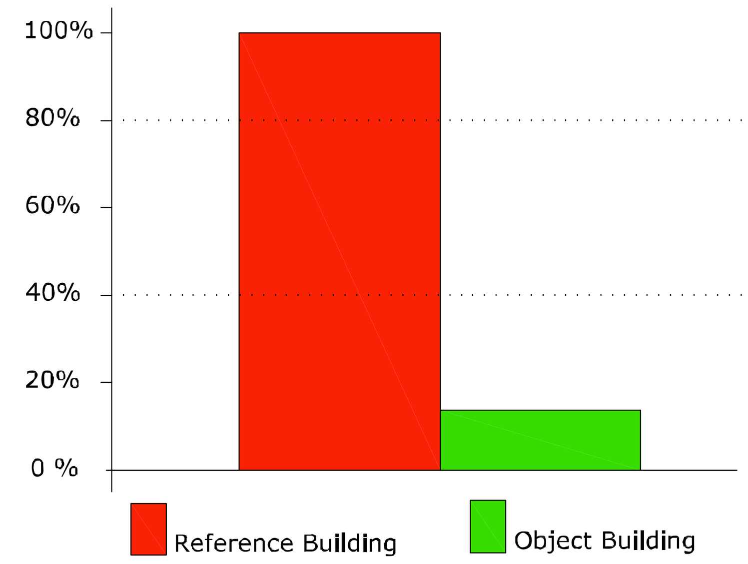



| Criteria | Reference Building | Object Building | Score |
|---|---|---|---|
| Consumption of potable water for occupancy needs | 183 | 98,6 | 3,9 |
| Retention of rainwater for later reuse | 1,67 | 0,75 | 5 |

The systems of storage for later re-use of rain water is integrated in the project, as well as a measures for water consumption reduction

### 7.Comfort and indoor quality

Percentage (%) of confort

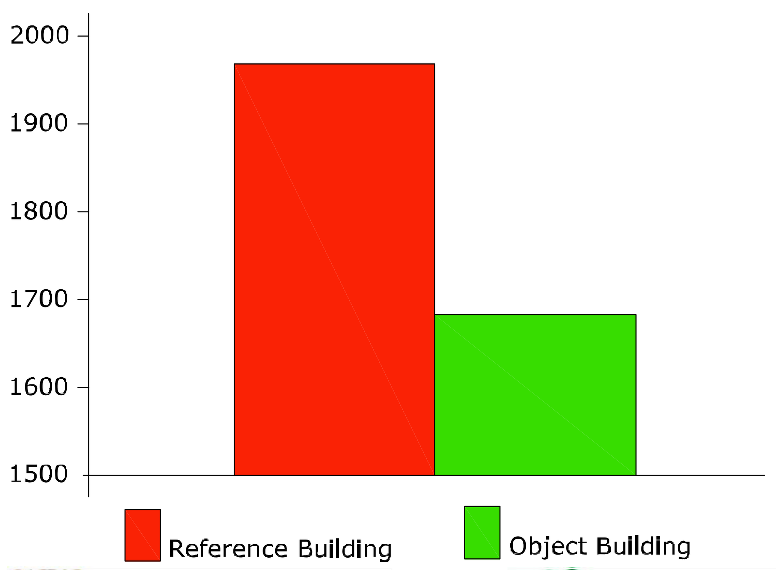



| Criteria | Reference Building | Object Building | Score |
|---|---|---|---|
| Air quality in natural ventilation occupancy | 100% | 25% | 5 |
| Air temperature in natural ventilation | ±3,2ºC | ±2ºC | 5 |
| Daylighting | 1% | 5,8% | 5 |

The aisles are integrated by a green house, to provide passive heat systems and natural lighting, that faces a polygonal courtyard.

### 5. Depletion of row material

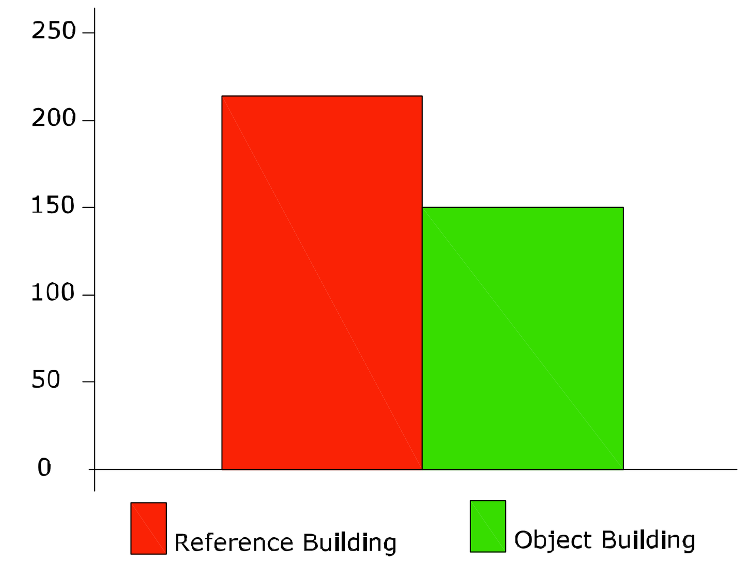
Estimated kg of Sb per m2 year




| Criteria | Reference Building | Object Building | Score |
|---|---|---|---|
| Use of bio-based materials | 0% | 1% | 4,7 |
| Design for disassembly, re-use or recycling | 0% | 1% | 3 |

### 9. Economic and social imbalance

Estimated cost in € per m2 year




| Criteria | Reference Building | Object Building | Score |
|---|---|---|---|
| Costruction cost | 24 | 5,83 | 5 |
| Operating and maintenance cost | 196 | 145 | 2,7 |

The interior spaces design is focused on flexibility and adaptability, as well as architecture improvement and the socialization between tenants.
Related to costs, energy demand and flexibility, the project stands within a favorable range. An integrated energy design has been used.

### RELATIVE IMPACT REDUCTION

| | Weight | Avoided Impact | Residual Impact |
|---|---|---|---|
| Climate change | 25,0% | 2,25 | 2,75 |
| Increase of UV radiation at ground level | 3,0% | 0,00 | 5,00 |
| Loss of aquatic life | 8,0% | 3,36 | 1,64 |
| Loss of fertility | 10,0% | 1,75 | 3,25 |
| Depletion of non-renewable resources | 20,0% | 3,22 | 1,78 |
| Land and water degradation | 10,0% | 1,38 | 3,62 |
| Comfort | 10,0% | 3,35 | 1,65 |
| Health and hygiene | 8,0% | 2,44 | 2,56 |
| Economic and social imbalance | 6,0% | 3,16 | 1,84 |
| Total impact avoided | | **2,51** | **2,49** |

**Result**

The result is calculated for each "impact", and shows the impact avoided, as amelioration from reference building.

Two outputs are presented:

One relative impact avoid based on weight at criteria levels, and the second shows the global impact reduction from reference building.

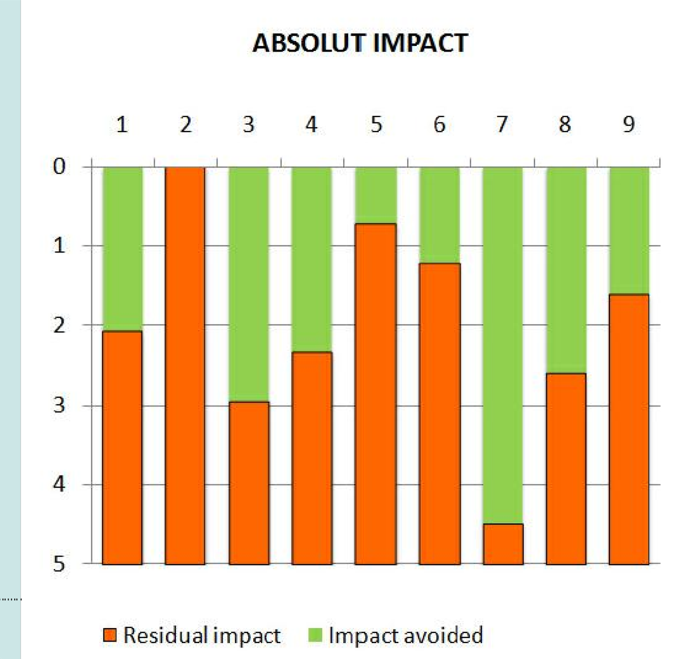
The result are shown as a block diagram, the red block indicates the Residual Impact and the green the Impact Avoided compared to the Reference building.

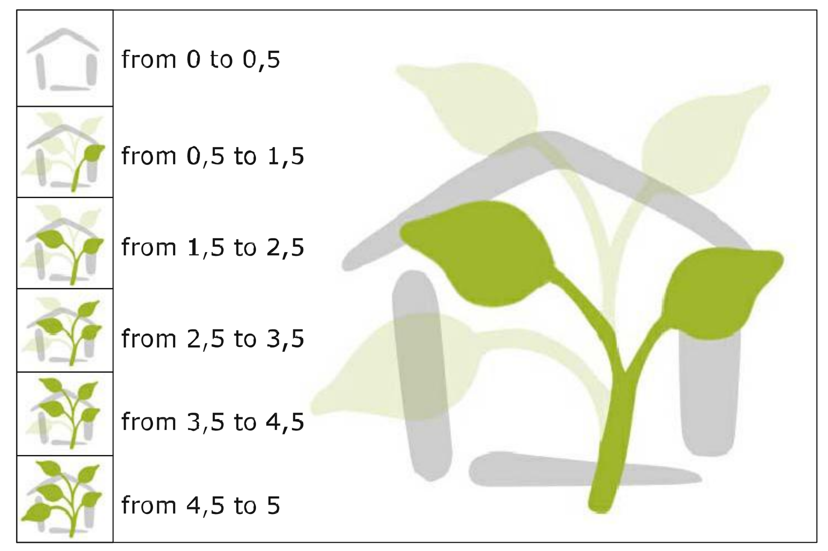
The system can provide annualized estimations of absolute impacts values, such as CO2 emissions due to construction materials and operations, NOx emissions, use of fresh water, costs, etc.

### ABSOLUTE IMPACT REDUCTION

| | | Reference Building | Object Building | % of Absolute Reduction |
|---|---|---|---|---|
| 1 | Net annual GHG emissions from building operations, kg. CO2 equivalent per year | 63,16 | 36,87 | **42%** |
| 2 | Net annual ozone depleting emissions from building operations, kg. CFC-11 equivalent per year | 0,008 | 0,008 | **0%** |
| 3 | Load of chemical nutrient, kg. Of PO4 equivalent per year | 1,57 | 0,65 | **59%** |
| 4 | Net annual acidifying components emissions from building oerations, kg of SO2 equivalent per year | 85,25 | 85,25 | **47%** |
| 5 | Depletion of non-renewable resources | 1969,74 | 1682,27 | **15%** |
| 6 | Net annual hazardous and non hazardous waste to disposal, kg/m2 | 14,41 | 10,90 | **24%** |
| 7 | Comfort conditions, percentage of ammeliorations | | | **90%** |
| 8 | Healt and hygiene, percentage | | | **52%** |
| 9 | Economic and social imbalance EUR per year | 222,16 | 150,69 | **32%** |

**IMPACT AVOID** **2,01**




**Score**

The final building assessment value is expressed as green leafs, from 0 to 5 as a maximum.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