



Development of European Ecolabel Criteria for Buildings

BUILDING LCA

Paolo Neri – LCA-lab Spin-off of ENEA



44 Study Cases of Building LCA

BUILDING RESTRUCTURE

'Corviale' popular building Roma(2 studies)
Slaughter house of Reggio C.
Slaughter house of Spilamberto (Modena)
Buildings by crude earth (Abruzzo)
Working-Class Houses (Messina)
Federico II University (NA)
ENEA Office (Bologna)
Vigo palace (Catania)
Social Center (Catania)
House in Luserna (Torino)

PLANT RESTRUCTURE

Office (Torino and ENEA Bologna)
Plants of 'Villa Monna Tessa' Hospital (Fi)
Plants of 'Corviale' building

BRICK PRODUCTION

Poroton and Poroterm bricks
ANDIL bricks
Floor-tile gres

FIXED AND REMOVAL BUILDING COMPARISON

House for emergencies
Bathing building and 'Trabocco

BUILDING PROJECT

House in Bologna
Center for sale Volkswagen
Kindergarten of Ramacca (Catania) (2 studies)
Student house of Messina University (2 studies)
Great hall of Bologna University
Kindergarten of Castelfranco E. (MO)
Museum of Cosenza
Primary School of S.Giovanni in Persiceto (BO)
House for elderly people (Bari)
Family house for young of Lodi
Working-Class Houses(Roma)
School of Longone Sabino (Rieti)
SICEP Shed (Catania)
Passiv house (Vicenza)

BUILDING LAYERS COMPARISON

External masonry: passiv house
External masonry: comparison with ITACA Protocol
External masonry and roof covering
External masonry of ATER di Rovigo
Windows and doors CORMO (S. Martino, RE)
Cement tiles (APTC, Rovigo)

CITY RESTRUCTURE

Rubattino Quarter (Milano)



The First Case: Project of a Working-Class House

Functional Unit

The building represented by 54 flats of 72 sqm with independent heating during 100 years of life.

System Boundaries

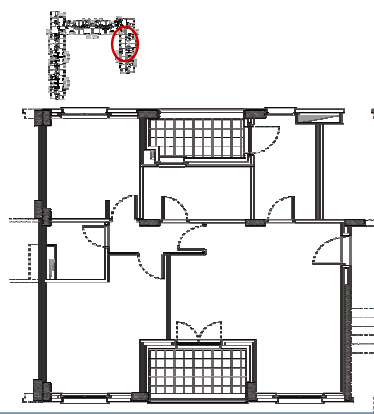
- From resources finding to end of life of building materials.
- Including all materials of building construction with furnitures, electric, thermal and hydraulic plants.
- Including winter and summer energy uses, energy of domestic uses and water use.

Calculation Code

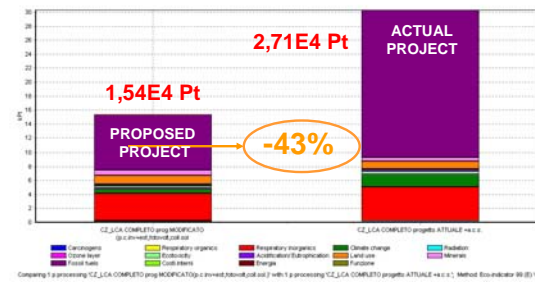
SimaPro

Method

Eco-indicator 99



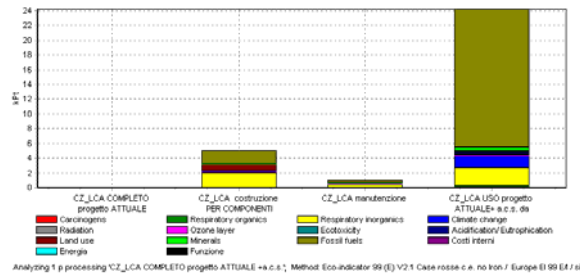
Comparison LCA : actual Project – proposed Project



Reduction of total Damage of 43%
Reduction of 29% in Human Health
Reduction of 59% in Resources



Building LCA of actual Project



Damage of **Construction** and **End of Life**: 17% of total
Damage of **Maintenance**: 3% of total
Damage of **Use Energy**: 80% of total

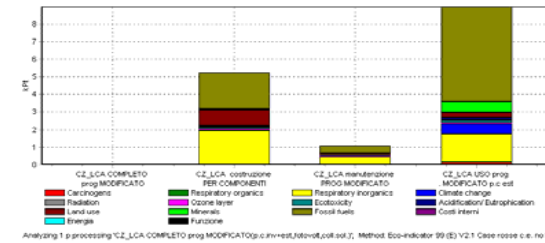
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Building LCA of proposed Project with Reduction of Heat Transmission and Use of photovoltaic and solar Energy



Damage of **Construction** and **End of Life**: 34% of total
Damage of **Maintenance**: 7% of total
Damage of **Use Energy**: 59% of total

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The second Case: Project of a passive House



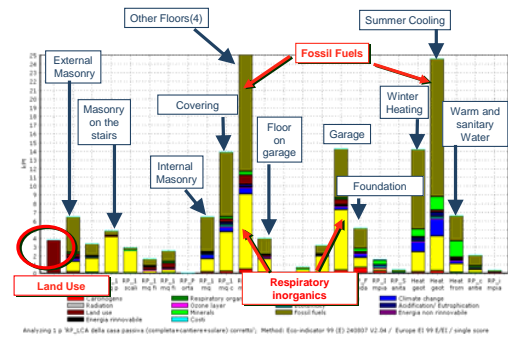
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LCA of a passive House



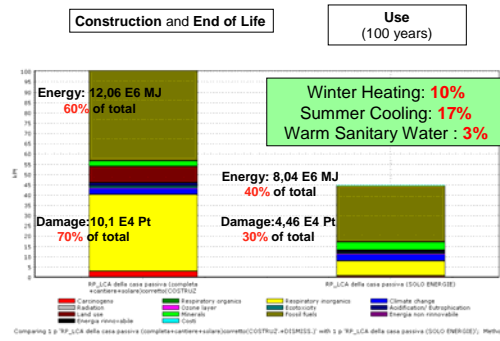
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Comparison among the Life Cycle Phasis



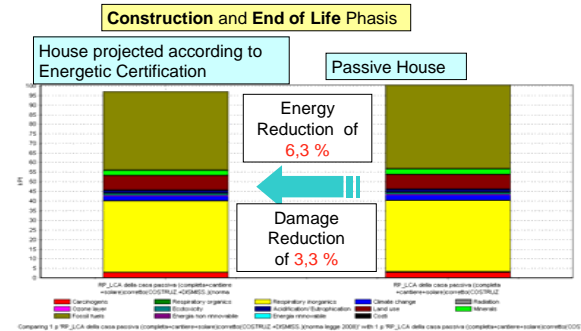
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Comparison between the Passive House and the House projected according to Energetic Certification



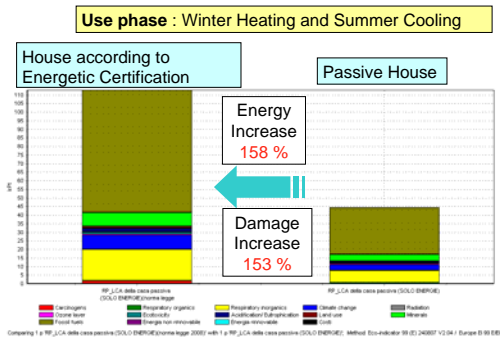
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Comparison between the passive House and the House projected according to Energetic Certification



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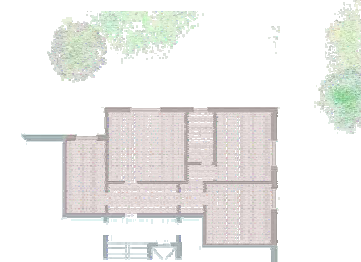
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3rd Case: Building Restructure

A Office Flat of Enea Center

Plan of the Office

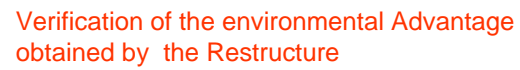


Height: 2.60m
Surface: 100 sqm
Volume: 264 cum
Form Coefficient S/V: 0.38

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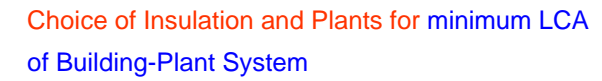


LCA of the actual Building greater than LCA of the restructured Building

LCA [Q₁]_{t₂}+N*LCA Maintenance
[Mat.Building+Plants)]_{t₂} + LCA Yard
[Mat.Building+Plants)]_{t₂}

$$\begin{aligned} & \text{LCA [Q}_2\text{]}t_2 \\ & + \text{LCA [New Mat.Building]}t_2 + \text{LCA} \\ & \text{[NewPlants]}t_2 + \text{LCA} \\ & \text{Maintenance[New(Mat.Building+plant} \\ & \text{s)]}t_2 + \text{LCA Yard} \\ & \text{[New(Mat.Building+Plantst}_2\text{)} \\ & + (\text{N-Nuovi}) * \text{LCA Maintenance} \\ & \text{[(Mat.Building+Plants)]}t_2 \end{aligned}$$

LCA (restructured Building)

Photovoltaic
Plant

Radiant Floor



LCA of the restructured Building

