

Advanced and Sustainable Housing Renovation

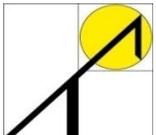


Sustainable vision of housing renovation

SHC Task 37 – subtask D

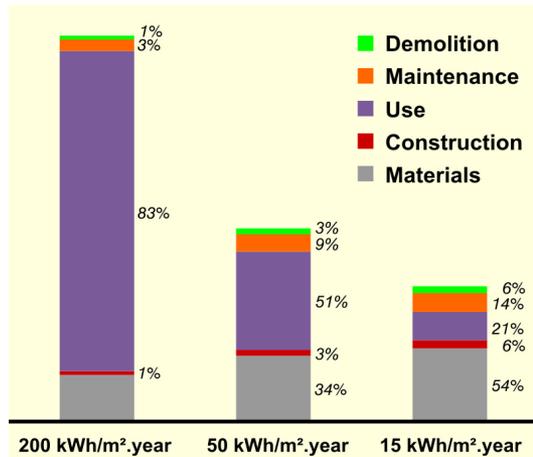
Sophie Trachte
leader subtask D
Belgium

Final task 37 SEMINAR – San Francisco
ENERGY CONSUMPTION IN EXISTING
HOUSING
CAN BE DRAMATICALLY REDUCED



1. What means « sustainable housing renovation

Impacts of the building sector



“A development which meets the needs of the present generations without compromising the capacity of the future generations to answer theirs.”

Brundtland Report, 1987

Impacts of the building sector:

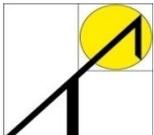
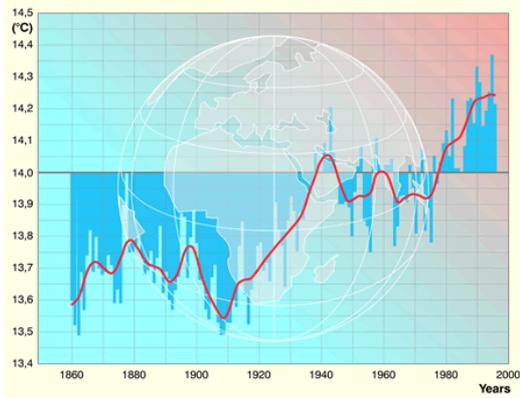
- 50% of natural resources tapping;

- 45% of energies consumption

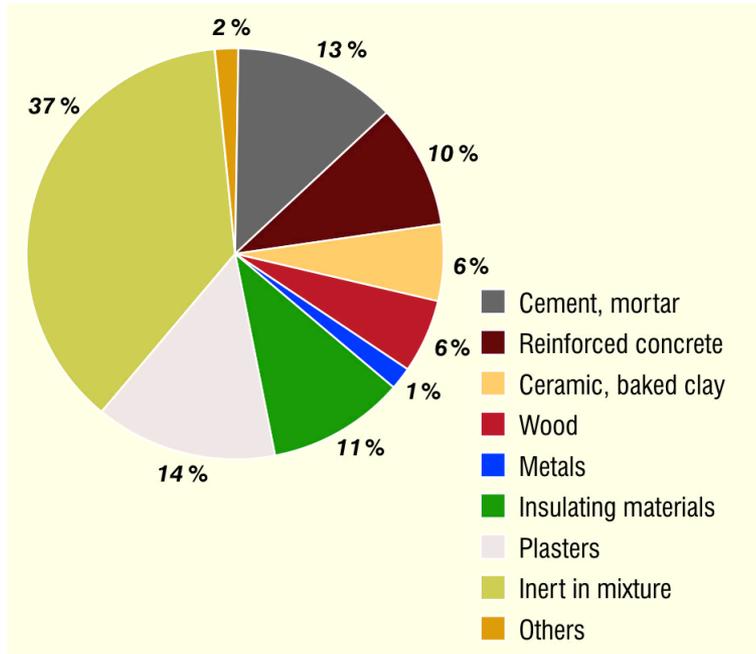
- 40% of produced waste ;

- 30% of greenhouse gas emissions

- 16% of drinkable water consumption



1. What means « sustainable housing renovation Impacts of the building sector



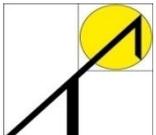
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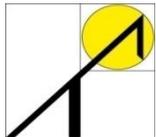
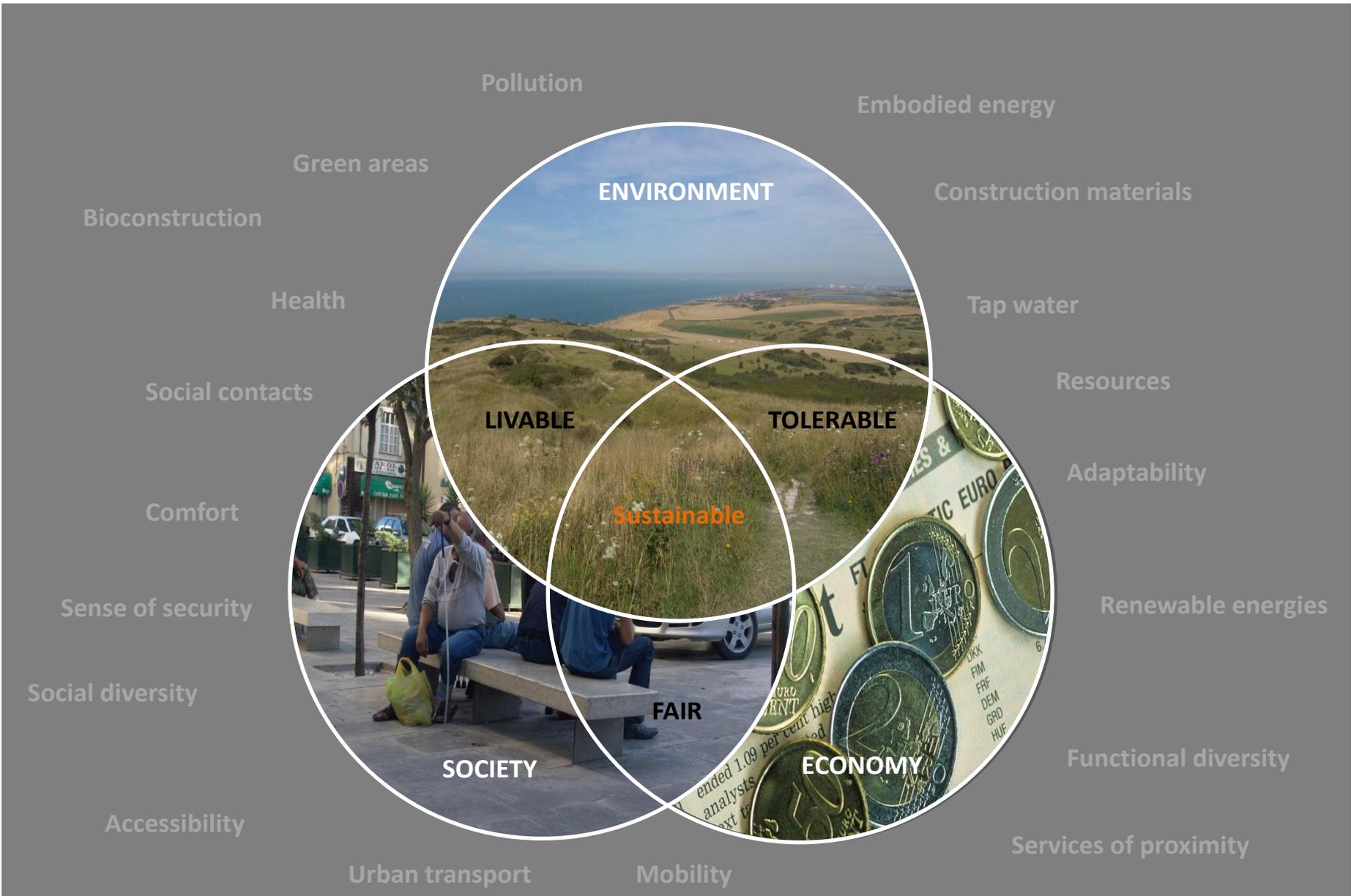
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Impacts of the building sector

- 50% of natural resources tapping;
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1. What means « sustainable housing renovation Sustainable housing renovation = Work in globality

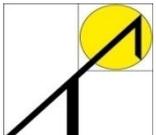
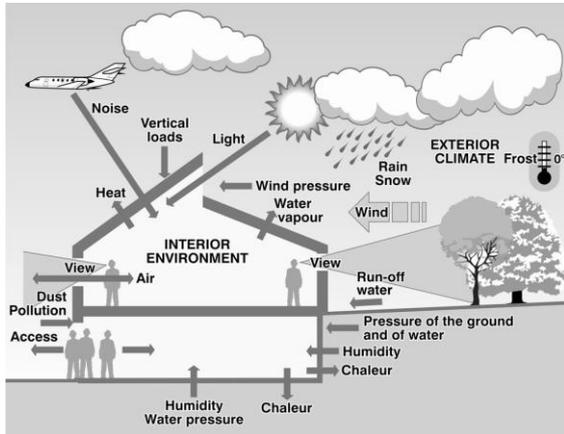
On the basis of the Rio Declaration and the 27 principles defining the concept of sustainable development, we can define a sustainable building or housing as a building which has **all usual qualities of a traditional building (technical, architecture, functionality, use, performances,...)** but with conditions such as its **environmental impacts are minimized on the long term**



on all scales: since the indoor spaces atmosphere to the scale of the planet, with going through the neighborhood



at all time: since raw materials extraction for the production or renovation to the demolition



2. Sustainable housing renovation

5 principles of Rio Declaration



1. Integration of ecological, economical, social and political dimensions

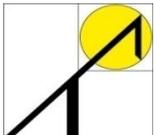
Sustainable architecture is an architecture which takes account of the context in which it fits and which makes take part this context throughout the process of design and construction



What can the existing urban environment bring to the project?



Which is the contribution of the project to the development of the existing urban environment?

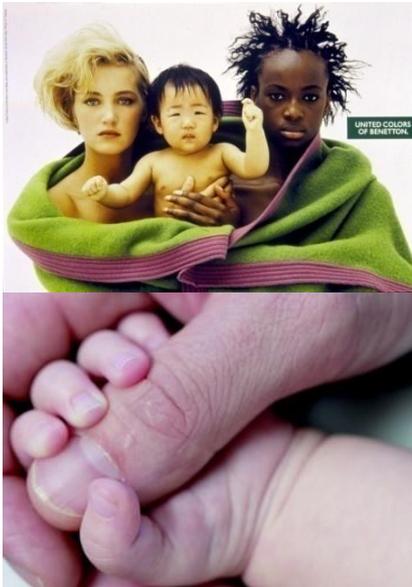


2. Sustainable housing renovation

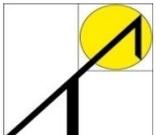
5 principles of Rio Declaration

2. The intra and inter generational equity

A sustainable and advanced housing renovation is a renovation which will take into account the needs for habitability of today, while having the capacity to satisfy the needs for the future and that without generating major harmful effects for the present and future generations.



- ➔ Flexibility and adaptation to the needs (long-life – loose fit principle)
- ➔ Capacity of construction waste to be re-used or recycled (waste management)



2. Sustainable housing renovation

5 principles of Rio Declaration



3. Principle of precaution

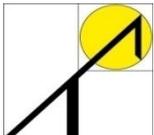
A sustainable and advanced housing renovation is a renovation which will limit the risks

as well to the level of the health of the workers and the users as on the level of the total environment

by taking account of the different phases of the life of a housing: materials production, construction, life in use and end of life as waste.

➔ Choice of construction materials

➔ Security on building site



2. Sustainable housing renovation

5 principles of Rio Declaration

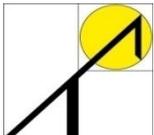


4. Principle of collective responsibility

A sustainable and advanced housing renovation is a renovation which will take account of four dimensions referred to above, by taking account of the present needs and to come, and that on the different phases of the project (design, construction, use and end of lifetime).

A responsible designer is a designer which also will limit the impacts of its project, so much on the level of the immediate environment (biodiversity, water resources...) that on the level of the general environment (power consumption, emission of pollutants...)

- ➔ Energy consumption
- ➔ Water consumption
- ➔ Spaces and materials consumption
- ➔ Air, ground and water pollution



2. Sustainable housing renovation

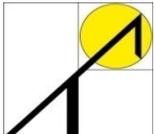
5 principles of Rio Declaration



5. Principle of participation

A sustainable renovation cannot function without the awareness and the active participation of its occupants

- ➔ Appropriation of the building by the occupants
- ➔ Implication of the inhabitants in the process of construction/renovation
- ➔ Responsibility of the users or the inhabitants in the use of the building



3. Sustainable housing renovation

6 OBJECTIVES for housing renovation

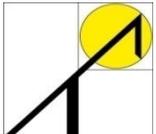


“A development which meets the needs of the present generations without compromising the capacity of the future generations to answer theirs.”

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Impacts of the building sector:

- 50% of natural resources tapping;
- 45% of energies consumption
- 40% of produced waste ;
- 30% of greenhouse gas emissions
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3. Sustainable housing renovation

6 OBJECTIVES for housing renovation



A. INCREASE THE QUALITY OF LIFE

Increase comfort of outdoor spaces



Work on outdoor and collective spaces

Increase social contacts and relations

Increase pedestrian and cycle movings

Favour and introduce biodiversity

Increase comfort of indoor spaces



Work on indoor air quality

Limit the indoor pollution

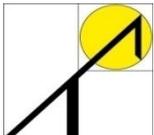
Optimize the ventilation system



Work on acoustical comfort

Acoustical insulation and correction principles

Optimize acoustical comfort



3. Sustainable housing renovation

6 OBJECTIVES for housing renovation

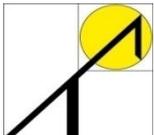
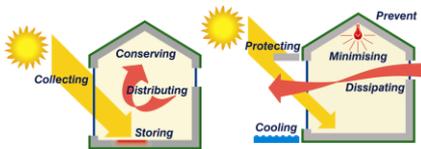
B. REDUCE CONSUMPTION OF FOSSIL ENERGY

Save ENERGY

- Energy in building use
- Embodied energy (production, implementation, demolition, transport)
- Energy for transport

Consume LESS, BETTER, DIFFERENTLY

- ➔ Selecting building materials
- ➔ Work on thermal performances and comfort of housing
- ➔ Work on systems efficiency
- ➔ Use renewable energies
- ➔ Favour soft mobility and urban transport



3. Sustainable housing renovation

6 OBJECTIVES for housing renovation



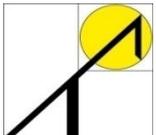
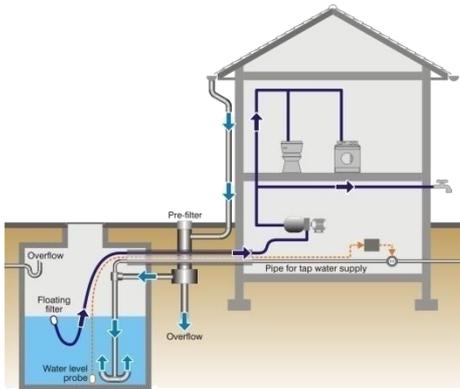
C. REDUCE WATER CONSUMPTION

Save Water

- Tap water in the building use
- Use of rainwater (if it's possible)

Consume LESS, BETTER, DIFFERENTLY

- ➔ Limiting water leakages on the network
- ➔ Use efficient appliances (tap, valves, flush system, shower)
- ➔ Use rainwater



3. Sustainable housing renovation

6 OBJECTIVES for housing renovation

D. INCREASE WATER RESOURCES IN THE GROUND

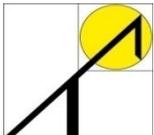
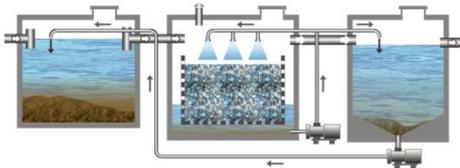
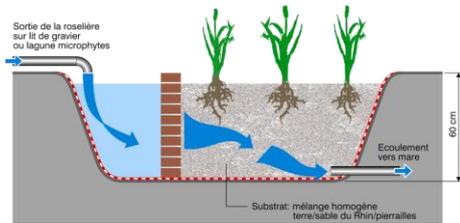
Increase the WATER RESOURCES in the GROUND

➔ Work on rainwater infiltration and retention

RECYCLING the WASTE water (used in the housing)

➔ Extensive systems for water recycling (plants)

➔ Intensive systems for water recycling (urban area)



3. Sustainable housing renovation

6 OBJECTIVES for housing renovation



E. REDUCE WASTE PRODUCTION

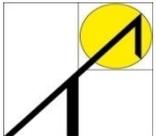
Reduce and manage CONSTRUCTION WASTE

- ➔ Preventive measures to reduce waste (design phase)
- ➔ Waste management on building site

Reduce and manage DOMESTIC WASTE

- Offer comfortable spaces of sorting and storage
- For housing and outdoor areas

- ➔ Preventive measures to reduce waste



3. Sustainable housing renovation

6 OBJECTIVES for housing renovation



F. REDUCE SPACES AND RESOURCES CONSUMPTION

Save ground areas, green spaces, virgin spaces

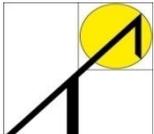
- Raw material
- Biodiversity
- Water resources (water tables)
- Urban network

Rational use of ground

- Preserving the existing biodiversity
- Increasing greens spaces and playgrounds
- Increasing water resources in the ground

➔ Reduce embodied energy consumption

➔ Construction materials



4. Advanced and sustainable housing renovation

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A. INCREASE THE COMFORT OF LIFE

A.1. Outdoor and collective spaces

A.2. Quality of indoor air

A.3. Acoustic comfort

B. REDUCE THE ENERGY CONSUMPTION

B.1. Increase the thermal performances of housing

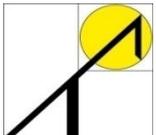
B.2. Reduce fossil energies consumption

B. REDUCE TAPWATER CONSUMPTION

C. INCREASE THE WATER RESOURCES

D. REDUCE PRODUCTION OF WASTE

E. REDUCE CONSUMPTION OF TERRITORY AND RESOURCES



4. Advanced and sustainable housing renovation

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A. INCREASE THE COMFORT OF LIFE

A.1. Outdoor and collective spaces

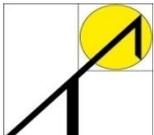
- sheet A10: Favour social interactions
- sheet A11: Favour soft mobility
- sheet A12 : Favour and reintroduce biodiversity

A.2. Quality of indoor air

- sheet A20: Limiting the indoor air pollution
- sheet A21: Optimizing the ventilation system

A.3. Acoustic comfort

- sheet A30 : Basics notions
- sheet A31 : Principles of acoustic insulation
- sheet A32 : Optimizing the acoustic comfort



4. Advanced and sustainable housing renovation

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B. REDUCE ENERGY CONSUMPTION

B.1. Increase the thermal performances of housing

- sheet B10: Optimizing the external walls performance
- sheet B11: Optimizing the orientation and the volume
- sheet B12 : Additional insulation in housing renovation
- sheet B13: Improving the air tightness
- sheet B14: Reducing thermal bridges
- sheet B15: Thermal inertia in housing renovation
- sheet B16: Optimizing the solar protections
- sheet B17: Natural nightcooling
- sheet B18: Optimizing the window conception
- sheet B19: “Passivhaus” standard in housing renovation

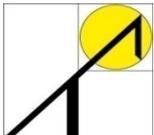
B. REDUCE ENERGY CONSUMPTION



B.1. INCREASE THE THERMAL PERFORMANCES OF HOUSING



B.2. REDUCE FOSSIL ENERGIES CONSUMPTION



4. Advanced and sustainable housing renovation

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B. REDUCE ENERGY CONSUMPTION

B.2. Reduce fossil energies consumption

- sheet B20: Optimizing the heating system
- sheet B21: Optimizing domestic hot water
- sheet B22 : Heat pump for heating production
- sheet B23: Hot water production by solar energy
- sheet B24: Optimizing the lighting system
- sheet B25: Renewable energies for generating electricity
- sheet B26: Heat recovery on ventilation system
- sheet B27: Air pre-heating by airground exchanger

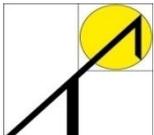
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B.2. REDUCE FOSSIL ENERGIES CONSUMPTION



4. Advanced and sustainable housing renovation

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C. REDUCE TAP WATER CONSUMPTION

sheet C01:

Rational use of tap water

sheet C02:

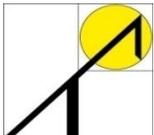
Recovery and use of rainwater

C. REDUCE TAP WATER CONSUMPTION



C01 - Rational use of tap water
C02 - Recovery and use of rainwater

Picture from Sophie Pascher



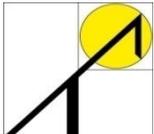
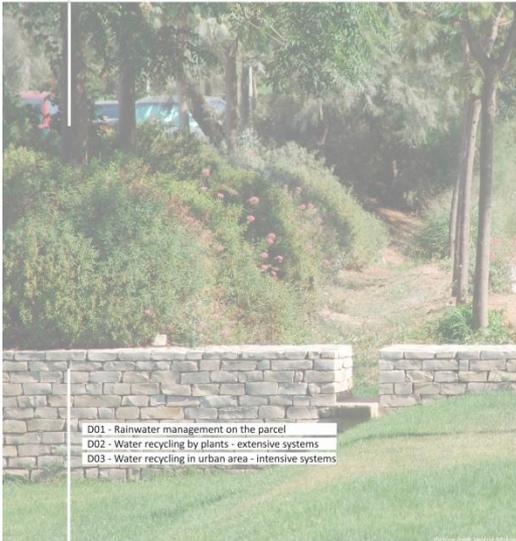
4. Advanced and sustainable housing renovation

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D. INCREASE THE WATER RESOURCES

- sheet D01: Rainwater management on the parcel
- sheet D02: Water recycling by plants
- sheet D03: Water recycling in urban area

D. INCREASE THE WATER RESOURCES



4. Advanced and sustainable housing renovation

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E. REDUCE THE PRODUCTION OF WASTE

E.1. Reduce construction and demolition waste

sheet E10: Preventives measures

sheet E11: Waste management on building site

E.2. Reduce and manage domestic waste

sheet E20: Preventives measures

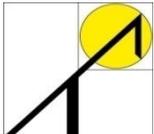
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E.1. REDUCE CONSTRUCTION AND DEMOLITION WASTE



E.2. REDUCE DOMESTIC WASTE



4. Advanced and sustainable housing renovation

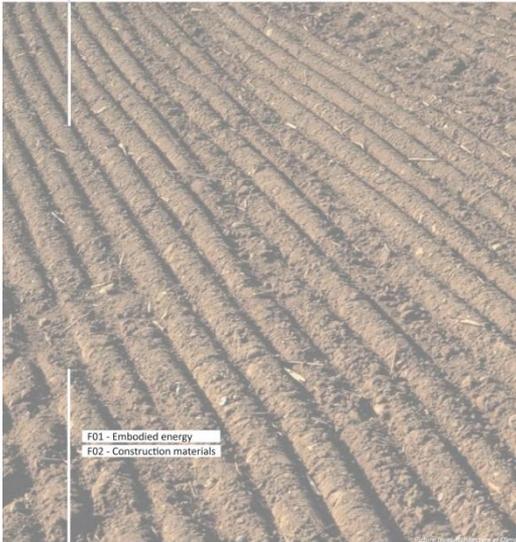
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F. REDUCE CONSUMPTION OF TERRITORY AND RESOURCES

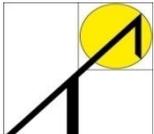
sheet F01: Embodied energy

sheet F02: Construction materials

F. REDUCE CONSUMPTION OF TERRITORY AND RESOURCES



F01 - Embodied energy
F02 - Construction materials



Thank you for your attention

Architecture et Climat
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<http://www-climat.arch.ucl.ac.be>
www.plea2011.be

