

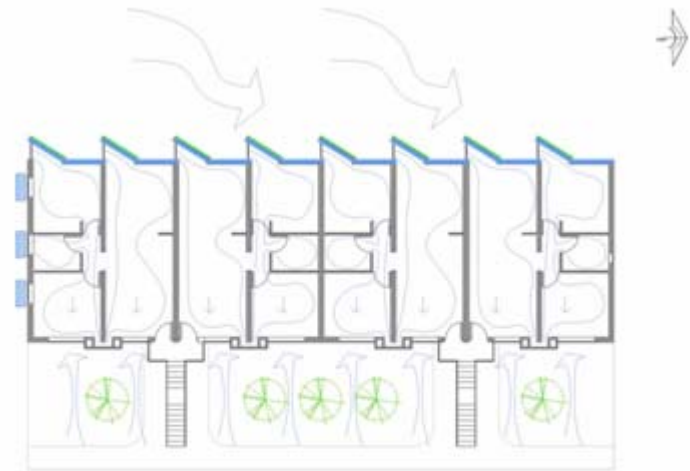
# LCA as a tool to Identify the Advantages of Bioclimatic Architecture



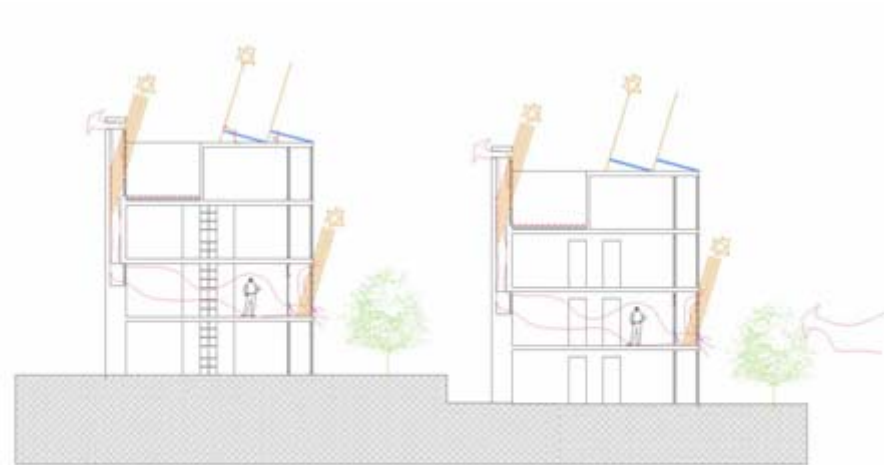
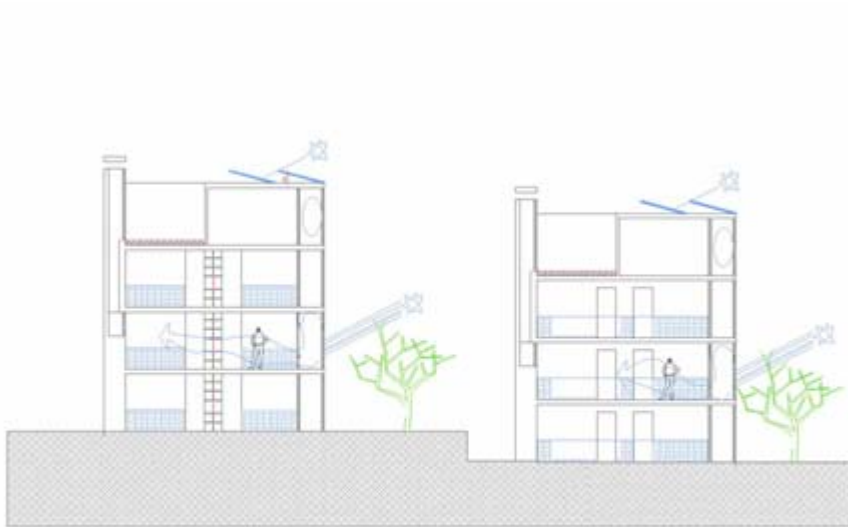
Rivela, B and Bedoya, C



- 01** Short Introduction
- 02** Goal and scope
- 03** Life Cycle Inventory
- 04** Impact Assessment
- 05** Conclusions



# 01. Short Introduction



## Why Construction?

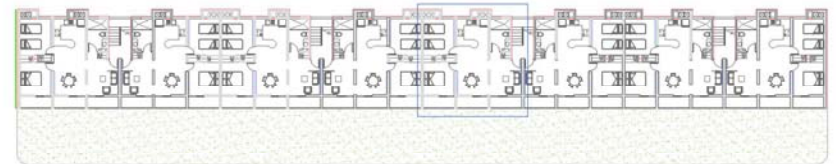
**50%** of all materials extracted from the earth's crust

**40%** of all energy end use

(similar percentage of greenhouse gas emissions)



**40-50%** of waste



**28.1%** of industrial employment

(7.5% of total employment)

## Sustainable Construction?

Sustainable

Ecological

Organic

Green

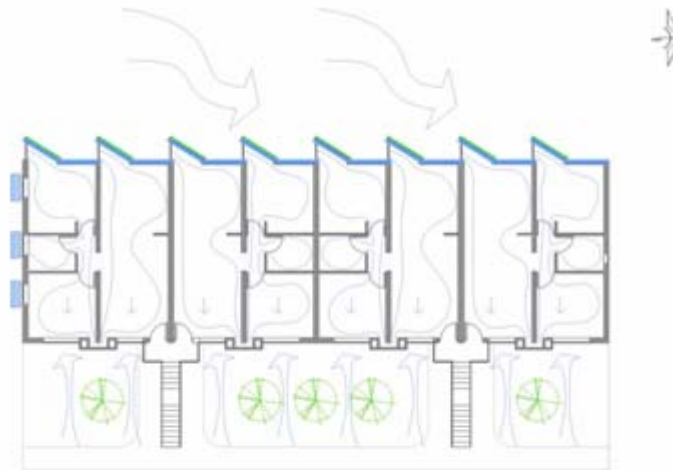


Tradition vs. Technology

Vernacular architecture

Technological imperative

## 01 Bioclimatic architecture

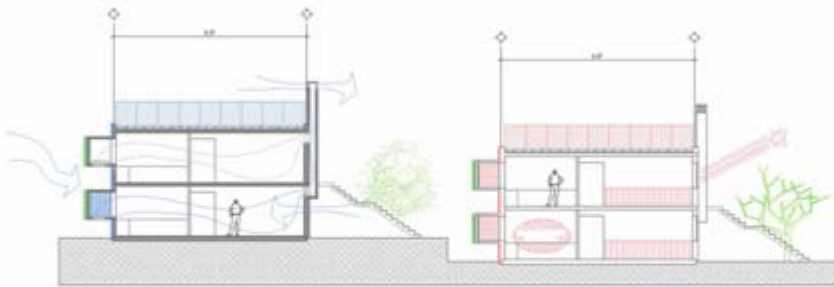


...working with natural forces around the building rather than against them.

climate

energy

## 02. Goal and Scope



# Goal & Scope <sup>(I)</sup>

## 01 Objective

Assess the importance of bioclimatic design related to the environmental impact of the entire life cycle of building

### 01.1 Relative contribution of different materials

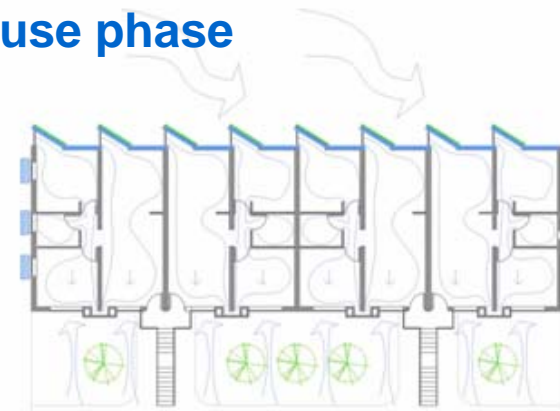
including the production and manufacturing of construction materials involved as well as the process of the envelope construction

### 01.2 Comparative analysis of construction vs. use phase

## 02 Functional unit

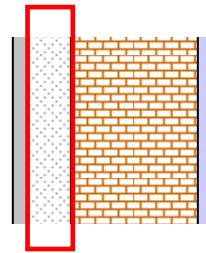


150 m<sup>2</sup>



## 03 Scenarios under study

### 3.1 Envelope A



**Outdoor**

Exterior rendering (2 cm)



Wood-fibre insulation (6 cm)

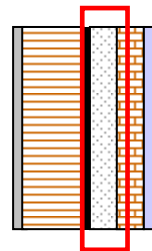


Brick (24 cm)



Plastering (1.5 cm)

### 3.2 Envelope B



Exterior rendering (2 cm)



Brick (12 cm)



Rendering (1 cm)



Polyurethane Insulation (4 cm)



Brick (5 cm)



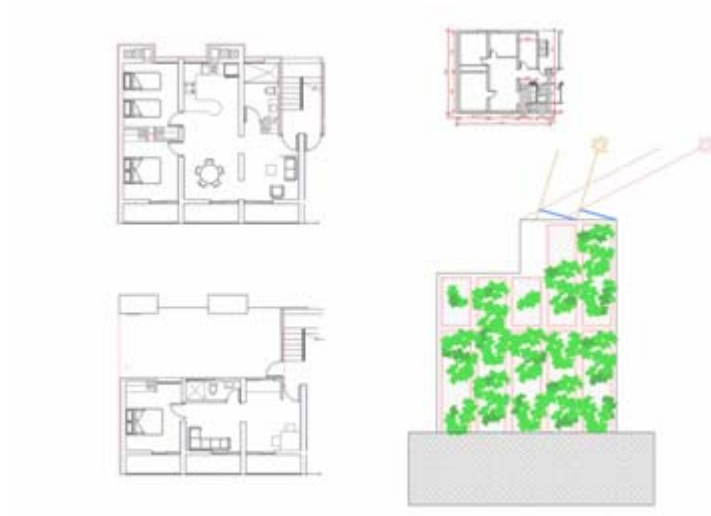
Plastering (1.5 cm)

**Indoor**

**Outdoor**

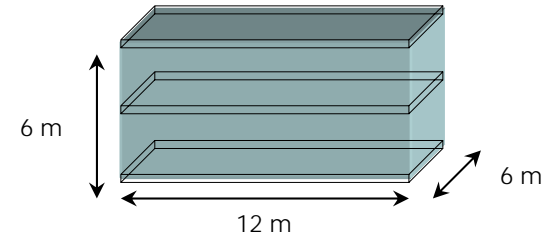
**Indoor**

## 03. Life Cycle Inventory



## 01 Construction materials

## 02 Energy use

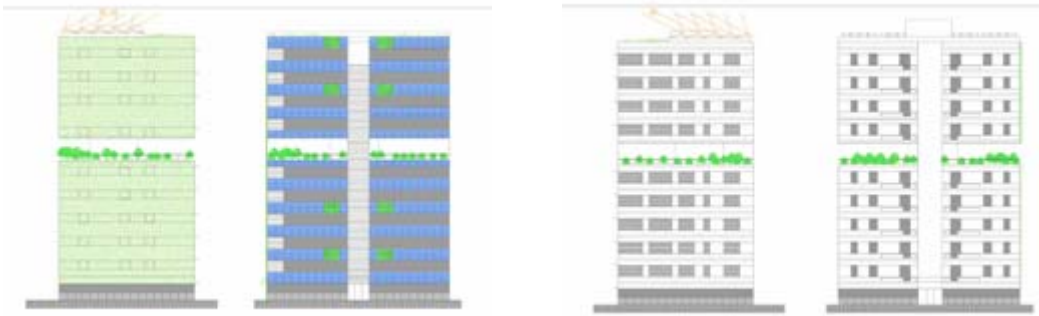


Envelope	Winter (kWh)			Summer (kWh)		
	San Sebastian	Madrid	Seville	San Sebastian	Madrid	Seville
A	239,805	226,665	200,385	42,705	45,990	49,275
B	640,575	558,450	440,190	279,225	374,490	436,905

✓ Operations phase activities considered include **heating, cooling** and **ventilating** the building.

✓ **Lighting, water supply** and **water heating** were leaved out

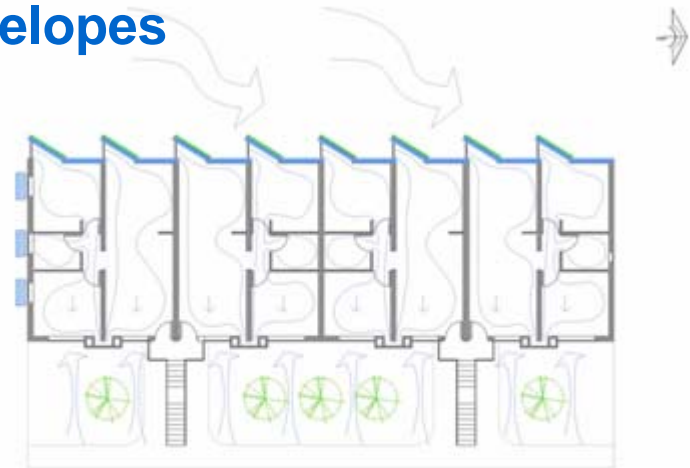
## 04. Impact Assessment



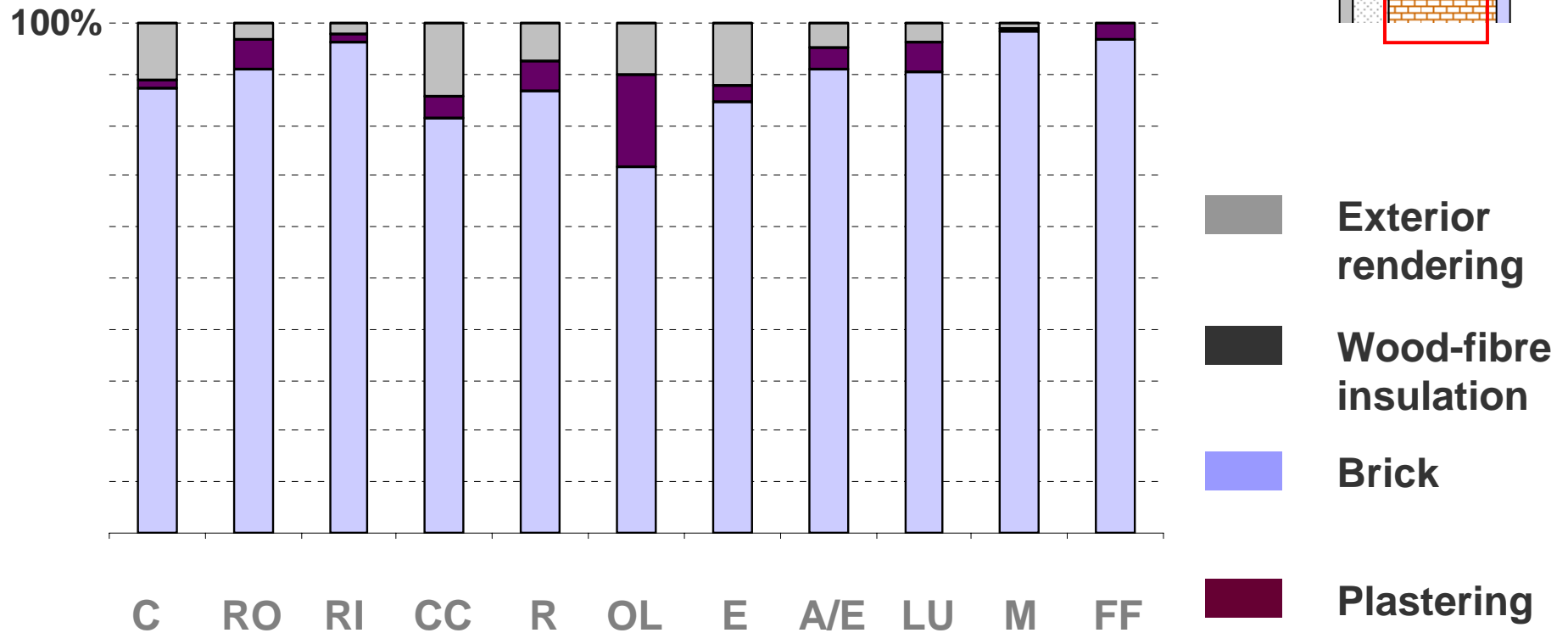
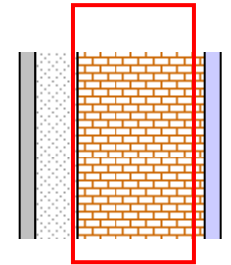
**01** Relative importance of materials

**02** Relative importance of construction vs. use phase

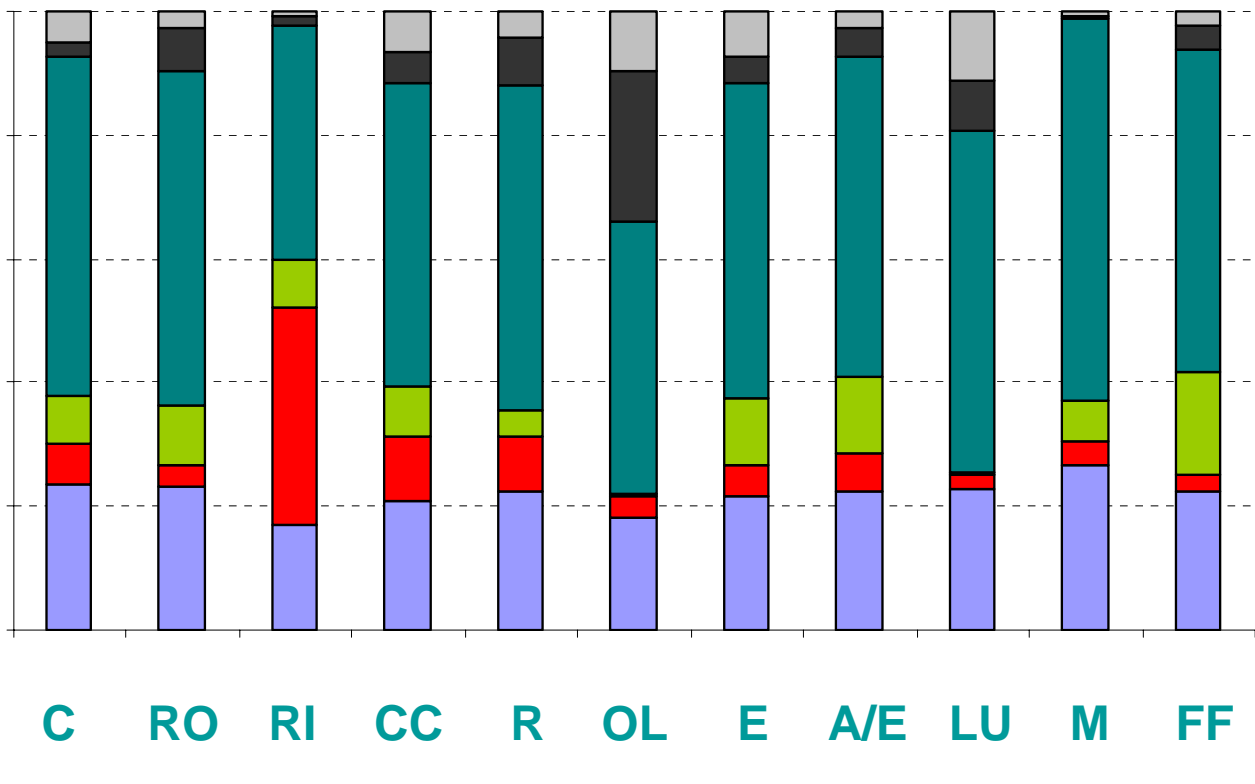
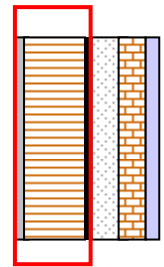
**03** Comparative assessment of envelopes



## 01 Relative importance of materials: envelope A

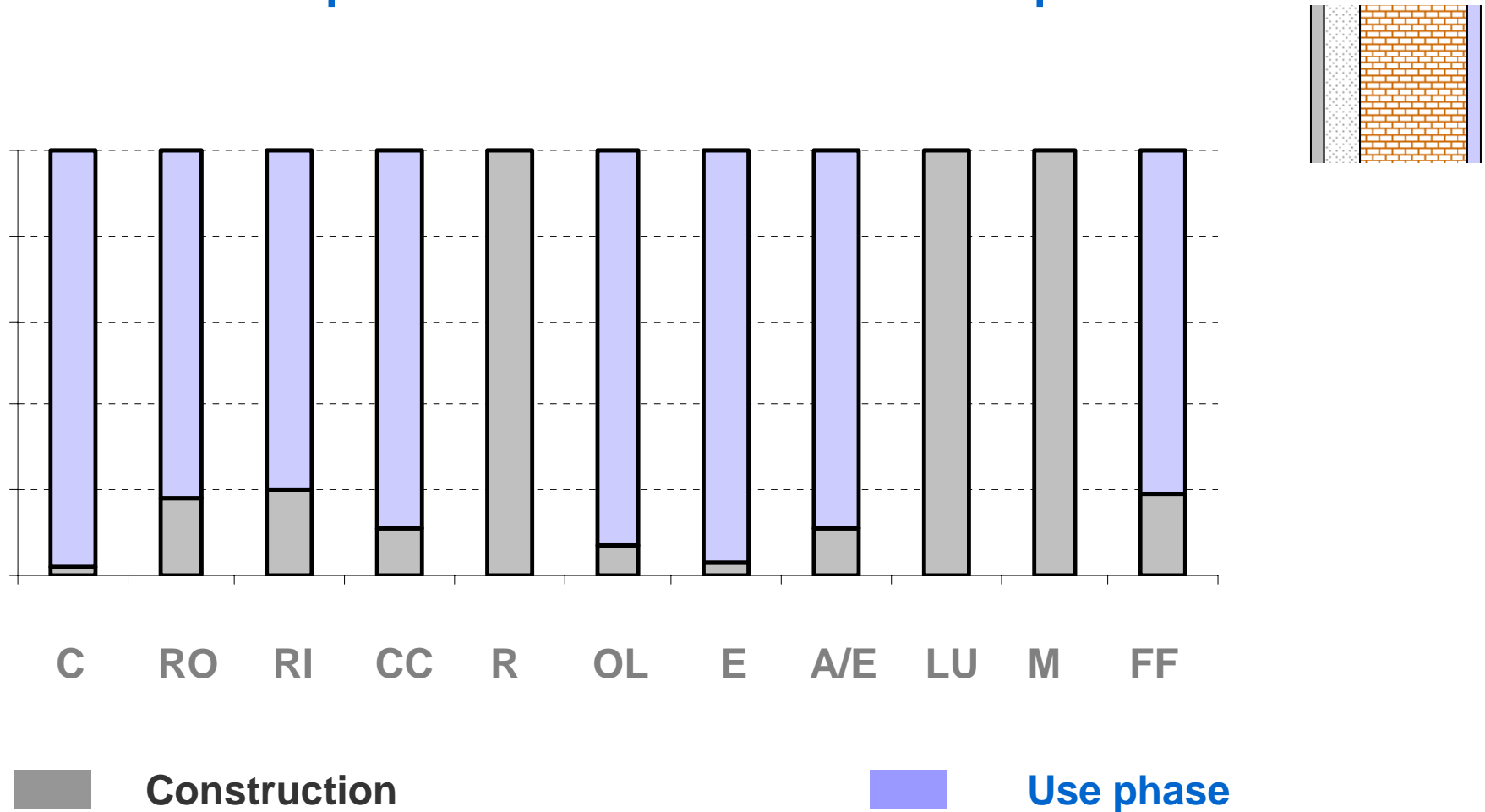


## 01 Relative importance of materials: envelope B

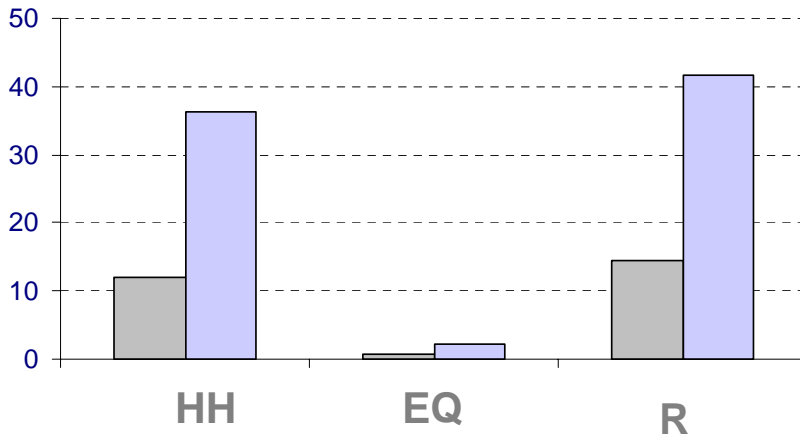
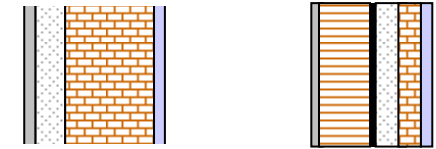
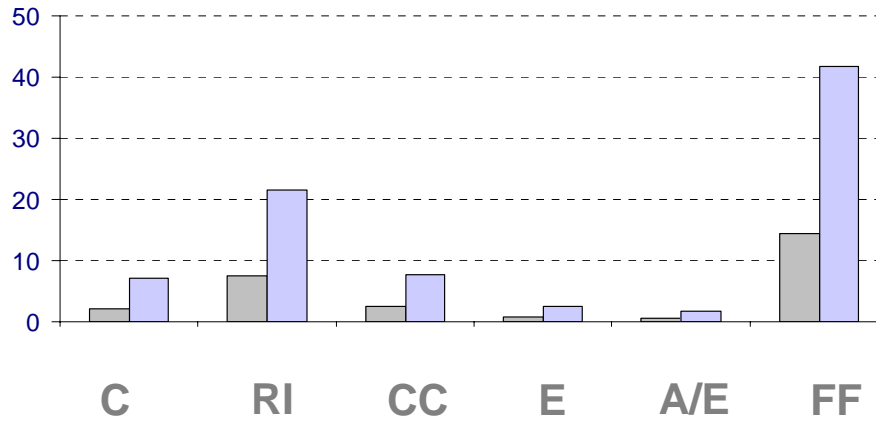


- Exterior rendering
- Brick (12 cm)
- Polyurethane
- Rendering
- Brick (5 cm)
- Plastering

## 02 Relative importance of construction vs. use phase



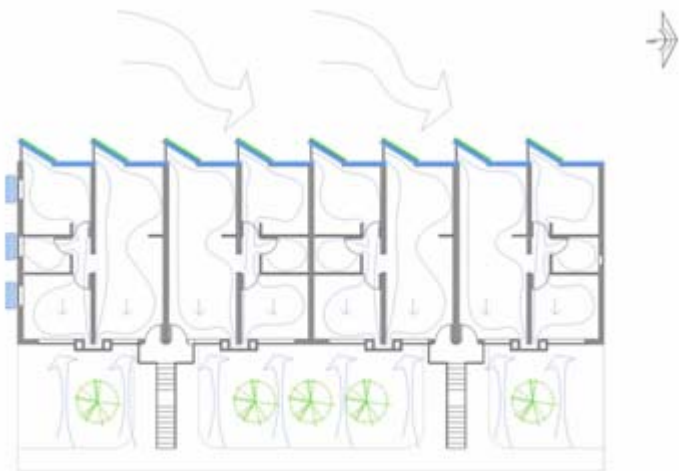
## 03 Comparative assessment of envelopes



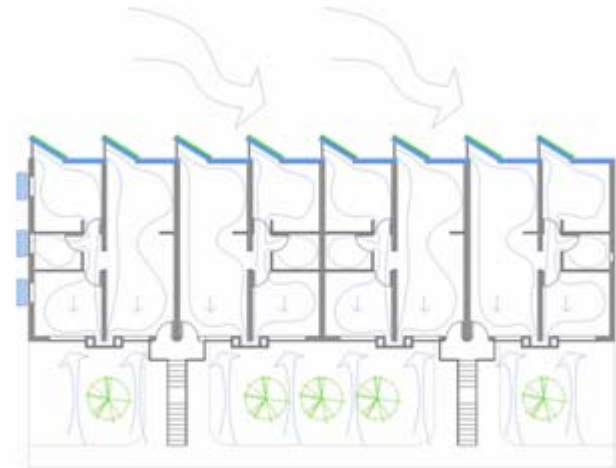
 **Envelope A**

 **Envelope B**

## 05. Conclusions



- 01 Bioclimatic strategies are ease of application with minimum additional investments, and provide a large reduction of the environmental impacts**
- 02 The use phase is of major importance in the scenarios analysed**
- 03 Further research must be done...**



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