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Resource efficiency -
The example of the "Cité de l'Environnement"

October 16th, Brussels, Belgium
Presented by: Thierry Roche

pôle innovations constructives

ONLYLYON

ATELIER ROCHE
ARCHITECTES & URBANISTES ASSOCIÉS

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Agenda

- Background
- The project
- The governance

The quest of performance!

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Saint-Pierre-La-Palud, France :
110 houses
Minergie® standard

The « Cité de l'Environnement », Lyon, France :
Positive Energy offices building (all uses)

« Zac de Bonne » in Grenoble, France :
Progr. Concerto
70 flats
Heat consumption: <50kw/h/m²/an

Engineering school of « Ponts et Chaussées » ParisTech, France:
Positive Energy building (all uses)

Hauts de Feuilly, France :
31 town houses
Passivhaus Status

Modulife Constructive process Passiv Status « cqfd » (cost quality time functionality)

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The quest of performance

- In arts, a « **performance** » means primarly an ephemeral art, that leaves behind it little to last,…
- In sports, a «**performance** »is part of achieving a goal that only leaves memories,…
- But « **thermal performance**» : what does it leave behind?

Genesis

The "Cité de l'Environnement" is the result of **a project initiated in 2005 by the POLE SOLERE**, a group of experts in the environmental quality of buildings.

At the turn of the century, the group was eager to **rethink the relationships,** in a sustainable way**, between humans regarding their environment through building construction and the way of living within buildings**.

The "Cité" is born from this idea of "building together" an **innovative showcase** based on the know-how of responsible builders and contractors.

The community centre named « Pôle SOLERE » (Renewable Energy and Environmental Solutions),

Founders of the « Cité de l'Environnement »

Founding members

- MCP Ingénierie, Atelier Thierry Roche, Atelier LD, Bastide Bondoux

Associate members

- Tribu, Enertech, Medieco, Betrec

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A center of excellence dedicated to environmental technologies

The "Cité de l'Environnement" is a **bioclimatic offices building**, which produces energy, brings together planners, architects, consultants, all of them recognized professionals in environmental quality of urban planning.

28 companies, 225 employees…
Areas of expertise:

- Engineering
- Training
- Real Estate

Beyond its exemplary environmental quality, the building was designed to **promote exchanges between its occupants** and create a true "Cité de l'Environnement"'s state of mind.

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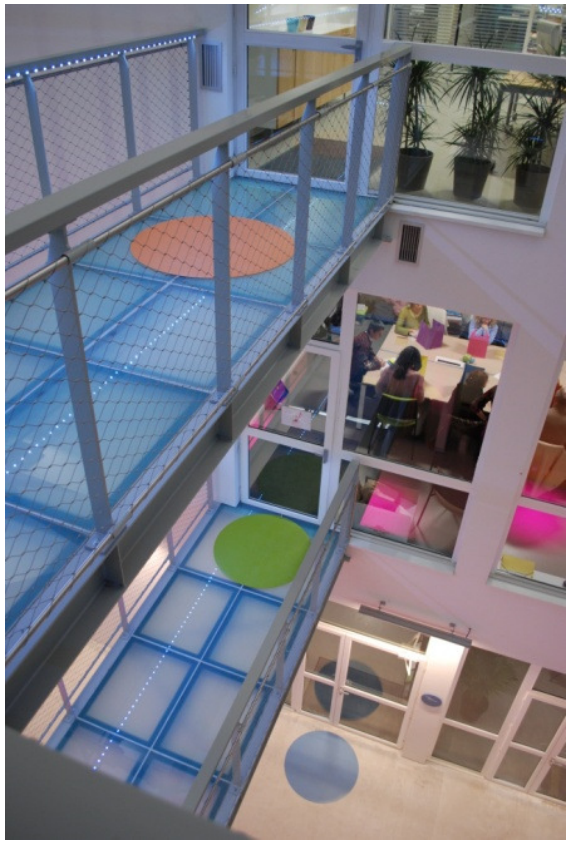
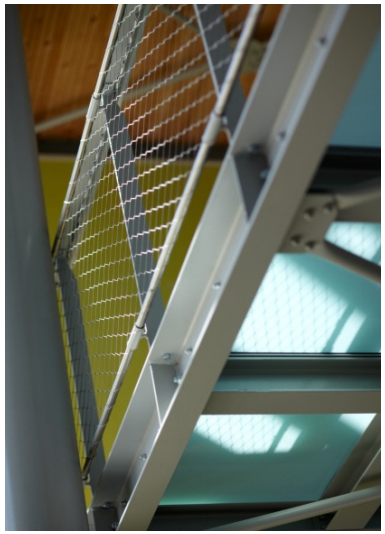
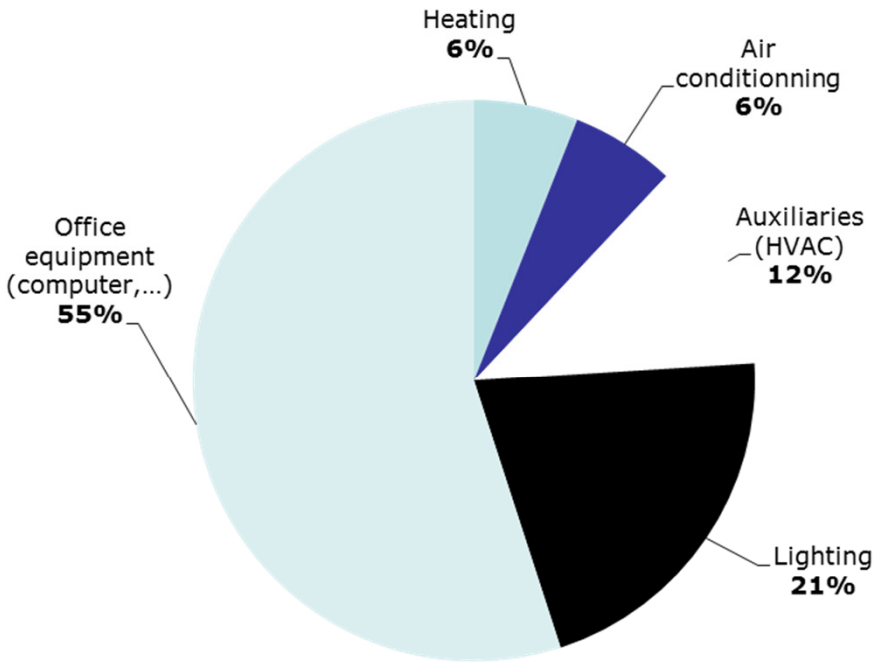
A successful building





A global vision of the environment



Energy consumption

- **A strategy on energy**

  On 4 topics:
  - "Passivhaus" labelization, with a heating demand < 15kWh/m²/an (CG67: 144kWh/m²/an)
  - Implementation of energy efficient equipment,
  - Monitoring the consumption of "specific energy",
  - Energy production exceeds consumption

- **A healthy approach**

  On 3 areas:
  - Air quality(ventilation),
  - Low VOC materials, elimination of formaldehyde,
  - Quality of lighting scenes, sound and color.

- **A creative and rational building management**
  - Water management: rainwater for garden and toilets (waterless urinals)
  - Sharing spaces or amenities
  - Establishment of a governance for management and decision making

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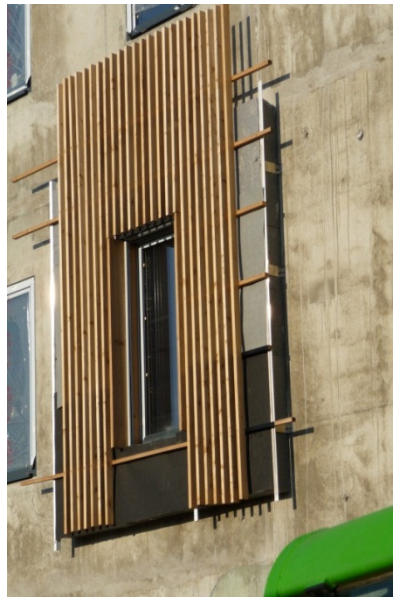
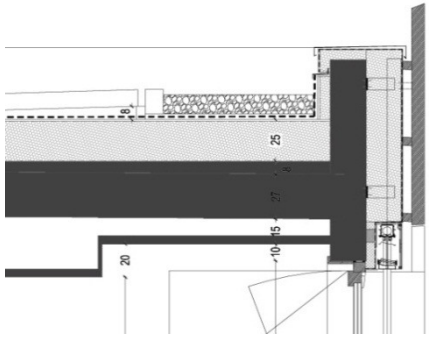
The Envelope

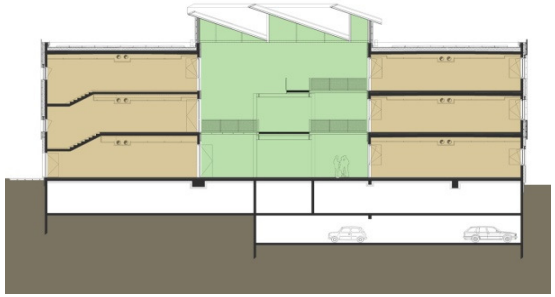
- **Optimization of the envelope, orientations and glass surfaces**
- **Atrium treated as a thermal "buffer" space (unheated)**
- **Choice of performance materials and glass**



Solutions for insulation:

- EXTERNAL insulation: expanded polystyrene 200 mm
- ATRIUM - internal insulation: mineral wool 40 mm
- OFFICES ROOF: 2 layers of polyurethane foam 120mm or 240 mm. A thickness of 40 mm of asphalt perlite to support the complex
- ATRIUM ROOF: 2 layers of 90 mm or 180 mm of mineral wool
- BASEMENT : projection of rock wool on the underside thickness 140 mm





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The Equipment

Heating system

- Reversible **heat pump - brine/water** (87 kW) with horizontal geothermal sensors, feeding a low temperature floor :
  - Surface geothermal horizontal: network cross linked polyethylene tubes, 1700 m² on 2 sheets of sensors (-60 et -120 cm)
  - Performance of heating network (COP winter = 5,2, summer = 5,8)
- **Over insulation of heating systems**
- Flow circulation with variable speed
- Management by GTB

Ventilation

- Offices: **dual-flow ventilation system** with:
  - Heat recovery from exhaust air by high-efficiency rotary heat exchanger (heat exchanger efficiency of 80%)
  - Speed variation
  - High level of filtration (G4 and F7 at blowing, F7 on return)
  - Pre-heating of fresh air by water coil (blowing at 18° C in the office)
  - Loss of ventilation outside the hours of occupation of the offices
  - Modulation speed manual tray by using the GTB
  - Ventilation of meeting rooms subservient to people presence (on or off)
- Coffee/lunch areas: **dual-flow ventilation** (timer) with air intake on atrium
- Basement: mechanical ventilation on detection of CO

The Equipment

The last user switch off all the office area, before leaving by the end of the day, just by its single switch action.

Management of summer comfort

- **Lowering the needs**
  - Architectural optimization and improvements to outsource specific charges
  - Minimization of internal heat gains (detection of presence on lightings, stand-by power cutters, efficient computers)
  - Effective sun protection with automatic front south
- **Passive and active measures**
  - At night, over-ventilation by opening windows
  - Under-floor cooling and ceiling fans
  - Punctual air conditioning for servers and training rooms (chiller condensing air)

Water management

- **Reducing the needs**
  - Cold water only (except for local cleaning, showers and cafeteria)
  - Rate limiting of self-regulated type moussers
  - Waterless urinals
  - Limiting surfaces requiring sprinkler
- **Reusing rainwater** roof to supply toilets and garden watering (underground tanks of 30 000 liters of water)

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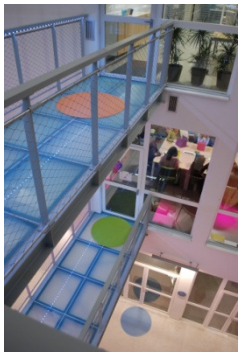
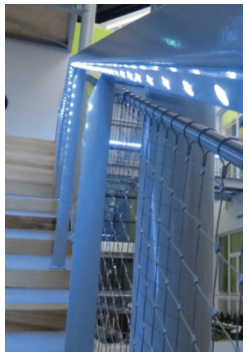
The Equipment



Several colorful animations are available for events

« Downlight » in the cafeteria



Lighting of the handrail by LEDs

An efficient lighting

A highly efficient lighting (6w/m²) based on:

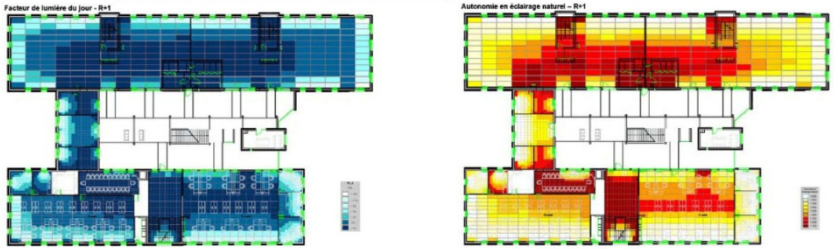
- Segmentation between office and desk spaces (200/400 lux) with auto-gradation = f (natural light)
- Electronic ballast
- A task light with LBC
- Piezolectric wireless switches (sana batteries)
- Blocks back up at a very low consumption(0.5w)
- Presence detection in all common areas

Optimization of natural light

Objectifs d'éclairage naturel : 2% de FLJ sur le plan de travail

Indice d'ouverture par orientation pour les bureaux

Nord Est	Sud Est	Sud Ouest	Nord Ouest	Atrium
17.95%	6.86%	17.66%	7.53%	50.0%



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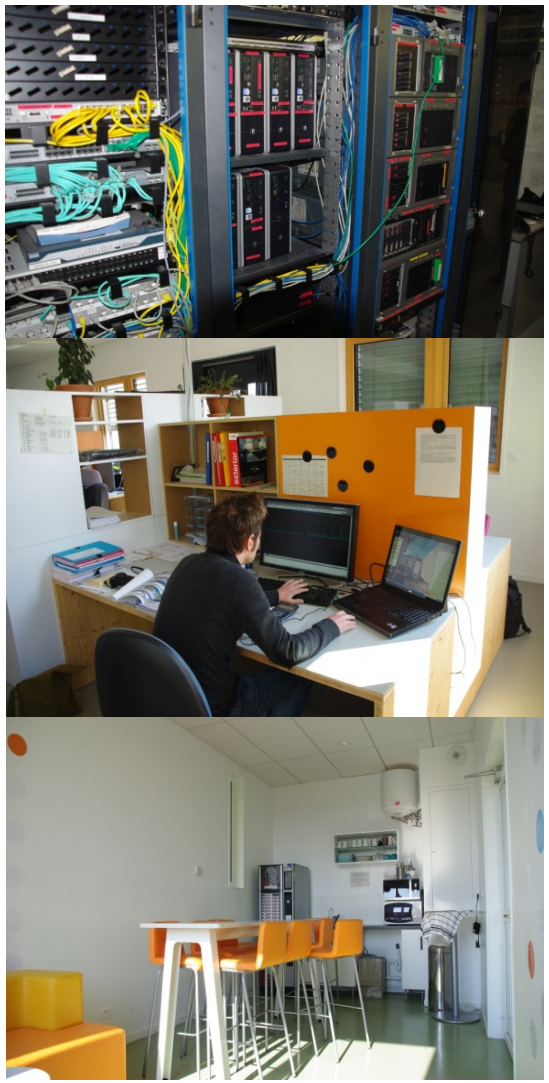
The Equipment



Consumption of specific electricity

- **Offices :**
  - The widespread use of laptops that can go from 400 kWh/year to 20 kWh/year per machine
  - The removal of corrugated centralized networks (which operate permanently under load and low efficiency) by UPS in each office

- **Servers :**
  - Can represent up to 50-60% of consumption of a building, they shared high performance and low power
  - Sharing of Internet access via optical fiber shared by 28 companies

- **Auxiliary equipment :**
  - Sharing of coffee areas (sharing of fridges, coffee makers, microwaves..)
  - Sharing of some reprographic equipment (printers)

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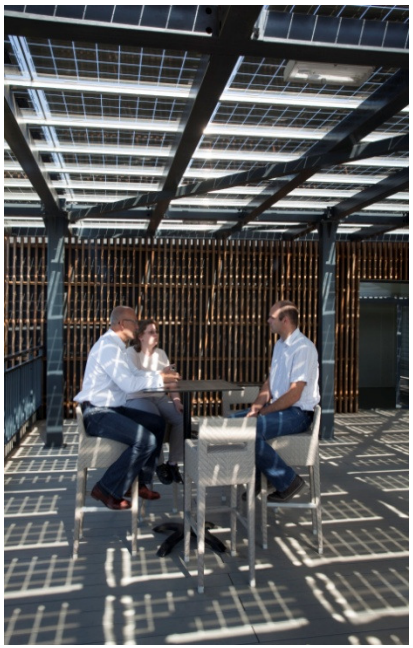
The Equipment



Energy Production

A positive energy building (all uses)

Photovoltaic production :

- 153 m² of semi-transparent modules -15kWp
- 1250 m² of photovoltaic polycrystalline type - 148kwc

Estimated production = 146 000Kwh/year

- Internal needs (low estimate): 88.850 kWh/year
- Internal needs (high estimate): 189.700 kWh/year

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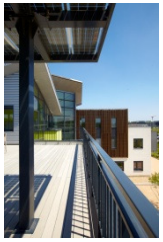
The Equipment



The building…

- **can produce 63% more energy** than the occupants needs… if occupants integrate in their behaviors the concept of energy restraints.

Some people do…and it works!

But it can also…

- **consume 30% more** and become a building with "negative" energy!

Contrary to what it is said, technology can not do everything!!

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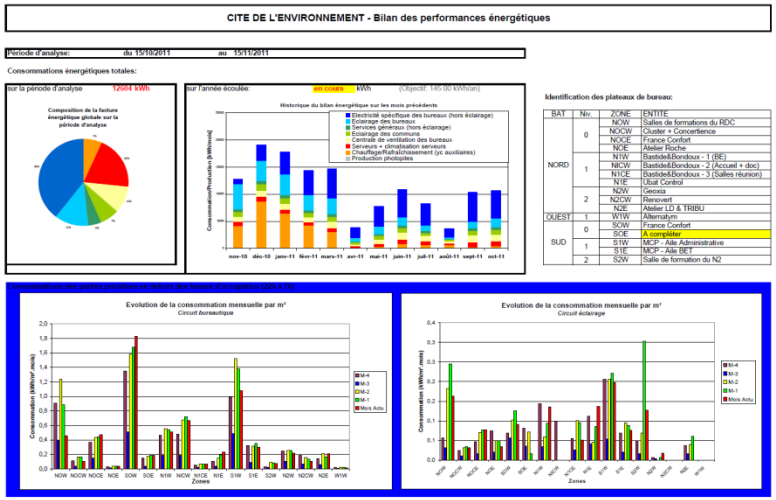
A « sociocratic » adventure

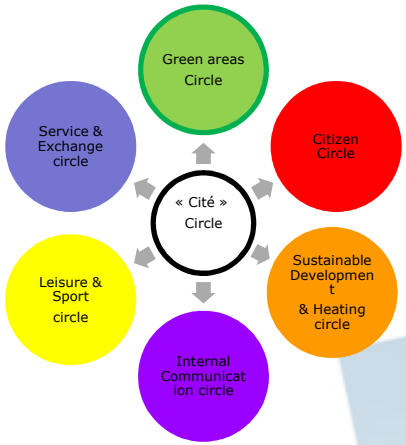


Today we know that it is possible to build a positive energy building, but its success depends mainly on controlling electricity consumption…t**he heating is not a problem anymore**

But with no changes in tenants / inhabitants habits, it will remain an illusion unless very expensive.

Building governance based on **a "sociocratic" management mode** creates a real framework and enables to position the cursor at the right level between in-use performance issues but also of usages, health quality, and social relationships…

It is above all the inhabitant who must be sustainable!



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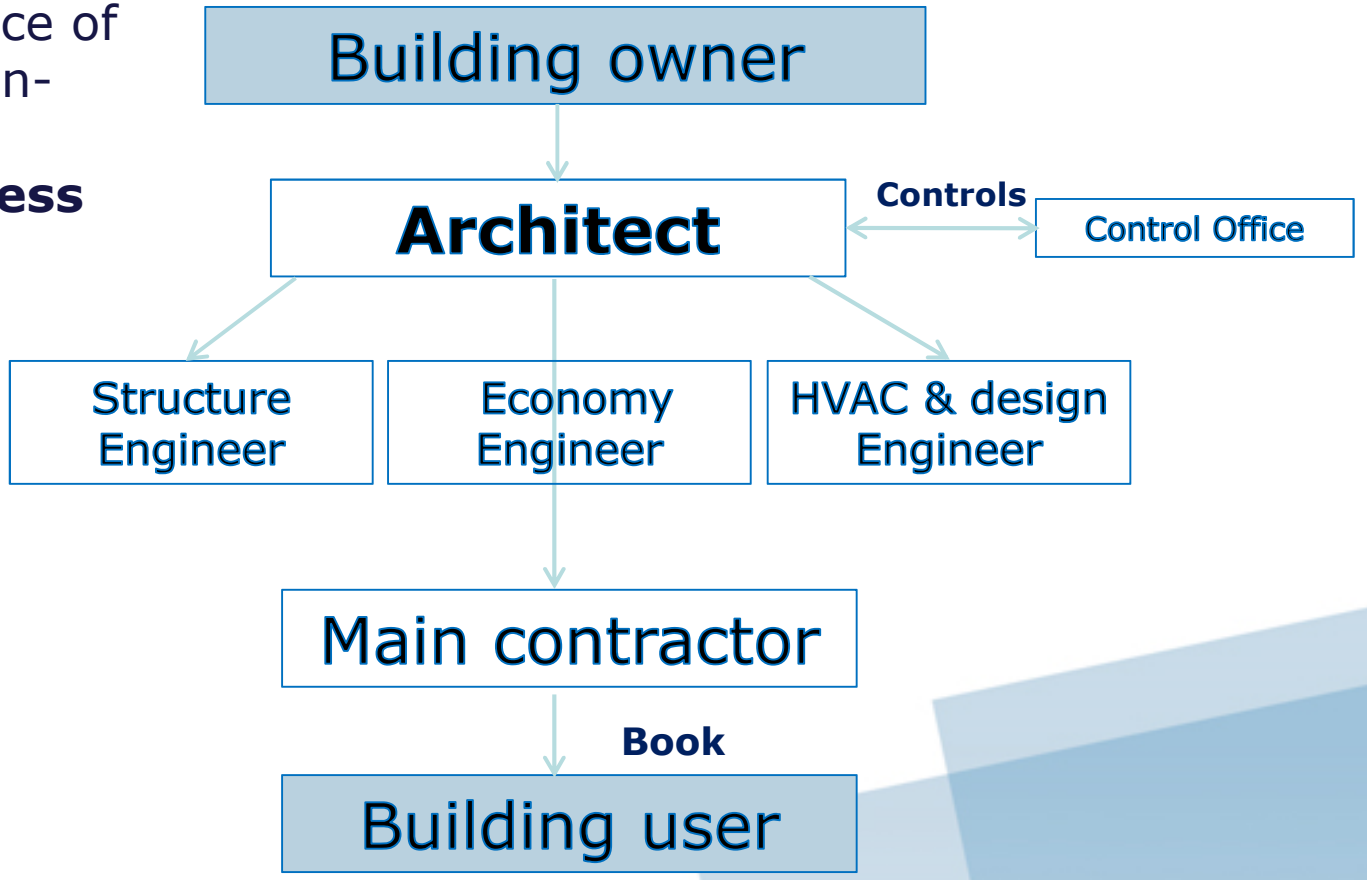
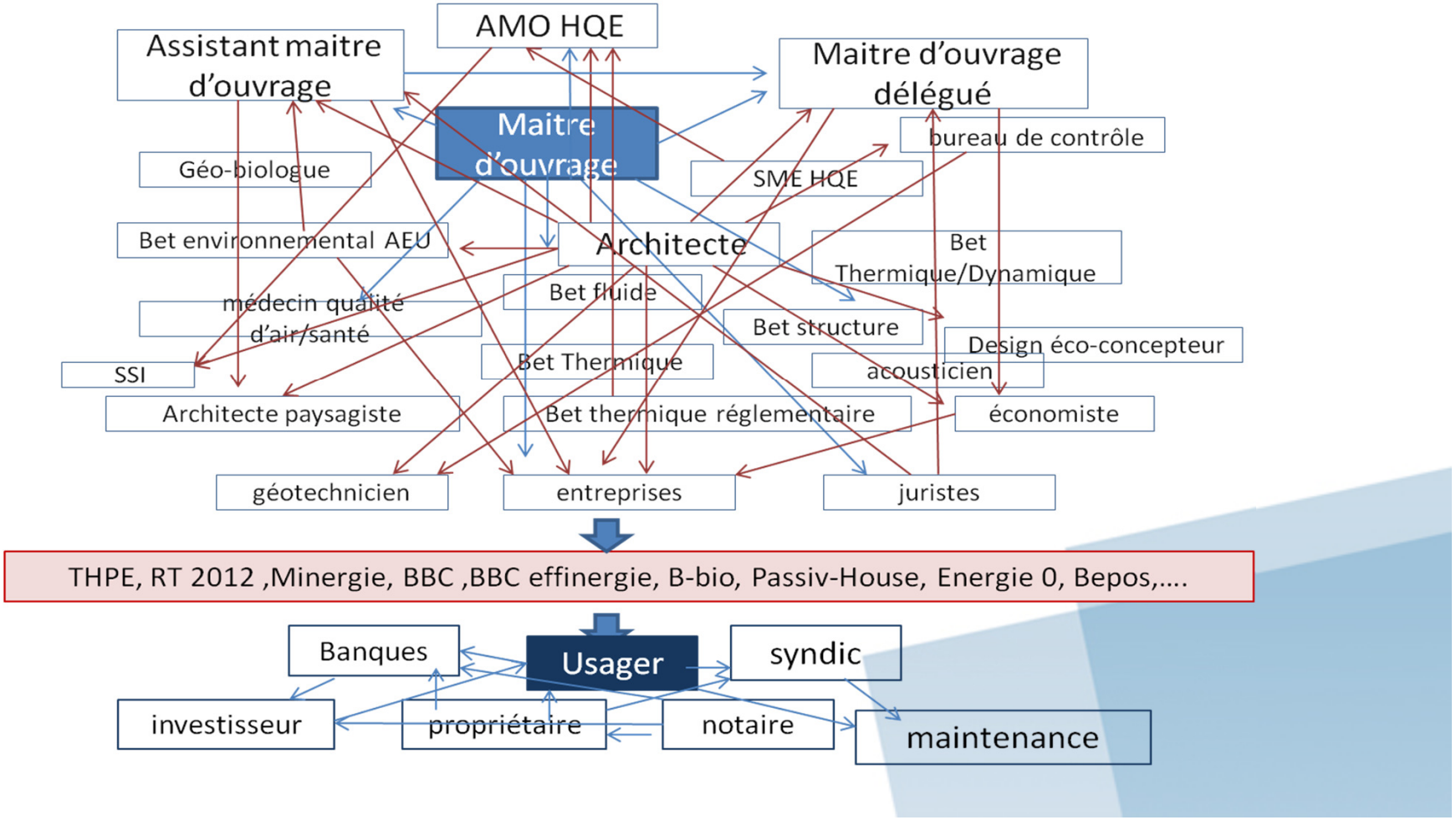
A « sociocratic » adventure

The ancestral practice of construction decision-making:
a reassuring process



A « sociocratic » adventure

The biggest challenge: **the illegibility !**



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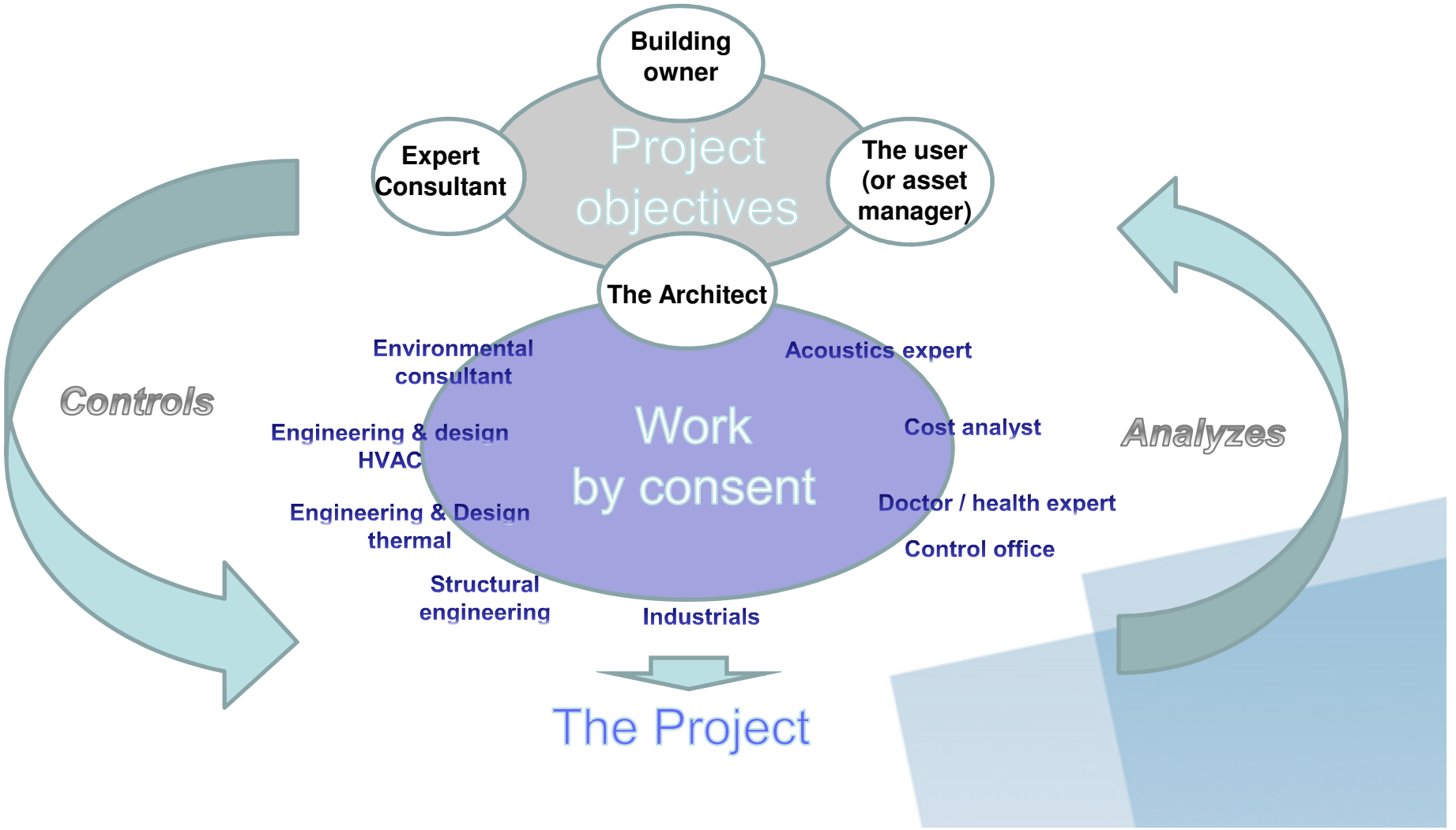
"Sociocracy" : a way of governance

« When you have a hammer on the head, you see all problems as nails!»

- The Sociocracy (power of a group) stimulates human relationships by providing consent as a form of decision-making: the common good.
- In Sociocracy, the majority can't impose his choice to a minority.
- The truth is not arising from the confrontation of ideas but from adding the point of view.

« An organization will adopt ethical behavior when it allows its members to openly discuss its decisions in light of the common good » (what does that mean?)

"Sociocracy" : a way of governance



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"Sociocracy": a way of governance

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"Sociocracy": a way of governance

Green areas committee

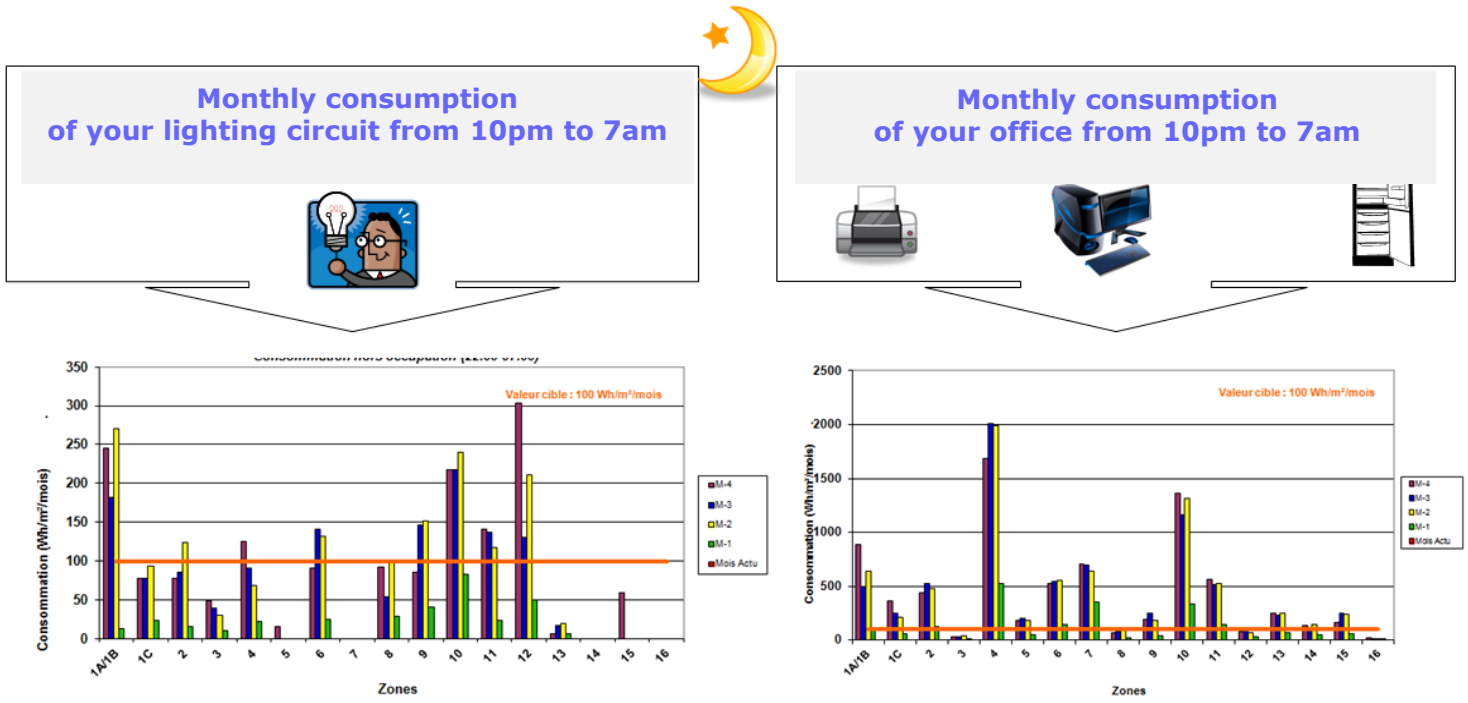
- Organization for actions to be done
- Inventory and purchase of tools
- Garden planning, selection of planting
- Setting up a maintenance plan
- Maintenance of the garden : cleaning, mulching, amend
- Watering trees
- Compost




"Sociocracy": a way of governance

Performance indicators / KPIs

Consumption by equipment & by time slots



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The «Cité» in pictures

25 000 visitors a year at the « Cité »…

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The «Cité» in pictures

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«Happy city, where old people plant trees for futur generations»

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