Data use in real Estate

indoor environmental quality
and building performance: value trigger?

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French real estate developer federation: technical director
RICS: member
REHVA: president
How to define environmental quality of buildings?

Effective Green Value = Building Intrinsic Quality \times Operation Utilities & Maintenance \times Use Env. best Practices

Time dimension: Life span and flexibility
WORKPLACE PRODUCTIVITY AND HEALTH

• Evidence shows that green design attributes can improve occupant productivity, health and well-being.

• Investing in better indoor environments can lead to better returns on one of every company’s greatest assets - its employees.
Staff costs, including salaries and benefits, typically account for about 90% of business operating costs.

Source: Health, Wellbeing & Productivity in Offices by WGBC
RISK MITIGATION

• Sustainability risk factors can significantly affect rental income and the future value of real estate assets, in turn affecting their ROI.

• Changing tenant preferences and investor risk screening may translate into risk of obsolescence for inefficient buildings.
Energy linked to a building: 4 main blocks

**Building energy**

- Actual new building:
  - 130 to 250 kWh\(_{ep}/m^2/an\)
- NZEB:
  - 40 to 65 kWh\(_{ep}/m^2/an\)

**Specific electricity**

- Housing:
  - 10 à 50 kWh\(_{ep}/m^2/an\)
- Office:
  - 30 to 300 kWh\(_{ep}/m^2/an\)

**Embodied energy**

- New building:
  - ≈ 1200 kWh\(_{ep}/m^2\)
- « As usual » NZEB:
  - ≈ 1600 kWh\(_{ep}/m^2\)

**Transport**

- French average daily distance:
  - 16km
- 20 km:
  - by car: 6450 kWh\(_{ep}/an\)
  - bus: 630 kWh\(_{ep}/an\)
Building Passport

Name:
Address:
Year of completion:
Heated floor area:
Number of occupants:

**Indoor environment quality:**
- Indoor climate class according EN16798-1 during design
- Measured annual user satisfaction of indoor environment (perceived thermal comfort, indoor air quality, illumination and acoustic privacy)
LIFE CYCLE ASSESSMENT

Embodied carbon footprinting process

- Quantity of materials
- Weight of materials
- Embodied carbon factors
- Contractor
- Maintenance/replacement

Uncertainty / complexity:
- 3%
- 15%
- 20%
- 30%
- 30%
GHG Emissions globally

Carbon impact of the built environment

831 MtCO₂e was the total carbon footprint of the UK in 2014

42% was attributable to the built environment

349 MtCO₂e

22% was total operational and embodied carbon footprint of the built environment

185 MtCO₂e

NEW CONSTRUCTION

EXISTING BUILT ASSETS

TRANSPORT

48 MtCO₂e was embedded through new construction

138 MtCO₂e was generated by operational energy uses (e.g. heating)

44 MtCO₂e was generated through plug loads and cooking in buildings

119 MtCO₂e was generated by direct emissions from road and rail transport
From a static vision ....

To a dynamic vision of value

User value

Functionality comfort

Adaptability to users' needs

Durability of components

Guarantee of performance in exploitation

Intrinsic value

Operating value

Sustainable value

Exploitation upkeep and regulatory upgrading

Intrinsic value

Operating value
To avoid ....
Set of CEN standards on Energy Performance of Buildings (EPB)

- The SET of 53 standards is based on a holistic (systemic) approach:
  - To assess the **integrated impact** on the energy performance of buildings (EPB)
    - Covering e.g. heating, cooling, ventilation, DHW, lighting and the impact of building automation and smart controls,
    - Also covering energy-using and renewable energy producing appliances
    - Respecting the IEQ requirements

- All published in 2017-2018
  - Full and coherent set of 53 European EPB standards (CEN)
  - and subset (key EPB standards) also already at global level (ISO):
    - The (EN) ISO 52000 family

[www.epb.center](http://www.epb.center)
Set of EPB standards: the holistic approach

From *product* standards to *overall* energy use

- Energy ratings
- Overall energy use
- Technical building systems standards (H, C, V, W, L) (system loss calculations), renewable energy
- Energy needs heating & cooling, ventilation, DHW,
- Climatic conditions, conditions of use (indoor temp. set points, vent., …)
- Input data on components & products

EN ISO 52000-1
Overarching EPB standard

Example:
Requirement in building regulation:
“Overall EP < 50 kWh\text{Penren}/m^2”
Translation to achieve
KEY QUESTIONS

1. Is there something like a "HVAC benefits value" part of the building market value?

2. What is the correct way to quantify the HVAC benefits?

3. Are the conventional valuation approaches suitable for the quantification of HVAC benefits?

Source | Valentina Fabi
MARKET VALUE = (income - expenses) + residual value
TECHNICAL SYSTEM IMPACT

RISKS

Physical risk
- Occupant satisfaction
- Increasing of noise
- HVAC inability to satisfy IEQ levels

Technology risk
- Indoor flooding
- Fire
- Losses of refrigerant
- Obsolescence of HVAC technology
- Increasing of operating costs

Risk due regulation
- Inability to compete with greener buildings
- Inability to compete with buildings with a better energy label
- Inability to lease due to new regulation

Market risk
- Change in discount rate
- Increased speed of depreciation
- Lower occupancy rates
- Shorter tenancies

source | Valentina Fabi
WORKPLACE REVOLUTION: The workplace is ripe for reinvention.

Flexible building services

- to subdivide a floor into multiple tenancies while being able to maintain quality lobby and reception facilities.
- to change individual office workstation configurations with minimal difficulties

- **Flexibility costs**: supporting rapid short-term changes in work setting arrangements (construction costs tied up in the design of flexibility)

- **Adaptability costs**: supporting large-scale and long-term changes in use and function

source | Valentina Fabi
The challenge

Risk management & insurances
DATA FLOW

TOOLS:
STD
BIM

CONSTRUCTION

DESIGN

REHABILITATION

DEMOLITION

Federation of European Heating, Ventilation and Air-conditioning Associations

Environmental Indicators
Technic
Functionnal
Social
Economic
Environmental
(EN 15978, …)

List of the components

Certification

The mechanisms
Building life cycle and value creation

DATA FLOW
DATA FLOW

Building Information (BIM) Database

PERFORMANCE INDICATORS:
- Embodied carbon of building (kgCO₂/m²)
- Carbon emission of energy use (kgCO₂/m²)
- Carbon emission of travelling (kgCO₂/person)
- Primary energy consumption (kWh/m²)
- Energy use (MJ)
- Water use (m³/person)
- Landfill waste (kg/person)
- Indoor air temperature deviation (%)
- Particulates matter (µg/m³)
- CO₂-level of indoor air (ppm)
- Maintenance cost (€/m²)
- Energy costs (€/m²)
- Rent income (€/m²)
Accounting for uncertainty

“When incorporating sustainability-related risks and opportunities into a DCF model, it is very important to use a set of ranges for potential adjustments to DCF input variables. This will help to avoid the impression of unrealistic levels of precision.” (UNEP FI, 2014, *Sustainability Metrics Report p85*)

Sustainability–related information represents a new source of uncertainty:

<table>
<thead>
<tr>
<th>Market uncertainties</th>
<th>Technical uncertainties</th>
<th>Legal uncertainties</th>
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<tbody>
<tr>
<td>- market sentiment on sustainable properties (Evolution in the rental gap and reletting period between sustainable and non sustainable properties)</td>
<td>- Installations remaining lifespan</td>
<td>- Evolution in the regulatory context</td>
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<tr>
<td>- Energy price volatility</td>
<td>- Evolution in the replacement costs of component</td>
<td></td>
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<tr>
<td>- evolution of users’ expectations</td>
<td>- Uncertainties on sustainability metrics</td>
<td></td>
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</tbody>
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From data transparency to valuable information

It is all about:

- data collection
- uncertainty management
- translation mechanisms through the market filters!
Translating information for decision-making

"From the boiler room to the board room."
How to get there: A selection of recommendations for best practice

Recommendations for Best Practices for Corporate Real Estate Sustainability Management (CRESM)
Relative impact of individual policies

Compact urban form is the most powerful leverage

Adapted from GEA, 2013
Building Long Term Value Assessment:

• Location
  – Connectivity infrastructure (grid & IT)
  – Local services and shops (positive impact density)
  – Security
  – Attractivity (image…)

• Quality
  – Indoor environmental quality
  – Energy performance
  – Lifespan
  – Flexibility / Mutability
Conclusion:

Policy
➢ Change land regulation and taxes: To support investment in “infrastructure” instead of energy needs increase

Finance
➢ Change to long term assessment integration into valuation investors
➢ Change to valuation of building quality (services & lifespan)

Designers
➢ Change to flexibility and dynamic strategic vision based on citizens life and expectations

Construction
➢ Change to quality efficiency instead of low cost competition

users
➢ Change occupier behaviour