QUANTITATIVE ENVIRONMENTAL ASSESSMENT OF DEVELOPMENT OPERATIONS FROM THE EARLY STAGES OF THE PROJECT IN STRASBOURG METROPOLIS (FRANCE)

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CONTEXT

Evolution of practices for assessing the environmental impacts of the construction sector

<table>
<thead>
<tr>
<th>2005</th>
<th>2012</th>
<th>2018 - 2020</th>
<th>...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usage</td>
<td>Cycle de vie</td>
<td>Energie</td>
<td>...</td>
</tr>
<tr>
<td>Energie</td>
<td>Carbone</td>
<td>Energie</td>
<td>Carbone</td>
</tr>
<tr>
<td>Carbone</td>
<td>Energie</td>
<td>Pollution de l’air</td>
<td>Biodiversité</td>
</tr>
</tbody>
</table>
NEST

QUANTITATIVE EVALUATION TOOL FOR THE SUSTAINABILITY OF DEVELOPMENT OPERATIONS

- Environmental indicators based on life cycle analysis methodology
- “Quality of life” indicator
- Economic indicator

AIMS

- Evaluate, on the basis of a 3D model, the impacts of a development operation
- Give decision-makers and designers key elements to integrate sustainable development into their projects right from the programming phase
- Master the impacts of development operations

INITIAL TARGET

- NEST ® IS INTENDED FOR THE MASTERS OF WORKS (URBAN PLANNERS AND BE) AS WELL AS THE MASTERS OF WORKS OF OPERATIONS OF INSTALLATIONS AND ECO-NEIGHBORHOODS

PLUG-IN SKETCHUP
STEP (1)

General data

- Place
- Use of land
- Distance to economic centers
- Number of users

STEP (5)

Population Distribution and Transport Scenarios

Répartition de la population

Scénario des transport
STEP(2)

Drawing and characterization of roads and surface types

STEP (3)

Drawing of buildings
Characterization of buildings

- Typologie
- Système constructif
- Performance énergétique
- PV / Solaire thermique
- Chauffage
- Ventilation
- ECS

NEST, AN QUANTITATIVE ENVIRONMENTAL ASSESSMENT SOFTWARE
INDICATORS

Indicators used in NEST

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Catégorie</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>Environnement</td>
<td>LCA (impact Indicator)</td>
</tr>
<tr>
<td>CO2</td>
<td>Environnement</td>
<td>LCA (impact Indicator)</td>
</tr>
<tr>
<td>Land Use</td>
<td>Environnement</td>
<td>LCA (impact Indicator)</td>
</tr>
<tr>
<td>Waste</td>
<td>Environnement</td>
<td>LCA (flow Indicator)</td>
</tr>
<tr>
<td>Air quality</td>
<td>Environnement</td>
<td>LCA (impact Indicator)</td>
</tr>
<tr>
<td>Water consumption (directe)</td>
<td>Environnement</td>
<td>LCA (flow Indicator)</td>
</tr>
<tr>
<td>Cost of the project</td>
<td>Economie</td>
<td>Acquisition + energy</td>
</tr>
<tr>
<td>Satisfaction of users</td>
<td>Social</td>
<td>Created by NOBATEK</td>
</tr>
</tbody>
</table>

STEP (6)

Visualization of the results

Primary energy consumption (MJ/an/users)
STEP (7)

Visualisation of résultats

Primary energy consumption related to the use of buildings

STEP (8)

Comparaison of scénarios
AN LCA THAT CAN BE UNPRODUCTIV

• This tool had significant limitations.
• The environmental indicators were not adapted to the management scale.
• It was impossible to use the tool on a large scale for heavy file issues.
• The proposed result was not meaningful for decision makers.

NEW POSTION

• PEDAGOGIC / SENSITIZATION tool "macro" scale.
• It was decided not to evaluate non-quantifiable indicators (such as biodiversity). Results from a computational approach tend to let non-specialists think that they are accurate.
• Diversified themes including energy, environment, transport, quality of life, biodiversity, up to an indicator of "happiness" (functional mixity).
IDENTIFICATION OF EXISTING METHODOLOGIES AND TOOLS + MAIN ENVIRONMENTAL, SOCIAL AND ECONOMIC ISSUES FOR EMS

25 indicators from the EMS documents

+ 60 indicators from other standards (ISO 37120, AUE2, etc.)

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<tr>
<th>Indicators</th>
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</thead>
<tbody>
<tr>
<td>Total primary energy</td>
</tr>
<tr>
<td>Climate change</td>
</tr>
<tr>
<td>Modal shares of employed assets</td>
</tr>
<tr>
<td>Urban sprawl / Soil artificialisation</td>
</tr>
<tr>
<td>Quality of the service of the territory</td>
</tr>
<tr>
<td>Functional mixity</td>
</tr>
<tr>
<td>Median income per consumption unit</td>
</tr>
<tr>
<td>Rent cost for social housing</td>
</tr>
</tbody>
</table>

Example of data taken into account for the functional mix:
The presence of medical practices,
The presence of schools
The presence of shops, The level of energy efficiency of buildings,
The presence of green spaces, The density of population:
The presence of cycle tracks
The quality of the public transport service.

OPERATIONS STUDY WITH NEST

Modélisation of the ZAC des Deux Rives with NEST (plugin Sketchup)
The SaaS platform developed by EEGLE show territorial digital data management in a visual environment.
CASE STUDY: ZAC DES DEUX RIVES

The operational area of the ZAC covers 74 hectares and covers non-contiguous sites:
- Citadelle
- Starlette
- Coop
- Port du Rhin
- Rives du Rhin

Issues of the ZAC

- Respond to a symbolic issue by creating an "urban" place correlated with Germany.
- Put mobility at the heart of urban design by relying on the tram as an axis of development and opening up of territories.

EXAMPLE OF USING THE TOOL NEST TERR

Results interpretation - Total primary energy

Operation scale

Territory scale

Figure from a post processing results in Excel
EXAMPLE OF USING THE TOOL NEST TERR

Results interpretation – Climate change

Operation scale

Territory scale

Comparaison

Figure from a post processing results in Excel

EXEMPLE D’UTILISATION DE L’OUTIL NEST TERR

Results interpretation – Etallement urbain/Artificialisation des sols

Operation scale

Territory scale

Comparaison

- 87.5% artificialised
- 12.5% not artificialized
EXEMPLE D’UTILISATION DE L’OUTIL NEST TERR

Results interpretation—Mixité fonctionnelle

Score 4 : Satisfactory functional mix

LIMITES ET DIFFICULTÉS RENCONTRÉES

❖ Territorial data management
  ❑ Diversity of data formats.

❖ Interoperability with 3D models
  ❑ Diversity of computer formats

❖ Calculation methods
  ❑ Environmental assessment: availability of data at equivalent perimeter
NEXT STEPS

❖ Objective 1: confirm the relevant sustainability indicators at different scales of the study
❖ Objective 2: develop the associated methodology to monitor the indicators
❖ Objective 3: apply all the elements developed in the project to other development operations to enable Eurometropolis of Strasbourg to have quantitative and objective elements for the definition of its management strategy