Performance Issues and SBTool

16Apr19

Nils Larsson
International Initiative for a Sustainable Built Environment
SBTool
SBTool - introduction

- SBTool Generic is a generic building performance assessment framework for rating the sustainable performance of sites and building projects;

- The system can be used by authorized organizations, such as municipalities or non-government organizations (NGOs) to establish rating systems to suit their own regions and building types;

- Think of it as a toolkit for rating systems;

- SBTool can be used by owners and managers of large building portfolios to specify their performance requirements to their staff, to consultants, or participants in competitions;

- It can also be used as an educational tool, since developing benchmarks for a wide range of issues is a useful experience for graduate students;
SBTool - introduction

- SBTool handles a variety of conditions;
  - pre-design, design, construction and operations
  - … new and renovation projects;
  - … up to three occupancy types in a single project;
  - … provides relative and absolute outputs;
- There are separate modules for sites and for buildings;
- Generic criteria are intended to be modified for local conditions and building types;
- The system is set up to allow easy insertion of local criteria in a local language;
- The scope (number of criteria) can be varied in the Design phase from a Maximum version (115 potentially active criteria) to a Minimum version (12);
- An algorithm provides quasi-objective weighting;
Performance issues referenced in SBTool

1. Climate change
2. Destruction of the stratospheric ozone layer
3. Acidification of land and water resources
4. Eutrophication of water bodies
5. Photochemical ozone creation (POCP)
6. Changes in local biodiversity
7. Depletion of non-renewable primary energy;
8. Depletion of non-renewable resources other than primary energy;
9. Depletion of non-renewable freshwater resources
10. Depletion of land resources with ecological or agricultural value
11. Exhaustion of suitable solid waste sites for non-hazardous waste
12. Hazards from disposal or storage of non-radioactive hazardous waste
13. Hazards from disposal or storage of radioactive waste
14. Ability of users with functional impairments to use the facility
15. Personal safety and security of users
16. Health, well-being and productivity for users of facility
17. Health, security and well-being of local off-site population
18. Changes to local social or cultural systems
19. Financial risks or benefits for investors
20. Housing affordability of commercial retail viability
21. Changes in local economic system (employment, economic stimulus)

Some items taken from ISO/CEN; others adapted or added
Performance trade-offs

- It is important to realize that there are performance trade-offs and that it is very difficult for a building to have very high performance in all aspects.
- For example, very good operating performance might be associated with a high level of embodied energy and emissions, which would get a lower score.
- Similarly, excellence in indoor environment may come at the expense of operating energy.
- The system includes the ability to require a certain minimum score (for example 3.0, 3.5 etc.) for the mandatory criteria, which ensures that the trade-off process does not result in a building that performs poorly in important areas.
SB Method - Structure

- The system consists of 2 linked Excel files;
- The SBTool-A file is used by local government or NGO organizations to set locally relevant weights, benchmarks and standards for generic building types in their own region;
- File A contains two separate generic assessment modules; one for Site Assessment and the other for Building Assessments;
- SBTool-B files allow designers to provide information about a single project, to use an IDP support module as design guidance and to carry out self-assessments;
- The information developed for File A can be used in a large number of B Files, to suit specific building characteristics defined in File A;
Three scenarios: one A File can produce many B files

Content defined by municipality or NGO

Examples of B files completed by designers or owners
The problem with SBTool

- SBTool has a large number of criteria that can be activated;
- The development of benchmarks for all active criteria in the full system requires a prohibitive amount of work and time;
- In addition, when a large number of criteria are active, the weight of each is very small;
- These facts have undoubtedly played a part in the lack of commercial success of SBTool;
- We suggest that users select a small or mid-size system scope, which also allows a focus on particular areas of interest;
- The following slides show examples of mid-size scope options that also show how various thematic focus areas can be emphasized.
The number of criteria by Issue and Phase.

The Max file is the largest available, the Min is the smallest and the Mid sized file is an intermediate size.

Note that numbers are slightly out of date.
Scope options to emphasize various issues

- Energy & Emissions
- Site
- Environmental Loadings
- Social, Cultural, Perceptual
- Cost & Economics
- Service Quality
- IEQ

SBTool 2015
Maximum scope
Active Criteria

Optional criteria
Mandatory criteria
Scope options to emphasize various issues:

- Energy & Emissions
- Site Environmental Loadings
- Social, Cultural, Perceptual
- Cost & Economics
- Service Quality
- IEQ

SBTool 2015 Minimum Scope
SBTool 2015
Mid-size: Energy and Environmental Loadings

Scope options to emphasize various issues

- Site
- Energy & Emissions
- Environmental Loadings
- Social, Cultural, Perceptual
- Service Quality
- IEQ
- Cost & Economics
Scope options to emphasize various issues

SBTool 2015
Mid-size:
Service Quality
Scope options to emphasize various issues

SBTool 2015
Mid-size: Service Quality and Social/Cultural Issues
Scope options to emphasize various issues

SBTool 2015
Mid-size:
IEQ and Perceptual
Benchmarking
When is a certain level of performance good, and when is it bad?

That depends on what we compare it to;

So performance is always considered relative to that of other buildings of a similar type that are considered to be typical or the best (or worst) of their type;

The establishment of such benchmarks is an important part of assessment;

The job is simplified if the benchmark is zero (net zero buildings).
Benchmarking

- The system requires that benchmarks be developed for each criterion, so that the predicted or actual performance can be compared to values of a similar building in the same region;

- Specifically, relevant benchmarks for Unacceptable (-1), Acceptable (0), Good Practice (+3) and Best Practice (+5), need to be developed;

- The Generic version of SBTool does contain default benchmarks, but these are mainly intended to show how the system works, and must be replaced by your own values;

- The system is designed to facilitate this by permitting local values and languages to be easily inserted.
Example benchmark, showing possibility for local content

Visible text is based on a formula that selects appropriate text at right
Example benchmark, showing data benchmarks for the total project

<table>
<thead>
<tr>
<th>A1.3 Vulnerability of the site to flooding.</th>
<th>✓</th>
<th>1.88%</th>
<th>Dsn.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intent</strong></td>
<td>To discourage the selection of land for building where there is a substantial risk that the site may be flooded.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Indicator</strong></td>
<td>Height above 100-year flood plain as defined in official documentation or assessment by competent authorities.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Applicable project type</strong></td>
<td>Any occupancy</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Information sources</strong></td>
<td>TBA.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Relevant information</strong></td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Assessment method</strong></td>
<td>Review of site analysis report.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Data values are inserted in yellow fields to establish slope**

<table>
<thead>
<tr>
<th>Applicable Standards</th>
<th>m</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>1.0</td>
<td>-1</td>
</tr>
<tr>
<td>b</td>
<td>1.3</td>
<td>0</td>
</tr>
<tr>
<td>c</td>
<td>2.0</td>
<td>3</td>
</tr>
<tr>
<td>d</td>
<td>2.5</td>
<td>5</td>
</tr>
</tbody>
</table>

**Total Project or Building**

<table>
<thead>
<tr>
<th>Negative</th>
<th>Minimum practice</th>
<th>Good Practice</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The height of the minimum elevation of the site above the elevation of the 100-year flood plain is :</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

File A
Example benchmark, showing text benchmarks for the total project

<table>
<thead>
<tr>
<th>A1.5</th>
<th>Remediation of contaminated soil, groundwater or surface water.</th>
<th>0.98% Dsn.</th>
</tr>
</thead>
</table>

**Intent**

To assess the success of remediation of contaminated soil, groundwater, or surface water in the project.

**Indicator**

Status of soil, groundwater, or surface water after treatment.

**Applicable project type**

Any project type with contaminated soil, groundwater or surface water.

**Information sources**

Environmental agencies and NGOs.

**Relevant information**

Type and intensity of original contamination, methods of remediation, final levels of contamination and assessment of long-term human health or ecological risks. Frequent causes are surface water contaminated by parking lots, or soils contaminated by previous industrial activity.

**Assessment method**

Review of pre- and post-remediation site analysis report by a geophysical and soils chemistry specialist.

**Standards or references**

- a
- b
- c
- d
- e
- f

**Information Submittals**

**Assessment criteria for total project**

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>After treatment, the site is documented as having a level of sub-surface contamination that presents unacceptable risks to long-term human health or the ecology.</td>
</tr>
<tr>
<td>0</td>
<td>After treatment, the site is documented as having a level of sub-surface contamination that presents acceptable risks to long-term human health or the ecology.</td>
</tr>
<tr>
<td>3</td>
<td>After treatment, the site is documented as having a level of sub-surface contamination that presents low risks to long-term human health or the ecology.</td>
</tr>
<tr>
<td>5</td>
<td>After treatment, the site is documented as having a level of sub-surface contamination that presents no detectable risks to long-term human health or the ecology.</td>
</tr>
</tbody>
</table>
Example benchmark, showing data benchmarks modified for residential and non-residential occupancies

C3.2 Solid non-hazardous waste from facility operations sent off the site.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Applicable project type</th>
<th>Information sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>To encourage the provision of facilities for storage of waste on each floor or each major work area, and space for the central sorting and storage of waste, with access to a truck loading area.</td>
<td>Separate criteria for residential and non-residential; NA for parking or open space</td>
<td>Facilities provided in the design for the storage and sorting of solid wastes in both dispersed and central locations.</td>
</tr>
<tr>
<td>Facilities provided in the design for the storage and sorting of solid wastes in both dispersed and central locations.</td>
<td>We specify storage areas per dwelling and per work group, and assume that the central storage area will be sized to suit.</td>
<td>Information on type, capacity and location of facilities for sorting and storing solid waste.</td>
</tr>
</tbody>
</table>

### Assessment criteria for Residential apartments

<table>
<thead>
<tr>
<th>Occupancy 1</th>
<th>Period</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td>71%</td>
<td>-1</td>
</tr>
<tr>
<td>Minimum practice</td>
<td>75%</td>
<td>0</td>
</tr>
<tr>
<td>Good Practice</td>
<td>87%</td>
<td>3</td>
</tr>
<tr>
<td>Best Practice</td>
<td>95%</td>
<td>5</td>
</tr>
</tbody>
</table>

### Assessment criteria for Offices

<table>
<thead>
<tr>
<th>Occupancy 2</th>
<th>Period</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td>70%</td>
<td>-1</td>
</tr>
<tr>
<td>Minimum practice</td>
<td>75%</td>
<td>0</td>
</tr>
<tr>
<td>Good Practice</td>
<td>90%</td>
<td>3</td>
</tr>
<tr>
<td>Best Practice</td>
<td>100%</td>
<td>5</td>
</tr>
</tbody>
</table>
To minimize the amount of potable water imported to the site and used for occupancy needs, excluding building system uses or irrigation of exterior areas.

**Prediction of total potable water use, in L per person per day, based on a credible water management plan for occupancy fixtures and use.**

Assumptions for daily use PP and volume per fixture:
- Toilet 6 L x 2 Times per Day
- Urinal 1.5 L x 3 TPD
- Shower 70 L x 0.8 TPD
- Tub 90 L x 0.2 TPD
- Lavatory 0.6 L x 4 TPD
- Kitchen sink 15 L x 2 TPD
- Clothes washer 40 L x 0.2

**Based on a credible water management plan, the volume of potable water predicted to be used for occupancy needs:**

<table>
<thead>
<tr>
<th>Occupancy</th>
<th>Apartment</th>
<th>on</th>
<th>L. pp / day.</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td></td>
<td>400</td>
<td>-1</td>
<td></td>
</tr>
<tr>
<td>Acceptable practice</td>
<td></td>
<td>350</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Good Practice</td>
<td></td>
<td>200</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Best Practice</td>
<td></td>
<td>100</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

**The volume of potable water actually used for occupancy needs, as recorded on metering systems over a period of at least one year, is:**

<table>
<thead>
<tr>
<th>Occupancy</th>
<th>Apartment</th>
<th>on</th>
<th>L. pp / day.</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td></td>
<td>400</td>
<td>-1</td>
<td></td>
</tr>
<tr>
<td>Acceptable practice</td>
<td></td>
<td>350</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Good Practice</td>
<td></td>
<td>200</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Best Practice</td>
<td></td>
<td>100</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

**SBT12-A benchmarks:** examples of default text criteria tailored to suit Design and Operating phases.
Weighting
SBTool compared to commercial rating systems

- Commercial rating systems use a system of fixed points to give more or less importance to various issues;
- This causes problems when the system is used outside its region of origin;
- BRE solved this problem from the outset by cautioning users that if BREEAM is used outside of the UK, the system must be adjusted;
- USGBC preferred to maintain the simple integrity of LEED by allowing regional organizations to add certain extra requirements and points to the system;
- This did not really solve the issue;
- Despite these defects, the commercially-oriented systems have played a major role in promoting the general goal of high performance in many regions.
Some problems

The following excerpts from LEED V4 scoring tables are examples of the issue:

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Credits</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daylight</td>
<td>Indoor environmental quality</td>
<td>Up to 3</td>
<td></td>
</tr>
<tr>
<td>Quality views</td>
<td>Indoor environmental quality</td>
<td>1 point</td>
<td></td>
</tr>
<tr>
<td>Acoustic performance</td>
<td>Indoor environmental quality</td>
<td>1 point</td>
<td></td>
</tr>
<tr>
<td>Innovation</td>
<td>Innovation</td>
<td>Up to 5</td>
<td></td>
</tr>
<tr>
<td>LEED Accredited Professional</td>
<td>Innovation</td>
<td>1 point</td>
<td></td>
</tr>
<tr>
<td>Construction and demolition waste management</td>
<td>Material &amp; resources</td>
<td>Up to 2</td>
<td></td>
</tr>
<tr>
<td>Minimum indoor air quality performance</td>
<td>Indoor environmental quality</td>
<td>1 point</td>
<td>Prerequisite Required</td>
</tr>
<tr>
<td>Environmental tobacco smoke control</td>
<td>Indoor environmental quality</td>
<td>1 point</td>
<td>Prerequisite Required</td>
</tr>
<tr>
<td>Enhanced indoor air quality strategies</td>
<td>Indoor environmental quality</td>
<td>Up to 2</td>
<td></td>
</tr>
<tr>
<td>Low-emitting materials</td>
<td>Indoor environmental quality</td>
<td>Up to 3</td>
<td></td>
</tr>
</tbody>
</table>
SB Method - weighting

- It is important to deal with the question of the relative importance of various criteria and their scores;

- The simplest approach is for an expert panel assign fixed scores for various criteria;

- But the assignment of 6 points for one criterion and 2 points for another means that the first is considered to be three times as important as the second;

- That may be true in some cases, but questions arise:
  - Who decides on the various scores?
  - Should the scores not be different for various regions?

- To provide more consistency in the assignment of weighting points, we include an algorithm that automatically assigns a weighting score based on the relevance of major impact categories, as well as factors for the probable intensity, duration and extent of performance effects.
Weights for each parameter is based on degrees of extent, duration and intensity of effect, combined with links to key issue areas.

Regional authorities can modify the weighting values shown and they may also increase or reduce the resulting weights to a maximum of 10% +/-.
How clean is your power?
Fuel emission values must be established for each region and are used to establish emissions for on-site fuels but also for delivered electricity.

The mix of fuels used to generate electricity varies widely between regions, and that affects the resulting emissions per kWh.

---

**Fuel Emissions Data for Amiel, Atlantis**

<table>
<thead>
<tr>
<th>Fuel used for off-site gen. of electricity only</th>
<th>CO₂</th>
<th>SO₂</th>
<th>Gross-up factor for primary energy (incl. combustion &amp; delivery loss)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural gas (BC)</td>
<td>131.39</td>
<td>0.00105</td>
<td>2.84</td>
</tr>
<tr>
<td>Fuel Oil (QC)</td>
<td>200.00</td>
<td>1.93889</td>
<td>3.02</td>
</tr>
<tr>
<td>Coal (ON)</td>
<td>241.11</td>
<td>1.16389</td>
<td>3.26</td>
</tr>
<tr>
<td>biomass and other</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>nuclear</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>hydro, with high-methane emission reservoir</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>hydro, with moderate-methane emission reservoir</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>hydro, with low- or no-methane emission reservoir</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>wind</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>geothermal</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electricity power generation base load mix</th>
<th>Generation mix by source</th>
<th>Arcane calculations for electricity GHGs</th>
<th>Fuel type</th>
<th>GHG fuels as % of all GJ</th>
<th>kg. GHG per GJ primary</th>
</tr>
</thead>
<tbody>
<tr>
<td>natural gas</td>
<td>8.40%</td>
<td>Fuel type</td>
<td>Nat. gas</td>
<td>8.4%</td>
<td>11.04</td>
</tr>
<tr>
<td>oil-fired</td>
<td>0.49%</td>
<td>Oil</td>
<td>Oil</td>
<td>0.5%</td>
<td>0.98</td>
</tr>
<tr>
<td>coal-fired</td>
<td>24.59%</td>
<td>Coal</td>
<td>Coal</td>
<td>24.6%</td>
<td>59.29</td>
</tr>
<tr>
<td>nuclear</td>
<td>40.80%</td>
<td>Biom/Oth</td>
<td>Biom/Oth</td>
<td>0.7%</td>
<td>0.00</td>
</tr>
<tr>
<td>hydro, with high-methane emission reservoir</td>
<td>0.00%</td>
<td></td>
<td>kg. GHG / GJ for elec.</td>
<td>71.31</td>
<td></td>
</tr>
<tr>
<td>hydro, with moderate-methane emission reservoir</td>
<td>24.91%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>hydro, with low- or no-methane emission reservoir</td>
<td>0.00%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>wind</td>
<td>0.00%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>solar</td>
<td>0.00%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>geothermal</td>
<td>0.00%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>biomass</td>
<td>0.66%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>other</td>
<td>0.0016%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- Only emissions from non-renewables are included. Emissions for biomass and other fuels are assumed to be zero, as per IPCC.
Assessment Results
Target scores for GMS Project 1, Guimaraes, Portugal

Whole building basis

Relative Performance Target B

Performance target level is Good Practice or better

Results are shown relative to the zero benchmark
**SBTool is unique in that it also shows results normalized by occupancy e.g. kWh/m2/yr*maph;**

**But they are also provided as absolute results, e.g. kWh/m2 per year;**

---

### Absolute Performance Results

These data are based on the Self-Assessment values

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
<th>By area</th>
<th>By area &amp; occupancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Total net consumption of primary embodied energy for structure and envelope, GJ/m²</td>
<td>0.3</td>
<td>33.3 GJ/m²*maph</td>
</tr>
<tr>
<td>2</td>
<td>Net annualized consumption of embodied energy for envelope and structure, kWh/m²*yr</td>
<td>14</td>
<td>1598 kWh/m²*maph</td>
</tr>
<tr>
<td>3</td>
<td>Net annual consumption of delivered energy for building operations, kWh/m²*year</td>
<td>681</td>
<td>77689 kWh/m²*maph</td>
</tr>
<tr>
<td>4</td>
<td>Net annual consumption of primary (source) non-renewable energy for building operations, ekWh/m²*yr</td>
<td>893</td>
<td>101921 kWh/m²*maph</td>
</tr>
<tr>
<td>5</td>
<td>Net annualized primary embodied energy and annual operating primary energy, kWh/m²*yr</td>
<td>907</td>
<td>103520 kWh/m²*maph</td>
</tr>
<tr>
<td>6</td>
<td>Total on-site renewable energy used for operations, kWh/m²*yr</td>
<td>5.6</td>
<td>634.20 kWh/m²*maph</td>
</tr>
<tr>
<td>7</td>
<td>Net annual consumption of potable water for building operations, m³ / m² * year</td>
<td>0.16</td>
<td>17.76 m³/m²*maph</td>
</tr>
<tr>
<td>8</td>
<td>Annual use of grey water for building operations, m³ / m² * year</td>
<td>1.42</td>
<td>161.72 m³/m²*maph</td>
</tr>
<tr>
<td>9</td>
<td>Net annual GHG emissions from building operations, kg. CO₂ equivalent per year</td>
<td>77.4</td>
<td>8831.39 kg/m²*maph</td>
</tr>
<tr>
<td>10</td>
<td>Total present value of 25-year life-cycle cost for total project, EUR per m².</td>
<td>2800 EUR</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Proportion of gross area of existing structure(s) re-used in the new project, percent</td>
<td>0%</td>
<td></td>
</tr>
</tbody>
</table>
IDP module in SBTool
An IDP Support Tool

- We have developed a simple IDP support tool for project managers;
- It was developed under contract to Natural Resources Canada and UNEP (Paris);
- It is located in File B and is a simple checklist on an Excel spreadsheet;
- As with all iiSBE tools, it is designed to allow easy insertion of local languages and criteria.
1. Consider program logic, renovation options and site issues
2. Set performance targets
3. Develop a building information model (BIM)
4. Undertake passive solar design and optimize envelope design
5. Maximize use of renewable energy
6. Use efficient systems to handle residual energy-using requirements
7. Construct and then commission key systems
8. Ensure effective operational management

Trias Energetica
Simplified overview of IDP process for a new building

- **Functional program**
- **Selected site**
- **Design team**
- **Baseline schematic design**
- **Moderate performance version**
- **Review & select**
- **High performance version**
- **Selected schematic design**
- **Develop detailed design**
- **Completed detailed design**
- **Construct & commission**
- **Operate**

- **Building Information Model (BIM)**
- **Performance targets**
- **Orient & locate fenestration for passive solar**
- **Maximize use of renewables**
- **Use high efficiency HVAC for residual loads**
- **Carry out energy simulations**
Simplified overview of IDP for renovation process

Existing building

- Inspect & Assess
  - Not suited for rehab, but some materials OK
  - Suited only for demolition / dismantling

Suited for renovation

- Bundle renovation tasks and consider a floor-by-floor approach to minimize disruption to existing operations.
- Set performance targets
- Establish process
- Construct and commission
- Acceptance
- Re-use existing materials and components if sound (may need review by engineer).
- Relocate tenants in adequate temporary accommodation.
## Overview of IDP

IDP key steps are shown in a linear sequence, but some steps may be performed in a different sequence or may be repeated. You may therefore wish to change the order or content on the IDP steps worksheet. See Level 3 for detailed comments. To see text for inactive steps, see IDP list worksheet.

### Key process steps for Megaplex, Amiel, Atlantis

1. **Assess site characteristics**
2. **Assess any existing structures and materials that may be re-used**
3. **Assemble the design team**
4. **Develop a functional program, examine assumptions and establish performance targets**
5. **Hold an Initial Design Workshop**
6. **Develop Reference design and benchmarks**
7. **Develop Concept Design**
8. **Consider site development issues**
9. **Determine building structure**
10. **Develop building envelope design**
11. **Develop preliminary daylighting, lighting and power system design**
12. **Develop preliminary ventilation, heating and cooling and wet services designs**
13. **Decide on major design options for detailed development**
14. **Screen non-structural materials for environmental performance**
15. **Complete design and documentation**
16. **Hold a Design Review Workshop**
17. **Develop design and constructability strategies**
18. **Complete Design**
19. **Hold a Design Review Workshop**
20. **Prepare a set of as-built construction documents**
21. **Carry out post-occupancy evaluation and monitor performance**

### Relevant steps completed

- Develop a functional program, examine assumptions and establish performance targets
- Hold an Initial Design Workshop
- Develop Reference design and benchmarks
- Develop Concept Design
- Consider site development issues
- Determine building structure
- Develop building envelope design
- Develop preliminary daylighting, lighting and power system design
- Develop preliminary ventilation, heating and cooling and wet services designs
- Decide on major design options for detailed development
- Screen non-structural materials for environmental performance
- Complete design and documentation
- Hold a Design Review Workshop
- Develop design and constructability strategies
- Complete Design
- Prepare a set of as-built construction documents
- Operate and maintain the building
- Carry out post-occupancy evaluation and monitor performance

### IDP worksheet within SBTool

To unprotect any worksheet, go to Tools, then Protection. Password is “IDP”.

**Click and select “a” to mark each step completed.**

**Click 1 to 3 at upper left for detail.**
# Details of IDP Steps and sub-steps

## Key process steps for Megaplex, Amiel, Atlantis

| Step | Description | Actors
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.09</td>
<td>Carry out an Environmental Impact Assessment, based on preliminary assumptions about the site characteristics, building program, size and location on the site.</td>
<td>EC, PM, GE</td>
</tr>
<tr>
<td>1.10</td>
<td>Prepare a Functional Program and Performance Goals Report, including a completed File B of SBTool.</td>
<td>DF, AR, PM, CL</td>
</tr>
</tbody>
</table>

### 2.0 Assess site characteristics

| Step | Description | Actors
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2.01</td>
<td>Assess the suitability of the site in terms of easy access to good public transportation services.</td>
<td>UP, CL, AR</td>
</tr>
<tr>
<td>2.02</td>
<td>Assess the suitability of the site in terms of access to commercial and public services, recreation and public green space.</td>
<td>UP, CL, AR</td>
</tr>
<tr>
<td>2.04</td>
<td>Assess erosion potential of surface soils and soil stability and bearing strength of subsurface soils.</td>
<td>GE, ST</td>
</tr>
<tr>
<td>2.05</td>
<td>Assess the ecological quality of the site. Report on results in ContextB worksheet.</td>
<td>EC, GE</td>
</tr>
<tr>
<td>2.06</td>
<td>This is a brownfield site, take steps to remediate conditions (see ContextB).</td>
<td>EC, CL</td>
</tr>
<tr>
<td>2.07</td>
<td>Examine soil for presence of radon.</td>
<td>GE</td>
</tr>
<tr>
<td>2.08</td>
<td>Identify any features in adjacent properties that may place constraints on the design of the subject building.</td>
<td>AR</td>
</tr>
<tr>
<td>2.09</td>
<td>Measure typical Sound Level (Leq) at the noisiest site boundary. Report on results in ContextB worksheet.</td>
<td>AS, UP</td>
</tr>
</tbody>
</table>

Yellow and blue circles are hyperlinks to relevant websites and other worksheets.

Use blue clickable boxes to select actors to be involved in each step from list below.

![List of actors](image)
Applications of SBTool

Earlier versions of SBTool work have influenced national systems being used in Italy, Czech Republic, Spain and Portugal.
SBTool in Italy

- In 2002 ITACA, the *Federal Association of the Italian Regions*, adopted the GBC methodology as basis to develop an institutional assessment system for residential buildings: Protocollo ITACA;

- Main objective of the association is to promote and disseminate the good practices for the environmental sustainability and to develop common policies for the Regions (the environment falls within regional competence).

- The aim of ITACA was to establish an objective set of requirements to define green building and to develop a simple assessment method to measure the environmental performance of buildings necessary to improve policies on sustainable building;

- The Green Building Challenge (GBC) method and its software tool (now SBTool) was found to give local authorities the ability to adapt the tool to their own conditions and priorities;

- The “Protocollo ITACA” was officially adopted by ITACA in January 2004, and is now the reference rating system of the regional authorities in Italy.
As with all implementations of GBTool or SBTool, the assessments are carried out with reference to locally meaningful benchmarks and weights, while results are expressed both as absolute results, and as relative performance using the minimum acceptable benchmark as a reference;

An important factor in the success of the Protocollo ITACA has been the role of iiSBE as an international body overseeing the activities of iiSBE Italia, and the partnership with the CNR and universities;

Another significant step was the decision to reduce the number of parameters from the potential maximum of 118 to 65;

A more compact version, using 25 criteria was developed, and a still smaller version with 12 criteria now exists;

Protocollo ITACA

- An important factor in the success of the Protocollo ITACA has been the role of iiSBE as an international body overseeing the activities of iiSBE Italia, and the partnership with the CNR and universities;
- Another significant step was the decision to reduce the number of parameters from the potential maximum of 118 to 65;
- A more compact version, using 25 criteria was developed, and a still smaller version with 12 criteria now exists;
SBTool CZ

SBToolCZ 2010 version for residential buildings in the design phase has in total 33 criteria. Structure of the set of assessment criteria is divided in accordance with principles of sustainable construction into three basic groups:

1. Environmental,
2. Social,

These issue areas are complemented by a fourth group:

4. Locality.

Assessment of the locality (building site and its surroundings) is separated from the building performance evaluation in concordance with the German approach in the BNB methodology.

The criteria accords to Czech and European standardization, reflects the outputs of CEN TC 50. The core indicators of the SB Alliance are also incorporated.
SBTool<sup>PT</sup> - Core

- SBTool<sup>PT</sup>-H (method for residential buildings) **was the first developed module and it is in application in Portugal since 2007**;
- At the moment, modules for office buildings, tourism buildings and urban planning are under development.

**Goals of the system**

- To develop a **regional system** adapted to the national context based on the global SBTool methodology;
- To be **harmonized with the CEN/TC350 standards** “Sustainability of Construction Works - Assessment of Environmental Performance of Buildings”;
- Include the **three dimensions of sustainable development**;
- Provide a list of parameters that is **wide enough to include the most important building impacts** and at the same time **as compact as possible for practical use**.
Monaco competition

- SBTool can be used by a client to identify its specific performance requirements for competitions or long-term portfolio development;

- We followed this approach in a major invited competition in Monaco which involves an extension of 11 hectares into the sea in the middle of the urban area;

- This approach allowed the client to be very specific and also provides clarity for the competing teams.

- This was an invited competition for five international teams.
Application of the SBTool framework to an invited competition for a large development in Monaco
### Bilan comparatifs de l'ensemble de projets

**Principauté de Monaco**  
**Projet d'urbanisation en mer : comparaison générale des soumissions**  

**avril 2008**  
**Equipe A**  
**Equipe B**  
**Equipe C**  
**Equipe D**  
**Equipe E**

<table>
<thead>
<tr>
<th>Observations générale</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SBTool - score au revoir</strong></td>
</tr>
<tr>
<td><strong>SBTool - score finale</strong></td>
</tr>
</tbody>
</table>

#### Critères

<table>
<thead>
<tr>
<th>Critères</th>
<th>Classement (passé)</th>
<th>Note (actuel)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong> Site, implantation, développement urbain et marin</td>
<td>30.1%</td>
<td></td>
</tr>
<tr>
<td><strong>A1</strong> Choix de l'implantation en mer et contexte marin</td>
<td>21%</td>
<td></td>
</tr>
<tr>
<td><strong>A1.1</strong> Préservation de la qualité écologique des zones sensibles</td>
<td>12.1%</td>
<td></td>
</tr>
<tr>
<td><strong>A1.2</strong> Préservation de la qualité écologique des fonds marins découverts</td>
<td>12.1%</td>
<td></td>
</tr>
</tbody>
</table>

#### Observations sur l'utilisation de SBTool

- Le dossier réalisé par une équipe de SBTool est dispo dans le soutien, et avec l'information supplémentaire détaillée jusqu'à E1.2.
- Ils ont utilisé SBTool correctement et ont également fourni des informations topographiques à vos équipes pour chaque lot.
- SBTool a été utilisé comme base pour l'utilisation des fonds découverts.

#### Notes

- **A1.1** Préservation de la qualité écologique des zones sensibles:
  - La distance minimale entre le pont de l'hydrogène de l'île du Grand-Port et des zones sensibles est de 550 m.
  - Les distances sont inférieures à 55m par rapport à la distance minimale.
  - FF respecté.

- **A1.2** Préservation de la qualité écologique des fonds marins découverts:
  - Les fonds découverts sont occupés par des fonds naturels de l'île du Grand-Port et du Fautas.
  - Le nombre de fonds découverts par rapport à la surface du projet est de 6.3%.
Conclusions

- SBTool takes a very different approach from commercial rating systems, by providing an open framework in which authorized regional users insert local context values, performance benchmarks and targets to suit certain building types;
- This requires a considerable effort and time, but allows the calibrated system to provide much more meaningful results;
- Of course, this approach appeals more to users who are interested in expressing performance in an integrated way, than others who want the marketing benefits of a label;
- But we will continue to develop a system that we consider to be the right approach.
Contacts & Info

- [http://www.iisbe.org](http://www.iisbe.org)
- Luis Bragança (President), braganca@civil.uminho.pt
- Nils Larsson (XD), [larsson@iisbe.org](mailto:larsson@iisbe.org)