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

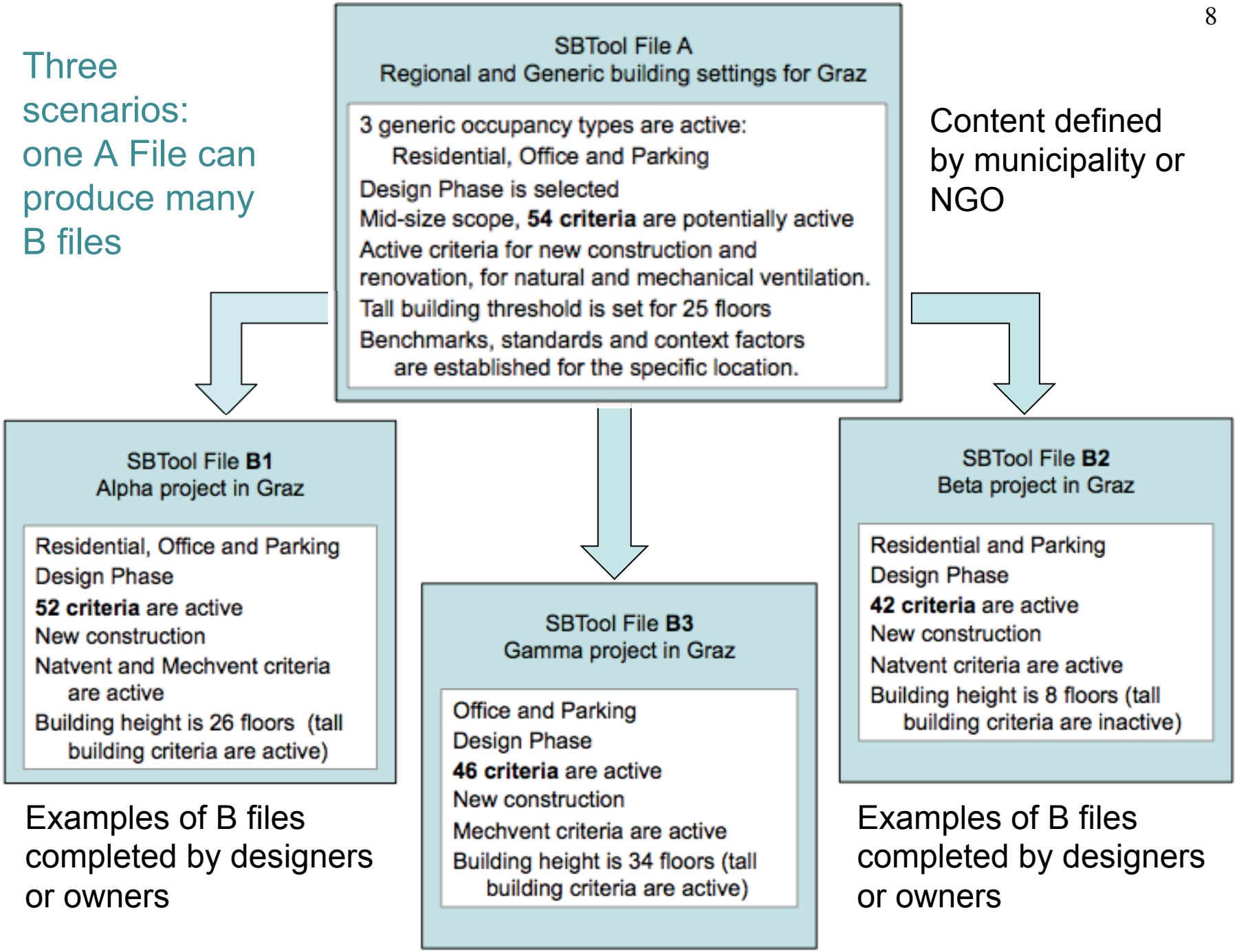
Performance trade-offs

- 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 aspect;
- 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

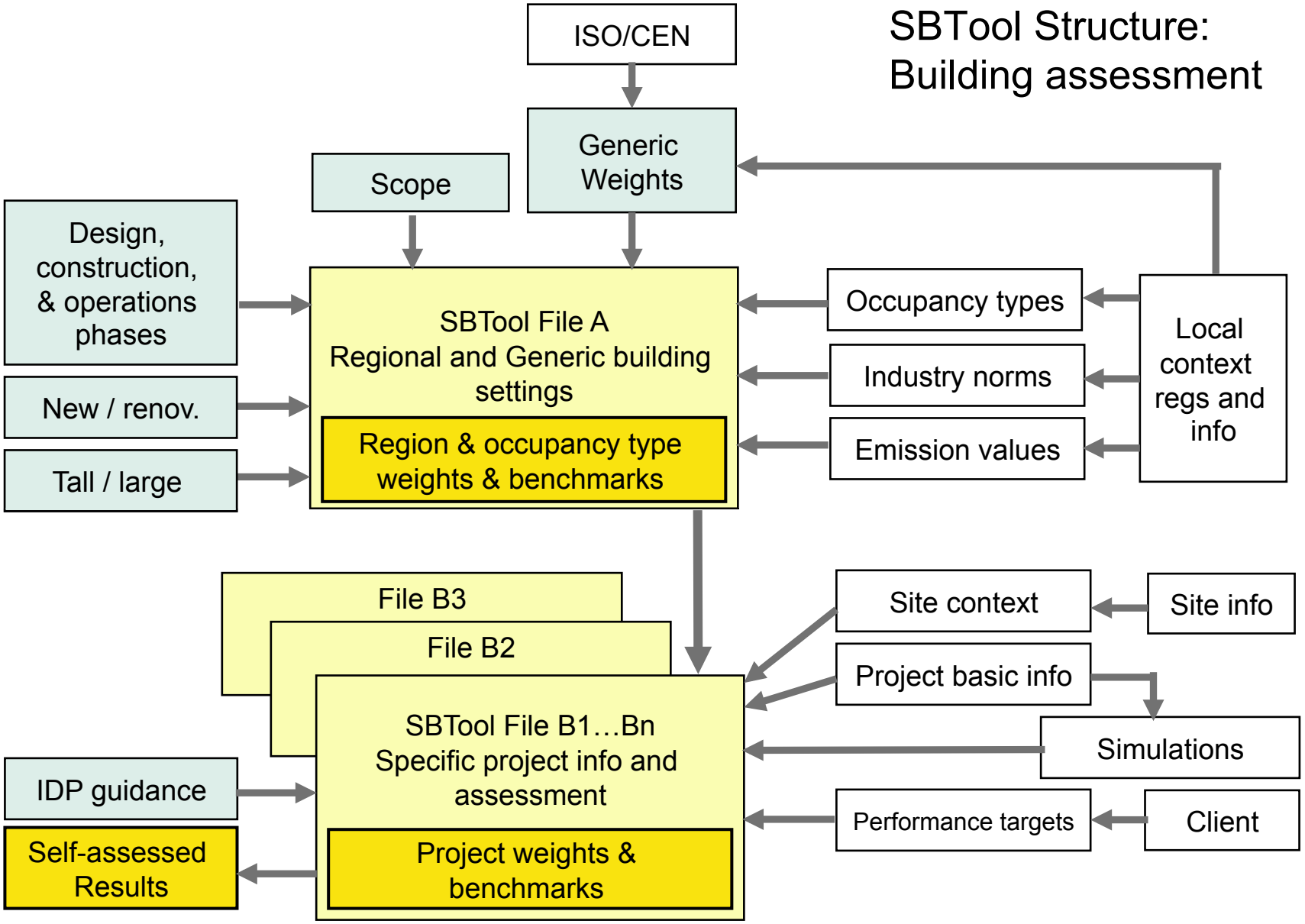


Content defined by municipality or NGO

Examples of B files completed by designers or owners

Examples of B files completed by designers or owners

SBTool Structure: Building assessment



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.

Figure 4: SBTool 2012 Generic, Active Criteria by Issue and Phase (excluding Developer version)

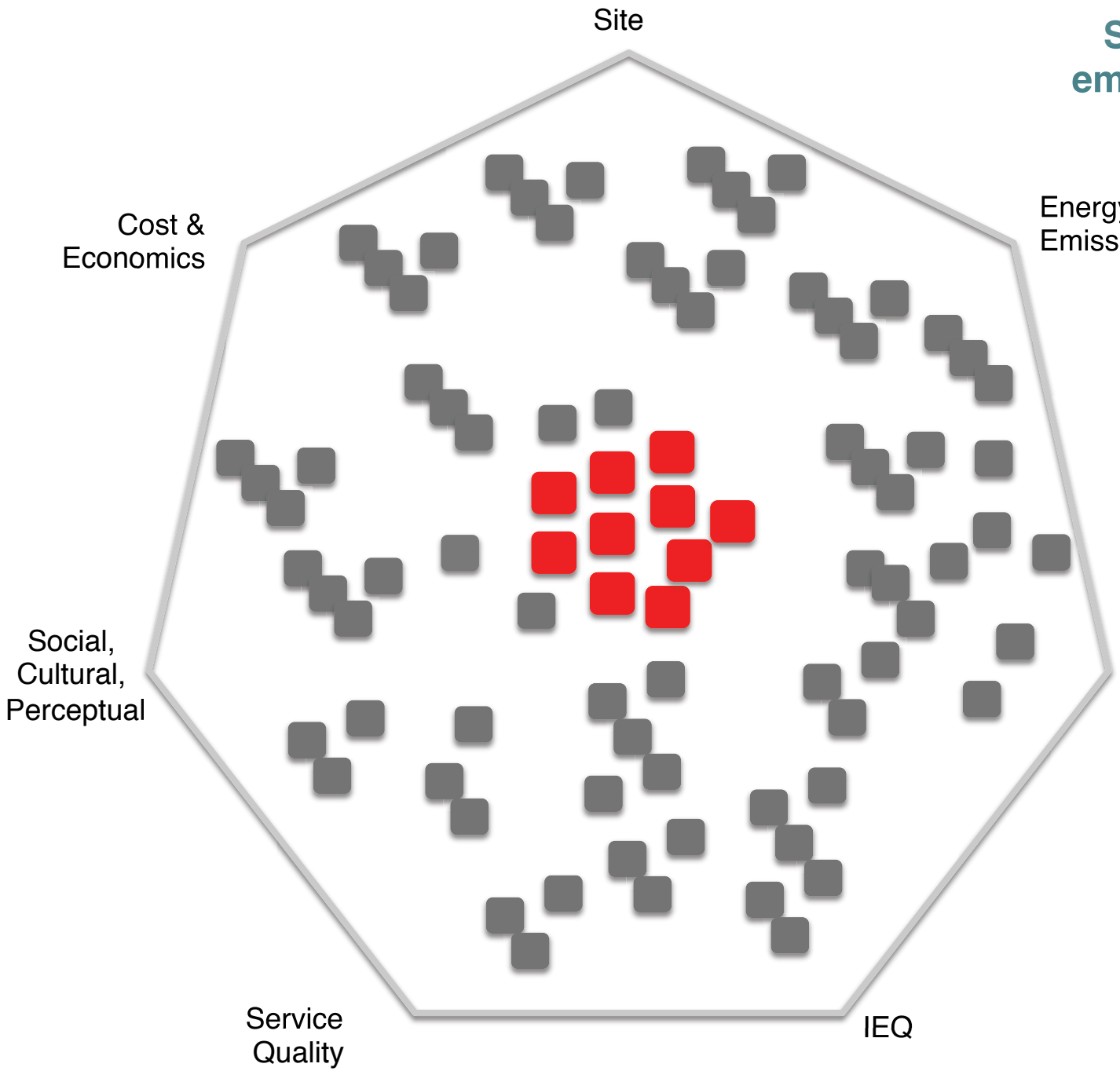
Issue area	Scope	Pre-design	Design	Construction	Operation
Site Location, Available Services and Site Characteristics	Max.	35			
	Mid.	20			
	Min.	8			
Site Regeneration and Development, Urban Design and Infrastructure	Max.		22	0	21
	Mid.		12	0	11
	Min.		2	0	2
Energy and Resource Consumption	Max.		10	6	10
	Mid.		8	4	7
	Min.		4	2	3
Environmental Loadings	Max.		19	7	18
	Mid.		6	1	6
	Min.		2	0	2
Indoor Environmental Quality	Max.		18	0	19
	Mid.		10	0	10
	Min.		2	0	2
Service Quality	Max.		20	9	25
	Mid.		10	4	13
	Min.		2	1	2
Social, Cultural and Perceptual Aspects	Max.		10	2	10
	Mid.		5	1	5
	Min.		1	0	1
Cost and Economic Aspects	Max.		4	1	4
	Mid.		3	1	3
	Min.		1	0	1
Total System	Max.	35	103	25	107
	Mid.	20	54	11	55
	Min.	8	14	3	13

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

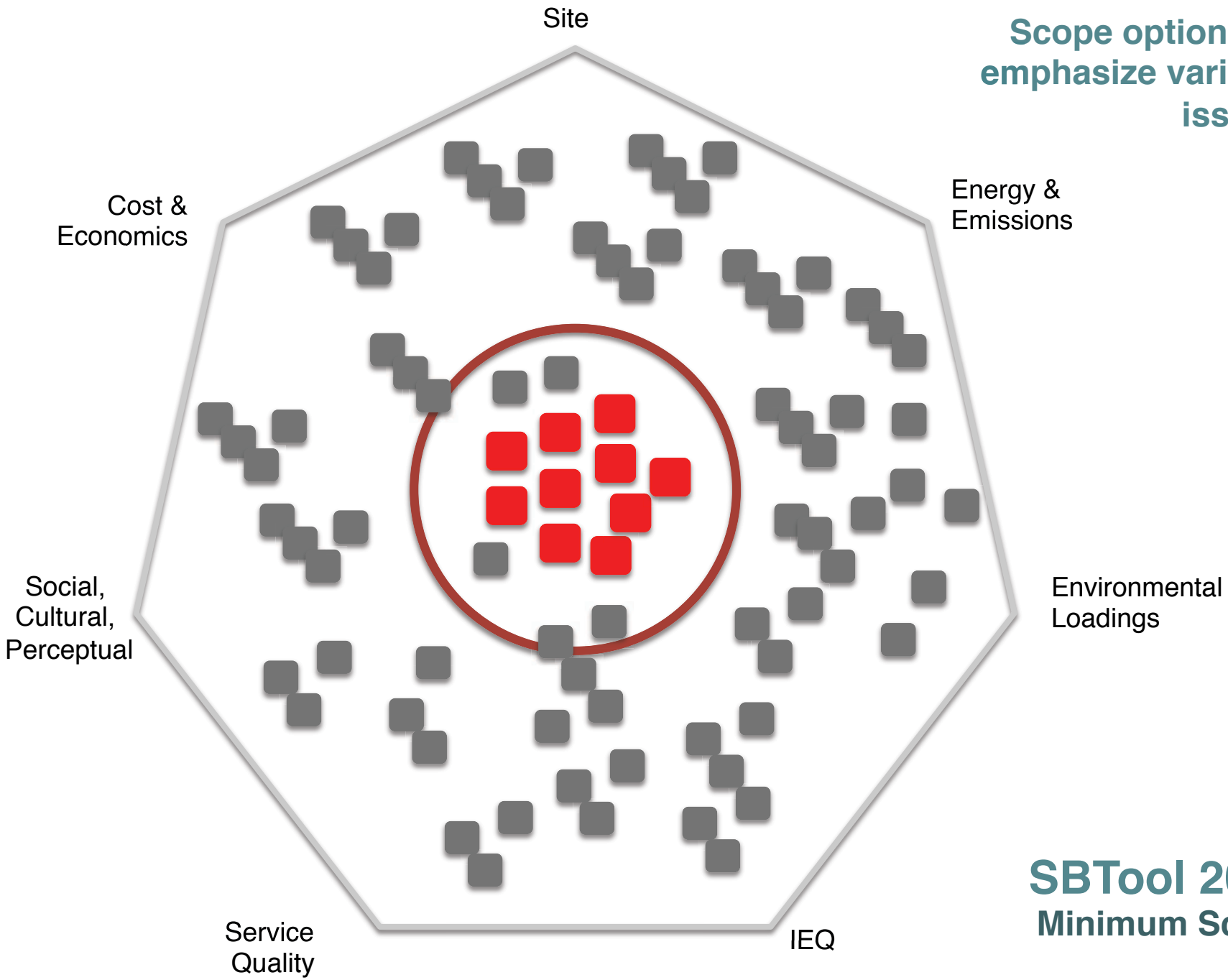


SBTool 2015
Maximum scope
Active Criteria

Optional criteria

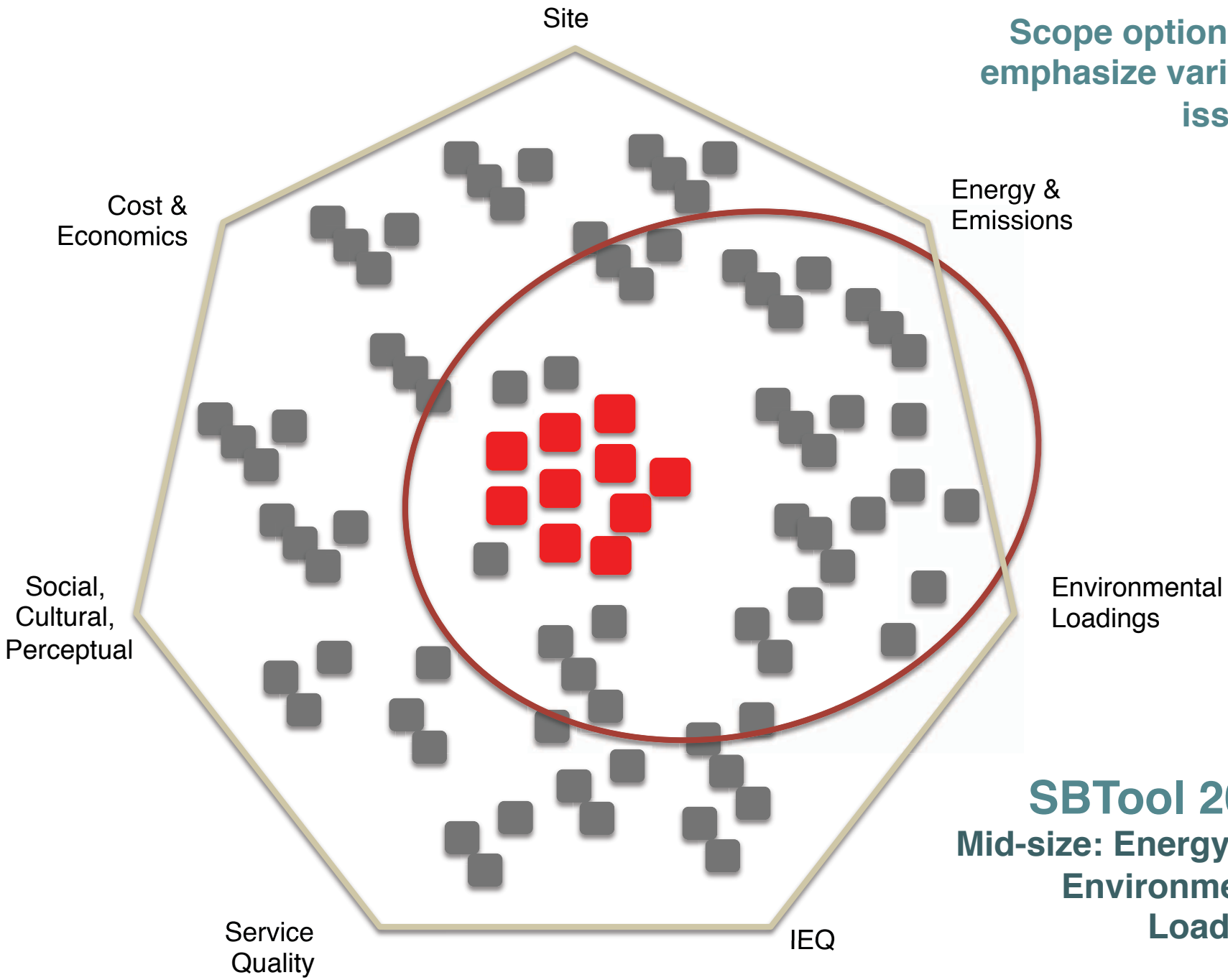
Mandatory criteria

Scope options to emphasize various issues



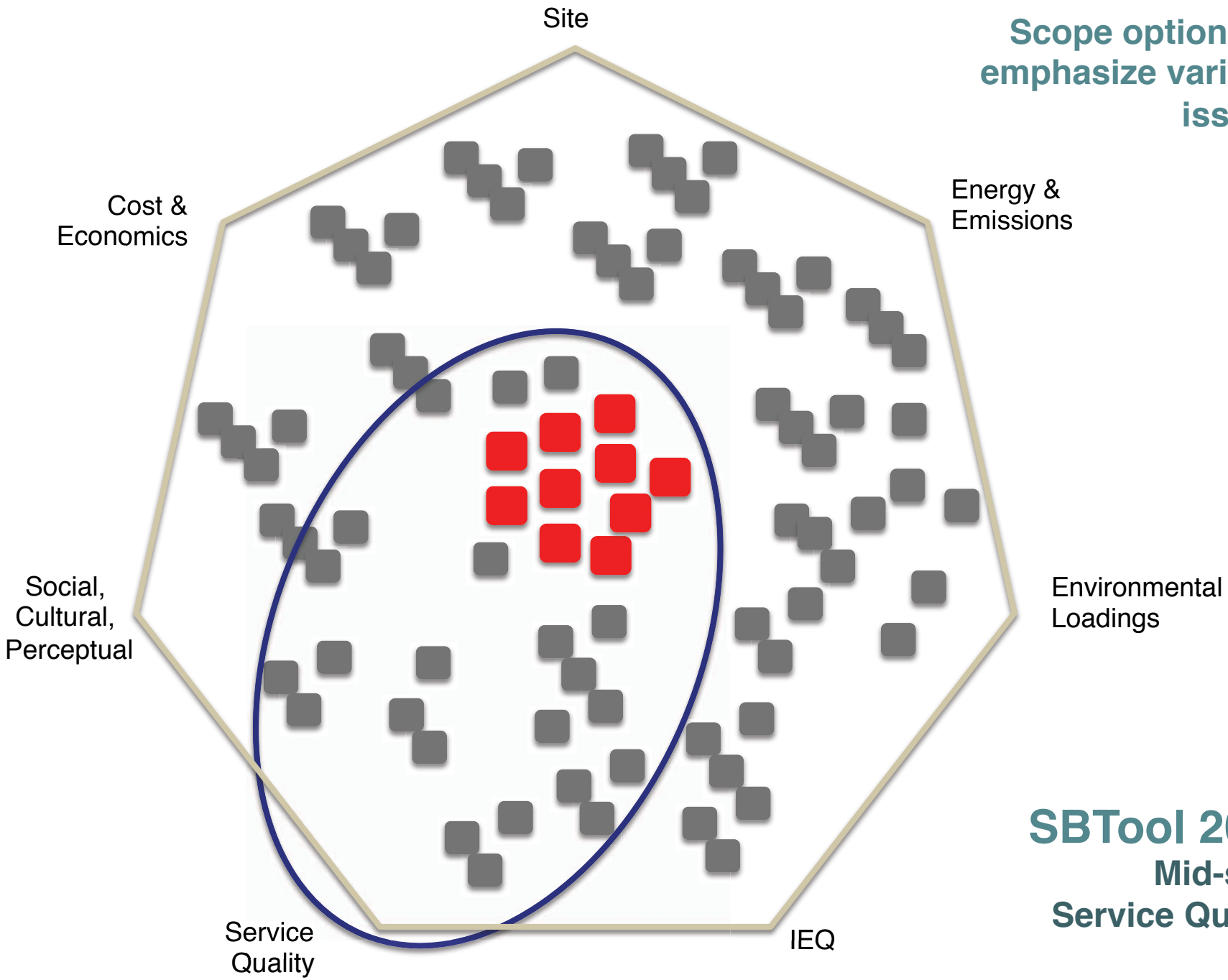
SBTool 2015
Minimum Scope

Scope options to emphasize various issues



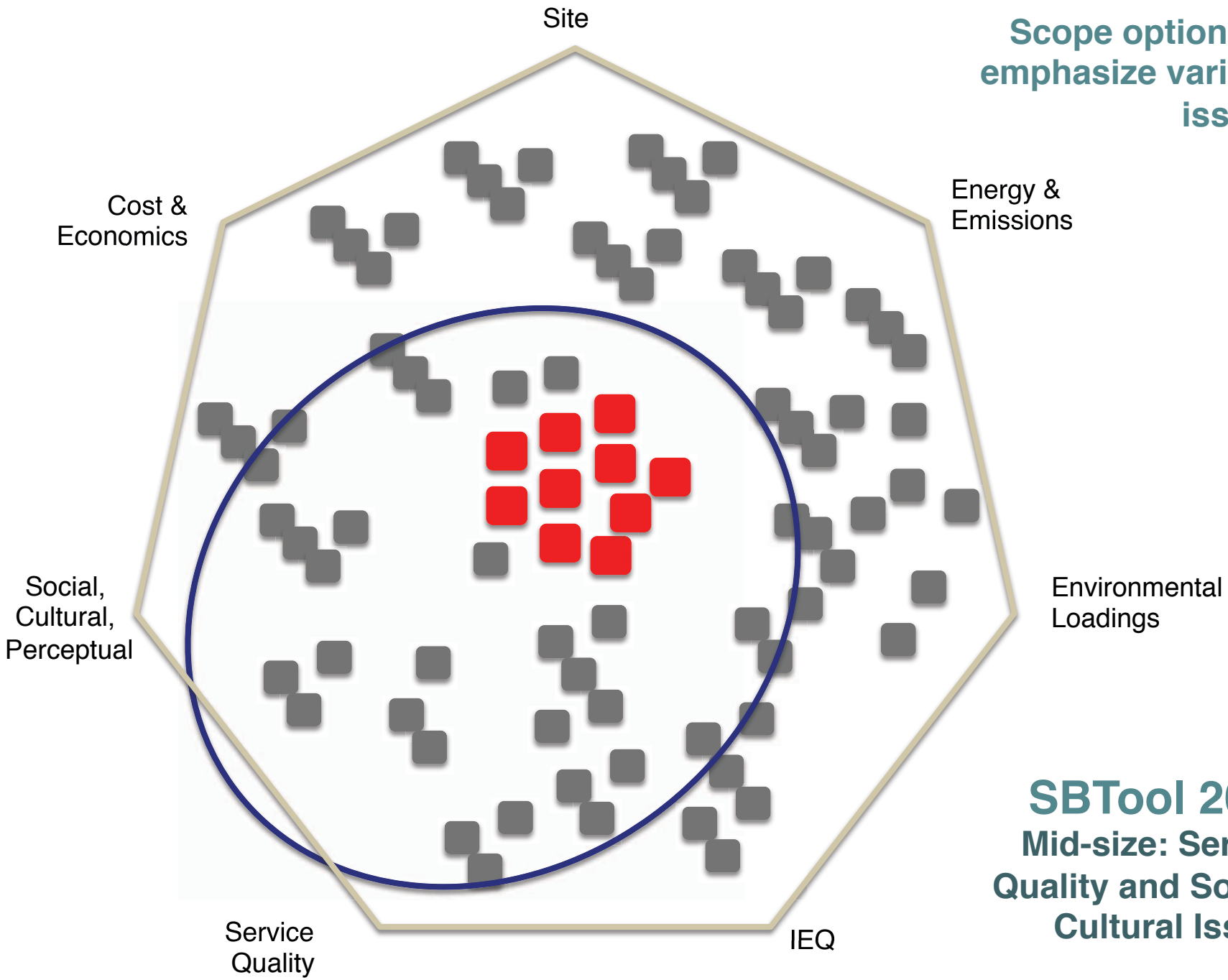
SBTool 2015
Mid-size: Energy and Environmental Loadings

Scope options to emphasize various issues



SBTool 2015
Mid-size:
Service Quality

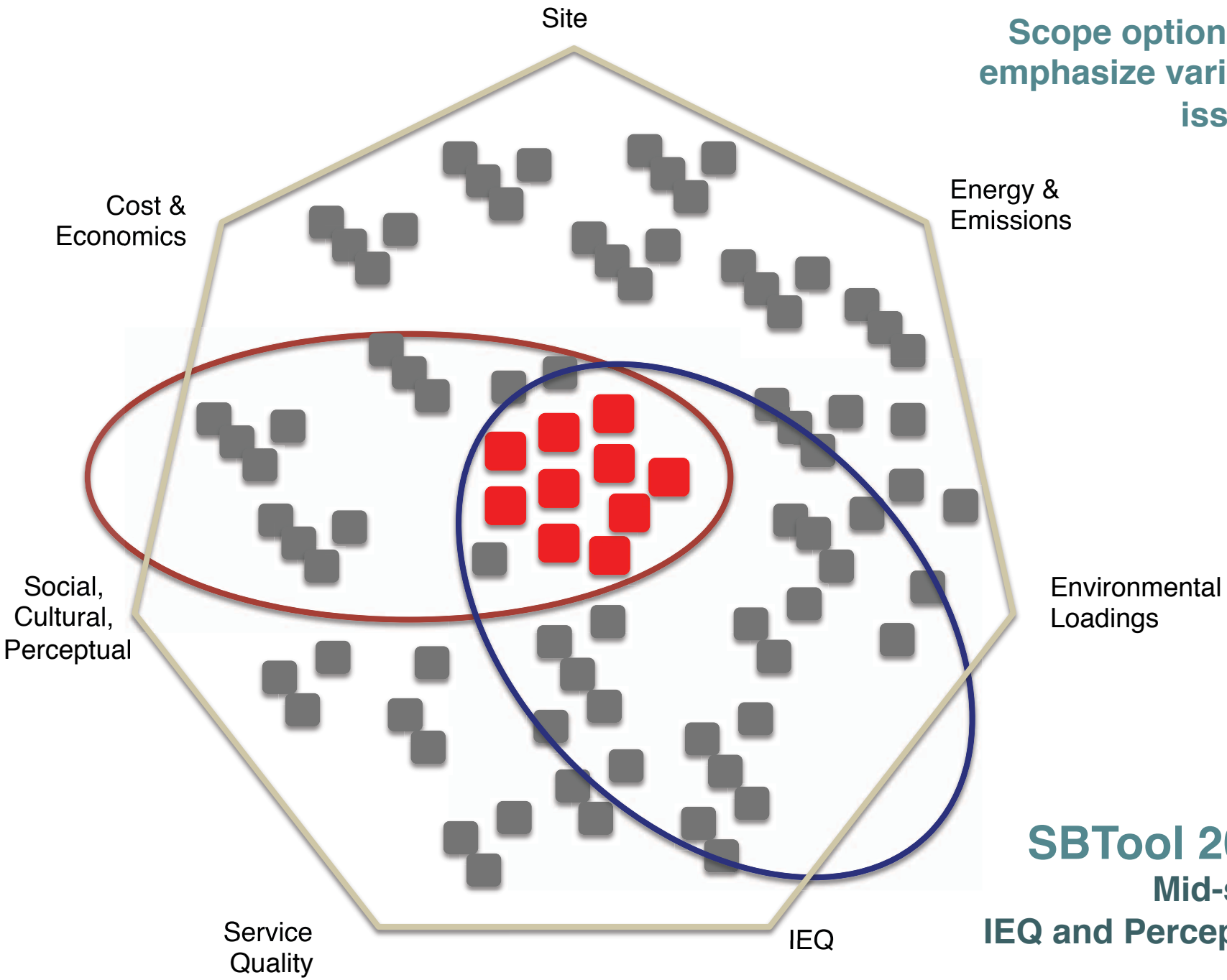
Scope options to emphasize various issues



SBTool 2015

Mid-size: Service Quality and Social/ Cultural Issues

Scope options to emphasize various issues



SBTool 2015
Mid-size:
IEQ and Perceptual

Benchmarking

Benchmarking

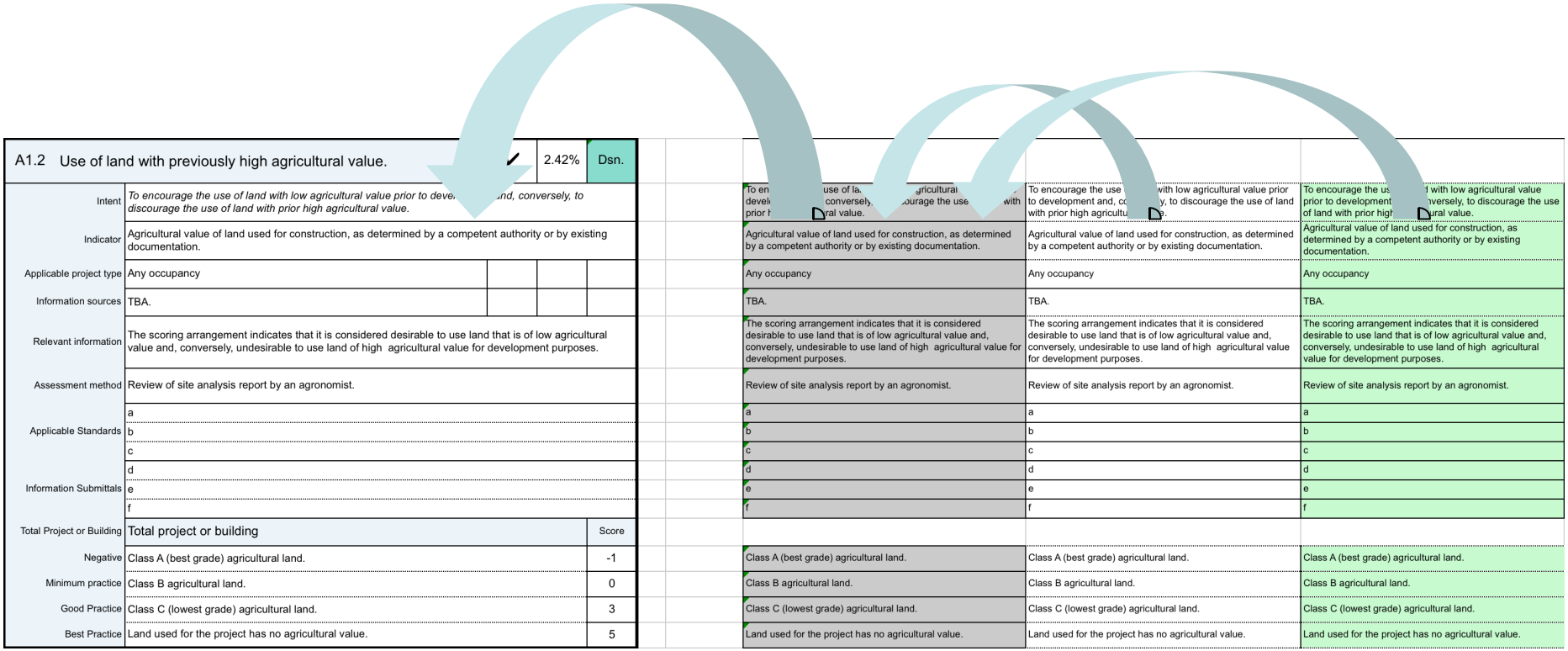
- When is a certain level of performance good, and when is it bad?
- That depends on what we compare it to;
- So performance is always considered relative to that of other buildings of a similar type that are considered to be typical or the best (or worst) of their type;
- The establishment of such benchmarks 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.

File A

Example benchmark, showing possibility for local content



A1.2 Use of land with previously high agricultural value.		✓	2.42%	Dsn.			
Intent	*To encourage the use of land with low agricultural value prior to deve… …nd, conversely, to discourage the use of land with prior high agricultural value.*				To en… use of la… …gricultura… develo… conversely, …ourage the use… …with prior h… …ral value.	To encourage the use … with low agricultural value prior to development and, co… …y, to discourage the use of land with prior high agricultu… …e.	To encourage the us… …l with low agricultural value prior to development … …oversely, to discourage the use of land with prior high… …ural value.
Indicator	Agricultural value of land used for construction, as determined by a competent authority or by existing documentation.				Agricultural value of land used for construction, as determined by a competent authority or by existing documentation.	Agricultural value of land used for construction, as determined by a competent authority or by existing documentation.	Agricultural value of land used for construction, as determined by a competent authority or by existing documentation.
Applicable project type	Any occupancy				Any occupancy	Any occupancy	Any occupancy
Information sources	TBA.				TBA.	TBA.	TBA.
Relevant information	The scoring arrangement indicates that it is considered desirable to use land that is of low agricultural value and, conversely, undesirable to use land of high agricultural value for development purposes.				The scoring arrangement indicates that it is considered desirable to use land that is of low agricultural value and, conversely, undesirable to use land of high agricultural value for development purposes.	The scoring arrangement indicates that it is considered desirable to use land that is of low agricultural value and, conversely, undesirable to use land of high agricultural value for development purposes.	The scoring arrangement indicates that it is considered desirable to use land that is of low agricultural value and, conversely, undesirable to use land of high agricultural value for development purposes.
Assessment method	Review of site analysis report by an agronomist.				Review of site analysis report by an agronomist.	Review of site analysis report by an agronomist.	Review of site analysis report by an agronomist.
Applicable Standards	a				a	a	a
	b				b	b	b
	c				c	c	c
Information Submittals	d				d	d	d
	e				e	e	e
	f				f	f	f
Total Project or Building	Total project or building			Score			
Negative	Class A (best grade) agricultural land.			-1	Class A (best grade) agricultural land.	Class A (best grade) agricultural land.	Class A (best grade) agricultural land.
Minimum practice	Class B agricultural land.			0	Class B agricultural land.	Class B agricultural land.	Class B agricultural land.
Good Practice	Class C (lowest grade) agricultural land.			3	Class C (lowest grade) agricultural land.	Class C (lowest grade) agricultural land.	Class C (lowest grade) agricultural land.
Best Practice	Land used for the project has no agricultural value.			5	Land used for the project has no agricultural value.	Land used for the project has no agricultural value.	Land used for the project has no agricultural value.

Visible text is based on a formula that selects appropriate text at right

Selected content

Default content

Local content

Example benchmark, showing data benchmarks for the total project

A1.3 Vulnerability of the site to flooding.		✔	1.88%	Dsn.
Intent	*To discourage the selection of land for building where there is a substantial risk that the site may be flooded.*			
Indicator	Height above 100-year flood plain as defined in official documentation or assessment by competent authorities.			
Applicable project type	Any occupancy			
Information sources	TBA.			
Relevant information	0			
Assessment method	Review of site analysis report.			
Applicable Standards	a b c	Data values are inserted in yellow fields to establish slope		
Information Submittals	d e f			
Total Project or Building	Total project or building		m	Score
Negative	The height of the minimum elevation of the site above the elevation of the 100-year flood plain is :		1.0	-1
Minimum practice			1.3	0
Good Practice			2.0	3
Best Practice			2.5	5

File A

Example benchmark, showing text benchmarks for the total project

A1.5	Remediation of contaminated soil, groundwater or surface water.		0.98%	Dsn.
Intent	*To assess the success of remediation of contaminated soil, groundwater, or surface water in th[illegible]roject.*			
Indicator	Status of soil, groundwater, or surface water after treatment.			
Applicable project type	Any project type with contaimnated 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 asessment 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			
Information Submittals	d			
	e			
	f			
	Assessment criteria for total project			Score
Negative	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.			-1
Minimum practice	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.			0
Good Practice	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.			3
Best Practice	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.			5

Phase

Weight

Scoring from -1 to +5 is standard; for subsequent assessments values can be interpolated to half-points

File A

File A

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.		1.70%	Dsn.
Intent	*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.*		
Indicator	*Facilities provided in the design for the storage and sorting of solid wastes in both dispersed and central locations.*		
Applicable project type	Separate criteria for residential and non-residential; NA for parking or open space		
Information sources	We specify storage areas per dwelling and per work group, and assume that the central storage area will be sized to suit.		
Relevant information	*Information on type, capacity and location of facilities for sorting and storing solid waste.*		

Occupancy 1	Assessment criteria for Residential apartments	on	percent	Score
Negative	Each dwelling unit has been provided with space for temporary storage of solid waste and recycling, and storage for solid waste has been provided on each floor. A central sorting and storage area is located close to to a truck loading area and it is estimated that the percentage of total waste that can be sorted and stored is:		71%	-1
Minimum practice			75%	0
Good Practice			87%	3
Best Practice			95%	5
Occupancy 2	Assessment criteria for Offices	on	percent	Score
Negative	A central sorting and storage area is located close to a truck loading area, and storage has been provided sufficient for all wastes that may accumulate over a period of one week. It is estimated that the percentage of total waste that can be sorted and stored is:		70%	-1
Minimum practice			75%	0
Good Practice			90%	3
Best Practice			100%	5

B5.2 Use of potable water for occupancy needs.

Intent	*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.*
Indicator	Prediction of total potable water use, in L per person per day, based on a credible water management plan for occupancy fixtures and use.
Information sources	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.
Applicable project type	By separate occupancies, excluding irrigation water for outdoor areas.
Assessment method	Review of contract documentation by a specialist in water use.
Applicable Standards	a
	b
	c
	d
Information Submittals	e
	f

Applica (Active

Dsn

Applicable phases (Active if green)

C&C. | Ops

Occupancy 1	Apartment	on	L. pp / day.	Score
Negativ			400	-1
Acceptable practic			350	0
Good Practic			200	3
Best Practic			100	5

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

SBT12-A benchmarks: examples of default text criteria tailored to suit Design and Operating phases.

Information Submittals	d
	e
	f

Occupancy 1	Apartment	on	L. pp / day.	Score
Negativ			400	-1
Acceptable practic			350	0
Good Practic			200	3
Best Practic			100	5

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

File A

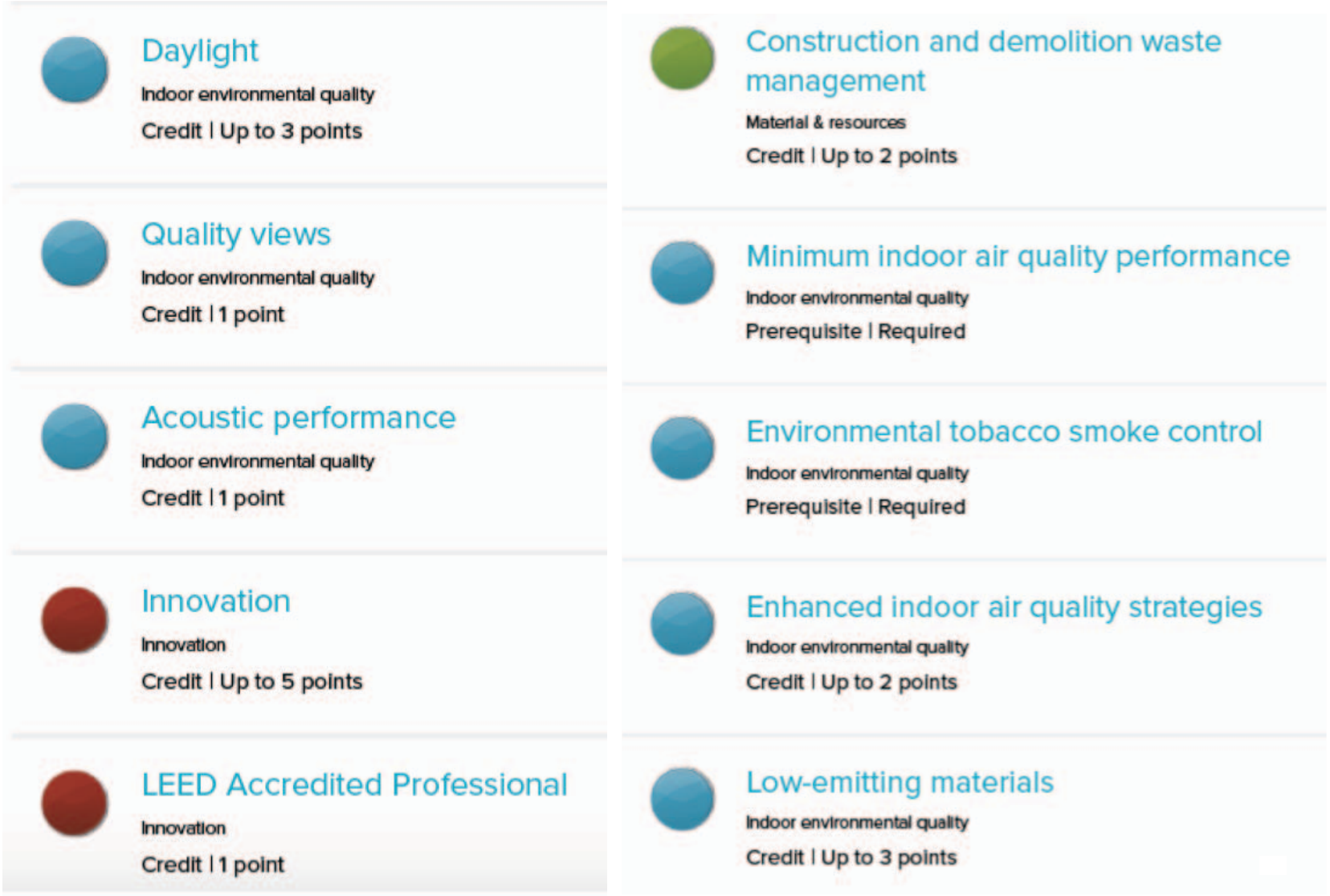
Weighting

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:



Daylight
Indoor environmental quality
Credit | Up to 3 points

Quality views
Indoor environmental quality
Credit | 1 point

Acoustic performance
Indoor environmental quality
Credit | 1 point

Innovation
Innovation
Credit | Up to 5 points

LEED Accredited Professional
Innovation
Credit | 1 point

Construction and demolition waste management
Material & resources
Credit | Up to 2 points

Minimum indoor air quality performance
Indoor environmental quality
Prerequisite | Required

Environmental tobacco smoke control
Indoor environmental quality
Prerequisite | Required

Enhanced indoor air quality strategies
Indoor environmental quality
Credit | Up to 2 points

Low-emitting materials
Indoor environmental quality
Credit | Up to 3 points

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.

SB method weighting algorithm

Regional adjustment		Extent of potential effect		Duration of potential effect		Intensity of Potential Effect		Primary issue or system directly affected	
1	Much less	1	Building	1	1 to 3 years	1	Minor	1	Cost and economics
2	Less	2	Site / project	2	3 to 10 years	2	Moderate	1	Functionality and servicability
3	OK	3	Neighborhood	3	10 to 30 years	3	Major	2	Well-being and productivity
4	More	4	Urban / Region	4	30 to 75 years			2	Social and cultural issues
5	Much more	5	Global	5	>75 years			3	Land resources
								3	Non-renewable material resources
								3	Non-renewable water resources
								3	Health, safety and security of individuals
								4	Renewable energy resources
								4	Non-renewable energy resources
								3	Ecosystem(s)
								4	Local and regional atmosphere
								5	Global climate

- 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 Emissions Data for Amiel, Atlantis

Title	
Click to select value	
Enter or revise text	

Emissions data is for: **Ontario, Canada**

Modify emissions data in this sheet to suit local generation mix.

Primary energy and environmental factors	Emissions from combustion in Kg. per GJ of energy produced		For more detail click on 2 or 3 at upper left
	CO_2	SO_2	
Fuel used for off-site gen. of electricity only			Gross-up factor for primary energy (incl. combustion & delivery loss)
Natural gas (BC)	131.39	0.00105	2.84
Fuel Oil (QC)	200.00	1.93889	3.02
Coal (ON)	241.11	1.16389	3.26
biomass and other	0.00	0.00	0.00
nuclear	0.00	0.00	Composite gross-up for electrical primary energy, based on generation mix, assuming only delivery losses for nuclear or hydro: **2.12**
hydro, with high-methane emission reservoir	0.00	0.00	
hydro, with moderate-methane emission reservoir	0.00	0.00	
hydro, with low- or no-methane emission reservoir	0.00	0.00	
wind	0.00	0.00	
geothermal	0.00	0.00	

Electricity power generation base load mix	**Generation mix by source**
natural gas	**8.40%**
oil-fired	**0.49%**
coal-fired	**24.59%**
nuclear	**40.80%**
hydro, with high-methane emission reservoir	0.00%
hydro, with moderate-methane emission reservoir	**24.91%**
hydro, with low- or no-methane emission reservoir	0.00%
wind	0.00%
solar	0.00%
geothermal	0.00%
biomass	**0.66%**
other	**0.0016%**

Arcane calculations for electricty GHGs

Fuel type	GHG fuels as % of all GJ	kg. GHG per GJ primary
Nat. gas	8.4%	11.04
Oil	0.5%	0.98
Coal	24.6%	59.29
Biom/Oth	0.7%	0.00
kg. GHG / GJ for elec.		71.31

Note: Only emissions from non-renewables are included. Emissions for biomass and other fuels are assumed to be zero, as per IPCC.

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

File A

Assessment Results

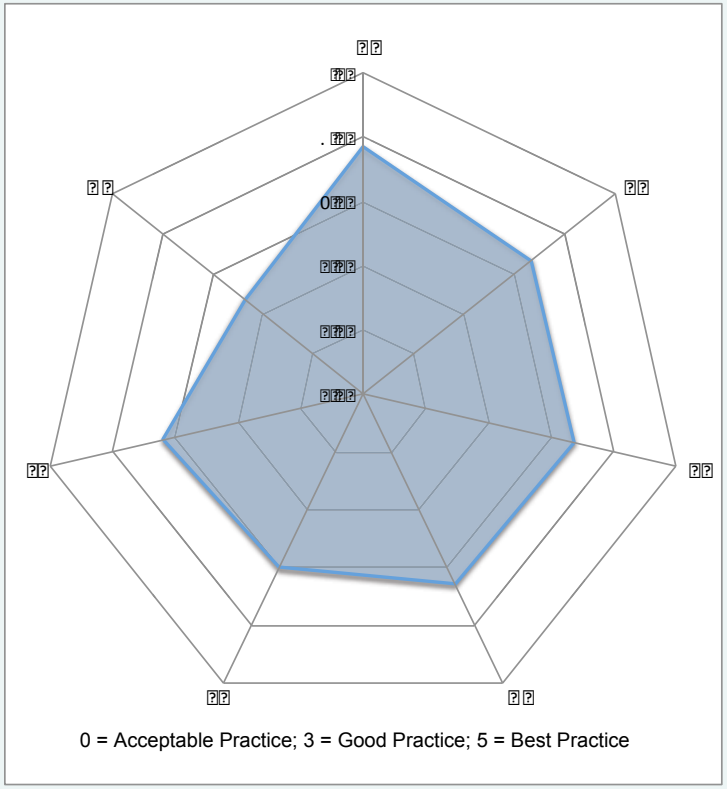
iiSBE

SBTool 2013

Target scores for GMS Project 1, Guimaraes, Portugal

Mid-size version	Design Phase	Target scores

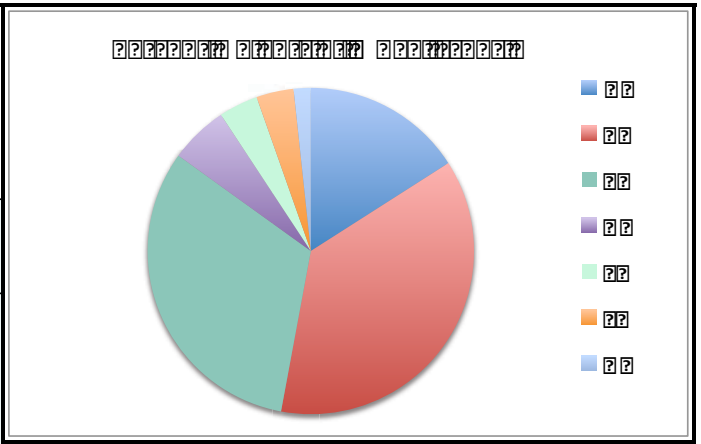
Whole building basis



0 = Acceptable Practice; 3 = Good Practice; 5 = Best Practice

Relative Performance Target **B**

Performance target level is Good Practice or better

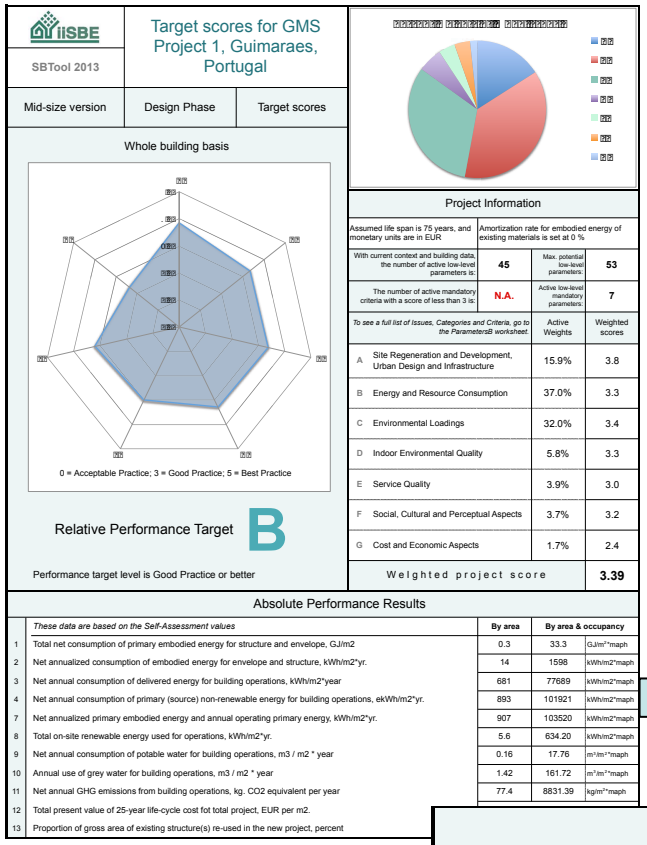


Project Information

Assumed life span is 75 years, and monetary units are in EUR		Amortization rate for embodied energy of existing materials is set at 0 %	
With current context and building data, the number of active low-level parameters is:	**45**	Max. potential low-level parameters:	**53**
The number of active mandatory criteria with a score of less than 3 is:	**N.A.**	Active low-level mandatory parameters:	**7**

To see a full list of Issues, Categories and Criteria, go to the ParametersB worksheet.	Active Weights	Weighted scores
A Site Regeneration and Development, Urban Design and Infrastructure	15.9%	3.8
B Energy and Resource Consumption	37.0%	3.3
C Environmental Loadings	32.0%	3.4
D Indoor Environmental Quality	5.8%	3.3
E Service Quality	3.9%	3.0
F Social, Cultural and Perceptual Aspects	3.7%	3.2
G Cost and Economic Aspects	1.7%	2.4
Weighted project score		**3.39**

Results are shown relative to the zero benchmark



iiSBE

SBTool 2013

Target scores for GMS Project 1, Guimaraes, Portugal

Mid-size version | Design Phase | Target scores

Whole building basis

0 = Acceptable Practice; 3 = Good Practice; 5 = Best Practice

Relative Performance Target **B**

Performance target level is Good Practice or better

Project Information

Assumed life span is 75 years, and monetary units are in EUR	Amortization rate for embodied energy of existing materials is set at 0 %		
With current context and building data, the number of active low-level parameters is:	45	Max. potential low-level parameters:	53
The number of active mandatory criteria with a score of less than 3 is:	N.A.	Active low-level mandatory parameters:	7
To see a full list of Issues, Categories and Criteria, go to the Parameters® worksheet		Active Weights	Weighted scores
A Site Regeneration and Development, Urban Design and Infrastructure		15.9%	3.8
B Energy and Resource Consumption		37.0%	3.3
C Environmental Loadings		32.0%	3.4
D Indoor Environmental Quality		5.8%	3.3
E Service Quality		3.9%	3.0
F Social, Cultural and Perceptual Aspects		3.7%	3.2
G Cost and Economic Aspects		1.7%	2.4
Weighted project score			**3.39**

Absolute Performance Results

	These data are based on the Self-Assessment values	By area	By area & occupancy	
1	Total net consumption of primary embodied energy for structure and envelope, GJ/m2	0.3	33.3	GJ/m²*maph
2	Net annualized consumption of embodied energy for envelope and structure, kWh/m2*yr.	14	1598	kWh/m2*maph
3	Net annual consumption of delivered energy for building operations, kWh/m2*year	681	77689	kWh/m2*maph
4	Net annual consumption of primary (source) non-renewable energy for building operations, ekWh/m2*yr.	893	101921	kWh/m2*maph
7	Net annualized primary embodied energy and annual operating primary energy, kWh/m2*yr.	907	103520	kWh/m2*maph
8	Total on-site renewable energy used for operations, kWh/m2*yr.	5.6	634.20	kWh/m2*maph
9	Net annual consumption of potable water for building operations, m3 / m2 * year	0.16	17.76	m³/m²*maph
10	Annual use of grey water for building operations, m3 / m2 * year	1.42	161.72	m³/m²*maph
11	Net annual GHG emissions from building operations, kg. CO2 equivalent per year	77.4	8831.39	kg/m²*maph
12	Total present value of 25-year life-cycle cost fot total project, EUR per m2.			
13	Proportion of gross area of existing structure(s) re-used in the new project, percent			

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

SBTool is unique in that it also shows results normalized by occupancy e.g. kWh/m2/yr*maph;

Absolute Performance Results

	These data are based on the Self-Assessment values	By area	By area & occupancy	
1	Total net consumption of primary embodied energy for structure and envelope, GJ/m2	0.3	33.3	GJ/m²*maph
2	Net annualized consumption of embodied energy for envelope and structure, kWh/m2*yr.	14	1598	kWh/m2*maph
3	Net annual consumption of delivered energy for building operations, kWh/m2*year	681	77689	kWh/m2*maph
4	Net annual consumption of primary (source) non-renewable energy for building operations, ekWh/m2*yr.	893	101921	kWh/m2*maph
7	Net annualized primary embodied energy and annual operating primary energy, kWh/m2*yr.	907	103520	kWh/m2*maph
8	Total on-site renewable energy used for operations, kWh/m2*yr.	5.6	634.20	kWh/m2*maph
9	Net annual consumption of potable water for building operations, m3 / m2 * year	0.16	17.76	m³/m²*maph
10	Annual use of grey water for building operations, m3 / m2 * year	1.42	161.72	m³/m²*maph
11	Net annual GHG emissions from building operations, kg. CO2 equivalent per year	77.4	8831.39	kg/m²*maph
12	Total present value of 25-year life-cycle cost fot total project, EUR per m2.	2800 EUR		
13	Proportion of gross area of existing structure(s) re-used in the new project, percent	0%		

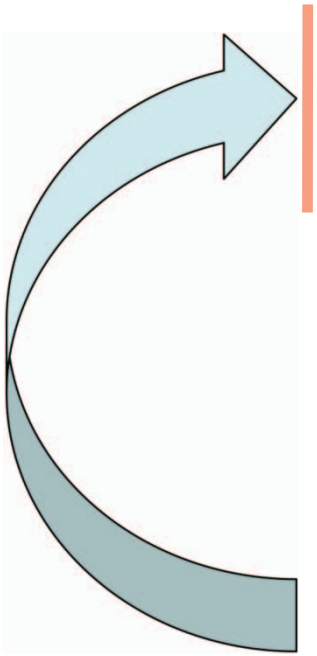
IDP module in SBTool

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.

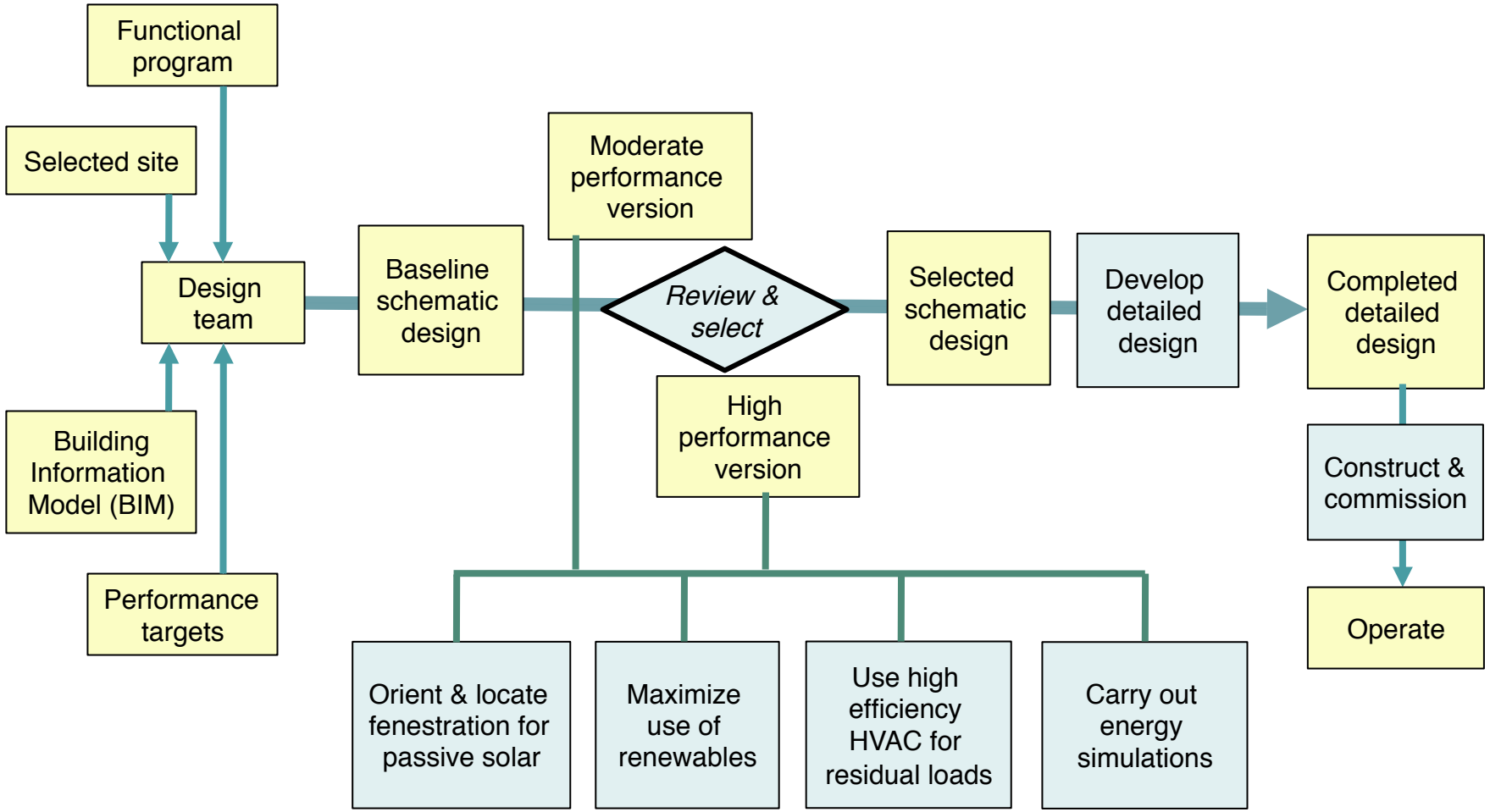
iiSBE approach for a more comprehensive process (overview)

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

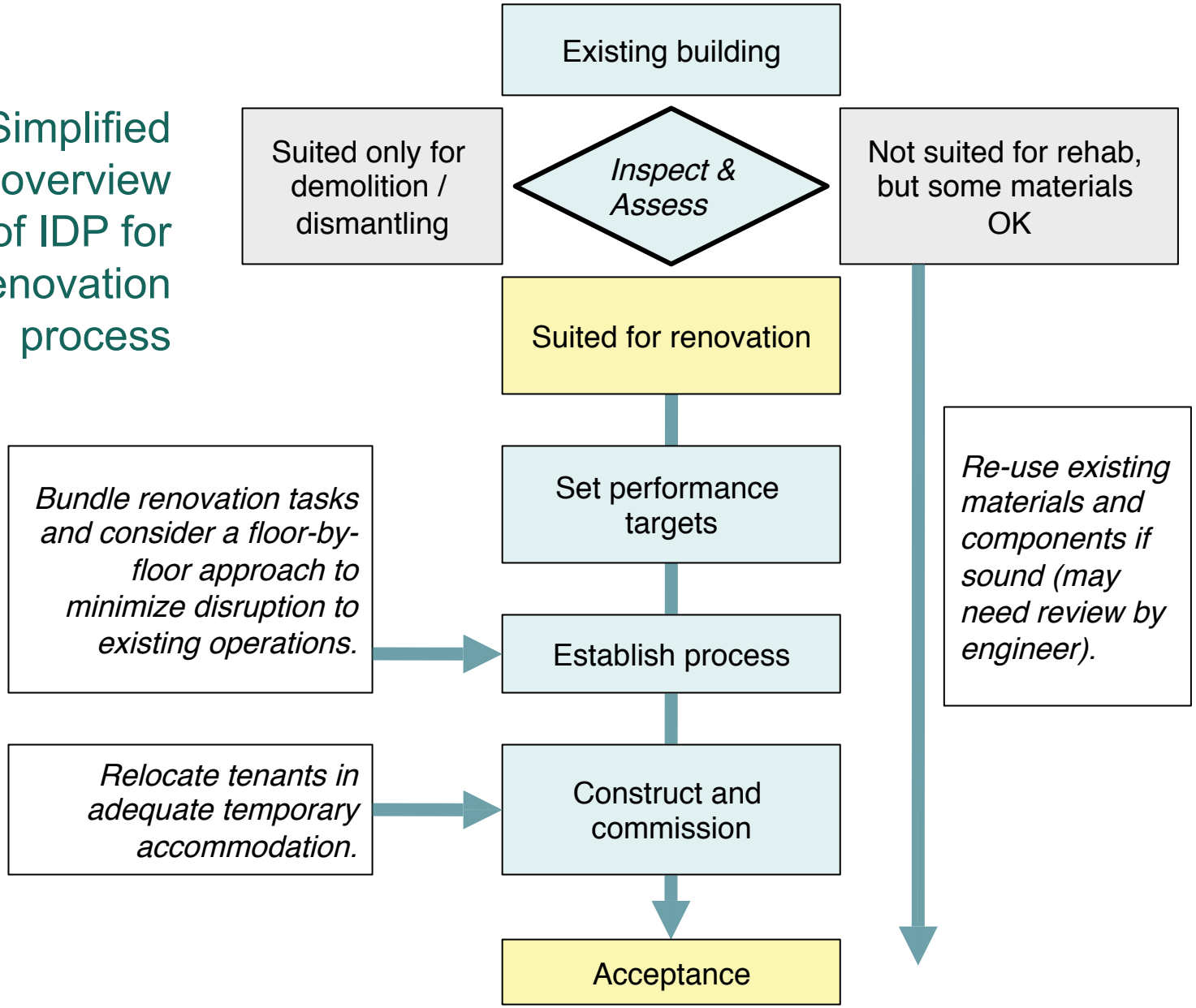


Trias Energetica

Simplified overview of IDP process for a new building



Simplified overview of IDP for renovation process



The number of completed steps is 4 and the number of inactived steps is 134	Key process steps for Megaplex, Amiel, Atlantis	To unprotect any worksheet, go to Tools, then Protection. Password is "iDP".
Click 1 to 3 at upper left for detail	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 IDPsteps worksheet. See Level 3 for detailed comments. To see text for inactive steps, see IDPlist worksheet.	Select up to 6 actors involved: AR DF ME Links within file and to websites Relevance (0=no, 1=yes, 2=resid., 3=renov.): 1 Click and select "a" to mark each step completed Relevant steps completed: 4

1.0	Develop a functional program, examine assumptions and establish performance targets
2.0	Assess site characteristics
3.0	Assess any existing structures and materials that may be re-used
4.0	Assemble the design team
5.0	Develop Reference design and benchmarks
6.0	Hold an initial Design Workshop
7.0	Develop Concept Design
8.0	Consider site development issues
9.0	Determine building structure
10.0	Develop building envelope design
11.0	Develop preliminary daylighting, lighting and power system design
12.0	Develop preliminary ventilation, heating & cooling and wet services designs
13.0	Decide on major design options for detailed development
14.0	Screen non-structural materials for environmental performance
15.0	Complete design and documentation
16.0	Develop QA strategies for construction and operation
17.0	Site takeover, existing building decontamination & deconstruction, excavation & foundations
18.0	Complete above-grade construction
19.0	Prepare a set of as-built construction documents
20.0	Operate and maintain the building
21.0	Carry out post-occupancy evaluation and monitor performance

IDP worksheet within SBTool

Overview of IDP process steps which is the KeySteps worksheet in the SBTool B file; this shows the highest level of detail

File B

Details of IDP Steps and sub-steps

	Key process steps for Megaplex, Amiel, Atlantis	To unprotect any worksheet, go to Tools, then Protection. Password is "iDP".			iiSBE		
1.09	Carry out an Environmental Impact Assessment, based on preliminary assumptions about the site characteristics, building program, size and location on the site.	EC		PM	●	●	
		GE			●	●	☐
1.10	Prepare a Functional Program and Performance Goals Report, including a completed File B of SBTool.	DF	AR	PM			
		CL					☐
2.0	**Assess site characteristics**						
2.01	Assess the suitability of the site in terms of easy access to good public transportation services.	UP	CL		●	●	
		AR			▶▶	●	☐
2.02	Assess the suitability of the site in terms of access to commercial and public services, recreation and public green space.	UP	CL			●	
		AR					☐
2.04	Assess erosion potential of surface soils and soil stability and bearing strength of sub-surface soils.	GE				●	
		ST				●	☐
2.05	Assess the ecological quality of the site. Report on results in ContextB worksheet.	EC			●	●	
		GE			▶▶	●	☐
2.06	This is a brownfield site, take steps to remediate conditions (see ContextB).	EC	EC		●	●	
		CL			▶▶	●	☐
2.07	Examine soil for presence of radon.	GE			●	●	
						●	☐
2.08	Identify any features in adjacent properties that may place constraints on the design of the subject building.	AR			●		
							☐
2.09	Measure typical Sound Level (Leq) at the noisiest site boundary. Report on results in ContextB worksheet.	AS			●	●	
		UP				●	☐

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

All	All
PM	Project manager
AR	Architect
AS	Acoustic specialist
BP	Building products rep
CA	Commissioning agent
CL	Client
CM	Construction manager
CS	Controls specialist
CV	Civil / services engineer
DF	Design facilitator
DS	Daylighting specialist
EC	Ecologist / env. Specialist
EE	Energy engineer

EL	Electrical engineer
GE	Geotechnical engineer
ID	Interior designer
LA	Landscape architect
LD	Lighting designer
MS	Materials specialist
ME	Mechanical engineer
OP	Operator of building
RS	Renewables specialist
ST	Structural engineer
TS	Telecoms specialist
UP	Urban planner
$$	Costing specialist

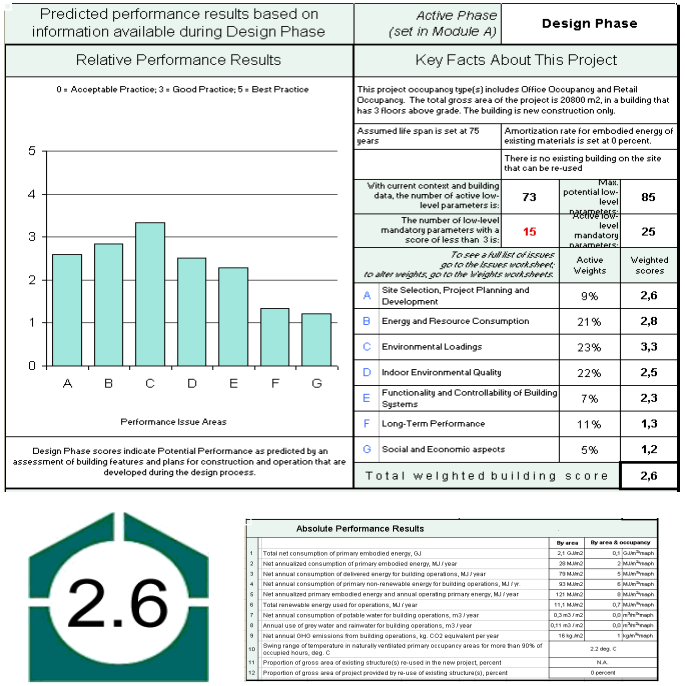
Applications of SBTool

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.

Protocollo ITACA



Predicted performance results based on information available during Design Phase | *Active Phase (set in Module A)* | **Design Phase**

Relative Performance Results

0 = Acceptable Practice; 3 = Good Practice; 5 = Best Practice

Design Phase scores indicate Potential Performance as predicted by an assessment of building features and plans for construction and operation that are developed during the design process.

Key Facts About This Project

This project occupancy type(s) includes Office Occupancy and Retail Occupancy. The total gross area of the project is 20800 m2, in a building that has 3 floors above grade. The building is new construction only.

Assumed life span is set at 75 years		Amortization rate for embodied energy of existing materials is set at 0 percent.	
		There is no existing building on the site that can be re-used	
With current context and building data, the number of active low-level parameters is:	73	Max. potential low-level parameters:	85
The number of low-level mandatory parameters with a score of less than 3 is:	15	Active low-level mandatory parameters:	25

To see a full list of issues, go to the Issues worksheet; to alter weights, go to the Weights worksheet.

		Active Weights	Weighted scores
A	Site Selection, Project Planning and Development	9%	2,6
B	Energy and Resource Consumption	21%	2,8
C	Environmental Loadings	23%	3,3
D	Indoor Environmental Quality	22%	2,5
E	Functionality and Controllability of Building Systems	7%	2,3
F	Long-Term Performance	11%	1,3
G	Social and Economic aspects	5%	1,2
	Total weighted building score		2,6

Absolute Performance Results

		By area	By area & occupancy
1	Total net consumption of primary embodied energy, GJ	2,1 GJ/m2	0,1 GJ/m²/reaph
2	Net annualized consumption of primary embodied energy, MJ / year	28 MJ/m2	2 MJ/m²/reaph
3	Net annual consumption of delivered energy for building operations, MJ / year	79 MJ/m2	5 MJ/m²/reaph
4	Net annual consumption of primary non-renewable energy for building operations, MJ / yr.	83 MJ/m2	6 MJ/m²/reaph
5	Net annualized primary embodied energy and annual operating primary energy, MJ / year	121 MJ/m2	8 MJ/m²/reaph
6	Total renewable energy used for operations, MJ / year	11,1 MJ/m2	0,7 MJ/m²/reaph
7	Net annual consumption of potable water for building operations, m3 / year	0,3 m3 / m2	0,0 m³/m²/reaph
8	Annual use of grey water and rainwater for building operations, m3 / year	0,11 m3 / m2	0,0 m³/m²/reaph
9	Net annual OHG emissions from building operations, kg. CO2 equivalent per year	16 kg /m2	1 kg/m²/reaph
10	Swing range of temperature in naturally ventilated primary occupancy areas for more than 90% of occupied hours, deg. C	2.2 deg. C	
11	Proportion of gross area of existing structure(s) re-used in the new project, percent	N.A.	
12	Proportion of gross area of project provided by re-use of existing structure(s), percent	0 percent	

- 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 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,

(3) Economics and Management.

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^{PT}

- SBTool^{PT}-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**.

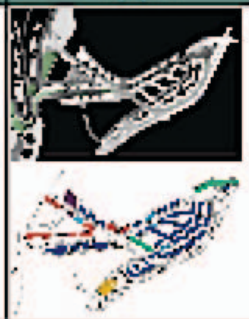
Monaco competition

- 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

iiSBE

Principauté de Monaco *Projet d'urbanisation en mer : comparaison générale des soumissions* V18, 28 mai

			avril 2008	Equipe A		Equipe B		Equipe C		Equipe D		Equipe E
			Bilan comparatifs de l'ensemble de projets									
			Observations générale									
			SBTool - score autoeval	3,6		3,8		4,1		3,7		4,5
			SBTool - score finale	**3,2**		**3,5**		**2,8**		**3,3**		**3,9**
			Observations sur l'utilisation de SBTool	Le dossier résilié de version des fiches de SBTool est dans la soumission, et inclut l'information supplémentaire détaillée jusqu'à C1.2.		Ils ont utilisé l'outil correctement et ont également fourni des informations supplémentaires très étendues et détaillées pour chaque critère.		Il y a vraisemblablement une erreur importante du dossier résilié de SBTool dans la soumission. Plusieurs points étaient plus hauts que 5.0 et deux-ci ont été donc exclus.		SBTool a été employé comme prévu.		SBTool a été employé comme prévu.
			Critères		Case grisée (gauche) = note revisée							
A	30.1%	**Site, implantation, développement urbain et marin**		Deux bras entourent une île centrale utilisé qui contient un parc public du marché couvert avec des vues du Monaco. L'impression globale est très urbaine et cohérente, avec un bon accès piétonnier le long des secteurs de bord de mer.		Deux éléments linéaires sont divisés par un canal mais liés par plusieurs éléments de logement et un pont, tous bien reliés au secteur urbain existant. Les éléments traversiers peuvent porter des mètres importantes sur les zones intérieures.		Beaucoup d'éléments divers sont reliés au continent par une presqu'île. Les grands espaces couverts semblent 'hospitaliers et créent un paysage urbain découvert'. Les résidents de la "péninsule" auront des vues faibles de la mer.		Trois sous-éléments sont reliés à la bande de terre et au grand élément assurant le lien avec le continent. Le plan urbain est dense et semble bien fonctionner mais des secteurs commerciaux sont dispersés le long de bords de mer.		Cet arrangement place plusieurs éléments séparés loin du rivage. Un de ces éléments est sans issue à ses extrémités alors que d'autres sont reliés par des ponts. Pour les marcheurs, les distances à parcourir pourraient être assez longues.
A1	21%	*Choix de l'implantation en mer et contexte marin.*				L'utilisation du remblai comme base pour le bras externe peut réduire des écoulements de l'eau.						
A1.1	1.9%	**Préservation de la qualité écologique des zones sensibles.**	-1.0	La distance minimale entre le pied sous-marin de la fondation des ouvrages et le tombant côtier des Spélugues est de 5 m. Ces distances sont reportées sur les deux plans...	0.0	PF respecté... une distance supérieure à 55 m entre l'extension et les zones sensibles.	0.0	50 m... PF respecté	0.0	PF. Voir plan masse et documents graphiques	3.0	100 m
A1.2	1.2%	**Préservation de la qualité écologique des fonds marins durs découverts.**	3.0	Les fonds durs découverts actuellement et qui ne le seront plus après la réalisation du Projet sont localisés entre le Grimaldi Forum et les plages du Larvotto. Conformément au plan joint, la surface de fonds durs occupée par l'emprise du Projet est de 8.7%.	4.0	9% fonds durs sont occupés par l'emprise effective des fondations.	0.0	6%; cf figure 42 du document PE-CSC-520.	2.5	10%; L'étude d'impact dénombre 1.6 ha de substrats durs recouverts pour sur les 20.5 ha Managasques soient une occupation de 7.8 %. La construction d'enrochements (9 ha) et d'habitats artificiels vont compenser cette occupation.	4.0	3%; Ainsi que l'indiquent les plans des fondations des Cordons et du Quartier Marin, la totalité des emprises reposent sur les fonds durs actuellement découverts de sédiments.

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
- Luis Bragança (President), braganca@civil.uminho.pt
- Nils Larsson (XD), larsson@iisbe.org