



Methodology for Sustainability Assessment of Tourism Buildings

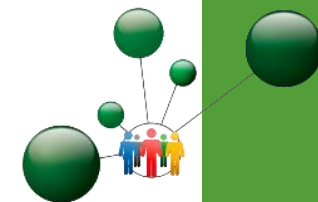
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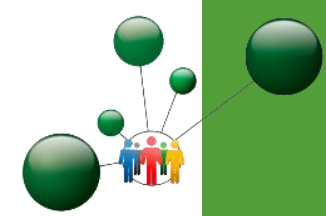
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1 Overview

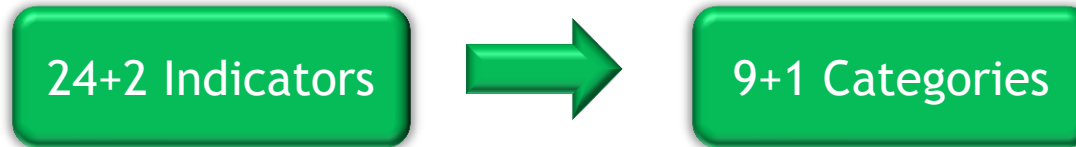
- ▶ Introduction
- ▶ System Structure
- ▶ Indicators
 - ▶ Environmental Dimension
 - ▶ Social Dimension
 - ▶ Economic Dimension
- ▶ Weighting System
- ▶ Rating system
- ▶ Presentation of the tourism building case Study - Tivoli Victória Hotel
- ▶ Assessment of Tivoli Victória Hotel using SBTool PT STPU methodology
- ▶ Conclusions



2 Introduction



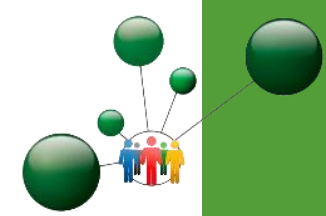
- ▶ Existing tools were analysed (SBTool PT, SBTool, SBTool CZ, ITACA, LEED, BREEAM, DGNB, CASBEE, HQE, NABERS)
- ▶ There was an effort to reduce the number of indicators



- ▶ Efforts to produce a structure to be used in building related SBTool PT modules
- ▶ Structure is similar in Office and Tourism buildings 'modules



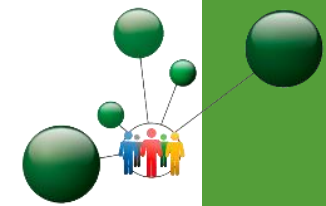
2 Introduction



- ▶ Structure was developed by impacts. Indicators were allocated in the dimensions and categories most related to the impacts assessed.
- ▶ No confusion between environmental, social and economic desires
- ▶ All Indicators are applied in all phases and all types of construction types:
 - ▶ Phases:
 - ▶ Project
 - ▶ Construction
 - ▶ Operation
 - ▶ Construction types:
 - ▶ New construction
 - ▶ Existing buildings
 - ▶ Renovation projects
- ▶ Calculation methods change according to phase and type

Dimension	Category	ID	Indicator
ENVIRONMENT	C1. Climate Change and outdoor air quality	I1	Life cycle environmental impacts
		I2	Heat island effects
	C2. Biodiversity and land use	I3	Land use efficiency
		I4	Sustainable location
		I5	Local biodiversity protection during construction
		I6	Certificated wooded materials
	C3. Energy	I7	Energy consumption
		I8	Renewable Energy
		I9	Commissioning
	C4. Materials, solid residues and resources management	I10	Reuse of materials
		I11	Materials with recycled content
		I12	Construction and demolition wastes
		I13	Environmental management plan
		I14	Flexibility and adaptability
	C5. Water	I15	Water consumption
		I16	Water treatment and recycling
		I17	Storm water management
SOCIETY	C6. User health and comfort	I18	Indoor air quality
		I19	Thermal comfort
		I20	Visual comfort
		I21	Acoustic comfort
		I22	Internal amenities
	C7. Accessibility	I23	Mobility plan
	C8. Security	I24	Occupants security
ECONOMY	C9. Life cycle costs	I25	Life cycle costs
C10: Regional Sustainability		I26	Accessibility to public transport

4 Indicators In Environmental Dimension



C1. Climate Change and outdoor air quality	I1	Life cycle environmental impacts
	I2	Heat island effects

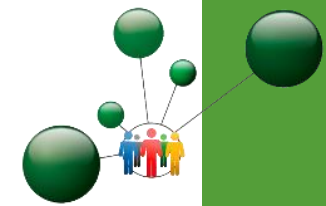
- ▶ Simplified LCA analysis (GWP, AP, ODP, ...)
- ▶ Need only to measure areas and select building solutions

C2. Biodiversity and land use	I3	Land use efficiency
	I4	Sustainable location
	I5	Local biodiversity protection during construction
	I6	Certificated wooded materials

- ▶ Innovative index to assess land use efficiency (OC, SE, AA and IA)
- ▶ Distance to infrastructures + pre developed areas



4 Indicators In Environmental Dimension



C3. Energy	17	Energy consumption
	18	Renewable Energy
	19	Commissioning

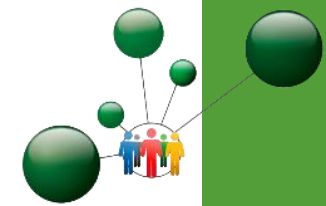
- ▶ Importance of commissioning in reducing energy consumption during operation

C4. Materials, solid residues and resources management	I10	Reuse of materials
	I11	Materials with recycled content
	I12	Construction and demolition wastes
	I13	Environmental management plan
	I14	Flexibility and adaptability

- ▶ All phases of the life cycle of materials
- ▶ Consideration of the selection of solutions to be reused at the end of the life cycle



4 Indicators In Environmental Dimension



C5. Water

I15 Water consumption

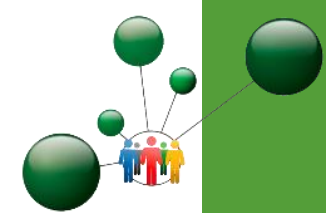
I16 Water treatment and recycling

I17 Storm water management

- ▶ Calculation includes water consumption outside the building (irrigation)
- ▶ Native plants are promoted as long as there is no watering
- ▶ Consideration of the treatment of water in-situ for re-use or disposal
- ▶ Consideration of waterproofing index and dimensioning of plumbing for water for disposal



5 Indicators In Social Dimension



C6. User health and comfort:	I18	Indoor air quality
	I19	Thermal comfort
	I20	Visual comfort
	I21	Acoustic comfort
	I22	Internal amenities

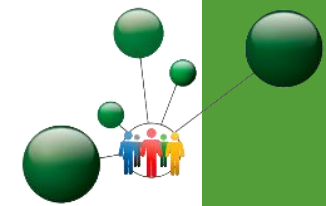
- ▶ Calculation depends on phase
 - ▶ Project or construction - predictions (simulation)
 - ▶ Operation - physical measurements (when monitoring is available) - some legal requirements

C7. Accessibility	I23	Mobility plan
C8. Security	I24	Occupants security

- ▶ Promoting bicycle use (parking) promote walking (exclusive paths); Persons with low mobility;
- ▶ Maintenance of energy/water/communications supply in case of emergency, security systems, night illumination



6 Indicators In Economic Dimension



C9. Life cycle costs | I25 Life cycle costs

- ▶ Considering initial costs and operation costs (direct sum)

C10. Regional Sustainability | I26 Accessibility to public transport

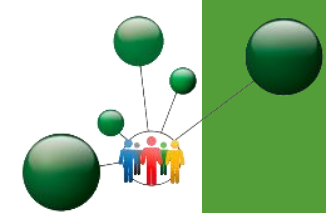
- ▶ Discussion about maintaining or removing the category
- ▶ Decisions are not in the hands of the contractor
- ▶ Weight = 0% but rating is presented in final certificate



7 Weighting System

ENVIRONMENTAL DIMENSION	40%	40%	Duration		
C1. Climate Change and outdoor air quality	18%	7%	Extension	Intensity	Duration
I1 Life cycle environmental impacts	60%	4,2%	3	2	2
I2 Heat island effects	40%	2,8%	2	2	2
C2. Biodiversity and land use	24%	9%			
I3 Land use efficiency	44%	4,2%	2	2	3
I4 Sustainable location	30%	2,8%	2	2	2
I5 Local biodiversity protection during construction	15%	1,4%	1	2	2
I6 Certificated wooded materials	11%	1,1%	3	1	1
C3. Energy	25%	10%			
I7 Energy consumption	43%	4,2%	2	3	2
I8 Renewable Energy	29%	2,8%	2	2	2
I9 Commissioning	29%	2,8%	2	2	2
C4. Materials, solid residues and resources management	18%	7%			
I10 Reuse of materials	19%	1,4%	1	2	2
I11 Materials with recycled content	38%	2,8%	2	2	2
I12 Construction and demolition wastes	10%	0,7%	1	1	2
I13 Environmental management plan	19%	1,4%	1	2	2
I14 Flexibility and adaptability	14%	1,1%	1	1	3
C5. Water	16%	6%			
I15 Water consumption	44%	2,8%	2	2	2
I16 Water treatment and recycling	44%	2,8%	2	2	2
I17 Storm water management	11%	0,7%	2	1	1

7 Weighting System

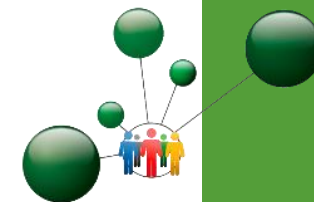


SOCIAL DIMENSION	30%	30%
C6. User health and comfort	80%	24%
I18 Indoor air quality	24%	6%
I19 Thermal comfort	32%	8%
I20 Visual comfort	25%	6%
I21 Acoustic comfort	19%	5%
C7. Accessibility	10%	3%
I22 Mobility plan	100%	3%
C8. Security	10%	3%
I23 Occupants security	100%	3%
ECONOMIC DIMENSION	30%	30%
C9. Life cycle costs	100%	30%
I24 Life cycle costs	100%	30%
REGIONAL SUSTAINABILITY	100%	0%
I25 Accessibility to public transport	50%	0%
I26 Accessibility to amenities	50%	0%

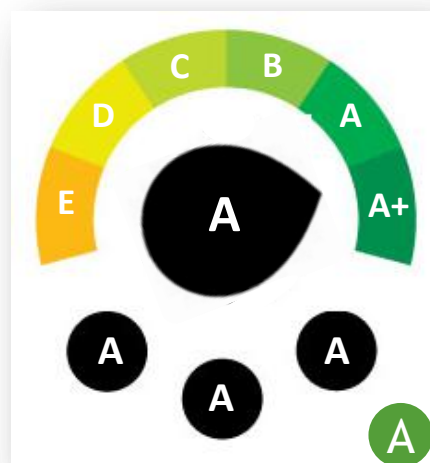
- ▶ Neural networks and non-linear regressions of user indoor comfort parameters and global perceived comfort



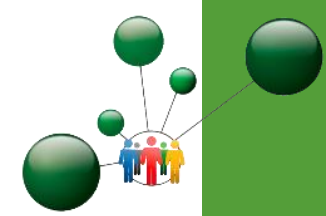
8 Rating System



Result	Class
$\bar{I}_i = 1$	A+
$0,70 < \bar{I}_i \leq 1,00$	A
$0,40 < \bar{I}_i \leq 0,70$	B
$0,10 < \bar{I}_i \leq 0,40$	C
$0,00 < \bar{I}_i \leq 0,10$	D
$\bar{I}_i < 0,00$	E



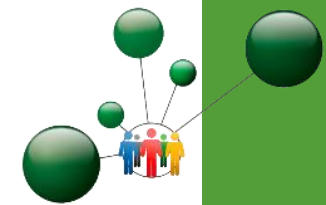
9 Presentation of the tourism building case Study



- ▶ Main features of the area:
 - ▶ Location: Vilamoura, Algarve
 - ▶ Area: 25.884,47 m² of floor area
 - ▶ 5 star luxury resort
 - ▶ 4 floors of hotel services and rooms
 - ▶ 900 m² for conferences, events and meetings



10 Assessment of the tourism building case Study



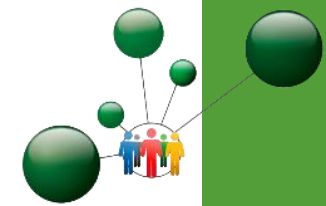
► Environmental Dimension

Environment (40%)				
C1. Climate change and outdoor air quality			0,10	C
Life Cycle environmental impact	0,02	D		
Heat island effect	0,26	C		
C2. Biodiversity and Land Use			-0,14	E
Land use efficiency	-0,39	E		
Sustainable Location	0,26	C		
Local biodiversity protection during construction	0,05	D		
Certified wooden materials	-0,50	E		

- Large green area but also large area with low reflectance
- Bad land use efficiency (too large areas and bad spatial efficiency)
- No use of certified wooden materials



10 Assessment of the tourism building case Study

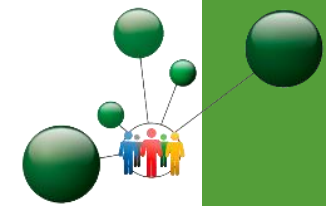


► Environmental Dimension (cont)

Environment (40%)				
C3. Energy			0,35	C
Energy consumption	0,30	C		
Renewable energy	0,40	C		
Commissioning	0,39	C		
C4. Material, solid waste and resource management			0,27	C
Reused materials	0,00	D		
Materials with recycled content	0,00	D		
Construction and demolition wastes	0,00	D		
Environmental management plan	0,64	B		
Flexibility and adaptability	1,00	A		

- Renewable energy use
- Energy and water consumption monitoring systems
- ISO14001 certified Environmental Management System

10 Assessment of the tourism building case Study

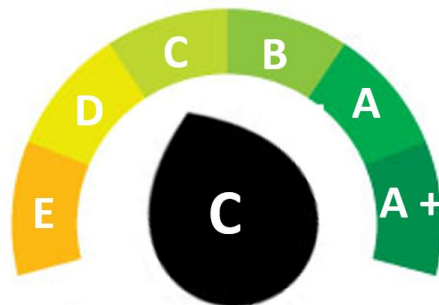


► Environmental Dimension (cont)

Environment (40%)				
C5. Water			0,33	C
Water consumption	0,70	B		
Water recycling and treatment	0,00	D		
Storm water management	0,14	C		

- Some efficient water equipment
- Large green area but also large waterproofing area

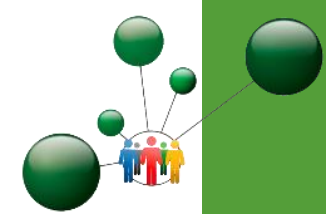
Environmental Dimension Performance



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10 Assessment of the tourism building case Study

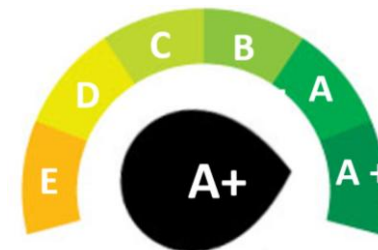


► Environmental Dimension (cont)

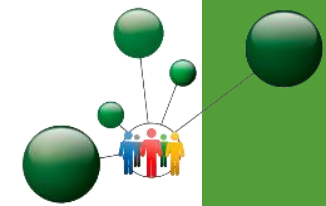
Social (30%)				
C6. User health and comfort			1,20	A+
Indoor air quality	1,17	A+		
Thermal comfort	1,62	A+		
Visual comfort	1,20	A+		
Acoustic comfort	0,70	B		
Interior amenities	1,00	A		
C7. Accessibility			0,31	C
Mobility plan	0,31	C		
C8. Security			0,33	C
Occupants security	0,33	C		

- Good indoor air quality
- Good thermal comfort
- Large glazing surfaces to promote solar lighting
- Dedicated pedestrian routes + partnership with a transports company

Social Dimension Performance



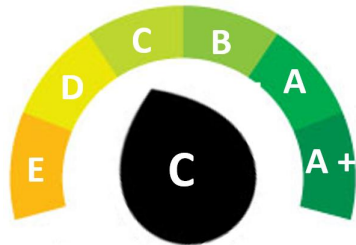
10 Assessment of the tourism building case Study



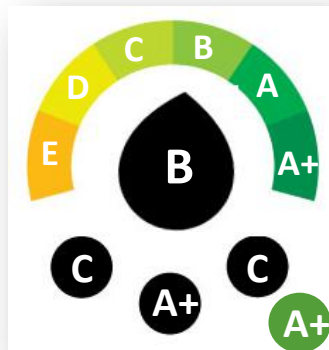
► Environmental Dimension (cont)

Economic (40%)				
C9. Life Cycle Costs			0,26	C
Life Cycle Costs	0,26	C		

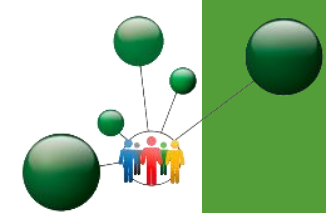
Economic Dimension Performance



Final Sustainability Rating



11 Conclusions



- ▶ Structure is simple and easy to understand (impacts)
- ▶ New methodologies apply innovative methods and innovative concepts
- ▶ Benchmarks are more demanding (focus on assessment instead of labeling)
- ▶ The use of online software makes the assessment easier and faster
- ▶ Continuous process - constant improvement
- ▶ The application of the methodologies in case studies showed that the methodologies were easily applicable and provide plausible results;
- ▶ It also allowed to test the methodologies and to improve it;
- ▶ The case studies also help the development of the software



Thank you for your attention!

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