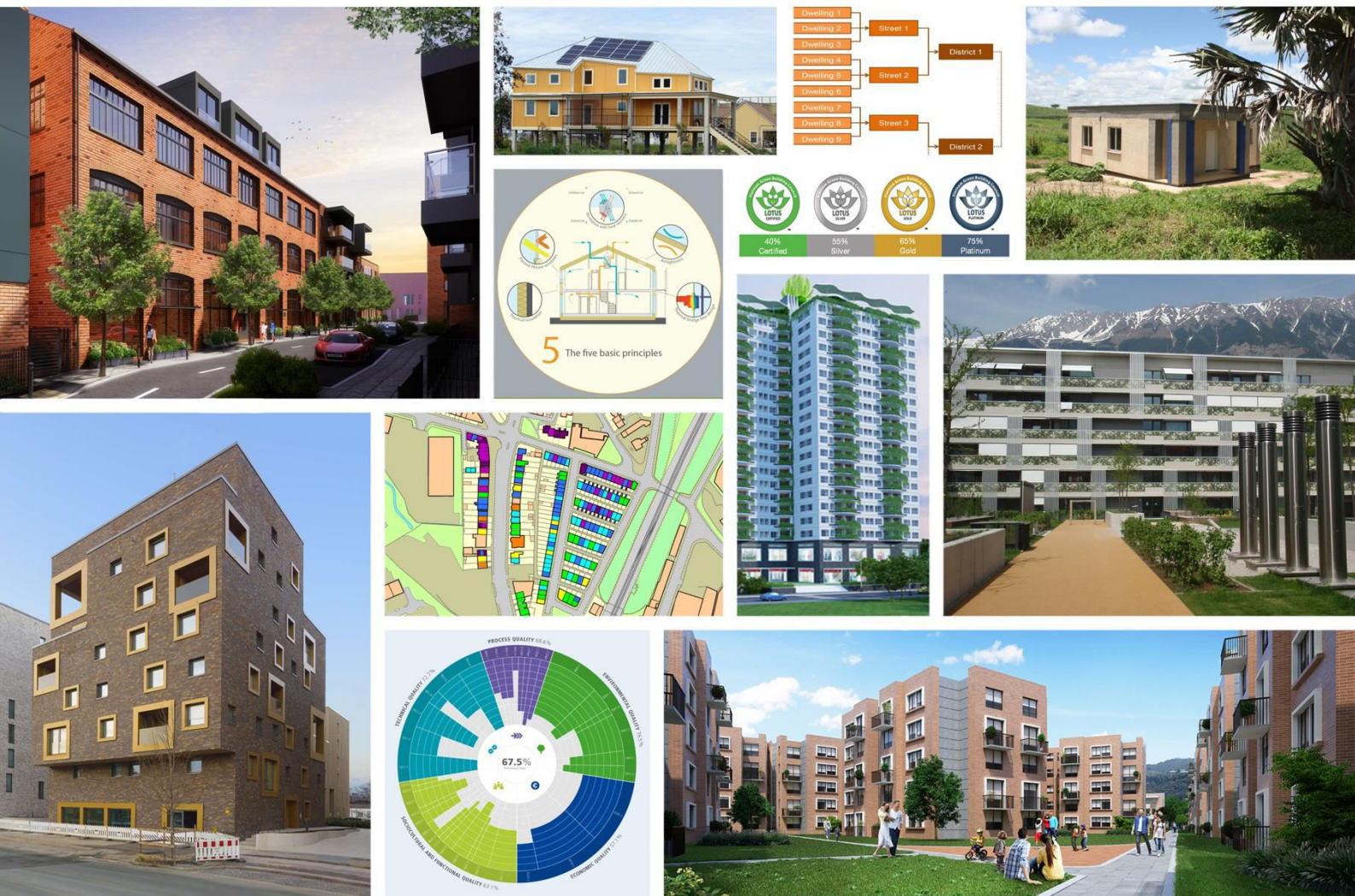


BUILDING SUSTAINABILITY ASSESSMENT AND BENCHMARKING

An Introduction



BUILDING SUSTAINABILITY ASSESSMENT AND BENCHMARKING - AN INTRODUCTION

COPYRIGHT © United Nations Settlements Programme (UN-Habitat), February 2017

All rights reserved.

www.unhabitat.org

HS Number: HS/007/17

ISBN Number: (Volume) 978-92-1-132728-1

DISCLAIMER:

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area, or of its authorities, or concerning delimitation of its frontiers or boundaries, or regarding its economic system or degree of development. The analysis, conclusions and recommendations of the report do not necessarily reflect the views of the United Nations Human Settlements Programme, the Governing Council of the United Nations Human Settlements Programme or its Member States.

ACKNOWLEDGEMENTS:

Main author: Gregor Herda

Contributing author: Vilma Autio

Team leader: Christophe Lalande

The authors are responsible for the choice and the presentation of the facts contained in this report and for the opinions expressed therein, which are not necessarily those of UN-Habitat and do not commit the Organization.

CONTRIBUTIONS:

Elizabeth Beardsley, Senior Policy Counsel, U.S. Green Building Council

Dr. Steve Burroughs, University of Canberra, Arts & Design Faculty, Board Member for the International Initiative for a Sustainable Built Environment (iiSBE), Scientific Committee Member for the World Sustainable Built Conference Series 2016

Dr. David Crowhurst, Mr. Alan Yates, Dr. Christopher Ward, BRE Global Ltd. (BREEAM)

Karine Dari, Ari Ilomäki, Comité Européen de Normalisation/Technical Committee 350: Sustainability of Construction Works

Dr. Jeremy Gibberd, Coordinator of Smart and Sustainable Built Environments Group W116 at CIB

Pr. Rajat Gupta, BArch MSc PhD FRSA, Professor of Sustainable Architecture and Climate Change, Director of the Oxford Institute for Sustainable Development (OISD) and its Low Carbon Building Group, Module Leader, MSc Sustainable Building: Performance and Design

Felix Jansen, PR Manager, Deutsche Gesellschaft für Nachhaltiges Bauen - DGNB e.V.

Dr. Marco Larcher, Dr Francesco Nesi, Zero Energy and Passivhaus Institute for Research (ZEPHİR), Italy

Nils Larsson, Executive Director of the International Initiative for a Sustainable Built Environment (iiSBE)

Anne-Sophie Perrissin-Fabert, Director Association HQE, GBC France

Ela Serdaroglu, International Federation of Red Cross and Red Crescent Societies, IFRC

Dr. André Stephan, Postdoctoral Research Fellow in Environmental Assessment in the Built Environment, Melbourne School of Design, The University of Melbourne, Australia

Vu Hong Phong, Project Manager, Vietnam Green Building Council

Pr. Holger Wallbaum, Full Professor in Sustainable Building, Civil and Environmental Engineering, Building Technology, Chalmers University of Technology, Sweden

UN-Habitat acknowledges the contribution of all individuals and organisations whose names are listed above. Without their generous contributions of time and expertise, this report would not have been possible.

BUILDING SUSTAINABILITY ASSESSMENT AND BENCHMARKING

An Introduction

February 2017

CONTENTS

EXECUTIVE SUMMARY	1
1. WHY ASSESS AT ALL?	3
2. THE CHALLENGES	6
2.1 Range of chosen indicators and credibility of “green” labelling.....	6
2.2 Weighting of indicators.....	7
2.3 Reliability of data	7
2.4 Comprehensiveness and user-friendliness.....	8
2.5 Predicted vs. actual performance.....	8
2.6 Subjectivity.....	9
2.7 Incomparability	9
2.8 Cost.....	10
2.9 Adaptability to regional contexts.....	10
2.10 Reductionism	11
3. SELECTED BUILDING SUSTAINABILITY ASSESSMENT AND BENCHMARKING TOOLS	12
3.1 Building Research Establishment Environmental Assessment Methodology (BREEAM)	15
3.2 CEN/TC 350	19
3.3 Common Carbon Metric (CCM)	22
3.4 DGNB Zertifikat	24
3.5 Domestic Energy, Carbon Counting and Carbon Reduction Model (DECoRuM)	27
3.6 High Quality of Environment (HQE™) Certification	30
3.7 Leadership in Environmental & Energy Design (LEED)	32
3.8 LOTUS	34
3.9 National Australian Built Environment Rating System (NABERS)	38
3.10 Passivhaus Certification	40
3.11 Quantifying Sustainability in the Aftermath of Natural Disasters (QSAND).....	43
3.12 SBTool.....	44
3.13 Sustainable Building Assessment Tool (SBAT) and related schemes	46
4. PATHWAYS TO WIDER UPTAKE	48
4.1 Enacting disclosure mandates.....	49
4.2 Demonstrating public sector commitment.....	50
4.3 Providing training in building sustainability assessment and regional, third-party adaptation.....	50
4.4 Finding the right business model.....	50
4.5 Limitations of the report.....	51
CONCLUSION	52
WORKS CITED	55

LIST OF TABLES

Table 1 - Types of tools profiled, by category, applying Hastings and Wall, and assessment or benchmarking objective....	15
Table 2 - Performance of building stock at city level, City A.....	23
Table 3 - Performance baselines of a single building type, Company A.....	23
Table 4 - LEED v4 Impact and Credit categories.....	32
Table 5 - Passivhaus certification criteria.....	40

LIST OF FIGURES

Figure 1 - Reconstruction of a house in Bagh, Pakistan, 2007	9
Figure 2 - Certified BREEAM Assessments, 2008 schemes onwards.....	17
Figure 3 - BREEAM National Scheme Operators and Countries with at least one Registered Asset	18
Figure 4 - Courtauld Road, London, mixed tenure housing scheme, refurbished Victorian warehouse. BREEAM Score 'Excellent' (80.69 per cent) and winner of the 2016 BREEAM Residential Award	18
Figure 5 - Mapping of standards developed by CEN/TC 350.....	21
Figure 6 - The DGNB Zertifikat's quality sections.....	24
Figure 7 - Sample DGNB Evaluation Graph.....	25
Figure 8 - Haus B1, Projekt VIER, Pelikanviertel, Hannover - DGNB Score 'Platinum'	26
Figure 9 - Functional units employed by DECoRuM.....	27
Figure 10 - Maps from the EVALOC project.....	28
Figure 11 - Organisation of HQE™ audits.....	31
Figure 12 - Rendering of the 2,600 unit housing development "Reserva de Madrid" in Bogotá, Colombia, the first HQE™ - certified social housing project in the country and the second in Latin America.....	31
Figure 13 - Distribution of LEED projects globally.....	34
Figure 14 - Post-Hurricane Katrina homes for residents of New Orleans, by the <i>Make It Right Foundation</i> . LEED Score 'Platinum', inspired by Cradle to Cradle thinking.....	34
Figure 15 - Available rating systems of LOTUS.....	36
Figure 16 - LOTUS certification levels and minimum thresholds	36
Figure 17 - Categories in the LOTUS Non-Residential rating system	37
Figure 18 - Diamond Lotus Lakeview, in Tan Phu District, Ho Chi Minh City. One of the first registered LOTUS Multi-Family Residential (LOTUS MFR) projects in Vietnam.....	37
Figure 19 - Private detached dwelling in Canberra, Australia - NABERS Home Tool Score 5.5/6.....	39
Figure 20 - Schematic representation of the basic design principles of the Passivhaus standard	41
Figure 21 - One of the world's largest Passivhaus residential complexes, Lodenareal.....	42
Figure 22 - The QSAND Process.....	43
Figure 23 - Pilot low-cost housing developed in Chilanga, Zambia. SBAT Score 2.3.....	47
Figure 24 - Jurisdictions with voluntary or mandatory building performance schemes or policies	49

GLOSSARY

Assessment tool	A methodology that aims to measure absolute values of a building's impact (energy consumed, GHGs emitted, etc.) without giving a comparative value judgment.
Benchmarking tool	A methodology that, firstly, assesses a building along a set of criteria; secondly, rates its performance against a given standard (e.g. reference sets of rated buildings, set criterion values or standards, national averages, modelled/simulated building behaviour, or other methods of comparison); and thirdly, communicates a value judgment about its performance.
BEST	Built Environment Sustainability Tool, developed by Dr. Jeremy Gibberd, Smart and Sustainable Built Environments Group W116 at CIB.
BREEAM	Building Research Establishment Environmental Assessment Method, developed by the UK-based Building Research Establishment (BRE).
BSA	Building sustainability assessment.
CCM	Common Carbon Metric, a UN-Environment protocol for measuring energy use and reporting GHG emissions from the operational phase of buildings.
CEN/TC 350	Comité Européen de Normalisation/Technical Committee 350, standards committee mandated with the development of a harmonized European assessment methodology.
DECoRuM	Domestic Energy, Carbon Counting and Carbon Reduction Model, developed by Pr. Rajat Gupta, Oxford Institute for Sustainable Development (OISD).
DfD	Design for Disassembly; the process of designing products so that they can easily, cost-effectively and rapidly be taken apart at the end of the product's life so that components can be reused and/or recycled.
DGNB	Deutsche Gesellschaft für Nachhaltiges Bauen, German Sustainable Building Council.
EF	Ecological Footprint.
EPD	Environmental product declaration, a standardized way of quantifying the environmental impact of a product or system, allowing the easy comparison of the environmental impact of different products and services. EPDs are calculated following product category rules (PCR).
ESUCO	European Sustainable Construction database.
EN 15804	European standard which provides core product category rules (PCR) for Type III environmental declarations for any construction product and construction service.
EN 15978	European standard which defines the rules for evaluating and reporting on the life-cycle impact of a building.
HDI	Human development index.
HQE	High Quality of Environment, Cerway certification scheme originating in France.
ISO 13790:2008	Provides calculation methods for the assessment of the annual energy use for space heating and cooling of a residential or non-residential building.
ISO 14040:2006	Describes the principles and framework for life-cycle assessment (LCA).
ISO 14044:2006	Specifies requirements and provides guidelines for all phases of life-cycle assessment (LCA).
LCA	Life-cycle assessment.
LCCA	Life-cycle cost analysis.

LCEA	Life-cycle energy analysis.
LCEM	Life-cycle energy modelling.
LCI	Life cycle inventory.
LEED	Leadership in Energy and Environmental Design, U.S. Green Building Council certification scheme.
PCR	Product Category Rules, common and harmonised LCA calculation rules for particular product groups to ensure that similar procedures are used when creating environmental product declarations (EPDs), enabling the comparability of EPDs of different products within the same product group.
POE	Post-occupancy evaluation.
QSAND	Quantifying Sustainability in the Aftermath of Natural Disasters, developed by the International Federation of the Red Cross and Red Crescent Societies.
SBAT	Sustainable Building Assessment Tool (SBAT), developed by Dr. Jeremy Gibberd, Smart and Sustainable Built Environments Group W116 at the Council for Research and Innovation in Building and Construction (CIB).
SBMI	Sustainable Building Materials Index, developed by Dr. Jeremy Gibberd, Smart and Sustainable Built Environments Group W116 at the Council for Research and Innovation in Building and Construction (CIB).

EXECUTIVE SUMMARY

Buildings, the majority of which are in residential use (Buildings Performance Institute Europe, 2011), accounting for 19 per cent of global total final consumption (IEA, 2014), are a major contributor to environmental degradation. The building sector is estimated to consume 40 per cent of the world's energy and materials while the construction industry, and its supporting industries, account for 16 per cent of the world's water used (Hoffman & Henn, 2008; Roodman, Lenssen, & Peterson, 1995; Dixit, Fernández-Solís, Lavy, & Culp, 2010). On a business-as-usual trajectory, **energy demand from the building sector is expected to rise by 50 per cent by 2050** (IEA, 2013).

At the same time, the building sector's potential for reducing GHG emissions is considered the largest of all sectors—a mitigation opportunity not to be missed. In addition, the built environment has the potential to contribute positively towards social-economic development along a range of indicators. But what are the real obstacles to action, especially given the urgency yet again made clear in the Sustainable Development Goals, the Paris Agreement, and the 'New Urban Agenda'¹?

For one, the large number of stakeholders involved in the production and consumption of buildings creates coordination problems with competing interests. Due to their long lifespan and the long-lasting effects of associated climate pollutants, sub-optimal decisions at the design stage of building processes can cast in concrete unsustainable usage patterns and lower the quality of life for building users for generations.

The building sector is a complex issue-focused, multi-stakeholder system (Feige, Wallbaum, & Krank, 2011). In order to positively influence decisions of this system's stakeholders, the **scientific, accurate and meaningful assessment** of existing and new buildings along a wide range of indicators has developed as a credible tool for achieving this objective.

Over the past 30 years, the number, scope and complexity of tools for assessing the environmental impact of buildings has increased dramatically. Examining the emergence of building sustainability assessment and benchmarking as a global phenomenon as well as some of their political and practical barriers can be useful in order to understand their possible role in realizing objectives of the 'New Urban Agenda' and the policies to be influenced by it.

Historical background

The potential of building assessment and benchmarking is no recent discovery. Section 69 e) of the *Habitat*

预览已结束，完整报告链接和二维码如下：

https://www.yunbaogao.cn/report/index/report?reportId=5_18401

