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Environmental Assessment Tools and its Rating system: A Review

ABD'RAZACK, Nelson T.A and Ahmad Nazri bin MUHAMAD LUDIN

Department of Urban and Regional Planning, Faculty of Built Environment, UniversitiTeknologi Malaysia, 81310 Skudai, Johor Malaysia.

Abstract: The process of sustainability emanates from the need for wholesome use of resources and environment in a manner that will enable it perform its role effectively and efficiently. The attendant effect of social, economic prosperity on the environment is in the forefront in 21st century. The rapid economic growth, social polarisation and poverty have greater effect on the urban environment especially in third world, thereby causing stress on resources and uneven development. New paradigm in the urban environment is Sustainable Development. There isawareness on the part of government and international organisation on the environmental issues that affects our society due to unsustainable use of resources as a result of advancement in technology. There is uneven development due to difference in the environmental, social and economic dimensions globally. There has been several ways to measure sustainability in the urban environment. Theycan be broadly divided into two: Ecological Assessment and Building Assessment Method. Ecological Footprint is the Ecological Assessment Tool which determines the consumption of resources and lifestyle in urban area. Building Assessment Method is used to measure the lifecycle of building that constitute the urban environment. BEQUEST, CASBEE, LEED etc. are examples. All the tools indicated that BREEAM has been proved to be most effective if three factors of adaptability to community, flexibility and financial consideration used.Despite the fact that all these tools were developed in different part of the world, they have a singular aim of sustainability, cultural and marketing incursion have been dictating the ability of the rating and weight ascribed to each tools. Sustainable development is a factor that shapes the city development and therefore, developing world need to consider it in the preparation of its master plan, so as to be able to measure and ameliorate the challenges of it. This will enable them to achieve pattern of influence that will make the city environment and natural resources utilisation more efficient and effective.

Key words: Assessment Tools, City Development, Environment, Indicators, Sustainable Development, Resources

INTRODUCTION

The sustainability process originated from general attribute to shift in the way environmental degradation are viewed and international development agenda such as poverty. The more awareness created by international, regional and national government and organisation about the problem been faced by people on environmental issues such as degradation of biodiversity, climate change, overconsumption and overburden of ecosystem. Differences in the rate of development have also contributed to the problem of poverty and health. Weiland (2006) argued that environmental, economic and social stress in the society today are related and caused by uneven development and over use of resources. The rate of consumption of resources (both natural and artificial) are in such that Sustainable Development will become problem except in attempt are put in place to stem the rate of consumption and lifestyle of the western world. Therefore, there is need for a holistic shift in the way development is viewed. Put in a simple form, sustainability is a process of paradigm shift that allow for economic development, qualitative growth, bioregionalism, symbiosis of man and natural environment. It also involves the agreement among the components of social, economic and environmental pillars of Sustainable Development.

The rapid economic growth, social polarisation and poverty with increasing environmental and health condition are the major problem of urbanisation in the third. High urbanisation is due to economic prosperity, increase in industrial and commercial activities and transportation. There has been high degree of environmental degradation due to high industrial production, transportation and inadequate housing in the cities. The major factor in urbanisation has been material put and flow (i.e. high consumption of water, fossil fuel, oil, food, building materials and energy etc.). The city consumes high percentage of this product and at end produces waste (solid, liquid, heat etc.). These processes take place at both local and global scale. This has brought to the fore, the problem of environmental risks which require sustainable development.

There is greater need for achievement of green urban environment going by the rate of pollution as a result of consumption of resources, waste generated and disposed indiscriminately due to the consumption, which in turn affect the air, water and soil (Patil *et al*, 2010; Carlos and Khang, 2009). There is higher need to work in

Corresponding Author: Abd'Razack, Department of Urban and Regional Planning, Faculty of Built Environment, UniversitiTeknologi Malaysia, 81310 Skudai, Johor Malaysia.
E-mail: Isbamat_2@yahoo.co.ukb-anazri@utm.my; +60146379331

tandem with the demand of land-use and natural resources utilisation so as to meet Sustainable Development that will meet the need of today and not compromising the need of future generation. This has to be done by incorporating the reduction of Green House Gas and improve environmental quality which will be economically viable and socially acceptable to the end users (UN-Habitat, 2009). The need to design a well adaptable built environment is inevitable to achieve the goals of Sustainable Development (Riley *et al*, 2004). There is no clear cut definition of Sustainable Urban Development at present. Therefore, there must be integration of all stakeholders in building team to make sure that every segment works in harmony with others so as to achieve the desired goal of Sustainable Development. This has led to the development of different tools to measure Sustainable Development.

Several tools have been developed which are meant to measure and assess the performance of buildings in relation to energy consumption, environmental and ecology with the input of technology and social integration of the project. There are two ways to measure sustainability from technology and social point of view. The technology aspect of sustainability deals with building assessment tools while the social/ecological point study sustainability from lifestyle point of view known as Ecological Footprint.

Assessment Models for Sustainable Development:

Majority of the existing indices of sustainability are based on economic and wealth indicators, depletion of resources, and environmental damage. There is inclusion of environment in some part of the indicators; despite that it is called sustainable development indices. Geographically they comprise a community or a nation and their purpose is to provide policy makers and officials with refined information for decision-making and for communication with the citizens. There is several research works going on about indicators for sustainable development globally. There are more than 600 initiatives working on indicators and frameworks for sustainable development of societies (IIDSD, 2005). Some societal sustainability indices are:Environmental Sustainability Index (ESI), Environmental Performance Index (EPI),Index of Sustainable Economic Welfare (ISEW), The Human Development Index (HDI), Ecological Footprints (EF), The Dashboard of Sustainable Development etc.

The prominent indices for measuring sustainability aggregate environmental performance indicator include Environmental Sustainability Index (ESI) which measures five indicators-Environmental System, Environmental Stresses, Human Vulnerability to Environmental Risk, Social and Institutional Capacity to respond to issues and Global Stewardship. Also is Environmental Performance Index (EPI) which is an indicator for Environmental Health, Air Quality, Water Resources, Bio-diversity and Habitat, Sustainable Energy, and Productive Natural Resources. All these tools have their merit and demerits.

Social/Ecological Assessment Method (Ecological Footprint):

Ecological Footprint is the analytical tool to determine the pressure on natural resources due to consumption pattern of the people on ecosystem and its attendant effect on the environment. This is a departure from Genuine Saving that deals with economic principles. The two indices cannot be used interchangeably as measure of sustainable use of natural resources. The Ecological Footprint as a measure of sustainability was postulated by Rees and Wackernagel in the 1990s. The core input of Ecological Footprint is that *"The impact that an individual or an individual development has on the environment and/or the community in which they live or are developed"* (Brandon and Lombardi, 2011). Ecological Footprint has a direct link with resources utilisation by every person. The global average of Ecological Footprint is about 2.7gha (GFN, 2011). Ecological Footprint encompasses embodied energy i.e. impact of resources utilisation of natural resources by individual. Ecological Footprint is calculated for every construction at inception stage and it entails consumption in materials, transportation, goods and services, labour, infrastructures. At the operation stage, Ecological Footprint is calculated for heating, cooling, operation costs and during demolition stage it involves the cost of demolition, disposal of waste etc. The sustainability goal can be achieve when the Ecological Footprint of the city or project is less or equal to its bio-capacity and can regenerate the consumption of such resources without any stress.

Ecological Footprint has emerged as one of the leading measures of human's demand on nature. This is done by measuring how much land and water area a human population required to produce the resources he consumed and to absorb its waste using prevailing technology (GFN, 2010). Ecological Footprint measure humanity demand on the biosphere by accounting for the area of biologically productive land and sea require to provide the resources used and to absorb the waste. This area of land include the cropland, grazing land, forest land, fishing ground (all land require to produce food, fibre and timber consumed by humanity), built up land (for provision of houses and infrastructure) and energy land use for transportation and the embodied conversion land for the absorption of waste and store humanity CO_2 emission which comes from burning fossil fuel and natural gas (Wackernagel and Rees, 1996; Wackernagel *et al*, 1999; Wackernagel and Monfreda, 2004; Wackernagel *et al*, 2000; 2001; 2002; 2004; 2005; Chambers *et al*, 2003, Rees, 2000; 2001; 2002; GFN, 2010).

Ecological Footprint has shown to be the most successful indicator of sustainability for providing necessary information about the concept of environmental sustainability and the limit of the earth physically. The past event over a decade has shown that Ecological Footprint has been the main measure for resource utilization and consumption at national and international level, because it shows the impact of man on the environment; though it is not the overall indicator of sustainability, it has proved to be one of the criteria for environmental sustainability. It has proved how much bio-capacity is available and used by man and how much is available on sustainable basis. Then, Rees (2001; 2002) put it forward that Ecological Footprint analysis therefore estimate the size of modern patch and it also serve as a measure of economic scale.

Ecological Footprint had faced many challenges and some scholars believes that bio-capacity cannot be estimated correctly (Herberl, *et al*, 2004; Van Koten and Bulte, 2000). Real issue are not reflected in aggregation of Ecological Footprint in some places. Economic indicators that uses aggregate is cumbersome as found in GDP so, Ecological Footprint could not follow the same procedure (Doughty and Hammond, 2004), checklist of indicators used in Ecological Footprint cannot describe logical and active nature of urban process. Fiala (2008) opined that *"the arbitrariness of assuming both zero Greenhouse gas emission and natural boundaries that the footprint is in fact a measure of inequality, historically evidence that intensive, rather than experiment is the main driving force of production growth, though footprint is an entirely static measure and so cannot capture this technological changes and lack correlation between land degradation and Ecological Footprint, which observe the effect of larger sustainability problems".*

Though Ecological Footprint have proved to show the relationship of consumption and production of resources (Holden, 2004), it is a better way to convey human resources utilization to policy-makers (Costanza, 2000). It has met some waterloo from critics, that it is a weak analytical tool and has nothing to show for sustainability process (Jorgensen, 2002; Moffatt, 2000; Van Kooten and Bulte, 2002). One of the accusations levelled against Ecological Footprint is that it takes the issue of strong sustainability for its ecological thought. Jorgensen(2002) said that the issue of strong sustainability is a matter of ecological status quo and does not reflect reality on ground. Strong sustainability indicated that there is paradox between natural capita and man-made resources. It also proves that natural capita are not reversible in some cases but the case of man-made resources could be reversible through technology (Hurley and Home, 2006).

The problems of social and economic indicator were not part of the Ecological Footprint Accounting and this could not occur because the environmental impact is caused mainly by economic development and social interaction. Therefore, social and economic is paramount in the environmental impact. Economic development leads to high level of consumption which has greater effect on the environment and natural resources; this is a factor in Ecological Footprint that cannot be left unaccounted for. The problem of environmental sustainability and extensive land use was not considered in Ecological Footprint. One function for land use is not a factor as mixed land uses is the major use of land in built up area and all those uses yield different Ecological Footprint and when which is been equated as one function, this does not depict the actual Ecological Footprint of such land. The aggregation measurement procedure for environmental impact for energy use is cumbersome because fossil fuel constitutes the major Ecological Footprint producer in the developed world and the use of nuclear energy; the resultant nuclear waste is not catered for.

Though Ecological Footprint is calculated at global, regional, national and local level, the environmental circumstances occurs at regional level and the boundaries of the regions are arbitrary, therefore, environmental impact of one region could be felt at another region. This implies that regional boundaries have to be viewed from environmental point of view. This will lead to environmental impact for instance continents, climatic zone, river catchment area etc. for better environmental management rather than political boundaries (Bergh and Verbruggen, 1999).

Lack of common definition and methodology-it is difficult to have a universally accepted method of calculating Ecological Footprint. It is not made according to universally accepted international convention such as United Nation System of National Accounting (UNSNA). This caused the divergence in the Ecological Footprint of nations by different authors, for example, the Ecological Footprint of New Zealand by Bricnell, *et al* (1998); Wackernagel, *et al* (1999) and Loh (2000) varies between 3.49 and 9.6 ha per capita. There is a wide gulf in these calculations.

Technological/Building Assessment Method:

The technological/Building Assessment tool measures quantitative performance of building design alternatives and the assessment tools measures the performance level of building in stars (there are 6 stars rating of the assessment tools). The entire environmental measuring tools are established to measure building sustainability at every stage. There are many types of Environmental Assessment Tools which include: Sustainability A Test by EU, Building Research Establishment Environmental Assessment Method (BREEAM) made in UK, Leadership in Energy and Environmental Design (LEED), Leadership in Energy and Environmental Design-Neighbourhood (LEED-ND) incorporated in USA, Sustainability Building Tool (SBT) an internal product, Comprehensive Assessment System for Building Environment Efficiency (CASBEE) made in Japan, Green Globe, Green Calculator, Eco-profile, Hong Kong-Building Environmental Assessment Method (HK-BEAM), Building and Construction Authority-Green Mark (BCA-GM) made in Singapore, Green Star from UK, National Australia Building Environmental Rating System (NABERS), MASTEEE (MASTEE), Green Olympic Building Association System (GOBAS) made in china, Evaluation Standard Green Building (ESGB), GreenRE made in Malaysiaetc (Poveda and Lipsett, 2011b). Some of the assessment tools are discussed thus:

The Sustainability A-Test (EU Project):

This is used to validate the context of sustainability as it is applied to varieties of evaluation such as methodologies, models, approaches and appraisals. This test uses different criteria such as Assessment Framework, Participatory tools, Accounting apparatuses, Scenario Analysis, Multi-criteria Analysis, Cost-Benefit Analysis, Cost-Effectiveness Analysis, Modelling Apparatus, Physical Analysis Tools and Indicator sets. The Sustainability A-Test was commissioned by EU for FP6-STREP programme which include EIA, Scenario tools, Multi-criteria Analysis, CBA, and Accounting tools (IVM, 2011). The method and tools for the analysis of The Sustainability A-Test is shown in table 1.

Table 1: Various Tools in 'Sustainability A – Test' of EU Project

Groups	Tools for measurement (Models)
Assessment Frameworks	• European Union Impact Assessment System • Environmental Impact Assessment • Strategic Environmental Assessment • Integrated Sustainability Assessment / Transition Management
Participatory Tools	• Electronic Focus Groups • Tools to inform debates, dialogues and deliberations • Consensus Conference • Repertory Grid Technique • Interactive Back-Casting • Focus Group • Delphi Survey • In-depth Interviews • Citizen`s Jury
Scenario Analysis	• Trends • Cross Impact • Relevance Trees and Morphologic Analysis • Modeling, Simulating, Training • Interactive Brainstorming • Scenario Workshops • Integrated Foresight Management Model • Ranking Method
Multi-Criteria Analysis	• Multi-Attribute Value Theory • Weighted Summation • Analytic Hierarchy Process • Preference Ranking Organization Method for Enrichment Evaluations • Novel Approach to Imprecise Assessment and Decision Environments • REGIME • Dominance Method • Software for MCA
Cost-Benefit Analysis and Cost-Effectiveness Analysis	• Cost-Benefit Analysis • Travel Costs • Hedonic Pricing • Cost of Illness • Contingent Valuation • Averting Expenditures • Contingent Behaviour • Market Methods • Conjoint Choice Questions • Cost-effectiveness analysis
Modeling Tools	• Family of Socio-Economic Models • General Economy Models • Demographic Models • Public Health Models • Partial Economic Models • Family of Bio-Physical Models • Climate Models • Biogeochemistry Models • Hydrology Models • Family of Integrated Models • Land use Models

	• Integrated Assessment Models • Qualitative System Analysis Models • Scenario Building and Planning Tools
Accounting Tools, Physical Analysis Tools and Indicator Sets	• Measure of Economic Welfare • Sustainable National Income • Genuine Savings • National Accounting Matrix including Environmental Accounts • Index of Sustainable Economic Welfare • Ecological Footprint • Global Land use Accounting • Economy-wide MFA • Life Cycle Assessment • Indicator sets for Assessments • Vulnerability Assessment: Livelihood sensitivity approach

Source: Adapted with modification from Pevoda and Lipsett, 2011b.

The Eco^2 Cities (Ecological and Economic Cities):

It was formulated by World Bank to help third world countries to achieve ecological and economic sustainability. This Assessment offers useful, measurable, logical and functionalbacking to urban centres. This was to allow cities to achieve the goal of sustainability worldwide and has an analytical framework for its operation.

Because the rate of urbanisation in the third world is alarming and is focus of the 21st century to tame its consequences of poverty. About 90% of the world urbanisation is taken place in third world countries, and between 2000 and 2030, the land that will, be needed for built up are of urban area will triple the present figure (UN-Habitat, 2008; World Bank, 2011). This will pose great challenges to the cities, national and international development community as many of the cities may not be sustainable. Though, it will also offer its own opportunities, but the challenges will be enormous. This requires proper planning, development and management of cities that will be ecologically and economically sustainable. There is limited time for this because urbanisation in third world cannot be stopped. Therefore, *"the decision we make together today can lock-in systemic benefit for the present and future generation"* (World Bank, 2011).

Suzuki *et al* (2010), have a contrary view about classification of Assessment tools for Eco^2 cities. They proposed three different leverage: ways to design collaboratively and make decision to allow cities to have leadership collaboration; Analysis of flow and form of cities that give method and additions that allow trans-disciplinary avenue for identification of the relationship between space attribute of cities (form) and physical resources consumption (flow) of the cities; Investment and planning assessment that allow accounting method, lifecycle estimation, practicalthreat,alleviation and adaptation in the city. This is what makes city support system for reality with continuing management and proper policy-making process.

The LUDA (Large Urban Distressed Area):

This is a scheme of EU to support "city of tomorrow and cultural heritage". It has in its programme such as *"Energy, Environment and Sustainable Development"*. This is the fifth charter plans of EU. LUDA has a tool that provides a better method for the urban rehabilitation, and also provides support for cities to plan and manage the approach more effectively at the beginning. It was the solution proffers to high level political instability been experienced in distressed cities due to environmental, economic and social impact so as to achieve swift improvement to human development index (LUDA project, 2011).Large Urban Distressed Assessment was carried out in all the 16 EU countries and twelve referenced cities between 2004 and 2006.

BEQUEST (Building Environmental Quality Evaluation for Sustainability Tool):

This was the first project that has building assessment tools, methods and procedures for measuring the sustainability of building or project within a city. The component of BEQUEST is shown in table 2 and the supporting tools such as rating of BEQUEST are also included.

Table 2: Sustainable Development Models of BEQUEST

1. Analysis of Interconnected Decision Areas (AIDA)[1]
2. Analytic Hierarchy Process (AHP) [1]
3. ASSIPAC (Assessing the Sustainability of Societal Initiatives and Proposed Agendas for Change)[1]
4. ATHENA[1]
5. BEAT 2002[2]
6. BeCost (previously known as LCA-house) [2]
7. BEPAC (Building Environmental Performance Assessment Criteria)[1]
8. BRE Environmental Assessment Method (BREEAM)[1]
9. BRE Environmental Management Toolkits[1]
10. Building Energy Environment (BEE 1.0)[1]
11. Building Environmental Assessment and Rating System (BEARS)[1]
12. Building for Economic and Environmental Sustainability (BEES 2:0)[1]

13. CASBEE[2]
14. Cluster Evaluation[1]
15. Community Impact Evaluation[1]
16. Concordance Analysis[1]
17. Contingency Valuation Method[1]
18. Cost Benefit Analysis[1]
19. DGNB[2]
20. Eco-Effect[1]
21. Eco-Indicator 95[1]
22. Eco-Instal[1]
23. Economic Impact Assessment[1]
24. Ecological Footprint[1]
25. Eco-points[1]
26. Ecopro[1]
27. Eco-Profile[1]
28. EcoProP[1]
29. Eco-Quantum[1]
30. EIA – Environmental Impact Analysis[1]
31. ENVEST[1]
32. Environmental Profiles[1]
33. Environmental Status Model (Miljostatus)[2]
34. EQUER[1]
35. ESCALE[1]
36. Financial Evaluation of Sustainable Communities (FESC)[1]
37. Flag Model[1]
38. Green Building Challenge, changed in Sustainable Building (SB) Tool[1]
39. Green Globes[2]
40. Green Guide to Specification[1]
41. Green Start[2]
42. GRIHA[2]
43. Hedonic Analysis[1]
44. HKBEAM[2]
45. HochbaukonstruktionennachokologischenGesichtspunkten (SIA D0123)[1]
46. INSURED[1]
47. LEED-TM (Leadership in Energy and Environmental Design Green Building Rating System)[1]
48. LEGEP (previously known as LEGOE)
49. Life Cycle Analysis (LCA)[1]
50. Mass Intensity Per Service Unit (MIPS)[1]
51. MASTER Framework[1]
52. Meta Regression Analysis[1]
53. Multi-Criteria Analysis[1]
54. NABERS[2]
55. Net Annual Return Model[1]
56. OGIP (Optimierung der Gesamtanforderungenein Instrument fur die IntegralePlanung)[1]
57. PAPOOSE[1]
58. PIMWAQ[1]
59. Project Impact Assessment[1]
60. Regime Analysis[1]
61. SB Tool 2005[2] (formerly known as GB Tool)
62. Quantitative City Model[1]
63. Planning Balance Sheet Analysis[1]
64. Risk Assessment Method (s)[1]
65. SANDAT[1]
66. Semantic Differential[1]
67. Social Impact Assessment[1]
68. SPARTACUS (System for Planning and Research in Town and Cities for Urban Sustainability)[1]
69. SEA (Strategic Environmental Assessment)[1]
70. Sustainable Cities[1]
71. Sustainable Regions[1]
72. Transit-oriented Settlement[1]
73. Travel Cost Theory[1]

NB: 1. Assessment methods, tool and procedures listed in the BEQUEST projects.
2. Additional tools (e.g. rating systems) complementing the BEQUEST project list
Source: Adapted with modification from Pevoda and Lipsett, 2011b.

Leadership in Energy and Environmental Design (LEED):

This uses rudimentary weighting calculation to determine the significance of credit as shown box 1. The innovative LEED 12 will use different set of classificationsthat will be determined by USGBC which have closely aligned with the present development (USGBC, 2011). The aim of the calculation is added up all the building impact data that has been collected and to see the performance of each credit (USGBC, 2009b).

Basic Weighting Calculation Relative importance of each impact category × Relative contribution of a building activity group to building impacts × Association between individual credits and activity groups = Credit Weight Where, •Impact Category: impacts of building on environment and occupants (e.g. TRACI categories) •Activity Group: a building-related function associated with a group of LEED credits (e.g., consumption of energy bybuilding systems, transportation, water use) •Association with activity group: a binary (yes/no) relationship indicating whether or not a credit contributes to reducing impact.

Box 1. The LEED Credit Weighting System Equation adapted from Pevoda and Lipsett, 2011

Impact Categories:

This is known and weighted by National Institute of Standard and Technology (NIST) via impact classificationspostulated by US Environmental Protection Agency's Tool for the Reduction and Assessment of Chemical and other Environmental Impact (TRACI) (Bare *et al,* 2002). The assigned weight of each category of assessments is thus:

Green House Gas emission 29%	Fossil Fuel 10%	Human Health Cancer 8%
Water use 8%	Ecotoxicity 7%	Indoor Air Quality 3%
Eutrophication 6%	Land-use 6%	Smog formation 4%
Human Health (non-Cancer) 5%	Particles 9%	Ozone formation 2%
Acidification 3%		

AHP is used by NIST to determine the weight which is aggregated to 100%

Activity Group:

These are the building impacts that are categorised in to:

- Building system (petroleum products and electricity consumption)
- Transportation (moving from one place to another and services)
- Water usage (local and landscaping)
- Material (core, shell and finishing)
- Indoor Environmental Quality.

CASBEE (Comprehensive Assessment System for Building Environmental Efficiency):

It assesses building from environmental efficiency and impact on the environment point of view. It has two factors in its analysis: Quality Q and Loading L. Q is known as Building Environmental Quality and performance that calculated progress in existingfacility for dwellingconsumers within the imaginaryland, and Loading L measures Building Environmental Impact that determine the negative aspect of Environmental Impact which is beyond the hypothetical space (CASBEE, 2006). CASBEE calculate BEE by using Qand L as ratio, thus it is expressed mathematically as:

$$BEE = Q/L$$

Where
Q has the following: Indoor Environment-Acoustic, illuminating, current comfort and air quality;
Service Quality-Adaptation, flexibility and durability and outdoor environment
L has the following: energy, material and off-site environment.

Assessment Categories:

Q = Q-1 (building environment); Q-2 (quality of service) and Q-3 (outdoor environment on site)
LR = LR-1(energy); LR 2-2 (resources and material); LR-3 (off-site environment)

Scoring:

There is criterion for each score. This is determined by practical and collective standard for the measurement.

Weighting:

All the items are weigh and the total of Q are added up to 1.0. The total of allcalculations are multiplied by the weight of co-efficient and then combined to attain SQ and LR which is the entire score for Q and L. then the formula is used thus:

BEE = Q/L

Building Research Establishment Environmental Assessment Method (BREEAM):

This categorisesare diverse environmental topics which are divided into three classes: Global issue such as CO_2 emission, acid rain, ozone depletion, natural capitals and bio-degradable resources, storage of green material and planning for permanence of resources; Nativematters such as transportation, noise, local wind effect, water reduction when use, intense or additional building and land re-use of neglectedland and biologicalassessment of the location; Internalmatters such as harmfulresources, natural and man-madeillumination, thermal comfort and warmth and aeration (air circulation).

Singular usage of these elements is credited. A sum total of figure is assigned if the design meets the requirement of the user in a specific issue. There is no intention of weighing the issue at the onset (Brandon and Lombardi, 2011). The total of the credits are used to determine the overall performance which are shown in sematic scale based on some conditions that credit must have as minimum level. These levels are issue at global, local and indoor.

BREEAM has nine classes and have the following predetermined weights.

Management	12%	Health and Well-being	15%	Transportation	8%
Pollution	10%	Land-use and Ecology	10%	Materials	12.5%
Water	6%	Waste	7.5%	Energy	19.0%

The level of achievement of each class determines the percentage aggregate for the assessment.

GT Tool (Sustainability Tool):

It has similarities with LEED and BREEAM though go beyond that to have best price and assessment scale imbedded in it. It is also based on LCA methodology and has a customise weighting criteria. The score ranges between -2 and +5 and it is shown thus:

-2 and -1 implies an unacceptable performance in a particular region

0 shows least acceptable level of specific space.

+3 indicated best practice

+5 is the best theoreticallypracticable at any rate.

The building phase is scored from predesign, plan, building and operation phases. Four parameters for measurement are used, which are-issues, classes, benchmarks and sub-criteria. The designers and construction staff vote for issues and categories while criteria and sub-criteria are automatically allotted. The score is determined by multiplying it by weight and the calculated scores (PETUS, 2011).

Green Star:

These also have nine classes for its calculation which are: administration, indoor environmental superiority, energy, transportation, water, resources, land-use and ecosystem, emission and novelty. These classes consider the ecologicaleffect which affects the project directly and is linked with location selection, plan, and construction and conservation process. Values are assigned to all classes to reportcreativities for advancement on the ecologicalact. Each class is assigned specific weight which is specifically given and the stakeholders also contribute to its acceptance. The weight include OECD's Sustainability Building Project Report; the Australian Greenhouse Office, Environmental Australia, CSIRO, the Cooperative Research Centre for Construction, the Commonwealth Department of Environment and Heritage, and National Survey conducted by the Green Building Council.

The weight is subjective as it varies at different geographical locations but have a standardised formula thus:

Weight Category Score = Category Score (%) X Weight Factor (%) /100:

Specificfigure of value is used in each class, which is built on proportion of the achieved points.

All the Sustainability/Environmental Rating System uses similar weighting tool except for CASBEE. The system uses categories to assign weight and different criteria within the category, though there is no direct weighting style for each credit. The LCA methodology is employed by all the rating system because of the similarity in the Environmental Management System (EMS) (Papadopoulus and Giama, 2009). EMS has a specific objective which is to have Continual Environmental Improvement. The evaluation and selection of rating system require a number of criteria. Fowler and Rauch (2006) indicated that proportionability, applicability, accessibility, growth, procedure, classificationdevelopment, methodological content, communiqué and rate are major criteria in rating system.

Comparison of different Tools:

BREEAM was the first to be adopted worldwide as an assessment tool, LEED, SBTool were derived from the work of BREEAM. All these tools measures the life cycle of building without consideration to its demolition debris as a waste. It is only CASBEE that looked into demolition factor. It is the same issues of sustainability that all these tools measure such as water, energy efficacy, materials and resources and the indoor environmental quality (Xiaoping *et al*, 2007).

Despite the fact that all these tools were developed in different part of the world, they have a singular aim of sustainability, cultural and marketing incursion have been dictating the ability of the rating and weight ascribed to each tools (Ding, 2007). BREEAM was introduced to the world by Building Research Establishment in the 1990s. It is the bestcommonly utilized tool because of been the first tool (EC, 2010). BREEAM has been used in different building worldwide such as Eco-homes, Education, Industries, Prisons, Retail communities, BREEAM communities, Court, Domestic, and Refurbishments etc. It is more flexible and adaptable worldwide. It has been used at community level and consideration is done on three variables such as adaptability to the community, flexibility and financial consideration aspect of the project compare with other tools. The comparison of different assessment tools indicated that base on the three criteria, BREEAM is the best., but locality place a factor in its acceptability.

Table 3: comparison of Different Assessment Tools for Measurement of sustainability

Tool	Adaptability to Community	Flexibility	Financial Consideration
BREEAM	√	√	√
BCA-GM	×	×	×
CASBEE	×	×	×
ESGB	×	×	×
LEED	√	√	×
SBTool	√	√	×

Conclusion:

The issue of sustainable development keep evolving overtime and its applicability and usefulness is fast becoming the order of the day in the sustainability parlance. There has evolved series of methodologies, models, approaches and appraisal to show how sustainable a development is. This is a departure from the 1960s and 1970s idea of balancing economics with environmental degradation. There have been several tools to measure sustainability and it is becoming popular as technology improves. There is need to classify the tools as many has evolved. There has been a generic strategic and integrated tool which shows sustainability and ecologicalscore system and their value weighting apparatuses. The ordering of the available tools shows different process of sustainability as it varies overtime and places. The measurement of sustainable development in urban area is the catalyst for socio-economic development of such cities, but cities are been faced by many challenges such as urban decay, manageability problem, liveability, housing, poverty and crime etc. Therefore, the sustainable development issues has to be considered in the development of cities in developing world during the process of preparing a comprehensive master plan for its development by the planners. There must be ways to measure sustainability of a city so as to ameliorate the challenges of attendant problem of urbanisation. Alberti (1996) is of the opinion that measurement of urban sustainability is a paramount issue that had to be given prompt attention. Measuring of urban sustainability should be given adequate significance about how urban pattern influence the city environment and natural resources utilisation.

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