

Land Ethic: A Different Perspective for Green Community Rating Systems

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Abstract:

Sustainability in India is rated through various Green Rating Systems for real estate developments, although on voluntary basis. This paper presents a scientific analysis of an Indian Rating System namely: IGBC Green Townships and two global rating systems namely: BREEAM Communities and Pearl Rating System on basis of a philosophy known as Land Ethic (LE). Coined by an American forester Aldo Leopold, LE is based on parameters like soils, waters, plants/animals or collectively: the land. This philosophy forms a roadmap to view the rating systems in terms of its intangible/non-monetary benefits related to soils, waters, plants/animals and land. The analysis involved selection of keywords which best represented LE philosophy, namely: Community, Soils, Waters, Plants/Animals, Land Health, Land Pyramid, Land Organism, Ecological Conscience, Land Use, Conservation/Preservation and Education/Awareness. Each issue/checklist listed in the selected rating systems was qualitatively evaluated in respect to the selected LE keywords. For quantitative analysis, a scoring system was formulated to give scores to each issue/checklist vis-a-vis LE keywords. Scores A represented scores for issues/efforts and Scores B represented scores for respective credit points earned by each LE keyword. Scores A and B were then used for the purpose of this study on basis of LE keywords and issues/checklist of the rating systems. A resultant matrix was formulated for the purpose of compatibility inspection of the rating systems in context to LE philosophy. Few guidelines on basis of LE philosophy were also recommended.

Keywords: Aldo Leopold, community, BREEAM, green rating systems, IGBC, Land Ethic, Pearl, sustainability

1.0 Introduction:

Civilization has so cluttered this elemental man-earth relationship with gadgets and middlemen that awareness of it is growing dim. We fancy that industry supports us forgetting what supports industry (Leopold, 1949). Leopold indicates that humans are impressed by their achievement of industries and civilization and considers it to be a means for their survival and progress. However, in doing so humans forget the primary aspect on which the industries and civilization depend upon: the land. Leopold defined land to be a collection of soils, waters, plants and animals. Since ancient times it is evident that humans have modified land or in other words soils, waters, plants and animals to be industrialized and civilized. Globally, humans have now entered an era of urbanization. Urbanisation in India is occurring at a rate that is faster compared to many other parts of the developing world. The Planning Commission of the Government of India estimates that about 40 per cent of the country's population will be residing in urban areas by 2030 (Rajashekariah, 2011). Urbanization involves development of cities in terms of infrastructure such as transportation,

electricity, water, sanitation, waste, public health and safety along with daily basic amenities, job opportunities and housing. These varied systems demand an efficient land use planning norms and governance. Urbanization has seen horizontal growth and lately for cities like Mumbai, the growth has now gone vertical. Undoubtedly, the growth of urbanization causes ecological intervention and uses natural resources. Also, urbanization and economic growth go hand in hand; urbanization is 70% of global GDP (Cities Alliance, 2011). However, the tremendous growth in economic activity across the globe is placing pressure on natural and environmental resources (Roy and Gupta, 2008). According to KPMG International Report (2012), water scarcity, urbanization, ecosystem decline and deforestation are few of the global sustainability mega forces that will affect the future of every business. Real Estate business which provides spaces for housing, offices, education and entertainment, health care and so on is no different from this.

According to a report by the Intergovernmental Panel on Climate Change (IPCC) in 1996, the real estate industry is expected to consume 38% of the

global energy and emit 3,800 mega tonnes of GHGs every year. This does not include the usage of other resources such as water (Roy and Gupta, 2008). Since the first oil shocks in the 1970s and the rise of environmental concerns in the following decades, there have been two main drivers that have brought the issue of environmental sustainability to the forefront of real estate investor and corporate occupier concerns - the continued pressure of energy costs and the potential threats of future climate change and its impact on the value of real estate (Jenowein, 2012). Hence, one of the ways currently adopted to increment the value of real estate is by constructing green buildings to become sustainable and claiming to combat the potential threats of future climate change.

Of all the many reasons, three top reasons often cited by those occupying green buildings are: operational savings, daylight and views and indoor air quality (Kumar, 2009). A green building is known to have both tangible and intangible benefits. The immediate and most tangible benefit is in the reduction in operating energy ranging from 25% – 40% and water costs right from day one, during the entire life cycle of the building (Kumar, 2009). Some of the intangible benefits include improved health of building occupants, improved company brand equity and goodwill, reduced environmental impact, and improved occupant comfort and productivity (Birkenfeld *et al.*, 2011). The tangible benefits of a green building are estimated through monetary gains for energy and water and hence are projected as benefits of green buildings. The intangible benefits considered as non-monetary gains are seldom projected. These benefits which include improved indoor air quality, occupant comfort and productivity are aspects which are centric to interiors of the built space. Can the interior spaces work efficiently without being engaged with the exterior spaces? Can the rating system prove successful holistically only on basis of the tangible benefits? What about the quality, comfort and productivity of exterior spaces?

Exterior are the spaces which include soils, waters, plants and animals, collectively: the land and the environment surrounding it. Estimation of aspects such as numbers of trees planted/retained, varied biodiversity created/retained, the amount of top soil preserved, fraction of water cycle enhanced, amount of heat island reduced and alike may prove useful to project the intangible benefits or non-monetary gains related to exterior spaces. The approach of green rating systems to be sustainable

may prove successful holistically by not only considering the tangible/monetary gains but also considering intangible/non-monetary gains. One of the ways to achieve this is by following the roadmap of Aldo Leopold's philosophy known as Land Ethic (LE). All ethics so far evolved rest upon a single premise: that the individual is a member of a community of interdependent parts. His instincts prompt him to compete for his place in that community, but his ethics prompt him also to cooperate. The land ethic simply enlarges the boundaries of the community to include soils, waters, plants and animals, or collectively: the 'land' (Leopold, 1949). This explains the crux of LE philosophy. Therefore, the question that arises here is how to check the compatibility of the green rating systems with the LE philosophy to lead towards a holistic approach by accounting for the intangible/non-monetary gains along with tangible/monetary gains. This paper seeks to examine this by way of inspecting its compatibility and measures to implement the LE philosophy on the guidelines outlined for green rating systems.

2.0 Materials and Methods:

Few representative words which best described LE philosophy were identified and were termed as keywords. These keywords were: Community (Co), Soils (So), Waters (Wa), Plants/Animals (Pl/A) Land Health (LaH), Land Pyramid (LaP), Land Organism (LaO), Ecological Conscience (ECo), Land Use (LU), Conservation/Preservation (CP) and Education/Awareness (EA). These LE keywords were formulated into a model called as LE Model (LEM) to explain LE philosophy (Figure 1). These selected keywords were used to analyse the selected community rating systems: BREEAM, Pearl and IGBC. Each issue stated in the rating systems guidelines were analysed in terms of its intent/purpose, surveys/studies expected, evidences/details demanded and efforts involved considering one (or more) LE keywords. This analysis was based purely on LE keywords namely: soils, waters, plants and animals, collectively: the "land". In other words, only that issue/checklist which was advantageous to LE keywords namely: soils, waters, plants and animals, collectively: the land was shortlisted. Those issues/checklist in context to energy, materials, transportation and alike were excluded from this analysis. Four methods were undertaken in a chronological order as under:

2.1. Evaluation Process

Starting with this process, each issue/checklist outlined in the guidelines of all the rating system

was qualitatively evaluated on basis of LE keywords. The issues were tagged into the selected LE keywords depending on the benefits and effects that it provided to them. In this way, each LE keyword acquired two types of scores: Score A provided the total numbers of 'issues' (or

in other words, 'efforts') being tagged under it and Score B provided the respective credit points laid in the rating systems guidelines for the issues tagged under it. Scores A and B formed a basis of further quantitative analysis and study.

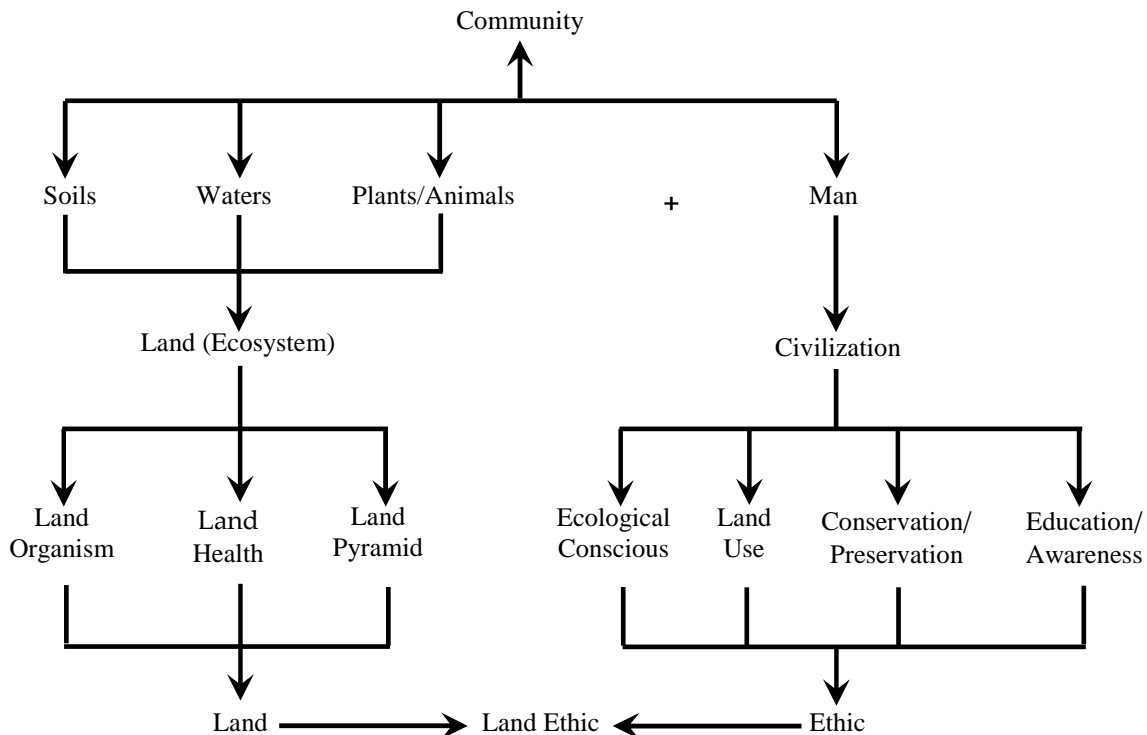


Figure 1:- Land Ethic Model (LEM)

2.1.1. Comparison Process

In this process, Scores A and Scores B for each rating system were mutually compared with the help of bar charts for all LE keywords. This comparison gave an estimate of the level of significance that each LE keyword obtained under each rating system in terms of issues/efforts and respective credit points. The results of comparison for each rating system were based on the compatibility between issues/efforts and credit points. Based on this compatibility, four ranks were evolved. LE keywords which fetched high (+) numbers for both issues/efforts (Score A) and credit points (Score B), were considered compatible and were given rank 'Good' (+A, +B). LE keywords which fetched high (+) numbers of issues/efforts (Score A) although respective credit points (Score B) were less (-), were given rank 'Average 1' (+A, -B). LE keywords which fetched less (-) numbers of issues/efforts (Score A) but still got high (+) numbers of credit points (Score B); not regarded at par, were given rank 'Average 2' (-A, +B). Lastly, those LE keywords which fetched the least (-) both in terms of issues/efforts and credit points, were given rank 'Bad' (-A, -B).

2.1.2. Compatibility Process

In this process, the compatibility between Total Scores A and B of each rating system was evaluated. This enabled to check the compatibility between the total issues/efforts that were tagged for all LE keywords and the respective credit points that they gained within a single rating system. Compatibility of Total Scores A and B were also compared mutually within the three rating systems to evaluate their performance in context to the LE philosophy. This was done with the help of bar charts.

2.1.3. Matrix Process

This process formed a combination of Comparison and Compatibility processes. It was carried out by comparing Scores A and Scores B of BREEAM, Pearl and IGBC in terms of each LE keyword individually. Combination of the two processes enabled to evolve a Matrix for the purpose of this evaluation. Matrix 1 shows a standard format of this Matrix. Following was the method of Matrix evolution:-

- i) Scores A and B of each LE keyword for each rating system were converted into percentage (Refer Table 1).
- ii) Comparing these percentages of Scores A and

B amongst the three rating systems, they were given grades as: Low (L), Medium (M) and High (H). Hence, the grades for 'Credit Points' (cp) were L_{cp} , M_{cp} and H_{cp} and those for 'Issues/Efforts' (e) were L_e , M_e and H_e .

- iii) A Matrix was formulated by plotting issues/efforts (Scores A) vertically and credit points (Scores B) horizontally.
- iv) Grades for 'Credit Points' was assigned a numerical value and a sign as $L_{cp} = (-) 11$, $M_{cp} = (0) 12$ and $H_{cp} = (+) 13$. 'Issues/Efforts' were considered comparatively significant and hence given more weightage by assigning higher numerical value by reversing the digits as $L_e = (-) 11$, $M_e = (0) 21$ and $H_e = (+) 31$, signs remaining same.
- v) Each LE keyword was assigned an Efforts-Points (EP) Grade under each rating system (Refer Table 1). The EP Grades thus obtained were: H_eH_{cp} , H_eM_{cp} , H_eL_{cp} , M_eH_{cp} , M_eM_{cp} , M_eL_{cp} , L_eH_{cp} , L_eM_{cp} , and L_eL_{cp}
- vi) These EP Grades were then assigned a numerical value, termed as Effort-Points (EP) Scores by plotting them in the Matrix for each LE keyword and by multiplying numbers assigned to the grades. For instance, EP Grade ' H_eH_{cp} ', being High for both efforts and credit points, gets a maximum score of 403 (31

multiplied by 13). EP Grade ' L_eL_{cp} ', being Low for both efforts and credit points, gets minimum score of 121 (11 multiplied by 11). Score increases proportionately, as any one grade increases. The EP Scores indicate relative compatibility between issues/efforts and respective credit points amongst the three rating systems.

- vii) Lastly, these EP Scores were plotted on a Graph for the purpose of analysis and comparison.

		CREDIT POINTS (CP)		
		H_{cp} (+)(13)	M_{cp} (0)(12)	L_{cp} (-)(11)
ISSUES/EFFORTS (E)	H_e (+)(31)	H_eH_{cp} (+ +) (403)	H_eM_{cp} (+ 0) (372)	H_eL_{cp} (+ -) (341)
	M_e (0)(21)	M_eH_{cp} (0 +) (273)	M_eM_{cp} (0 0) (252)	M_eL_{cp} (0 -) (231)
	L_e (-)(11)	L_eH_{cp} (- +) (143)	L_eM_{cp} (- 0) (132)	L_eL_{cp} (- -) (121)

Matrix 1:- Standard Matrix

Table 1:- BREEAM, Pearl and IGBC – Percentage conversion, EP Grades

SN	LE Keywords, EP Grade	BREEAM				Pearl				IGBC			
		Efforts (E)		Credit Points (CP)		Efforts (E)		Credit Points (CP)		Efforts (E)		Credit Points (CP)	
		Scores	%	Scores	%	Scores	%	Scores	%	Scores	%	Scores	%
1	Co	4	18	9	15	2R+8	21	16	25	2R+6	30	28	42
	EP Grade	L_e	L_{cp}			H_e	M_{cp}			M_e	H_{cp}		
2	So	4	18	24	42	3R+6	19	30	47	2R+2	18	22	33
	EP Grade	L_e	M_{cp}			H_e	H_{cp}			M_e	L_{cp}		
3	Wa	7	32	23	40	4R+7	23	44	69	1R+5	25	36	53
	EP Grade	M_e	L_{cp}			H_e	H_{cp}			L_e	M_{cp}		
4	PI/A	6	27	25	44	5R+6	23	19	30	5	19	40	60
	EP Grade	M_e	M_{cp}			H_e	L_{cp}			L_e	H_{cp}		
5	LaO	5	27	13	23	1R+4	11	17	26	1R	-	-	-
	EP Grade	M_e	M_{cp}			H_e	H_{cp}			L_e	L_{cp}		
6	LaH	6	27	16	28	2R+5	15	20	31	2R+3	19	18	27
	EP Grade	M_e	L_{cp}			H_e	H_{cp}			L_e	M_{cp}		
7	LaP	3	17	20	35	1R+7	17	39	61	2R+1	11	6	9
	EP Grade	L_e	M_{cp}			H_e	H_{cp}			M_e	L_{cp}		
8	Eco	6	27	19	33	3R+11	30	30	47	2R+3	19	26	39
	EP Grade	M_e	L_{cp}			H_e	H_{cp}			L_e	M_{cp}		
9	LU	12	54	40	70	6R+6	26	14	80	3R+8	42	56	54
	EP Grade	M_e	M_{cp}			H_e	L_{cp}			L_e	H_{cp}		
10	CP	9	41	28	49	3R+11	30	52	81	2R+9	42	72	107
	EP Grade	L_e	L_{cp}			H_e	M_{cp}			M_e	H_{cp}		
11	EA	6	27	21	37	2R+3	11	7	11	2	8	14	21
	EP Grade	H_e	H_{cp}			M_e	L_{cp}			L_e	M_{cp}		

3.0 Results and Discussion:

3.1. Evaluation Process

This process enabled to generate Scores A for total numbers of issues/efforts and Scores B for respective credit points for all LE keywords, by evaluating every issue/checklist outlined in the rating systems guidelines. For instance, issue 'Green Infrastructure' in BREEAM Rating System was found beneficial for LE keywords such as community, ecological conscious, land use and conservation/preservation. Similarly, issue 'Natural Systems Design and Management Strategy' in Pearl Rating System was found beneficial for LE keywords such as soils, land organism, land health, ecological conscious and conservation/preservation. In IGBC Rating System, issue 'Preserving Existing Trees and Water Bodies' was found beneficial for LE keywords such as water, plants/animals, land use and conservation/preservation. On similar grounds based on qualitative analysis, one or more LE keywords were tagged under all those issues which proved beneficial to them. Consequently, LE keyword 'Community' tagged issues such as Consultation Plan (credit point 1), Community Management of Facilities (credit point 3), Green Infrastructure (credit point 4) and Inclusive Design (credit point 3) in BREEAM Rating System. Thus, 'Community' got 4 numbers of issues for Score A and 11 numbers of credit points for Score B in BREEAM Rating System. Similarly, in Pearl Rating System, LE keyword 'Community' tagged issues such as Integrated Development Strategy (required), Community-Dedicated Infrastructure Basic Commissioning (required), Guest Worker Accommodation (credit point 2), Food Systems (credit point 2), Provision of Amenities and Facilities (required), Neighbourhood Connectivity (credit point 3), Housing Diversity (credit point 2), Community Walkability (credit point 4), Safe and Secure Community (credit point 1) and Regional Material (credit point 2). Thus, 'Community' got 10 numbers of issues (required 3 + 7) for Score A and 16 numbers of credit points for Score B in Pearl Rating System. In IGBC Rating System, LE keyword 'Community' tagged issues such as Public Landscape Areas (credit point 6), Local Fruits & Vegetable Produce (credit point 8), Basic Facilities for Construction Workforce (required), Housing Typologies (credit point 8), Social & Cultural Initiatives (credit point 6) and Design for Differently Abled (required). Thus, 'Community' got 6 numbers of issues for Score A and 28 numbers of credit points for Score B in IGBC Rating

System. All other LE keywords got Scores A and B quantitatively in a similar manner. These Scores A and B were used for further processes in this study.

3.2. Comparison Process

Comparison of Scores A with Scores B for each rating system gave an analysis of significance given to each LE keyword in terms of issues/efforts and respective credit points allocated. Based on this comparison, LE keywords were given ranks such as 'Good' (+A, +B), 'Average 1' (+A, -B), 'Average 2' (-A, +B) and 'Bad' (-A, -B). The comparison process for each LE keyword and their ranks for each rating system are as under:-

3.2.1. Comparison Process: BREEAM Scores A and B

BREEAM Rating System has total 41 numbers of issues which fetches maximum of 119 credit points (BREEAM Communities – Technical Manual, 2012). Out of these, the numbers of issues found suitable specifically for LE keywords and shortlisted after analysis were 22 which fetched maximum 68 credit points. Figure 2 shows the comparison between Scores A and B for each LE keyword under BREEAM Rating System. For instance, LE keyword, Land Use fetched 10 numbers for Score A and 36 numbers for Score B, which is highest both in terms of issues/effects and credit points, thus proving it relatively compatible. Conversely, LE keyword Land Pyramid fetched least numbers 3 for Score A while got average numbers 20 for Score B, which proved it to be incompatible, in terms of issues/efforts expected, being less as compared to respective credit points allocated.

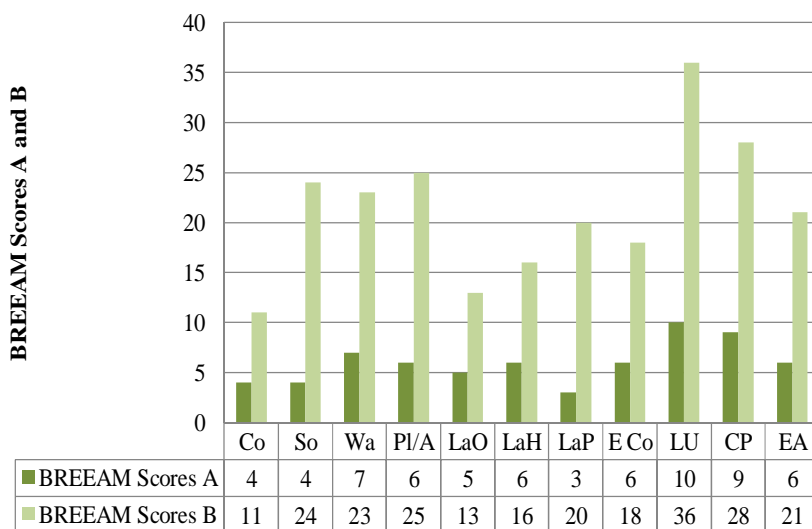


Figure 2:- BREEAM Scores A and B

After re-arranging LE keywords starting from those fetching the highest Score A (with their respective Score B) the level of significance and compatibility that each LE keyword fetched, in terms of

issues/efforts and credit points were highlighted (Figure 3). This also enabled to give ranking to each LE keyword as Good, Average 1, Average 2 and Bad.

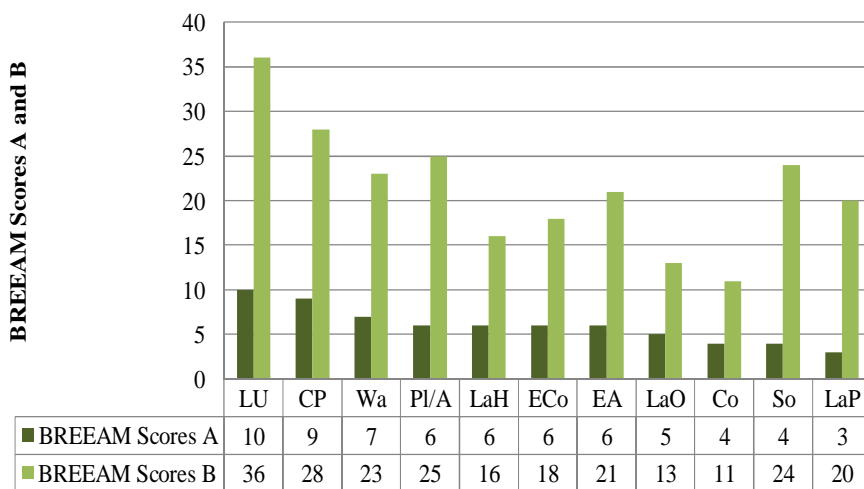


Figure 3:- Re-arranged BREEAM Scores A and B

LE keywords fall into the following ranks for BREEAM Rating System (Refer Table 2):-

Table 2:- LE keywords ranking under BREEAM Rating System

Rank	Remarks	LE keywords - BREEAM
Good	Issues and credit points are compatible (+A, +B)	Land Use, Conservation/Preservation
Average 1	Issues are more but respective credit points are less (+A, -B)	Land Health, Ecological Conscious
Average 2	Issues are less but respective credit points are more (-A, +B)	Water, Plants/Animals, Education/Awareness, Soil, Land Pyramid
Bad	Issues and respective credit points both are less (-A, -B)	Land Organism, Community

3.2.2. Comparison Process: Pearl Scores A and B

Pearl Rating System has total 64 numbers of issues which fetches maximum of 159 credit points (Pearl Rating System for Estidama, 2010). Out of these, the numbers of issues found suitable specifically for LE keywords and issues shortlisted after analysis were 47 which fetched maximum 102 credit points. This system also has few 'required' issues/checklist which meant those issues are mandatory to be complied with even without credit points. These Scores are included in Scores A for all LE keywords. Figure 4 shows the comparison between Scores A and B achieved by each LE keyword under Pearl Rating System. For instance, LE keyword, Conservation/Preservation fetched 14 numbers for Score A and 52 numbers for Score B, which is highest both in terms of issues/effects and credit points, thus proved it relatively compatible. Conversely, LE keyword

Education/Awareness fetched the least number 5 for Score A with least number 7 for Score B, which made the keyword neglected in both aspects of issues/efforts and credit points. However, LE keyword Land Organism, fetched same numbers (5) for Score A as compared to Education/Awareness, but fetched unfair numbers (17) for Scores B.

After re-arranging LE keywords starting from those fetching the highest Score A (with their respective Score B) the level of significance and compatibility that each LE keyword fetched, in terms of issues/efforts and credit points were highlighted (Refer Figure 5). This also enabled to give ranking to each LE keyword as Good, Average 1, Average 2 and Bad.

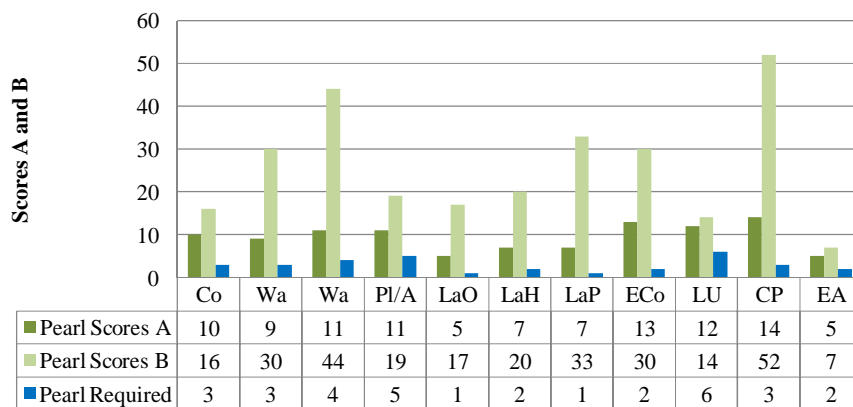


Figure 4:- Pearl Scores A and B

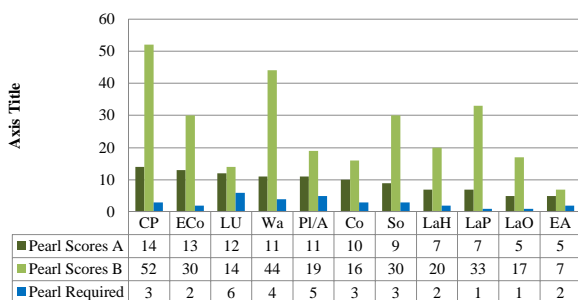


Figure 5:- Re-arranged Pearl Scores A and B

LE keywords fall into the following ranks for Pearl Rating System (Refer Table 3):-

Table 3:- LE keywords ranking under Pearl Rating System

Rank	Remarks	LE keywords - Pearl
Good	Issues and credit points are compatible (+A, +B)	Conservation/Preservation, Ecological Conscious
Average 1	Issues are more but respective credit points are less (+A, -B)	Land Use, Plants/Animals, Community
Average 2	Issues are less but respective credit points are more (-A, +B)	Water, Soil, Land Health, Land Pyramid
Bad	Issues and respective credit points both are less (-A, -B)	Land Organism, Education/Awareness

3.2.3. Comparison Process: IGBC Scores A and B

IGBC Rating System has total 40 numbers of issues which fetches maximum of 200 credit points (IGBC Green Townships, 2010). Out of these, the numbers of issues found suitable specifically for LE keywords and the issues shortlisted after analysis were 26 which fetched maximum 134 credit points. This system also has few 'required' issues/checklist which meant those issues are mandatory to be complied with even without credit points. These Scores were included in Scores A for all LE keywords. Figure 6 shows the comparison between Scores A and B achieved by each LE keyword under IGBC Rating System. For instance, LE keyword, Land Use fetched 11 numbers for Score A and 56 numbers for Score B. LE keyword Conservation/Preservation fetched 10 numbers for Score A while 66 numbers for Score B. This evidently showed incompatibility between the

issues/efforts and credit points for these two LE keywords. Conversely, LE keyword Education/Awareness fetched 2 numbers for Score A with 14 numbers for Score B, as against LE keyword Land Pyramid which fetched 3 numbers for Score A for low numbers 6 for Score B. LE keyword Land Organism fetches only 1 number for Score A, which is a 'required' issue/effort and hence fetching no credit points.

After re-arranging LE keywords starting from those fetching the highest Score A (with their respective Score B) the level of significance and compatibility that each LE keyword fetched, in terms of issues/efforts and credit points were highlighted (Refer Figure 7). This also enabled to give ranking to each LE keyword as Good, Average 1, Average 2 and Bad.

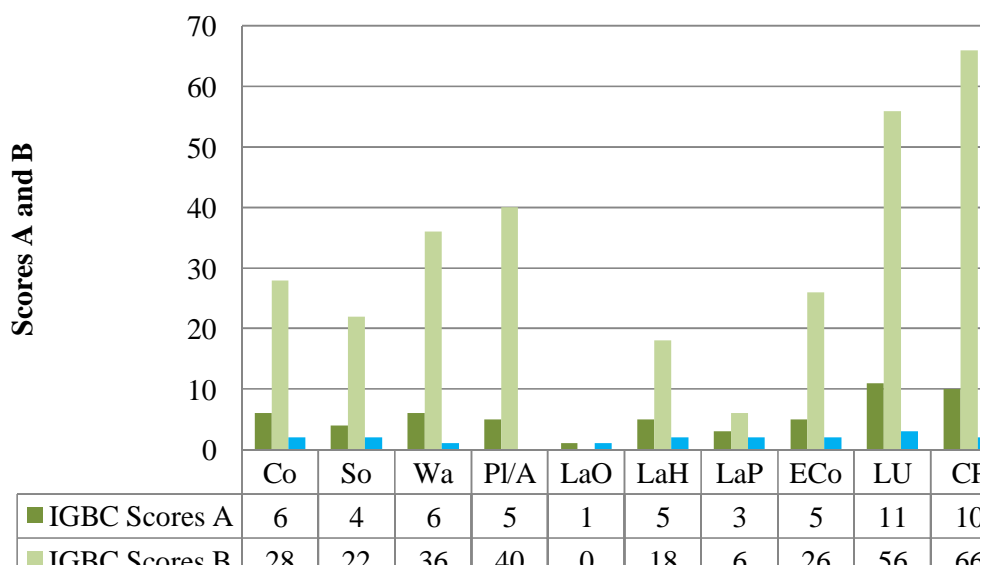


Figure 6:- IGBC Scores A and B

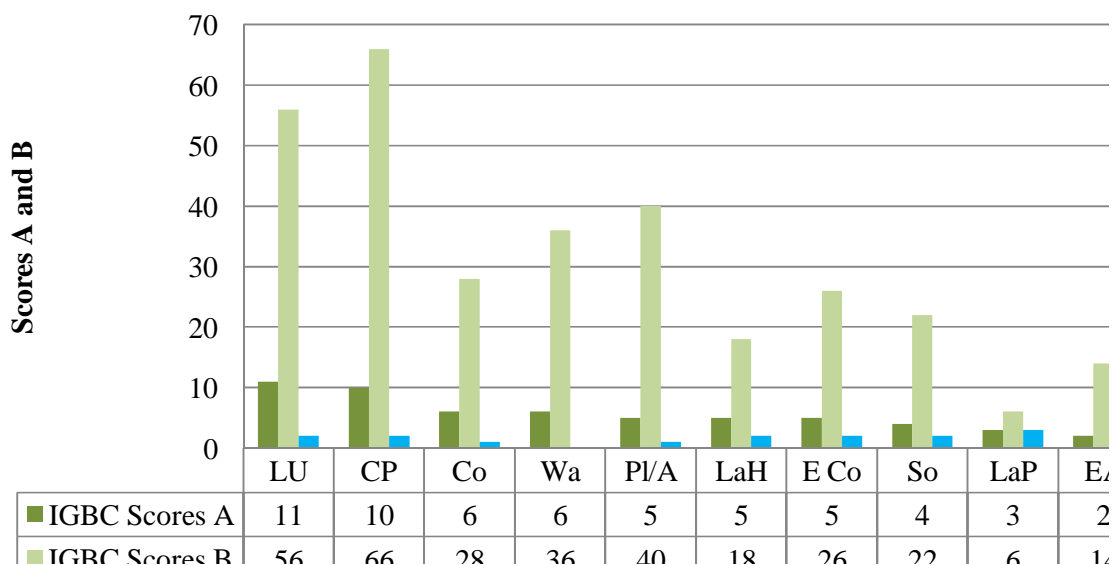


Figure 7:- Re-arranged IGBC Scores A and B

LE keywords fall into the following ranks for IGBC Rating System (Refer Table 4):-

Table 4:- LE keywords ranking under IGBC Rating System

Rank	Remarks	LE keyword - IGBC
Good	Issues and credit points are compatible (+A,+B)	Land Use, Conservation/Preservation
Average 1	Issues are more but respective credit points are less (+A, -B)	Land Health
Average 2	Issues are less but respective credit points are more (-A, +B)	Community , Water, Plants/Animals, Ecological Conscious, Soil
Bad	Issues and respective credit points both are less (-A,-B)	Land Pyramid, Education/Awareness, Land Organism

A summary table (Refer Table 5) of ranks achieved by all LE keywords for every rating system gave an overview of the level of significance that the LE keywords obtained in a particular rating system. LE keyword Conservation/Preservation gets a 'Good' rank whereas LE keyword Land Organism gets a 'Bad' rank in all the three rating systems. Three LE keywords (Ecological Conscious, Land Use and Conservation/Preservation) get 'Good' rank, five LE keywords (Community, Plants/Animals, Land Health, Ecological Conscious and Land Use) get 'Average 1' rank, eight LE keywords (Community, Soils, Waters, Plants/Animals, Land Health, Land Pyramid, Ecological Conscious and Education/Awareness) get 'Average 2' rank and four LE keywords (Community, Land Organism, Land Pyramid and Education/Awareness) get 'Bad' rank within the three rating systems.

Consequently, BREEAM Rating System gets four LE keywords (Land Use, Conservation/Preservation, Land Health and Ecological Conscious) under ranks 'Good' and 'Average 1'. Pearl gets five LE keywords

(Ecological Conscious, Conservation/Preservation, Community, Plants/Animals and Land Use) under ranks 'Good' and 'Average 1'. IGBC gets three LE keywords (Land Use, Conservation/Preservation and Land Health) under ranks 'Good' and 'Average 1'. Remaining LE keywords for all the rating systems get ranks 'Average 2' and 'Bad'. This illustrates a comparatively good inclination of Pearl Rating System (with five LE keywords under ranks 'Good' and 'Average 1') towards the LE philosophy.

Table 5:- Ranks Summary for LE keywords

SN	Rank	Good	Average 1	Average 2	Bad
	LE Keyword				
1	Community		Pearl	IGBC	BREEAM
2	Soils			BREEAM	
				Pearl	
				IGBC	
3	Water			BREEAM	
				Pearl	
				IGBC	
4	Plants/Animals		Pearl	BREEAM	
				IGBC	
5	Land Organism				BREEAM
					Pearl
					IGBC
6	Land Health		BREEAM	Pearl	
			IGBC		
7	Land Pyramid			BREEAM	IGBC
				Pearl	
8	Ecological Conscious	Pearl	BREEAM	IGBC	
9	Land Use	BREEAM	Pearl		
		IGBC			
10	Conservation / Preservation	BREEAM			
		Pearl			
		IGBC			
11	Education / Awareness			BREEAM	Pearl
					IGBC

3.3. Compatibility Process

This process evaluated the Total Scores A (issues/efforts) and Total Scores B (credit points) amongst BREEAM, Pearl and IGBC to check compatibility between Scores A and B. For the

purpose of this comparison, the total of Scores B was converted into percentage on basis of the maximum credit points (Y) mentioned in guidelines of the rating system. A summary of the Total Scores A and B are shown in Table 6 below:-

Table 6:- Total Scores A and B – BREEAM, Pearl and IGBC

SN	Rating System	Total Scores A	Total (Y)	Total Scores B	Total Scores B1
		<i>Issues/efforts</i>	<i>Credit points</i>	<i>Credit points</i>	<i>Credit points</i>
1	BREEAM	22	119	68	57
2	Pearl	47	159	102	64
3	IGBC	26	200	134	67

As the maximum achievable credit points in each rating system are unequal the credit points as per Total Scores B were converted to a base point of 100 (termed as Total Scores B1) to achieve an unbiased analysis. Thus, the equivalent credit points to the base point of 100 for BREEAM, Pearl

and IGBC are 57, 64 and 67 respectively. Figure 8 gave a comparative analysis of the selected issues/efforts and their respective credit points (to the base of 100) amongst BREEAM, Pearl and IGBC.

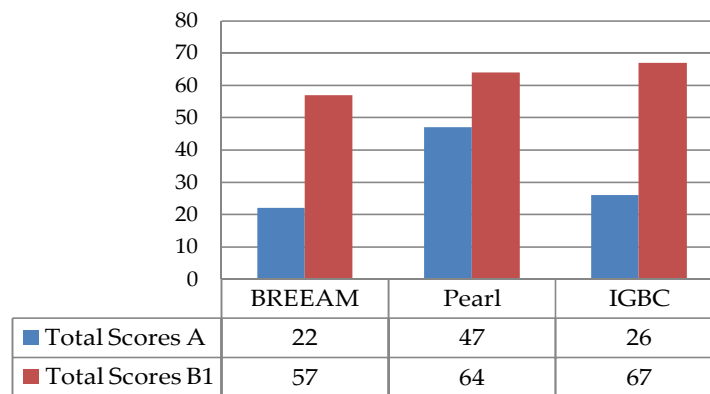


Figure 8:- BREEAM, Pearl and IGBC Issues (Efforts) versus Credit Points

Comparing the three rating systems from Figure 8 above, it was observed that:-

- i) BREEAM (nearly equivalent to IGBC) involved 22 numbers of issues/efforts and fetched 57 credit points.
- ii) Pearl demanded 47 issues/efforts, which is highest amongst the three, but granted average credit points of 64 as compared to BREEAM and IGBC.
- iii) IGBC involved 26 numbers of issues/efforts but fetched 67 credit points which is highest amongst the three.

Giving more weightage to Scores A (for issues/efforts) and compatibility between issues/efforts and respective credit points, this process illustrated Pearl Rating System to be comparatively more arduous to achieve compared to BREEAM and IGBC in context of LE philosophy. Thus, through this process, Pearl Rating System illustrated to be inclined towards the LE philosophy, thus making it holistic towards sustainability in terms of intangible or non-monetary gains.

3.4. Matrix Process

The EP Grades and EP Scores derived for each LE keyword from the matrix were used for comparative analysis. Table 7 provides a summary of EP Grades and Scores. These scores when plotted on a graph (Refer Graph 1) indicated Pearl Rating System to be above the graphs of BREEAM and IGBC. The summary table indicates that Pearl gets ‘High’ grade for most LE keywords in terms of issues/efforts and credit points, thus deriving high EP Scores. BREEAM stands in the middle of the

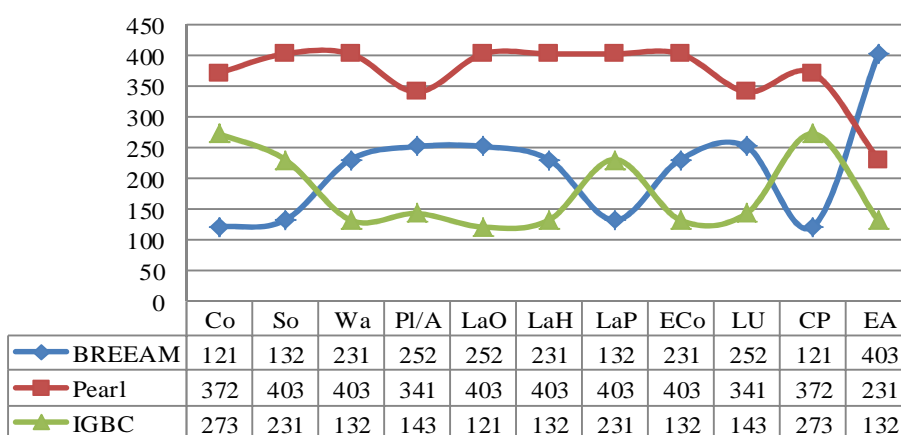
graph with drops for few LE keywords. The summary table indicates most grades for LE keywords under BREEAM as ‘Medium’ for both issues/efforts and credit points, thus giving it an average EP Scores. IGBC goes lowest in the graph except for few LE keywords. The summary table indicates ‘Low’ grade for IGBC for most LE keywords in terms of issues/efforts and credit points.

The EP Grades and Scores also indicate the credibility between the issues/efforts and the credit points. For instance, H_eH_{cp} grade (with EP Score 403) indicate equal credibility between issues/efforts and credit points, thus making it rewarding, whereas H_eL_{cp} fail to indicate equal credibility as High issues/efforts are rewarded by Low credit points making it incompatible. Nevertheless, High grade for issues/efforts fetches it comparatively a good EP Score (341). Seemingly, H_eM_{cp} Grade gets EP Score of 372 which is higher than Grade H_eL_{cp} .

This analysis indicated that Pearl Rating System being comparatively higher on the graph follows the roadmap of LE philosophy as compared to BREEAM and IGBC. This was proved primarily by the high grade/score it achieved for issue/efforts which claimed towards the benefit of LE keywords and compatibility of grade/scores between issues/efforts and credit points in context to LE keywords, thus proving it holistic towards sustainability in terms of intangible or non-monetary gains.

Table 7:- BREEAM, Pearl and IGBC – Summary of Grades and EP Scores

Sn	LE Keyword	BREEAM Grade		EP Score	Pearl Grade		EP Score	IGBC Grade		EP Score
1	Co	L _e L _{cp}	(- -)	121	H _e M _{cp}	(+ 0)	372	M _e H _{cp}	(0 +)	273
2	So	L _e M _{cp}	(- 0)	132	H _e H _{cp}	(+ +)	403	M _e L _{cp}	(0 -)	231
3	Wa	M _e L _{cp}	(0 -)	231	H _e H _{cp}	(+ +)	403	L _e M _{cp}	(- 0)	132
4	Pl/A	M _e M _{cp}	(0 0)	252	H _e L _{cp}	(+ -)	341	L _e H _{cp}	(- +)	143
5	LaO	M _e M _{cp}	(0 0)	252	H _e H _{cp}	(+ +)	403	L _e L _{cp}	(- -)	121
6	LaH	M _e L _{cp}	(0 -)	231	H _e H _{cp}	(+ +)	403	L _e M _{cp}	(- 0)	132
7	LaP	L _e M _{cp}	(- 0)	132	H _e H _{cp}	(+ +)	403	M _e L _{cp}	(0 -)	231
8	ECo	M _e L _{cp}	(0 -)	231	H _e H _{cp}	(+ +)	403	L _e M _{cp}	(- 0)	132
9	LU	M _e M _{cp}	(0 0)	252	H _e L _{cp}	(+ -)	341	L _e H _{cp}	(- +)	143
10	CP	L _e L _{cp}	(- -)	121	H _e M _{cp}	(+ 0)	372	M _e H _{cp}	(0 +)	273
11	EA	H _e H _{cp}	(+ +)	403	M _e L _{cp}	(0 -)	231	L _e M _{cp}	(- 0)	132



Graph 1:- BREEAM, Pearl and IGBC – EP Scores

Graph 1 and EP Grades and Scores achieved by the three rating systems illustrate the scope of improvement for IGBC Rating System on basis of LE philosophy. The success of employing a rating system to follow the roadmap of Land Ethic to achieve sustainability, depends on high scores for issues/efforts i.e. Scores A and compatibility between issues/efforts and credit points i.e. Scores

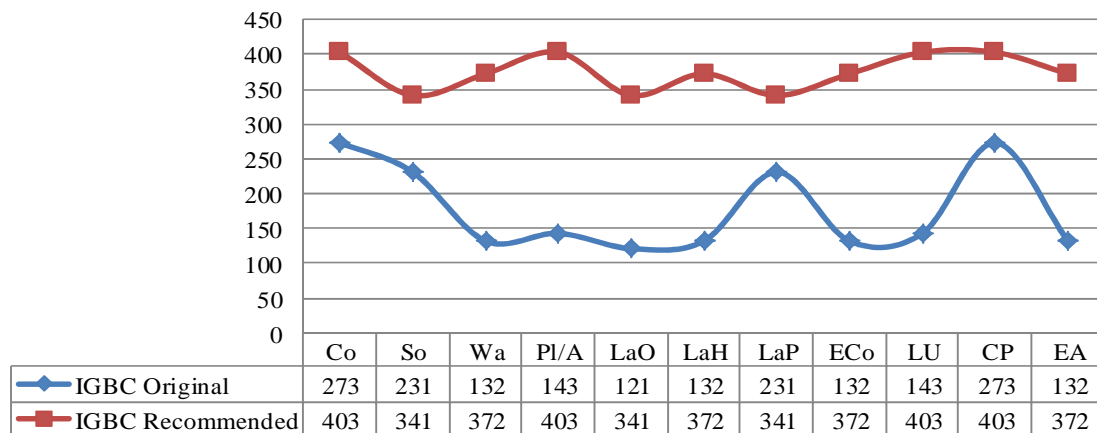
A and B. Thus the scope of improvement for IGBC Rating System in context of LE philosophy lies in raising the issues/efforts to be at par with credit points (considering the current credit points). Thus, referring to Table 7 above, after raising the issues/efforts to the highest grade i.e. (H)(+)(3), the resultant EP Grade and Scores for IGBC would be as under:-

Table 8:- IGBC Recommendations

SN	LE keyword	Grade		EP Score	New EP Grade		New EP Score
1	Co	M _e H _{cp}	(0 +)	273	H _e H _{cp}	(++)	403
2	So	M _e L _{cp}	(0 -)	231	H _e L _{cp}	(+-)	341
3	Wa	L _e M _{cp}	(- 0)	132	H _e M _{cp}	(-0)	372
4	Pl/A	L _e H _{cp}	(- +)	143	H _e H _{cp}	(--)	403
5	LaO	L _e L _{cp}	(- -)	121	H _e L _{cp}	(+-)	341
6	LaH	L _e M _{cp}	(- 0)	132	H _e M _{cp}	(+0)	372
7	LaP	M _e L _{cp}	(0 -)	231	H _e L _{cp}	(+1)	341
8	ECo	L _e M _{cp}	(- 0)	132	H _e M _{cp}	(+0)	372
9	LU	L _e H _{cp}	(- +)	143	H _e H _{cp}	(++)	403
10	CP	M _e H _{cp}	(0 +)	273	H _e H _{cp}	(++)	403
11	EA	L _e M _{cp}	(- 0)	132	H _e M _{cp}	(+0)	372

EP Scores achieved in Table 8 is plotted on a graph (Refer Graph 2) to understand the difference. Thus, this indicates that it is vital to consider the

numbers of issues/efforts that are rendered for a rating system to be successful and worthwhile, followed by compatibility of credit points.



Graph 2:- IGBC EP Scores – Original and Recommended

4.0 Conclusions:

The analysis has shown that the amount of issues/efforts dedicated considering the LE philosophy for the sustenance and betterment of LE keywords and respective credit points plays a vital role in following the roadmap of LE philosophy. It is ideal to expect a reasonable score of credit points towards the issues/efforts that are rendered. Any kind of imbalance is discouraging for implementation. Consequently it is advisable to create a rating system which engages as much issues/efforts as possible towards sustenance and betterment of LE keywords and which fetches compatible credit points. This compatibility shall eliminate the difference between those efforts giving tangible/monetary gains and those which do not, thus proving the system to be successful holistically towards sustainability following the roadmap of LE philosophy. In addition to making issues/efforts and respective credit points compatible, the rating systems guideline can also be formulated in a manner which portrays its outcome in terms of LE keywords, thus giving them emphasis and making them a focal point. Few instances are cited as under:-

- 1) Formulate a method to compute 'Biodiversity Index' (The University of Northampton) for a real-estate development project for LE keywords such as Land Organism, Land Health, and Plants/Animals.
- 2) Develop a checklist of Ecosystem Services in context to real-estate development projects and encourage strategies for enhancement of the same for LE keywords such as Ecological Conscious and Conservation/Preservation.

- 3) Develop and incorporate the use of tools such as i-Tree Tools (USDA Forest Service, 2006) which are instrumental in many aspects such as quantifying ecosystem services, pollution mitigation, storm water run-off reduction, carbon sequestration and storage and much more for LE keywords such as Plants/Animals and Waters.
- 4) Encourage the use of Biomimicry Concepts in the design of Green Buildings (usgbc.org) exceptional performance in the rating system for LE keywords such as Land Organism and Land Health.
- 5) Insist for mitigation measures enabling water cycle enhancement for Land Pyramid, Soils and Water.
- 6) Adapt methods such as 'Circles of Sustainability' (Global Compact Cities Program, 2012) which uses four main-domain models for assessing sustainability namely economics, ecology, politics and culture for keywords such as Community, Land Use and Education/Awareness.
- 7) Incorporate targets set in the National Missions (National Action Plan on Climate Change, 2008) such as National Mission on Sustainable Habitat, National Water Mission, and National Mission for 'a Green India' as applicable to real-estate development projects in a way that proves useful to achieve the targets set in the missions in whatever ways possible for LE keywords such as Community, Land Health, Ecological Conscious, Waters and Plants/Animals.
- 8) Proposing Campaigns / slogans for promoting green education and awareness for and in context to the project for LE keywords such as Community and Education/Awareness

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