Selection of Sustainable Composite Partition Material for Sri Lankan context

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Abstarct

Building materials are deemed to play a vital role in increasing buildings sustainability while contributing to the economic prosperity. Usage of large quantity of non-renewable resources in the building materials has a major impact on the environment, depriving future generations of its usage. These building materials are used to construct diferent types of building element. Thus, it is believed that the appropriate selection of building materials for different purposes is one of several factors that contribute to sustainability within the built environment. However, traditionally the selection of such materials depends on consensus-based understanding of environmental issues in designing and construction of facilities. On this note, this study investigates the most suitable composite material that can be used for partition wall construction in Sri Lanka with respect to sustainable parameters. The research is quantitative in nature where a preliminary market survey and a subsequent questionnaire survey were conducted to identify the available materials used in partition wall and evaluate the materials' performance, in terms of embodied energy, toxicity, locally produced material, price, maintainability, aesthetics, resistance and durability respectively. The questionnaire survey was administered to 35 professionals (Architects, Engineers, Quantity Surveyors and Facility Managers) practicing in the construction industry. In order to compare the materials pair wise, an Analytic Hierarchy Process (AHP) based on was employed.

Research findings show that Medium Density Fibre (MDF) board, Gypsum Board (GB) and paddy straw composite board (DURA) are alternatives of composite partitioning materials. In terms of embodied energy (EE), Cost (C), toxity (T), natural and local available materials (N&L) and maintainability (M) with recieving a relative weight (RW) of 0.471, 0.487, 0.420, 0.398, 0.339 Dura board is preferred over the other materials. However, in terms of aesthetic (A) and resistance (R) criterions with obtaining a RW of 0.414, 0.421 GPD board serves better than other materials. MDF board is at the top in terms of durability with a RW of 0.351. When the overall performance is focused, DURA offers the best value while MDF and GPD board occupy the next places respectively. This study, therefore identifies the most suitable composite alternatives to assist professionals in the selection of most suitable materials for partition walls in Sri Lanka.

Keywords: *Partitioning, composite materials, sustainability, construction, Sri Lanka.*

1.0 Introduction

Within the past couple of decades, the world has changed with an ever-increasing recognition that the mankind can no longer continue to use natural resources without facing the environmental consequences (Kibert, 2005). This has led to the enhanced concern of the protection of environment in which construction activities take place where sustainable construction has been hailed as a way forward to eradicate the adverse impact on the environment (Asad & Khalfan, 2007). Mora (2007) states that in the perspective of construction, buildings have a profound impact on the environment and even a small change in their sustainability can create a major reduction in the current ecological footprint of the whole society.

Further, Haggag and Elmasry (2011) highlighted that the materials used in building constructions are one of the key areas of architecture to achieve sustainability in the built environment. These materials used for constructing building elements and obtained from the local resources with the help of renewable materials like recycled materials, coral stone, agro waste, etc. If these materials used locally then it may add value to the development of the economy and lead to sustainability while enabling the citizens to have economically benefited. The growing interest in sustainable buildings and the great demand for its profitability in the long run such as improved quality, enhanced durability, enhanced occupational health and safety, material conservation, less construction site waste and less environmental emissions (Chen, Okudan and Riley, 2010) etc has led the researcher to identify alternative sustainable building materials to build building elements.

However, non-structural elements such as partition walls of a buildings are not a part of the main load-resisting system. Therefore, these are often neglected from the structural design point of view and given less important on sustainable parameters (Manike and Sooriyaarachchi, 2008). Further to overcome such this paper begins with a literature review where it identifies the composite materials and sustainable selection criteria. Then, the paper summarizes the findings using AHP tool and identifies the most suitable composite material for partitioning.

2.0 Literature Review

The building material industry consumes more of the earth's natural resources than any human activity. It consumes 40% of raw materials and energy produced on the planet and creates tens of millions of tonnes of greenhouse gasses, air and water pollution and other waste (Erp and Rogers, 2008). Further, Sri Lanka has committed itself to the control of substances that deplete the ozone layer according to the Montreal Protocol (1985) and the emissions of green house gases according to the Kyoto Protocol (1997). In this context, assessment of environmental burdens associated with different construction materials used for buildings is necessary in order for decision makers to select environmentally benign materials (Abeysundara, Babel, and Gheewala, 2009).

In building construction building elements can be categorized as structural and non-structural (Murty, Goswami, Vijayanarayanan, Kumar, & Mehta, 2013). Structural elements bear the dead and live loads while non structural elements do not bear the main loads though they are attached to the building (Murty et al., 2013). Munir (2012) mentions that the columns, beams, foundations and slabs are fallen under the structural elements while cladding, ceiling and partition walls are under the non-structural elements. Therefore this study focuses on the partition wall which includes in non-structural element.

2.1 Composite materials used for partitioning

Sanjay and Mazumdar (2002) define composite as "a macroscopic combination of two or more distinct material having a recognizable interface between them" a(refer figure 1). The composite material has more useful applications when compare to that of constituent materials because composite material consists of two or more basic materials combined in one resulting material (Kanakaji, 2009). The features of such are modulus, bending stiffness, chemical resistance and high specific strength etc. Due to these availabe advantages this study focus on composite material rather than the constituent material.

Moreover in the arrangement of boards there are a number of different sub-products such as plywood, gypsum board, paddy straw composite board, cement bound composite board and medium-density fibreboard (MDF) (Binggeli, 2008). Although these products are considered as a type of composite board, the sustainability of each differs from one to another on how they are made, where and what they are used for, and how much they cost etc (Binggeli, 2008).

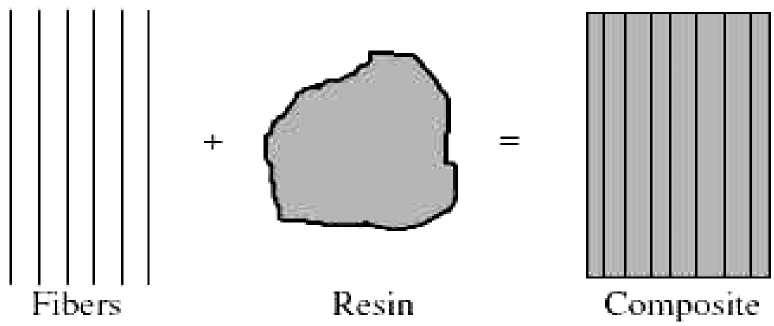

Figure 1: Formation of a composite material using fibres and resin

a. Ply wood

Plywood is manufactured from thin wood veneers, glued together into boards, generally using formaldehyde or occasionally, isocyanine resins. The veneers are produced by soaking logs to soften the fibres, then peeling the veneer off using a rotary cutter or by slicing (Joffe et al., 2003). The plywood 'core' may consist of particle board, hardboard or other materials, rather than a veneer (Oslen, 2001). Installation works of plywood partitions are more complicated and time-consuming. The procedures include cutting the wooden studs and plywood boards into specific sizes, fixing the studs and tracks, as well as applying lime and other top finishes. These lead to both higher labour cost and time cost.

Besides, using wood as the major partitioning material is not desirable in view of environmental protection and fire hazard (Chow and Leung, 2011).

b. Medium Density Fibre (MDF) Board

A renewable resource that has been primarily made from wood is known as MDF. MDF is an engineered wood product made by breaking hardwood or softwood residuals into wood fibres, often in a defibrator, combining it with wax and a resin binder, and forming panels by applying high temperature and pressure (McKeever, 2012). MDF is generally denser than plywood. It is made up of separated fibres, but can be used as a building material similar in application to plywood (Rivela, 2007). It is stronger and much denser.

c. Cement-bonded board

Cement-bonded board is an engineered particle composite product prepared from wood or other lingo cellulosic raw materials bonded with inorganic binders such as cement, chemical additives and water and pressed under regulated pressure. Usually, cement-bonded wood are produced from strands, particles or fibres wood mixed collected with cement and manufactured into panels, bricks, tiles and other products used in the construction industry (Joffe, Andersons & Wallstroma, 2003). This material would reduce or completely eliminate wastages, reduce labour to be engaged and reduce cost as well as the time for construction. According to Adedeji (2011) this material offers several advantages such as design flexibility, light-weight and environment friendliness.

d. Gypsum Particle Board (GPB)

GPB consists mainly of natural gypsum with residual or recycled wood particles. In the manufacturing process for GPB, gypsum is added to water citric acid, pressed into stable and odorless panels, dried, and cut to the customary sizes (Lee et al., 2011). This has superior properties, such as a lack of formaldehyde emission, fire-resistance and sound insulation compared to wood-based panels (Feng et al., 2007) such as particle board (PB), medium density fiber board (MDF), plywood, hardboards and wood flooring (Akgül and Çamlibel, 2008). Moreover, the wood particles are not dried, and GPB is pressed under cold conditions, which reduces the thermal energy consumption.

e. Paddy Straw Composite (DURA) board

Dura board is a solid building panel manufactured from densely compressed straw using high pressure and heat in the manufacturing process (Dura building systems (Pvt) Ltd., 2013). Jayakody, Kondadeniya, and Jayasinghe (2010) states that straw obtained from paddy cultivation can be a good candidate for manufacturing of straw bonded solid panels in Sri Lanka. Straw bonded solid panels are manufactured by Dura building systems, a subsidiary of the International Construction Consortium, is known as "Dura" panels. They are manufactured to a width of 1.2 m. The length can be 2.4 m, 2.7 m, 3.0 m or 3.3 m. The thickness of the panel is 58 mm. The general applications have been internal partitions and semi – permanent detachable buildings such as site offices, store rooms, etc. Due to densely packed straw, the fire resistance of Dura is high (Jayakody, 2010).

2.2 Selection of Sustainable Materials

Careful selection of sustainable building materials has been identified as the easiest way for designers to begin incorporating sustainable principles in building projects (Godfaurd, Croome and Jeronimidis, 2005). According to Nassar et al. (2003) the sustainability of a building project lies in the selection of building materials. Further, it is emphasised that the life cycle of a building design depends on the choice of appropriate material (Treloar, et al (2001). However, in designing the designer has an objective to make it as cheap as possible, or as light, or as safe or some combination of these (Sirisalee, et al., 2004). Therefore, the selection of building materials is regarded as a multi-criteria decision problem (Akadiri, Olomolaiye and Chinyio, 2013).

On this note, Abeysundara, et al. (2006) has highlighted that a greater environmental burden is placed on concerned parties towards sustainable development by the means of proper selection of building materials. Abeysundara et al. (2006) states that the environmental, economic and social impacts need to be considered for proper selection of material. Chen (2010) further provides seven dimensions for selection of building material under three catagories namely, economic, social, and environmental factor. The following sections explain the parameters considered under each of these factors briefly.

1. Economic Factor

a. Cost

The construction clients are very much concern about the buildings' long-term cost effective performance (Bartlett and Howard, 2000). These include the total cost of an item through its life time, including initial cost, maintenance costs, energy costs, cleaning costs, overhead management cost, utilization costs, less any residual value at the end (Emmanuel, 2002). Thus it is said that the Life Cycle Cost (LCC) of the building materials needs to be considered rather than focusing only on the initial cost (Emmanuel, 2002).

b. Durability

Increasing the durability of the materials could enhance the sustainability of a building (Malhotra, 2002). On the same opinion, Treloar (2001) states that, greater the durability of the material is lower the need of time and resources. These resources include such as 38.9% of primary energy use, 38% of all carbon dioxide emissions, and 30% of waste output which is used for building construction in US (U.S. Green Building Council, 2009). Hence, the materials with high durability requires less replacement and produces less amount of landfill waste over the building's lifetime.

c. Resistance
According to Bartlett and Howard (2000), a building's life-cycle cost could be analysed depending on the resistance of materials. Therefore, when it comes to the resistance issues, long lasting materials have to be selected though sometimes it may be turned down as expensive.

d. Maintainability

According to Malhotra (2002), maintenance of a building consumes an important portion of the operational budget. The maintenance expenses include cleaning/polishing materials, equipment, labour costing, and replacements. Zhou, Ang, and Zhou (2010) suggest that the frequent cleaning of the materials may damage the outlook or the exposure of the building occupants as the chemical used for cleaning may damage the material shining or may omit the surfaces. This is mainly because of systems that have to be cleaned only with petroleum-related solvents.

2. Environmental Factor

a. Embodied Energy

"Embodied energy is the amount of energy consumed in manufacturing a unit quantity of a material, and it is usually expressed in KJ/Kg (Sturges, 2000). The embodied energy of building materials will vary from one country to another, depending on the sources of energy used for manufacturing (Emmanuel, 2002). In Sri Lanka there is a wide range of energy sources used in the manufacture of building materials such includes electricity for cement production, fossil fuel for brick production etc. However, aluminium contain a high value of embodied energy while aggregate has a very less value therefore, embodied energy value need to take into account when selecting a material.

b. Use of natural and local materials

Godfaurd et al. (2005) suggest that natural materials are surely lower in toxicity and embodied energy than man-made materials. This kind of natural materials are certainly does not damage the environment or less damage. Jospeh and Tretsiakova (2010) further, highlighted that the use of natural building materials will definitely help in the reduction of pollution (air, noise, and smoke), travel distances for transport of materials and lower the burdens of environmental aspects etc.

3. Social Factor

a. Aesthetics

Aesthetics of the building is an important thing to bear in mind because it is an asset which creates an image for a company (Bingelli, 2008). Every company would like to promote its construction through the architectural design with a corporate image Therefore, emphasizing the need of aesthetical requirement in the building is said to be one of the few important aspects of sustainability.

b. Use of non-Toxic or less-Toxic materials

The building industry is concerned about the health and community such as workers' health and safety, health of occupants, labour availability, traffic congestion, and community disturbance. Thus, it is important that less hazardous measure with minimal negative impact should be considered always with the use of no or less-toxic materials because it may cause danger to the workers, potential occupants, and surroundings.

The Table 1 represents the composite materials identified for partitioning and its sustainable selection criteria.

Table 1: Composite material and sustainable selection criteria

Composite materials	Sustainable selection criteria
Ply wood Medium Density Fibre (MDF) Cement-bonded board Gypsum Particle Board (GPB) Paddy Straw Composite (DURA) board	Economic Factor • Cost • Durability • Resistance • Maintainability Environmental Factor • Embodied Energy • Use of natural and local materials Social Factor • Aesthetics • Use of non-Toxic or less-Toxic materials

3.0 Methodology

A comprehensive literature review was carried out initially identifying the composite materials used for partitioning and the criteria to be considered in selection of sustainable materials. As shown in table 1, 5 composite materials and 8 sustainable parameters were identified under 3 criteria namely economic, environmental and social factors. In order to find out materials used in the Sri Lankan context a market survey was conducted.

Further, a questionnaire survey was administered to 35 building professionals which include architects, engineers, quantity surveyors and facility managers to evaluate the performance of the three building materials identified through market survey. 30 participants out of 35 have responded to the survey. The table 2 provides the details of participants' profession and experience.

Table 2: Profile of the research participants

Profession	**No.**	**%**	**Experience**	**No.**	**%**
Architects	14	47	0-5 years	8	27
Engineers	4	13	5-10 years	7	23
Facility Managers	6	20	10-15 years	4	13
Quantity Surveyors	6	20	15-20 years	7	23
Total	**30**	**100**	20+ years	4	13
			Total	**30**	**100**

Pair wise comparison technique was used in assessment of selected sustainable criteria. It enables participants to compare and judge each variable with other. This pair wise comparison technique is based on the Analytic Hierarchy Process (AHP) which is a popular method in solving Multi criteria Analysis (MA) problems (Saaty, 1995; Deng, 1999). AHP therefore consists of mainly five steps Step 1 involves development of hierarchy for all levels while step 2, deploys a pair wise comparison. The step 3 employs normalisation and this is followed by undertaking the consistency test as step 4. Finally the step 5 involves estimating relative weights. In addition to determining the relative weights, the AHP provides a measure of consistency called consistency index which provides the pertinent information in terms of how consistent the pair wise comparisons are (Mendoza and Prabhu, 1999).

4.0 Data analysis and findings

As explained above the first step of AHP involves developing a hierarchy structure for the assessment problem. In order to carry out this, the problem needs to be identified which is "selection of suitable composite material for partitioning" to structure the hierarchy. Therefore to solve the problem a 3 level hierarchy is determined as observed from Figure 1. The first level is the overall goal (problem) of "selection of suitable composite material for partitioning". The second level consists of 8 criteria: cost (C), durability (D), resistance (R), maintainability (M), embodied energy (EE), Use of natural and local materials (N&L), aesthetics (A), and use of non-Toxic or less-Toxic materials (T) which contribute to attain the goal. Finally, the third level is the decision alternatives of different composite materials such as MDF, GPB and Dura Board that the participants want to compare.

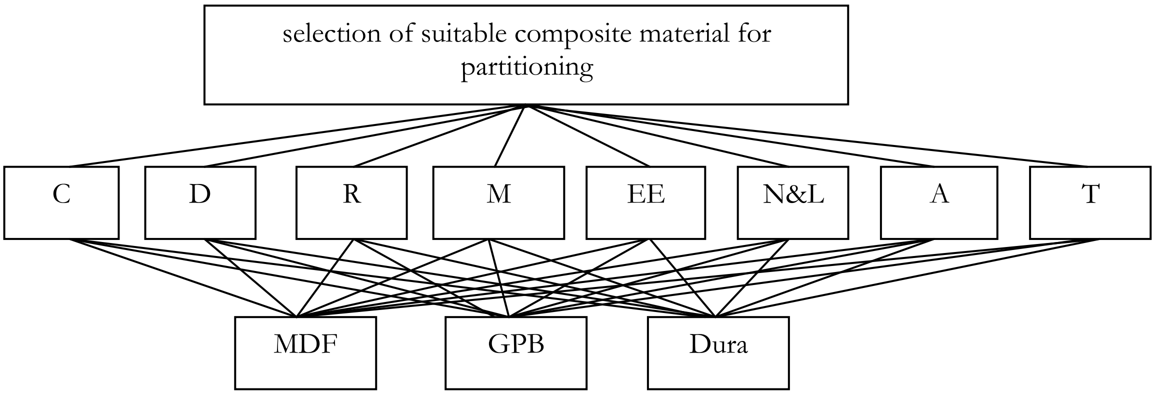

Figure 4: Decomposition of the problem into hierarchy

The second step employs pair wise comparisons among decision elements and form comparison matrices. AHP pair wise comparison procedure represents the relative importance to the decision maker (Ofori, *et al.* 2002). This comparison will enhance a numerical representation in respect to the relative importance between two sustainable criterion in level 2. The numerical quantifications of relative importance were done by using 1 to 9 scales as presented in Table 3. The question to ask when comparing two criteria are as following kind, of the two criteria being compared which is considered more important in selection of sustainable material for partitioning example, if the toxity (T) criteria is judged to be strong importance than cost (C) in supporting sustainability then a score of 5 is given.

Table 3: Nine point intensity of importance scale and its description (Adapted from Saaty, 2008)

Intensity of Importance	Definition	Explanation
1	Equal importance	Two activates contribute equality to the objective
3	Moderate importance	Experience and judgement slightly favour one activity over another
5	Strong importance	Experience and judgement strongly favour one activity over another
7	Very strong and demonstrated importance	An activity is favoured very strongly over another, its dominance demonstrated in practise
9	Extreme importance	The evidence favouring one activity over another is of the highest possible order of affirmation.

The pair wise comparisons of the criteria given by the respondents in selection of sustainable material is given in table 4. This compares each element in the corresponding level and calibrate them on the numerical scale. This requires n (n - 1)/2 comparisons, where "n" is the number of elements with the considerations that diagonal elements are equal or 1 and the other elements will simply be the reciprocals of the earlier comparisons (Vaidya and Kumara, 2006). These results were further taken ahead to satisfy the fourth step of the AHP analysis which is to normalise the pair wise comparison matrixes. The normalization can be done by dividing each entry by the sum of the entries in its column (Ehrhardt and Tullar, 2008) and then get the sum of each row. Subsequently, dividing each sum by the total of all the sums (Darin, 2008) to derive the Performance Score or Relative Weight (RW) enables to compare each sustainable criteria in the matrix. The table 4 represents the normalized values for sustainable criteria.

Table 4: Normalized comparison for sustainable criteria

Criteria	**EE**	**C**	**T**	**N&L**	**A**	**Re**	**D**	**M**	**SUM**	**RW**
EE	0.181	0.402	0.308	0.201	0.171	0.091	0.096	0.073	1.524	0.190
C	0.046	0.102	0.326	0.128	0.128	0.074	0.079	0.095	0.979	0.122
T	0.093	0.049	0.158	0.393	0.248	0.369	0.314	0.240	1.864	0.233
N&L	0.088	0.078	0.039	0.098	0.163	0.197	0.193	0.132	0.990	0.124
A	0.063	0.047	0.038	0.036	0.059	0.063	0.049	0.121	0.476	0.059
R	0.191	0.133	0.041	0.048	0.090	0.096	0.130	0.150	0.879	0.110
D	0.165	0.113	0.044	0.044	0.107	0.065	0.088	0.119	0.744	0.093
M	0.172	0.075	0.046	0.052	0.034	0.045	0.051	0.070	0.545	0.068
			Sum of relative weights							**1.000**

According to Ehrhardt and Tullar (2008), a perspective with a higher RW is preferred over one with a lower RW. Thus, toxity received the highest performance score of 0.233 among the eight sustainable criterions (refer table 5). Obtaining the final relative weights (RW) the sustainable criterions can be ranked as shown on Table 5.

Table 5: Ranking of sustainable criterions

Criteria	Relative Weights (RW)	Rank
Toxicity (T)	0.233	1
Embodied Energy (EE)	0.191	2
Natural or locally produced material (N&L)	0.124	3
Cost (C)	0.122	4
Resistance (R)	0.110	5
Durability (D)	0.093	6
Maintainability (M)	0.068	7
Aesthetics (A)	0.060	8

Similarly pair wise comparison was carried out among all composite materials with respect to all sustainable criterions which is presented in table 6 to 13.

Table 6: Comparison of materials respect to Embodied Energy

EE 0.191	**MDF**	**GPD**	**DURA**	**RW**
MDF	0.281	0.221	0.231	0.244
GPD	0.298	0.312	0.243	0.284
DURA	0.504	0.484	0.426	0.471

Table 7: Comparison of materials respect to Aesthetic

A 0.06	**MDF**	**GPD**	**DURA**	**RW**
MDF	0.233	0.254	0.263	0.250
GPD	0.433	0.399	0.411	0.414
DURA	0.350	0.346	0.311	0.336

Table 8: Comparison of materials respect to Cost

C 0.122	**MDF**	**GPD**	**DURA**	**RW**
MDF	0.279	0.255	0.222	0.252
GPD	0.243	0.295	0.244	0.261
DURA	0.467	0.482	0.513	0.487

Table 9: Comparison of materials respect to Resistance

R 0.11	**MDF**	**GPD**	**DURA**	**RW**
MDF	0.273	0.248	0.247	0.256
GPD	0.411	0.431	0.420	0.421
DURA	0.304	0.314	0.352	0.323

Table 10: Comparison of materials respect to Toxily

T 0.233	MDF	GPD	DURA	RW
MDF	0.313	0.355	0.315	0.328
GPD	0.217	0.256	0.285	0.253
DURA	0.426	0.410	0.423	0.420

Table 11: Comparison of materials respect to Maintainability

M 0.068	MDF	GPD	DURA	RW
MDF	0.319	0.325	0.341	0.328
GPD	0.341	0.304	0.352	0.332
DURA	0.330	0.346	0.342	0.339

Table 12: Comparison of materials respect to Natural & Local material

N&L 0.124	MDF	GPD	DURA	RW
MDF	0.379	0.355	0.385	0.373
GPD	0.241	0.227	0.218	0.229
DURA	0.402	0.399	0.394	0.398

Table 13: Comparison of materials respect to Durability

D 0.093	MDF	GPD	DURA	RW
MDF	0.353	0.325	0.375	0.351
GPD	0.321	0.355	0.311	0.329
DURA	0.333	0.315	0.312	0.320

Table 6 to 13 depicts the values obtained for each alternative materials for partitioning with respect to each sustainable materials. The best materials with respective to each criterions varied example; Dura is best comparatively with respect to embodied energy (EE), Cost (C), toxity (T), natural and local available materials (N&L) and maintainability (M) with receiving a relative weight (RW) of 0.471, 0.487, 0.420, 0.398 and 0.339. GPD is comparatively best compared with the aesthetic (A) and resistance (R) criterions with receiving a RW of 0.414 and 0.421. Moreover, MDF is considered to be best with regard to durability (D) by achieving a RW of 0.351.

However to compute the contribution of each alternative to the overall goal "selection of sustainable composite material for partitioning" the overall weight is obtained by summing up all weights. Obtained final weights and ranking of alternatives to overcome the problem is shown in table 14.

Table 14:

	EE 0.191	C .122	T 0.233	N&L 0.124	A 0.06	R 0.11	M 0.068	D 0.093	Overall weight	Rank
MDF	0.244	0.252	0.25	0.256	0.328	0.373	0.351	0.328	0.282424	3
GPD	0.284	0.261	0.414	0.421	0.253	0.229	0.329	0.332	0.32837	2
DURA	0.471	0.487	0.336	0.323	0.42	0.398	0.32	0.339	0.389982	1

The computation of overall weight for alternative material for MDF is as follows;

Overall weight MDF = (0.244x0.191) + (0.252x0.122) + (0.25x0.233) + (0.256x0.124) + (0.328x0.06) + (0.373x0.11) + (0.351x0.068) + (0.328x0.0093) = 0.282424

Similarly, 0.5292 and 0.6136 are for GPD and Dura respectively.

This was followed by a consistency measure as the fifth step to control the results of AHP. This is expressed through the following equation 1, where the measure of inconsistency is called consistency index (CI). The consistency ratio (CR) which is used to estimate directly the consistency of pair wise comparisons. The CR is computed by dividing the CI by a value obtained from a table of Random consistency Index (RI) which is shown in equation 2.

$$CI = \frac{(\lambda max - n)}{(n-1)} \qquad 1$$

(Adapted from; Saaty, 1980)

Where, "λmax" is the maximum eigenvalue and "n" is the number of factors in the judgment matrix.

$$CR = \frac{CI}{RI} \qquad 2$$

(Adapted from; Saaty, 1980)

In this study with respect to the pair-wise comparison of 8 sustainable criteria λmax=8.651, CI=0.093 were derived. This is accompanied to calculate the consistency ratio (CR), which is used to estimate the consistency of pair wise comparison which resulted in CR of 0.066. According to Saaty (1980) if the CR is less than 0.10 the comparison is accepted. However the CR value for this is 0.066 < 0.1 which means all the respondents results are consistent.

5. Conclusion

This study was based upon a model introduced by (Saaty, 1980) which determined the relative weights for different partition material alternatives. This examines the 8 sustainable criteria namely toxicity (T), cost (C), aesthetics (A), durability (D), embodied energy (EE), locally produced material (N&L), resistance (R) and maintainability (M) and its benefits in selection of suitable composite material. The AHP methodology could help assess relevant criteria critically and logically while assisting to make sensible decisions.

However, This study was carried out based on the perceptions of professionals involved in the construction industry among architects, engineers, quantity surveyors and facility managers through pair wise comparison. The findings shows that Dura is the best in terms of embodied energy (EE), Cost (C), toxity (T), natural and local available materials (N&L) and maintainability (M) with receiving a relative weight (RW) of 0.471, 0.487, 0.420, 0.398 and 0.339. GPD is comparatively best compared with the aesthetic (A) and resistance (R) criterions with RW of 0.414 and 0.421. Moreover, MDF is considered to be best with regard to durability (D) by achieving a RW of 0.351. However, by combining the overall weights it is observed that the order of preference is; Dura, GPD and MDF. At the end it is concluded that Dura alternative is the solution for the problem achieve performance excellence in selection of suitable composite material for partitioning.

Finally, the aim of this study was accomplished by identifying the most sustainable composite partitioning material for Sri Lankan context. Moreover the suggested findings with regard to partitioning is in essence of strategic outline which would help as being a tracking tool that can be used by the construction practitioners.

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