EMBRACING ADAPTIVE RE-USE OF BUILDINGS: THE CASE OF SRI LANKA

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ABSTRACT

Because of land scarcity, the ever-increasing demand for new constructions has caused a grave crisis in the construction industry. This has led to the inevitable demolition of the existing building stock. In many cities, there are malfunctioning or abandoned ancient buildings situated mostly in commercially significant locations. These buildings which narrate the evolution of their cities have become important, either for historical reasons or because of their cultural heritage. For any country, its existing building stock will be of significant economic, physical and socio-cultural value. Adaptive Re-use of Buildings (ARB) is the best option available to make optimum use of the existing stock. Developing countries still have not appropriately embraced this concept as in developed countries. Thus, the objectives of this research were to identify the key parameters, benefits, barriers and challenges related to ARB in Sri Lanka. A qualitative research approach was adopted to achieve this aim by conducting expert interviews on five case studies and semi-structured interviews involving 15 local expert professionals already practicing ARB to validate the expert interview findings. Content analysis was used to analyze the findings. Physical, social and economic considerations, building codes, regulations, lack of awareness on adaptive re-use opportunities and the scarcity of material and skilled tradesmen were identified to be the most frequently encountered barriers among which were further categorized under five major groups.

Keywords: *Adaptiveness; Adaptive Re-use of Buildings (ARB); Barriers and Challenges; Existing Building Stock; Socio-Cultural and Environmental Benefits.*

1. INTRODUCTION

The increasing demand for new constructions along with the scarcity of land has led to the demolition of existing buildings (Hakkinen, 2007; Petersdorff *et al*., 2004). The authors emphasise that demolition is actually required for only 0.5-1.0 % of the existing building stock as the rest have 30-50 more years left of their life spans. Reuse of these buildings would fulfill current building needs. According to Langston (2008), older buildings which have made a significant contribution to the historical and cultural aspects of their countries are probably situated in areas of high commercial value and the Adaptive Re-Use of Buildings (ARB) can play a pivotal role in the regeneration of the built environment by preserving the prestige of historic buildings.

According to Latham (2000), adaptive re-use is a process that upgrades and enhances the performance of buildings to meet modern standards and changing user requirements while the original building is retained as much as possible. Johnson (1996) emphasizes that even when buildings have been designed to last long, they can become unfit for the originally designed purpose due to obsolescence and redundancy due to change in the demand for their services or lack of continuous maintenance. This building redundancy has a large impact on the existing building stock. In developed countries, strategies such as, “adaptive re-use” (Kincaid, 2000) which have shown positive trends have been adopted to mitigate such impacts. The situation in developing countries in this regard has so far not been analyzed. The decision to demolish historical buildings is taken considering their low economic values while ignoring their socio-cultural and historical importance (Smith, 2005; Wood and Muncaster, 2012). The cost effectiveness, rising energy costs and the high cost of new constructions make clients to opt for adoptive re-use of the existing building stock (Douglas, 2006; Kohler and Yang, 2007).

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Unlike developing countries, developed countries focus on identifying effective methods and opportunities of designing new buildings to cater to ARB and the sustenance of the existing stock to cater to the future market (Sheffer and Levitt, 2010). Developing countries too need to explore such avenues to ensure sustainable investment on the existing building stock, which at present is mostly under-used or abandoned. Such trends can yield numerous socio-cultural and environmental benefits to the respective communities. O'Donnell (2004) argues that an adapted building cannot compete with a new building as far as its performance is concerned, and that this gap needs to be balanced against social gains. This provides an opportunity to re-life an existing building and optimises its whole lifecycle cost. In the developing countries, such opportunities have not yet been identified.

ARB is common in developed countries where there is restoration of historically important buildings preserving their historical value towards using them for greater causes. On the contrary, in the developing countries, ARB has not yet become popular in the absence of proper research done on it. Hence, this research became necessary to identify the barriers and challenges related to the embracing of ARB in developing countries with Sri Lanka as an example. The parameters influencing the adoption of ARB, its benefits, barriers and challenges of its implementation identified in the literature for developed countries cannot be directly applied to Sri Lanka because of the socio-cultural, environmental, legal, geological and economic disparities. Although the building stock in Sri Lanka is comparatively small, it has evolved very much with time. Hence, the systematic identification of the barriers and challenges related to the embracing of ARB in Sri Lanka becomes a critical need to make the construction industry practice ARB knowledgeably preserving the evolution of the existing building stock.

The aim of this research was to analyze the barriers and challenges related to the embracing of Adaptive Re-use of Buildings in Sri Lanka. The objectives were identified as (a) To identify the key parameters influencing adaptiveness of the existing building stock in Sri Lanka, (b) To identify the benefits of ARB in Sri Lanka and (c) To validate the identified barriers and challenges of ARB in the context of Sri Lanka.

2. LITERATURE FINDINGS

2.1. CONCEPT OF RE-USE AND EMBODIED ENERGY IN THE EXISTING BUILDING STOCK

A key decision the owners of an old building have to make is whether to reuse it or demolish it. In the construction industry today, the demolition of existing buildings is considered as a waste of energy and material (Department of the Environment and Heritage [DEH], 2004). Due to land scarcity, the demolition of buildings ignoring its environmental consequences had been the choice in the past as against refurbishment and re-use (Shipley *et al*., 2006). Graham (2003) wants to limit the expansion of the existing building stock to conserve its embodied energy. Binder (2003) claims that a considerable amount of embodied energy is packed in the existing building stock and that building re-use is important to mitigate its waste. The re-use of built assets is environmentally sustainable as it retains the embodied energy of the original building (Treloar *et al*., 2001; Treloar *et al*., 2000) and ARB is a dynamic alternative that will minimize such issues (Kincaid, 2000).

2.2. ADAPTIVE RE-USE OF BUILDINGS

Any work on a building that will change its capacity, function or performance can be identified as building adaption (Douglas, 2006). Adaptive reuse has been derived from building adaptation (Latham, 2000) and is defined as a process of upgrading and enhancing the performance of a building to meet modern standards and changing user requirements while retaining the original building as much as possible. DEH (2004) describes ARB as a process that transforms a disused or ineffective item into a new item that can be used for a different purpose (p.3). Latham (2000) suggests that adaptive reuse should use the hidden qualities and embodied energy of the original building in a sustainable and dynamic manner to perform afresh. Latham's (2000) definition on ARB was chosen for this study as it covers the main aims of ARB, namely the retention of the character and the architecture of the original buildings while reusing them. Figure 1 presents ARB in relation to other alternatives as determined by Kincaid (2002).Ellison and Sayce (2007) emphasize that adaption can take place as "within use" or as "across use". For example, if when an office is adapted it continues to remain as an office, it will be called a "within use adaptation" and if the adapted office is used for a different purpose like for a residence, it will be called an "across use adaptation".

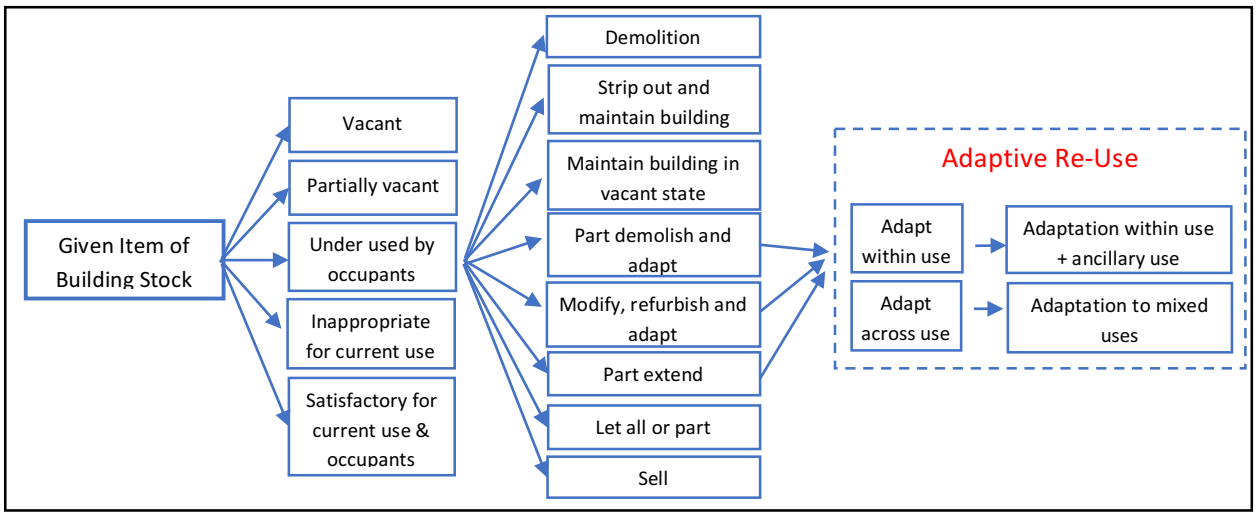

Figure 1: Position of Adaptive Re-Use Among Other Alternatives
(Source : Adapted from Kincaid, 2002, p.12)

2.3. PARAMETERS AND CHARACTERISTICS INFLUENCING THE ADAPTIVE RE-USE OF BUILDINGS

There are several building parameters that influence ARB both directly and indirectly and which have been proved through research studies conducted by Manewa, *et al*. (2016), Ball (2002), Wilkinson (2014) and Snyder (2005). Table 1 presents a summary of the most influential parameters found.

Table 1: Parameters Influencing the Adaptiveness of Buildings

Parameters	**Identified Research Study**
Age	Ball (2002, 1999)
Internal Space/ Area	Manewa *et al*. (2016); Larssen and Bjorbery (2004)
Flexibility available for different users	Gann and Barlow (1996)
Heritage Value	Snyder (2005); Ball (2002)
Vertical Circulation	Rawlinson and Harrison (2009); Larssen and Bjorbery (2004)
Fire/ Safety Design	Arge (2005)
Building Envelope and External Façade	Rawlinson and Harrison (2009); Arge (2005); Gann and Barlow (1996)
Building Width	Gann and Barlow (1996)
Technical Span and Services	Wilkinson (2014); Snyder (2005); Gann and Barlow (1996)
Location/ Site Conditions	Douglas (2006); Kincaid (2002); Larssen and Bjorbery (2004)
HVAC Distribution	Rawlinson and Harrison (2009); Arge (2005); Gann and Barlow (1996)
Building Condition	Snyder (2005); Swallow (1997); Baird *et al*. 1996)
Floor to Ceiling Height/ Story Height	Wilkinson (2014); Rawlinson and Harrison (2009); Arge (2005);
Structural Design	Rawlinson and Harrison (2009); Larssen and Bjorbery (2004)
Accessibility/ Proximity	Ball (2002); Ellison and Sayce (2007); Remoy and van der Voordt (2007); Gann and Barlow (1996);

Each parameter has its own risks and advantages. The parameters need to be identified, assessed and managed properly to enable the best decision (Wilkinson *et al*., 2009). ARB provides numerous benefits to both owners and occupants of buildings.

2.4. BENEFITS OF ADAPTIVE RE-USE OF BUILDINGS

Bullen (2007) and Dyson *et al*., (2016) categorize the benefits of ARB into three interactive groups, namely economic benefits, social benefits and environmental benefits.

***Economic Benefits*:** Shipley *et al*. (2006) indicate that the average cost saving possible from the adaptive re-use of a building as compared to a new construction is approximately 10-12%. Many research work indicate that it is often less costly to adapt a building rather than constructing a new building (Ball, 2002; Bullen, 2007; Campbell, 1996; Douglas, 2006; Shipley *et al*., 2006). In Hong Kong, a 9.8% increment in property values was noticed as resulting from ARB (Chau *et al*, 2003).

***Environmental Benefits*:** Itard and Klunder (2007); Bullen (2007) and Johnstone (1995) consider demolition as not environmentally friendly. While studying a renovation project, they have observed that building adaptation consumed fewer materials and generated less waste and energy compared to demolition and reconstruction. Ball (2002) has observed in a UK study that environmental and social benefits can influence an ARB decision favorably in spite of economic costs. The negative impacts of pollution caused by construction can cause the degradation of habitats and bio-diversity, altered eco-systems, reduced water and air quality and the spread of infections that affect both animals and humans (Koren and Buttler, 2006).

***Social Benefits*:** Bullen (2007) suggests a broader recognition for ARB as it forms a part of urban regeneration which helps future generations to yield benefits from building protection (DEH, 2004). Adaptive reuse is identified as a strategy for extending the physical and social function of a building to give it a new purpose while preserving its historic legacy (DEH, 2004; Latham, 2000; Wilkinson *et al*., 2009). Remoy and Wilkinson, (2012) stated that vacant or obsolete buildings can lead to anti-social activities which can be prevented through ARB. ARB investments can contribute significantly to boost the living standards of communities of neglected areas (Ball, 2002, 1999; Langston and Shen, 2007).

2.5. BARRIERS AND CHALLENGES: ADAPTIVE RE-USE OF BUILDINGS IN DEVELOPED COUNTRIES

Bullen (2007) believes that there is a wide range of barriers and opportunities for adaptive reuse and further that economic factors are a common concern with regard to barriers. For example, the cost of adaptive reuse will be difficult to estimate. Moreover, he insists on the importance of awareness on ARB that will help to acknowledge its immeasurable social and environmental benefits. Common barriers and challenges as found from the literature are summarized in Table 2.

Table 2: Barriers and Challenges Common in the Adaptive Re-Use of Buildings

Barriers and Challenges related to ARB	**Brief Description**	**Identified Research Study**
Physical barriers	Existing structural and walls, floor; column layouts	Bruce *et al*. (2015); Bullen and Love (2011); Bullen (2007); Reyers and Mansfield (2001)
Economic restrictions	Conservation costs (Direct or Indirect)	Bullen (2007); Douglas (2006); O'Donnell (2004); Reyers and Mansfield (2001); Shipley *et al*. (2006); Yung and Chan (2012)
Social concerns	Imperceptible non-economic values	DEH (2004); Yung and Chan (2012)
Building codes and regulations/ legal constraints	Current planning requirements, building codes and regulations; conservation	Bruce *et al*. (2015); Bullen and Love (2011); Bullen (2007); Douglas (2006); Shipley *et al*. (2006); Wilkinson *et al*. (2009)
Lack of material and skilled tradesmen	Availability of experts and material matching to the existing crafts	Bullen and Love (2011); Douglas (2006); Remoy and van der Voordt (2007); Reyers and Mansfield (2001)
Limited response to sustainability agenda	Reluctance of the property owners towards transformation to sustainable methods	Ellison and Sayce (2007); O'Donnell (2004)
Complexity and technical challenges	Innovative technical and refurbishment solutions for heritage buildings	Bruce *et al*. (2015); Bullen and Love (2011); Ball (1999); Shipley *et al*. (2006)
Maintenance challenges	Physical defects and deteriorations causing maintenance issues	Bullen and Love (2011); Remoy and van der Voordt (2007); Bullen (2007); O'Donnell (2004)

Barriers and Challenges related to ARB	Brief Description	Identified Research Study
Lack of awareness on ARB opportunities	False and negative beliefs with less awareness on ARB	Bullen and Love (2010); Remoy and van der Voordt; (2007); Bullen (2007; 2004); Shipley *et al*.; (2006)
Financial and technical perceptions	The notion that demolition is the only avenue to get a sensible profit as ARB is considered too expensive	Bruce *et al*. (2015); Bullen and Love (2011); Shipley *et al*. (2006); Yung and Chan (2012),
Commercial risk and uncertainty	Lengthy and difficult renovation or reuse often leads to reduced profits	Bruce *et al*. (2015); Bullen and Love (2011); Shipley *et al*. (2006),
Delayed constructions with higher remediation costs	Corruption due to the use of hazardous materials in buildings that causes extra costs; time delays	Bruce *et al*. (2015); Bullen and Love (2011); Bullen (2007); Wilkinson *et al*. (2009)
Imprecision of available drawings and information	Heritage buildings are lacking correct information/ drawings	Remoy and van der Voordt (2007); Reyers and Mansfield (2001)
Classification (Zoning) changes	Scope and classification changes of buildings that need building code and zoning compliance	Conejos *et al*. (2016); Bullen and Love (2011); Reyers and Mansfield (2001)
Inactive production and development criteria	Development criteria of cities pose challenges to urban regeneration	Conejos *et al*. (2016); Bullen and Love (2011);
Creative value compared to redevelopment	Finishing related creativity and outer appearance of the building	Bullen (2007; 2004)

Lack of awareness has caused misunderstandings about safety and health among people, high maintenance costs and commercial uncertainty on investments (Bullen, 2007; Bullen and Love, 2010; Remoy and van der Voordt, 2007; Shipley *et al*., 2006). Bullen (2004) claims that many buildings have some potential for adaption although the environmental impact could be significant. Hence, to optimize ARB, it is necessary to make a proper assessment of its barriers and challenges.

3. RESEARCH METHODOLOGY

Brikci and Green (2007) claim that the best method for collecting opinions and facts from people on their experience and behavior is the qualitative research approach. Willis (2007) suggests proceeding with qualitative information when an in-depth analysis is required. Thus, the qualitative research approach was used in this research. In Sri Lanka, there are only a few projects that have used Adaptive Reuse of Buildings, which is yet to gain popularity in the country. The number of professionals who have had exposure to ARB in Sri Lanka is thus limited. Data collection was carried out through expert interviews, in depth case studies and physical observations. The expert interviews were with three professionals who were practicing ARB successfully and passionately in Sri Lanka having over 20 years of overall professional experience out of which over 15 years were in ARB. Five substantially significant recently completed ARB projects (see Table 3) located in Colombo area and Galle were selected for the case studies. The case studies were required to validate the expert interview findings. During each case study, semi-structured interviews to collect data were held with the project architect, quantity surveyor, and structural engineer, all of whom had over 12 years of professional experience. Interview findings were analysed using content analysis to arrive at the conclusions.

Table 3: Summarised Details of the Case Studies

Description	Case 1	Case 2	Case 3	Case 4	Case 5
Currently Adapted Use of Building	Shopping and Restaurant Complex	Luxury Boutique Hotel	Technological Park Building Complex	Saloon and Spa	Shopping and Restaurant Complex
Previous use (Before Adaption)	Office complex of an asylum	Dutch residence of a merchant	Colonial warehouse	Colonial warehouse	Colonial hospital
Approx. Cost	US$ 3.61 Mn	US$ 1.64 Mn	US$ 7 Mn	US$ 0.49 Mn	US$ 1.31 Mn
Location	Colombo 07	Galle Fort	Colombo 10	Colombo 02	Colombo Fort
Employer Type	Public	Private	Public + Private	Private	Public

4. FINDINGS AND ANALYSIS

4.1. KEY PARAMETERS INFLUENCING ADAPTIVENESS OF EXISTING BUILDINGS IN SRI LANKA

Expert interviewees considered building characteristics and parameters as factors to be considered critically when deciding on the adaptive re-use of buildings. The key parameters influencing the adaptiveness of existing buildings in Sri Lanka were identified from the expert interviews. Parameters such as age; internal space/ area; building condition; floor to ceiling height/ story height; building envelope and external facade; technical span and services; vertical circulation; location/ site conditions; structural design; accessibility/ proximity; flexibility for different uses; heritage value, influence mostly the adaptiveness of the existing building stock of Sri Lanka. Fire/ safety design and HVAC distribution parameters were omitted (see Table1) based on case study validations.

4.2. BENEFITS OF ADAPTIVE RE-USE OF BUILDINGS IN SRI LANKA

ARB can provide many opportunities for developing countries if proper investments could be made by identifying the scope, method and market for adaptability. The expert interviews indicated their possible social, environmental and economic benefits if used in Sri Lanka (Table 4).

Table 4: Benefits of Adaptive Re-Use of Buildings in Sri Lanka

	Benefits of Adaptive Re-use of Buildings	Found in Literature	Applicability to Sri Lanka	Validated by (out of 5 cases)
	Social Benefits			
01.	A good alternative to retain the embodied cultural and social capital of important buildings	✓	✓	5
02.	Fulfils a new purpose while preserving the historical legacy	✓	✓	5
03.	Prevents antisocial activities in the abandoned buildings	✓	✓	4
04.	Boosts the living standards of the people in neglected areas	✓	✓	5
05.	Creates additional jobs in the neglected areas	✓	✓	4
06.	Provides a glimpse of the past about the characteristics and identities of certain areas	✓	✓	5
07.	Indicates city evolution	✓	✓	5
08.	***Sense of belonging felt by the people***		✓	4
	Environmental Benefits			
09.	Nil or less demolition	✓	✓	5
10.	Consumes fewer materials and provides for the reuse of materials	✓	✓	4
11.	Generates less waste and energy than demolition and reconstruction	✓	✓	4
12.	Causes less environmental pollution during construction	✓	✓	5
13.	Preserves embodied energy of the original buildings	✓	✓	4
14.	Leads to sustainability in the built environment	✓	✓	3
15.	***Ensures cleanliness and good appearance of the city***		✓	5
	Economic Benefits			
16.	Lower costs compared to those related to putting up a new building	✓	✓	3
17.	Higher profits made from higher plot ratios of older property	✓	✓	3
18.	Increased property values after the adaption	✓	✓	5
19.	Extension of building's life cycle	✓	✓	4
20.	Existence of structural components	✓	✓	4
21.	Shorter contract and construction periods	✓	✓	5
22.	***Commercial initiatives in abandoned buildings generate revenue***		✓	5
23.	***Avoidance of demolition and its related costs***		✓	5
24.	***Tourist attractions***		✓	5
25.	***Willingness of companies to move into adapted buildings to demonstrate their passion and identity***		✓	5

The benefits indicated in bold italics (see Table 4) are found specific to Sri Lanka. The sense of belonging the people will have and the cleanliness and good appearance of the cities would be socially and environmentally beneficial. As a famous tourist destination, Sri Lanka will specifically benefit by attracting tourists to the

adaptively re-used historic buildings. This will generate revenue both directly and indirectly to the associated communities and meet building operational costs. Simultaneously, leading Sri Lankan companies would opt to occupy the adapted buildings to enhance their local identities and provide their employees with a mind soothing working environment that will lead to improved productivity.

4.3. VALIDATION OF THE BARRIERS AND CHALLENGES FACED IN SRI LANKA

Although, ARB is being practiced in the construction industry to some extent in Sri Lanka, the expert interviewees highlighted that it is not being practiced at its best. They further emphasized that several barriers and challenges hinder the proper functioning of ARB in the country. These barriers and challenges were validated using the case studies and grouped under five categories, namely as social; environmental; economic; legal-regulatory and physical, technical and other barriers (See Table 5).

Table 5: Validation of the Identified Barriers and Challenges in the Context of Sri Lanka

	Barriers and Challenges of ARB in Sri Lanka	Expert Interview Findings	Validated from Case Studies				
			Case 1	Case 2	Case 3	Case 4	Case 5
	Social Barriers and Challenges						
01.	Lack of awareness on ARB opportunities and benefits	✓	✓		✓		✓
02.	Social upheavals against changing of the genuine heritage property	✓		✓			✓
03.	Notion that demolition is the best alternative since ARB is costly	✓	✓	✓	✓	✓	
04.	Social reluctance due to the building's previous usage (asylums etc.)	✓	✓				
05.	***Social reluctance for changing day to day activities in the property***	✓		✓	✓	✓	
06.	***Traditional practice being preservation of buildings rather than their reuse***	✓	✓	✓			✓
	Environmental Barriers and Challenges						
07.	Inadequate responses to sustainability criteria	✓			✓	✓	✓
08.	***Adverse weather conditions experienced halfway during renovation***	✓		✓			✓
	Economic Barriers and Challenges						
09.	Fund/ capital allocation	✓	✓		✓	✓	✓
10.	High maintenance and repair costs	✓	✓				✓
11.	Financial uncertainty/risk on the investment	✓		✓	✓	✓	✓
12.	***Higher opportunity costs***	✓	✓	✓	✓	✓	✓
	Legal and Regulatory Barriers and Challenges						
13.	Adherence to existing building codes	✓	✓	✓	✓	✓	✓
14.	Zoning (Classification) restrictions	✓	✓	✓			
15.	Health and safety requirements of the authorities	✓	✓	✓	✓	✓	✓
16.	***Special legal acts -Sri Lanka archeological sites act***	✓		✓			✓
17.	***Unclear deeds and ownerships***	✓					
	Physical, Technical and Other Barriers and Challenges						
18.	Restrictions due to structural system layouts	✓	✓	✓			✓
19.	Scarcity of required material and skilled tradesmen	✓		✓	✓		✓
20.	Need for innovative solutions for heritage/ historic buildings	✓	✓	✓		✓	✓
21.	Unavailability of structural and services drawings	✓		✓	✓	✓	✓
22.	***Insufficient space available to accommodate modern HVAC and fire safety services***	✓	✓		✓	✓	✓
23.	***Lack of complex technologies and skilled technicians***	✓	✓	✓			✓
24.	***Maintenance issues due to physical defects after adaption***	✓	✓			✓	

The barriers indicated in bold italics in Table 5 above are specific to Sri Lanka. In the cross case analysis, the lack of awareness on ARB opportunities and benefits; the notion that demolition is the best alternative, ARB

being expensive; *Social reluctance for changing day to day activities in the ARB potential property; Preservation of buildings being the traditional method rather than the reuse of buildings*; Inadequate response to sustainability criteria, Fund/ capital allocation; Financial uncertainty/ risk on the investment; Higher opportunity costs; Adherence to current building codes; Health and safety requirements of the authorities; *Special legal acts like Sri Lanka archaeological sites act; Restrictions due to structural system layouts*; Scarcity of required material and skilled tradesmen; Need for innovative solutions for proper adaption of heritage/ historic buildings; Unavailability of structural and services drawings; *Insufficient space available to accommodate modern HVAC and fire safety services; Lack of complex technology and skilled technicians*, were derived as most significant from the validation process. Moreover, the expert interviewees revealed that, in developing countries the economic barriers are overruling most of the other concerns, specifically in private sector initiated ARB projects. They further added that, when it comes to public sector ARB projects the government rather concerns on social and environmental benefits over economic barriers unless that significantly make a negative impact on the country's economy.

5. CONCLUSIONS

The key building characteristics influencing ARB, benefits of ARB and barriers and challenges related to ARB, relevant to developing countries were identified in the context of Sri Lanka for a more effective and systematic implementation of ARB. The relevance of parameters influencing ARB were proved and the benefits and opportunities of ARB for Sri Lanka were validated and grouped under social, environmental and economic aspects. The barriers and challenges related to ARB implementation in Sri Lanka were identified and validated through five recent case studies that were significant. The barriers and challenges that obstruct the successful adoption of ARB in Sri Lanka were categorized under Social; Environmental; Economic; Legal-Regulatory; and Physical, Technical-Other; barriers and challenges, to make it easy to address their root causes. The benefits as well as the barriers and challenges specifically observed in Sri Lanka were identified in Sections 4.2 and 4.3 respectively.

6. RECOMMENDATIONS

The following improvements could be done to make ARB in Sri Lanka more effective and systematic:

- Government Involvement: To make an impressive boost to ARB related decision making;
- Incentives and Tax concessions: To directly influence people to adopt ARB
- Incorporation of ARB into subject areas in related curricula: To teach ARB concepts to students of related subject areas to educate them on the true value and the importance of ARB
- Continuing Professional Development (CPD): To enlighten industry professionals about ARB and on the new trends and technologies of ARB

The above recommendations would allow Sri Lanka and other developing countries to reap optimum benefits of ARB practice and support their community development, enhancing living standards as well.

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