

Potentials of Using Bamboo as a Building Material for Permanent Structures in Sri Lanka

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Abstract— Most of designers in all over the world thoroughly concerned about sustainable designs. Natural Materials such as wood is mainly considered as sustainable building materials. But now there is a scarcity of wood in Sri Lanka because of over using. Because of these circumstances, some countries try to use Bamboo as a sustainable and renewable building material in building construction.

In Sri Lanka Bamboo is only using for temporary Structures as a material even though, Bamboo is fast and easy growing plant in Sri Lankan tropical climate which has an easy access, Bamboo is not a prominent building material in Sri Lanka when building permanent structures. But Bamboo is a good material that using in some other countries in Asia like China, Bali, Nepal and India.

In those countries they have techniques for enhance the natural qualities of Bamboo wood as a construction material. So if we can use adopt this techniques to our industry it will be a good solution for our construction industry. If it is possible to adopt those techniques for Sri Lankan context that will be a help to develop the sustainable designs with using Bamboo as a building material.

So, this research will be mainly consider about the techniques that they are using for enhancing the natural qualities of bamboo and how we can adopt them to Sri Lankan construction industry. Other than that, the viability of adopting those techniques and using the Bamboo as a building material for permanent structures in Sri Lanka also will be discussed.

Keywords— Bamboo, Sustainable, Technology, Material

I. INTRODUCTION

Sustainability is a key concept that is gaining an ever increasing awareness across the globe. At present, every new building is expected to embed sustainable strategies from the inception itself.

In this light, designers are focusing on using natural materials as much as possible, in a quest of achieving a lower carbon footprint. Bamboo is becoming a popular alternative

to steel and concrete, especially in Asian countries such as China, Indonesia, Nepal and Vietnam. In these countries, bamboo is widely used as a primary material for permanent structures.

Bamboo is a fast and easy growing plant in tropical climates, such as that in Sri Lanka. However, in Sri Lanka, the use of Bamboo is often limited to temporary structures, partitions, screens and cladding.

II. OBJECTIVES

- To determine the usage and popularity of bamboo in Sri Lanka
- To determine the availability and production of bamboo in Sri Lanka
- To identify various techniques and methods of using bamboo in construction industry around the relative countries
- To identify the positives and negatives of using bamboo as a building material

III. RESEARCH METHODOLOGY

The methodology has done in three phases. In the first phase literature review has been done for the collect relative data about Bamboo resources of Sri Lanka. In this phase in literature review, it mainly discussed about following areas Such as,

- The different Bamboo species in Sri Lanka.
- Bamboo classes which using for the building construction in Sri Lanka,
- utilization of Bamboo
- Bamboo as a construction material in Sri Lanka

In the second part also done by the literature review. This phase briefly discuss the use of Bamboo plant as building material. It mainly discussed the about the following areas,

- Qualities of Bamboo as a plant

- Preservation of Bamboo
- Methods, techniques used in Bamboo construction
- Application of Bamboo in building structures
- Comparative discussion of advantages and disadvantages of Bamboo with regard to other wooden materials.

Final Phase is done by relevant case studies. In this studies are done according to the data collected in second phase. . These case studies were selected under purposive sampling method. When selecting case studies three factors were considered. Those are as following,

First the problem was identified through the relevant articles which are done based on topics which are of the same area. This was done in the first two chapters of this study. The data collection was done based on relevant case studies

- How to construct and entire building from Bamboo.
- Construction methods which are done by Bamboo merged with other materials.
- Bamboo for Civil Engineering Constructions.

After collecting the data based on each consideration, the Architectural value of each method has been analysed comprehensively in this study.

IV. DATA ANALYSIS

Sustainability has become a major requirement in present construction industry and most of the time implementing systems, methods and the technologies which complies with concept of sustainability has become difficult due to technical issues, implementing issues and issues regarding cost. But when analysing the gathered data, the concept of using Bamboo as a building material has overcome most of these issues.

And the most countries which located in tropical climate zone using Bamboo as a goad construction material. Some of these main Bamboo species used in constructions in following tropical climatic countries, are also can easily grow in Sri Lankan climate. And there are some promotional programmes held in Sri Lanka. (Business Times, 2016) And there are some Bamboo species introduced to Sri Lankan tropical climate by Peradeniya Botanical Garden. (Forest Department, 1998)

Most of the countries in the Asian region has used Bamboo as a material in the constructions for a long time. It has proven that Bamboo is a reliable material which can be used

for permanent structures and its strength and other required qualities has been tested for a long time and proven its reliability. According to Jayaneththi, L. (1998). There are plenty of methods of fixing and jointing Bamboo and the strength of a Bamboo structure which consisting with multiple Bamboo parts is comparatively high. In these countries Bamboo has been used in different scales and different types, but the application of the Bamboo for these structures are varies depend on the building type and scale. These applications can be used in Sri Lankan buildings with regard to the scale and type of the building.

And in some cases Bamboo also used as not only construction purposes, and for enhance the aesthetic and cultural values.

Bamboo is a material which can be gathered easily with a low cost. Even though most of the materials which complies with the concept of sustainability have a higher price, Bamboo has a very lower price comparatively. Other than that when considering Bamboo it is a material which can be obtained easily because it is available in most of the countries according to Sumitharaarachchi, D. S. (1993).

Bamboo is a highly durable material under good preservation conditions. Its outer surface is naturally waterproof, which enables Bamboo to be used as a structure which is open to any kind of environment. And also because of this quality there is no need bearing additional cost on water sealing and painting.

V. CONCLUSION.

Asian countries like China, Japan, India, Bali, Philippine, Vietnam utilized Bamboo as a sustainable construction material. Due to its natural appearance, natural structural properties, fast and easy growing, sustainability and easy preservation methods and easy construction techniques Bamboo has become a regular construction material.

But in the Sri Lankan context Bamboo still is not identified as a good material for permanents structures. Because of less knowledge and less techniques used in current situation. With the complexity of the building local traditional methods are not practical.

But there are many techniques and practices following by other countries using Bamboo as a material.

Possibilities of using Bamboo for Sri Lankan construction industry-

There are five Bamboo species already used in cottage and housing industry in Sri Lanka. And there are twenty one Bamboo species recommended by Royal Botanical Garden Peradeniya which is suitable for large scale cultivations for construction industry. Thirteen Bamboo species among

them are identified as suitable Bamboo species for permanent constructions.

Tropical climate of Sri Lanka is also suitable for the growth of Bamboo plants.

Bamboo requires preservation treatments before being used for the construction process. Preservation methods which use to treat the Bamboo poles are not complex. But when adopting these methods, the process must be clearly understood because these methods must be done correctly. After identifying the correct process and the special requirements with the help of professionals these methods can be trained. With the experience of workers, Sri Lankan construction industry can adopt these preservation methods easily.

Like the preservation methods, Bamboo joineries are also important. It requires well trained workmen ship. With the guidance of experts, local workers can adopt these jointing methods also.

Priority of Sri Lanka general people have not believe on Bamboo as building material. They have not identified the value of the Bamboo as sustainable building material. The material needs to be established within the construction industry within time.

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