

Sustainable buildings and construction

Introduction

With the onset of a resource crisis, the modern world tries to make wrongs right. As a result, they have shifted attention towards sustainable development. Sustainable development is defined as accomplishing our needs while preserving the environment for the future. A crucial aspect of this stance is sustainability in buildings and construction. This centers around the environment, society and economy. Our approach to achieving sustainability in this manner can be divided into the changes we do during the construction process and in maintenance and upgrading. The careful use of resources, preference for environment-friendly resources while gladly welcoming recycling of resources are the key strategies of this concept. Not to forget that waste management is also a challenge. In a nutshell, we preserve our environment while trying cost-effective methods during the site project.

The green building concept is not a new trend. Though it can be acknowledged that vast advances in technology and the changes made in the approach to such fields that so strongly is bound to the environment have made this format a popular choice. Under this topic, the steps that are taken to bring about sustainability into construction' is as follows: the selection of eco-friendly material, the management of the utilisation of energy, proper waste management.

Discussion

Green buildings can be further classified based on their energy consumption and the level of carbon pollution. There are five main types of green buildings: net-zero energy ready, net-zero energy, net-zero carbon, zero carbon, zero-carbon and grid-interactive. In this order, they are placed from least to the most energy-efficient. Net-zero energy ready and net-zero energy green buildings use fossil fuels and electricity. The only difference between the two types is that renewable energy sources are also utilised in net-zero energy buildings. Both types of buildings are capable of carbon pollution. Net-zero carbon buildings also use both fossil fuels and electricity, but the fuel use is balanced by the utilisation of low carbon-emitting energy sources. Zero carbon buildings and zero carbon and grid-interactive buildings both do not use fossil fuels. Zero carbon buildings may use electricity or fuels that produces low carbon. On the other hand; the latter generates the load in an optimised manner to meet the needs of the grid. It also provides energy storage methods.

Such a 'sustainable' project would be quite a challenge. It will require expert personnel of many fields to collaborate in a single attempt to achieve a sustainable building standard successfully. The selection of material requires a lot of research and depends on the environment of the chosen site. There is a range of eco-friendly construction products available in the market. Many factors such as the environment the building is to be erected, the budget, etc; should be considered when purchasing material. Especially when considering the environment; certain materials can retain hot or cold air as an added advantage.

One of the old architecture materials is making a comeback. Bamboo is taking over the list of preferred materials, to bring that nature vibe into most buildings. Many constructors opt to go for reclaimed steel and wood, due to its advantage of budget reduction. Reclaimed metal takes less cost to produce than extracting metals. Cork is becoming popular especially in the use of tiles because of its impermeable nature. Not only that it is an eco-friendly material, it is also known for its properties of fire resistance, the resistance to rotting and its thermal insulation properties.

The concrete slabs are more sustainable than traditional concrete as the energy needed for production and assembly is much less. The production techniques used generates much less waste materials than usual. The use of recycled materials is the main sustainable nature. There are many advantages as it can adapt better into the environment it has been erected in. This is done by the thermal mass of this material adapting to hot or cold temperatures without cracking. Energy is saved by delaying the heat up or cool down. It can effectively retain hot or cool air saving energy used to do this via appliances.

Autoclaved aerated concrete (AAC) block is a light, porous material capable of thermal insulation which allows it to stand out from other sustainable concrete types. By looking at current market statistics, it is expected to be in popular demand by 2023. It is an affordable material that also promotes the quality of the green building. It is also durable, fire and pest resistant as additional advantages and recommended by the LEED certification.

Rammed earth, an interesting method used in history, is coming back to use. This is not a complex approach. It is simply compacted earth reinforced mechanically. They tend to make thicker walls in place of concrete and have excellent control of temperature conditions. Grasscrete is another approach in which instead of concrete tiles, there would be patches of grass organized between concrete borders. Hence their name. The concept may seem to be superficial but the real intent is to improve stormwater absorption and drainage. Mycelium, a mind-boggling material is simply dried and used as bricks in the same way straw bales are used. They can be grown into various needed furnishings. This way reduces the techniques used for processing the furnishings from their original material.

Energy management has long since been a struggle. The ideal energy saver building model is the zero-energy using buildings. During construction as well as while using the building, various renewable energy sources could be utilised. A now growing trend is solar panels. An aspect that requires a bit of expertise to build an energy-efficient model. Increasing the use of natural daylight is a simple solution to this matter. Instead of pointlessly using air-conditioning, ventilation of the building to its optimum level is advisable to reduce carbon emissions. There are also various eco-friendly conditioning technologies available for purchase.

Certain aspects that promotes maintenance of the environment within the building is the key to the mystery. This is where again much expert knowledge should be applied. Using green roof is a creative technique. It doesn't have to be a mini hanging garden of Babylon, but creatively using the space is adequate. This is literally a model of our earth a little higher from the ground than usual. It contributes in many ways to the environment the way a usual garden would. For example purification of the air, utilizing the excess carbon dioxide emissions. Another advantage of a 'green roof top' is that stormwater drainage management is better than that of a bare roof.

Also, it helps to reduce the heat island effect and brings about a cooling effect to the building while improving the quality of air.

Another approach is the green wall. This is composed of carefully selected greenery and established irrigation methods and is a creative alternative. Green surroundings are shown to reduce workplace anxiety, an added benefit. A messy tangle of climbers on an old fence doesn't meet the requirements of a green wall. There should be a well-planned design to help an active air circulation for effective purification. Also the added cooling effect mentioned above can be provided via a green wall as well.

Some technological aspects currently being used in sustainable building construction are as follows ; an automation system could be developed to automatically adjust the ventilation and lighting of the building using sensors. Electrochromic panels also change according to external stimuli to allow light in. Three-dimensional printing to reduce fuel costs for transporting material is also a quite baffling advancement. Thereby the required material is 'printed' : so the manufacture of building materials can be done onsite.

Waste management is perhaps one of the most important parts of sustainable construction. A large quantity of water is used during the construction process. Thereby development of water recycling practices will lead to the sustainability of our project. Waste management is another key criterion for sustainability. The use of compost bins is recommended in sites of ongoing projects. The reason is that much of the waste generated onsite generally ends up in landfills. By reducing waste output to landfills, automatically the adverse impact on nature is massively reduced.

In this mindset introduction of recycling of water has been practised. The optimal idea would be to use greywater plumbing systems that recycle all water sources except that of the toilet system. The practice of using recycled materials should be mentioned here. The aim of this management is to avoid sending waste into landfills. This step is where our attention to preserving nature is encountered. This means during the maintenance of the building, various steps to minimise paper and plastic usage or make sure they are properly recycled is preferred. Incineration of waste has become a popular approach as it is far by the most cost-effective method.

Compost bins are recommended which can also be used as an alternative income method. Anaerobic digestion of waste is also an interesting approach. This is due to the slow fermentation of waste materials; the production of biogas allows us to use it as an alternative energy source

Green building certifications are present for the accurate determination of the degree of sustainability of the building. The most popular certifications in Sri Lanka are; The GREENSL rating system; Urban Development Authority(UDA) green rating system and the Leed certification. The green rating system by the Green Building Council of Sri Lanka is also known as the GREENSL rating system. This is awarded via a committee of experts that is appointed by the council itself. This rating system has been developed after a careful study of both local and international projects, including the recommendations of national and international experts. This is a step taken to provide a good quality building combined with environmentally sustainable aspects.

The UDA rating system is also another certificate system that rates the many aspects of a sustainable green building. Implemented in 2017 first, this was made compulsory for all government and semi government-owned buildings. The UDA hopes to make it compulsory for private buildings as well. However in this article we will focus mainly on the various aspects seen in LEED -certified buildings.

World-renowned certification is the LEED certificate. A LEED Platinum certification is the highest achievement for green buildings. LEED acronym is for the Leadership in Energy and Environmental Design. Many of the following qualities are required to obtain such a certificate. Energy efficiency, air quality, environmental factors, eco-friendly material used and so on. Such qualifications are given standard levels like: certified, silver, gold and platinum. This is a certification ideal for any establishment that requires a good reputation .

There are many examples of sustainable buildings. One of the most famous is the Iberdrola tower in Bilbao, Spain. It is renowned for its renewable energy strategies. It also encompasses an environment-friendly environment together with the added bonus of a creative atmosphere for working staff. The Beitou public library of Taipei is Taiwan's first green library. It reduces the consumption of both water and energy. What makes it stand is its use of photovoltaic cells on its roof to generate energy and the collection of rainwater to be used in the toilets.

California Academy of Sciences, San Francisco, USA has all the characteristics of the previous examples and uses natural lighting to its maximum while utilizing the rooftop to grow plants. This rooftop garden is about 1 hectare in area.

The world trade center of Manama, Bahrain makes its way into the list by using wind turbines to generate energy. Museum of Tomorrow in Rio de Janeiro, Brazil is special as it uses water from a nearby bay for its air-conditioning system.

Sustainable buildings in Sri Lanka? Yes, we do! This is no new topic in the field of construction in Sri Lanka. Logistics park Colombo has been well recognised as a construction where renewable energy, the maximum use of both ventilation and daylight. It has also focused on the recycling of water. The next on our list is Clearpoint residencies, Rajagiriya. This is the much to boast first sustainable high rise building in our country. Covered head to toe in greenery to reduce the need for air conditioners. It also has a sustainable waste management plan.

Cinnamon Bay hotel has gone a step ahead of the above two examples. While reducing utility costs effectively it has also successfully reduced water wastage by sending more than 50% to recycling centres. It has a well-versed plan in reducing pollution and contamination of the surrounding environment; a classic example of the extent sustainability in construction can lead to. MAS intimates Thurulie has taken another angle to recycle as it recycles plastic and glass that counts as their waste products. It is a platinum -certified building that has special designs to save energy.

Many more LEED -certified buildings include the HNB regional office in Jaffna; Hidramani Fashion Pvt Ltd in Vavuniya. There is a clear interest for 'green projects' in the construction sector in Sri Lanka and a steady rise in the number of projects especially during the period of 2008 to 2015.

Climate responsive buildings are buildings that encompass most of the aspects of a sustainable building - such as energy saving; and environment-conscious designs but it also takes into consideration the weather the building is to be erected in. This is using weather and climatic data, seasonal variations, illumination of the area by sunlight and other factors. The Priarie House in Illinois uses photochromic inks that cause the interior of the building to be a lighter colour and a darker shade during cold days.

To sum up all that are discussed above, both advantages and disadvantages of sustainable buildings and construction are present. The advantages are as follows: These are energy efficient and have been built of eco friendly as well as recycled building materials. Water is recycled as well as preserved as much as possible. There are rainwater collection methods installed in these buildings. Waste management is at its best in these categories of buildings. The move to have compost bins is a small step but rewarding ecomanagement. The ideal achievement is to reduce greenhouse gas emissions and minimize pollution as much as possible. While focusing on natural resources there is a shift to use renewable energies instead of non-renewable sources. Daylight and ventilation of the building environment are modified to get the maximum benefit out of standards that could be met by existing conditions in nature while using minimum energy sources. Green buildings are even encouraged in some countries by providing various reliefs, that are especially tax-related. Such a building has a higher market value as well.

There are disadvantages as well. The huge initial cost may be a factor to repel any potentially interested construction party. Also, the maintenance may require a lot of time, effort and cost. Sometimes there may be a scarcity of eco-friendly building materials. This is a yet progressive arena that may not possess many experienced personnel available.

We face a global crisis: the unforeseen and disastrous covid 19 pandemic. Statistics are updated every day any possible hope to focus back on the recovery of attention paid to sustainable development. No one is to blame as we try to recover from a great economic backlash, trying to pump in our resources, no matter how meagre, to save people's health. Yet when we do recover, can we cover up the damage that has occurred from losing our interest in sustainable construction? That remains the question. The long term impact of this area of sustainability is that it actually does help resolve the current situation. Thereby there should be a global effort to achieve sustainability. Developing countries must not be left behind in this venture. Thereby the more economically stable countries would be more than welcome to assist them.

An analysis by the China green building council revealed its concern on this matter. Sustainable buildings are not a luxury in the midst of such a pandemic. It's rather the long term solution to cope up with it. Yet the advertising of such an idea to keep progressing is not strong enough. Will it be too late to recover this industry?

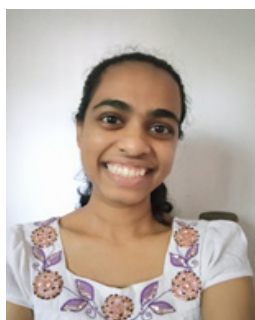
Let's look at the aspects of green buildings that make them even more appropriate for the current situation. Energy sustainability is a blessing; both in terms of environmental concern and budget. Reducing energy expenditure is one of the major points. The constant monitoring of water and air quality is another. These buildings are mostly independent to recycling all waste they produce, even wastewater. Waste produced is used up in either compost-making or the production of biogas. The ways that the virus may transmit is greatly reduced, by preventing the waste materials from reaching the public as much as possible. Ventilation is a much-exercised quality of these buildings. They will promote a more health-safe environment for employees.

Finally, the challenge encountered in this era is to push the interest towards the construction of sustainable buildings amid a pandemic. Elsewhen the pandemic has come and gone; we, may be left with too little time to compensate the environment for what we have taken from it.

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Contributor



Ms. Anuki Gunathilake

Ms. Gunathilake medical student at University of Kelaniya.