Comparison Between Traditional Building Materials & Innovative Green Building Materials

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***Abstract*—Civil Constructions are practiced since decades. We had Harapan civilization, Mohen-jo-daro civilization, ancient Egyptian civilization and many more alike them, but what differentiated each other was the planning practices and the types and forms of construction. Building materials such as cement, aggregates, etc are in use since last 1800's but as and when the time passes by, we have come across various other materials such as asphalt, bitumen, etc. which are found not to be eco-friendly in nature and thus the main aim of this paper is to study about various other alternatives to these traditional building materials and move towards or take a shift towards the sustainable and innovative green building materials. This paper will focus on comparison between such building materials and perform a precise literature review on the same.**

Keywords—Green materials, traditional materials, construction, innovative building materials

I. INTRODUCTION

Buildings are actually responsible for maximum resource consumption therefore green building is only solution to the present trend of construction. Green building is described as people with healthy, comfortable and safe living, working and activities of the space, while the building full life cycle (material production, construction planning, design, construction, operation and maintenance) process to achieve efficient use of resources (energy, disabilities, the water, materials) with minimum impact on the environment of buildings, also known as sustainable building envelope. Establishment of institution by Formation of IGBC, TERI launch of LEED India the Government to encourage and BEE and TERI-GRIHA Sustainability in India. The green building uses locally available building materials which are energy efficient, sustainable, and durable. Looking at the availability of local material lime is one of such material which reduces the internal room temperatures by 4° to 5° C as compare to cement in plastering work. Using lime in building it absorbs carbon rather than emitting which also lead to reduce hazardous impact on environment.

II. AIM OF PAPER

To Compare Traditional Building Materials & InnovativeGreen Building Materials

III. OBJECTIVE OF PAPER

- To understand property of Traditional BuildingMaterials
- To understand property of Innovative GreenBuilding Materials
- To compare Green Building Materials & Traditional Building Materials
- To give review about Green Building Materials &Traditional Building Materials after compression

IV. LITERATURE REVIEW

“Forest And Ecology Development”,—Richard Cristan ,
W. Michael Aust , M. Chad Bolding, Scott M. Barrett, John F. Munsell, Erik Schilling‖, Forest Ecology and Management
– (Elsevier October 2015). [1] This literature review indicates that forestry BMPs minimize water quality effects of forest operations when implemented as recommended by state forestry agencies. While BMP effectiveness studies are often site or region specific, they clearly demonstrate a common outcome. Stuart and Edwards (2006) emphasized that BMPs based on physical principles continue to be effective with the passage of time. These effectiveness studies provide critical information and insight on how state BMP programs comply with the goals of the CWA. Forestry BMP effectiveness studies can help states formulate or update BMP guidelines. Effectiveness research commonly notes that areas such as forest roads, skid trails, and stream crossings should receive considerable attention since they have the greatest potential for erosion and sediment delivery. Research studies from multiple regions across the U.S. have demonstrated that BMPs are effective and reduce sediment delivery to stream.

“Green Building Architecture: a Literature Review On designing techniques”—Kushagra Varma, Mayank Chaurasia, Tariq Ahmed— (February 2014) [2] : Green building are today the most widely used form of architecture. Creating green building is an important focus of building owners and even governments worldwide. In India some world class Green Buildings have constructed in past few years, but still the concept of Green Buildings for general masses is in infancy stage. Present work is an attempt in the direction to make people,communities and general public aware about the advantages of Green Buildings for sustainable environment development and management.

“Towards the implementation of the Green Building Concept in agricultural building ” —M.Samer‖ (july 2013) [3]: According to the issues raised in this study, it can be concluded that: 1) The existing livestock barns and greenhouses do not comply with the green building concept as they miss some or most of the

properties that formulate the green building aspect. Hence, the implementation of the green building concept in agricultural buildings is still limited; and, therefore, should be conceptualized and initiated. 2) In order to make the construction of green buildings cost-effective, the agricultural wastes, e.g. plant residues, should be used as green building materials. 3) The green building and agriculture are interdependent. Precisely, the agricultural wastes and the biowastes can be used to make sustainable and recyclable green building materials on the one hand and green buildings provide sustainable agricultural structures on the other hand. 4) An agricultural green building assessment and rating system should be developed in order to be implemented in assessing and rating the livestock barns and the greenhouses. 5) Most of the green building materials should enter the natural cycle i.e. originate from the nature and turn back into the nature where it will break down. 6) The studies on agricultural buildings have focused on research points that form a small part of the whole green building concept. Such studies need to be integrated together to make the baseline and the first milestone on the way to apply the green building concept in agricultural buildings. Research projects should be developed on the implementation ofgreen buildings in agriculture. 7) The role of agricultural and biological engineers can be defined as follows: (1) investigating the local agricultural materials that can be used as green building materials, e.g. giant reed, straw, clay etc.;
(2) manufacturing biomaterials, e.g. extracting bio-silica from plants, to be used for fabricating green building materials, e.g. bio cement, eco-cement, and green concrete;
(3) developing farm green building assessment and rating system (4) implementing the guidelines of green buildings when constructing new farm buildings; and (5) retrofitting old farm buildings to fulfill the green building criteria.

‘‘Review on Intelligent Street Lighting System’’ —Kavita A. Bajaj, Tushar S. Mote‖ (IJSR 2013) [4]: This project describes an intelligent street lighting system using LED supplied by solar energy and with a control system for efficient management. This feature switching ON the lights only when necessary increasing the energy saving and Lamps lifetime. The wireless nature of the control system using ZigBee offers very less maintenance and flexible, extendable and fully adaptable user needs in rural and urban areas. The simplicity of ZigBee, the reliability of electronic components, the feature of the sensor network, the processing speed, the reducedcosts, andtheeaseofinstallation arethefeaturesthat characterize the proposed system, which presents itself as an interesting engineering and commercial solution as the comparison with other technologies.

‘‘ Sustainable Building Material for Green Building Construction, Conservation And Refurbishing’’, —Usman Aminu Umar , M. F. Khamidi and Hassan Tukur ‖ , Management in Construction Research Association (MiCRA) Postgraduate Conference ,(December 2012).[5]: Sustainable building materials by definition are materials whicharedomestically created andsourced whichdecreases transportation costs and CO_2 emissions, they could consist of reused materials, they possess a lower environmental effect, they are thermally effective, they need less energy than conventional materials, they make use of renewable resources, they are lower in harmful emissions and they are economically sustainable. A sustainable building material needs to be used properly and contextually in every community development. The application of sustainable building materials not just minimizes transport costs, carbon emissions, and in most cases materials costs, it also offers employment and skills development opportunities for community members. Sustainability as an alternative criterion for building materials are generally chose through functional, technical and economical specifications. Nevertheless, with sustainability as a crucial challenge in the past decades, particularly in developed nations, the environmental load of building materials additionally become a more significant requirement. The construction sector, directly or perhaps indirectly creating a 22-substantial portion of the annual environmental destruction, may take up the obligation to promote sustainable development by finding more environmentally kind approaches to construction and building. Among the directions for solutions is to be seen in new material applications, recycling and reuse, sustainable manufacture of products, or use of green resources.

‘‘ A Review of Solar Energy: Markets, Economics and policies”— Govinda R. Timilsinaa, LadoKurdgelashvilib and Patrick A. Narbelc ‖ (October 2011) [6]: Physically, solarenergyconstitutesthemostabundantrenewableenergy resource available and, in most regions of the world, its theoretical potential is far in excess of the current total primary energy supply in those regions. Solar energy technologies could help address energy access to rural and remote communities, help improve long-term energy security and help greenhouse gas mitigation. The market for technologies to harness solar energy has seen dramatic expansion over the past decade – in particular the expansion of the market for grid connected distributed PV systems and solar hot water systems have been remarkable. Notably, centralized utility scale PV applications have grown strongly in the recent years; off-grid applications are now dominant only in developing markets. Moreover, the market for larger solar thermal technologies that first emerged in the early 1980s is now gathering momentum with a number of new installations as well as projects in the planning stages. While the costs of solar energy technologies have exhibited rapid declines in the recent past and the potential for significant declines in the near future, the minimum values of levelized cost of any solar technologies, including tower type CSP, which is currently the least costly solar technology, would be higher than the maximum values of levelized costs of conventional technologies for power

generation (e.g., nuclear, coal IGCC, coal supercritical, hydro, gas CC) even if capital costs of solar energy technologies were reduced by 25%. Currently, this is the primary barrier to the large-scale deployment of solar energy technologies. Moreover, the scaling-up of solar energy technologies is also constrained by financial, technical and institutional barriers. Various fiscal and regulatory instruments have been used to increase output of solar energy. These instruments include tax incentives, preferential interest rates, direct incentives, loan programs,

23 construction mandates, renewable portfolio standards, voluntary green power programs, net metering, interconnection standards and demonstration projects. However, the level of incentives provided through these instruments has not been enough to substantially increasethe penetration of solar energy in the global energy supply mix. Moreover, these policy instruments can create market inefficiencies in addition to the direct costs of requiring more costly electricity supplies to be used. While not discussed in this paper, these indirect impacts need to be considered in assessing the full opportunity cost of policies to expand solar power production. Carbon finance mechanisms, in particular the CDM, could potentially support expansion of the solar energy market. While some changes in the operation of the CDM could increase solar investment, the price of carbon credits required to make solar energy technologies economically competitive with other technologies to reduce GHG emissions would be high. The fundamental barrier to increasing market-driven utilization of solar technologies continues to be their cost. The current growth of solar energy is mainly driven by policy supports. Continuation and expansion of costly existing supports would be necessary for several decades to enhance the further deployment of solar energy in both developed and developing countries, given current technologies and projections of their further improvements over the near to medium term. Overcoming current technical and economic barriers will require substantial further outlays to finance applied research and development, and to cover anticipated costs of initial investments in commercialscale improved-technology production capacity.

‘‘Forest Cover Thins as Development Wins’’ —Prashant Rangnekar‖ (Mumbai, Sun Jun 14 2009) [7]: The forest cover in the Mumbai Metropolitan Region (MMR) is shrinking rapidly as the pressure on the city's green lungs is mounting. Officials and environmentalists blame soaring urbanisation, blocking of natural corridors of animals, encroachment and misuse of the Tribal Act for the trend.The MMR has five sanctuaries —Sanjay Gandhi National Park (103 sq km) in the heart of the city extending up to Thane, Tungareshwar(85 sq km) on the fringes of VasaiVirar, Phansad(77 sq km), Karnala(12 sq km) and Tansa(320 sq km). The rapid urbanisation of these areas is taking a toll on the forests. "The areas around the forests are seeing rapid urbanization. More importantly, the buffer zone is lost. This has led to a decrease in grazing 24 areas, which has a direct impact on the herbivores," said Deputy Conservator of Forest (DCF) Dilip Gujar.The urbanization of Malad, Bhandup, Vikhroliand Thane on the fringes of the Sanjay Gandhi National Park (SGNP) has also seen the buffer zone vanishing. This buffer zone, though not a protected forest, was an extension of the park.Road widening, though an important aspect of infrastructure development, has disturbed the natural animal corridors. SGNP, Tansa and Tungareshwar sanctuaries were earlier interconnected. The widening of a 24-km stretch of Ghodbunder road had closed the natural animal corridor of SGNP. Wild animals, including leopards, used to cross over to the other side of the park earlier. Since 2003, five leopards have been run over by vehicles

V. GREEN BUILDING COMPONENTS

- Grass Pavers

Grassed paving systems allow turf grass to grow through an open cell of concrete or plastic that transfers the weight of vehicles to an underlying base course. According to one manufacturer ‘s study, every 1,000 square feet of grass paving infiltrates nearly 7,000 gallons per 10 inches of rainfall, which would otherwise be runoff; converts enough carbon dioxide to oxygen to supply 22 adults for a year; provides cooling equivalent to 1.7 tons of air conditioning annually; and, in the case of one manufacturer, recycles more than 400 pounds of plastic in the product itself. Grassed paving is somewhat limited in its applications because grass will not survive constant daily traffic. Three general types of grassed paving systems exist: poured-inplastic systems such as Bormanite‘s Grasscret consist of steel reinforced concrete; precast concrete pavers that like poured-in-place concrete provide rigid structural support; and a large number of the available systems as recycled plastic pavers.

- Cross Roofing Solar Panels

A solar tracker is a device that orients a payload toward the Sun. Payloads are usually solar panels, parabolic troughs, Fresnel reflectors, lenses or the mirrors of a heliostat. Sunlight has two components, the "direct beam" that carries about 90% of the solar energy, and the "diffuse sunlight" that carries the remainder – the diffuse portion is the blue sky on a clear day, and is a larger proportion of the total on cloudy days. As the majority of the energy is in the direct beam, maximizing collection requires the Sun to be visible to the panels for as long as possible. The energy contributed by the direct beam drops off with the cosine of the angle between the incoming light and the panel. In addition, the reflectance (averaged across all polarizations) is approximately constant for angles of incidence up to around 50°, beyond which reflectance degrades rapidly. The purpose of a tracking mechanism is to follow the Sun as it moves across the sky. In the following sections, in which each of the main factors are described in a little more detail, the complex path of the Sun is simplified by considering its daily east-west motion separately from its yearly north-south variation with the seasons of the year.

- Green Walls

Green walls offer effective alternatives to conventional landscape retaining walls of cast-inplace concrete, metal, or wood. A vegetated surface suits many functions and aesthetic preferences: it deadens and diffuses noise, makes graffiti impossible, cuts heat and glare, holds or slows rainwater, traps air pollutants, and processes carbon dioxide, while providing food and shelter for wildlife Most green walls use small, light elements, installed without heavy equipment. Many require reduced materials, no formwork, and for some type no footings, saving money and resources. Most deal flexibly with unstable soils, settling, and deflection—even earthquakes. Careful attention to irrigation and microclimateis richly repaid.

The choices for green wall structures include:

- Block—engineered with gaps where plants root through thewall.
- Crib wall—concrete or wood elements stacked log-cabin style. A related stackable unit looks like giant jacks from a child‘s game.
- Frame—interlocking circle-or diamond-shaped units stacked like masonry (mostly in Europe and Japan). Also used flatto ―blanket‖ water channels. For parking, Grass- Crete is a similar concept.
- Trough—stackable soil filled tubs (retaining or free standing).
- Gabion—wire baskets filled with stones to provide a strongbut permeable wall or dam.
- Mesh—like minigabions, holding a thin layer of soil to asurface.
- Cell—flexible, strong honeycombs filled with soil. Closelyrelated are plastic turf support systems like Grass paved.
- Sandbag—geotextiles wrapped around soil, formallycalled ―vegetated geogrid.‖

- Smart Glass

Smart glass or switchable glass (also smart windows or switchable windows in those applications) is glass or glazing whose light transmission properties are altered when voltage, light or heat is applied. Generally, the glass changes from translucent to transparent, changing from blocking some (or all) wavelengths of light to letting light pass through. Smart glass technologies include electro chromic, photo chromic, thermo chromic, suspended particle, micro-blind and polymer dispersed liquid crystal devices. When installed in the envelope of buildings, smart glass creates climate adaptive building shells, with the ability to save costs for heating, air-conditioning and lighting and avoid the cost of installing and maintaining motorized light screens or blinds or curtains. Blackout smart glass blocks 99.4% of ultraviolet light, reducing fabric fading; for SPDtype smart glass, this is achieved in conjunction with low emissivity coatings. Critical aspects of smart glass include material costs, installation costs, electricity costs and durability, as well as functional features such as the speed of control, possibilities for dimming, and the degree of transparency.

- Coffered Ceilings

Boxed-beam ceiling creates an illusion of space. To further enhance the feeling of spaciousness to a room, install narrow beams closer to the ceiling. The beams should be painted a different color to the recessed panels of the ceiling. Coffered ceilings also add audio comfort in the sense that they absorb echoes and excess sound in the room. This makes the room a conducive area for work or relaxation. Coffered ceiling definitely adds a touch of class and elegance to a room or kitchen. Together with some embellishments, the makeover transforms a plain room into one that is visually appealing.

- Unit Pavers

Another potentially permeable surface uses unit pavers (pavers set as individual pieces, rather than a continuous sheet like poured concrete). They must be laid on sand, crushed stone, stone screenings, or some other permeable material. Because the percolation actually takes place in the joints between the pavers, the width and the material of the joints become critical.

- Use wide joints.
- Use thicker pavers to compensate for loss of rigidity, if necessary.
- Use permeable joint-filler materials.
- After initial installation, settling of the paving occurs; brush in coarser joint-filler materials, rather than allow finer debris to accumulate and block the pore space. Where possible, leave joints lower than the walking surface.
- Make the base course beneath the pavers as coarse as possible to prevent water being retained in the surface layer.
- Do not compact the base course excessively.

Storm Water Management

One of the most important benefits of the green infrastructure is in naturalizing the hydrological cycles in a city. The hard surfaces of the urban fabric increase the intensity of the run- off and the amount of pollutants in urban waters. Instead of water soaking into the ground, it travels quickly into storm drainage systems that flow into rivers and streams, causing increased flooding and erosion. The green fabric, on the other hands, absorbs the water at the source, recharging the groundwater filtering pollutants, and slowing down the energy of water travel. This improves water quality and, as a nonstructural approach, is cost effective. Urban development has a profound influence on the quality of local streams because it dramatically alters the local hydrologic cycle, most often undertaken without regard to ecological requirement, trees that had intercepted rainfall are removed, and natural depressions that had temporarily ponded water are graded to a uniform slope. The spongy humus layer of the forest floor that had absorbed rainfall is scraped off, eroded or severely compacted. Having lost its natural storage capacity, a cleared and graded site can no longer prevent rainfall from being rapidly converted into storm water runoff.

- Use of Wooden Logs as Pillars

Wooden logs have been a part of construction since

ancient times and even today there are some special kind of trees whose growth keeps on increasing even after they are chopped off. If we make use of those wooden logs then it would impart more aesthetic beauty to the structure. And help to support the slab externally in load bearing structures.

VI. CONCLUSION

After reading and do analysis of different paper I can understand different properties of green materials like thermal absorption, light weightiness, eco-friendly, more durable etc. As I compare these materials to traditional building material this material also cost effective in nature so compression between green and traditional building material give clear idea about suitability of material for different requirements and according to availability of green material it gives best alternative for traditional material.

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