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Green Rehabilitation

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Abstract—*This paper aims at sensitizing practitioners and stakeholders involved in post disaster reconstruction about the advantages of employing renewable energy and alternative technologies, to reduce the exploitation of depleting natural resources and dependence of vulnerable communities on external markets. The consequences of disasters are enormous losses including heavy death tolls, irrecoverable damages, and unforgettable miseries, undermining human survival, growth and sustenance.The aim of this paper is to explore the introduction of environmentally sustainable solutions and improved local building techniques into the practice of post-disaster rehabilitation. Thus, not only after the initial trauma of disaster relief operations can be conducted but also measures can be adopted which seek to reduce thelikelihood or consequences of a hazard risk before a disaster ever occurs, therebyplaying the most vital role in saving human life to a greater extent.*

1. INTRODUCTION

Disaster means a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or manmade causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of, property, or damage to, or degradation of environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area (DM ACT 2005).Disasters have mostly become the price that we pay for the uncontrolled progress that we are making. Both natural and man-made disasters can be explained as direct or indirect consequences of the so-called urbanization and development that we are undergoing at the cost of exploiting the natural cycles. It is often said that disasters, their occurrence cannot be controlled and hence it becomes pretty important that we somehow mitigate its effects and manage the aftermath so as to ensure minimum social and economic loss.Green building design is a practical and climate conscious approach to building design, various factors, like geographical location, prevailing climatic conditions, use of locallyavailable and low embodied energy materials and design parameters relevant to the type of usage of the building are normally taken into consideration. Such an approach ensures minimum harm to the environment, whileconstructing and using the building. A look at traditional building techniques clearly shows that the concept of green or sustainable buildings has existed in our country for a long time. These buildings work generally made of locally available materials like wood, mud and stone and dealt with the vagaries of weather without using a large amount of external energy to keep the inhabitants comfortable. When a number of green buildings are located in proximity, they would create a green zone, providing much healthier environment and minimize heat-island effect. The ultimate aim will then be to create many such areas, which would help the towns and cities and therefore the nation in reducing total energy requirement and also the overall global carbon footprint.

2. CYCLE

Before we move into the vitals, we should be aware of the stages that circumscribe a disaster management;the following Fig. shows different phases and stages inside phases, of a disaster management cycle.

Fig. 1: Stages in the disaster management cycle.

Disaster Management calls for mainly four levels of short-term and long-term interventions:-

(1) Mitigation

Mitigation, sometimes called prevention or risk reduction, is often considered the "**cornerstone of disaster management.**" Mitigation measures seek to reduce the likelihood or consequences of a hazard risk before a disaster ever

occur.These could be both structural and non-structural measures. Structural measures could be, for example, flood levees while non-structural measures could be legislation, land use planning and insurance and, also the creation of policies and regulations pertaining to evacuation.

(2) Preparedness

This would be a continuous cycle, with the aim of minimizing loss of life. It would include communication plans, emergency shelter and evacuation plans, training in emergency response, and building community emergency response teams, especially in high risk localities.

(3) Response

Disaster response includes disaster relief operations, rescue operations, re-location, provision of food, treatment and prevention of disease and disability, repairing of essential utilities and services, providing temporary shelter and emergency health care.

(4) Recovery

Recovery from a disaster involves re-settlement, rehabilitation, and reconstruction.

Modern disaster recovery approaches have adapted the principle of 'building back better'.

Of all this stages, we argue that more concentration of efforts are required in the RESPONSE and RECOVERY phases, as both these stages have high relevance in disaster management.

3. DISASTER RISK REDUCTION

Disaster Risk Reduction comprises all forms of activities including structural and non-structural measures to avoid (prevention) or to limit (mitigation and preparedness) adverse effects of disasters in the pre-disaster phase and post disaster stage (Response, Relief, Recovery, and Reconstruction).

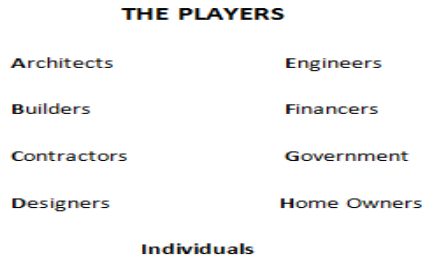

Fig. 2: Players of DRR

4. GREEN REHABILITATION

A green rehabilitation process can be defined as a process which allows building safe and disaster resistant shelters by employing materials and techniques that generate the lowest impact on the environment. This is achievable by minimizing energy consumption and related emissions during the various stages of site planning, house design, construction, usage and maintenance of the new building and eventually, during the phases of demolition and dismantling of the structure, in order to connect those stages in a continuous life-cycle where the final outcome is that wastage is minimized.

Objectives of Green Rehabilitation

The purpose of Green Rehabilitation is to reduce the impact of the built environment on human health and natural habitat. It encourages to a more respectful use of prime sources, (land, water, air, green cover and energy), emphasizing on renewable sources, energy efficient building practices and minimization of wastes.

A more eco-friendly reconstruction will also help the beneficiary communities to reduce the running costs of the building by saving on consumption of biomasses and fuels, electricity and water in the long run.

5. ELEMENTS OF GREEN BUILDING

. We believe that any house style can be made to require relatively minimal amounts of energy to heat and cool, and be comfortable. It's easier now to get your architect and builder to use improved designs and construction methods. Even though there are many different design options available, they all have several things in common, a high R-value; a tightly sealed thermal envelope; controlled ventilation; and lower heating and cooling bills. Recent technological improvements in building components and construction techniques, and heating, ventilation, and cooling (HVAC) systems, allow most modern energy saving ideas to be seamlessly integrated into any type of house design without sacrificing comfort, health or aesthetics. The major elements of energy-efficient home design and construction systems includes "thermal envelope" which is everything about the house that serves to shield the living space from the outdoors. It includes the wall and roof assemblies, insulation, windows, doors, finishes, weather-stripping, air sealing, controlled ventilation, foundation and slabs and air/vapor-retarders.

Fig. 3: Elements of a Green Building

6. WAYS TO ACHIEVE ENERGY EFFICIENCY

6.1 Sun Pipes (Day Lighting)

Sun Light tubes or Sun light pipes are used for transporting or distributing natural or artificial light. In their application to day lighting, they are also often called tubular day lighting devices, sun pipes, sun scopes, or daylight pipes.

Generally speaking a sun pipe may refer to:

- A sun tube or sun pipe for transport of light to another location, minimizing the loss of light.
- A transparent tube or pipe for distribution of light over its length, either for equal distribution along the entire length or for controlled light leakage.
  The essential components are:
- Dome
- Consists of clear polycarbonate reflector to capture daylight and light intercepting transfer device to redirect day light.
- Increases the daylight collection and harvest for low sun angles.
- Pipe
- Consists of a very high reflective internal finish with 98% to 99.7% reflectance.
- Straight run or with elbow to convey daylight.

Working

- The sun rays incident on the Dome gets reflected within the tube multiple times before it finally emerges out from the light scattering device.
- The Dome is placed at the top of the roof or terrace and the light scattering device is fixed on the ceiling of the room to be illuminated.

The tube extends from the dome till the light scattering device and the length of the tube will vary accordingly.

6.2. Cavity Insulation (Passive Walls)

Heat transfer in a room follows the following aspects:

- Heat energy in the form of radiation strikes the external surface of walls.
- Depending on the absorption coefficient of the wall material, a part of this energy is absorbed and transferred conduction through wall surface.
- Finally, heat energy is transferred into the room by radiation from walls and convection currents generated in the room, thereby, increasing the temperature of the room.

Cavity Wall Insulation

- The cavity within a cavity wall is initially empty and can be filled with insulation by various methods.

- Cavity wall insulation is used to reduce heat loss through a cavity wall by filling the air space with a porous material. This immobilizes the air within the cavity, thus preventing convection of air currents within the cavity.
  - Reflective Membrane
  - Reflective membranes are woven fabrics which act as a heat reflector by blocking the infrared radiations across an air space. Reflective membrane installed within timber frame enhances the thermal characteristics of the wall and roof cavities, thus improving the insulation performance.

SMART HOMES

1. Overview

A smart house is a house that has highly advanced automatic systems for lighting, temperature control, multi-media, security, window and door operations, and many other functions. A smart home appears "intelligent" because its computer systems can monitor so many aspects of daily living. For example, the refrigerator may be able to inventory its contents, suggest menus, recommend healthy alternatives, and order groceries.

The four key aspects of a smart home are:

- An internal network through which devices talk to each other.
- Intelligent controls for managing the system.
- Sensors that collect information.
- Smart features, such as intelligent heating systems, which respond to information from sensors or user instructions.

Four smart features with environmental benefits:

- Smart electricity and gas meters.
- Smart water meters.
- Intelligent controls for heating, lighting, windows and blinds.
- Efficient water management.

2. Smart Home Technology

The use of stand-alone equipment for helping people carry out everyday activities - assistive technology - is widespread. By integrating stand-alone equipment into systems, the possibility to create a far more customized and integrated approach to healthcare increases but also the complexity of the system.

As computer-based systems and artifacts penetrate more and more into people's everyday lives and homes, the 'design problem' is not so much concerned with the creation of new technical artifacts as it is with their effective and dependable configuration and integration

Smart home technology is the integration of technology and services through home networking for a better quality of living. At the moment smart home technology is shifting from being purely concerned with the integration of electrical equipment within the home to a broader perspective, which also includes ICT functionalities. This is visible in the home environment in terms of different networks for work & productivity, entertainment, communication and information and home automation that are merging and connected to the outside world by a residential gateway(s).

The value of the home network does not depend on one single system but on the way the different systems are connected to each other and supplement each other. Furthermore the process is not static but the preferences and desires can change over time. This section starts with general technological developments that could provide benefits for assisted living. Thereafter the focus is on technology for the home environment.

Advantages

Overall, a smart home is seen as being more:

- Secure.
- Convenient.
- Resource efficient.
- Comfortable due to better temperature control.
- Responsive to your preferences and the local environment.
- Adaptive to different life stages, with assisted living for older people.

6.3 Stage Wise Strategic Planning for Disaster Relief

The strategic plans for a disaster relief activities involves tasks that needs to be taken care are determining community needs, estimating disaster conditions, its uncertainties, information quality and complexity, developing coordination plans amongst various actors of a disaster relief chain, establishing communications channels both internally within the given organization or aid-agency and externally within different organizations, logistics companies, army, NGOs etc, rationalizing the supply base and encouraging trust and commitment amongst every actors in the disaster relief supply chain.

6.4. Issues and Challenges

i. Assessment of vulnerability conditions of existing buildings, structures and infra-structures in geo-hazards prone areas.
ii. Re-strengthening and Retrofitting of vulnerable elements.
iii. Application of Disaster Resistant Techniques in new construction and development – Building a Culture of Safe Sustainable Practices in Development Sector
iv. Rehabilitation and Reconstruction Policies
v. Role of Insurance Sector in DRR and Loss-sharing
vi. Community Participation in DRR
vii. Long term holistic and sustainable solutions for DRR
viii. Training in State of Art Technology and Management Practices for different functionaries and officials
ix. Training of staff of local bodies in implementation of building byelaws and safety guidelines
x. Training of Artisans (ITIs, Masons, Carpenters, Plumbers etc.) through hands on practical trainings

7. CONCLUSIONS

A green rehabilitation process that is socially, culturally and environmentally sensitive can provide a wide range of long term benefits to the environment and communities, with positive consequences on living conditions, livelihood and environment.

ENVIRONMENTAL BENEFITS

- Enhanced thermal performances in buildings
- Conservation of prime resources (biomass, fossil fuels, water, air, land)
- Reduction of GHG emissions and waste generation

SOCIO-ECONOMIC BENEFITS

From culturally and climate sensitive design concepts

- Enhanced residents' health
- Improved living conditions
- Reduction of construction and maintenance costs

From improved disaster resistant techniques with local materials

- Awareness raising.
- Capacity Building / Skill upgrading on local techniques
- Job security and growth

From the process

- Community Empowerment

Participatory Process
Capacity Building
Sustainable Livelihoods

- Establishing cooperation and knowledge sharing among stakeholders
- Scaling-up of this approach to other geographical areas and wider realities.

Multifaceted aspects of disaster management require an inter-disciplinary cross-sectoral and multi-level action strategy. But the success of the strategy depends on education, training and capacity development of all stakeholders to make them act in an integrated manner towards a convergent holistic approach for mainstreaming disaster risk reduction and disaster management. Also ―DISASTER-PROOF‖ house does not mean that they will survive a direct meteor strike or a ground zero atomic bomb, but these are unpredictable forces for which appropriate engineering techniques are not yet known.This is an attempt to bring to light, the need of the best managers in disaster management authorities also and not only in MNC's, and the need of technocrats in such authorities apart from being a work geek in some distant land abroad.

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