INTRODUCTION

"The earth does not belong to us, we belong to the earth"

– Chief Seattle

Human beings and the Earth are an interconnected system. An impact that affects one, whether positively or not, will ultimately affect the other in the same manner, but not necessarily to the same magnitude or at the same pace.

The human race is at a never-ending quest for modernizing its life. Nevertheless, this quest has become the bulk of many serious types of global impacts. In the late 1980's and early 1990's, scientists started realizing the exploitation caused by the ecologically irresponsible human decisions and its magnitude on the environment. In the last few decades of the 20th and 21st century, the concern for the environment and the damage that the human race is inflicting on its multiple sectors has risen dramatically. Most of those concerns revolved around global warming and ozone depletion due to green house gas emissions, species extinction, acid rain, toxic waste sites, and growing landfills.

All industrial activities were found to have a certain level of contribution to the environmental deterioration, some of which were severe enough to push them to the point of no return. The burgeoning population has resulted in extraordinary levels of demand for raw materials, water, and energy sources, thus creating unprecedented exchange rates between the ecosphere and the human economic subsystem (Chini and Balachandran, 2002). ***"The world we have created today has problems which cannot be solved by thinking the way we thought when we created them", said Albert Einstein.*** Now, the problem has become multi-pronged.

The environment is fast deteriorating in its ability to support life forms. With every large stride taken towards development, ten strides are taken backward because they fail to protect the environment as well as save rare species from the danger of extinction (UN Habitat, 2006). Scientists and researchers are certain that if the industrial countries do not take drastic measures to stop or at least minimize the depletion of natural resources, and in return reverse the cumulative effect of the global population, the sustained trend in abusing nature will be catastrophic on all living things.

Like any developing country, India too is plagued with pollution. The construction sector, an important part of India's economy, is steadily contributing about eight per cent to the national GDP over the last five years. Fuelled by strong economic growth, rising population and rapid urbanization, it is one of the fastest growing sectors in India today. It also provides employment to eighteen million people directly. The downside is the enormous carbon footprint of the sector. The sector emits about 22 per cent of India's total annual CO_2 emissions as it is the major consumer of all non-renewable resources mankind consumes. It accounts for 90 per cent of all non-fuel mineral use, and a large proportion of timber use (Howard, 2000). Impacts considered from building materials could be addressed at different stages; from processing and manufacturing to logging and storage through installation and use.

Given the massive growth in new construction and the inefficiencies of the existing building stock worldwide, if nothing is done, greenhouse gas emissions from buildings are expected to more than double in the next 20 years (Balakrishna, 2014). As a response to the global attention on climate change, the Indian Government in November 2009 pledged to voluntarily reduce domestic emission intensity levels from between 20-25 per cent by 2020.The Twelfth Five Year Plan (2012-2017) also focuses on achieving a low carbon inclusive growth (Nagrath, 2013).

"We shall require a substantially new manner of thinking if mankind is to survive."

- Albert Einstein

Society has an almost insatiable appetite for buildings which is met by:

- ***Construction of new buildings on vacant sites***
- ***Demolition of existing buildings and their replacement with new buildings.***
- ***Adaptation of existing buildings.***

The quest for housing has tremendously increased urbanization and the built environment resulting in various environmental impacts and environmental degradation is recently being traced to human activities with construction projects (Rubin and Davidson, 2001).

A building's life cycle consists primarily of the construction phase, the renovation and maintenance phase, and the end-of-life phase. Inevitably buildings decline in utility

or usefulness over a period of time. Interventions will be required in order to ensure this stock retains its utility – these interventions come in the form of refurbishments, renovations, retrofits and adaptive reuse or conversion of buildings from one use to another e.g. industrial to office space (Wilkinson and Reed, 2008). That requires global environmental awareness.

Increased environmental awareness means that, rather than throwing away, people can increasingly be told to recycle and re-use. This ethos is also being applied to buildings. Rather than knock down and start again, the option to recycle and re-use buildings is being examined more carefully with a view to gaining cost and embodied CO_2 savings - as it may prove more carbon efficient to re-use what is already built.

"Old ideas can sometimes use new buildings; new ideas must use old buildings"

- Jane Jacobs

Existing buildings that are obsolete or rapidly approaching disuse and potential demolition are a 'mine' of raw materials for new projects; a concept described by Chusid (1993) as 'urban ore'. An even more effective solution than raw material recovery is to leave the basic structure and fabric of the building intact, and change its use. This approach is called ***'adaptive reuse'***. Breathing 'new life' into existing buildings carries with it environmental and social benefits and helps to retain one's national heritage.

Adaptive reuse is conventionally defined as "the process of adapting old structures for new purposes" (Kramer and Seltz, 2011). Adaptive reuse of buildings is a phenomenon of saving old buildings from the demolition ball by recycling, often retrofitting them with the introduction of modern services to cater to a new contemporary usage. It means leaving the main portion of the building structure and shell in place while performing what is known in the trade as a "gut rehab" (Kubba, 2012). A key factor in building reuse is the durability of the original structure.

Many older buildings were designed with detail of fine aesthetic quality built with craftsmanship that is now difficult or impossible to equal. When such older buildings become neglected, it is often tempting to modernize them totally, but in many cases it is wiser and cheaper to restore existing work, making appropriate changes to adapt it to modern uses and needs (Pile, 2003).

There are more than 90 million residential buildings and nearly 10 million commercial buildings in India today. These buildings together use 1/3rd of all energy consumed in the country (Gautham, 2009). Adding up to this existing stock will only add to the using up of resources and emissions of carbon. Identification of possible impacts of building construction projects on the environment is a task that needs to be accomplished for the realization of an effective environmental solution.

Chairman of the IGBC Green Existing Building Rating System, Mr. Arora, at the Conference on Green Existing Buildings by CII, had suggested that the focus should be on the existing buildings to solve energy and water crisis. Stating that India is the fourth largest carbon emitter, he said that the only solution to these existing problems is making the existing buildings green. By doing that it is estimated that India can save 20-30 per cent in energy, 30-40 per cent in water and at the same time, enhance great occupant health and comfort.

"Buildings are brick and mortar! Green home is a culture!!"

- Theodore Roosevelt

Jacobs (1993) stated **"the greenest building is the one that is already standing"** as:

- Repairing a building rather than tearing it down saves natural resources, including the raw materials, energy, and water resources required to build new.
- It prevents pollution that might take place as a byproduct of extraction, manufacturing, and transportation of virgin materials.
- It would avoid creating solid waste that could end up in landfills.
- While taking up existing structures for reusing, it can be equipped with environmentally friendly solutions that will achieve higher operational performance making the workplace energy efficient so that the resource and energy consumption decreases along with the carbon emissions and waste.

"Every profession bears the responsibility to understand the circumstances that enable its existence."

— Robert Gutman

Today, high vacancy rates, deferred maintenance, and in many cases abandoned spaces have left gaping holes in the fabric of the urban communities. Adaptive reuse is

the ultimate end game for empty, abandoned space in metropolitan and cosmopolitan areas. It is a special form of refurbishment that poses interesting challenges for designers.

The design, construction and maintenance of building have a tremendous impact on the environment and natural resources (Blowers and Hinchliffe, 2003). It is generally said that if the design profession is the solution; adaptive reuse is the tool. Adaptive reuse is a potential opportunity to develop a solution that meets both the financial needs of owners and the functional needs of consumers through design that addresses the nuances unique to the customers. Designers can help to appreciate what has already accomplished and to revive, repurpose, and reuse what is already created (Davenport, 2012).

In the technology driven society where everything is just a click away some 44 per cent of India's rapidly growing carbon emissions have urban origins, emanating from transport, industry, buildings and waste. This highlights the potential benefit of a new model of urban development (The New Climate Economy, 2014).

The reuse of older sites and buildings for new uses is a sustainable choice in building. It conserves land, saves energy and resources, preserves the heritage, saves money, and provides employment thereby satisfying the triple bottom line of sustainability – Environmental, Economic and Social. According to a white paper prepared by the CII, the general awareness on green buildings in India is scarce and scattered. Less than two per cent of rural and eight per cent of urban population is actually aware of what green building practices are and how they will help them (Gautham, 2009).

Though the concept of Adaptive reuse of buildings has been mainstreamed in the developed countries, it is still a nascent concept in India that presents a huge opportunity to conserve energy and heritage building resources, giving a new lease of life to the mammoth stock of structures that dot the cityscapes but, due to lack of information and research in this field, no specific actions were taken to reduce or mitigate the damage (Lambah, 2010). This system has been in practice, though on a different mask. But in recent years, the trend to refurbish for adaptive reuse is gaining momentum as commercial centers and business enterprises are on the lookout for spacious structures which are functionally obsolete and capitalizing on zoning and building laws coupled with the real estate boom the practice has really reached its peak of recognition. The role

of all stakeholders – government, public, local governance, business men, building owners, architects, interior designers, civil engineers- on this issue is paramount.

This endeavor further obliges to the nation's call to preserve and reuse existing buildings citing environmental benefits. These factors inspired the investigator, a research scholar in Resource Management to launch a study on **"Adaptive Reuse and Refurbishment of Buildings as Prospects for Sustainability"**. As the whole exercise is a means of locating resources from wasted resources instilled a genuine interest in the investigator to take up the study which was launched with the following objectives -

- ***To assess the views of architects and interior designers on adaptive reuse of buildings***
- ***To analyze the pros and cons of preference for existing buildings to new construction***
- ***To examine the trend in the type of adaptive reuse practices in the City***
- ***To elicit information from architects and interior designers regarding the use of eco-friendly materials in construction***
- ***To create a database on the various creative ways of adapting and reusing existing buildings.***

Hypothesis:

- ***Concepts on green technology and use of eco friendly materials are ingrained in the construction aspects and are followed by all clients.***
- ***Architects and Interior Designers insist on green tech practices and use of eco-friendly materials as essential mandates in all their projects.***

It is hoped that this study would help to bring out the important details regarding adaptive reuse of buildings, their advantages to the environment, and simultaneously generating awareness on creative ways of reusing buildings and green practices during adaptive reuse that can lead to sustainability. This knowledge would also strengthen the approach of how adaptive reuse of buildings can lead to a sustainable future with existing buildings being the zenith/priority.