

# REDUCING THE NEGATIVE ENVIROMENTAL IMPACT OF BUILDING CONSTRUCTIONS

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**Abstract:** *In these times there is a much greater awareness of the environmental impact of the way we live, than at any time in the past. For better constructions we must use materials that provides a very low environmental impact, locks up carbon (negative emissions) and can create very thermally efficient, healthy, comfortable buildings. It is vital that in the future we design and construct buildings that consume as little energy as possible in their use. It is possible to make a significant additional contribution to the reduction of CO<sub>2</sub> emissions by building with natural products.*

**Key words:** *environmentally friendly buildings, construction, ecological, carbon footprint (CO<sub>2</sub>).*

## 1. Introduction

Behind every engineering feat there is an idea, a design and a construction project. When a project is conceived, we can help make the plans a reality by ensuring processes run efficiently, construction sites are safe and reliable materials are used.

A modern environmental architecture will have to respond to the modern context, which is far more complicated than the one within which traditional builders worked. Design decisions today contribute not only to local environmental problems, but to regional and global ones, and to health problems as well, [6].

Modern buildings, represent an extraordinary achievement but with a hidden cost. They make life easier for many today, but their construction and operation inflict grievous harm upon the environment, threatening to degrade the future habitability of the planet, [6].

Buildings consume large amounts of energy and raw materials, which is a heavy burden on the environment. The large quantities of materials extracted from the natural environment (quarry quarries, gravel, gravel sand, wood in forests, etc.) cause severe injuries to the natural environment. Each of these interventions can influence humidity, air currents, ground-waters, fertile soil, etc., which has costly repercussions for the ecosystems on which it operates. See [3, 4].

During the exploitation period, new pollutants are present, mainly represented by the energy consumption and the disposal of the residues conditioned by the use of the

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constructions (household waste in residential and industrial buildings, agricultural, etc., very different in quantity and from the point of view of harmfulness).

The impact which a building has on the environment should be evaluated from the beginning, starting from the project planning, the selection of the resources and the materials, from the factors involved in the building process, and the abilities to manage the activities during the construction lifetime.

The application of sustainable development principles in the building construction field aims to reduce resource consumption, waste production and negative environmental impact while warranting the high quality and utility of built-up areas.

## 2. Related Research and Discussions

Environmentally friendly buildings are those that aim to consciously fight against environmental degradation. Bioclimatic constructions are based on the idea of a balanced way of building, emphasizing on the fact that the modern habitat is far from giving to the residents a healthy environment for living. Modern construction could be argued to be moving more and more away from its function as a biological mediator between man and nature. Sustainable development seems to be the most logical and viable solution.

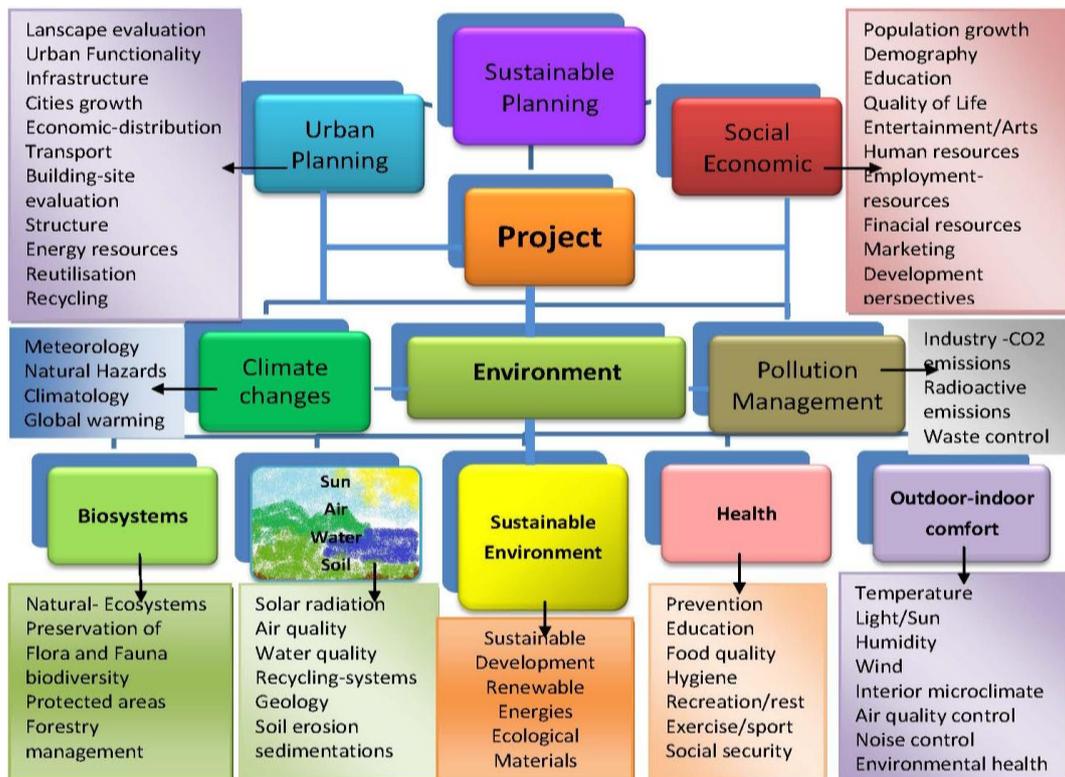


Fig. 1. *Project impact on the environment*

It may not be the architects, designers, engineers and planners that are responsible for the increasing number of constructions and urbanized areas, but they are responsible for the

energy inefficiency of many of them, and the global impact that these items have on the environment. It's very important to understand how new building projects have hurt the environment and how they have contributed to climate change over the years. The following are some of the major ways that building construction causes damage to the planet, and requires a new approach.



Fig. 2. *Global environmental impact of buildings*

#### • **Environment and Natural Resources (exploitation risks and prevention solutions)**

- Evaluating the existing microclimate of building-site areas (geological studies, hydrologic evaluations, seismologic risks),
- Preserving and analysing the characteristics of local geo-systems, natural and human resources, economical issues, [2]
- Evaluating the effects of the building constructions over the natural water resources (water flow, water pollution, dysfunctional water ways and streams)
- Choosing the appropriate solutions for treating water waste, preventing the infiltrations in the groundwater layers, or preventing the excessive water consumption.
- Espouse measures for soil protection (in regards to excessive forestry, erosions, landslides)
- Taking measures for preserving the eco-system balance, local fauna, flora and landscape.
- Recycling the solid waste, protection in case of chemical waste and toxic substances.
- Evaluating the environment changes in regards of social and sanitary population care.
- Evaluating the risks in case of inappropriate water utilisation and lack of waste recycling in creating health issues for population.

#### • **Management of Building Constructions Resources and Technologies**

- What can be produced and sourced locally, on a country or on a continental regional scale of building materials for houses, buildings and other constructions?
- Which materials in use today can be replaced with more environmentally friendly products, or even better and still sustainable products?

Building techniques and materials which have been used in buildings that have stood for hundreds even thousands of years are largely being ignored in modern constructions, and many modern buildings are being built with an estimated or realistic lifecycle of less than 50 years. This may in many countries not be an economically sound investment, neither for the building or unit itself, nor in terms of the cost of that unit's share of managing the global

environmental crisis that we are experiencing.

➤What can be done in terms of reducing the environmental footprint of raw material extraction, processing, forming/shaping/producing/manufacturing and transportation?

In many countries including the Scandinavian ones building codes have gotten stricter over time and are getting stricter still. Buildings located near lakes, seawater and in other geographically attractive locations may not be approved for construction anymore. What one is seeing examples of along the Eastern and Southern Norwegian coast to provide an example, is that well built, solid constructions that can be relatively easily maintained and upgraded are allowed to be repaired and slightly modernised (energy efficiency etc.) even in the very strict zones. Whereas poorer constructions from the late 1950's, to the late 80's are becoming beyond easy or manageable repair, and the land is effectively losing its value, or becoming worthless in construction terms.

As the climate is changing, the impact of weather, and as an example wind and water especially, in open spaces not shielded by mountains and forests seems to be becoming more severe. This has a fundamental impact on many constructions, but as one can see from especially the United States of America, The Caribbean and the Continent of America, the lighter, and not properly constructed structures cannot withstand the elements as well as properly built houses. These factors have huge consequences from economical, sociocultural, and environmental perspectives to mention a few.

It is fully possible to make buildings that will last, that can be easily maintained, that are quite energy efficient, and which will keep the upkeep costs of running the building over a lifetime, within acceptable ranges. For many people involved in the building industry a lack of knowledge, may be a key factor, but for many there are also lack of incentives for proper constructions. As important as the construction technological challenges itself, the key factor to more sustainable development and better financial and environmental investments of our resources, are the larger political will and framework, [1, 5].

For those building a house or making a safer investment which the property sector is considered as, there are incentives to making long term sensible investments, which many of today's environmentally friendly building projects can be considered as. For other sectors there are fewer incentives. Sections of the following sectors and industries; construction industry, producers, bureaucrats, politicians, etc. may not have the same incentives, or understand the same need.

Large construction projects that tend to have difficult processes, poor management, and the cost overruns are essential to large scale corruption. Unfortunately on a global scale, creating the framework needed from the construction sector, the financial sector, the labour sector, the environmental sector and from societies as a whole is going far too slowly. The understanding of the necessities of such transformation is lacking, but there is hope as one can see that important sectors of the finance industry which have often been a key part of the problem, is now seeing sustainability as a necessity, a good investment and source for considerable financial wealth creation.

- **Indoor Air Quality**

Modern buildings also create dangerous indoor environments for their inhabitants.

Ventilation systems installed to protect air quality often hurt it, subjecting occupants to stale air for hours on end, or harboring and spreading unhealthy molds. Headaches and nausea can result. [6]

The *sick-building syndrome* is more and more frequent and the causes mainly are thermal discomfort and low air quality. The research proved on a group of 4000 persons (43.1% males and 56.9 % females) who are working in a office building in Frankfurt, showed the following discomfort factors: room microclimate 65.4%, noise 32,7%, weak light 25.5%, lack of space to the working place 23.5%, working extra-hours 12.8%, stress from the staff 9.7%, competition 7.1%. The results showed that the rooms microclimate, due to the architecture and equipments, affect not only the comfort of the occupants, but also their health. See [4]

Sealed buildings also trap volatile organic compounds that can seep out from composite materials, furniture, carpets, and paint, and accumulate at concentrations hundreds of times higher than those just outside. Long-term exposure to some organic compounds may increase the risk of cancer and immune disorders, [7].

The medical and worker productivity costs of unhealthy indoor air may run into the tens of billions of dollars each year. In addition, some researchers suspect that forced air circulation may facilitate the spread of airborne illnesses like the common cold and influenza. If these suspicions are correct, the economic impact of sick buildings could run to hundreds of billions of dollars annually.

We can improve indoor environmental quality by waste management with storage collection and better reuse of recyclables and construction formwork and waste. See: [6]

Other solutions can emerge from laboratories, where researchers continue to develop healthier, more resource-efficient materials and technologies. Increasingly, successful building will recover some of the ancient techniques recently discarded by designers and combine them with new technologies to create a synthesis that is better for the environment, and better for humanity.

#### • **Waste From Building Construction and Demolition**

Construction system and site management can be protected by:

- minimizing on-site construction;
- reducing material wastage and construction wastage to land fill sites;
- reducing polluting effects of construction and from workers during construction.

Clearly, the building industry-designers, financiers, developers, and contractors have a key role to play in the creation of a sustainable society. The important question is whether it will act fast enough. In the last hundred years, the amount of heat-trapping carbon dioxide in the air has risen 27 percent, of which one-quarter has come from the combustion of fossil fuels to provide energy for buildings. This build-up threatens ecosystems, agriculture, and human settlements with higher temperatures and changed weather patterns, [6].

Since buildings are the business of everyone, all concerned need to contribute to minimizing the industry's impact on the environment and on human health. Governments, educators, investors, and consumers can help the building industry alter its course by formulating better policies and making better investment decisions, [6].

Better construction and use of buildings in the European Union would influence 42% of final

energy consumption, about 35% of our greenhouse gas emissions and more than 50% of all extracted materials. It could also help to save up to 30% of water consumption, [3].

#### 4. Conclusions

Reducing the environmental impact by managing the natural resources and materials in order to create products and services, is a key for the development of the new generations by allowing them to balance the traditional methods with innovative, cutting edge technologies. Through life-cycle thinking and analysis one can better manage the natural- and manmade resources, the materials and the efficient use of energy, that goes into construction and life time operation of buildings and constructions. Decreasing constantly and gradually the use of fossil fuels, and traditional resources will lead the future communities towards Net Zero Energy status concepts.

Nowadays the integrated planning, the architecture and engineering design have concluded that the focus on the beneficiary's desires, respect for the environment and site will lead to a sustainable growth and should also create a social integration within the modern communities.

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