Does contemporary methods of building design compromise ecolological demands?

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Abstract

Our children do not inherit the earth from us – we borrow the earth from them.

Artificial surroundings lead to either hot or cold weather; bleak winter to stifling summer.

INTRODUCTION

The ecological demand increases with the threat of devastation of our natural environment in one way or another. To a certain extent global warming, affected biodiversity, deforestation and pollution are all factors caused by human interference and in addition it has been said that the planetary and human needs have become of lower priority with the growing industrial and technological development. The building design amounts for up to 50% of the CO2 emissions in the atmosphere (Birkeland. J, Design for sustainability). It has been said that great extremes in temperatures and dried up supplies of natural resources is the intermediate consequence. The UN Conference on Human Environment in Stockholm in 1972 brought a worlwide agenda of ecological demands. For the last 30 years the development has evolved into hundreds of national, regional and global partnerships with an agenda to enhance the human environment as part of the Earth Summit.

The industrial and technological progression has led to a society that relies on fast solutions, communication, effectiveness and technological progression, and it has brought
some convenience that the modern society has become dependent on. Consumerism and rapidly changing trends has created a wealthy business for some designers.
As a key figure within the building design interior architects, architects and designers have got a great opportunity to effect the client and the population into a sustainable development as well as the demand for more ecological manufacturing processes and products.

Rapidly growing urbanisation and with it over pollution and over crowdedness calls for changes of the building construction. Morale and responsibility should encourage a sustainable development to decrease the consumption of materials, resources and fossil-fuel driven energy.
Methods of Building Design should be cooperating with the natural elemental sources, it should be humane and based on social responsibilities.

CHAPTER I

ECOLOGICAL DEMANDS- ENVIRONMENTAL DAMAGE AND INTERACTION

Human and planetary living needs

All living beings on earth are part of the photosynthesis and the food chain.
The key element for life on earth is Carbon. Its main task is to provide the earth with right temperatures so that the living species can live there. The process to do so incorporates all plants and micro-organisms as well as water and rocks.
The Carbon Cycle needs to be in balance with the photosynthesis and the food chain to create a healthy and existential environment for the earth and its occupants. Too high degree of effluents of Carbon dioxide in the atmosphere will suffocate and destroy the vegetation, which will loose the ability to convert carbon into complex substances such as oxygen which will further increase the CO2. It is mentioned that through human interference, modernising societies and industrial development the earth has become unable to naturally keep a balance between the "wheels of life", leading to climate change, global warming, ozone holes, melting of the polar ices, raised sea levels and polluted air and water. Those are factors that are all threatening to destroy all life on earth and that in a near future.

> "Some say that all glaciers in the eastern and central Himalayas will disappear by 2035 and that it will be devastating for the populations that rely on the great rivers like Ganges which are fed by melt ice. (Smith, Peter F, Architecture in a Climate of Change, 2001). Others say however that these predictions are not based on real facts. More investigations will need to take please to determine the correct truth."

> "It has also been said that illnesses like vector born malaria and Leishmaniasis will by year 2020 have spread to the southern parts of Britain, all caused by global warming and higher temperatures. (Smith, Peter F, Architecture in a Climate of Change, 2001). However this too is to be investigated into though there are differing ideas with regards to the subject as well as the costs involved to stop the developments."

Human Experiencing Needs

Industrial and technological developments have had prosperous advantages in the progression of the world economy. However, it has led to more negative costs to the natural environment including wellbeing and health of living beings. The demand for fast and economically advantageous solutions within the building industry, to serve the needs for a rapidly growing migration and industry within the cities, has led to an artificial movement. The effects point in a devastating direction with low energy efficiency, pollution, stressed working environments and society, health problems and sick building syndromes. It sounds negative but it is all possible to change. Fast solutions and effectiveness are key issues of our modern society and with increased population comes increased competition as well as a wider gap between classes. Social problems increase with the size of the cities and its artificial surroundings. To bring up an example, the worlds most successful society within the technological development, USA, has in addition the worlds highest rates of mental illnesses (33%) and crime. Between the years 1981 – 1994, more young men were killed caused by mentioned issues than in the Vietnam War (Day C, Spirit and Place). Psychological studies, in relation to the built environment, shows that the disconnection from natural processes and surroundings creates a loss and an imbalance of the human experiencing needs.

The 5 Human Experiencing Needs
(after God)

1. Human Contact
2. Communication Needs
3. Animal Contact
4. Vegetation/ Nature
5. Artefacts

There are five needs or sensory impressions that according to the research needs to exist around human civilisation to make a society complete in regards of personal and social welfare (Hesselgren S, En Arkitekturhistoria baserad pa Psykologisk Forskning)

"The 49% of Russian food grown on minute (600-11—square metres) private plots isn't just for physical survival, it keeps people healthy in body and mind."
(Day C, Spirit and Place)

Affecting Factors

The first international environmental conference took place in 1972 in Stockholm, The UN Conference on Human Environment. The Conference led to the formation of the UN Environment Programme (UNEP), which has for the last 40 years developed into a worldwide development called the Earth Summit process. Other conferences have taken place after that, such as Hague, Rio, Kyoto, Johannesburg for example, with a public goal to strengthen global commitments on sustainable developments. Despite set regulations and targeted decisions, very little has been done in 2003 by the developing and industrial countries to decrease the main factors for CO2 emissions in to the atmosphere. The increased competition between industries and the industrial countries, unsteady stock markets, greed and fear of economic crisis seem to be the reasons.

The building Design of today 2003 includes a large quantity of non-renewable recourses such as fossil fuels and metals etc. This production needs an exorbitant amount of energy to create materials that are usually highly toxic and contains wasteful by-products. The content of the production affects the land and damages the bio-diversity at source of lineage. Estimates show that because of a swiftly growing population, urbanisation and lifestyle expectancy, the quantity of materials used in current building methods will have raised 3 – 4 times by the year 2020 (Birkeland. J, design for sustainability). Yet, at the same time it is said that the earth is about to run out of material resources. Intelligent decision making is needed to create a sustainable building design, architecture and environment.

The main activity that creates an imbalance in the natural wheels of life is the burning of fossil fuels. Fossil fuels contain a large amount of Carbon and they are most definitely the largest reason for the global warming of the earth. Fossil fuels are not only great pollutors but the earth is also about to run out of its supplies.

" According to Peter F Smith estimates show that we are in the peak years of the world's oil production. The availability of oil will comprehensively decrease by the year 2005 which will lead to a major oil shock already five years later (2010). Larger reserves will only exist around the Caspian Sea, which belongs to Russia and will leave the West World as a minority within the global economy (Smith, Peter F, Architecture in a Climate of Change, 2001, pg 17)."

"The gas reserves in the North Sea are estimated to last for about 20 more years. By 2020, 90% of the gas in Britain will be bought from Iran, Nigeria or Russia (Ministry of Defence, 8 February 2001)."

"The nuclear reactors in Britain are getting old and British legislations are set to run only two stations by the year 2008 (Smith, Peter F, Architecture in a Climate of Change, 2001, pg 17)."

Freshwater is essential for the survival of life. It cleanses, transport waste, and frees the body from radicals while polluted water in turn spreads disease and carcinogens. Yet, fresh water is becoming less usual and it may become the most rare resource in the future; Only 3% of the world's water is freshwater whereby 22% of it is in one place, in Lake Baikal – Siberia (Day. C, Spirit and Place).
Freshwaters main task has for centuries been for drinking, cooking and washing. Through modernisation people have moved indoors and dwellings, offices, supermarkets, shops, car parks etcetera has been built. Today, buildings in the UK consume 140 litres of freshwater per person every year and only 0,7% of that water is drunk (Day. C, Spirit and Place). Overall, buildings consume 1/6 of all freshwater supplies (Brown 1996), which leads to polluted drinking water and the emergence of

carcinogens. On top of that the Sewage treatment works themselves are major polluters though they cause disposals of toxic sludge and use substances like aluminium salts and chlorine that in the end will be let out in the natural environment and sink to the ground water level, which in turn will be used as drinking water.

2.Ethics and social responsibilities

Fossil fuel is part of our daily society. It heats up the homes and other buildings. It gives us hot bathing water, run our cars, vehicles, trains, planes and buses. It runs the oven, toaster, tea cooker and the hairdryers, the lighting and the copy machine at the office and the machines in the manufacturing of everything from matches to clothes to building materials. It has become a part of the global economy and it does make peoples lives convenient and easy. There are still people among us who think that the earth is here to supply us with what we need and it will repair the damage that we bring on its own. Facts show the opposite. However, evidentially there are more environmentally friendly alternatives. Those are alternatives that can still make lives efficient, comfortable, and the economy going. It is just a matter of knowledge, wisdom, understanding, education and change of mind-set and lifestyle changes. Among the elements of Agenda 21 that was assessed at Rio + 5 in New York (1997) issues like Information, Public Awareness and Education were proclaimed, see figure 1. There is something to do for everyone. In Sweden among other countries it has become common practice to collect the household rests in four separate bin bags instead of one. One for recyclable materials, one for plastic, one for carton and one easily decomposable food rests etc. These developments where supported by the government as a part of Agenda 21. Information has been sent out to all households and schools and the Swedish population has been educated into a new lifestyle thereby. Though I was born in Sweden but have been living abroad and therefore not having been part of this development I noticed the change in peoples way of thinking. Information and knowledge has brought a willingness and a positive pride of being part of an environmentally friendly development.

Figure 1. Elements of agenda 21(www.earthsummit.org)

Social and economic dimensions to develop	Poverty, Production and Consumption, Health, Human settlement, Integrated Decision – Making
Conservation and management of natural resources	Atmosphere, Oceans and Seas, Land, Forests, Mountains, Biological Diversity, Ecosystems, Biotechnology, Freshwater resources, Toxic Chemicals, Hazardous Radioactive and Solid Waste
Strengthening role of Major Groups	Youth, Women, Indigenous people, Non-Government organisations, Local Authorities, Trade Unions, Business, Scientific and Technical Communities, Farmers
Means of Implementation	Finance, Technology transfer, Information,PublicAwareness, Capacity Building, Education, Legal Instruments, Institutional Frameworks

The architects / designer's role.

The disposal of waste increasingly grows alongside economical systems of consumerism and rapidly growing technologies unless used advantageously. The sense of identity and information technology plays a major role in societies and it is meant to be seen in the way we live, where we work, how we dress and in which brands we purchase. Companies and shops, lead by the Designers, follow the trends by more regular, often seasonal changes of facades, interiors and logos with the result that the meaning of waste is no longer an end product of materials that are no longer useful or practical. An increasing part of the waste is products that have simply become "out of fashion". The "out of fashion- products" have become an ecological cost of obsolete and devaluated resources, although yet well functioning and with a lower value of embodied energy.

The Building Designer plays a key role in a society. Though the building design plays a large part for the pollution and burning of fossil fuel, his/hers moral responsibilities would also be to lead the way within the development of an ecological environment. Unfortunately there are designers/ interior designer / architects and other trades people involved that lives superficially, designing only for the sake of the aesthetics. The United Nations Earth Summit 2002 led to the rise of thousands of local Agenda 21 initiatives/ partnerships and the formations of legally binding conventions such as Biological Diversity and Framework Convention on Climate Change and a Statement of Forest Principals. Yet, Jonathan Lash, the President of World Resources Institute, who joined the conference in Johannesburg 2002 was not all satisfied. He said that an "opportunity was missed to increase energy production from non-polluting sources and provide companies taking action to reduce emissions with a secure framework for their actions " (www.johannesburgsummit.org).

Though the sustainable subject lies within a comprehensively broad area it can be difficult for the designer to follow-up every step that is made within the different stages. For that reason, for the last years a new profession has been brought forward, the Environmental Designer. The Environmental Designer's role is to be up-to-date with the sustainable advance and to educate and to work side- by- side with the Designer/ Architect/ Engineer.
However, precautions and considerations should be taken into account and brought into the Designers standard agenda to bring the ecological design approach forward. To be able to keep the building design ecological and environmentally friendly it is important that the designer take part of the responsibility to gather knowledge and information about appropriate choices of materials and building methods. By choosing reused or recycled materials for the building design there will be less industrial influences leading to a decrease of pollutant substances into the natural surroundings. Processes by which specific ingredients are manufactured should be questioned and suppliers should be obliged to demonstrate that local legislations and acceptable ecosystems regarding emissions have been attended. It would help to restore the natural environment, the ozone layer and to reduce land devastation

caused by waste from non-renewable resources. To further decrease transportational costs the designer should, as long as it is possible, choose materials that are locally available. To build with local materials would in addition produce recognition and evoke a sense of positive pride among the local population.

CHAPTER II

ECOLOGICAL METHODS- THE SOLUTION

3. Sustainability

The cities in the worlds steadily grow. Estimates show that the population of the world now have reached an urbanisation by about 47% and by the year 2006, 1% of the land on earth will inhabit about a half a million of people (Yeang, Ken The Green Skyscraper). More and more people are moving into the cities to live and work or study. The cities become overcrowded and over-polluted and as long as there is no trend of rural development and therefore also a rural migration we need an urban solution to match the changes of our modern behaviour and environment. In order to develop living needs and spaces for the growing population of the cities we seem to have two choices. We can either expand the width of the cities or we can build upwards. The opinions are many and divided. One part means that the design methods should be of natural shapes and human scale (Day C, Spirit and Place). They claim that the high rise dwellings consume an alarming amount of both materials and energy that destroys the surrounding eco-system, the environment and the landscape the high-tech spokesmen means that the comprehensive picture should be considered to understand the positive advantages. By viewing the overall picture the high-tech spokesmen mean that the energy consumption per habitat will fall considerably. By calculating on not only the environmental systems but also on the buildings life cycle and on the larger web including living species they mean that the "skyscraper" is the best solution for a fast growing city. By letting people live on top of each other the diameter of the town would be smaller. The distances to work, school and other daily facilities would be shorter and the use of a car would decrease considerably. Shorter distances would increase the practicality for public transport as well as for pedestrian and cycling movement.

Building small cities within a city creates a sense of belonging and security.

“ Walking becomes important by approximately 100 units/hectare “ (McLaren, 1996). “ The energy used by driving a car 5 days a week/year for a 30-kilometre roundtrip emit as much amount of energy as for heating a house for the same period “ (Hertzog, ed, 1996).

Joseph Prince, who is the founder and pastor of a prominent church in Singapore, New Creation Church, asked God for a word for his church people for 2016 and the anser was that the people should walk for 20 minutes 2 days per week. Health is also an element that needs to be taken into account when building architecture and interiors and design but also full infrastructures.

So if this is to be done then there would no longer be a considerate need for a car in peoples everyday lives, and therefore not as many parking spaces within the cities. The parking lots could be converted into pedestrian usage and/or green areas or living facilities and cycling roads. A great advantage of this kind of design method would be the use of materials. As they see it, high-rise dwellings are huge and because of the great size building materials offer great opportunities for recycling, restoration and recovery at the end of the entire buildings life, to be used for other purposes instead of new energy consuming resources. This is a consideration. The 1960’s high-rising concrete blocks might give one and another a shivering and reminding thought of disaster and social maladjustment. And some could refer to the psychological research made from evidential failure in fulfilling the 5 human experiencing needs. But by comparing the two one will soon realise that this new development has nothing much in common with the latter one.

Until recently, for a long time holistic approaches versus technological seems to have been standing on contrary sides. The new movements, though, encourages to knot these sides together. Whether building on the height or on the width the first decisions should be holistically considered. The building should be considered in relation to the entire site; the surrounding environment, the wind, sun, vegetation, directions and materials. Some proclaim that to create dwellings with low environmental cost the three key factors Climate, Energy and Materials should be

carefully calculated on ever from the beginning of the planning.

Environmental Construction

By positioning the building in the right directions the natural elemental forces could perform as free energy for ventilation, heating, cooling and lighting.
Electricity is the most used element in our daily society. At the same time it is said to be among our worst CO2 emitters. Alternatives and more energy-efficient methods should be considered such as micro-turbines, solar panels and hydrogen powered fuel cells for the production of electricity, heat and water. The most adaptable for the building design is the solar energy. Different methods are to be chosen such as passive or active solar systems as well as photovoltaic cells. The adequate choice should be made upon a careful outline of requirements, purposes and structural, human and climatic needs and uses. As with the nature itself the different applications should be used in collaboration with each other to gain effectiveness of the ecological use.

Solar systems would be used to heat the internal and/or external building through glass, cells and/or on heat absorbing materials to be stored in heating systems or batteries, or in slabs and walls to be gradually released during the evening. Appropriate insulation levels should be provided to make a sufficient use of heat gains as well as heat losses during the changing climates of the year. There should be an even balance between the heat gaining south side of the building and the heat loss on the north side. Compact building forms would decrease the heat loss and appropriate sizes and positions of windows would maximise the overall gain.

Solar shading, external and/or internal would prevent from overheating and glare. As a construction, movable devices are preferable though they, in the summer, could be regulated to obtain solar energy and sunlight whilst they as closed devices in the winter would protect the building from heat loss. Again, the position would require a well thought about and flexible precision though the sun lits higher respectively lower in the four cardinal points. However, the most green option to offer would be the use of trees, plants or vines which would not only work as explicit shading

devices but also, in cooperation with a natural ventilation system, to increase air quality, the carbon cycle and the general mind, SEE FIGURE. Their thick vegetation of leaves would screen out the sunlight in the summer and the seasonal felling in winter would provide the building with required warmth and energy by letting the sunlight through. The choice of greenery would have to be considered carefully in terms of seasonal growth, required position and climate. Preferably existing plants on site or of local availability should be used.

Movements within the advance of natural ventilation systems have increased in use although most commonly yet in a mixed combination with artificial mechanical ventilation and air-conditioning. Besides of being comprehensively cost-inefficient, both economically and environmentally, the air conditioning system has proved to be a health hazard though it transports the same air time after time around the building and therefore collect and spread bacteria's in its way. Natural ventilation on the other hand provides fresh air, usually enhanced by greenery both from the outside and inside of the building, see fig 2, although precautions has to be made in relation to the pollutions. Diagrams of diesel particulate matter zones should be calculated and the air intakes positioned above those levels.
The planning for a good natural ventilation system requires a plan provided for cross-ventilation. The natural system relies on the gravity whereby cool air is heavier than humid air and therefore forced downwards towards the earth and the internal building. The ventilation system uses the night-time air to cool the structure and, during the day, sometimes with the help from wind catchers and/or mechanical devices, increases the fresh air movement through provided paths and turbines built into the structure of the building to give appropriate and healthy ventilation for the occupants. High ceilings, air columns and in some cases verticle towers as well as minimised openings would help to increase the flow. The building should be provided with openable windows for manual airflow adjustments in changing weather conditions. To further increase energy-efficiency the choice of eco labelled and low energy products in everyday devices such as lighting and office equipment should be part of the standard routines and knowledge around the occupants.

Artificial lighting accounts for up to 50% of electricity costs in many modern office buildings (Edwards B, Sustainable architecture, pg83). Yet, evidence has shown that the use of natural light tends to increase health and well being among the occupiers. Manual task lighting and centralized control over general lighting levels, preferably with alternative "manually on" – "automatically off" switches, would help to keep the electricity costs down. The use of daylight should be maximised by appropriate positioning and use of windows and a good space planning. The main side of the building should face close to south and working spaces should be positioned in angle with the windows to replace the use of artificial light as well as maintain awareness of time and outside environment. Adjustable light shelves could be used to reflect the daylight into the room thus preferably onto the ceiling to perform additional illumination.
However, this method would only be effective on a sunny day. The glazing industry is currently under a rapid development and several types of glazing could be chosen to eliminate overheating and glare effects.

The use of fresh water could be used differently than it currently does in the western world in order to create effective use of the resources that have been handed down to us. The use of rainwater could be an important and cost effective source as a complement to freshwater. However, the treatment should be considered carefully though the conventional way of catching the rainwater into conduits, ditches, risers and pipes have a tendency to increase the risk for floods, pervious paving and soak ways. Preferably rainwater should be collected where it falls and dismissed as slow as possible. It could be detained in tanks on-site and used as grey-water in for example toilets. With regards to gardens filters are available in different grades as well as ways to create different PH to the water to make the produce clean, organic and edible for people and animals. Further on the quality could be improved by the use of the Greenhouse system to create a class 1 drinking water, again with preferred alkaline and other ph options as well as a complete restoration of the water from added chlorine, metals etc. Depending on where the site would be positioned one would have to conform to the amount of waterfall per capita by for example using mains water as a security for top-up or, in areas with a comprehensive rainfall, create wetlands or ponds.
Biological Sewage treatment systems could be an alternative to the conventional

wastewater treatment works that not only have many environmentally but also economical advantages. Instead of transporting water for long distances through pipes from buildings to treatment works smaller and more local systems could be built. That would not only save the cost of construction and maintenance but also of pipelines and pumping cost. As mentioned earlier the conventional sewage treatment systems emit a large part of pollution to their surroundings. The biological wastewater systems should be run naturally.

4. Materials and Choice

The building design has become less durable. 1940's buildings still stand steadily and without greater need for refurbishment while the modern counterparts have been set to a life-span of about 40 – 60 years within the European building design. In addition, regular refurbishment and stylistic changes has become a normal and usual process within every 5 to 15 years providing great expenses of usually non-renewable materials and energy. (Day C, Spirit and Place).

To create an ecological and environmentally friendly building design the global and holistic impact should be regarded as a whole to improve the sustainability. By the choice of building materials the complete life-cycle should be regarded and ecological and environmental impact as well as energy should be calculated on. Studies show that the best way to decrease the effluent of Carbon emissions are through the built environment, though the building in use or in the course of erection stands for up to 50% percent of total emissions based on carbon emissions that are produced by fossil fuels. By adding transport cost on top of this UK government estimations increase to number to 75% (Smith. Peter F, Architecture in Climate of Change, 2001, pg 15).

Random and unnecessary solutions should be avoided and materials with low embodied energy should be chosen before materials with high embodied energy. The design should be made so as to minimize the quantity of materials and design methods should be applied to prolong the buildings life as well as to decrease the need for refurbishment. Recycled or recyclable materials should be of primary choice, preferably with local availability.

Life- Cycle Assessment and Knowledgeable Sources

One method to assess the total environmental impact of a material is by the life-cycle assessment. The life-cycle costing is a calculation made on the entire embodied energy. It used to assess the total environmental impact connected to a material and its use, from extraction to manufacturing, distribution and use to disposal. The method should be used in the early stages of the planning as a precise guide and decision maker to the best ecological use of materials for the construction, were to get them as well as to decide whether the building in its end should be demolished, dismantled or reused (refurbished). The method is as thoroughly as to trace finite materials such as electricity, copper and water as well as carbon monoxide, nitrogen oxides and hazardous chemicals and it is a good instrument to minimize ecological damage, maximise recycling and to save virgin materials from unnecessary extraction.

However precise in results, the life-cycle assessment is a time-consuming process and the contemporary designer should always be up-to-date with the progress of the ecological development. The gathering of information from knowledgeable sources, literature and/or Environmental Designers should always be part of the designers agenda to enhance the ability to select and promote materials and methods to a minimum of environmental damage. One source for information among others are the AIA environmental resource guide that was established by the International Union of Architects as an addendum to a section of Agenda 21 (Steele J, Sustainable Architecture, Principles Paradigms and Case Studies, 1997, pg 16). Some of the acquaintances from such research are mentioned below.

Materials

Glass

Glass is used more often in our environment. Although the manufacture of glass is of high energy intensity the use of glass in comparison to alternative materials such as

brick or concrete is more advantageous though the product can be of multi-purpose use such as for solar heating respectively reduction as well as for natural ventilation. Many companies within the glass industry have made it their policy to ensure environmental advances in all stages of the manufacture process. In addition, glass can be fully or partly recycled.

Insulation materials

Insulation materials have been mentioned in chapter 3 as a potential use for sustainability, as a means to decrease energy costs and to gain the use of free natural heating. However, the choice should be of the most natural sort though materials such as urea-formaldehyde foam could provide off-gassing and therefore be of risk to the occupants. In addition many of them are oil-based with a high level of embodied energy.
Mineral wool and glass wool, although yet considered as a health hazard within the production process, has been recognised as a relatively sustainable alternative, but it is said that the most energy efficient choice would be the recycled paper/cellulose insulation.

Timber

Because of low embodied energy and strength timber is regarded as a good substitute for metal, plastics, concrete and brick. However, local availability should always be regarded in consideration to energy inefficiency in transport costs. Yet, large parts of rain forests, old-growth- and boreal forests have been and are intensely exploited with the result of affected bio-diversity and alteration in carbon cycles. The origin of the timber products should always be carefully studied and potentially provided labelling such as the Forestry Stewardship Council who undertakes forest management should always be asked for.

Ex. Timber frame construction is upto 20% less energy intensive than traditional construction and it can take 2 years for polymer based insulation to “pay for” the energy consumed in manufacture while in typical structure energy consumption.

Plywood, MDF, OSB and Chipboard.

Plywood, MDF, OSB and Chipboard should not be mixed up with timber. Although board materials consist of timber products many of them are bonded with hazardous chemicals and adhesives, such as fomaldehyde and require protection masks within the production to protect from emissions and wood-dust. Off-gassing is also known as a common fenomenon within the in situ use of MDF and Chipboard which could provide atmospheric pollution and decreased health in the internal environment and to the occupants. However, the development of formaldehyde-free alternatives is increasing and more environmentally friendly boards, such as formaldehyde-free MDF is currently becoming available on the market (as of the year 2003).

Steel, aluminium and plastics

Despite a very high energy cost, steel is almost 100% recyclable in Britain.

5. Environmental Economics.

The economic interaction within the ecological movement has had a slow progress. The global economy is built upon the technological and industrial movement and safe investments. To understand all of the ramifications of sustainability all levels within the built environment must interact with environmental economy.

Is it possible to undertake environmental planning and management in a way that does minimum damage to ecological processes without putting a break on human aspirations for economic and social improvements (sustainable architecture)? The national economy is built upon ”flows and stocks”. It has been proven that energy savings can be made by the use of the natural elemental forces, which would be a cheap as well as sustainable method for gaining savings of the biodiversity, forests, water and our health. However, one of the great hazards is that as an economic tool natural energy is inefficient though it in banking terms does not have a specific value.

The attributes of Economics and Sustainability have for centuries had the tendency to

walk opposite ways. However, the Brundtland Report, published in 1987 and established in Norway by the United Nations, made a significant turn on the issue. New suggestions and restrictions were set to develop the concept of sustainability in relation to economic and political assets. The main statements were defined as:

" Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. "

" The economic growth can and should be managed so that the natural resources be used in such way that the quality of life of future generations is ensured. " (http://www.doc.mmu.ac.uk/aric/eae/Sustainability/Older/Brundtland_Report.htlm) 19/08/03

Economical Progression and Methodology

Despite critiques in the vague declarations on the matter and slow somewhat cast about for progression, it did awaken the happening of an important opening in the bank world. An interest was born and a sustainable development was started in 1993 in The World Bank with Sven Sandstrom in the lead. The new department of Environmentally Sustainable Development (ESD) have since had a rapidly growing progress of promotions and lending in different parts of the environmental agenda all over the world. During the years the bank has developed environmental economic tools to create innovative financing for the Sustainable development.

The World Bank 2001 conference declared approval of three main objectives:

- *Improving the quality of life* – peoples health, livelihood and vulnerability – affected by environmental conditions
- *Improving the quality of growth* – by supporting policy, regulatory, and institutional frameworks for sustainable environmental management and by promoting sustainable private development
- *Protecting the quality of the regional and global commons*, such as climate change, forests, water resources and biodiversity.

These objectives called the Environment Strategy would be the grounds for a five-year plan as a guide to the environmental agenda.

(http://Inweb18.worldbank.org/ESSD/envext.nsf/41ByDocName/Environment)
18/18/03

The World bank developed a new economic method very close in likeliness to the Neoclassical cyclical model. - producers=goods and services (firms) – purchasers of output (households) - interact a market
The assessment of option values, bound up in the concept of the willingness to pay – easy choice – dichotomous choice.

Balance between two desires.

Deductions from cycle by households for loan and comparable withdrawal by firms for investment = interest represents return for forfeiting liquidity on both sides, are all secondary to the basic cycle – optimise distribution of resources and is considered to be most efficient when "the benefits of participating in the market exceed their costs by the maximum possible amount.

Ecological hazards and Morale

Thinking and morale within the economic respectively holistic aspects are in need for a change. Economic growth should be part of and in collaboration with environmental protection and social improvement. The common belief that green development is for the "hippie" generation and of no advantages for the contemporary society, which depends on technological and economical growth, is somewhat worn out. Statements such as "ecological design is much more costly and of no gain for the paying developer" could easily be proved wrong. The comprehensive picture shows that up to 90% gain in energy costs could be made by the use of natural heating and cooling systems, which may includes the exclusion of costly mechanical devices. An example based on reality could be the district schemed solar collectors in Denmark whereby the installation has made savings of up to 80%

over the norm and in addition gained up to 30% more energy (Smith P F, Architecture in a Climate of Change, pg 53).

Today in 2016 we also have Tesla batteries that can help to save up the energy made. It is also in this day and age possible to sell the stored up energy made through solar panels and wind power.

However, the fact that a buildings construction and life is divided in three parts/ professions; the designer who does the job, the owner who wants solutions and fair economic results, and very often a tenant who pays the rent, energy and water; makes the issues is more complicated. Ecological responsibilities are easy to deviate from when there is only an economic gain to win. Though the owner of a commercial building rarely acts as the occupant, the ecological responsibility is usually seen as low priority though he/she will not be personally affected of either health hazards nor expensive electricity and water bills. An example would be the use and installations of electricity.

With a what is said a rapidly coming shortage of energy operating supplies and a possibility of natural disasters a raised environmental responsibility as well as economic norms is adviced. A raised environmental responsibility would lead to an increased demand of products. A raised demand would lead to an increase of manufacturers as well as of a technological development. An increase of manufacturers would lead to a competitive market and cut prices and products such as photovoltaic cells, which are presently still expensive, could be more affordable (2003). Ove Arup and partners estimate that one-third of the electricity needed to run an office complex could come from PV's with only a 2% addition to the building cost. (Architecture in a Climate of Change, pg 68) which would lead to a healthier environment as well as economic growth and social improvement.

The embodied energy would be a good tool for the designer as well as a tool for staying up-to date with financial and constructional developments within sustainable areas. Calculations of lifecycle costs would prevent mistakes and show evidence of

appropriate use of sustainably right materials and methods.

However, Changes must be made to increase the base of resources and to encourage changes in the technological use and development.

CHAPTER III

CONTEMPORARY METHODS OF BUILDING DESIGN

VERSUS TRADITIONAL

7. Reichstag, New German Parliament in Berlin

The New German Parliament in Berlin was reconstructed in 1995 - 1999 by Norman Foster. Through a competition between worldwide architects Norman Foster received the challenge as a foreign architect to design a new home for the German Parliament in Berlin.
His initial idea was to demolish the old building to create a new. However, as the conceptual stage went on, historical aspects became of a considerable importance and the decision to preserve and refurbish was made.

The concept was based around four cooperative issues:

- The importance of the Bundestag as one of the world's greatest forums.
- A commitment to make the process of government publicly accessible.
- An understanding of history
- A commitment to the sustainable agenda.

(GA Document Extra 12, Norman Foster, pg 134)

History was rolled up before their eyes as they stripped off the layers of the building and reparations were made in the way to preserve historical memories such as the graffiti made by Soviet soldiers in 1945. New interiors were made compatible to old to avoid interference and evoke recognition.
The international environmental legislation is led by Germany. Yet, the German Parliament's building, as it was, produced an exorbitant amount of hazardous emissions every year. 7000 tonnes of carbon dioxide was emitted each year at a cost of about 2.5 million D-Mark.

By following the set concept of a sustainable agenda Foster and his colleagues turned

the fossil- fuel spitting and extremely economically disadvantageous building into an environmentally friendly and much cheaper historical and powerful construction. The 1960's fossil-fuel services that had provided for heating, air-conditioning etcetera were exchanged to a bio-fuel driven co-generator which was to be run by renewable oils from sunflower, palm and rapeseed to produce electricity. The efficiency would redeem up to 94% reductions in carbon dioxide emissions. Any excess heat would be stored 300 m under the Parliament in a natural aquifer to be used for heating of the building in cold weather conditions. There would also be a cooling plant, which would pump up cold water into the ceilings to chill the building in summer.

The Parliament building was opened up from the roof down to the bottom of the chamber three storeys below to create free natural lighting, solar heating and ventilation. The dome was later substituted with the glass cupola, which would play a major role within the sustainable development by reflecting daylight through a mirrored sculptor from the dome into the chamber and to cooperate with the whole building by extracting warm air to enhance the effectiveness of the ventilation system. A movable shield was installed inside the cupola to prevent the internal building from glare and overheating. It would tie together old and new and give a more holistic as well as political approach to the contemporary German population. It would invite the public into the parliament and evoke an understanding and communication between the general person and the politician who works for him. It has also created a better and healthier working environment with natural daylight and better views for a good well-being as well as a set of good example on the German map of an environmentally friendly future.

8. Skyhouse, London

The husband and wife architect firm Marks Barfield have developed a skyscraper housing project, which would provide affordable flats for key workers on the strained housing as well as land market in London. The project consists of three towers with up to 500 flats and daily facilities such as shops, restaurants, health clubs and day nursery are incorporated in to the three towers to create a feeling of community.

The sky towers would provide for 250 flats for every hectare of land and 65% of it would be green area's. The green area would be divided into several gardens on different heights containing grass, trees and waterfalls to promote well being in an overall holistic sense, psychological, physical as well as ecological.

The towers are designed to manage the energy and electricity for the communal area from solar panels. Water supply for the greenery would be in form of rain-water which would be collected on the roof and controlled with help from the energy from the solar energy. Excess water would then be channelled down and stored in an underground borehole to be pumped up to the tower gardens or the surrounding park areas again when needed.

The development was launched in February 2003 and the couple believe to have a site ready within a year and the towers would be ready for living in two years later.

CONCLUSION

Well- known architects and designers such as Norman Foster, Future Systems and Marks Barfield and seems to have taken on the lead and responsibility of a sustainable future.

The creativity and the principles that lies within the practice of design has created innovative solutions where multi-purpose use and accountancy of the natural elemental forces have led to a building design with high ecological efficiency.
By the use from the sun, wind, vegetation and rain a new approach has been brought forward to create naturally free ventilation, heating and cooling systems that could partly or wholly reduce the use of energy inefficient machinery and save the shortage of freshwater. Whether it regards refurbishments or the construction of new buildings and its interiors it would be made able to apply those principles to a low

cost of the environment and the embodied energy and in addition many of the methods would decrease the overall economic costs within the construction and its use.

In addition, ecological constructional methodology and planning, to organize the chaotic urban confusion of migration and overuse are on a developing basis with the inclusions of everything from infrastructure and town planning to human experiencing needs such as community organisation and greenery.

The invention of the embodied energy and life-cycle assessments has made it possible to track the hazardous issues that create emissions from a material into the atmosphere so that the appropriate and right amount of use for the buildings entire lifetime could be decided before construction. With the foundation of the Earth Summit and the Brundtland report knowledgeable sources and organisations have grown to enhance the progression of the sustainability. Recycling and legislations, education and governmental restrictions are in progress or on its way all over Europe. Building materials such as steel and glass are wholly or partly recyclable in the UK, which makes it sustainably advantageous and benign as a use for the contemporary and attentive building designer.

However there are still disadvantages and a lack of improvements within the ecological demands such as the issues around new ecological materials, which are usually very expensive on the market and therefore decrease the probability and advance of enhanced purchase and natural ventilation and heating systems has not yet become as self-sufficient as to work all year around in parts of the world such as Northern Europe which has seasonal changes with cold winters.

Unwillingness of risk-taking are issues that slow down the environmental progress. There is a need for the global economy to catch up with the sustainability and find new tools with the account of the global needs. A break of narrow-mindedness and a change of state of mind create new paths for new improvements. The sustainable development is still young and methods that we regard as eco-principles today might

turn out to be the opposite such as with the creation of the Aswan Dam, which was among the first hydroelectric generators to be built (in the 1960's). Although the Aswan Dam in Lake Nasser provides a non-fossil burning energy for a major part of Egypt it has also become responsible for saline pollution and interruption of the agricultural greenery. Wisdom, knowledge and understanding is key here.

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