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# ("The Thermal Re-Adaptation by Using interior Design Elements")

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**Abstract:** This paper introduces to us the concept of Re-Adapt as a tool of hope that may lead us to a sustainable future. And it reviews the importance of looking to nature to find a path for a sustainable future which is the main idea that biomimicry inviting us to embrace. Also illustrates what is meant by biomimicry and its different descriptions and definitions, and the difference between it and the other terms that share the same idea. by discussing the idea of using thermal simulation by using interior design elements

Thermal mass perform the same function performed by the solar batteries in non-self-heating system (solar electricity system active solar system) Both stores solar energy for re-use when needed. Thermal mass incorporated into domestic vacuum in several forms: -

- 1-Internal floors covered with finishing material that the capability of storing solar energy (such as cement brick wood processing) flooring.
- 2- The Trombe walls or walls of a water pipeline, Thermal mass elements, which include floors and walls is one of the key elements in the solar house of self-absorption and heat storage materials.

Keywords: Re-Adapt, thermal mass, sustainable, Solar Radiant Floor heating, Trombe wall.

# 1. Introduction: What is Adaptation?

The Intergovernmental Panel on Climate Change (IPCC 2008) defines four kinds of adaptation:

- -Anticipatory (proactive) adaptation: Adaptation that takes place before actual climate change impacts occur. Such adaptation is a pre-emptive measure to prevent or to minimise potential climate change impacts. It weighs up the vulnerability of natural and man-made systems as well as the costs and benefits of action versus inaction.
- -<u>Planned adaptation</u>: Adaptation that is the result of a deliberate policy decision, based on an awareness that conditions have changed or are about to change and that action is required to return to maintain or achieve a desired state.
- -Reactive adaptation: Adaptation that takes place after impacts of climate change: for instance when new building regulations follow a severe bushfire event.
- -<u>Autonomous (spontaneous) adaptation</u>: Adaptation that does not constitute a conscious response to climatic stimuli but is triggered by ecological changes in natural systems and by market or welfare changes in human systems.

Technological advances that we are dealing with is aimed at improving human beings and to provide means of comfort to him for this progress a lot of negative effects, which led to a lot of environmental damage. So scientists have been studying some of the natural sources of non-conventional energy production (such as wind power - solar energy - energy waves of the sea - the geothermal surface-biological - nuclear energy gases, energy).

It was the most important of those studies and the study of solar energy used to serve people in various fields as clean energy and safe, by reference to the various global statistics, which indicate that global stocks of oil will wane over the next twenty years, as well as growing fears of use of nuclear energy to produce electricity and consequent environmental pollution has led to the need for solar energy study alternative naturally the need for alternatives energy being: -

- 1. Alternative Clean does not lead to pollution of the environment.
- 2. Energy available in nature and free of charge.
- 3. Renewable energy and inexhaustible.

Direction to the application of new technologies to provide the energy consumed in buildings through the use of double glazing technologies and paint windows with layers of reflective to reduce solar radiation acquired in the tropics, as well as the installation of reflectors units fluorescent lighting to reduce the number of bulbs unity by half, while maintaining the same level of light intensity. In the area of housing there are the so-called smart home Smart Houses and designed to provide the highest level of comfort with reasonable costs and the potential to efficient use of energy through lighting control systems and heating and cooling.

Then began the direction to the exploitation of solar energy in a lot of architectural and residential installations, in particular, be used either for heating or cooling the interior spaces [1]

Study thermal mass floors processors in the internal architecture of sustainable and solar blanks self-represent a significant departure from floors processors traditional spaces where processors and raw materials used in finishing plays an important role where the thermal mass and a means represent to store heat in the blanks, and those raw materials vary depending on their ability to store and re-stored energy.

And therefore it represents the study floors One of the difficulties facing the interior designer architecture where needs to study the ability of each severity to store heat, which puts it within the limits and at the floors for lack of raw materials available to design mode (Some of the raw materials to develop even fit with the set designs [2]

#### -Climates and Thermal Mass

Thermal mass is most useful in locations that have large swings of temperature from day to night, such as desert climates. Even if the thermal mass does not prevent heat energy from flowing into or out of occupied spaces, like insulation would, it can slow the heat flow so much that it helps people's comfort rather than causing discomfort. (Figure.1)-(Figure.2).

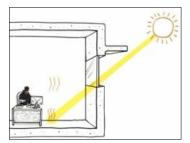


Fig. 1: Thermal mass captures and stores solar heat gain

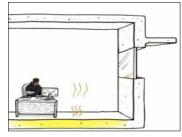


Fig. 2: Thermal mass re-radiates heat after the sun is gone

In climates that are constantly hot or constantly cold, the thermal mass effect can actually be detrimental. This is because all surfaces of the mass will tend towards the average daily temperature; if this temperature is above or below the comfortable range, it will result in even more occupant discomfort due to unwanted radiant gains or losses. Thus, In warm tropical and equatorial climates, buildings tend to be very open and lightweight. In very cold and sub-polar regions, buildings are usually highly insulated with very little exposed thermal mass, even if it is used for structural reasons

### 1.1. The Relationship Between the Glass and Thermal Mass:

The amount of glass is installed in the southern facade is connected directly by a thermal mass in the home, and vice versa. The relationship between the amount of glass and the proportion of thermal mass: - Account Glass ratio begins in any design by 7% in the southern facade of glass and to increase the proportion of 7% requires increased thermal mass and increase usually in a block ground first and then the walls and so on as follows: -

# In addition square feet of glass 1.sq.ft South of the interface may add to each of: -

• 5.5 square feet of flooring thermal mass exposed to sunlight. http://dx.doi.org/10.17758/UR.U1215336 128

- 40 square feet of flooring, this is not exposed directly to sunlight.
- 8.3 square feet of walls or ceilings.

So that the maximum amount exposed to the light of the sun is the equivalent of 1.5 times against the wall of windows in the southern area, taking into account not exceed the amount of glass in the south facade in the direct loss of about 12% to 15% system.

• There is also an inverse relationship between the thickness of the severity of thermal mass in the floors and increase the proportion of thermal mass in a vacuum The smaller the thickness of the severity of the thermal mass of the floor whenever thermal mass ratio increased so as to reach the equivalent of 3 to 6 times of the windows in the south wall space. [3]

Therefore, the less severe the thickness of the thermal mass of the flooring floors be more effective than the thickness of the top and flooring because the flat floor allows the distribution of heat in all the internal spaces easily (Figure.3).

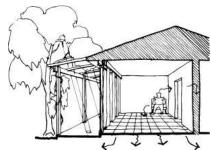


Fig. 3: Increase For the floors Area will allow the distribution of heat in all the internal spaces easily

Finishing materials given to floors with dark colours such as (dark red - brown) perform the best it can store 70% of the radiation falling out and increases its ability to storage if the surfaces matte not shiny so that less reflected rays ratio and thus increases the amount of heat stored flooring. (Figure.4).



Fig. 4: The percentage of thermal mass floors Cover must be low

The interior designer architecture must take into account the capacity of material for energy storage at the work of any development in the severity of the floors using the new finishing materials and has appeared several systems for floors to increase the thermal mass capable of storing energy and that can be designed interior architecture adapted and utilized in the design development user helping interior architecture is designed to create multiple alternatives commensurate with the solar system of self-rules.

#### 1.2. Solar Radiant Floor Heating:

Solar Radiant Floor heating is used for centuries and are used channels or pipes installed in cement slabs Embedded in)) or vehicle down the floor tiles, usually made of thermal floor slabs of cement blocks or bricks or any material high-capacity to absorb energy.[4]

Solar Radiant Floor heating using the same raw materials with the addition of hot fluid (air - Water - Away transfer fluid temperature) this fluid is pumped through a network of pipes. Heat-absorbing fluid and spewed regularly to the internal spaces which makes thermal mass of the ground operating a battery thermal and thus increases the efficiency of the floors as a block heat and radioactive ground systems to heat re-heat to the internal void more slowly, allowing the preservation of stored energy for a longer period, and Flooring Systems has thus become radioactive heat homes eligible for solar energy self In many areas, and often the amount of solar heat gained is not sufficient to heat the interior spaces of the house for a great addition to the inability to heat distribution to all the blanks. (Figure.5).

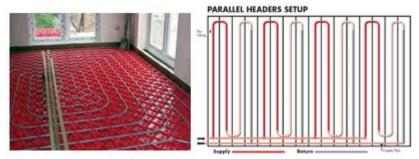


Fig. 5: Solar Radiant Floor heating

Thermal mass flooring absorbs heat from the liquid and spewed regularly to the internal spaces which makes thermal mass of the ground operating a battery thermal and thus increases the efficiency of the floors as a block heat and radioactive ground systems to heat re-heat to the internal void more slowly, allowing the preservation of stored energy for a period of the longest, and thus became the flooring systems for radioactive heat qualify for homes solar energy self In many areas, and often the amount of solar heat gained is not sufficient to heat the interior spaces of the house for a considerable period in addition to the inability to heat distribution to all the blanks. Table (1)

TABLE 1: Some	of the mat	terials used in	the f	finishing	thermal	mass floors	and the amo	unt of heat-banked

Material	Volumetric heat capacity (j/m3. deg. C)	Density (kg / (m3)
Water	4186	1000
Concrete	1764	2100
Brick	1360	1700
Stone: marble	2250	2500
Plasterboard	798	950
Timber	866	610
Glass fiber	25	25

## 1.3. Thermal Mass Floors In The Heat Storage Spaces:

In cold climates, most of the interior spaces need to be different heating means either fireplaces or conditioning. Either in the solar energy owns homes, the floors and walls are a natural alternative to traditional means of heating. And the idea of the design depends on the floors that absorb heat gradually, then re-heat the interior of those spaces gradually need to use conductive materials for heat and have the ability at the same time to store heat.

- For example: -(Metals, for example, a good conductor of heat, but not have the ability to store heat on high-density concrete otherwise the heat will be stored inside the concrete block and then that heat returned to the internal vacuum on a regular basis). Thermal mass in the internal vacuum performance depends on many factors such as the severity of the installation of thermal mass and thermal mass site and its relationship with other elements of the internal vacuum and ventilation strategies within the vacuum [5] (Figure.6).

Floors near the openings of both doors and windows need special treatments of the insulation where those areas represent areas of high heat loss, taking into account the work of the bishop or external doors umbrellas to avoid heat loss. Floors near the openings of both doors and windows need special treatments of the insulation where those areas represent areas of high heat loss, taking into account the work of the bishop or external doors umbrellas to avoid heat loss.



Fig. 6: Relationship with walls and lighting sources in direct light

#### 2.1 The Environmental Impact of the Construction Used Materials [6]

When selecting construction materials used as internal finishing in the solar system of self-houses there are many factors you must take into account, it is unlikely that there will be an absolute rules can give all cases.

The first question that may come to us what is the environmental impact of severity?

When studying the materials used in the internal vacuum must know the construction materials used as both internal finishing (Concrete Bricks - milk adobe ..) and its impact on the internal environment of the dwelling or in other words (the environmental impact of the house).

#### - Factors affecting the choice of the physical materials used: -

- 1. Article age and the possibility of re-used again.
- 2. The extent to which the material used in the enrichment of the user as well as style to reduce the environmental impact on the vacuum.
- 3. Fits in with the interior design flexible user and the possibility of change over time.
- Renewable energy and materials used in the self-solar design houses: -

Interior designer can control the house in renewable energy significantly worthwhile studying the specifications of those raw materials, and find out how much banked energy and their ability to be retrieved (radiance) again.

Used brick and mud brick and concrete blocks to build and finishing thermal mass walls treated wood is also used in thermal mass floors - will eat explanation -

You must remove the carpet or any Insulating tape works to prevent heat transfer from the cluster of concrete floors thermal mass which is exposed to the sun's heat in the winter, taking into account the non-use of shiny floor tiles to facilitate heat gain.

# 3.Trombe Walls

A Trombe wall is a passive solar building design where a wall is built on the winter sun side of a building with a glass external layer and a high heat capacity internal layer separated by a layer of air.

- 1) When using the Trombe wall to collect and store heat should not there is what obscures the sun's rays from the wall and so the heavy furniture upholstery many screened emitted from these walls heat.
- So I preferred to use one-piece or just two of the units open furniture (Side chairs) so as not to obscure the heat.
- 2) Dark colored paint (such as green and purple, brown and black) for painted Trombe walls.
- 3) Preferably spray paint instead of using a roller or brush, and so as to obtain maximum absorption of heat.
- 4) You should not use any units Accessories or paintings on the walls such as heat emitted lead to damage.
- 5) When using the walls of the half Tromp must isolate the windows at night to prevent loss of heat gained during the day.

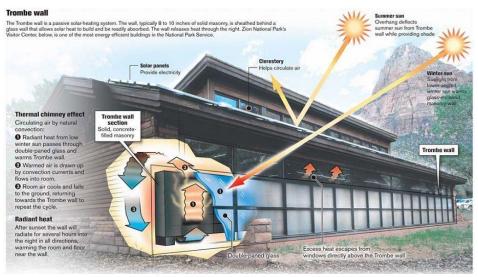


Fig. 7: A Northern hemisphere Trombe wall

# 3.1. The importance of isolating Trombe wall:

-Insulation the Trombe Wall Research on the Trombe wall proved to be gaining heat quickly during the day and lose quickly during the night, which requires the installation of a mobile insulating material on the walls to isolate it at night and in order to improve its effectiveness and its ability to retain heat during the night.

Either in the summer it must be the provision of panels for shading from the outside to reduce the x-ray fallen on the wall from the outside, in addition to the use of isolation cells in an orderly manner positively affect the effectiveness of these walls.

#### 3.2 The Greenhouse or Solar Space: -

- 1) When the greenhouse furnishing or solar space as an entry point for the home or sun space possible to use bamboo scheduler in units of furniture because it bears the light and the heat of direct sunlight and moisture.
- 2) The use of tables and tables with glass surfaces and helps facilitate the arrival of sunlight into floors made of thermal mass.
- 3) Better to use walkers with fabric and open sutures or floor is not covered.
- 4) Solar blanks spaces represent isolated from the rest of the house and spaces so the methods of isolating and windows systems in these spaces is unnecessary.

# 4. Straw-bale construction

Straw-bale construction is a building method that uses bales of straw (commonly wheat, rice, rye and oats straw) as structural elements, building insulation, or both. This construction method is commonly used in natural building or "brown" construction projects. Research has shown that straw-bale construction is a sustainable method for building, from the standpoint of both materials and energy needed for heating and cooling.[8]

Advantages of straw-bale construction over conventional building systems include the renewable nature of straw, cost, easy availability, naturally fire-retardant and high insulation value.[9][10][11] Disadvantages include susceptibility to rot, difficulty of obtaining insurance coverage, and high space requirements for the straw itself.[12] Research has been done using moisture probes placed within the straw wall in which 7 of 8 locations had moisture contents of less than 20%. This is a moisture level that does not aid in the breakdown of the straw.[13] However, proper construction of the straw-bale wall is important in keeping moisture levels down, just as in the construction of any type of building. (Figure.8)



Fig 8: Straw bale construction project in Willits, California

Straw bale building typically consists of stacking rows of bales (often in running-bond) on a raised footing or foundation, with a moisture barrier or capillary break between the bales and their supporting platform. [14] There are two types of straw-bales commonly used, those bound together with two strings and those with three. The three string bale is the larger in all three dimensions. Bale walls can be tied together with pins of Bamboo, Rebar, or wood (internal to the bales or on their faces), or with surface wire meshes, and then stuccoes or plastered, either with a cement-based mix, lime-based formulation, or earth/clay render. The bales may actually provide the structural support for the building [15] ("load-bearing" or "Nebraska-style" technique), as was the case in the original examples from the late 19th century. The plastered bale assembly also can be designed to provide lateral and shear support for wind and seismic loads. (Figure.9)



Fig 9: This straw bale house plastered with loam earthen plaster is located in Swalmen, in the southeast Netherlands

Straw bales can also be used as part of a Spar and Membrane Structure (SMS) wall system in which lightly reinforced 5 - 8 cm (2 - 3") gunite or shot Crete skins are interconnected with extended "X" shaped light rebar in the head joints of the bales.[16] In this wall system the concrete skins provide structure, seismic reinforcing, and fireproofing, while the bales are used as leave-in formwork and insulation.

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