



Wood Preservation: A Practical Approach to Mitigating Climate Change

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ARTICLE INFO

Article history:

Received: 14 January 2019;

Received in revised form:

17 February 2019;

Accepted: 27 February 2019;

Keywords

Climate Change,

Wood Preservation.

ABSTRACT

Scientists all over the world have been concern for the earth due to the effect of climate change that has now become a matter of discuss. The effect of climate change is not only limited to several natural disasters such as Tsunami, melting of ice Berge, high rise water bodies etc. It has been agreed that mitigating the effect of climate change can be achieved through reforestation and replanting of trees in the forest. To ensure that climate change is mitigated holistically, all hand must be on deck. As such implementing the use of treated wood to forestall needless replacement of wood due to failure resulting from fungi decay and insect attack is another practical approach to ensure that the forest the major player in mitigating climate change is kept intact. It is therefore recommended that government policy should include ensuring that wood meant for building construction is given necessary treatment before installation to safeguard the integrity of the forest.

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Introduction

Prior to the 21st century the phenomenon climate change in respect of global warming was not a matter of much concern to the environmentalist because the visible effect of climate change has measured and experienced today in global warming, melting of sea ice in the polar region of the Arctic did not pose a serious problem (NASA, 2007). Thus continuous human activities in, manufacturing, urbanization, clear felling of forested areas for new settlement without careful consideration of the negative impact on man and his environment; had contributed to the overall effect of climate change being experienced today. But as scientist began to study solar flares, issues such as sun intensity becoming hazardous to man began to raise concern as to whether the sun intensity, cosmic ray as well as aerosol could be responsible for the change in warmer climate being experienced (Union of Corncern Scientist, 2017). And as this concern began to gain momentum, it gradually became necessary to evaluate the effect of such solar flare, sun intensity, cosmic ray and other human factors on the earth atmosphere in relation to human existence. These among other things give rise to the phenomenon of climate change vis-à-vis the effect on the environment.

Climate change today has been one of the major issues being discussed by the world government as well as environmentalist, because of the changes it has brought to human survival. There had been much natural disaster that has been attributed to the effect of climate change, which includes:

Tsunami, Hurricane, Tornado, Typhoon, Ice Berge melting, High rise water body, Heat wave, Drying of water body (e.g lake chad)

The ripple effect of climate change is not limited to the aforementioned, but transcend into other areas of human endeavour, those who depend on the water as a major such of revenue like those living in the region of lake Chad basin in Nigeria, have their occupation affected by the reduction in the water level. For them to survive they will resort to other

means of livelihood. One of such is to resort into felling trees from the forest as fuel wood as alternative to fishing for their survival. Other could also resort into the production of charcoal from the already lean forest.

The forest being close to rural dweller becomes ready source of alternative revenue to them when other sources of revenue become unavailable. Thus the forest becomes the culprit to pay for the consequences of the climate change. But the forest from time immemorial has being the major source of material for building and food for man. From it man derived his shelter, food and livelihood for many years.

Natural resources from the forest include timber, leaves, fruit, wild animal, fuel wood, poles and charcoal, of which timber had been the major forest product that forms bulk of the products coming from the forest for man. Timber has been a raw material for both building and other household products; due to the strength properties some wood species possesses; in terms of its resistant to compression, tension as well as resistant to decay (Ogunsanwo, *et. al.*, 2006). As such, wood have found its place in construction purposes. However, not all wood species are suitable for this kind of purpose; this is because not all wood are durable even if it is a strong wood in terms of its properties, it therefore becomes necessary for such wood species to be reinforce with chemical to make it durable to serve a longer period in use when it's of the desired strength property.

Importance of Wood to Man

The closest utility material to man has been wood, stone and bone from the early civilization. This is evident in one of the earliest civilization as stated in the Bible, where molar was used to build sky scraper and building of city in the land of Egypt (Genesis 11:3-4; Exodus 5:7-8). The uses of wood ever since the prehistory of man had ranged from being used as tools, rod to assist in direction whether as walking stick or Sheppard stick to very sophisticated material like bows, carved images, paper etc (Paola, 1996; Keeley and Toth, 1981). Wood has not only been a source of material to man, but has also been a source of energy to man (it serve a

fuelwood and charcoal for many rural dweller as well as urban dwellers alike).

Wood is an important renewable natural resource which is abundant in our everyday lives and the economy, in wood-frame houses and furniture; newspapers, books, and magazines; bridges and railroad ties; fence posts and utility poles; fuelwood; textile fabrics; and organic chemicals. Wood and wooden products are also a store for carbon, thus, helping to minimize carbon dioxide in the atmosphere. (Durak, *et al.*, 1998, Werner, *et al.*, 2010)

Today's modern houses have been built with wooden product has divider as well as perimeter wall of house to prevent movement of heat from inside the house to the environment; to guide against the effect of lower temperature especially during winter in regions of the world where they experienced snow fall. The use of wood has a prefabricated housing unit do not only serve has buffer against lower temperature in winter; but in the region where they have had to suffer the effect of such natural disaster like hurricane, tornado earthquake etc (Gunawardena, *et al.*, 2014; Ford, *et al.*, 2014). The use of wooden house as against bricks reduces the impact of such disaster if it were to be bricks. Clearing the rubble after the disaster is less tedious when compared with concrete or bricks; in fact rescue operation in such structures is a lot easier than for bricks structures. Wood is a better insulator compared to brick and metal, the cost of making the house warmer or cooler is usually cheaper with wood than concrete and brick not to mention aluminium. The beauty of interior décor is more conspicuous when wood is used than another material; for example the use of Formica as decorative surface will wear off over time but the surface of wood will remain the same; all that may be required is to polish the wood to bring it back to its former or better aesthetic. According to Planet Ark (2018), the increasing use of wood has health benefits to man both physiologically and psychologically. It has been discovered that workers are less stressed with increasing productivity, students learn better, patient recuperate faster, and that people are generally happier and calmer in places and spaces that contain natural elements like wood which depict nature (makeitwood.org). From cradle to the grave wood has been the closest companion to man, it is used to make the bed as cradle and it is as well used to make the final casket for man's burial.



Source: Planet Ark (2018)

Plate 1. Wood create a sense of happiness and self esteem for calm relaxation as well as assimilation.

Wood Tackles Climate Change by Sequestering Carbon

Tree uses carbon, a major component as climate change indicator, to make food through photosynthesis. The food is used to build biomass within the tree as it grows year in year out, this biomass build into trunk, branches, leaves, twig and other internal material needed for the survival of the tree. The carbon sequestered from the atmosphere remains locked in wood as long as the tree remains as a stand in the forest. But man will make use of wood for his various needs, and then these trees are felled, extracted and converted to planks (wood product) for various uses. Wooden products retains the carbon in it until deterioration set in when the carbon are released again; but when wood is well treated against deterioration, carbon in wood remain locked in the wood providing a cleaner environment that is free of carbon (De Araujo, *et al.*, 2016, Werner, *et al.*, 2010).

The implication of this on the forest is that, as desired trees are extracted from the forest, the under-growth will take over the space being occupied by the larger tree extracted and start competing for light and carbon to build biomass in trunks, branches leaves etc. This process will further increase mopping up carbon from the air since younger trees increases steadily in girth and in height than older trees that may or may not increase in height or girth after attaining to its rotational age or gestational age.

Extraction of trees from the forest in a sustainable manner does increase more carbon sequestration provided that such wood extracted are not combust as fuelwood which releases the carbon sequestered back into the atmosphere.

Natural Durability of Wood

Wood with its versatile uses and being one of the renewable resources endowed to man by nature does fail in service. The most desired interest in wood aside its aesthetic is for the wood to last long in service; however wood does fail in service giving conditions that support its deterioration. When wood therefore fails, the beauty and value is gone and there would be no other reason than to replace the failed wood. This will in turn result in further extraction of wood from the forest to meet the demand of failed wood in service. Apart from the fact that more extraction would be done on the forest, the failed wooden product may further release the once locked carbon into the atmosphere. Indiscriminate felling of trees to meet both failed wooden products in service as well as new product should be discourage; and how will this be achieved except by putting in place uses of matured durable wood.

Plant produces secondary metabolite to keep them alive against biological attack. They include include tannin, alkaloid, saponin etc. These secondary metabolite impact wood tissue with extractives that are beneficiary to the plant. Generally, trees in the family melleacea are known to be durable

Wood Deterioration

The principal organisms that degrade wood are fungi, bacteria, insects, and marine borers. Decay, molds, and stain are caused by fungi. Decay is the most serious kind of damage because it causes structural failure and consequently, tremendous economic losses. Soft rot is another type of decay that weakens wood, but it typically progresses slowly and is most often associated with very wet wood. Moisture conditions conducive to decay occur when the moisture content of the wood is above fiber saturation (~30%). The optimum temperature range for most decay fungi is about 25-30°C, although some species grow at temperatures as low as 0°C and some as high as 45°C. The optimum pH is in the range of 4.5 to 5.5. Oxygen is essential for growth of all

species. Decay can be prevented by keeping wood either too dry (below 20% moisture content) or too wet (lumens filled with water) for fungal development, by using naturally decay-resistant species, or by treating with preservatives. Mold and stain fungi primarily attack the sapwood. Mold fungi growth occurs primarily on the surface of the wood, while stain fungi may cause a stain throughout the affected sapwood. These fungi can be controlled by dipping the lumber in a fungicidal solution immediately after cutting (Durbak, *et al.*, 1998).

Bacterial degradation of wood generally is not a serious problem, although in some situations of extreme wetness, bacteria may increase the permeability of wood after many years or reduce the strength of the wood (Eslyn and Clark, 1976).

Termites are the most destructive insects that attack wood. Their attack can be prevented or lessened by using naturally resistant wood or by treating wood with preservatives. For subterranean termites, which generally require contact with the ground to survive, poisoning the soil around the wood structure is the principal means of preventing infestation. A promising new approach to subterranean termite control is the use of food bait with an insecticide (Esenther and Beal, 1979). The drywood termite flies directly to the wood, bores into it, and does not require contact with the ground. Physical barriers, such as paint or screens, prevent infestation. Despite great differences between fungi and termites, chemicals that inhibit fungi usually also inhibit termites.

Marine borers inhabit saline or brackish waters where they cause serious destruction to untreated wood. The mollusks include the *Teredo* and *Bankia* borers; among the crustaceans, the *Limnoria* borers are the most widespread and destructive. Preservatives or borer-resistant woods deter marine borers. For practical purposes, the sapwood of all species may be considered to be susceptible to biodeterioration. The heartwood of some species, however, contains toxic extractives that protect it against biological attack. Among the native species that have decay-resistant or highly decay-resistant heartwood are bald cypress, redwood, cedars, white oak, black locust, and black walnut (FPL, 1967). Douglas-fir, several of the pines, the larches, and honey locust are of intermediate decay resistance. Species low in decay resistance include the remainder of the pines, the spruces, true firs, ashes, aspens, birches, maples, hickories, red and black oaks, tupelo, and yellow poplar. Native woods considered somewhat resistant to termite attack include close-grained redwood heartwood and resinous heartwood of southern pine. Although several tropical woods show resistance to marine borers, no commercial native woods are sufficiently borer resistant to be used untreated (Wood Handbook, 1987).

The best protection for wood against the attack of decay fungi, insects, or marine borers is obtained by applying preservatives under pressure before installation. Both oil-type preservatives, such as creosote or petroleum solutions of pentachlorophenol, and waterborne preservatives, such as copper-chrome arsenate and ammoniacal-copper arsenate, are used when wood is to be in direct contact with the ground or in the marine environments. Where wood is to be used under low to moderate decay hazard conditions (eg, above ground), it can be protected by brushing, spraying, dipping, or steeping (Scheffer and Eslyn, 1978; Highley, 1980). Once decay is established, preservatives brushed onto the wood will not enerate, and decay cannot be eradicated in this way.

However, high vapour pressure fungicides (fumigants) penetrate deeply into wood and have successfully stopped

internal decay in structural timbers. Diffusible preservatives such as boron and fluoride are also used to eradicate decay (Schmidt 1990).

Wood Preservation

The act of wood preservation is to make wood that would have been available for deterioration not available to destroying agents (fungi and insects). This is process that involves making food (substrate) unsuitable for destroying agent either by staining the wood cell with chemical that will repel the organism or that will impact the cell wall of the wood with deleterious chemical whether by odour or taste. Various approaches have been adopted by local people to keep their wood intact from destroying agent, to a more advance method. Whichever way, it is to make a choice wood species have a longer service life. The implication of this is that wood treated against deterioration will last longer in service and will prevent further replacement from the forest to serve the same purpose.

Consequences of Untreated Wood

There had been serve failure in building, house hold wooden furniture and other wooden item due to infestation caused by destroying organism aside other failure that arises trough mechanical failure. Wood as a hygroscopic material responds to relative humidity in the environment, this responses makes wood increase in its size known as "wood working". The absorption and desorption of water by wood to gain increment in its dimension is referred to as wood working; this processes continues as long as wood is in service. The tendencies for wood in service to failure due to absorption of moisture in the environment to support the life processes for such destroying organism as fungi becomes unavoidable for wood that is not treated. Eventually, this will lead to the failure of such wood. Where the presence of fungi is not present others forms of decay through insect could also cause lost in money thought the failure of the wood. The overall effect is that such wooden item or part in building becomes necessary for it to be replaced. The forest estate suffers for this.

Trees unlike any plant take a very longer gestation period to reach its rotational age; so a tree harvested today owing to the fact that such trees has reached its matured age or merchantable size, may not be ready in the near future for another harvest even when it is replaced. The many sharp practise by illegal feller as common in developing country like Nigeria is even making matter worse (De Arajore, *et al.*, 2010, Bowles, *et al.*, 2016)). Trees felled through illegal means are not replaced, several other juvenile ones are destroyed and gestation of trees extraxcted is not considered before felling. Making the forest more depleted. When all of this inter play you we have in the plank market timber species that have not reached its maturity stage (less durable because of its age, and may consist more sapwood than heartwood (Ogunsanwo, *et al.*, 2006). These are the species you find in the plank market. Purchasing such plank without treatment means they will fail in service quicker than expected.

The overall effect is that the forest will become leaner and the implication is that fewer trees in the forest to sequester carbon. Resulting in more sever climate change.

Conclusion

Despite the effort of government in sensitising the populace in planting of trees to mitigate climate change, and several afforestation and reforestation project; the level of deforestation currently accounts for about 15% of global greenhouse-gas emissions. Utilization of wood will still continue, however, when wood extracted from the forest is given the necessary treatment, it will compliment the effort of

several programme put together to mitigate climate change. It does means that using treated wood will enhance and compliment effort towards achieving a sustainable forest management.

It is therefore recommended that:

1. Government policy should include utilization of treated wood for all project awarded
2. Ensuring that planks are well seasoned before sales and
3. Onsite inspection to enforce compliance in using treated wood for building construction.

This is to ensure that the forest estate will be preserved in the long run, since the forest estate belongs to the government and the preservation of such is the responsibility of the government.

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