



Human and Environmental Health Benefits of Forests: Impetus for Greening the Future

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Abstract

Forests and trees provide wealth of ecosystem services that help in creating healthy living for human and environments by restoring degraded ecosystems. Forests are significant storehouses of medicinal compounds used in the production of drugs from wild organisms used for health purposes. In this reviewed paper, highlights were made on the health benefits of the forests. Human psychological disorder treatment, pharmaceutical benefits, traditional medicine practices for human health, regulation of infectious diseases by forest and forest as source of food for healthy living were discussed. Also, the synergy between environment and human health consequent on the forests were highlighted. These include: forests as antidote to air pollution, purification of ground water, panaceas to noise pollution control and the role of forest as means of mitigating the upsurge in global temperature and attended human health challenges were brought to light. It was postulated that if forests play such indispensable role in human and environmental health and are conserved, it would serve as impetus for future greening of the environment. It was concluded that sensitization of conservation of wild and urban forests among forest stakeholders should be encouraged to foster future greening of renewable forest.

Keywords: Forest, health, environment, greening, tree, medicine.

Introduction

Forests are seen and valued differently by different people for the many services they render. Ranging from usage to services they provide, forests are viewed to supply timber products; it is a natural environment that is composed of varied forms of biodiversity; it is a habitat for native people, a storehouse for carbon, a base for numerous flora and fauna services, and complex systems for living organisms (Chazdon *et al.* 2016).

World Health Organization (WHO) defined health in 1948 as “a state of absolute physical, mental and social well-being and not just the lack of disease or infirmity.” Health has also been defined as “the nonexistence of any disease or harm; a condition that allows the humans to sufficiently deal with all contending forces of daily life which also implies the dearth of disease and injury and a status of stability, a balance that human being has created within himself and between human and his social and physical environment as reported by Sartorius (2006).

Lukkumanul (2019) reported WHO as defining Environmental health as comprising aspects of human health that include quality of life that are determined by the physical, biological, social, and psychosocial factors in the environment. The impact of forests on human health is a specific issue which has not been very visible within the larger framework on biodiversity, climate change, poverty, and human well-being (Karjalainen *et al.* 2020). Forests provide enormous possibilities to improve human health conditions.



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Our natural environment, whether urban forests or woodland, has so much positive effect on human health. The wellbeing ranging from the physical to mental health with the social well-being are certainly affected when they come into contact with forests and experience nature (Cervinka *et al.* 2014). Forests and trees provide numerous ecosystem services that enable healthy living environments and restore degraded ecosystems. Forests are known to be principal health resources and could play a key role in disease prevention (Oh *et al.* 2017; Prüss-Üstün, 2016). The main objective of this paper is to review the human and environmental health benefits of forests as impetus for greening the future

Human Health Benefits From Forests

i. Pharmaceutical benefits of Forests to human health

Forests are significant storehouses of medicinal compounds used in the production of drugs from wild organisms (Seters, 1997; Bryant, 2002). Forests contain rich natural pharmacies through plant and microbial material which supply prospective medicinal or nutritional value. Forests are very rich habitat with abundant of plant-based medicines and bioactive compounds that enhance healthy living (Kris-Etherton *et al.* 2002; Moutsatsou 2007). As much as 50 % of prescription medicines are obtained from chemicals arising naturally in plants. Global Trees Campaign (2020) reported that an estimated 50,000 plant species were used medicinally, with worldwide trade with more than \$60 billion annually. Forest resources used in drug production include alkaloids, cocaine, reserpine, quinine, ipecac, ephedrine, caffeine, and nicotine. Antibacterial compounds and antifertility compounds found in both plants and animals are also used in pharmaceutical industries (Colfer *et al.* 2006). According to study, about 10 % of drugs like quinine, curare and a number of steroids available were obtained from tropical medicinal plants. Also, about three thousand plants are reported to possess anti-cancer features and 70 % of which were to be found in tropical forests (Eni scuola 2013).

ii. Traditional medicine and cultural health benefits of Forests to human

Tree species supply balanced diets to majority of traditional healthcare systems that provide the primary healthcare for about two-thirds of the global population (Farnsworth 1994). Traditional medicine is the amount total of skills, knowledge, and practices that depend on the beliefs, theories, and experiences native to diverse cultures which are applied to preserve health, prevent, improve, or treat different illnesses (Mahomoodally 2013). Approximately two-thirds of global population depends on traditional medicines for their basic healthcare and 85 % of traditional medicines are derived from plant extracts (DFID 2004). Plant-based medicines include herbs, plant materials, plant preparations, and finished plant products that contain parts of plants as active ingredients. Medicinal plants are an integral part of the African healthcare system since time immemorial (Mahomoodally 2013).

Contemporary medicine has benefited noticeably from traditional medicine in drugs with comparable effects and drugs with dissimilar effects from those of traditional medicine. In the history of drug development, it is apparent that many drugs have been developed from inspiration from traditional medicine (Haidan *et al.* 2016). A number of medicines, such as anticancer, antihypertensive, and antimigraine medication, have profited greatly from natural products (Joo 2014; Newman *et al.* 2003).

iii. Psychological health benefits of Forests

Exposure to forest environment is regarded as one approach to enhancing stability and harmony of lives in urban setting which is why forest ecosystem is portrayed as a huge health machine (Shin *et al.* 2010). Humans have been living in the natural environment composing of trees for almost five



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million years of their emergence based on physiological anthropology. As a result, man's physiological systems are skewed to natural environment (Miyazaki *et al.*2002). It is for this reason forest environment is said to enhance human relaxation (Park *et al.*2010). Study by Park *et al.* (2010) has shown that forest environment contain relaxing and stress-relieving impact. The finding revealed that viewing forest landscape leads to the low relative illumination that reduces human anger while high relative humidity obtained within forests lowers tiredness. Also, forest located at high altitudes has low atmospheric pressure that reduces depression in man (Park *et al.*2010). The act of walking through and watching forest environments is capable of efficiently comforting people living in urban communities thereby improving their health and well-being (Park *et al.*2007).

Besides, blood glucose levels in diabetic patients are reported to reduce when they walk in a forest for 3 to 6 km with regards to person physical strength (Ohtsuka *et al.*1998). Several studies revealed that viewing forest scenery and walking in forest environment leads to lower concentrations of cortisol, pulse rate, blood pressure and enhances high-frequency component of the heart rate variability (Park *et al.*2010; Lee *et al.*2014). Park *et al.* (2007) noted that forest ecosystem reduces the absolute value of the total hemoglobin concentration (t-Hb), an index of cerebral function in the left prefrontal portion of human brain. Forests therapy reportedly showed some potential benefits in the handling of psychological disorder such as anxiety and depression (Morita *et al.* 2007); mood disorder (Shin *et al.*2012); burnout syndrome (Sonntag-Öström *et al.* 2014); lifestyle-related stress (Park *et al.*2007); and overall quality of life (Sung *et al.*2012). Study by Shin *et al.* (2011) has demonstrated that forest therapy on physiological well-being has positive impact on cognitive function and immune function in humans (Li *et al.*2008a; Li *et al.*2008), blood glucose levels in diabetic patients (Ohtsuka *et al.*1998); hypertension (Tsunetsugu *et al.*2007); cardiovascular disease (Mao *et al.*2012) cancer (Nakau *et al.*2013) and pain (Kang *et al.*2015).

iv. Forests as source of human food for healthy living

Forests landscapes supply micronutrient rich food for millions of people globally and as such it is a food producing habitat. Food is significance to the nutritional quality of people living close to forests; particularly in group of people with poor access to markets (Rowland *et al.* 2016). Inadequate nutrition is one of the major risk factor for heightened vulnerability to infectious diseases, and is a major risk factor for a wide range of non-communicable diseases round the world (Ezzati *et al.* 2002; Lopez *et al.* 2006). Black *et al.* (2013) reported that poor quality feeding, limited in diversity and micronutrients are leading causes of malnutrition.

Suggestive evidence indicates that organic food consumption may reduce the risk of allergic disease and of overweight and obesity (Mie *et al.* 2017). Most of the forest foods consumed by locals constitute essential minerals and protein that enhance the well-being of humans. Mangrove forests provide important fisheries in many areas inhabited by poor people (Barbier and Strand, 1998; Colfer *et al.*2006). Bushmeat, fish, fruits, leafy vegetables, nuts and seeds from forests are noted to be high in micronutrients (Vinceti *et al.* 2008; Arnold *et al.* 2011) and as such, they very important for the nutritional quality of people living close to forests (Blaney *et al.* 2009; Golden *et al.* 2011).

Forest leaves hold fats, protein, minerals, and vitamins while the roots and tubers of plants are possible good sources of carbohydrates with minerals; while gums and sap from trees have nutritional properties for man's benefit (Colfer *et al.*2006). In so many rural communities that depend on the forests, bush meat gives much of the animal foods consumed (Fa *et al.* 2003; Nasi *et al.* 2008). From Madagascar, it has been reported that the loss of access to wild bush meat because of deforestation would lead to about 29% increase in the number of infants with anaemia (Golden *et al.* 2011).



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v. **Regulating infectious diseases**

Epidemiological studies likewise report about a correlation between actual availability of woodland and the physical health aspects of inhabitants in adjacent regions (Cervinka *et al.* 2014). Due to the heavy reduction of large forested areas in response to pest infestation (Emerald Ash Borer) in the period from 1990 to 2007, a rise in the mortality rate relating to cardiovascular disease and diseases of the lower respiratory system was observed among the inhabitants of the regions affected by the loss of trees (Donovan *et al.* 2013).

Synergy between Environment and Human Health Consequent on the Forests

Forests remarkably support stability, regulation and healing of the environmental problems resulting from ever increasing anthropogenic activities due to increased in human population and technology. These remedial potentials of forests contribute to the enhancement of human wellbeing in the following ways.

a) **Forests as antidote to air pollution in relation to human health**

Air pollution constitutes a major health problem to three million people each year (WHO, 2000). It is a major public health problem in many cities with high human population. Badach *et al.* (2020) noted the report of World Health Organisation that in 2016 alone, some million cases of early deaths resulted from exposure to outdoor air pollution. Lelieveld *et al.* (2019) also reported that a recent study which estimated that in Europe, the average life expectancy has reduced by about 2.2 years because of exposure to air pollution.

Forests have the ability to reduce air pollution by sequestering many toxins from the atmosphere. Trees eliminate harmful gases that cause air pollution from the atmosphere by the interception of particulate matter on the surfaces of plant and the removal of gaseous pollutants by means of leaf stomata (Nowak *et al.* 2014). Study has shown that forests sequester atmospheric carbon of about 60 billion tonnes each year which can help to mitigate the negative effects of climate change (Kasting 1998).

b) **Purification of water by trees for wellbeing**

It was reported by UNICEF (2009) that globally, about 1 billion people which amount to 15 % of the world population have no safe drinking water. The majority of these people without safe drinking water live in sub-Saharan Africa, South Asia and East Asia (Dungumaro, 2007 and UNICEF 2009). About 5 million lives are reported by WHO, (2006) to die yearly because of drinking and using contaminated water as children, people living under unsanitary conditions and the elderly are at greatest risk (WHO 2006). Four billion cases of diarrhoea are reported globally every year resulting to the death of about 1.8 million people from which 90% are children below five years old (UNESCO 2007).

The major source of drinking water for about 60 % of the population in Southern Africa is groundwater (UNEP 2002). Water shelters so many microorganisms, some of which are responsible for so many diseases. Pathogens like bacteria, viruses, protozoa and helminthes that live in water cause a diversity of diarrhoea-related diseases for example cholera, typhoid and dysentery. Woody plants especially are very instrumental to removing nitrates and phosphates (nutrients) and solvents, metals, pesticides, hydrocarbons and oil contaminates from water and soil. These pollutants are either used by plants for growth and nutrients or are stored in wood



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(Makuchy 2008). Plant extracts have been used to purify water for many years. For instance, between the 14th and 15th centuries BC., *Strychnos potatorum* was employed as a clarifier. About 4,000 years ago in India, *S. potatorum* seeds were used as agent to clarify turbid river water (Shultz and Okun (1984; Sanghi *et al.* 2006).

c) Forests as panaceas to Noise pollution control for healthy living

Noise pollution according to World Health Organization (WHO) is unwanted and too much sound that could post harmful consequences on human wellbeing and environmental quality. Human ears are known to be sensitive to an extremely wide range of intensity varied from 0 to 180 dB (Pantawane *et al.* 2017). The constant exposure of human to loud levels of noise can easily result in the damage of our ear drums and loss of hearing and reduces man's sensitivity to sounds that our ears pick up unconsciously to regulate our body's rhythm. Studies reported by Pantawane *et al.* (2017) show that the occurrence of aggressive behaviour, disturbance of sleep, constant stress, fatigue and hypertension in humans can be associated to excessive noise levels. Blood pressure levels, cardiovascular disease and stress related heart problems are on the rise due to noise pollution. Studies suggest that high intensity noise causes high blood pressure and increases heart beat rate as it disrupts the normal blood flow (Pantawane *et al.* 2017).

Plants mask unwanted sounds from the environment. They also play a vital role in noise abatement. Trees are very effective in the control of noise pollution when they are densely planted. Thus trees, shrubs and all other vegetation aid in noise pollution reduction if used properly (Ansari 2003). Maleki and Hosseini (2011) reported that urban green areas and particularly trees have a significant role to decrease the noise pollution. Studies have shown that designing the highways with dense plant coverage not only eliminates noise pollution arising from roads traffic but also beautifies the area (Cackowski and Nasar, 2003; Mok *et al.* 2006). Stress caused by noise pollution (Bogo *et al.* 2001) could be reduced through creating forests near residential areas (Grahn *et al.* 2005).

d. Forests as means of mitigating the upsurge in global temperature and attended human health challenges

Human health and well-being are threatened by climate change and these impacts are on increase globally. These impacts include death, injury, or illness; worsening of primary medical conditions; and unpleasant effects on mental health (Balbus *et al.* 2016). Other health effect of climate change and ozone layer depletion on humans includes thermal stress, skin cancer, cataracts and immune suppression ((Horton and McMichael 2008).

Heat due to climate change has a direct negative impact on human health. During high temperatures respiratory and cardiovascular diseases are the major causes of illness and death. According to WHO (1996) and McMichael (1996) the main worldwide environmental changes significantly affecting health are climate change and ozone depletion. Higher temperatures increase production of different secondary air pollutants like ozone and particulates which increase the frequency of allergic and cardio-respiratory disorders and deaths (Nwoke *et al.* 2009).

Forests and trees have the ability to improve the climate system of atmosphere in a numerous ways. They absorb carbon dioxide from the atmosphere and utilize it during photosynthesis in the production of carbohydrate. Forests store carbon in forest soils, absorbed through leaf litter, woody debris and roots. Since 1750, it has been estimated that forests have naturally sequestered



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about half of the carbon emissions from the atmosphere while the rest absorbed by the oceans (Brack 2019). Forests influence local temperatures, provide a cooling effect through transpiration and shade particularly vital in cities, where trees can help to offset the urban heat island effect thereby reducing adverse human health challenges.

Benefits of forest as impetus for Greening the Earth

The evidences of the significance of forests to human health and well-being should serve as momentum for greening the earth particularly the urban areas with high population density. Increase in forest plantation and forest management globally will sustain human and environmental health.

Conclusion

Forests function a great deal in both human and environmental wellbeing. Since forests are potential in pharmaceutical industries, traditional medicine, as source of human food and means of mitigating rising global temperature, it has become absolutely necessary for all stakeholders globally to sensitize and mobilize sustainable afforestation, reforestation forest plantation, management, conservation and urban forestry to foster future greening of earth with this indispensable renewable resource.

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