

Sustainability and Challenges of Climate Change Mitigation through Urban Reforestation: A Review

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Abstract

Several serious steps must be implemented in order to mitigate the harmful effects of the global climate change scenario. Urban reforestation is one of these solutions, particularly in underdeveloped countries where forest resources have been heavily and uncontrolled exploited. Apart from a few administrative centres that have trees that are lovingly maintained by the government through its respective institutions, most other African cities are bereft of trees for whatever reason. Lands are cleared to make way for structures or open spaces, with no attempt made to plant trees. As a result, these cities lack the enormous responsibilities that urban trees play. To combat excessive heat in major cities caused by exposure of urban land areas, which has consequences for current global warming, an urban reforestation exercise must be undertaken. This research looked at the literature to see what it takes to create a long-term reforestation programme in our communities. The work examined the characteristics of our cities, the required tree types due to poor planning characterized by most of the ancient cities and other prerequisites for a viable and productive urban reforestation programme. The implication of the exercise is the enhancement of oxygenated urban environment while the environment is decarbonized for the sustenance of ozone components of the atmosphere.

Keywords: Sustainability; Climate change; Urban trees; Climate change mitigation; Reforestation

INTRODUCTION

The global community's main priority is to address growing climate unpredictability and associated dangers, as well as their mitigation, because of the consequences for man's long-term survival on the planet. In support of this claim, Akay said that rapid climate change and growing climatic variability pose major global threats that require immediate global action. The United Nations and other international, national, and local parties have been involved in a series of conferences aimed at finding measures to mitigate it, based on this observation. For instance series of Conferences on Climate Change have been organized by the United Nations since 1995 when the first conference was held in Berlin, Germany. The last three Conferences have been held between 2nd and 13th December, 2019 in Chile; between 2nd and 15th December, 2018 in Katowice, Poland and between 6th and 17th November in Bonn Germany. The 2020 version is scheduled to hold from 9th to 19th November, 2020.

Stockholm Environmental Institute and Amapo had revealed that the results of recent research has estimated the average annual damages from disasters triggered by climatological, hydrological and meteorological hazards in 2002-2011 at US\$163 billion, US\$24 billion and US\$52 billion respectively. Of all these damages done, further exposed that 47.9% occurred in Asia, 38.6% in Americas, 9% in Europe, 3.7% in Oceania and less than 0.8% in Africa. It was also highlighted that global variations in economic losses demonstrated that they were largest in wealthy countries, whereas mortality rates and economic losses in terms of GDP were higher in underdeveloped countries.

Climate-related disasters, on the other hand, have become a rallying point in international climate discussions to push for more ambitious climate action. As a result, this research into climate change impacts and mitigation is both urgent and politically relevant in developing countries.

In her own view, Akbari et al. stated that since human lives are directly linked to the climate, it is therefore of no gain saying that human activities are changing the climate. He further lamented that there has been a continuous rise in global temperature in the last 130 years, which has huge consequences on a wide range of climate-related factors. He highlighted climate change impacts to include ice caps melting due to rise in temperature, rise in sea levels among others. Thus, as man experiences impacts of climate change which will not be favourable to human existence, it is imperative that we begin to make choices that will reduce greenhouse gas emission (GHG), which, according to Uwakwoala, stated the best way to achieve is get younger generations educated through our educational systems and other avenues of public enlightenment. Corroborating this view stated that GHG reduction needs to be pursued vigorously to avoid surpassing a 2°C increase in temperature since preindustrial times. Alterations in forest management can contribute to increasing the land sink and decreasing emissions by keeping carbon in high biomass forests, extending harvest cycles, reforestation, and afforestation. It was further asserted that forests are carbon-ready and do not require new technologies or infrastructure for immediate mitigation climate change. Aliyu, et al in their view expressed that industrialised countries started to increase CO₂ emissions from energy use much earlier while developing countries contributions to the emissions are majorly through land use changes and forestry as well as of methane (CH₄) and the nitrous oxides (N₂O) were

substantial before their emissions from energy use.

Burden discovered that healthy trees and forests bring a slew of climate-related advantages to communities. The urban forest's resilience to climate change can be improved via active design, management, and care, which can help cities and communities better adapt. Similarly, indicated that maintaining urban green spaces is one of the techniques advised for managing climate change risk through adaptation, namely through the reduction of vulnerability and exposure through development, planning, and practises that include "low regret" measures. , i.e. those that produce benefits even in the absence of climate change and with which the adaptation costs are relatively low compared to the benefits of the action. Borelli, et al. defined urban forest as "the art, science and technology of managing trees and forest resources in and around urban community ecosystems for the physiological, sociological, economic, and aesthetic benefits trees provide society". The urban forest has been described as "the sum of all woody and associated vegetation in and around dense human settlements, ranging from small communities in rural settings to metropolitan areas". Revealed that urban forests accordingly comprise different elements, such as urban woodlands, parks, civic squares, green corridors and single trees. They form part of the urban and peri-urban green infrastructure that is usually shaped and managed, by professionals from different disciplines and public authorities. In another sense, green infrastructure is being used in our contemporary times, especially among the Europeans and Americans. Defined green infrastructure as an interconnected network of green space that conserves natural ecosystem values and functions and provides associated benefits to human population. It was submitted that Green Infrastructure is taken to encompass connected networks of multifunctional, predominantly unbuilt, space that supports both ecological and social activities and processes".

Apartment complexes with high levels of greenery have been demonstrated to have around half the amount of crimes as those with little or no greenery; also, individuals who live in places without surrounding nature reported greater hostility and violence than those who live in areas with nearby green. moreover, access to nature also provides humans with other benefits such as :(i) Parks and other green spaces provide a space for people to play, walk, joy, bird watch or just to sit quietly. All these activities are good for human physical health in a society that is increasingly sedentary and also good for our mental health by providing a place to unwind. In addition, trees reduce noise levels.

Economic benefits of urban forestry: Research has demonstrated that urban forestry, among other things, can be a valuable source of investment. Other advantages, as described by Boyko et al., include: Reduced energy expenditures, shading, evapotranspiration, and wind speed reduction given by trees help buildings preserve energy, reducing urban heat island. Trees also make homes and neighbourhoods more appealing places to live. Urban forests also serve as source of income when properly managed in such a way that the cost of raising and maintaining such parks/forests can be defrayed from the income. However, proper guides, rules and regulations must be put in place to ensure that the other benefits of the tree are not jeopardized. In addition listed ecological advantages derived from urban forests including absorption of gaseous pollutants (e.g. ozone, nitrogen, oxides, sulfur chlorides) through leave surfaces, interception of particulate matter (e.g. dust, ash, pollen, smoke), capturing of CO₂ and the release of oxygen through photosynthesis and these lastly, transpiration of water and shade surfaces, which lowers air temperatures, thereby reducing ozone levels.

Aside from this, Cohen highlighted that trees may have a favourable impact on rainwater runoff, which can be a problem in cities. Most runoff control technologies (such as storm sewers) cause a slew of issues, including pollution, failure to recharge groundwater, and species extinction. Leaves and branch surfaces intercept and store rainfall, thereby reducing runoff volumes and delaying the onset of peak flows. Cohen noted the following benefits: that roots create air spaces in soil and thereby increasing the rate at which soil absorbs rainfall and the capacity of soil to store water which reduces runoff; tree canopies reduce soil erosion by diminishing the impacts of raindrops on bare soil; transpiration through tree leaves reduce soil moisture, increasing the soil's capacity to store rainfall. When runoff is reduced, the number of pollutants entering groundwater, rivers and lakes decreases.