

Responding to Global Warming Using Integrated Land use Management in Sub-Saharan Africa

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Key words: Greenhouse Gases, Global Warming, Deforestation, Integrated Land Use.

SUMMARY

The impact that man is making on his environment as a result of technological advancement is monumental in his bid to develop and raise his standard of living. Unfortunately, this also comes with different costs and hazards which, if not properly managed, may threaten his survival. One of such is the phenomenon of the global warming of the earth's atmosphere.

The focus of this paper is on the challenges posed to the Sub-Saharan Africa by Global Warming and how Integrated Land Use Management can be used to achieve sustainable development without necessarily aggravating the already precarious situation.

The countries in Sub Saharan region are more vulnerable to climate change because of their heavy reliance on climate-sensitive sectors, such as agriculture, forestry, and tourism, since the performances of these sectors also depend on how land is used and managed, hence there is the need to review the existing operations especially in relation to land use and management. In this wise, population growth, technological and social hazards, and environmental degradation have all to be taken into greater account when formulating and implementing Land Use Policy.

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1. INTRODUCTION

Global warming is the sustained increase in the average temperature of Earth's near-surface, air and oceans since the mid-20th century. Scientists who have elaborated on Arrhenius' theory of global warming are concerned that increasing concentrations of greenhouse gases in the atmosphere are causing an unprecedented rise in global temperatures, with potentially harmful consequences for the environment and human health (Watson and Harrison; 2005). It is now a scientific fact that the greenhouse gases in the atmosphere caused the Earth's overall temperature to be higher than what it would be without them.

Most greenhouse gases have both natural and human-caused sources. During the pre-industrial era, concentrations of existing gases were roughly constant. In the industrial era, human activities have added greenhouse gases to the atmosphere, mainly through the burning of fossil fuels and clearing of forests (Intergovernmental Panel on Climate Change, 2007).

The main sources of greenhouse gases due to human activity are:

- burning of fossil fuels and deforestation leading to higher carbon dioxide concentrations. Land use change (mainly deforestation in the tropics) account for up to one third of total anthropogenic CO₂ emissions.(Solomon et al, 2007)
- livestock enteric fermentation and manure management (Steinfeld et al, 2006), paddy rice farming, land use and wetland changes, pipeline losses, and covered vented landfill emissions leading to higher methane atmospheric concentrations. Many of the newer style fully vented septic systems that enhance and target the fermentation process also are sources of atmospheric methane.
- use of chlorofluorocarbons (CFCs) in refrigeration systems, and use of CFCs and halons in fire suppression systems and manufacturing processes.
- agricultural activities, including the use of fertilizers, that lead to higher nitrous oxide (N₂O) concentrations.

Anthropogenic warming, due to elevated greenhouse gas levels, has had a discernible influence on many physical and biological systems. Gradually, this warming is beginning to affect the potential of the earth to develop and sustain life-habitability. Studies have shown that the small shifts in climate have dramatic consequences for our planet earth and the life that depends on it.

For instance, Root et al (2003) show that a significant impact of global warming is already discernible in animal and plant populations. According to them, in species ranging from molluscs to mammals and from grasses to trees, more than 80% of the species show that changes are shifting in the direction expected on the basis of known physiological constraints of species.

Watson et al (2002) in a study of 59 plants, 47 invertebrate species, 29 amphibians and reptiles, 388 birds and 10 mammal species, found that approximately 80% showed change in the biological parameter measured ... in the manner expected with global warming. According to Gian-Reta et al (2002), evidence of recent climate change, from polar terrestrial to tropical marine environments indicates that only 30 years of warming temperatures at the end of the twentieth century have affected the phenology of organisms, the range and distribution of species, and the composition and dynamics of communities. Menzel and Fabian, (1999) found that spring events, such as leaf unfolding, have advanced by 6 days, whereas autumn events, such as leaf colouring, have been delayed by 4.8 days. This means that the average annual growing season has lengthened by 10.8 days since the early 1960s. According to them, these shifts can be attributed to changes in air temperature.

From the numerous studies carried out on the subject matter, it is now a scientific fact that climate change, influenced by humans is beginning to influence ecosystems. "From the streets of New York City to the banks of river Congo, to the glaciers in South America, humans are warming the planet by emitting more and more greenhouse gasses". "This rise in temperature is having a significant impact on physical and biological systems around the world. Glaciers and permafrost are melting, lakes and rivers are warming, flowers are blooming earlier, birds are migrating sooner, and both plant and animal species are searching for higher ground". The question is what can man do to stop this imminent catastrophe? The irony is that if development must continue, some of these activities must be carried out. Since these developmental activities directly impinge on how we use and manage the land resources, consequently effective land use management can be used to mitigate against global warming.

In Sub-Saharan Africa, land, in most cases, is one of the most treasured possessions. It is a capital asset, a productive economic factor and serves as an unlimited reservoir of sustenance for the man who has the use and enjoyment of a usable portion of it (Yakubu, 1985, Bello, 2006).

However, the failure to manage land and land based resources in an integrated and holistic manner in the sub-region has led to a multitude of problems. Apart from conflicts and related matters on land question, the sub-region is characterized by erosion, desertification, deforestation, and extinction of species. For example, Wayumba and Mwenda (2006) observed that change in land use from nomadic grazing to sedentary agriculture around Amboseli, Kenya led to subdivision of land which has subsequently led to interference with major Wildlife migration routes and diminishing in size of Wildlife dispersal areas. The effect is the degradation in the capacity of the land to optimally support human activity. These, coupled with inefficient and wasteful use of resources together with application of inappropriate technology have been linked to the numerous socio-economic problems including unemployment, poverty, disease and starvation in the sub-region.

In line with the above, the remainder of the paper is structured to highlight the specific effect of man activities within the tropical environment (Deforestation) that contributes in no small

measure to global warming and the role integrated land use management can play in mitigating against this.

2. IMPLICATIONS OF GLOBAL WARMING FOR SUB- SAHARA AFRICA

Africa is one of the most vulnerable regions in the world to the consequences of Global Warming. For this region, the exact nature of the changes in temperature, precipitation, and extreme events is not known, however, there is agreement about the following general trends (Desanker, 2002) :

- a) Global mean surface temperature is projected to increase between 1.5 °C (2.7°F) and 6 °C (10.8°F) by 2100.
- b) Sea levels are projected to rise by 15 to 95 centimeters (6 to 37 inches) by 2100.
- c) Climate change scenarios for Africa indicate future warming across the continent ranging from 0.2°C (0.36°F) per decade (low scenario) to more than 0.5°C (0.9°F) per decade (high scenario) (Hulme et al. 2001; Desanker and Magadza 2001).

Countries in this region are more vulnerable to climate change as a result of Global Warming because most of them heavily rely on climate-sensitive sectors, such as agriculture, forestry, and tourism, with limited capacity to adapt to climate change, given their lower income levels and weaker institutional frameworks (Kato, 2008). Consequently, global warming will have tremendous effects on biodiversity and food security in the sub-Saharan region. It has been predicted that, many African countries are likely to experience more severe droughts and declines in water supply, which would further aggravate food shortages on the continent. In addition, Health and Water Systems of African countries may also come under increased stress in the coming decades from more intense and possibly more frequent natural disasters. Coasts may be flooded, and populations may seek to migrate, raising the risk of social conflicts (Kato, 2008).

Table I shows the summary of possible impacts of global warming and climate change in Africa at predicted 1.5°C, 2.0 °c and 4.0°C rises in temperature respectively

Table I: Summary of Possible Impacts of Global Warming and Climate Change in Africa.

1.5°C	2°C	4°C
➤ Potential yield increases in East Africa and the highlands; reductions in the Sahel.	✓ Potential crop yield increases in highland areas; significant reductions in Southern Africa.	⇒ Anticipated drops in wheat, maize and rice crops in some areas.
➤ Potential increases in net revenue for small livestock farms; losses for large farms.	✓ Potential increases in net revenue for small livestock farms, losses for large farms.	⇒ Increased risk of hunger among up to 128 million more people.
➤ Twelve million people could be at risk from hunger.	✓ Net revenue loss to agricultural sector could be as much as	⇒ Higher risk of flooding in low-lying areas.
➤ Fisheries could be negatively	US\$133 billion, about 4.7 per	⇒ Potential increases in net revenue for small livestock

<p>affected by drought.</p> <ul style="list-style-type: none"> ➤ Widespread coral bleaching could occur on Indian Ocean coasts. ➤ Possible increases in exposure to malaria of 0-17 per cent; diarrhoea by -0.1-16 per cent ➤ Increased inland flood deaths by 0-127 per cent. ➤ Increased flooding resulting in damage to infrastructure and property. ➤ Water stress increases, particularly in North Africa. ➤ Up to 15 per cent of sub-Saharan species could be at risk of extinction. 	<p>cent of Africa's total GDP.</p> <ul style="list-style-type: none"> ✓ An additional 55 million people could be at risk from hunger. ✓ Water stress could affect between 350-600 million more people. ✓ Increases in malaria transmission and exposure are possible. ✓ Up to 40 per cent of species in sub-Saharan Africa could at risk from extinction. ✓ Flooding in coastal areas could cause around US\$50 billion worth of damage. 	<p>farms, losses for large farms.</p> <ul style="list-style-type: none"> ⇒ Malaria transmission area could double by 2100 in South Africa. ⇒ Increased water stress, particularly in northern and southern Africa. Rainfall could increase in eastern Africa.
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Source: adapted from Clements, (2009):The Economic Cost of Climate Change in Africa

3. TROPICAL DEFORESTATION AND GLOBAL WARMING

Tropical forests play a significant role in the planetary climate system, as well as in human-induced climate change (Ebeling, 2006). In recent decades, researchers have established direct links between deforestation and global warming. Forests are vital for absorbing and storing the world's carbon dioxide (CO₂), and when forests are cut and burnt en masse, the damage is two-fold:

- the world's capacity to absorb CO₂ is reduced, and
- large amounts of stored carbon are released into the atmosphere (Cramer (2006).

Deforestation releases carbon, principally as CO₂, to the atmosphere as the organic carbon stored in trees and soil is oxidized through burning and decay. Other greenhouse gases, such as CH₄ and N₂O, are also emitted as a result of deforestation. Deforestation in the tropics is one of the largest sources of current emission of carbon dioxide –the most important Green House Gas; and current emissions of greenhouse gases from deforestation amount to about 25% of the enhanced greenhouse effect estimated to result from all anthropogenic emissions of greenhouse gases. The destruction of the tropical forest is second only to the combustion of fossil fuels in contributing to global warming (IPCC, 2001; IPCC, 2000). Food and Agriculture Organization (FAO, 2001) estimated that during the 1990s 16.1 million hectares per year were affected by deforestation, most of them in the tropics, consequently, Global deforestation and forest degradation rates have a significant impact on the accumulation of greenhouse gases (Achard *et al.*, 2002; Houghton, 2003; Fearnside and Laurence, 2004).

The effect of Global Warming (due to greenhouse effect) is real, and time is short to avoid the most devastating impacts (Graßl *et al.*, 2003; Hare, 2003; ECF and PIK, 2004). In order to prevent dangerous climate change, governments, WWF and other NGOs have stated that global average temperature must stay well below a 2 degrees C rise in comparison to pre-industrial temperature (EU, 2005).

There is the need therefore, for a rapid reduction in the global greenhouse gas emissions over the next one to two decades in order to ensure that this dangerous threshold is not crossed (Den Elzen *et al.*, 2005; Den Elzen and Meinshausen, 2005c). The sources of emissions are clear. An estimated 75 to 80% of global emissions stem from industrial sources, specifically, the burning of fossil fuels. The remaining 20 to 25% can be sourced to deforestation emissions, predominantly in the tropics (IPCC, 2001). Both, the burning of fossil fuels and deforestation, must be urgently and effectively addressed in order to save the world's biodiversity and people from catastrophic climate change (Morgan *et al.*; 2005). However, if the current trend is allowed to continue, tropical deforestation will release about 50% as much carbon to the atmosphere as has been emitted from worldwide combustion of fossil fuels since the start of the industrial revolution (Houghton, 2005). To avoid this, there is the need to use and manage our forest and forest resources in a manner that would reduce future emissions of greenhouse gases. This will not only be possible but easy if land and land resources are used and managed in a holistic and integrated approach.

4. INTEGRATED LAND USE MANAGEMENT, GLOBAL WARMING AND POVERTY ALLEVIATION IN THE SUB REGION

According to (Desanker, 2002), An integrated approach to environmental management is needed to guarantee the conservation of African biodiversity that will ensure delivery of ecosystem goods and services (soil health, water, air, etc...) necessary to human life support systems. To achieve an enduring and sustainable environment as envisaged, the present way and manner in which land is used and managed in the sub-region has to be overhauled. An integrated approach to land use and management is a *sin qua non*.

An integrated approach to land use maximizes public benefits and takes into greater account the population growth, environmental degradation, technological and social hazards associated with the use and enjoyment of land and land based resources. Since it is fully integrated into the community where it operates, it contributes to the enhancement of the environment and economy of the area. This type of land use management has not evolved in Sub Saharan Africa.

Integrated Land Use Model is essentially made up of three parts. The first part provides the inputs which are to be processed (in the second part) to produce the outputs (in the third part).

4.1 The Inputs

The existing regulatory framework including received colonial and statutory laws, native laws and customs, socio-economic characteristics of the population, population growth, technological and social hazards, and environmental degradation, all have to be taken into account in the light

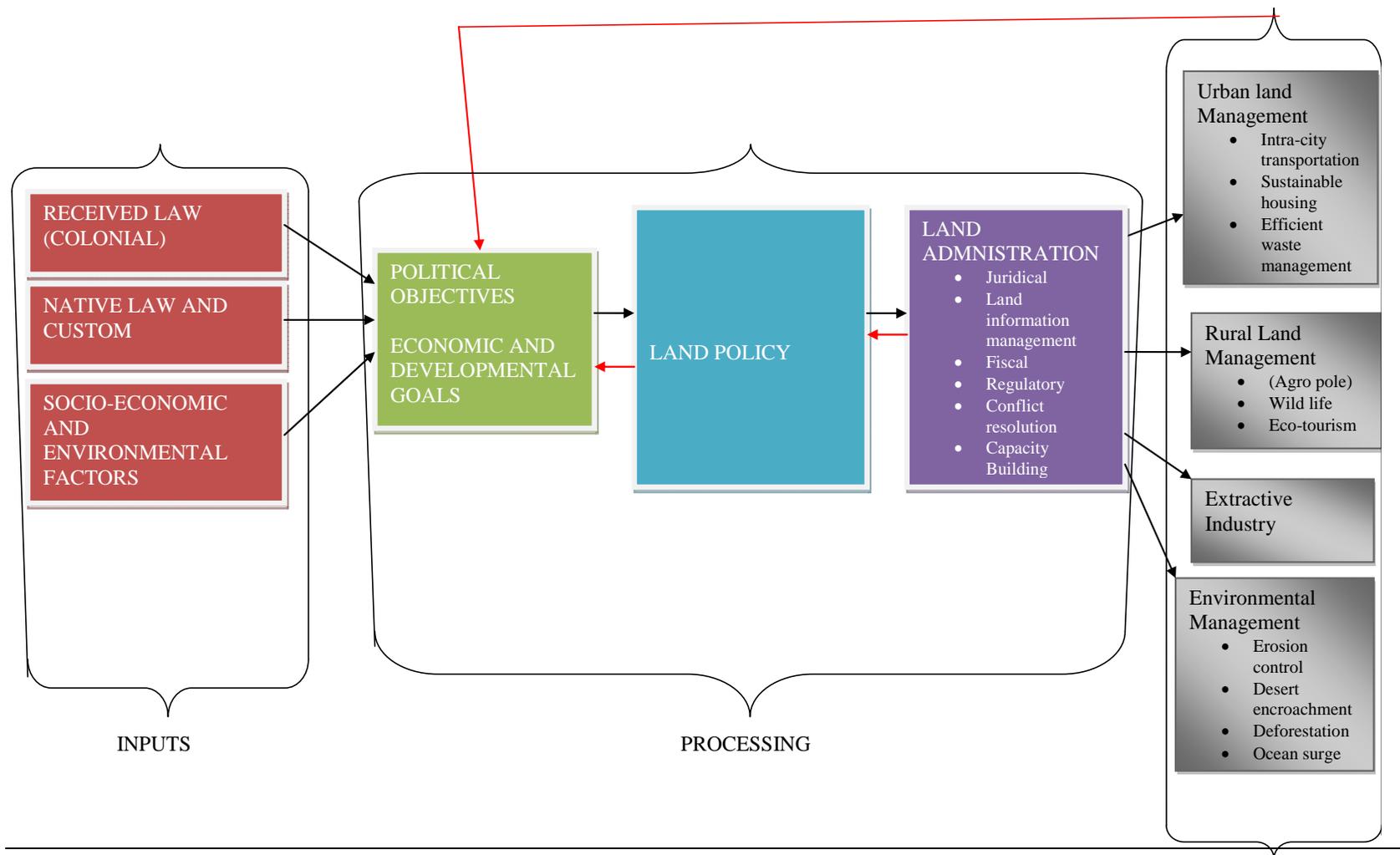
of the political objectives, economic and developmental goals to formulate the national land policy.

4.2 Land Policy

Land policy consists of “the whole complex of socioeconomic and legal prescriptions that dictate how the land and benefits from the land are to be allocated” (UN/ECE, 1996). Land policy shows the way governments want to deal with land matters in sustainable development (Osskó, 2006). Land policy of course should derive its inputs from the culture, history and attitude of people (GTZ, 1998). Countries of the sub-region inherited a dual system of statutory and customary tenure at independence. Before independence, there was one set of rights for the colonizers and their supporters (in terms of imported laws) and another for the local people under their ‘customary’ laws. The British Colonial Administration, for example, concluded that African lands should be held in trust because the community rights of Africans transcended those of individuals and their immediate relatives. Consequently, the colonial administration, held African land ‘in trust’ and designated it ‘Trust Land’, ‘Crown Land’, ‘Native Land’ or ‘Native Reserve’, which could be acquired by the state upon payment of compensation extending only to un-extinguished improvements, without regard to the potential value of the land to the individual, the family and future generations.

On attaining independence African governments have found it convenient to hold on to this legacy and have retained control over land allocation and use. Those in a position of power inevitably use their powers over land allocation in their own political and personal interests (Adams, 2006). Since independence, many countries of the sub region have realized the inadequacies of this land policy to resolve the land question, hence agitation for land reforms have been on increase.

The request is that there should be a planned change in the terms and conditions under which people use, occupy and have access to land. “The fundamental goals of tenure reform are to bring about a more equitable distribution of land and land resources, to secure people’s control over land rights and to devolve power over land-rights management nearer to the ordinary landholder”(Adams, Kalabamu, and White, 2003). However, for the reforms to be able to engender the desired increased accessibility to land, efficient rural land use and sustainable urban development, there is the need for it to take a holistic approach to land question with a view to integrate this with overall political and developmental objective of the nation. This is the type of policy anticipated in this paper and this will not only proffer solutions to the plethora of problems associated with the existing policy in this sub region but also enhance property development, harmonious environment and the efficiency of transaction in real estate.



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OUTPUTS

FIG. 1 MODEL FOR INTEGRATED LAND USE

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4.3 Land Administration

To facilitate the implementation of the type of land policy envisaged, appropriate machinery for suitable land administration must be put in place. Land administration is the “process of determining, recording and disseminating information about ownership, value and use of land when implementing land management policies” (UN/ECE Land Administration Guidelines, 1996). No matter how good a nation’s land policy is, without a greatly improved and reinvigorated land administration, none of these policy initiatives will ever see the light of day. Land administration presents a special challenge, and according to Okoth-Ogendo (2002), this has been ‘the forgotten factor in land reform in Africa’. Five components of land administration have been identified as juridical, regulatory, fiscal, land information management, and conflicts resolution.

The juridical component of the land administration function is to ensure that the land rights, or ‘incidents’, attached to a particular tenure category (e.g. freehold, state lease, customary grant) are clearly defined in law and in practice and resources are thus made available for land rights allocation, adjudication of rights, demarcation, registration and record keeping which are essential to assure the tenure security of the holder.

The element of land administration which is to enforce and maintain standards is the regulatory component. This is the public intervention into how land as a resource is developed and used to achieve the goals of the people or nation (Gamu, 2003). Regulatory functions are necessary not only for safeguarding the value of property but also for ensuring that the wider interests of citizens and not just the owner are adequately safeguarded. Within the sub region, Regulatory function has suffered a lot from corruption and maladministration, in some cases, physical planning laws, development control and building regulations do not exist, where they exist, they are ignored or widely abused. In this wise, Gihiring (1976) (in Gamu,2003), observed that the Nigerian Town Planning Law(1976) was inconsistent with changing public aspirations and amounted to a legal reinforcement of elitism in the exercise of power. The 1992 Urban and Regional Planning Law (Decree 88 of 1992) that came thereafter is yet to be implemented in many states in Nigeria. The failure of effective regulatory function is seen in weak land use and development control. The concomitant effects of this are epitomized in the worsened problem of sanitation, infrastructural decay and growing slums in the cities. For effective and efficient land management, this issue needs to be addressed. Appropriate regulatory measures should be put in place and compliance strictly monitored.

Another significant component of land administration is Land Information Management. This entails effective land records and information systems together with land registration and transfer processes. It would be difficult to implement a land policy if it is not clear who owns or is in possession of land, where it is located and what it is used for, and what it is worth. The situation with regard to land records and information in the sub region is chaotic and fragmentary. In many countries of the sub region, there is no attempt to have a detailed cadastral or mapping of ownership, whether in urban or rural areas (Mabogunje, 2003). In few where attempts were made of recent, these, although better than none, fall short of that needed to have efficient land management system.

Land Registration is another critical aspect of land information management. Through land registration, the following are taken care of:

- A record of who lays claim to a particular parcel of land is made.
- Establishing an unequivocal title to land
- Registration of subsequent transaction or transfers in land.

Land registration system in the sub region needs a lot of attention to ensure it is expeditious. The difficulties in getting property transfers are extreme in many African countries; however few have shorter, less costly and more efficient procedures (Toulmin, 2006)

According to Mabogunje,(2003) “It is claimed that there are some 32 stages that have to be gone through to register a plot of land or a transaction involving the land in some states of Nigeria”. “The execution of these various stages could take a number of weeks or months and itself is a cause for delay in the formal registration process”. To make land registration effective, there is the need to review the stages involved in order to reduce their numbers without necessarily undermining the efficacy of the registration instruments. Land registration should also be decentralized to the local governments with efforts made to launch a man power development programme for these institutions to be able to handle this task.

The fiscal component of land administration take cognizance of the financial worth of property both to the owner and most especially to the state as a veritable source of revenue in the form of land taxes, property rates, transfer duties, etc. The revenue generated from this sector should pay a significant proportion of government expenditure in the sector. Unfortunately, this is not so partly due to official corruption and partly due to poor assessment and collection of rates.

Conflict resolution which is the fifth component of land administration is, according to Okoth-Ogendo (2002), ‘a complex terrain’ Presently, mechanisms for this purpose in the sub region range from informal mediation, traditional courts, administrative tribunals, land boards and ordinary civil courts. An effective conflict resolution procedure should be able to ensure the preservation of the integrity of individual and community land rights and their peaceful enjoyment.

4.4 The Outputs: - Adaptation Strategies and Tools for Poverty Alleviation.

An efficient and effective land management is the one which, maximises public benefits; and contributes to the development of the economy of the areas. In the rural areas, land use in this manner, should be directed towards the use that has comparative advantage over other uses. Since agriculture is the main stay of the economy of many countries in the sub region, the development of Agropole (Agriculturally Productive Districts) should be encouraged. Others such as wild life and ecotourism where there are potentials should be fully harnessed. Land use management that guarantee security of tenure and marketable title, the type envisaged here, will increase farmer accessibility to credit and hence will enable the region’s farmers to invest, expand production and compete in world markets.

The management of urban land poses a variety of challenges for many stakeholders. Efficient and Sustainable Land management keeps urban life in urban agglomerations, restricts the extent of urban sprawl and minimises transportation and traffic problems. Integrated Land Use will increase the supply and reduce the cost of land for housing and thereby reducing the need for

poorer households to squat. With its virile Land Use Planning and Control component, it will also increase the proportion of urban households with access to basic services. "In much of the region, women are particularly vulnerable to dispossession, because they lack power and rights of inheritance. The rising incidence of HIV/AIDS often exposes them to an even greater risk of being dispossessed, when their male partner dies, since the rights of the dead man's kin usually prevail over those of the widow"(Toulmin, 2006). Integrated Land Use management as envisaged here will usher in equitable policies and laws that will promote gender inclusion at all levels of decision making and protect the interest of this category of land users.

For those in the informal sector, the significance of accessibility of land goes beyond the need for housing. In order to access funds and credit facility (for business growth) from government scheme and financial institutions, they need landed property as collateral security. For some, rental payment constitutes the highest component of their operating cost (Bello, 2007). Any policy that will lead to increasing accessibility of land to these individuals will therefore play a vital role in poverty reduction and enhancing the status of this group of individuals.

Integrated land use is very conscious of the threats in the misuse of the environment and therefore will not aggravate the destruction of the environment and by harnessing the inherent opportunities; it will contribute to the enhancement of the beauty of the environment. In this wise, it should be used as a panacea to resolve some environmental problems such as desertification, deforestation, ocean surge, and soil erosion plaguing the sub region.

5. CONCLUSION AND POLICY IMPLICATION.

The phenomenon of the global warming of the earth's atmosphere, once only a conjecture, is now an observed reality. It is estimated that under current emission trends, by 2100 average temperature will increase between 4° and 7° C, with potentially catastrophic social and environmental consequences, including rising sea levels, inundation of coastal cities, and large-scale ecosystem transformations (Moutinho Paulo and Stephan Schwartzman, 2005). Consequently, the overwhelming majority of the world's leaders adopted the United Nations Framework Convention on Climate Change (UNFCCC) in 1992, which is to establish binding targets for emissions reductions in the Kyoto Protocol in 1997, and ultimately to ratify the Protocol, ensuring that it will come into force in 2008. Unfortunately, neither the Convention, nor the Protocol currently offer any means to address emissions from the tropical deforestation which account for some 20%-25% of global CO₂ emissions. Not only should this be revisited, and while this is being contemplated, efforts should be made by governments and Non Governmental Organizations in the region to sensitize people of the need to imbibe environmentally friendly practices. Since countries in Sub Saharan region are more vulnerable to climate change because of their heavy reliance on climate-sensitive sectors, such as agriculture, forestry, and tourism, the decision makers must take cognizance of the fact that there is the need to review the existing operations in these sectors especially in relation to land use and management. In this wise, population growth, technological and social hazards, and environmental degradation have all to be taken into greater account. Those professionals who are involved in land matters (such as, estate surveyors, land surveyors town planners); the

general public and administrators should be actively involved in policy formulation and implementation.

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