

Solving Deforestation, Protecting and Managing Key Water Catchments in Malawi Using Smart Public and Private Partnerships

Kenneth A. Wiyo¹, Lameck Fiwa¹ & Weston Mwase²

¹ Agricultural Engineering Department, Lilongwe University of Agriculture and Natural Resources (LUANAR), Lilongwe, Malawi

² Department of Forestry, Lilongwe University of Agriculture and Natural Resources (LUANAR), Lilongwe, Malawi

Correspondence: Kenneth A. Wiyo, Agricultural Engineering Department, Lilongwe University of Agriculture and Natural Resources (LUANAR), Bunda Campus, P.O. Box 219, Lilongwe, Malawi. Tel: 265-888-352-121. E-mail: wiyoengineering@gmail.com

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Abstract

Deforestation, habitat loss and forest degradation are the most critical issues facing Malawi today driven by higher population growth. Deforestation in water catchments has a direct link to the blackouts of the state-owned power producing company (Electricity Supply Commission of Malawi, ESCOM) and to the inadequate water supply by the semi-public Water Boards, both in dry and wet seasons due to sedimentation and low flows in the rivers. As a result, water and power utilities, private sector and communities are all severely affected by the impacts of deforestation. To solve deforestation in Malawi, the country requires a multi-sectoral integrated approach through creation of smart partnerships between public, semi-public and private sectors to support community-based afforestation and forest regeneration programmes. It is proposed that Malawi Reforestation and Environmental Protection Authority (MAREPA) be established through an Act of Parliament to collect funds and finance afforestation and forest regeneration activities. A small non-prohibitive tax (administrative levy) on selected key products, such as water, beer, electricity, sugar, tea, coffee, and tobacco, could be introduced to finance the MAREPA fund. This will be achieved through Payment for Ecosystem Services (PES), where a smart partnership among government, semi-public water and power utilities, private sector, development partners, and civil society would be paying for services rendered through conservation of forest resources which in turn reduces sedimentation in key water catchments. The ecosystem services could include carbon sequestration, water protection for consumption and hydroelectric power generation, biodiversity conservation, and natural landscape preservation. The proposed MAREPA can provide a way to finance sustainably afforestation and forest regeneration programmes instead of various stakeholders independently tackling deforestation in Malawi without coordination. A multi-sectoral taskforce could be formed to carefully review the feasibility of MAREPA and set a regulatory framework and a tax regime to cover annual funding needs for Malawi's afforestation and forest regeneration aims.

Keywords: afforestation, deforestation, payment for ecosystem services, tax, water and power utilities

1. Introduction

Malawi is a country in Southern Africa bordered by Tanzania to the north, Zambia to the West and Mozambique to the East and South West (Figure 1). Deforestation in key water catchments in Malawi is affecting the livelihoods of local communities through loss of natural habitat, soil erosion, flooding, and water shortages (Poppy *et al.*, 2014 and Kafumbata *et al.*, 2013). As a result of poverty and survival strategies, communities are often accused of over felling forests causing land deforestation and forest degradation (NSO, 2012). Deforestation is also affecting the operations of the semi-public Water Boards in ensuring sustainable water supplies at source water catchments, both in the dry and wet seasons (NWDP, 2008).



Figure 1. Map showing location of Malawi in relation to other countries in Southern Africa

While there is an important problem of low flows in most source rivers during the dry season, the wet season is characterised by flooding and sedimentation in rivers affecting pump operations at water abstraction points. As an example, floating vegetation, excess sedimentation, and low stream flows in the Shire River are affecting hydro-electric power production at Nkula, Tedzani and Kapichira power stations belonging to the Electricity Supply Commission of Malawi (ESCOM), the power utility in the country (GoM, 2010). As of 2010, Malawi relied on hydro-electric power generation from the Shire River for 98% of its power production (MCA, 2012). This fact becomes more relevant and worse according to the environmental effects of the climate change resulting in, annual changes in the rainfall patterns and quantity (Wiyo, 1999 and Simelton *et al.*, 2013).

Therefore, there is the need to create smart partnerships among the government, water and power utilities, private companies, non-governmental organizations and local communities, among others, in order to solve the

problem of deforestation in key water source catchments of Malawi. Thus, this paper reviews some options in building smart partnerships among key stakeholders, particularly between public and private sectors, in solving deforestation in Malawi key water catchments and ensuring sustainable state water and power productions in the climate change era.

2. Deforestation in Malawi

2.1 Causes of Deforestation in Malawi

The extensive deforestation in water source catchment areas in Malawi is the clear result of several interrelated socioeconomic factors (FAO, 2012; Rudel, 2013; Munthali, 2013; Wiyo, 2009). First, the significant population growth during the last years in Malawi is cited, an annual rate of population growth of 2.8% on the 2008 public population census (NSO, 2009). This rapid increasing of country's population combined with the significant consumption of biomass as the majority source of energy, clearly results in an increment of land deforestation. According to the 2011 Malawi integrated national survey (IHS3) and population census of 2008, wood energy (charcoal and firewood) is the first source of energy for over 95% of the Malawi population, principally for cooking and water heating (NSO, 2009; 2012). According to NSO (2009), rural areas particularly rely more on firewood (98.5%) than on charcoal (0.4%), while urban areas are consumers of both firewood (39.8%) and charcoal (45.8%). In summary, high population growth in Malawi means more forest fellings in order to serve the high domestic energy demands in rural and urban areas.

Furthermore, fuelwood is the main power source in making burnt bricks, the quasi-exclusive raw material in Malawi buildings. In fact, brick making is a lucrative business for the urban poor living in the peri-urban areas of Mzuzu, Lilongwe, Blantyre, and Zomba cities. It has been calculated that the brick making industry in Malawi alone consumes around 850,000 tons per year of fuelwood contributing significantly to land deforestation (MCA, 2012; Munthali, 2013 and NSO, 2012).

The extreme poverty of the majority of Malawians economically (NSO, 2012) limits the use of alternative energy sources to wood and charcoal consumption for domestic purposes. Natural gas, paraffin and ESCOM electricity are not affordable by the majority of the rural and urban populations, although some urban households combine the use of electricity for lighting and wood resources for cooking and water heating (NSO, 2009; 2012). ESCOM, the sole power utility, has not managed to entice through appropriate incentives urban households to rely on electricity rather than wood energy for cooking and water heating. This is partly due to ESCOM high tariffs compared to average Malawi incomes, high connection charges and long wait times to have electricity connected (MCA, 2012).

Second, increasing population in Malawi also results in land conversion from forests into agrarian crops and settlement areas (ASWAP, 2010; NSO, 2012). The lack of available agrarian lands determines that farmers are converting marginal and steep terrains into agricultural areas, triggering deforestation and, consequently, soil erosion and river sedimentation (MCA, 2012). Encroachment of forest and game reserves is on the rise for example Dzalanyama Forest Reserve in Lilongwe and Zomba Mountain Forest Reserve in Zomba City (Munthali, 2013 and Kafumbata *et al.*, 2013). Malawi's efforts to control its population by reducing female fertility levels have had limited success. Less than 28% of the Malawi's child-bearing age females are practicing birth control (MDHS, 2010). Malawi population is about 16 million and growing while the country land size is limited. As a result, Malawi has one of the highest population densities in Africa, only exceeded by Rwanda and Burundi (NSO, 2009). Coupled with high population is the high rate of urbanization in cities such as Lilongwe, Blantyre, Zomba and Mzuzu. While the Malawi population still remains largely rural, with only 20% of Malawians living in urban areas, the urban population has been increasing rapidly. The country is experiencing one of the highest rates of urbanization in Africa, at 6.3% per annum, three times the global rate and nearly twice the Africa rate of 3.5% (CCODE, 2013). Given that urban residents are the main consumers of commercially traded fuels, this progressive urbanization of the population, in tandem with the rapid overall growth rate, have major implications for the growth of commercial wood fuel demand for cooking, heating, and burning bricks (Mauambeta *et al.*, 2010).

Finally, the rapid expansion of the tobacco and tea estate sectors in the 1970s and 80s also accelerated the forestland conversion in cultivation areas and, then, deforestation process. Even more, the tobacco industry is annually using unsustainable indigenous miombo wood from community forests for barn construction poles and rafters (for burley) and tobacco curing (for flue and dark-fired tobaccos) (MCA, 2012). While efforts are being made by the tobacco industry to use wood from sustainable sources, this is not universally done by all tobacco farmers (ASWAP, 2010). Also, the efforts to have the industry rely on alternative energy, like ESCOM electricity, waste coal and natural gas, have not been universally adopted partly due to cost and partly due to lack of a

comprehensive national strategy to entice the tobacco industry to use ESCOM electricity or alternative fuels for tobacco curing (MCA, 2012). Thus, the tobacco industry is a major contributor to deforestation in Malawi. While tobacco companies have started to tackle the problem of deforestation due to tobacco activities, it is still in early stages and the impact is yet to be seen (Minde *et al.*, 2001; Missanjo & Kamanga-Thole, 2015).

2.2 Effects of Deforestation on Power and Water Supply

There is a strong connection between deforestation in the upstream areas in Malawi and frequent ESCOM blackouts and water shortages in cities and towns (Poppy, 2014; Rudel, 2013; Walker, 2004). There is a strong link between deforestation in the water source catchment and ESCOM electricity blackouts, both in the wet and dry seasons. Because of deforestation, the soil becomes bare and is exposed to raindrop impact when it rains. Consequently, a lot of soil particles (sediments) and evasive vegetation are detached from land and river banks. These detached soil particles and evasive vegetation eventually make it to gullies, streams and rivers into Lake Malawi and the Shire River causing sedimentation and blockages at the intakes of power generation stations (MCA, 2012; Wiyo, 2009). More sediments or floating vegetation at Nkula, Tedzani and Kapichira Hydro Electric Power (HEP) stations means reduced power generation capacity because sediments and vegetation decrease the volume of water reaching the turbines and is destructive to power generation equipment. This is the same at Walker's Ferry water pumping station for Blantyre Water Board and Lilongwe river intake for Lilongwe Water Board. The results are extremely high load shedding of power and critical water shortages in the cities during the wet season (Nation Newspaper Reports, December 2014). For instance, flooding led to choking of power generation machines by trash and sediments the whole month of January 2015. Malawi faced critical low energy power generation due to the shutdown of its two power stations Nkula A and B on the Shire river. Because of the shutdown, the electricity generation was reduced by 124 Megawatts from 315 Megawatts and the utility company lost over USD 30,000 per day for a month (ESCOM Press Release, 2015). Households in cities experienced an average of 7 hours without power per day and 4 hours without running water supply (ESCOM Press Release, 2015).

Because of high deforestation rates, soil structure changes resulting in less rainwater infiltrating into the ground to replenish groundwater available to streams during the dry season (Njoloma, 2009). The net effect of low infiltration rates is that even very small storms (less than 30mm) result in a lot of surface runoff and sediment transport to the rivers causing extensive flooding and sediment problems. More surface runoff means rivers and streams bursting their banks resulting in flooding and more sediment loads in the wet season. Since the year 1998, the frequency and district distribution of floods have increased (DDMA, 2015) with more districts reporting flooding cases. For example, the 67.9% of the Malawi districts reported flooding in 2015, compared to 14.3% of the districts registered in year 1998 (DDMA, 2015).

Even more worrying is the fact that Malawi is losing a lot of water during a short wet season period (December to April,) to Zambezi River into the Indian Ocean. The irony is that this excess water being lost to the Zambezi is needed during the dry 8 months by many Malawi industries, including ESCOM, Water Boards, ILLOVO Sugar, beer companies, and irrigation schemes. Unfortunately, there is simply no cheaper way of retaining this water for use during the 8 dry months when water is needed most. A modern barrage and more dams could be constructed upstream at great cost but without checking deforestation upstream, they are likely to be filled-up with sediment in no time (NWDP, 2008; Wiyo, 2009).

Furthermore, the consequence of less water entering the ground to become groundwater is that streams and rivers dry-up during the dry season or have very low flows. Most rivers including the Shire are drying up during the dry season or have low base flows (Kumambala, 2010; Njoloma, 2009). Low base flows in the dry season in the Shire river means lower power production at Nkula, Tedzani and Kapichira HEP stations. Less power generated means more power blackouts and load shedding in the dry season (MCA, 2012).

Lastly, low flows in the dry season in rivers means domestic water rationing by Water Boards in the dry season and inadequate water for irrigation. Throughout Malawi along streams and rivers, water is being extracted for gravity-fed systems for rural domestic water supply, water supply for small towns, and market centres and for irrigation. Low base flows or no stream flows during the dry season means that water is in short supply for domestic water uses and irrigation resulting in severe competition between domestic water users and irrigation and in some cases leading to conflicts between town residents and irrigation farmers, as the case was with Central Region Water Board (CRWB) at Ntcheu township in Ntcheu District in 2014. Water shortages can even dictate when education institutions open. Even more, wells and boreholes are drying up resulting in water shortages for domestic and irrigation in the dry season (Kafumbata *et al.*, 2013; Poppy, 2014). Ministry of Agriculture, Irrigation and Water Development reported extensive water shortages across the country during

2014 dry season (Benson Sumani, personal communication) to the extent that even Diamphwe, a large perennial river in Lilongwe district, dried up. Given less water infiltrating the ground over time due to deforestation, rivers will dry up in the dry season and water tables will continue to decline necessitating even deeper wells and boreholes.

Since deforestation affects many service providers including ESCOM, Water Boards, beer companies, irrigation companies (e.g. ILLOVO Sugar), schools and colleges, local communities, tobacco industry, smallholder farmers, irrigation schemes, domestic water supply for towns, cities, rural areas and individuals, there is need for an innovative mechanism requiring a coordinated integrated solution through afforestation and forest regeneration of upstream water catchment areas as a long-term cost-effective solution.

3. Addressing Deforestation in Malawi's Key Water Catchments

3.1 Past Malawi Afforestation Efforts a Failure

Malawi's past efforts at afforestation have not been a great success (French, 1986; NSO, 2012; Walker, 2004). Currently, Malawi is felling more trees than it is planting. According to Malawi Forestry Department, over 50,000 ha of forests are annually destroyed and only a third area is reforested. This means that Malawi is currently depleting the forest parent stocks (FAO, 1992, 2012; GoM, 2010). The few that are planted are not properly cared for and die in the first three years of life (GoM, 2010; Walker, 2004). Walker (2004) and Malawi Forestry Department reports that this is the case despite 40 years of various national efforts to plant and protect trees (e.g. National Tree Planting day, National Tree Nurseries, Carlsberg's Make Malawi Green campaign, gazetted forests, Blantyre and Lilongwe City Fuel wood projects, Mvai Forest Plantation, Viphya Pulp Wood Project, and Agroforestry Promotion). The bottom line is that Malawians are not planting as many trees as they are using resulting in forestry stock depletion. The reason is very simple: it is not worthwhile for them to plant trees on their fields, homesteads or estates. This is because it is still cheaper to source firewood from communal forests than planting their own (Anderson, 1988; French, 1986; Walker 2004). There lies the deforestation problem and a pointer to its solution (French, 1986).

The picture is somewhat changing in some districts because of high demand and low supply of wood energy in recent years and consequently, wood prices are rising (NSO, 2012). Now, it is worthwhile for farmers to plant trees as a commercial crop for sale. This is beginning to happen in cities, towns and market centres and the heavily deforested areas of Ntcheu and Dedza Districts. The high firewood prices are now prompting Malawian farmers to start planting own trees as woodlots and in field and homestead boundaries for use and sale. The hope is that high wood prices will encourage more farmers to plant trees nationally for cash assuming land to plant trees is there. This is Malawi's best hope of reversing deforestation through afforestation within a short time (French, 1986; Munthali, 2013).

3.2 Multi-Sectorial Community-Based Afforestation Approach

To confront deforestation in Malawi, there is need to solve two major problems: (1) How to encourage local communities to plant and manage trees and protect deforested areas to allow forest regeneration and (2) how to reduce Malawi's overdependence on wood as a source of energy. This paper will tackle the issue of community-based afforestation and regeneration programmes financed through a proposed Reforestation and Environmental Protection Authority (MAREPA) created through an Act of Parliament and made possible by regular multi-sectoral financial contributions by government, power and water utilities, NGOs, donor agencies and private sector affected by deforestation or suffering from its effects. It will be implemented at district level through the already proven Local Development Fund (LDF) structures for infrastructure and watershed management activities.

Then, what can be done realistically to afforest or encourage forest regeneration in Malawi? The issue is complex and there are no easy answers. The key lies in local communities, government, power and water utilities, NGOs and private sector working together in an integrated and coordinated pattern. An individual organization like government or ESCOM will not reverse deforestation in Malawi. The government tried to do it alone through Forestry Department (Blantyre Fuel Wood Project, Dzonzi-Mvai Forest Reserve, Viphya Pulp Wood Project) but it failed (French, 1986; Walker, 2004). If anything, the Blantyre Fuel wood Project did show that government cannot plant trees economically because the cost per hectare planted was later found to be too high (Jumbe, 2005; Kachule *et al.*, 1998).

Although the Government of Malawi has established a Forest Development and Management Fund that get royalties from forestry and contributions from estate owners relying on fuel wood to support afforestation, these public funds are likely to be abused because of a lack of a regulatory framework. The institutions that generate

the funds are failing to get required funds due to failure to remit funds by the Malawi Department of Forestry. The funds collected are often misdirected to other activities. Furthermore, there is some corruption in allocation of plots for logging and sale of concessions through undervaluation of volume of wood sold (GoM, 2010). The need for a regulatory framework through an act of Parliament is apparent. The proposed MAREPA will address this gap.

3.3 Sedimentation and Evasive Vegetation at Power Stations Is Not an Engineering Problem

Sedimentation and evasive vegetation at intakes of HEP power stations is not primarily an engineering problem requiring an engineering solution; but it is primarily a water catchment problem requiring a catchment management solution upstream. It is not a hydraulic problem requiring manipulation of the hydraulics of channels in an attempt to flush out sediments. It is not an embankment design or dredging problem at Walker's Ferry to free the sediments. It is simply a catchment management problem requiring an upstream solution. The caution of the river hydraulics and sediment transport guru, Professor J.J. Peters of Belgium Free University of Brussels (VUB) is worth remembering: you cannot economically separate water from sediment in rivers. In other words, rivers will never run out of sediments, as Malawi sand extractors can testify. The only way is to make sure that sediments do not enter the river system in the first place (Peters, personal communication).

ESCOM strategy in solving sediments and evasive vegetation in Shire river should not lean heavily on engineering solutions, but on long-term catchment management solutions such as afforestation and forest regeneration. Engineering solutions are short-term while catchment management solutions are long-term. Long-term integrated catchment management programmes are the public tools or measures necessary to solve sedimentation and evasive vegetation in Malawi.

4. Creating Smart Partnerships for Community-Based Afforestation and Forest Regeneration Programmes

4.1 Rationale for Engaging Various Stakeholders

Various stakeholders will play various roles in creating smart partnerships in afforestation or forest regeneration programmes. Thus, local communities would mobilize and implement tree planting and tree protection activities, while government would create the regulatory environment and policies for financial mobilization by government, power and water utilities, private sector, and development partners. Table 1 summarizes the rationale for targeting various stakeholders and their likely contribution in afforestation and regeneration programmes through MAREPA.

4.2 Role of Local Communities

Local communities and their traditional leaders are the custodians of customary lands on which forest resources are found and where deforestation and encroachment are taking place. Thus, the involvement of chiefs and their networks in the afforestation and regeneration programmes is vital. The trick is to make local communities have an economic stake in the management and protection of forest reserves through smart partnerships and co-management as the case is with African Parks Ltd at Majete Game Reserve in the South. The Forestry and Wildlife Departments faced by numerous challenges, have seen the wisdom of partnering with local communities and private sector in the care and management of forestry and wild life resources. It is a partnership with shared plans, benefits and responsibilities. It is naive to think that local communities will protect and respect forestry reserves or ESCOM woes with sedimentation and evasive vegetation when there are no direct economic benefits to the communities in protecting the forests (French, 1986 and Walker, 2004). Local communities will protect forest resources if it can be demonstrated that they are beneficiaries of forest reserves through sustainable harvesting of dead wood or non-timber products such as mushrooms, fruits, honey, grass and medicinal plants. It should be in the economic interest of local communities to protect forests and plant trees (Anderson, 1988; Dougill et al., 2012; Walker, 2004). By engaging in apiculture and collecting dead firewood and other non-timber forest products in these areas, communities can have economic stake in protecting key water catchments.

Table 1. Rationale for creating smart partnerships with various stakeholders

Stakeholder	Rationale for their inclusion	Possible Contribution to MAREPA
Malawi Government	Key stakeholder on environmental protection, water and power shortages	Provide tax funding through subvention, regulation and control
ESCOM Utility/Power Companies e.g. Ethanol, Fossil Fuels	Generates Electricity from HEP. Affected by low flows, sedimentation and floating vegetation. Contributes to carbon footprint.	Small non prohibitive consumer tax(1-3%) on electricity, fuel and ethanol bills.
Water Utilities (Water Boards)	Use water for domestic water supply in towns, cities and market centres	Small non prohibitive tax (0.5-3%) on water bills
Beer, bottled water and beverage companies (e.g. Carlsberg, Cocacola, Quench)	Rely heavily on water. Affected by water shortages and quality of water	Small non prohibitive tax (0.5-3%) on bottled product
Private Irrigation, Fish Companies (e.g. Illovo sugar, tea, MALDECO, company)	Use a lot of water to irrigate sugarcane, tea, macadamia, rice or produce fish etc	Small non prohibitive tax (0.5-3%) on every kg sugar, tea, coffee, macadamia, rice, fish sold,
Timber Companies	Forest fellings for timber, need to replant trees for sustainability	Small non prohibitive tax (0.5-3%) on timber products
Tobacco Companies	Contribute to deforestation through use of wood for barns and curing	Small non prohibitive tax(0.5-3%) on every kg of tobacco sold
Mining/Natural Resources (minerals, cement, etc)	Mining is often destructive to the environment	Small non prohibitive tax(0.5-3%) on every kg mine sold
Other Private Sector companies	May not directly contribute to deforestation but have a stake in water and power shortages, good environment	Contribute through Social Responsibility Corporate Funds (CSR)
Non State Actors (NGOs, FBOs, CBOs etc)	May not directly contribute to deforestation but have a stake in water and power shortages, good environment	Can source funds from development partners for environmental management and protection
Development Partners	have a stake in water and power shortages, good environment	Donors do fund various environmental protection and management activities
Tourism Companies and Facilities	Tourism benefit from a good environment, wildlife and reliable supplies of water and power	Will contribute from taxfor water and power utilities

The chiefs and their network of village headmen can and do exert tremendous pressure (even, penalties) to protect certain areas deemed to be of vital interest to local communities. No villager can cut a tree from a graveyard without the chief's permission or risk a heavy penalty. There are lessons to be learned in the way local communities protect and manage graveyards and other important cultural sites like initiation and *dambwe* sites (Dougill *et al.*, 2012; Kafumbata *et al.*, 2013).

4.3 Role of Water and Power Utilities

A number of power and water utilities (ESCOM, City and Regional Water Boards-Blantyre, Lilongwe, South, Central, and North) have been seriously affected by the effects of deforestation (flooding, sedimentation, water and power shortages). The semi-public water and power utilities would be compelled by government (majority shareholder) to contribute across the board a small MAREPA tax (say 0.5 to 3 % of the monthly water and power

bills) for afforestation and environmental protection activities. These semi-public utilities can be charged to be part of the deforestation solution by paying to MAREPA an ecosystems services charge and not just be complainers of destruction of the environment. Solving the deforestation problem is clearly in their economic interest. The City and Regional Water Boards will not sit back as water shortage hit them in both the dry and wet seasons. They are bound to do something to solve the water shortage. The good thing is that deforestation is now high on the political agenda (GoM, 2010). Malawi government is showing political will to solve deforestation once for all and is likely to compel semi-public power and water utilities to contribute to a small tax for ecosystems services through MAREPA.

However, water and power utilities solution to deforestation should not be extra embankments or dredging as being pushed in some quarters (MCA, 2012). Rather, these utilities should be levied a small non-prohibitive MAREPA tax for community-based afforestation or forest regeneration programmes in their key water catchments (Dzalanyama, Chikangawa, Middle Shire etc). A distinction should be made between a direct tax and a levy. In Malawi's case, the tax is more of an administrative levy signed by minister responsible while a direct tax will need the prior approval of parliament. In a few years, sedimentation and evasive vegetation in the Shire and other areas can be checked and at the same time, river flows can be stabilized ensuring sustainable flows in streams and rivers during the dry season. Stable flows in the dry season means sustainable (no shortages) water and power supplies (Kafumbata *et al.*, 2013).

4.4 Role of Heavy Water and Wood Users

A number of private sector businesses have been seriously affected by a shortage of wood resources and by the effects of deforestation. The good thing is that deforestation and its effects are now affecting big industry with the know-how and financial muscle to do something about it. These would now willingly come forward to be part of the afforestation solution and not just being water and wood users. Solving the deforestation problem is clearly in their economic interest. These private companies include the Tobacco Industry (Tobacco Association of Malawi, TAMA and Tobacco Exporters Association of Malawi, TEAM), Tea and Coffee Industry, ILLOVO (irrigation water), beer and beverage companies (Carlsberg Malawi, Malawi Distillers, Chibuku Breweries, Dairiboard, Suncrest Cremaries Limited among others). The companies above have vested interest in forest resources either through a need for wood energy or a need for a reliable power and water supplies. Through an Act of Parliament or industry agreement, a small non-prohibitive MAREPA tax(0.5-3%) could be applied on their products such as tobacco, sugar, water, electricity, beer, soft drinks, juices, bottled water and help generate funds for afforestation and regeneration activities in key water catchments. Few examples suffice.

The tobacco industry, through Tobacco Control Commission (TCC), would come in and taxa certain small percentage (say 0.5-3%) to MAREPA fund on all tobacco sales for afforestation and regeneration programmes. The tobacco industry being a major industry can contribute a lot to afforestation and forest regeneration. In addition, Tobacco Control Commission (TCC) and TAMA should tighten tobacco quota conditions on estate afforestation. The authors are in favour of annual estate afforestation based on size of tobacco quota, that is, no trees are planted, no quota for that year is authorized. The sugar and ethanol companies, such as ILLOVO sugar, Mtalimanja, Ethanol and Press cane, would also come in and agree to pay a tax of 0.5-3% to MAREPA for a price of a packet of sugar or litre of ethanol sold. The bottlers, beer, beverage and bottled water companies would do a similar thing by paying a tax of 0.5-3% on the price of their products to MAREPA for afforestation and regeneration programmes. The key is that the tax should be small and not prohibitive to the private sector (Anderson, 1988).

All private industries affected by deforestation and its effects would work together perhaps through a national task force (commission) on deforestation and environmental protection of MAREPA whose main task will be to pool know-how and financial resources from government, semi-public utilities, private companies, NGOs and local communities to address deforestation in Malawi. Such a national task force should group experts (academia, government, private sector, industry leaders, community leaders and representatives of the international community). A piece-meal approach to arrest deforestation or each stakeholder independently acting alone will not give the necessary impact. These companies should contribute through a MAREPA Fund. Given the damage by floods in 2015 and the resultant extensive power and water shortages, power and water consumers and households should be able to understand the need to protect catchment areas in order to reduce black-outs and water shortages. With proper civic education, the political risks for such a tax on products should be low.

Such mutually beneficial collaboration between government, private companies and communities need to be extensively promoted. To create a win-win situation such contributions could also be attached to individual companies marketing objectives such as product promotion, image building and pricing policy but MAREPA

national fund should be flexible enough to receive funds from as many sources as possible and in return, companies should be able to meet their profit, operational, branding and corporate responsibility objectives through MAREPA.

4.5 Role of Government, Development Partners and NGOs

The government through ministries, departments and district local governments is needed to provide a regulatory framework for MAREPA, facilitation and provision of technical expertise but not implementation of MAREPA activities. It can also provide direct taxpayers funding through a subvention to MAREPA. Apart from high implementation costs, government machinery is slow due to built in bureaucratic procedures. Afforestation and regeneration programmes can be left to local communities to implement with technical assistance from sector ministries at the district level using LDF structures and NGOs working through local communities. NGOs and international donors can provide international expertise and experience on deforestation and provide financing to MAREPA. NGOs have fast implementation times compared to government departments and are best suited to work with local communities on afforestation and regeneration programmes (Dougill *et al.*, 2012).

In addition, NGOs and development partners can provide or mobilize badly needed financial resources to MAREPA. Government would also contribute to the proposed MAREPA financial resources directly from tax revenues through subvention. The existing Malawi drought fuel levy could easily be channelled to MAREPA with minimum political risks. Even more, government would mobilize funds from Development Partners such as World Bank and African Development Bank (AfDB) and bilateral donors through the LDF structures for afforestation and regeneration activities.

4.6 Implementing Afforestation and Regeneration Programmes Using MAREPA Funds

Funds collected under MAREPA for afforestation or regeneration programmes will be implemented by local communities through district structures as per Local Development Fund (LDF). Local communities will do afforestation and regeneration programmes with financial assistance from MAREPA on self-help basis. This will re-ignite the spirit of self-help which is almost gone with the advent of multi-party politics. MAREPA funds should be channelled to districts using LDF structures. Communities will decide which areas will be forested or protected, what kind of trees to plant, how the planted trees will be managed and protected during the first five years and how the trees will be used later by the local community (tree tenure). The local community contributes labour for tree planting activities and in turn MAREPA will fund any community that shows interest in afforestation or regeneration programmes through LDF structures at the district level. Initially in the first phase, key degraded water catchments (e.g. Dzalanyama, Chikangawa and Middle Shire) will be targeted for afforestation and regeneration programmes but must later be extended to other catchments countrywide to ensure political support for MAREPA.

Another area that MAREPA should not overlook is the regeneration of forests after deforestation through protection of secondary forest growth in deforested catchments and promotion of farmer managed natural regeneration. It should not just be afforestation (i.e. planting new trees) but local communities could be given funds to protect certain vulnerable deforested catchments and bare hills from bush fires, tree felling for a given number of years (say 6 to 10 yrs) in order to give a chance to trees to regenerate. There is growing evidence in several parts of Malawi that a deforested area if left alone for some years, can regenerate and be just as good as the original forest (Kafumbata *et al.*, 2013; Munthali, 2013). Evidence from Mzimba, Ntcheu, Dedza, Machinga, Chikwawa and Kasungu districts shows that re-generation of forests is a cheap and fast way for afforestation in Malawi (Mauambeta *et al.*, 2010). Even more, it uses existing forested lands.

It should also be noted that MAREPA funds can be leveraged to Global Environment Facility (GEF), EDM, REDD+ mechanisms for carbon sequestration and trading further benefiting local communities. Once the forests are re-established, local communities can benefit through sustainable wood harvesting and non-timber forest products (mushrooms, wild fruits, grass, medicines and apiculture) ensuring that local communities have an economic stake in the established forests. MAREPA should be able to financially support such downstream activities.

5. Conclusions

Smart public and private partnerships between government, power and water utilities, private sector, civil society and local communities are possible for afforestation and forest regeneration in Malawi. Working together, it is possible to solve deforestation in Malawi and address its effects on flooding, siltation, water and power shortages. It is proposed that a Malawi Reforestation and Environmental Protection Authority (MAREPA) be established by an Act of Parliament to collect funds and finance afforestation and regeneration activities at the local level

through district LDF structures. MAREPA will collect funds from government, semi-public power and water utilities, private sector, civil society and development partners. Before MAREPA can be established, a taskforce is needed to carry out feasibility study of MAREPA, set up a regulatory framework for MAREPA and set an appropriate small but none prohibitive tax regime to meet financial requirements given annual afforestation and regeneration targets.

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