

Towards Integration of Sustainable Environmental and Biodiversity Conservation in Secondary Schools Students Extra-Curricular in Tanzania: Where do We Start?

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Abstract

In this paper the approach to integrate sustainable environmental and biodiversity conservation in secondary schools students' extra-curricular is presented. The proposed approach is based on the case study from the East Usambara Biosphere Reserve in Tanzania, on a pilot project on environmental education in schools being developed by the UNESCO Office in Tanzania. The paper is based on the UN Decade of Education for Sustainable Development (DESD, 2005-2014) that highlights the need for engagement of people through innovative ways of learning about biodiversity by focusing on education and training to address the interlinking issues of ecosystems and livelihoods, the interactions of nature with culture, society and economy, and the actions that can be taken without affecting peoples quality of life. In developing the entry point to sustainable environmental and biodiversity conservation various key environmental and biodiversity challenges were identified in a participatory approach and the basic approaches to integrate sustainable management on the extracurricular activities of students in secondary schools were also identified. Literature review, validation workshops with teachers, students and elders in the areas surrounding East Usambara Biosphere Reserve were the main methodological approaches used. Environmental issues identified which are presented in this paper include high dependence on forest and forest related products notably Timber and Non-Timber Forest Products (NTFPs); illegal gold mining by artisanal miners; soil degradation contributed by poorly managed agricultural activities; forest degradation attributed to farmers involved in illegal and unsustainable land use practices; increased demand and treatment costs of water from Zigi River; soil erosion; erosion of local knowledge and local practices. Other issues identified are population growth, inadequate participation and involvement of community in environmental conservation, inadequate environmental education and poaching, and climate change. Various extra-curricular activities are proposed as a way to address the impacts. The pilot chooses to propose the establishment of students clubs as a vehicle to ensure sustainable environmental and biodiversity management in the area surrounding East Usambara Biosphere Reserves in Tanzania and elsewhere in the world, a strategy that this paper strongly supports.

Keywords: climate change, ecosystem services, livelihoods, participatory approach, quality of life

1. Introduction

Emphasis on introducing environmental education in the teaching practices has been gaining strength from 1970s. Some of the examples that have been illustrated in Kimaryo (2011) showing the emphasis on the inclusion of environmental education include: The UN Conference on Human Environment in Stockholm (UN, 1972), The Belgrade Charter (UNESCO, 1976), The Tbilisi Declaration (UNESCO, 1978), The Brundtland Report (WCED, 1987), The Rio Earth Summit (UNCED 1992) and the Johannesburg Summit (UN, 2002). UNESCO in 1972 as explained in Kimaryo (2011) for example stressed the need for the international agencies to take necessary steps to establish international programmes in environmental education adopting interdisciplinary approach, in schools and out of school encompassing all levels of education. Further initiatives have been taking place at the international level and one of the good examples is the United Nations Decade of Education for Sustainable Development (DESD, 2005-2014) that highlights the need for engagement of people through innovative ways of learning about biodiversity by focusing on education and training to address the interlinking issues of ecosystems and livelihoods, the interactions of nature with culture, society and economy, and the actions that can be taken without affecting peoples quality of life (UNESCO, 2005). The international efforts to mainstream environmental inclusion in education have also been cascaded to the national levels. In Tanzania for example, environmental education has highly been given due accordance in the legal framework. The Environmental Management Act no. 20 (URT, 2004) has clearly indicated the need for the inclusion of environmental education as a requirement for sustaining environment and sustainable natural resources utilization. Although this has been given a legal priority in Tanzania, little has been documented on how sustainable environmental management and biodiversity conservation have been included in the extracurricular programme for students in the secondary schools especially in the areas surrounding biosphere reserves in the country. In this paper, experience from the East Usambara Biosphere Reserve (EUBR) on the need and the approach on to how sustainable environmental and biodiversity conservation can be integrated in secondary schools students' extra-curricular is described.

Three major questions addressed in this paper include: (i) what are the key environmental and biodiversity issues that are resulting into the loss of biodiversity and hinder sustainable environmental management in the areas surrounding the East Usambara Biosphere Reserve? (ii) are there some activities that students in the secondary schools in the surrounding areas of the East Usambara Biosphere Reserve can do on an extracurricular mode in the area to ensure sustainable environmental and biodiversity conservation is achieved? and (iii) which appropriate vehicle can be used to ensure such activities are sustained in these areas?

Two main approaches were used to identify environmental issues being discussed in this paper and these were literature review and feedback workshop with teachers and other stakeholders at Muheza district council held in the context of the UNESCO assignment. Various documents and study reports from the East Usambaras and other areas surrounding the mountains were reviewed. Similarly, additional environmental issues and potential solutions were solicited and captured from participants during feedback workshop. The validation workshop was attended by a range of stakeholders including teachers from selected secondary schools, school board members from the selected schools, Muheza District Forest Officer and students from the University of Dar es salaam

2. Characteristics of the areas surrounding East Usambara Mountains

East Usambara Mountains are surrounded by people with different social-cultural practices. The main ethnic group found in most of the villages is the Wasambaa who depend on agriculture for their livelihood and mostly rely on the existing forests with significant implications and pressure on biodiversity. In most of the villages in East Usambara Mountains, the main cash crops are cardamom, sugarcane, black pepper, groundnut, and beans. The main subsistence crops are maize, cassava, beans and cocoyam. The most commonly grown fruits are bananas, coconuts, oranges, avocados, and cocoa. Land for agriculture is expanding at the expense of forested areas. The main issue of concern in the expanding agricultural practices consists of inappropriate cultivation practices on slopes including steep slopes, thus contributing to soil erosion and sedimentation in the streams and rivers. Regarding levels of education of the communities in most of the villages in the East Usambara Mountains, the majority of the villagers have at least primary education (92%), and very few (5%) achieved secondary education, with those who were illiterate or with no formal education accounting for about 3% of those interviewed (Jambiyaa *et al.*, 2011). The understanding of the villager's education status provides an opportunity for the type and level of interventions on matters related to environment and biodiversity conservation in the areas.

3. Environmental information and key issues

In this paper, several environmental and biodiversity issues are discussed. These include high dependence on forest and forest related products from the East Usambara Mountains, illegal gold mining by artisanal miners, soil degradation contributed by poorly managed agricultural activities, forest degradation attributed to farmers involved in illegal and unsustainable land use practices, increased demand and treatment costs of water from Zigi River, soil erosion, erosion of local knowledge and local practices, inadequate sources of livelihoods, population growth, inadequate participation and involvement of community in environmental conservation, inadequate environmental education, poaching and many others.

3.1. High dependence on forest and forest related products from the East Usambara Mountains

Studies conducted in the east Usambara mountains (Abdullahi, 1998, Mwanyoka, 2005, Jambiya, 2011) show that in the East Usambara Mountains the dependence of forest and its associated resources is high. Community mainly depends on the forests for their livelihoods. This is not a unique phenomenon as about 1.6 billion people around the world depend to some degree on forests for their livelihoods (World Bank 2004). Subsistence farming which is the main livelihood source in the East Usambaras is supported by the existing forests as they provide for fertile soil and at times the expansion of the farmlands is made at the expenses of the existing forests. Forests serve as well for catchment of water for localized irrigation and other domestic needs. Equally important, from the forest the community secures fuel wood which is the major source of energy for the majority if not all of the community members across the East Usambara Mountains. Moreover, forests are used as a source of timber and for logging. Some community members depend on the so called Non Timber Forest Products (NTFPs) such as spices, building materials like poles, ropes as well as vegetables. More so, people in and around the EUBR use the forests for cultural and spiritual purposes.

3.2. Illegal Artisanal Gold Mining

A study by Burgess *et al.* (2004) reported illegal gold mining activities in the East Usambara Mountains to have caused severe environmental degradation. Burgess *et al.* 2004 estimated that about 40,000 of miners are working in various streams and swampy areas particularly within the Amani Nature Reserve and that about 30% of the wetlands areas have been excavated for gold mining. These illegal gold mining activities in this area have posed

a real threat to the survival of birds, amphibians, aquatic life and humans. Burgess *et al.*, (2004) furthermore, stressed that these mining waste effluent into the aquatic ecosystem threatens the dragonflies (with wholly aquatic larvae) that are endemic to the East Usambara Mountains.

Illegal gold mining by artisanal miners has caused a substantial degradation of water resources, natural vegetation and biodiversity particularly in the Amani Nature Reserve (Doggart *et al.*, 2004). As described by Kihampa *et al.*, (2015), illegal artisanal gold mining in the East Usambara Mountains much as it is still at small scale, it requires high labor intensity, uses rudimentary machinery and poses very high health risk due to the use of mercury for gold extraction. Kihampa *et al.*, (2015) note that piles of mine waste can easily be seen along floors of affected valleys. The artisanal mining that uses mercury to extract gold has very high potential of impacting the biodiversity and also threatens the water quality downstream. The impact can range from loss of fauna and flora biodiversity to contamination of water sources. The water from this area supplies the local community and Tanga City. Inadequate sources of income and lack of environmental conservation education could be one of the main factors for the flourishing sporadic illegal gold mining in and around the EUBR.

3.3. Soil degradation contributed by poorly managed agricultural activities

Soil degradation contributed by poor agricultural practices, predominantly the tea cultivation and horticulture farming through use of uncontrolled irrigation and application of chemical fertilizers and pesticides contributes to environmental pollution (Kihampa *et al.*, 2015). Poor agricultural practices which are dominant in the East Usambaras entails cultivation on steep slopes without using any adequate methods for such as terraces and grass strips which would help checking soil erosion and at the same time improve land productivity. More specifically, soil degradation is attributed to the dependence on trees as a source of energy as well as farming at the expense of vegetation cover. Furthermore, farmers cultivate and plant crops close to the river banks leading to soil erosion hence siltation of the Zigi River. The use of agrochemicals in the production of vegetables in some of the areas as well as the cultivation of tea contributes to the pollution of the river. During feedback workshop it was observed that there was also an urgent need to harmonize the existing policies and legislations such as water policy, forest policy and agriculture policy which provides conflicting provisions on a range of issues. For instance while the Water Management Act says any human activity should be conducted 60 metres away from the river bank, the Agriculture Act provides for 40 meters hence constraints clear management of the respective resources.

3.4. Forest degradation attributed to farmers involved in illegal and unsustainable land use practices

In East Usambara Mountains, forest degradation is mentioned to be a major threat to the unique biological diversity. One of the most serious current pressures for the forest degradation as mentioned in Reyes *et al.* (2010) is the widespread cultivation of cardamom (*Elettariacardamomum*) and other spices under the diminishing forest canopy, cultivating in the river banks as well as clear felling of the *tectona grandis* tick trees from the plantations that expose soils to erosion. Some factors mentioned to enhance the improper cultivation of the cardamom include as per Reyes *et al.* (2010) poor land use planning, lack of social capital, and the lack of government assistance and extension services for small-scale agribusiness. Other factors that have resulted into more dependence of the cardamom cultivation include lack of alternatives for better income or possibilities for investing in agriculture as well as lack of better markets for agricultural products is also lacking.

In these areas, forest degradation has been experienced due to poor agricultural practices, lack of vegetation cover resulting from tree felling, cultivation on steep slopes and clearing marginal land for agricultural uses. These as a result have caused soil erosion and hence siltation of the rivers especially the Zigi river which is the sole source of water in the Downstream of Muheza and Tanga city.

3.5. Increased demand and treatment costs of water from Zigi River

As detailed in WWF(2010) report on Hydrologic and Land Use/Cover change Analysis for the East Usambara/Zigi River Watershed, Zigi River Catchment is a source of water for various uses (domestic, irrigation, public water supply and environment). The report indicate that based on the register of legal water users from Pangani Basin Water Board, the catchment has 32 registered users, who draw a total of 360.38 litres of water per second. Large portion (89%) of the water uses of the catchment goes to supply the Tanga Urban residents and their business including Tanga Cement Industries. The supply is through Mabayani Reservoir and Mowe treatment plant. Other uses are concentrated at the headwaters of the catchment in the upper Zigi catchment where water is used for irrigated agriculture in tea estates. In the Lower Zigi sub catchment; there is a sisal decortications factory which also uses water in its activities. Increased demand for water that is growing rapidly at a time of (a) diminishing supply of water (due to reduced storage capacity in the reservoir from increased levels of sedimentation in the river), b) increased cost of providing water (due to treatment cost increases) and c) reduced ability to invest in new infrastructure – treatment plant capacity etc (as a consequence of lower profits) d) reduced useful life of the dam itself due to increased sediment in the water (Tanga UWASA 2012) have been

mentioned as one of the other environmental issues that need to be addressed in the East Usambara Biosphere Reserve (EUBR).

At the individual levels, increased demand for water is mainly attributed to the growing population within the EUBR which results into increased water use for domestic purposes and local irrigation for vegetable production which in some cases. The water is mainly drawn from the main Zigi River and numerous streams found in the Biosphere Reserve. In fact much of the water from Zigi River is consumed downstream in the Tanga City with several water use categories notably domestic, institutional commercial, and industrial. Some past studies e.g. Mwanjoka (2005) had indicated that communities in the East Usambara Mountains who are the stewards of the catchment areas are concerned about the role they play in managing water sources and yet they benefit less as compared to their counterpart-downstream water users. The water regulatory authorities could be introduced to concepts of Payments for Watershed Services (PWS) which advocates for downstream water users to provide incentives to the upland community for the to continue managing the water (re)sources.

3.6. Soil erosion

The livelihoods and land tenure assessment study for equitable payments for watershed services (EPWS) programme in the East Usambara Mountains, Zigi River Basin conducted in the area in 2011 (Jambiya *et al.*, 2011) ranked soil erosion as one of the environmental issues warranting attention. Soil erosion is a serious problem in these areas, particularly when there are heavy rains and floods occur. The causes of the soil erosion in these areas include poor agricultural practices such as cultivation on the steep slopes but without using mitigating interventions, cultivating close to river banks and in the river beds, slash and burn and tree felling for cultivation and other purposes including selling. The reduction in the fallow period and extended periods of exploitation of the same piece of plot accelerates soil erosion, leading to decline in soil fertility, encrustation and even compaction of topsoil. This is another environmental issue that has also impact to the biodiversity and related resources in both up and down stream.

3.7. Erosion of local knowledge and local practices

In the East Usambara Mountains for years, local knowledge and practices have helped in the forest and vegetation cover conservation. Utilization of Non Timber Forest Products, worshiping and other related practices have had impacts on the forest conservation in these catchment areas. Based on the local knowledge and practices sacred forest were respected, medical trees were respected, not every tree was cut for domestic uses, catchment areas were highly respected. In the recent past, things have changed as communities residing into the villages in East Usambara Mountains have ignored the Indigenous Knowledge (IK) in the planning and conservation of the forest, as a result the forests suffers a serious threat of degradation than it used to be in the early 1900's. According to Brossius, (2005) the extinction of biological diversity is inextricably linked with the destruction of cultural diversity. With the loss of native cultures, there is also disappearing of the vital important knowledge of a way of living in balance with the earth and the value system in which it is encoded. The current forest management initiatives and the proliferation of protected areas implies that peoples are pushed further from the forests and their interaction with forest resources is becoming more controlled with superimposed rules and regulations which have limited or no positive relationship with the indigenous way of living and interaction with forest resources.

As detailed in Bwagalilo *et al.*, (2013), erosion of indigenous knowledge that was replaced by modern scientific approaches of forest management as well as limited or insignificant influence on forest decision making has resulted into forest degradation in various areas. This justifies that local people possess, in their ecological knowledge, an asset of incalculable value: a map to the biological diversity of the earth on which all life depends. Encoded in indigenous languages, custom, and practices may be as much understanding of nature as stored in the libraries of modern science. In these East Usambara Mountains, the erosion of local knowledge and limited inclusion of such knowledge and practices in the modern management of the forest resources in these areas have resulted into forest degradation hence reduced the water catchment capability level, reduced functionalities of the catchment hence more erosion and biodiversity degradation. This has also cost implication especially in terms of the downstream residents who are dependant of the ecosystem services provided by the forest resources in the mountains. However, as explained at the outset these traditional practices are on demise despite the critical role they have been playing in the management of the environment and biodiversity in particular. Providing knowledge to students on the usefulness of this practice through relevant subjects could make difference in the long-run in terms of contributing to the management of the EUBR.

3.8. Population growth

In several decades, the East Usambara Mountains have been attracting people due to its climatic condition which is suitable for agricultural activities. Thus; both natural population growth factors as well as migration have contributed to the extension of the population in and around the EUBR. This is well confirmed by Jambiya and

Sosovele (2001) cited in Mwanyoka (2005) who indicates that the East Usambara Mountains experience an increasing population attributed to natural increase and immigration. They further note that immigration into the area is due to the fact that the area is endowed with exceptional environmental services among other factors. Such situation has direct implications on biodiversity within the EUBR and hence imparting knowledge related to proper management of the environment amid population growth to students is critical. Among aspects that could be included in the biology subject would be educating students about the existing linkages between population growth and pressure it exert on the existing biodiversity and natural resources in general. Similarly, emphasizing on the importance and benefits of intensive farming as opposed to extensive farming is important. Installing such kind of knowledge will result into reducing possible natural resources conflicts which have also gender impacts as detailed in Shemdoe and Mwanyoka(2015)

3.9. *Inadequate participation and involvement of community in environmental conservation*

Situation on the ground suggest that there's inadequate involvement of local community in various environmental conservation projects and programmes being implemented in the East Usambara Biosphere Reserve. Mwanyoka (2005) revealed that just slightly over half of the community members in the East Usambara were involved in the environmental conservation activities through activities such as tree planting. However, such involvement isn't effective to depict real community involvement which should entail planning, supervising and decision making and hence not in line with the National Environment Policy of 1997 and National Environmental Management Act (URT, 2004) both of which emphasizes on effective community involvement in the management of natural resources. It is thus critical that relevant subjects particularly Biology and Civics in secondary schools (and perhaps primary schools) emphasize on the importance of effective community involvement in environmental conservation and management which is actually important in terms of creating sustainability and sense of ownership among community members. Students should be made aware of the critical need for effective community involvement in environmental conservation as a way of creating environmentally responsible adults and hence invest in the country's and the EUBR future in particular. This also suggests the need to consider the adoption of alternative conservation policies and practices whereby strategies should include the active engagement of communities in the process as well as considering the use of community environmental education for shorter term impact.

3.10. *Inadequate environmental education*

Environmental education is a process directed at creating awareness and understanding about environmental issues that leads to responsible individual and group actions. Back in 2002, over ten years; Frontier Tanzania in collaboration with partners implemented an Environmental Education Programme in the East Usambaras whose aims were: To translate biodiversity survey science and its results into a language that is both accessible and of interest to local communities; To increase knowledge on the importance of biodiversity in the East Usambara mountains within local communities; To increase local awareness of national environmental issues and to promote a concept of responsibility and pride for Forest Reserves; and To build the capacity of local communities to understand the importance of biodiversity in their local forests, in the hope of helping effective future management of forest resources.

Although such efforts were made in the past to implement environmental education programmes in the East Usambaras this type of education is still needed in this area as besides time lapse; it is also true that environmental challenges in the area and knowledge have changed tremendously over time and therefore new knowledge and refresher sessions are called for. Additionally, past programmes targeted a wide range of beneficiaries notably extension workers (e.g. forest managers), resource managers, local leaders, village committees, school children and teachers, environmental committees, youth groups, women's groups and the general public whose impact assessment could be challenging. Having specific target is likely make more impact and can indeed be much easier to assess. Environmental education in schools have a more medium and long term impact especially when considering that it instills in the young minds the sense of responsibility and awareness on the need for environment conservation. On the short term, community at large including the various stakeholders should be reached and various communication channels such as Community Radios and other forms to reach out to community leaders and the community in general should be explored. Establishing tree nurseries in schools and preaching on catchy messages like "*trees can live without people, but people cannot live without trees*" could be one of the "impact-making" approaches to instill conservation interest and knowledge among students.

3.11. *Poaching /illegal hunting*

The Feedback workshop with teachers at Muheza district council revealed that, poaching is one of the environmental issues within the EUBR that needs to be addressed. The problem is critical in that, there are times when hunters start fire that burn off large area of forest and hence tremendously disturb the biodiversity as lots of

plants and animals die in the fires and it destroys the reserves. Through special intra-curricular tackling of these issues in subjects such as Civics and/or Biology, students can be taught about the negative impact of poaching on biodiversity and eventual impact on community livelihoods and other important activities such as eco-tourism which is one of the important sources of income to the Amani Nature Reserve (ANR) Authority and the community in general (Shemdoe, 2008). Basically, illegal hunting is against the law in Tanzania and that people caught doing illegal hunting are punished by the Government. It is important that students are exposed to this understanding. Students should as well be taught about the importance of having in place by-laws to address poaching and where these by-laws exist, emphasis should be on enforcement of the same. Subjects should entail an emphasis on the need for students and community members taking part in the enforcement of these by-laws.

3.12. *Commercial farming and environmental degradation due to Industrial activities (tea factories)*

Running of the tea factories situated within the EUBR involve land clearing to establish farms and planting tree species which are believed to have detrimental effects on biodiversity and water resources such as the eucalyptus. It is therefore important to consider conducting environmental impact assessment and audit to see the suitability of the activities that are being carried out so that amelioration solutions are developed. It is important that students are trained on the impact that could be caused by such activities. In so doing students could be introduced to the issues of and the importance of undertaking Environmental Impact Assessment (EIA) prior to the establishment of farming and industrial activities within and around the EUBR.

3.13. *Livestock keeping/Overgrazing*

This is one of the environmental issues within the EUBR which has been identified even by some past studies (see Shemdoe, 2008; Jambiya *et al.*, 2011), which actually requires attention. In terms of education and knowledge students should be trained on the benefits of controlled grazing as opposed to open grazing which is detrimental to the environment. Such issues should be included in Biology and Civics. Similarly Kiswahili subject could include such aspects by training students/pupils to write essays on the impact open grazing and benefits of zero grazing. Subjects could as well entail issues around establishment of designated grazing areas as part of Land Use Planning (LUP) within the EUBR.

3.14. *Collection of herbs from the forest reserves*

To some extent collection of herbs by traditional healers/herbalists from forest reserves is said to contribute in degrading biodiversity as it entail cutting down preferred tree species. Traditional healers should be taught on such impact and the best approaches to address them. This could include domestication of the tree species from which preferred herbs are obtained.

3.15. *Forest/Bush fires*

Bush and/forest fires have been a major problem in the East Usambara landscape for long time, mostly in the lowlands especially during the dry season (July to November) when people clears land for cultivation (WWF, 2006). Apparently Fire is one of the least expensive methods to clear and prepare land for agriculture and other land uses in the area. It also caused by illegal timber dealers, hunters, people clearing land for cultivation, by children playing with fire, and cigarettes, people smoking out beehives during honey harvesting and making charcoal. Forest/bush fire has devastated impact as it destroys forests, biodiversity, farmlands, crops, livestock, houses and other properties. Teachers should be knowledgeable on the terrible impact that bush fire causes to forest biodiversity and the same knowledge should be imparted to students through relevant subjects. Similar knowledge need to be mainstreamed to the community at large and in particular the community leaders. Such knowledge should entail skills on fire bush/forest fire management. In turn students through environmental clubs can impart the knowledge they would have acquired to the community members.

3.16. *Climate change*

Climate change is a major issue that is likely to affect the Eastern Arc Mountains (under which the EUBR falls) to some degree – through increasing temperatures and reduced amount of rainfall. The effects on the flora and fauna of the Eastern Arc are expected to be serious. The strategy asserts that some of the predicted consequences of climate change for the Eastern Arc forests and their species are that many species will need to move to higher altitudes as the temperature rises and rainfall declines. It is predicted that some species will not survive because their climatic tolerances will be exceeded and they will have no-where left to go. This might result in a huge decline in the biological values of these mountains regardless of whatever other management interventions are undertaken.

Thus, providing to students some insights about relevant ways to address climate change such as adaptation and mitigation measures is important. Importantly, research on the likely effects of climate change on the Eastern Arc Mountain forests & the EUBR in particular could be one of the long terms measures towards

addressing climate change. Ways could seek on how best students could be involved in research activities as part of their practical training. This could be through collaboration with research projects and various organizations undertaking research in the ANR and the EUBR in general such as the Tropical Biology Association (TBA) which undertakes regular biodiversity courses and research in the East Usambaras.

3.17. *Water Pollution*

Pollution of the water (re)sources is one of the environmental issues within and around the EUBR happening through various ways including washing, cleaning vehicles, cleaning of alluvial gold etc. Students and communities should be taught about the impact of washing and cleaning vehicles in the rivers which include deteriorating water quality. They should as well be provided with the knowledge on the best way of washing without polluting the water including users refraining from washing directly from the river and take aside the water for that purpose. In turn the students should be encouraged to provide this education to the rest of the community members in and around the EUBR.

4. **Conclusions and recommendations**

In this review paper, various environmental and biodiversity issues have been identified for the East Usambara Mountains. These have impacts in various ways mostly in the sustainability of the livelihoods of the communities upstream whereby their lives are linked directly to the existence of the biodiversity resources and their associated ecosystem services in the area. These environmental and biodiversity issues identified have also impact to the downstream communities who are also dependent of the ecosystem management upstream. This has further financial implications especially to the downstream areas in terms of the amount of flowing water whereby cost of purification and treatment is also increasing due to the increase in siltation as well as the increasing concentration of metals in water resources. Environmental issues that have been identified and reported in this paper include, illegal gold mining by artisanal miners, soil degradation contributed by poorly managed agricultural activities, forest degradation attributed to farmers involved in illegal and unsustainable land use practices, Increased demand and treatment costs of water from Zigi River, soil erosion, Erosion of local knowledge and local practices and others. Based on the analysis made, on the UNESCO ESD approach in schools in the pilot in Tanga and the on the environmental issues identified which are presented in this paper, the following are some of the recommendations:

- Establishment of the environmental clubs where students will be trained and implement some of the activities that are relevant in addressing environmental degradation;
- Environmental and biodiversity issues be mainstreamed in Biology under specific topic of “Balance of Nature and waste management and disposal” offered in form one and form two. Likewise in Civics they could be under the topic on “Culture”. They could as well be included in Geography subject.
- Ensuring that examinations given to students be based on environmental skills and knowledge.
- Some environmental issues be mainstreamed through Kiswahili subject where students could be taught and assessed on writing letters and essays on issues related to a wide range of environmental issues.

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