Regional Integration and Environment: A Case of PTA

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1. Introduction

The Preferential Trade Area for Eastern and Southern African States (PTA) is a part of an integral part of the economic co-operation arrangement of the African continent. It was established as a strategy for the generation of sustainable economic development of post-colonial Africa. The group comprises about 20 countries many of which border each other. The aims and objectives of the PTA as stated in Article 3 of the organizations treaty includes, among others,

> ...to promote co-operation and development in all fields of economic activity, particularly in the fields of trade, customs, industry, transport, communications, agriculture, natural resources and monetary affairs with the aim of raising the standard of living of its peoples, of fostering closer relations among its member states, and to contribute to the progress and development of the African continent.

PTA also aims to govern such matters as may be necessary to further the aims of the Preferential Trading Area. Environment matters are important and are best tackled on regional basis than when left to individual countries alone. This is because there is abundant externalities which exists in the field of environment which, if left to an individual country, will be difficult to tackle.

Much of the thinking today has emphasized the fact that it is impossible to separate economic development from environment issues. Poverty, for example, is both a cause and aftermath of global environmental problems. It is thus vital that when we address the matters pertaining to environmental problems we take a broader perspective that involves details like poverty. Poverty in Africa

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cannot be solved individually by each country, but rather it is regional integration, co-operation and combined efforts that can assist the continent in solving these problems.

This paper addresses the important issue of environmental problems in East and Southern Africa. We show why some questions of the environment should be, and can only be, resolved at the regional context. In this case we take the PTA as an example of how any regional cooperation can be a suitable forum for discussing and solving environmental problems. After the introduction, section two discusses in details some issues of the environment. Section three is concerned with the environment resource and private property. Here we differentiate environment with other utility enhancing commodities. Section four discusses the PTA objectives as concerning the managing of the environment. Here we also look at the characteristics of the PTA countries. Section five looks at the concerns of different member states of the PTA on regional issues of environment which affects them. Section six gives conclusion and policy implications.

2. Some Important Issues of the Environment

Environmental issues includes numerous variables which are all important. These can include shared lakes and rivers, forests, land, roads, etc. Although we shall discuss the issues in isolation, there is a need of underscoring that the environmental variables are interconnected. Deforestation destroys natural habitats and also increases run-off which accelerates soil erosion and siltation of rivers and lakes. This makes ecological and environmental issues highly interdependent and they need to be taken together in our decisions so as to strike a balance between environment and economic development.

The environment is also linked to many social and political factors. Rapid population growth which has a significant effects on the environment is, for example, connected with the status of women. Environmental problems of ecological dimensions do not respect political boundaries -- water pollution moves through shared lakes, rivers and seas. The atmosphere carries pollutants over vast distances. Chemical run-off from farms, hazardous emissions from factories, and polluted water released from power plants transgress national frontiers. Ecological and economic interdependence therefore challenges the very nature of national sovereignty. We share common interest in this earth which can be achieved through regional co-operation in the development and

management of the parts of the planet that transcend national jurisdictions.

Energy sources are divided into renewable and non-renewable. Examples of renewable sources are wood, plants, dung, falling water, geothermal, solar, tidal, wind, and wave energy. Non-renewable sources include natural gas, oil, coal, peat, and conventional nuclear power. Each energy type has its own economic, health, and environmental costs, benefits and risks. Meeting energy needs in developing countries is not only difficult but the choice is also limited by available resources. It is advised that future development should consider the availability of energy sources that are dependable, safe, and environmental friendly. Otherwise the development and use of energy sources can pose several environmental problems. These include, climatic change, especially global warming through the "greenhouse effect" caused by gases emitted to the atmosphere; urban industrial air pollution caused by atmospheric pollutants from the combustion of fossil fuels; acidification of the environment from the same causes; risks associated with the use of nuclear energy, including nuclear reactors; etc.

The relationship between economic development and environmental issues is yet to be given the priority it deserves, and indeed the acknowledgement that these problems are to be best solved by international efforts and therefore regional bodies are not fully realized. The pressures on the environment is a result of unsustainable development. The PTA countries -- which include some of the poorest countries in the world -- are very vulnerable to the continued degradation of the environment which is an important cornerstone to their economies.

3. Environmental Resources and Private Property

The institutions of private property have evolved together with other economic institutions so that the economic system is well-attuned to securing the efficient use of things that are owned. Adam Smith attests in the 'invisible hands' that competitive markets guide resources into uses in which they will produce the things consumers want most. This applies to resources that are privately owned, and to commodities that are individually consumed. If any resource is not privately owned, or if a consumer wants a commodity that he/she cannot procure and use individually, then the invisible hand does not work.

However, ordinary economic institutions do not provide incentives for furnishing such resources in the environment because many important resources

are not privately owned, and consequently they lack the protection and guidance that a private owner normally provides.

The resources that make up the environment are unsuitable for private ownership because of their uniqueness. In many cases they lack the "excludability property", that is, it is not practical to exclude or prevent people from benefiting from these resources, either because of the physical impossibility, or because controlling access would be quite expensive or cumbersome, or because limiting access would be socially unacceptable. This is the case with the atmosphere, with most public roads, waters, beaches, forests, etc. Another peculiarity of environmental resources is the likelihood of there being enormous economies in the joint consumption or use of the resource as contrasted with individual use. Most resources in the environment are used in common by substantial numbers of people. The difficulty that this common use creates is that users may interfere with each other, thus reducing the serviceability of the resource to them. Typical examples are road congestions and the use of the atmosphere and waters for discharging waste products.

Environmental protection has also income distribution implications. The poor and the wealthy will assign different degrees of priority to environmental protection. For example, a proposed establishment of a factory which is a potential environmental polluter will produce different reactions from each class. The rich might consider the environmental hazards, while the poor ones would most probably think of the potential job creation.

In addition to the differences in demand for environmental quality, distributive elements also come into play when one considers how the costs of environmental protection are likely to be distributed among individuals with differing incomes. By ignoring the distributive effects of an environmental policy, we may either unintentionally ffarm certain groups in society, or undermine the programme politically. It is true that such a programme has both pro-poor and pro-rich elements.

In most cases, however, without specific redistributive measures as part of an environmental policy, we can expect programmes of environmental improvements to be typically pro-rich in their redistributive effects. Programmes for environmental improvement promote the interest of higher income groups more than those of the poor, and in some cases may increase the degree of inequality in the distribution of real income. Low-income families are more likely to feel that basic needs, such as better food and housing, constitute more pressing concerns than cleaner air and water. Moreover, where new

environmental programmes threaten jobs, redistributive effects may weigh particularly heavily on certain individuals.

In international environmental issues, the public discussion of programmes for the protection of the environment has emphasized their international implications. Two issues are important here: first, the effects upon the competitive position in international trade of the country undertaking the programme; and second, the transportation across national boundaries, not of commodities desired by the recipient nation, but of pollutants which are difficult to prevent. Joint programmes for the control of pollution, for example, are difficult to achieve. As such a victim nation cannot do much to protect itself in the absence of effective collective measures.

3.1 The Problems of the Commons

Environmental problems can be likened to the problems of the commons. Political philosophers and economists have underscored the fact that if citizens respond only to private incentives, public goods will be underprovided and public resources overutilised.

The problem of the commons is illustrated in Appendix 1 to signify the environmental problems we have today. A rational farmer taken individually, seeks to maximize his gain by adding extra cattle. Individually the farmer receives positive utility if he can sell the additional cattle. But the strategy has a negative component which is a function of the additional overgrazing created by one more cattle. But because the negative utility is shared by all, individually the effect is not fully felt, and all farmers may decide to add cattle which in the long run results in ruin. Many of the environmental problems, including the pollution of oceans, rivers, lakes, and misuse of national parks under the example.

3.2 Prisoner's Dilemma

Environmental issues can also fall in the prisoner's dilemma game of resource allocation. Environmental problems and their solutions call for inter-temporal choices, i.e., to consume now at the expense of environmental degradation, or to postpone consumption in the quest for environmental balance when the problem has been detected.

To illustrate this we consider two countries *A* and *B* which exploit a common

resource, for example, a lake. Neither of the two countries has a control on this lake, and as a result the lake has been overfished. The suggestion is given to the two countries that if they stop fishing in two years period the lake will restore the level of fish resource, and thus a long-run survival of the fishing industry. The two countries have two options: to ban the fishing for two years, or to continue overfishing. One of the country can decide to ban the fishing while the other country continue; both can ban fishing for two years, or both can decide to continue with fishing. The return that either country receive by pursuing its policy depend on the choice the other makes, and so we can say the utilities are interdependent.

We present the four possible combination of policy choices and possible payoffs below.

Choices	Payoff ('000 US$)	
	Country A	Country B
A allows B the policy of overfishing.	10	50
B allows A the policy of overfishing.	50	10
Both A and B do not agree to limit fishing	30	30
Both A and B agr[illegible] limit fishing	40	40

If both agree to limit fishing they get a profit of US$ 40,000 each. If they do not adopt the new policy they will each receive US$ 30,000. If only one country adopts the new policy while the other one remains with the old policy of overfishing, the country which adopts the new policy gets US$ 10,000 while the other which does not adopt the new policy gets US$ 50,000.

This example illustrates the conflict of individual maximization as compared to bilateral maximization. If both limit fishing this is not the equilibrium taken individually since if A limits fishing, B's optimal choice is to impose no restriction, and thus B's payoffs increases from US$ 40,000 to 50,000. The

mutual adoption of the new policy even if agreed by both can be upset by either country. While the two countries can enter into a treaty to restrict fishing, any country has the incentive to break the treaty, and thus other enforcement methods are required since individual maximization is not global maximization.

4. PTA Objectives in Managing the Environment

Many PTA member states have started implementing Structural Adjustment Programmes (SAPs) with the support of the World Bank and the International Monetary Fund (IMF). Adjustment programmes envisage achieving three principal objectives: one, attaining macro-economic balance; two, allocating resources more efficiently; and three, mobilizing more concessional resources over the long term to raise the rate of economic growth and living standards. The need for structural adjustment arises in the sub-region because economic indicators show that in the past 20 years, there have been serious fiscal and financial disequilibrium. Some of the macro-economic imbalances that have characterized the economy of the subregion are:

(a) Foreign exchange shortages, and unsustainable budget deficits.
(b) Debt servicing which consumes more than half of many of the countries' export earnings.
(c) The adoption of inappropriate fiscal and monetary policies that have promoted inefficiency in management and administration of government budget.
(d) Low levels of interest rates and high inflation rates.
(e) Parastatal organizations which depend on government subvention and fails to deliver adequate services.
(f) Low level of food production which has not matched the rate of population growth leading to malnutrition in some cases.
(g) Poor real GDP per capita growth, which in some countries was negative.

As we can note from Table 1, the GDP per capita growth in the PTA countries has fluctuated over the years shown. Burundi, for example, shows a falling trend from US$ 236 in 1982 to only US$ 197 in 1990. Similarly, Tanzania gives a falling rate from US$ 317 in 1982 to that of US$ 100 in 1990. Zambia

is another country in the group of falling rates from that of US$ 635 in 1982 to US$ 385 in 1990.

Table 1: GDP per capita at current market prices (US dollars)

Country	1981	983	1984	1985	1986	1987	1988	1989	1990
Angola	708	731	644	662	604	722	682	746	841
Burundi	136	252	219	249	257	227	215	207	197
Comoros	288	280	268	285	408	493	520	400	496
Djibouti	1113	1127	1130	835	828	850	868	878	893
Ethiopia	109	115	113	110	118	119	120	121	119
Kenya	358	320	318	304	345	366	375	356	360
Lesotho	246	235	211	168	174	231	267	289	323
Malawi	179	180	170	153	155	150	163	187	211
Mauritius	1078	1090	1040	1076	1463	1831	2069	1916	2306
Moz'que	192	174	189	246	294	100	84	68	99
Rwanda	257	264	269	281	309	331	347	319	326
Somalia	156	143	152	162	166	178	176	179	144
Sudan	367	355	426	305	410	429	376	667	1026
Swaziland	842	868	768	523	661	784	837	716	821
Tanzania	317	310	275	318	217	153	139	114	100
Uganda	130	159	185	232	238	259	286	266	218
Zambia	535	527	418	331	238	285	484	557	385
Zimbabwe	913	798	635	539	578	620	652	644	670
Total PTA	304	293	283	272	282	279	282	312	352

Source: PTA Development Report 1993.

These are but a few examples in the group with falling rates. However, there exist also good performers who indeed improves the overall group performance

from US$ 304 in 1982 to US$ 352 in 1990. The good performance include countries like Lesotho, Angola, Comoros, Mauritius, Sudan, Swaziland, among several others.

Table 2: Basic Economic Indicators

Country	Population 1990 ('000)	GDP US$ 1980	Total Exports 1991	Total Imports 1991	Intra-PTA Exports	Intra-PTA Imports	External Debt 1990
Angola	10011	9473	3091	1971	0.00	6.40	7152
Burundi	5470	1385	101	247	6.70	24.09	850
Comoros	475475	174	28	129	0.04	2.43	177
Djibouti	427	338	54	376	25.80	21.73	145
Ethiopia	51183	4891	307	1114	29.27	9.72	3116
Kenya	24368	10844	1324	2229	251.4	65.58	4810
Lesotho	1771	558	58	103	0.32	2.22	372
Malawi	8504	1622	443	545	34.71	36.66	1366
Mauritius	1074	1774	1120	1445	7.54	19.62	739
Moz'que	15784	2125	390	899	5.79	85.01	4053
Rwanda	7113	1359	203	213	13.77	33.75	692
Somalia	6284	801	106	197	0.67	36.03	1922
Sudan	25191	7779	358	1419	0.70	38.26	9156
Swaziland	789	816	327	77	27.13	6.08	251
Tanzania	27300	6597	385	1090	17.95	37.30	5294
Uganda	17358	2396	171	464	2.14	100.08	2301
Zambia	8122	4348	1061	1066	40.82	86.63	4784
Zimbabwe	9809	8408	1541	1488	197.6	50.76	2449
PTA as a Whole	221033	65688	11086	15063	662.35	662.35	49629

Source: PTA Development Report 1982 - 1992.

Other basic indicators as given in Table 2, shows that these countries differ a great deal in terms of population, ranging for example from 27.3m people for Tanzania in 1990 to .427m people for Djibouti. Intra PTA trade also varies, showing quite low figures for some countries, and large for others including Kenya and Zimbabwe. The external debt (outstanding disbursed) figure is interesting as it shows that many of these countries are highly indebted.

That many PTA member states have adopted structural adjustment programmes essentially implies moving more towards market determined economic systems. Liberalization of markets is one of the policy variable given large emphasis under SAPs, and in that respect trade in general is supposed to be expanded. The expansion of trade in the region is (or should be) supported by internal investment, and therefore increased production in the countries concerned which is largely based on the private sector. It is this competitive liberalization in the region and the importance of the private sector which increases the need for regional cooperation in environmental management. One can foresee a situation where technology transfer in the region is carried out without proper supervision from the nation counties, as indeed the frenzy for investment is recorded. It is more likely in such circumstances for technologies which add more to pollution to enter the region uncoordinated. It is also quite possible that with the advocacy of export promotion much of the resources shall be overutilised. This includes, for example, wood-related products, fish, etc., in addition to other natural resources based exports.

The PTA countries have resolved that they will all work towards a common environmental management policy to preserve the sub-region eco-systems. The PTA strategy is to prevent, arrest and reverse effects of environmental degradation and industrial pollution, declining biodiversity, and loss of genetic diversity. PTA member states believe that an essential element of its development strategy is to co-operate fully in the management of its environment for present and future generations. New sub-regional arrangements are especially encouraged among PTA countries to discuss trans-boundary environmental and conservation policies, and measures needed to develop capabilities for addressing these environmental problems adequately.

The key areas of focus in the management of the environment and efficiency improvement are to prevent, arrest and reverse the effects of deforestation, erosion, deterioration of coastal waters, declining biodiversity, and loss of general diversity, polluted soil, water and air. It is also recognized that rapid urbanization has several environmental and social impacts, one of which is the

need for clean drinking water. PTA intends to assist national authorities in developing technologies to ensure the availability of clean drinking water. More than two-thirds of the population in the PTA region live in the rural areas, depending on agriculture, livestock farming, fishing or forestry for their subsistence. Population growth and the exploitation of rural areas, consequently, are directly linked. PTA aims to adapt agricultural systems (technology, marketing, processing) which do not exceed the carrying capacity of the environment. These initiatives should guarantee food security in the sub-region.

The extinction of species hand in hand with an irreplaceable loss of genetic information. The strategy will develop abilities to anticipate and prevent further depletion of its scarce resources. The aim is to develop a special strategy for two of its important renewable resources: Forests and Marine resources, through the formulation of a Regional Conservation Strategy (RCS) The preparation of a RCS involves government agencies, non-governmental organizations, private interests, and the community at large in the analysis and evaluation of its natural resource base and assessment of priority actions. Taking into account the growth trends of many countries in the sub-region, it is apparent that measures to reduce, control and prevent industrial pollution must be greatly strengthened. This includes a rapid increase in pollution and resource degradation. There is a need to incorporate improvements in resource and environmental management being achieved in industrialized countries which will avoid the need for expensive clean-ups. Such technologies can reduce the ultimate costs and stretch scarce resources.

Environmental measures are often thought to dampen investment, growth, jobs, competitiveness and trade, while driving up inflation. However, this is not always true. An OECD survey undertaken in a number of industrialized countries concluded that expenditures on environmental measures over the two decades had a positive effect on growth and employment. For the PTA, therefore, there is the need to broaden the technological base through the diffusion of information, strengthening institutional capabilities, and evaluating existing technologies in the PTA with a view to assessing their impact on the environment. The key element for controlling industrial pollution in the PTA sub-region includes:

1. Establishing a series of environmental control regulations, incentives

and standards, leading eventually to the adoption of a common code on the protection of the environment. PTA aims to develop and consequently apply, basic common principles and guidelines concerning environmental protection and resource use, particularly with respect to foreign trade and investments. Prior to major investments, environmental impact analyses must be carried out. For existing industries and transport equipment, technologies must have to be developed with the aim of reducing pollution. PTA member states should adapt a Polluter Pays Principle (PPP), and should set strict limits on the importing of technologies which cause pollution or have dangerous effects on the environment. On the other hand, PTA intends to compensate the added cost of environmental protection measure to industries through a system of market-based incentives.

2. Developing sub-regional capabilities in assessing environmental impacts and industrial hazards.

3. Creating greater awareness for industrial managers on the consequences of pollution and the precautions which must be taken; and prohibition of the dumping of wastes, including toxic waste by industrialized nations in the sub-regions.

4. Establishing an information network for the delivery of information to member states on the consequences of industrial pollution and available technological options. Sub-regional legal institutions will also be strengthened to enable them to effectively deal with environmental issues and cases as they arise, including penalties for the infringement of environmental protection laws and regulations.

To achieve the goal of a regionally integrated and harmonized environmental policy, the PTA member states believe that the existing sub-regional structures for the environment should be strengthened. Furthermore, these structures should be made responsible and accountable for ensuring that PTA programmes encourage and support the sustainable development policies and practices in the sub-region. An enlightened PTA environmental policy should integrate environmental issues in its macro-economic trade, agricultural, industrial, energy and other sectoral programmes. Capital expertise is required to establish measures which protect the environment. The PTA member states will seek

support for its role in African environmental protection from the international community, particularly the United Nations Environment Programme (UNEP), since environmental protection is a global concern in which the PTA can only play a sub-regional role.

5. Individual PTA Countries Concern for Environment

PTA staff conducted a detailed study in most of the PTA countries belonging to this sub-regional on the issue of the environment. Following the thrust of this paper we shall try to revisit some of the issues raised individually and assess their commonality or convergence. This will educate us to what is regarded as pressing issues to be solved on regional basis.

The topics addressed in the study included forests and woodland, land and soil resources, water resources and fisheries, energy, bio-diversity and tourism, industry, infrastructure and mining, hazardous and non-toxic wastes, health and other issues, institutions and training, and public awareness and education. The study further reviewed the key environmental actions in different PTA countries. Let us bring out what each country regarded as important cross-border priorities and concern.

5.1 Angola

On forest and woodlands, the country showed concern on the migration of people from neighbouring countries which was expected to increase pressure on forests and woodlands. The resultant instability in settlement patterns led to unprecedented migration to urban areas and large concentrations of people along coastal zones. On water resources and fisheries, the country indicated that there was a need of better use of shared international waters. The country also showed concerns over the share of marine resources with Zaire. On energy, it indicated a need for interconnection of power grid with Namibia, including joint development of hydro-power on Cunene River in the South. On bio-diversity and tourism, Angola indicated the problem of poaching and illegal felling of trees by neighbouring countries. On industry, infrastructure and mining, it indicated cross-border air pollution and dumping of industrial waste from neighbouring countries. Concerning hazardous and non-toxic wastes, the country indicated that there was no conditions or regulations for the protection of coastal waters from international dumping of toxic wastes. Angola recognizes the need for a regional environmental institutional network.

5.2 Burundi

The country showed interest in the possibility of cooperation with Tanzania and Zaire on sustained use of resources of lake Tanganyika. The major constraints to the implementation of environmental action plans in Burundi are limited financial, technical and human resources, in particular specialists in various fields of environmental programmes.

5.3 Ethiopia

On land and soil resources, Ethiopia raised concern about cross-border smuggling of cattle for sale out of Ethiopia. On water resources and fisheries, concern is on the management of the water resources of the Blue Nile. Concern in Egypt, Sudan and Ethiopia was on the long-term water resource capacity of Nile, and also on the upstream and downstream impacts of major dams. On energy, concern is shown on the scope for exporting hydro-electric power. On bio-diversity and tourism, Ethiopia is concerned with the wildlife meat being traded to SPLA over Sudanese border and some poaching of elephant for sale through Djibouti/Somalia routes. The country also expressed a need for improved cross-border communications with Sudan and Kenya for the development of tourism.

5.4 Kenya

The country has indicated concern about patterns of regional climate and causes of drought on the part of land and soil resources. On water resources and fisheries, concern is about pollution and fish stock degradation in Lake Victoria, while there is also a growing concern about the sharing of water resources, e.g., Lake Rudolph with Ethiopia. Concern is also about cross-border pollution of seas, lakes and rivers. On bio-diversity, Kenya has shown concern about the proposal to downgrade elephant to CITES, and about cross-border wildlife management and control of poaching. Concern is also shown about cross-border security of tourists in National Parks, e.g., Masai Mara.

5.5 Lesotho

The priority of the country on water resources and fisheries is on sustained use and maintenance of quality levels on international rivers. The dependency on South Africa for imported energy is also of concern. On bio-diversity, the concern is on the reduction in the trade of live animals across neighbouring borders.

5.6 Malawi

On water resources and fisheries, concern is shown on the use of Zambezi River resources with Zambia, Angola, Namibia, Zimbabwe, Mozambique; and the use of lake Malawi resources for water, fishing and transport with Tanzania and Mozambique. On energy, priority is on the possible supply of electricity from Zambia; while on bio-diversity the priority is the control of cross-border poaching.

5.7 Mauritius

The country showed a growing concern about the risk of a major oil spill in the Indian Ocean.

5.8 Mozambique

On water resources and fisheries, concern is on sustainable management of freshwater stocks of anchovy, mackerel and prawns in lake Malawi, sustainable harvesting of fish stocks shared with South Africa, and transport of goods and use of coastal waters as major international shipping channel. On energy, concern is on the rehabilitation of Cabora Bassa to generate domestic energy supply from HEP and provide export energy to South Africa and Zimbabwe. On bio-diversity, concern in shown on coral theft by neighbouring states, and the management of national parks bordering neighbour states. With industry, infrastructure and mining, concern is shown on the environmental impacts and maintenance of the Cabora Bassa hydroelectric scheme supplying 900 km power line to South Africa. On health, concern is given over air pollution from titanium smelting in South Africa.

5.9 Rwanda

On forests and woodlands, the country has shown priority on protection and management of natural areas bordering Burundi, Zaire, Uganda and Tanzania (Nyarange, Birunga and Akagera). On water resources and fisheries, priority is on the exploitation of Lake Kivu for gas extraction with Zaire. On biodiversity and tourism, concern is on the possibility of cooperation with Uganda and Zaire on the management of volcanoes, national parks, and the possibility of co-operation with Tanzania on the National Park of Akagera.

5.10 Sudan

The country is concerned that it has limited access to Nile waters because of the Nile International Waters Agreement. According to the Agreement, Sudan and Egypt share the water in the ratio 18:55 respectively.

5.11 Tanzania

Priority and concern is on illegal trade in protected timbers, sustainable use of shared natural resources of lake Victoria, lake Tanganyika, lake Malawi; protection of papyrus along shores of Lake Victoria which contributes to local mat-making industry and is believed to remove certain pollutants from the lake. Others includes, the use of shared rivers: River Ruvuma (border with Mozambique), River Songwe (border with Malawi), River Malagarasi (border with Burundi) and Kagera (border with Rwanda). Concerns is also shown on the flooding and movements of Songwe River which creates an indeterminate boundary between Malawi and Tanzania. Plans to construct a flood protection scheme have been delayed by the lack of finance and the lack of agreement over national responsibility for the river.

Concern is also on the protection of marine resources along coastlines of Kenya, Tanzania and Mozambique, together with natural ecosystems of Oceans islands of the Comoros and Seychelles. On bio-diversity, concern is shown on cross-border poaching of wildlife and the management of Mkomazi/Tsavo National Park, and the Serengeti National Park/Masai Mara Game reserves, both of which straddle international borders. On hazardous and non-toxic wastes, concern has been shown on oil pollution along Tanzania coast experienced mostly during the South-west monsoon. The pattern of ocean current disperses oil northward along the East African coast during this season. Oil can reach the beaches of the Comoros in liquid form, the Tanzania coast in tar flakes, and the Kenya/Somali coast in tar balls. It is estimated that 33250 metric tonnes of oil are dumped in the ocean each year.

5.12 Uganda

Concern is shown on desertification which is spreading south from Sudan into northern Uganda. On water resources and fisheries, concern is on Lake Victoria falls within Uganda, Kenya and Tanzania. Water hyacinth is becoming an international problem. The Nile whose source is in Uganda is the principal water supply for Sudan and Egypt, and this is of concern. On bio-diversity and

tourism, concern is on the pollution of the critically endangered mountain gorilla which falls within three countries: Uganda contains half of them, Zaire and Rwanda the rest.

5.13 Zimbabwe

The concerns includes cross-border conflicts in forest areas including illegal grazing, wood, and grass poaching. On bio-diversity and tourism, concern is that in spite of the degree of protection and the CITES ban on trade in ivory and rhino horn, poaching of black rhinos in the Zambezi Valley by Zambian peasants from over the border has increased.

5.14 Summary

From the country's concerns and priorities as detailed above, it is obvious that there are many environmental problems in the region which are best solved by combined regional efforts. We can notice that most of the commonly cited cases are those concerning the shared commons including rivers, lakes, and oceans; and also natural resources, national parks and forests which transcend national borders. To solve problems associated with the use of these resources calls for regional efforts and seriousness, otherwise individual abuse and overutilisation will be harmful not only to the individual country, but also the countries which share the resource.

6. PTA's Future Plan About the Environment

It has been acknowledged by PTA that the exploitation of the environment needs to be explored and managed with utmost care and considerations to future generation. However, while conceding that solving environmental problems was of utmost urgency, many of the PTA countries lament on lack funds and expertise, including trained and qualified manpower. With the above background, the PTA Authority prepared an Environmental Action Plan (EAP) for the sub-region. The EAP was prepared to assist member states in establishing effective environment management policies and programmes, and encourage sub-regional co-operation with other sub-regional or regional bodies as appropriate, in tackling common or shared environmental problems. The EAP prepared an estimates of costs for the Priority Programme of Action over an initial period of three years as contained in the Environmental Action Plan for the PTA.

As can be seen in Table 3, one can conclude that environment issues have received some attention in the PTA countries. The plan for action have been established but it is difficult to assess the level of accomplishment of this noble cause.

Table 3: Estimates of Costs for the Priority Programme of Action.

Project Title	Estimated cost (US$ '000 per Annum)			
	Year 1	Year 2	Year 3	Year 4
1. Programme of support for member states in tackling their environmental priorities	300	300	300	900
2. Regional support for the strengthening of national environmental institutions	300	200	200	700
3. Regional research project to identify ways of integrating environment into the sectoral programming process	250	250	250	750
4. Development oil environmental assessment procedures and guidelines for key sectors	200	250	250	750
5. A forum for negotiating regional agreement over the use of shared freshwater resources	100	100	100	300
6. A regional energy trading and renewable energy research programme	50	50	50	150
7. Regional support for the marketing and trade of sensitive export products	100	100	100	300
8. An environmental strategy and action plan for PTA exports	750	350	350	1450
9. A plan for harmonizing PTA environmental policy and standards	500	200	200	900
10. Conservation of biological diversity and genetic resources	800	800	800	2400
Total	3350	2600	2600	8550

Source: **PTA** Development Report 1982 - 1992

Solving regional issues cannot be a smooth exercise because in most cases there is no mechanism for policing on the regional level, and no tangible body has been created to oversee the implementation of the policies. The level of implementation will therefore depend on the good will of the individual countries. This can become a problem when the regional interest conflict with national interest. A good example is a shared river. One country upstream can decide to harness hydroelectric power for its domestic use and this will definitely improve the welfare of its people. But the exploitation of this power by country **A** will affect the level of water, and may even contribute to floods for country **B** downstream, hence have a negative effect and loss of welfare for country **B**. Now even if a regional body like PTA intervenes to suggest to country **A** to stop getting hydroelectric power, there is little possibility that country **A** will comply. This is just one simple example but which typically demonstrates the conflict between national interest.

Many countries can also follow "beggar thy neighbour" policies on environmental issues, and become "free riders" in solving the regional environment issues. Another level of conflict is the case where poverty is a more binding problem than environment. Here any rational individual will try to solve the poverty problem first. This can be relevant with, for example, felling trees for charcoal making. Indeed the practice is harmful to forests but again the users of the trees many feel that getting income is more important than conserving the trees.

7. Conclusion

This article has raised the important issues of environment in a regional context, the region being that of PTA of East and Southern Africa. The article has shown that environmental problems are numerous; and while others could be solved on national levels, others need a regional solution, and hence call for regional cooperation. It is advanced that environment and economic development is linked, and therefore for sustainable economic development, the environment needs to be given more consideration.

The article has shown the plans of PTA concerning the environment. It has also shown what different countries have expressed as their concern and priorities in the environmental issues on the regional context. It is apparent that issues like the managing of the commons poses a big problem. The interdependency of different countries to solve environmental problems indeed

mandates an organization like the PTA to be upfront in directing and identifying the problems, while at the same time looking for feasible solution to solve regional environmental problems.

However, PTA initiatives need to be backed by national compliance and cooperation. As shown in the example of prisoner's dilemma game and the problem of the commons, the implementation lies squarely on national governments and individuals to make a positive change in conserving the environment and improving it for the future generation. As some have said, "the life you are saving might be yours."

On the issue of environment and even in other germane concerns, the strategies of PTA sub-regional countries require the cooperation and harmonization of policies adopted independently in the different countries. There is a need to design and follow a regional macro-economic policy through which programming and monitoring at the sub-regional level can become possible. Its main objective is to ensure that policy reforms in one member states do not result in great market distortions that would adversely affect the economic equilibria in the rest of the member states.

There is therefore a need for governments of the PTA sub-region to cooperate in solving regional environmental problems. Individually the cost might be restrictive, but together issues like lake problems can be reversed, rivers can be cleaned, and little by little the environment can be improved.

The level of awareness of environmental problems is quite important in the region. This is especially true for those people who are closer to the natural resources. Education and information is therefore a key to sustainable development which take into consideration the environmental impacts of development. Without agreed, equitable, and enforceable rules, the global pressures on these areas will deplete their resources. Environmental issues on regional level need to be dealt with in a political context through well-enforced laws and strict liability legislation, but essentially through positive and tangible co-operate efforts of participants in regional integration.

APPENDIX 1

The Tragedy of the Commons.

We consider a number of farmers in a village. Each summer, all the farmers graze their cattle on the village pasture land which is commonly shared. We can denote the number of cattle the i^{th} farmer owns by gi and the total number of cattle in the village by $G = gi + ... + gn$. The cost of buying and caring for a cattle is C, independent of how many cattle a farmer owns. The value to a farmer of grazing a cattle on the pasture when a total of G cattle are grazing is $v(G)$ per cattle. Since a cattle needs at least a certain amount of grass in order to survive, there is a maximum number of cattle that can be grazed on the pasture land:

$$Gmx: v(G) > O \text{ for } G < Gmax \text{ but } v(G) = O \text{ for } G > Gmax.$$

Also, since the first few cattle have plenty of room to graze, adding one more does little harm to those already grazing, but when so many cattle are grazing that they are all just barely surviving, then adding one more dramatically harms the rest. During the spring, the farmers simultaneously choose how many cattle to own. If we assume that cattle are continuously divisible, a strategy for farmer i is the choice of a number of cattle to graze on the pasture gi. Assuming that the strategy space is $(O. \propto)$ covers all the choices that could possibly be of interest to the farmer, $[O, Gmax)$ would also suffice.

The payoff to farmer from i from grazing gi cattle when the numbers of cattle grazed by the other farmers are:

$$(g1,....,gi\text{-}1,gi+1,...,gn) \text{ is}$$

$$gi\ v(g1+....+gi\text{-}1+\ gi\ +\ gi+1\ +.....+gn) - cgi.$$

Thus if $(g1^*,....gn^*)$ is to be a Nash equilibrium then, for each i, gi^* must maximize the above expression given that the other farmers choose $(g1^*,....gi\text{-}1^*,\ gi+1^*,...gn^*)$.

The first-order condition for this optimization problem is:

$v(gi+g^*\ +giv'(gi+g^*\text{-}i) - C = O$, where $g^*\text{-}i$ denotes $g^*1\ ....+g^*i+1...+g^*n$.

Substituting gi^* into the earlier expression, summing over all n farmers' first-order conditions, and then dividing by n yields

$$v(G^*) + 1/n\ G^*v'(G) - C = 0.$$

Where G^* denotes $g^*1 + \ldots\ldots + g^*n$. In contrast, ;the social optimum, denoted by G^{**}, solves $Max\ Gv(G) - Gc,\ O, G\ x$ the first-order condition for which is

$$v(G^{**}) + G^{**}v'(G^{**}) - C = 0.$$

Comparing 1 to 2 shows that G^* G^{**} too many cattle are grazed in the Nash equilibrium, compared to the social optimum. The first-order conditions reflects the incentives faced by a farmer who is already grazing gi cattle but is considering adding one more. The value of the additional cattle is $v(gi + g^*\text{-}i)$ and its cost is C. The harm to the farmer's existing cattle is $v'(gi + g^*i)$ per cattle. or $giv'(gi + g^*\text{-}i)$ in total. The common resource is overutilised because each farmer considers only his her own incentives, not the effect of his actions on the other farmers, hence the presence of $G^*v'(G^*)n$ in 1 but $G^{**}v'(G^{**})$ in 2.

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