

Growth, Poverty and Environment Linkages: Towards A Sustainable Development Strategy for Bangladesh

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Abstract: In this study attempt has been made to review the inter-linkage between the environment, poverty and economic growth in Bangladesh. It is found that while economic growth, often, negatively affect the improvement in the environment, it is the improvement of the environment that has positive linkage with poverty reduction. It is also found that certain policies such as providing common resources rights to the poor people can improve the environment. In Bangladesh, we see, that the pressure to increase food production has resulted in excessive uses of fertilizers in past decades that had serious impact on the quality and fertility of land. We have also found that the objective of export led growth strategy through shrimp culture brought loss in bio-diversity and increasing salinity of soil. On the other hand environment degradation like soil degradation and river erosion has severe impact on poverty specially on the rural poor. Thus at the end appropriate policy framework is suggested for the balanced and sustainable development of the country in light of the study.

Key words: Growth, poverty and environment linkages, Sustainable development strategy

Introduction

The alleviation of poverty is a major development challenge and sustainable development is most crucial seen by the policy planners now a days. The Millenium Declaration in United Nations General assembly of September 2002 underscored the eradication of extreme poverty and hunger as the paramount goal. While the linkage between economic growth and poverty reduction is generally obvious, the relationship between economic growth and improvement in the environment remains unclear. In recent times, the fast economic growth in many countries, including developing countries of the Asian and Pacific region, where two thirds of the world's poor live, has often been accompanied by a range of adverse environmental impacts. Apparently, there is a trade-off between economic growth and environmental improvement; achieving both of these goals simultaneously may not be easy, especially in the early stage of development.

For many developing countries, the enhancement of economic growth is often the major macro-objective of economic development although the associated adverse environmental impacts are recognized. It is expected that sustainable poverty reduction will take place through a trickledown of economic growth; the benefits of economic growth will percolate down to the poorer section of the population and increase their income. Under this premise, the tempo of economic growth is maintained as much as possible in order to maximize the pace of poverty reduction.

Although absolute poverty in the Asian and Pacific region is predominantly a rural phenomenon, rapid urbanization and the expansion of urban-based economic activities have recently led to very substantial rural-urban migration. The migration process has, to some extent, helped to reduce population pressure on agricultural land and contributed to increasing agricultural productivity and reducing rural poverty. However, the migration has put pressure on city housing and other services, leading to the development of slums, thus having an impact on the environment.

In Bangladesh the impact on environment originates from the negative externalities that arise from pursuing a set of development strategies in the 80s of the past century. In the present context the key development objectives are increasing food production and pursuing an export-led growth strategy. The World Bank" supported the government's primary objective too increase foodgrain production, to the end of attaining self-sufficiency and a more equitable income distribution (World Bank, 1990). The World Bank also supported the strategy of the Government "to develop a broader and diversified industrial and export base" (World Bank, 1990). Also the outcomes of these objectives were desired to be rapid, " job-creating economic growth and interventions" (World Bank, 1998).

Let us look at the first set of cause and effect. Excessive emphasis on (rapidly) increasing yield has led to excessive use of fertilisers. On the other hand current input pricing policy distorts related prices of various types of fertilizers (say between phosphatic and nitrogenous fertilizers as we will se later) resulting in the use of an unbalanced mix of fertilizer. Such pricing policy may have led to use of spurious fertilizers as well. Liberalisation of imports may also have resulted in excessive use of fertilizers or use of spurious fertilizers or use of an unbalanced mix of fertilizer. Thus excessive use of fertilizer, use of spurious fertilizers and their use in inappropriate mix may have caused land degradation as reflected in a decline in micro nutrient and erosion of soil fertility. This set of "cause of effect" chain

Aktar: Growth, Poverty and Environment Linkages

takes us to the major issue of fertilizer policy.

The second set of cause and effect takes us to the issue of shrimp management policy. The specific structural adjustment policies here involve promotion of non-traditional exports and privatisation. Availability of cheap labour and coastal land supply of product of nature helped shrimp producers and exporters to benefit from market opportunities outside. Shrimp culture in the coastal region of Bangladesh has resulted in many negative environmental consequences. One of them is increased salinity of soil and the another is loss in biodiversity (resulting from shrimp seed collection and throwing away of by-catches).

Thirdly, we can see that the poor live in places which are ecologically more vulnerable and are forced to earn their living from low-productivity natural resources (IFAD 2002). The rural poor often live in low-lying, flood-prone areas, on steep mountain slopes or on dry land and possess low-productivity naturally. The economic and social consequence of natural degradation have been immense, especially when 45% of the population live below the poverty threshold and they are naturally vulnerable to the slightest change in environment. It includes damage to human resources, agriculture, fisheries, forestry and livestock. In this context it is very important to study the environment-poverty-growth relations in a systematic way for the sustainable development of the country.

Objectives of the Study: Bangladesh is a developing country with acute poverty in the world (nearly 45%) and environmentally endangered. In this context general objective of this study is to address different issues relating sustainable pro-poor development strategies for Bangladesh standing in the 21st century. The specific objectives of the study are:

to locate the Growth-Environment-Poverty linkages at a wider perspective,

to identify the export-led and growth-targeted development strategies of Bangladesh following 1980s and their environmental impacts,

to identify the pattern of environmental degradation in Bangladesh and its consequences on poverty and growth, and to suggest policy recommendations for the future pro-poor and environmentally sustainable development strategies for Bangladesh.

Materials and Methods

This study is based on several standard environmental impact assessment techniques. Several such methods are available: counterfactual method, with or without method, control group approach, general equilibrium method and so on. All these methods have their strengths and weaknesses. For example, a general equilibrium method would have been more appropriate for the current study but lack of data, particularly longitudinal data, is a major bottleneck for carrying out such exercise. By design, this study is entirely based on published work, both by the Government of Bangladesh World Bank and by other institution as BIDS, CPD, ADB and individual researchers. This is a desk-review geared towards accumulating evidence to understand the causality between growth environment and poverty in Bangladesh. No primary data has been used in the preparation of the study. Therefore, in effect, this study will be using findings from studies that applied the various methods mentioned above.

The Environment-Poverty-Growth Linkages

Economic Growth Can Cause Environmental Costs: There is little doubt that the fast economic growth in the region has contributed to the reduction of poverty in recent decades. Poverty in the region has declined dramatically since the 1970s, despite explosive population growth (DFID 2002). This fast growth, however, was achieved at the cost of environmental degradation, such as the depletion of natural resources, atmospheric pollution, the depletion of biodiversity, the drying-up of aquifers, the pollution of aquatic and marine ecosystems and the increasing production of wastes. The extent of the damage, however, varied from country to country and depended on a number of factors, including the state of economic development, industrial structure and technologies. Linkages between economic activities and the environment can be illustrated through the following

Observations

Observation1: Most traditional economic activities comprise the transformation of resources into products and services useful to human beings. Thus, regardless of the income level or stage of development, practically any economic activity would alter the state of the environment in one way or another and has the potential to cause a number of negative impacts in the form of unsustainable depletion of resources and deterioration in the quality of resources and the environment. For example, agricultural activities for producing food and generating employment and income in rural areas are the major sources of methane flow to the atmosphere. Commercial energy is the most crucial input which enables economic activities to take place but is the major source of carbon dioxide emissions into the atmosphere and, together with manufacturing and other user sectors, contributes significantly to atmospheric and

aquatic pollution.

Observation 2: The environmental impacts of household consumption activities are no longer negligible. The use of resources such as freshwater and the production of wastes are examples of two such impacts. The consumption of various forms of energy, including the increasing use of fossil fuels by private vehicles, increases direct and indirect environmental stress through the burning of fuel.

Observation 3: In the agricultural sector in the region, particularly in Asia, pressure to increase production and improve the yield to cope with the growing population has led to the intensive use of fertilizers, pesticides and water for irrigation. There is no doubt that this process has contributed to the substantial increase in agricultural production and associated beneficial effects, including the reduction of rural poverty. However, such resource-intensive agriculture has also posed various environmental problems that, in turn, have an adverse effect on agricultural productivity. For instance, the overexploitation of freshwater resources has in some cases resulted in the drying-up of spring-fed rivers; the intensive use of fertilizers and pesticides has contributed to water pollution; and the overuse of surface water for irrigation has resulted in aquifer depletion, land subsidence or sea-water/saline intrusion.

Observation 4: In industry, the adverse environmental impacts of production activities are well known. For instance, the use of energy is essential for undertaking almost all industrial activities and operating transport infrastructure and services, but the production and use of a major part of the energy consumed in industry and transport have a detrimental environmental impact. However, the process of industrialization and economic development could entail improvement in resource efficiency and relative shifts into less resource-intensive industries, as well as the adoption of clean technologies and incremental improvements in the enforcement of environmental regulations, which have beneficial mitigating impacts. Nevertheless, rapid industrialization in the region, the resulting increase in energy production and consumption and the associated pollution has often outweighed such benefits.

Environment Degradation Leads Further Poverty: Four observations highlight the strength and importance of the inter linkages between the environment and poverty:

Observation 1: The poor live in places which are ecologically more vulnerable and are forced to earn their living from low-productivity natural resources (IFAD 2002). The rural poor often live in low-lying, flood-prone areas, on steep mountain slopes or on dry land and possess low-productivity marginal land devoid of any irrigation facilities. The number of the rural poor in developing countries living on "marginal" land could be twice the number found on better-developed land (DID 2000). The urban poor are found in the shanty towns of big cities, which are often built on flood-prone, low-lying areas or around city drains; many of the poor earn their livelihood from environmentally hazardous scavenging. Environmental deterioration in the form of land degradation, frequent flooding, increased pollution and other hazards reduces the income of both the rural and urban poor and worsens their health disproportionately by comparison with the rich.

Observation 2: It is commonly observed that poor households, especially in rural areas, derive their livelihood income from natural resources, for example, land resources for agriculture and water resources for fishing. It is also found that the poorer the household, the greater is the share of its income from environmental resources. It may be worth mentioning that a similar situation exists even at the level of countries; the shares of GDP (and exports) originating from sectors whose production is directly connected with environmental resources in poor countries are higher than those in rich countries. In addition to providing a livelihood, the environment plays a very significant part in influencing the health of the poor; while the incidence of disease in poor countries is about twice that of rich countries, the disease burden from environmental risks is 10 times greater in poor countries (World Bank 2000). Environmental degradation has a disproportionate negative impact on both the livelihood and the health of the poor.

Observation 3: It is apparent that the intensity of suffering of the poor from the adverse impacts of environmental shocks is much higher than that of the rich. However, because of the lack of proper assets, the poor are less capable of coping with those impacts. The vulnerability of the poor to environmental shocks is much higher than that of the rich in both rural and urban areas.

Observation 4: There is overwhelming evidence to show that the impact of poverty on the environment is weak compared with the damage to livelihood and health which the poor suffer owing to environmental degradation not caused by them (As much as 70 % of the world's consumption of fossil fuels and 85 % of its chemical products are

Aktar: Growth, Poverty and Environment Linkages

attributable to 25 % of the world's population who are not poor. The consumption pattern of forest products and many other commodities has the same direct inverse proportion to the size of the population of the top 20 % of the richest societies. See International Fund for Agricultural Development, op. cit.)

It can be seen that the environment has strong linkages with the livelihood, health and vulnerability of the poor. "Environmental goods and services" which are crucial to all, particularly the poor, can be classified into three broad categories: natural resources, environmental conditions, including environmental stresses, and the ecosystem. The nature and extent of their linkages with poverty, encompassing the livelihood income and health of the poor, are somewhat different. These are discussed below.

Natural Resources: Natural environmental resources can be atmospheric, land-based or sea-based. Of these, the resources which have a major bearing on the poor's livelihood and health are the following:

Land used for agricultural operations, including grazing land for animal husbandry, provides an important (often the only) source of rural livelihood. Land degradation, either natural or due to the overuse of chemical fertilizers, and the mechanization or depletion of groundwater, which increases soil salinity, could erode the most important modality of livelihood of the rural population, especially the rural poor, who do not possess the means to counter such adverse impacts. The widespread use of chemical fertilizer, pesticides and other chemicals for farming poses a formidable health hazard to the rural poor. Illiterate farm labourers who lack appropriate training in the use of poisonous chemicals are unable to read the instructions written on them and cannot afford protective devices can easily fall prey to a number of associated diseases. The poor, in both rural and urban areas, often do not have the luxury of access to safe drinking water. They have to rely on water sources which are frequently contaminated for various reasons. Water-related diseases such as diarrhoea and cholera kill a large number of people every year in the developing countries. A large number of people (2.1 million) die every year from diarrhoeal diseases (including cholera) associated with inadequate water supply, sanitation and hygiene. According to WHO, the majority are children in developing countries. Any improvement in water quality is likely to yield rich dividends in terms of improving the health standards and productivity of the poor. Fishing provides income and protein for the poor living near the sea, rivers, marshy lands and swamps. However, in many developing countries fishing sources are commercially over harvested in an unsustainable manner, which has a negative effect on the livelihood of the poor. Many commercial fishing ventures result in a number of adverse environmental impacts that could constitute health hazards for the poor who are associated with them. Coordinating policies and programs at the regional and sub-regional levels aimed at the conservation and sustainable development of fisheries forms an important element of the Plan of Implementation of the World Summit on Sustainable Development, of which poverty reduction to achieve the relevant target is a major objective.

Forest products often provide livelihood income to the rural poor. Twigs and wood collected from forests provide a major part of the energy used by the poor for cooking and heating. Forests prevent soil erosion, flooding and mud slides in hilly areas during heavy rains. The unsustainable destruction of forests causes much misery to the poor, both directly and indirectly.

Environmental Conditions: Worsening of the quality of atmospheric resources could be extremely harmful to the poorer sections of the population. There are two major environmental conditions that affect both the livelihood and health of the poor:

Indoor air pollution due to the use of bio-mass fuels (e.g., wood, crop residue) for cooking and heating in poor households affects the health of a large number of people, causing various respiratory diseases. The incidence of this type of health hazard is higher in women and children as they face primary exposure. Nearly 2 million women and children die every year from indoor pollution (DID, World Bank 2000). As many of the poor live in ecologically vulnerable places (e.g., lowlands, mountain slopes, dry areas), atmospheric changes, both gradual (climate change) and sudden (disasters), can cause severe damage to the livelihood and health of the poor. Disasters, which include hurricanes, cyclones, floods and earthquakes, have been known to have a devastating impact on the poverty situation, giving rise a large number of "new poor" almost overnight. These concerns and the extent of such damage have been highlighted in a recent publication (Mallik 2002).

Ecosystem: Forests, grasslands and the coastal ecosystem, including coral reefs, provide a wide variety of services that contribute to the continuation of economic activities in both rural and urban areas. One important activity which exploits the existence of the natural ecosystem is Ecotourism. Ecotourism is often labour-intensive and employs persons from the most vulnerable groups in rural areas, including those in remote and isolated areas and islands. Some examples of other ecosystem services include the provision of natural habitat for wild pollinators that are essential to food crops; watershed protection and the maintenance of hydrological regimes (recharging of water

Aktar: Growth, Poverty and Environment Linkages

tables) by natural processes, including rainfall; and the natural breakdown of waste products and pollutants. It is apparent that the livelihood and health of a large number of the poor are intimately related to the activities facilitated by the ecosystem and its services, and any deterioration in their availability on quality could be detrimental to the reduction of poverty.

Conservationists have shown concerns on this aspect. For example, it was indicated that the tourism development plan under the Government's economic stimulus scheme for the archipelago of Koh Chang in Thailand could threaten its rich biological diversity and genetic resources. Most of the projects under the tourism master plan are likely to cause damage to the island's ecosystem. A study has found that the island is home to 1,513 species, including ferns, mosses, algae, lichens, fungi, flowering plants and various insects. It is alleged that efforts to develop the area for tourism without addressing environmental concerns adequately, could destroy these rare species.

It has been found in another study that the construction of tourism facilities in Koh Chang would definitely drive away rare insects, particularly fireflies, which are a huge source of income for the local people (Sanabuddhi 2002). Firefly watching is one of the island's most popular eco-tourism activities. This perpetuates the dilemma of whether to develop a resort to generate income opportunities or to put greater emphasis on the protection of the natural ecology. Such trade-offs could occur in a range of other similar concerns (Raj Kumar 1986).

Environmental Hazards Due to Growth Strategies in Bangladesh

Fertilizer Policy and Environment: Measured the impact of input market reforms on the production of rice in Bangladesh by using a multi-equation model. The results indicates that reforms in the fertilizer and irrigation markets of Bangladesh can be reasonably credited with the remarkable success in rice production over the period 1984-1992 approximately 20 to 32 % of the increase in production. This increase is primarily attributed to the impact of reform on fertilizer consumption and private sector irrigation development. Bangladesh would have remained immersed in food grain shortages and higher food prices had there been no changes in the fiscally unsustainable public interventions in agricultural input markets.

Excessive Use of FertiliserL: The increase in use of fertilisers, though at a declining rate, can be explained by the attempt of the farmers to apply higher doses of fertilisers to raise production and to withstand yield decline problems due to land degradation (Pagiola 1995, p.18). This can be seen in table 1 below. As Pagiola (1995, p vii) mentions, "farmers often claim that yields have been declining and that

Table 1: Use of Chemical Fertilizer in Bangladesh (000, metric ton)

Fertilizer	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-00	2000-01	2001-02	2002-03
Urea	1547.4	1579.0	1748.5	2045.5	2141.0	1867.0	1902.0	2151.1	2121.0	2247.42	2239.0
TSP	407.0	234.2	122.9	111.1	72.6	62.4	170.2	259.3	399.5	425.31	405.0
DAP	2.0	28.7	1.8	0	0	6.8	38.6	109.2	90.1	127.03	112.0
MP	126.1	103.9	154.2	155.9	219.3	193.5	210.8	239.5	124.0	222.26	250.0
SSP	119.8	170.6	533.5	596.9	525.3	473.3	362.4	237.2	138.6	127.13	130.0
NPKS	0	0	0	0	0	0	0	0	10.2	12.87	30.0
AS	5.0	10.0	2.5	8.7	11.7	9.7	12.4	26.0	13.0	20.19	10.0
Zinc	0.7	5.2	0	1.0	1.2	0.7	0.3	1.2	3.0	0.24	2.0
Gypsum	108.2	86.1	77.2	103.6	86.6	113.4	128.2	189.4	102.3	96.05	120.0
Others	0	0.1	0	0	0	0	0	0	0	0	0
Total	2316.2	2217.8	2640.6	3022.7	3057.7	2726.8	2824.9	3212.9	3001.7	3278.50	3298.0

Source : Ministry of Agriculture

higher fertiliser applications are necessary to maintain yields". A recent study carried out by Toufique (1999, p-27) vindicated this. The findings presented there are based on a questionnaire survey of 199 farming households, 88 from Chandina and 111 from Madhupur. About 97% of the farmers believed that the use of chemical fertilisers has been increasing over the decade. Declining soil fertility (47%) and lower yields (45%) were singled out by the farmers to account for the increase in use of chemical fertilisers.

Evidence on Land Degradation: World Bank (1998) diagnosed that deforestation is the third highest of the world in Bangladesh and protection against floods, erosion, salinity is desirable where it is feasible. The report also showed concern about overuse of pesticides for vegetables. This was a serious concern expressed by Pagiola (1995). Soil degradation relates to erosion, waterlogging, salinity and depletion of nutrients. As Brandon (1998) mentions all these are found in Bangladesh. About 10% of net cultivated land suffers from medium and high salinity in the dry season. Another 10% in the hilly areas is considered highly eroded. More than half of the total land has impeded drainage and

Aktar: Growth, Poverty and Environment Linkages

they suffer from waterlogging and poor aeration (Karim, 1993).

Direct study of soil quality shows evidence of land degradation in highland agroecological zones. Such land degradation is attributed to increasing cropping intensity (Karim, Z. and M. Miah, 'Demonstration/ Development of Fertiliser Use in Bangladesh', unpublished but quoted in World Bank 2000). Soil quality is measured as the extent of organic matter between 1969-70 and 1989-90. World Bank (2000) also quoted a BIRRI study conducted in 1993 where it was found that application of organic matter in combination with nitrogen resulted in higher grain production than that produced in nitrogen only or organic matter only plots. However, average annual grain production over a period of nine years declined with every combination of organic and or chemical treatment with the decline more pronounced when organic and inorganic nitrogen fertilizers were applied together. A more recent BARC study (quoted again in World Bank 2000) found that about 33% of total land acreage falls below the minimum threshold (defined as mineral such as sulphur, zinc content of at least 1.72%) for sustainable cultivation.

We have already noticed the gradual rate of decline in the use of fertilizer. At the same time it is the total increase of fertilizers that has maintained a positive growth rate of crop, to quote Pagiola (1995), "if increase in input use had not counteracted the effects of degradation yield might have fallen even further". Pagiola (1995) boldly mentions that, "chemical fertilizer use has increased, but not sufficiently to compensate for the higher rates of offtake and has been offset by reductions in applications of farmyard manure, which is in increasing demand for use as fuel".

Bangladesh now subsidizes mainly nitrogen, so farmers over apply it and under-apply phosphate, potassium type of fertilizers (see table 1 above). There is the strong evidence on land degradation and increasing use of fertilizers is attempting to make up for this.

Shrimp Management Policy and Environment: Before the extensive shrimp culture practices that exist today traditional bheri/gher aquaculture was practiced in the coastal belt of Bangladesh. In 1950 more than 100 farms were involved in shrimp farming through trapping and rearing wild shrimp fries that came with tidal wave. The coastal embankment project of the sixties eroded this practice and made these lands suitable for rice cultivation. In the seventies the farmers began to produce shrimps in the polders in response to strong demand for shrimps in the international market. At the same time production of rice became unprofitable due to waterlogging that resulted from poor drainage. This triggered off the boom in shrimp culture and its adverse impact on the environment followed.

Shrimp farming gathered momentum during the transition from a more inward looking development strategy characterized by high degree of regulation and control on international trade to a strategy that promoted investment in export oriented activities by private agents. The following incentives were given to the shrimp sector in the process of pursuing an export-led growth strategy :

zero tariff access of imports

fiscal incentives for exports

income tax rebate

speedy customs clearance

cheap credit

leasing of private and khas land in favorable terms

institutional support for setting up downstream factories

Shrimps now account for about 9 % of total national exports (Talukder 1999) and this sector grew at rate of around 9 per annum during the last decade (Bhattacharya *et al.* 1999).

Evidence of Environmental Degradation due to Shrimp Culture in Bangladesh: As rightly observed by Bhattacharya *et al.* (1999), existing literature mainly include perception and case studies on socio-economic, politico-economical and a bit on environmental consequences of shrimp farming. Manju (1996) applied a before- after approach to identify what might be called forced livelihood diversification in village Chalbunia, the %age of population belonging to the category of rice cultivators decreased from 33% to 13% while corresponding %age for those involved in shrimp cultivation increased from 20% to 32%. Manju (1996) also found income loss for the peasant households due to shrimp culture. Income losses occurred from decline in rice productivity, loss of poultry and livestock and erosion of homestead vegetation and social forestry. Manju (1996) again mentioned that post-shrimp income level of local peasant households was only 62% of the pre-shrimp level. Adnan (1991) by applying a with-without approach, found loss in vegetation and livestock: Half of Jackfruit and Mango trees were destroyed and one-third of cattle heads disappeared in the shrimp polders during 1987-90. A scientific study sponsored by Nijera Kori (1996) found increase salinity and soil degradation vegetation loss in the south-western region of Bangladesh.

The Fourth Fisheries Project (World Bank, 1999) reflects World Bank view not only on the impact of shrimp culture on environment but also on its impact on more pressing social issues. The document admitted that "the expansion of shrimp farming has raised important issues regarding land and water use in the coastal areas" as:

Aktar: Growth, Poverty and Environment Linkages

The contrasting demands of rice farmers and those involved in shrimp farming have generated frequent conflicts in which poorer social groups in shrimp farming areas have often been the losers.

Unplanned shrimp farming development has led to degradation of agricultural land and negatively affected the livelihoods of local people”

Outbreak of diseases, particularly “White Spot” may continue to threaten the shrimp culture.

The sustainability of shrimp farming is also threatened by its reliance on the collection of wild shrimp fry. They activity now sustains a large number of households using cheap methods that supply key seed inputs to shrimp farmers but may, in the process, be gravely damaging wild stocks of both shrimp and other aquatic species.

And as long as the coastal shrimp aquaculture is concerned two further potential adverse impacts have been envisaged in the document:

The shrimp culture extends into rice growing period reducing the time needed for paddy to mature; and

The collection of wild shrimp seed increases fishing pressure on shrimp larvae and other larvae further threatening coastal biodiversity and marine and inland fisheries productivity

Major Environmental Degradations of Bangladesh and its Impact on Poverty: The economic viability of Bangladesh as a nation has long been in question mainly because of its over population, poor natural resource base, vulnerability to natural disasters and universities economy dependent on the production of two crops, rice and jute.

The economic and social consequence of natural degradation have been immense, especially when 45% of the population live below the poverty threshold and they are naturally vulnerable to the slightest change in environment. It includes damage to human resources, agriculture, fisheries, forestry and livestock. Here we will try to address the major environment problems of Bangladesh (both man- made and natural) and their impact on poverty.

Land Degradation: Land is the most prominent environmental resource for us as the majority of population live on agriculture. But the soil of our land is in a severe threat of degradation. Desertification, erosion and salinization are three types of land degradation which are commonly reported in the national dailies of Bangladesh. A process of gradual change in basic soil composition has already been set in many parts of the country. Though this is a part of a long term process, its impact has already started to be felt. The process has displaced many small and marginal farmers. There are three means through which this can happen: (1) an increase in salinization os soil, (2) accumulation of sediments of sand and stone and (3) brick klins on cultivable land. A fourth reason for degradation of soil quality may be an application of chemical fertilizers whose time limit of use has already been expired.

Increase in salinization may arise from (1) increased shrimp cultivation (2) an intrusion of salinized sea water into main land due to decrease in normal river flow because of low rainfall, and (3) the side-effect of Farakka barrage built in India which has been causing desertification in some parts of Bangladesh. However, situation has been improving since the signing of the Ganges Water- Sharing Agreement and subsequent availability of much needed water in the dry season. The salinization of soil has not only been affecting its fertility but also making the availability of fodder difficult. As a result the traditional ecological balance has been disrupted. A survey of newsstudies reveal that about two hundred thousand acres of land have already lost fertility to a significant extent due to salinization.

Degradation of land is reflected in the decline of land productivity due to losses of vegetation, exposure of the soil erosion, reduction of the organic and nutrient content of the soil and deterioration of the soil structure and its capacity to retain water. The severe arsenic contamination an emerging environmental disaster in some parts of Bangladesh, is thought to be an out come of changing land composition. The process of desertification is preceding many natural calamities (frequent and prolonged draughts) as well man made hazards (large scale deforestation, overgrazing, over cultivation of marginal lands). The gradual deterioration of agricultural soils, particularly in dry season is considered to be more menacing than desertification. A study reveals that 1.2 million hectares of land in Bangladesh suffer from sulfur deficiency, about 1.6 million hectares from zinc deficiency and about 60% of agricultural land contains less than 2% of organic matters.

Effects of River Bank Erosion: The incidences of loss of cultivable and non-cultivable land in Bangladesh due to river bank erosion are being reported regularly in the dailies. There are also ample evidences of well to do families losing their inherited land because of river bank erosion. There are two fold effects of this destructive activities of the river: a direct loss of land and sudden onset of poverty. The compinent of Task Force Report on Poverty Alleviation led by M. Hossain, (constituted by professor Rehman Sobhan in 1991) under the auspices of the than Caretaker Government of Justice Shahabuddin Ahmed, also found concentration of the poverty in areas where erosion of river bank is more acute. The end result of these twin processes is mostly migration out of the area where people and their forefathers have been living for ages (see Table 3 for incidences of landless due to river bank erosion during 1992-95 as reported in three newspapers). It should be noted here that all reports published in the newspapers did not cite the

Aktar: Growth, Poverty and Environment Linkages

exact Fig. of loss of land or migration of households. So there appears some discrepancies in the numbers of houses, people and total devoured area in relation to numbers of incidents, affected villages and families. The table however, helps understand the trend rather than computing the numbers. These Fig.s should, therefore, be taken cautiously.

Over the years thousands of rural people have migrated to urban areas not because they were fascinated by the glitters of urban life but mainly for not having any other option to keep them selves alive in the rural setting. The post erosion rehabilitation of the affected families is another sad story. Table 4 summarizes the immediate effects of erosion no the affected families.

According to in from reports and features published in the newspapers the relatively affluent ones among the affected families have been able to relocate their shelters temporarily in the houses of their relatives. They live on their past savings and move back to a lower life style. The small, marginal and the landless households normally take shelter in open road and sides of embankments. Most of these people later migrate to urban centres. They live in slums and take the least paid jobs in the informal sectors in he cities living like insects.

Table 2: River Erosion and Landlessness

Affected items reported in the newspaper	Meghna and its branch rivers	Padma and its branch rivers	Tista, Jamuna and Brahmaputra	Other rivers	Total
Number of incidents	8	18	31	21	76
Number of villages	110 (12.7)	152 (17.5)	568 (65.7)	35 (4.0)	865 (100)
Number of families	3000 (3.6)	21590 (26.1)	48210 (58.4)	9785 (11.8)	82585 (100)
Number of houses	900 (4.4)	11044 (54.0)	7650 (37.4)	850 (4.2)	20444 (100)
Number of people	195000 (38.6)	235000 (46.5)	70000 (13.8)	5650 (1.1)	505650 (100)
Cultivable land (acre)	-	72420 (45.8)	69150 (43.8)	16400 (10.4)	187970 (100)

Deforestation and Poverty: Deforestation is a major cause that damages environment in different ways. The causes of deforestation are many. It is caused by farmers engaged in expanding agricultural production, by logging companies, and big fuel wood collectors. It is revealed that fuel- wood and charcoal supply is 75% of our energy needs.

Forests are not just a source of fuel- wood and timber. They also perform a wide range of social and ecological functions. It provides livelihood and cultural integrity to forest dwellers and a habitat for plants and animals. It protects and enriches soils, provides natural regulation of the hydrologic cycles that affect local and regional climate through evaporation, influences watershed flows of surface and ground water and helps stabilize the global climate by absorbing carbon as they grow. In spite of these contributing functions of forest the pace of deforestation continues to be alarming. In 1960, the total forest area of Bangladesh was about 20% of the total landscape. In 1989, this came down to 15% (Hansen, S., 1993). While the desirable proportion of forestry in total land area of a country for ecological stability is 25 %, the Fig. continues to decline every year. Of course, there has been some improvement in the area of social forestry.

Table 3 : Resettlement of Affected People

Name of eroding rivers	Name of incidents	Emergency shelters of the affected people					Resettlement of the affected people				
		On the roads embank	In other village	Under open sky	In educational institutions	Not men-- tioned	In Dahka city	n other cities	Ports and market places	On the embank	Not men
Tista, Jamuna and Brahmaputra	31 (100)	8 (25.8)	1 (3.2)	2 (6.5)	1 (3.2)	19 (61.3)	2 (6.2)	1 (3.2)	2 (6.5)	1 (3.2)	5 (15.6)
Padma and The branch rivers	18 (100)	8 (44.4)	1 (5.6)	4 (22.2)	1 (5.6)	4 (22.2)	1 (5.6)	4 (22.2)	1 (5.6)	1 (5.6)	11 (61.1)
Other Rivers	29	5	5	2	1	16	3	4	2	2	18

Aktar: Growth, Poverty and Environment Linkages

and the sea	(100)	(34.93)	(27.00)	(10.75)	(16.70)	(76.2)	(19.1)	(29.53)	(10.75)	(33.35)	(85.7)
Total	(78)	21	7	8	3	39	6	9	5	4	54
(11.5)	(6.4)	(5.1)	54	(69.2)	(100)	(26.9)	(9.0)	(10.3)	(50.0)	(7.7)	(11.5)
											(6.4)
											(69.2)

The Natural Disasters and Poverty: Bangladesh is one of the most disaster prone countries of the world. Almost regularly, Bangladesh experiences different types of natural disaster both natural and man-made. These include flood, famine, cyclone, drought, tidal-bore, pest-attack and riverbank erosion. During the period of 1960-19, Bangladesh has been struck by at least 63 different types of natural disasters of various intensity. Among the various types flood is unquestionably the most recurrent and devastating kind of natural disaster in Bangladesh. Any abnormality in water level caused by excessive rainfall, may cause flood from normal to abnormal intensity. The annual flood affected areas usually varies between 25,000 sq. km. to 40,000 sq. km. The flood vulnerable area is however much larger. Experts estimate that out of the total of 1,42,777 sq. km., 82,088 sq. km. (i.e. 58%) area is flood vulnerable in Bangladesh. Another estimate says that the onrush of water from upstream drainage areas could create havoc by flooding about 80% of the country. In the last thirty five years since 1954, there were 28 occurrences of flood, out of which 11 were devastating and 5 most devastating. In recent years Bangladesh experienced two devastating floods in 1988 and 1998.

Besides flood, Bangladesh is also subject to several tropical cyclones which generally originate in the Bay of Bengal. Cyclone in Bangladesh occurs in April-May and October-November periods. Between 1960 and 1986, Bangladesh has been struck by 33 cyclones of which seven were most severe. Every year north-westerly winds also cause significant damage to life and crops in some pockets of Bangladesh. The recent earthquake (1999) in Maheshkhali area near Cox's Bazar has been a major source of environmental hazard as well. Pest attacks are infrequent but not rare. When there is pest attack, crops of thousands of acres of land are damaged putting the farmers in a helpless situation. It should also be mentioned that floods cause enormous shifts in river course and widespread bank erosion causing dislocation of rural peasant population. It is estimated that annual riverbank erosion causes dislocation to an estimated one million

Table 4 : Disaster and Death Toll

Date	Location	Disaster Type	Death Toll
1970	Bangladesh	Cyclone	300,000
		Earthquake	10,000
1971	Bangladesh	Civil Strife	200,000
1974	Bangladesh	Food	28,000
1978	Bangladesh	Civil Strife	6,150
1985	Bangladesh	Cyclone	10,000
1987	Bangladesh	Flood	800*
1991	Bangladesh	Cyclone	14,000
1998	Bangladesh	Flood	40,000
2004	Bangladesh	Flood	65,000

Source: UNDP, Disaster and Development: A Study in Institution Building, (Vol. I and II, United Nations Development Programme, August, 1991); and Daily Ittefaq.

population, many of whom permanently displaced. The demographic and socio-economic consequences of the problem are far reaching and often enormous. Natural disasters not only bring immense suffering and misery to millions of the affected people but also triggers a whole set of mechanisms that affects the economic and social life of people in a variety of ways bringing many changes. These changes have both short and long term socio-economic implications which require in-depth analysis. The environmental consequences of these changes are yet to be adequately documented.

Impact on the Poor: When disasters hit vulnerable populations, the effects can be devastating. In Bangladesh, a cyclone in 1970 killed an estimated 300,000 people and another cyclone in 1985 killed 19,000. The 1987 and 1988 floods brought fewer deaths, but affected almost the whole country and economic devastation. The 1998 flood was more prolonged and devastating for the poor.

It is usually the poor who suffer the most, because they lack the resources to overcome their economic losses. Their economic staying capacity is mostly low and cannot withstand the onslaught of such disasters. It is mostly emphasised that disasters result more from environmental changes and can be quite devastating if a community remains vulnerable to them.

In most cases, this vulnerability derives from poverty. Poor people are more likely to live in areas known to be disaster

Aktar: Growth, Poverty and Environment Linkages

prone since these are the least expensive sites. Poverty drives communities to move to steep hillsides in cities, which are vulnerable to landslides or in flood prone areas along river valleys. This vulnerability is further exacerbated because the poor who are forced to live in these areas are not always aware of the danger or cannot afford to undertake measures to reduce the risk of natural disaster.

That the poor are affected more adversely by flood disaster has been noted during 1998 flood as well. Most of the flood shelters were occupied by the poor men and women (See table 11). Of the 100 households who have been interviewed in a typical flood shelter in Dhaka, 70% were male headed. They were either day laborers or rickshaw pullers. The women were mostly maids in various households. Most of these poor men and women again migrated from high disaster

Table 5: Gender and Occupational Categories of Flood Affected Households, 1998

HH Category	Day Labourer / Worker	House Maid	Rickshaw	Lowpaid service	Begger	Small Business man	Unemployed man	Total
Male Headed	25	-	32	3	-	6	5	71
Female Headed	7	19	-	1	2	-	-	29
Total N=100	32	19	32	4	2	6	5	100

Source: Socio Economic Survey on Flood '98 Affected HHs Sheltered in a Flood Shelter Center (Goran Adarsho Girls High School, Dhaka) done by Unnayan Shamunnay, September, 1998.

Prone areas, mainly because of economic hardship prevailing there. (See table 12). River bank erosion also played significant role in forcing these people to migrate out of the rural areas.

Table 6: Factors Affecting RUM with Special Reference to Disaster-Prone Area

Migrating factors Disaster proneness	Migrated from High Disaster prone Area	From Less Disaster Prone Area	Total
Unemployment/ lack of work	38	23	61 (64.8)
Land/ Assetlessness	9	10	19 (20.2)
Flood/ River erosion	7	0	7 (7.5)
Social factors	6	1	7 (7.5)
Total	60 (63.7)	34 (36.3)	94 (100)

Note: Fig.s in the parenthesis represent %ages. Sample size is 100 (6 cases are non-migrant) Source: Socio Economic Survey on Flood '98 by Unnayan Shamunnay, September, 1998.

Policy Options: Environment policies can be classified into two broad groups: those which aim at reducing the adverse environmental impacts of economic growth, leading to an improvement in the environment in general and a consequent beneficial impact on the poor, and those which are targeted specifically at the poor and have a positive impact on the environment. These are discussed below.

Coordination : Achieving economic, social and environmental objectives for a country requires coordination between many agents, namely, government, producers, consumers and domestic and foreign investors; policies, namely, sectoral, fiscal and monetary, and trade policies; and institutions, including regulatory agencies and the judiciary. Strategies for achieving these objectives include raising environmental awareness and education and promotion of the 3p (people, public sector and private sector partnership).

Sectoral Policies: Visions and strategies of sustainable development must be supported by sectoral action plans that fulfil national obligations under global environment conventions of biodiversity and the phasing out of ozone-depleting substances, while ensuring adequate growth of the sector. Sectoral plans and policies have to be developed to address concerns about agricultural land and water. In order to counter deforestation, which has a negative impact on the livelihood and vulnerability of the poor, especially in rural areas, a shift towards plantation forestry is a policy option, which can be pursued. This type of shift will relieve the pressure on national forests and

Aktar: Growth, Poverty and Environment Linkages

at the same time enable the development of reliable sources of industrial raw material and contribute to strengthening the income-earning potential of the person associated with this sector.

Command and Control-Based Mechanisms: This utilizes the power of the state in forcing the agents, that is, producers and consumers, to adhere to environmental standards. For example, many countries use a quota system in forestry and fishing, in which many of the poor earn their livelihood, to keep the catch within sustainable limits. A number of countries have used command and control mechanisms to regulate effluents, emissions and disposable wastes. For example, a unique Vehicle Quota System to control the number of vehicles is in operation in Singapore, thereby reducing traffic congestion and emissions from fossil fuel. Under this system the number of new vehicles allowed for registration is predetermined annually. The quota for new vehicles takes into account the prevailing traffic conditions and the number of vehicles taken off the road permanently, while the supply-demand condition of the market determines the price of new vehicles.

Institutional Policies: Policies and programmes, whether economic, social or environmental could be implemented effectively only with the support of an interconnected network of institutions at different levels national, sub national and local. To achieve this aim, the institutions and policies (which have a bearing on the environment) of various sectors/ areas need to be well coordinated not only horizontally but also vertically. Horizontal coordination between institutions will avoid conflict and exploit complementarities, thus enhancing the impact of policies. Vertical coordination requires the existence of institutions at different levels from the national to the community level, and interaction between them. It ensures people's participation and ownership, without which all policies, especially environmental policies, will not be effective.

Property Rights of the Poor: The property rights to resources, that is, land, water and trees, play an important role in the environment-poverty linkage, especially in the rural areas. As the rural poor often rely on customary and informal arrangements, they are deprived of formal property rights and, at times, exploited. Uncertain ownership conditions have a negative impact on agricultural productivity by inhibiting investment and reducing incentives for resource conservation. The situation can be reversed by ensuring property right through policy interventions.

Social Forestry: Social forestry is the sustainable management of trees and forests by farmers, landowners, industries or community based organizations in order to provide forest products and services to meet local needs. It is distinguished from commercial forestry by the extent of stakeholder's involvement, their decision-making powers and the benefits that accrue to them. Social forestry should a wide range of activities, such as tree-planting, agro forestry, management of natural forests, watershed management and the collection of non-wood forest products. At times, social forestry can touch upon other sectors, such as the energy sector, when families plant and harvest fuel wood for domestic cooking and heating, or the agricultural sector, when farmers use trees to enrich soil, produce fodder to feed livestock and plant windbreaks to protect crops.

Access of the Poor to Environmentally Clean Technologies: One of the areas in which simple technology could bring immediate benefit to the poor as well as to the environment is an improvement in cooking stove technology to reduce air pollution and associated acute respiratory infections. The objectives of improving cooking stoves have been to conserve and optimize the use of fuel wood, especially in the rural and semi-urban areas, help to alleviate deforestation, reduce the drudgery associated with cooking, especially for women, and the health hazards caused by smoke and heat exposure in the kitchen and bring about improvements in household sanitation and general living conditions.

Implementing Anti-Corruption Measures: Corruption is directly to the unsustainable management of natural resources, especially forestry resources. A recent report by FAO identified corruption and illegal practices as the biggest threat to successful forest management, river and water management in Bangladesh. Corrupt practices can be reduced by providing quality information on the state of natural resources, effective publicity concerning corruption practices and anti-corruption laws, the agencies responsible and the penalties applied and be ensuring that violators are punished.

Disaster Management Plans and Policies: The poor are disproportionately vulnerable to environmental shocks in

Aktar: Growth, Poverty and Environment Linkages

the form of natural disasters. Natural calamities such as cyclones, typhoons, flood and mudslides occur fairly regularly and affect many countries like Bangladesh. While not all natural disasters can be predicted or prevented, policies and programmes can be formulated and implemented to mitigate the loss of life and property of the affected people and avoid destitution. A plan of action for disaster management can be formulated and periodically updated.

Strengthening Environment-Poverty Monitoring: There are substantial lacunae in the availability of data that capture environment-poverty interlink ages. In many cases, environmental data focus on environmental changes without measuring their impact on the poor, and poverty data do not capture environmental concerns. This situation can be remedied by devising appropriate environment- poverty indicators. Indicators such as deaths from acute respiratory infection by income class could quantify the state of environment health. Similarly, the extent of dependency indicated by the proportion of income generated by using primarily natural resources can be an indicator of poverty; a reduction in the extent of dependency can indicate a possible reduction in poverty. Substantial research should be taken to identify effective environment –poverty indicators. Institutional mechanisms are also needed through which the information on these indicators could be analyzed and used for designing policies to improve the environment and reduce poverty.

Fertiliser Policy: The issue of fertilizer subsidy has to be reconsidered not only on the ground of efficiency and equity but also in the context of its relation to environment.

The imbalance in general subsidy has to be removed/ reduced. Bangladesh now subsidises mainly nitrogen, so farmers over-apply it and under-apply phosphate, potassium type of fertilizers. The latter is crucial for long run conservation of soil fertility and hence it has to be subsidized more.

A regulatory framework has to be designed and maintained for expected performance of the fertilizer market.

To halt the process of and degradation the farmers should be encouraged to use organic fertilizers. This can be done by the NGOs or by the government's agricultural extension networks.

Shrimp Policy: Shrimp production will have to be done in a planned manner (for example, zoning), not in a haphazard way. Project area should be limited to those where shrimp is alternatively cultivated with rice or salt. Extensive production should be strictly directed.

Existing laws relating to shrimp production has to be strictly enforced. Sufficient sluice gets should be constructed to curb salinity and shrimp producers should argue to bear the costs of maintenance of these.

Conclusion

The aim of this study has been modest. Attempt has been made to review the inter-linkages between the environment, poverty and sustainable development and selected policies and programmes that can minimize the adverse environmental impacts of economic growth. Against the background of the positive linkage between improvement in the environment and the reduction of poverty and the negative linkage between growth and environment it can be argued that policies and programmes for improving the environment could form an important element of a pro-poor economic strategy to strengthen the impact of economic growth on poverty reduction. It is also found that certain policies (such as providing resource rights to the poor) centered directly on the poor people can improve the environment, and environmental interventions such as the prevention of land degradation and controlling indoor smoke pollution from cooking can improve the income and health of the poor.

We have seen that the pressure to increase food production has resulted in adopting policies such as excessive emphasis on (rapidly) increasing yield, withdrawal of subsidy and liberalization of input imports in Bangladesh. Adherence to these policies has generally resulted in excessive use of fertilizers, use of spurious fertilizers and inefficient use of various type of fertilizers. These had serious impact on the quality of land: nutrient content in soil declined and fertility of land eroded. Therefore the issue of fertilizer subsidy has to be reconsidered on the ground of efficiency, environment and equity. The issue is how do we make up for land degradation and there are other policies that may work well as compared to reducing the use of fertilizers by removing subsidy. For example, encouraging farmers to use organic fertilizers through NGOs or the government's agricultural extension networks. We have also seen that the objective of pursuing an export-led growth strategy has led to adoption of policies such as promotion of non-traditional exports, for example, shrimps. Privatisation was promoted to boost up exports. In the shrimp sector this resulted in rapid increase in shrimp production. The negative effects or externalities of increasing shrimp production are loss in biodiversity and increasing salinity of soil. Of course, there are other related environmental

Aktar: Growth, Poverty and Environment Linkages

concerns but these came up clearly from the consultative exercise. However a total ban on shrimp production will have strong macroeconomic effects and at the same time an unbridled production of shrimp will have serious environmental consequences. Existing evidence shows that shrimp culture is highly profitable even when environmental costs are taken into consideration at the farm level. Therefore there is nothing apparently wrong in increasing shrimp production as long as it is done in a planned manner. The impact of environmental first falls on its victims- i.e. the local people. They are the one who can describe how it affects their life and livelihoods and hence their voices have to be heard first. The problem is that the victims are not homogenous- they are differentiated and therefore they have different capabilities to withstand environmental degradation. Thus what is needed is a community response to environmental degradation and the Government policy planners, NGOs, Academics and Civil Society should work for that altogether.

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